

Edinburgh Tram Network

Draft Final Business Case

November 2006

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GLOSSARY

1. EXECUTIVE SUMMARY

Background

- 1.1 Substantial road traffic growth across the Edinburgh area combined with forecast population and employment increases will lead to significant growth in road congestion and demand for transport solutions. To support the local economy, City of Edinburgh Council (CEC) has identified trams as the preferred way to provide the backbone for a comprehensive, higher quality public transport network to support the local economy and to help to create sustainable development. The Edinburgh Tram Network (“the tram”) has been central to transport policy and planning and the wider economic development aspirations of the City for more than six years. The scheme has had in-principle funding support from the Scottish Executive (now represented by Transport Scotland) since 2003.
- 1.2 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.
- 1.3 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.
- 1.4 After consideration of a range of options it was concluded that the core of the network from Leith Waterfront to Edinburgh Airport (Phase 1a), via Haymarket and Princes Street, would give a good balance of costs and benefits, would present a high probability of being financially viable when integrated with Lothian Buses services and that the first phase of the tram development should include the section from Roseburn to Granton Square (Phase 1b) serving the development area in Granton.
- 1.5 The assumed Phase 1 (Phase 1a plus Phase 1b) carries the support of Transport Edinburgh Limited (TEL), which is charged by CEC with the delivery and management of an integrated tram and Lothian Bus network and of Transdev, the future operator of the tram.
- 1.6 This Draft Final Business Case has been prepared to support the implementation of Phase 1 of the tram, comprising Phase 1a and Phase 1b, and examines the three core tests of the viability of the scheme:
 - **Economic viability** – The quantified economic benefits and costs of Phase 1 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 1 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.
 - **Affordability** – The prospective deliverability of Phase 1 of the tram within the constraints of available funding.

Sections 2-5 of this document set out the scope, development process and the justification of the proposed scheme. A summary of these aspects is set out below.

Economic viability

- 1.7 The economic benefits and costs of Phase 1 of the tram have been assessed in accordance with Scottish Transport Appraisal Guidance (STAG) by Steer Davis Gleave, building upon the previous work submitted to Parliament in 2004 but 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

- 1.8 The tram is integral to the regeneration of the brownfield areas in the North of Edinburgh at Granton Waterfront (served by Phase 1b) and Leith Docks (served by Phase 1a). Some 25,800 new residential units (7,800 at Granton) and nearly 350,000 sq.m. of new office, retail and other commercial development (244,000 sq.m. at Granton) is projected to be built in North Edinburgh progressively between now and 2020, reflecting the growth in Edinburgh's economy and population. Without Phase 1 of the tram it is unlikely this large scale redevelopment would go ahead on the desired scale and timetable.
- 1.9 Significant new development is also envisaged in West Edinburgh with some 250,000 sq.m. of new office space (mostly at Edinburgh Park) and over 200,000 sq.m. of other commercial space again predicted to be progressively built between now and 2020. Phase 1 of the tram will facilitate and encourage this new development and, crucially, provide improved public transport between the new housing in Granton and Leith and the new job opportunities in the West of the City.
- 1.10 The forecasts reflect that by 2015 more than 5,000 residential units and 114,000 sq. m. of employment related development will not be built in the absence of Phase 1 of the tram. Granton will account for most of the additional residential units and over 50,000 sq.m. of the additional employment related development. Beyond 2015, the predicted level of new development in the absence of tram recovers but ultimately it is predicted that 2,800 residential units (mostly at Granton) and 34,000 sq.m. of new commercial development will not be built without Phase 1 of the tram.
- 1.11 In employment terms it is anticipated that more than 930 full-time permanent jobs in the City will be generated or brought forward by the development impact of Phase 1 of the tram of which 590 can be attributed to Phase 1a. 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.
- 1.12 The positive relationship between high quality transport capability – and 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 and is a critical driver of future economic growth in Edinburgh and Scotland as a whole.

Environment

- 1.13 Phase 1 of the tram will make a positive contribution towards 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 so improving mobility and accessibility but 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 towards objectives set in the Air Quality (Scotland) Amendment Regulations 2002 and to national objectives to reduce emissions of greenhouse gases.

- 1.14 The construction and operation of Phase 1 of the tram will address potential impacts on the World Heritage Status of Edinburgh by applying 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 the Phase 1 corridor, including badger setts, are prescribed in the Landscape and Habitat Management Plan approved during the Parliamentary process.
- 1.15 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 are under active development.

Safety and reliability

- 1.16 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 vehicles will also assist this objective.
- 1.17 Trams will improve the overall reliability of public transport as they generally benefit from greater segregation from general traffic and priority at junctions and present an opportunity to significantly reduce the variability of dwell time at stops compared to a bus only public transport service. 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 in the absence of trams. 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

- 1.18 Areas of Granton and Pilton to the North (on Phase 1b) and a zone around Leith Walk, as well as around Saughton and Balgreen in the West (on Phase 1a) 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 employment areas, including the new development in Granton, Leith and the West of the City at Edinburgh Park and the Airport.
- 1.19 Trams and tramstops 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 Lothian Buses for these groups.

Transport and land use integration

- 1.20 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 Granton and Leith. Phase 1 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.

1.21 Carefully considered bus-tram service integration plans and ticketing arrangements will enhance the opportunity to make journeys on the public transport network. Effective interchange facilities will be provided at the foot of Leith Walk, St Andrews Bus Station, Ocean Terminal, Gyle Shopping Centre and Crewe Toll. The tram route will integrate with Ingliston Park & Ride, already operating successfully and planned for expansion, and with other park and ride sites are under active consideration. Phase 1 of the tram also provides an opportunity to significantly improve integration with other transport modes at Haymarket, Waverley 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

1.22 Extensive work has been undertaken to build new demand forecasting models to predict use of the tram and the impact upon use of other 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.

1.23 Annual demand for Phase 1 is predicted to be 13m tram passengers in 2011 (11m for Phase 1a only). This reaches 20m once the system is fully established after 3 years from opening and rises further to 32m in 2031 (24m for Phase 1a only). 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.). The tram will meet a large proportion of this increased demand which could otherwise be met only by cars or buses on increasingly congested roads.

1.24 Mode shift from car is a key objective of the Local and Regional Transport Strategies and is fundamental to achieving the environmental, sustainability, health and traffic aspirations of the tram. Phase 1 of the tram is forecast to generate 3m additional public transport trips in 2011 increasing to over 6m additional trips in 2031, mostly in areas directly served by the tram where the change from car to public transport use will be up to 10%.

1.25 In 2011, about 17% of tram patronage will be new to public transport rising to 20% in 2031 with the balance being predominantly 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. It is therefore 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 that achieved on successful tram schemes elsewhere in the UK such as Croydon Tramlink and Nottingham.

Benefits and costs to Government

1.26 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 the Edinburgh Airport Rail Link (EARL) is developed as planned reflecting wider transport planning in Scotland.

£m Present Value, 2002 prices	Phase 1	Phase 1a	Incremental Phase 1b
Value of scheme benefits	709	373	336
Value of scheme costs	436	340	96
Net benefits	273	33	240
Benefit Cost Ratio to Government	1.63	1.10	3.50

- 1.27 The results demonstrate the positive impact delivered by the tram project. Phase 1 and Phase 1a deliver positive benefits and their benefit: cost ratios exceed the accepted minimum of 1.0. At 1.63 and 1.10 respectively, in the context of large-scale transport schemes, these ratios are regarded as representing good value for money.
- 1.28 The strong incremental benefit of completing 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 financial implications of this are summarised below.

Interaction with EARL

- 1.29 Tram and EARL can serve different market demands, tram serving the local price sensitive and time insensitive market and EARL the national, relatively price insensitive and time sensitive market. There may be scope to generate interchange trips at the airport between rail and tram, increasing demand for both and providing inter-urban links via rail with local access on the tram. Attracting patronage to such interchange journeys will depend on effective fares policy and ticketing systems. TEL sees the inclusion of multi modal through ticketing as a key element of adding to the flexibility and usability of the public transport systems.
- 1.30 Sensitivity testing shows that in the absence of EARL, tram would gain market share, particularly in respect of those travelling between the Airport and the City Centre, with additional tram patronage forecast to be 0.5m in 2011 and 1.6m in 2031. In the absence of EARL the Benefit Cost Ratio for Phase 1 of the tram would be increased from 1.63 to 2.31 (from 1.10 to 1.58 for Phase 1a only) reflecting significant increased decongestion benefits to other road users (including cars) as a result of the tram in the absence of EARL.

Financial viability (the TEL Business Plan)

Background to TEL

- 1.31 TEL was established by CEC to build on the success of the current Lothian Bus (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 at the level currently received by CEC from Lothian Buses.
- 1.32 However TEL, like LB, will also target the delivery of a 'social dividend' by maintaining lower 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.

Section 8 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

- 1.33 The table below provides a summary of the financial highlights from the forecast of TEL's profitability operating with bus and tram.

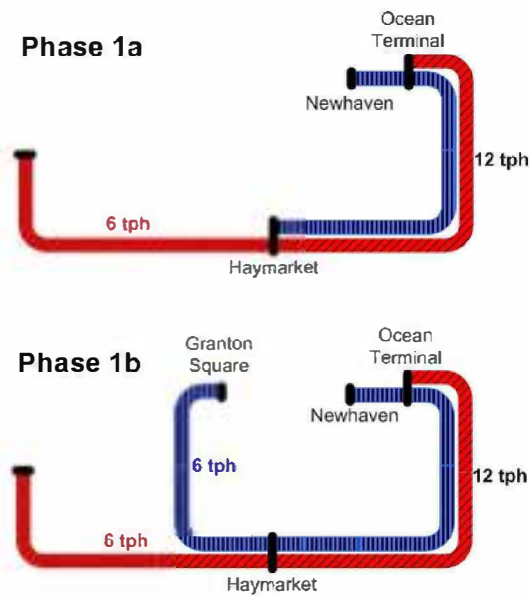
Tram in service	Pre-tram		Ph1a Only	Phase 1a plus 1b				
Tram service pattern (see below for explanation)	n/a	n/a	6/12	6/12	6/12	8/16	8/16	8/16
Year	2006	2010	2011	2011	2012	2016	2021	2031
Patronage (Pax m)								
Bus	108	117	112	110	112	121	128	142
Tram	-	-	11	13	16	23	26	32
Total TEL Patronage	108	117	123	123	128	144	154	174
Revenues and costs (£m)								
TEL Revenues	88	109	119	119	128	168	216	357
TEL operating costs			120	121	127	157	195	312
Pre-tax operating profit/(loss)			(1)	(2)	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)	(2)	1	4	10	25

NB All £ figures inflated

- 1.34 Figures for 2011 are presented on two bases; that Phase 1 of tram will be operating in its entirety in 2011 and separately that Phase 1a of the tram will operate in 2011 with Phase 1b coming into service in 2012. The forecast has been developed using the patronage and revenue forecasts for both tram and bus developed using the transport model described above and validated by TEL, tie and Transdev. The forecast reflects that TEL is prospectively a very viable and profitable business.
- 1.35 The forecasted patronage and revenues for tram in 2011 to 2014 have been conservatively reduced to take account of a ramp-up period as new services take 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.
- 1.36 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.
- 1.37 The operating cost projections provide adequately for the purchase of new buses to renew and/or expand the existing bus fleet. 'Tram lifecycle costs' is the expenditure on the tram infrastructure and vehicles necessary to ensure the tram assets reach the end of their useful lives. Provision is made in the forecast for such expenditure required to achieve the life expectancy of the system over the first 30 years of operation and to ensure the system performs effectively throughout, including the half-life refurbishment of tram vehicles after approximately 15 years. The TEL Business Plan does not specifically provide for the major replacement expenditure which will be required after 30 years.
- 1.38 Taxation is provided at the currently prevailing rate on forecast net profits. TEL will engage in the examination of tax mitigation opportunities in the same way as other commercial entities.

Integrated service patterns

- 1.39 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 beyond 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 1 of the tram are depicted below for Phase 1a only and for a complete Phase 1.



tph = trams per hour

- 1.40 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 Leith to Haymarket section and 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.
- 1.41 Amendments to bus service patterns are envisaged where the tram runs parallel or close to an existing bus route to prevent unnecessary overlap of services, the principle being 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. Feeder buses will be provided linking Crewe Toll with the Western General Hospital and existing services to the area would be maintained.
- 1.42 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 the Foot of Leith Walk, St Andrew Square and Crewe Toll.

3rd party responses

- 1.43 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

- 1.44 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 - journeys to and from the Airport and night services. It is a fundamental assumption that TEL bus and tram will both participate in the national concessionary ticketing scheme. The relevant agreement has not yet been finalised although Transport Scotland have given support for this assumption in the preparation of the TEL Business Plan. 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 Lothian Buses patronage. This level of recompense is assumed to continue.
- 1.45 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.
- 1.46 Tram tickets are to be purchased off-board and ticket machines will be provided at all trams 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 from ticket vending machines. TEL will continue and enhance 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

- 1.47 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

- 1.48 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

- 1.49 TEL's bus operating cost projections are based on the current experience of LB for buses. Tram operating costs are based upon the planned service patterns and required number of tram vehicles, validated by Transdev and subjected to a thorough review and benchmarking process. 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.
- 1.50 Maintenance of the tram vehicles and infrastructure is being procured separately to cover maintenance services, including lifecycle maintenance, with a significant proportion of the maintenance fees based on a punctuality and availability monitoring regime and high

presentational standards. Key Performance Indicators (KPIs) will be adopted with which the success of TEL in realising the benefits expected from the integrated bus and tram business can be measured. These KPIs have or will be 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

- 1.51 Phase 1 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 assumed new development at Granton reduced by 75% and new development delayed by 5 years in other areas, overall TEL revenue would be reduced by 3% in 2011 (13% in 2031)
- 1.52 Although not at first sight dramatic, these reductions are significant to forecast levels of profitability and cash flow. 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.
- 1.53 On Phase 1b the opportunities to mitigate the impact of lower demand are lower than on Phase 1a since a greater proportion of the patronage will be carried by the tram. Opportunities will however exist to reduce the planned level of tram services to mitigate the negative impact. Although forecast patronage on Phase 1b in 2011 amounts to c30% of total tram passengers, nearly 70% of that demand will be directly dependent on the new development at Granton waterfront. In context however this represents a relatively small proportion of TEL's total revenue.
- 1.54 A key issue arises in the early period of operations, when the development at Granton is building up. This is the period when overall network profitability is most challenging because of the ramp-up period described above. Careful evaluation of the inherent risk is necessary to avoid unacceptable early period losses and the means to do so are addressed in the context of affordability.

Affordability

- 1.55 The summaries above demonstrate that Phase 1 of the tram (and Phase 1a on it own) can deliver significant economic benefits in return for the proposed investment. Phase 1b will make a very positive contribution to the economic case. TEL can operate as a financially viable integrated bus and tram business with Phase 1 of the tram. Here we consider the affordability of Phase 1 of the tram in the context of visible funding, the risks being borne by CEC and Transport Scotland as the principle funders and the rationale for keeping decision making flexible with respect to Phase 1b. Section 9 contains the detailed analysis.

Cost estimates

- 1.56 In November 2006, tie and its advisors completed a detailed review of the cost estimate for the project to reflect the agreed scope of Phase 1 and a programme for delivery of Phase 1 into service by Mid 2011. The updated estimate for Phase 1 is:

Phase 1 in total	£592m
Phase 1a only	£500m
Phase 1b incremental cost	£92m

- 1.57 Based on the estimating methodology used, the level of certainty and confidence associated with the updated estimate is considered to be relatively high. Nearly 98% of the costs have been estimated based on rates and prices from firm bids received, known rates applied to quantities or based on market rates applied to quantities derived from Preliminary Design. The level of confidence is reinforced by benchmarking against other tram schemes and the relatively high allowance for risk included in the estimate as explained below.
- 1.58 The updated estimates comprise base costs and an allowance for risk and uncertainty. A rigorous Quantitative Risk Assessment has been applied to identified 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 12% of the underlying base cost estimates. This prudent allowance for cost uncertainty reflects the evolution of design and the increasing level of certainty and confidence in the costs of Phase 1 as procurement has progressed through 2006.
- 1.59 **tie** 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.
- 1.60 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 an appraisal of the prices received
 - **Infrastructure** – Tenders were issued for Infraco in October 2006 and pricing information is due to be returned in early 2007. Quantified estimates for the infrastructure works prepared by the System Design Services consultant and based on design were reviewed and reconciled with independent estimates prepared by Cyril Sweett. The cost estimates have been benchmarked against other comparable tram schemes.
 - **Land compensation costs** - Estimates have been provided by the District Valuer and it is intended to commit to certain of the acquisitions required for Phase 1a using a General Vesting Declaration procedure by March 2007.
 - **Internal costs** – Comprises mainly 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, Transdev, all of which have been estimated using a detailed resourcing plan and known or market rates.
- 1.61 The Tramco contract cost and MUDFA contract rates are fixed price at outturn price levels. The base estimate costs for remaining items were estimated at current (2nd Quarter 2006) price levels and have been inflated over the duration of the works at an annualised rate of 5% with a further 1% allowed for in the calculation of risk allowances given the uncertainty of forecasting future market price levels. This allowance is consistent with the forecasts assessed by the RICS Building Costs Information Services (BCIS) and indices prescribed by Transport Scotland.
- 1.62 In summary, the cost estimate reflects substantial external validation and contains a sensible level of risk contingency.

Measuring affordability

- 1.63 In January 2006, CEC made an in-principle commitment to make a contribution of £45m towards the capital cost of Phase 1 and in early February 2006, Scottish Ministers announced an increase, in line with indexation, of the grant of £375m originally offered in March 2003 up to approximately £500m. The final level of the grant will depend upon the actual level of cost inflation in the industry and the programme over which Phase 1 of the tram project is built.
- 1.64 The benchmark total funding package is therefore £545m. The updated cost estimates above reflect that Phase 1a, at a cost of £500m, is affordable within this level of funding with a 9% headroom over and above the 12% risk allowance provided for in the cost estimate. However a complete Phase 1, at a cost of £592m, is £47m or 9% in excess of the benchmark.
- 1.65 In considering the affordability equation, there are a number of variables which may change the final picture:
- The receipt and final negotiation of Infraco tender prices. The progression of Detailed Design would serve to further mitigate the pricing of risks by Infraco bidders and to reflect further examination of value engineering opportunities.
 - The effectiveness of **tie** and other stakeholders in mitigating the risks which have been quantified in the cost estimates at 12% of base costs.
 - The application of Transport Scotland's indexation proposals to the final contracted capital costs.
 - Examination and execution of opportunities to secure contributions from property developers over and above the levels of contribution which were assessed by CEC as necessary for the delivery of their existing £45m contribution.
 - Updated assessment of the pace and scope of development at the Granton Waterfront.
 - Final determination by CEC and Transport Scotland of the level of funding which can be made available by each party for Phase 1 of the tram in the context of the economic and public transport benefits assessed in this Draft Final Business Case.
- 1.66 In order to maintain momentum on the project and to realise the benefits forecast for the project, it is critical that construction commences as soon as possible in 2007 with early commitment to mobilisation of the MUDFA contractor and to the procurement of long lead items. It is therefore appropriate to adopt an approach to construction commitment which manages overall affordability risk.

Phased 1a then 1b approach

- 1.67 One solution to these issues would be to adopt a phased approach to the implementation of Phase 1 such that construction of Phase 1a proceeds with a target opening date of end December 2010 and construction of Phase 1b would commence in mid 2009 with a target opening date for Phase 1b for December 2011.
- 1.68 The principal advantages of adopting the phased approach would be:
- Phase 1 is maintained as the preferred first phase of the tram as supported by the tests of economic viability and financial viability. The economic benefits to be derived from Phase 1 are diluted by the adoption of the phased approach but Phase 1a is economically viable in its own right.
 - If approved, elements of the construction of Phase 1a as the 'spine' of Phase 1 can commence immediately as it is currently comfortably within the affordability envelope, currently assumed to be £545m.
 - Phase 1a could be delivered into operation earlier – potentially by the end of December 2010 – and with greater certainty.
 - Detailed design activities could in the short term be more focussed on the challenges of Phase 1a and thereby on the project risks associated with that section.

- It reflects a prudent, risk-controlled approach to managing the financial impact on TEL if the scale of development assumed for Granton in particular does not materialise in the timescales currently envisaged. In addition this approach would provide TEL with an increased focus on the integration of Phase 1a with the bus services in advance of integrating Phase 1b.
- Decisions regarding the timing of commitment to Phase 1b can be made with the benefit of greater clarity with respect to the variables which still exist as explained above. In addition, there would be significant construction progress on Phase 1a providing greater capital cost certainty for that phase and therefore the whole of Phase 1

- 1.69 A review of the updated cost estimates by tie indicates that, if contracts can be appropriately concluded, adopting the phased approach to implementing Phase 1a and then Phase 1b would not materially increase the overall cost estimate for Phase 1 compared to simultaneous construction assuming that construction of Phase 1b does not commence significantly later than Mid 2009 as reflected in the programme.
- 1.70 The tender documents for the Tramco and Infraco contracts have been structured such that separate prices can be derived for the delivery of Phase 1a and Phase 1b subject to clarification and negotiation with the bidders. This would provide CEC with priced and contractually committed options to proceed with Phase 1b when approval is given.
- 1.71 However, any decision to adopt a phased approach must be taken in light of the disadvantages such an approach might bring. The redevelopment at Granton which is facilitated by Phase 1b is very likely to be delayed as a result of a later introduction of the improved transport infrastructure which is required to encourage and serve the new development. The wider economic benefits which can be delivered by Phase 1b as detailed above would be realised later even if they are not materially reduced in total.
- 1.72 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.

Application of available funding

- 1.73 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 9. Funding from Transport Scotland 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 to the private sector as part of tie's Procurement Strategy.
- 1.74 CEC must balance its desire to support the project with its fiduciary responsibility and limited resources. CEC's contribution, therefore, 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.
- 1.75 It is recognised that the sources of CEC funding may be received after key milestone payments are required, which could cause CEC to suffer cash flow difficulties and, in the event any element of the contribution were borrowed, additional interest payments. In these circumstances, Transport Scotland will consider whether there is scope to relax the strict

proportion in the early years, without reducing the binding commitment on CEC to make its overall agreed contribution. 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.

- 1.76 Certain other aspects of the funding structure remain to be agreed between CEC and SE in the period up to the award of the Tramco and Infraco contracts, most importantly the mechanism by which increases in capital costs would be managed, funded, or shared in the unlikely event that the forecast outturn costs for the project at any time exceeded the funding available.

Procurement strategy and progress

Overview of Procurement Strategy

- 1.77 The Procurement Strategy being followed by tie responds to feedback from the national Audit Office in 2004 on the effectiveness of light rail schemes. The objectives of the Procurement Strategy are summarised as follows:

- Transfer design, construction and maintenance performance risks to the private sector
- Minimise the risk premia (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).
- Gain the early involvement of the operator to mitigate the risk relating to the future operation of the tram.

- 1.78 The five key contracts that tie has or will enter into are:

- **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
- **Multi Utilities Diversion Framework Agreement (MUDFA)**
Awarded to Alfred McAlpine in October 2006
- **Infrastructure provider and maintenance (Infraco)**
Tender documents issued in October 2006 and due to be returned in early 2007
- **Vehicle supply and maintenance (Tramco)**
Tenders received in October 2006 and currently being evaluated.

- 1.79 In addition to advance utility diversions, the outcome of the strategy will be two contracts with different private sector entities: an operating contract, the DPOFA, and an infrastructure contract, the Infraco. 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. deliver value for money.

- 1.80 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.
- Bonds and Warranties in the SDS, Tramco and Infraco contracts - to provide recourse in the event of failure.

1.81 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.

1.82 Section 7 provides a detailed analysis of the procurement strategy and Section 10 describes the approach to risk management in all aspects of the project.

Risks retained by the public sector

1.83 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.

1.84 As the project moves towards 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** must 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. A prompt start to utility diversions is a key element of the mitigation of this risk.
- **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 Transport Scotland. However significant

unforeseen changes to scope and specification could have a very significant impact on the deliverability of the project. Effective management of the consideration of any significant changes through the Governance processes implemented for the project will be vital to mitigate this risk.

- **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.

Programme

- 1.85 The table below presents the key milestone dates with respect to the continuing procurement and implementation of Phase 1 of the tram in chronological order. The detailed programme from which these dates have been extracted is described in Section 11 and has been prepared on the basis that construction of Phase 1a will commence in December 2007 and Phase 1b will commence in June 2009, with opening dates in December 2010 and December 2011 respectively. The programme for implementation of Phase 1b will require to be kept under review as the resolution of affordability constraints becomes clear.
- 1.86 tie, CEC and Transport Scotland will continue to develop the integrated programme for review, approval and decision making by stakeholders required to meet these milestones in accordance with the agreed Governance structure for the tram project.

Milestones	Date
Approval of Draft Final Business Case by CEC	21 Dec 06
Approval of Draft Final Business Case by Transport Minister – approval and funding for utility diversions	15 Feb 06
TRO process commences	13 March 07
Tramco - complete initial evaluation/negotiation	19 Mar 07
MUDFA - completion of pre-construction period of MUDFA contract	02 Apr 07
MUDFA - commencement of utility diversions	Apr 07
Infraco – return of stage 2 bids	05 April 07
Tramco - appointment of Preferred Bidder	10 May 07
Infraco - completion of evaluation/negotiation of bid	10 May 07
Infraco - appointment of Preferred Bidder.	10 May 07
Tramco/Infraco - facilitation of novation negotiation complete	07 Jun 07
Tramco/Infraco - final negotiation and appointment	19 Jul 07
Infraco - negotiation of Phase 1b complete.	13 Sep 07
Approval of Final Business Case by CEC and Transport Scotland – approval and funding for Infraco / Tramco	27 Sep 07
Tramco/Infraco - award following CEC/TS approval & cooling off period.	11 Oct 07
Construction commences on Phase 1a	07 Dec 07
TRO process complete	17 July 08
Construction commences on Phase 1b	29 Jun 09
Construction complete Phase 1a	08 July 10
Operations commence Phase 1a	Dec 10
Construction complete Phase 1b	11 July 11
Operations commence Phase 1b	Dec 11

Funding requirements from April 2007

- 1.87 To date, Transport Scotland and CEC have approved sufficient funding to meet forecast expenditure up to 31st March 2007. This includes funding of payments of compensation under a General Vesting Declaration process to secure land required for the construction of Phase 1a insofar as it is not already owned by CEC or contributed under section 75 agreements.
- 1.88 Upon approval of this Draft Final Business Case, there will require approval of additional funding amounting to £61m for forecast expenditure in the period from April 2007 to the planned award of Infraco and Tramco in October 2007. This additional funding will provide c£30m for all scheduled utility diversion activities (including those under MUDFA) and certain other ancillary and advance works required to be undertaken prior to the commencement of Infrastructure works. The balance will be required for continuing design, project management and progression of approvals and consents.

Summary of specific approvals arising from this business case

1. Commence utility diversions under the MUDFA contract and other advance works in preparation for the awards of the Infraco contract programmed for October 2007 – such approval being conditional on an analysis of the first stage Infraco tenders demonstrating the continued affordability of Phase 1a.
2. Proceed with detailed design and procurement in accordance with the principles and programme detailed in this Draft Final Business Case
3. Funding to cover the period from 1 April 2007 to financial close in October 2007 in the amounts of £61m.

Conclusion

- 1.89 The Edinburgh tram project has now been under assessment for 6 years. During that period, the underlying rationale for the project, support to the growth of the Edinburgh economy by providing high quality transport connectivity, has been reinforced by events. The city's economy and population continue to grow and the prospects are that this will continue. The Scottish economy as a whole is strongly influenced by the success of Edinburgh.
- 1.90 The business case seeks to set out in an objective and clear manner the advantages and disadvantages of the proposed scheme as a means of providing the enhancement to transport provision which the city will require if its growth ambitions are to be realised. The documentation is detailed and complicated, reflecting the scale of the scheme and the need for rigorous, professional analysis of the proposal. In its entirety, the document should represent a "balanced scorecard" assessing all the key aspects of the proposal. The document also sets out the means by which the project may be implemented in a risk-controlled manner, should the business case be approved.
- 1.91 The responsibility for delivering this document was given to the Tram Project Board by the City of Edinburgh Council through Transport Edinburgh Limited and by Transport Scotland. It is these organisations who now have the responsibility of concluding on the way forward for the project, based on the evidence presented in this business case.

2. INTRODUCTION

2.1 The following summarises the content of the remaining sections of this Draft Final Business Case:

3 - Project Development and Phasing: Details the historical development of the project up to the end of the Parliamentary process and describes the adoption of Phase 1 as the first phase of tram implementation.

4 – Project Justification: Summarises the findings of the STAG2 on Phase 1 of the tram which is included in full at Appendix II.

5 – Project Scope: The functional specification for Phase 1 of the tram.

6 – Governance: The agreed Governance structure which summarises the roles of TEL, tie and the Tram Project Board as well as the powers reserved by CEC and Transport Scotland.

7 – Procurement & Implementation: Details the contractual structures for the implementation of the project and the way risks are allocated between the public and private sector in a way which delivers value for money for the Government.

8 – Operational plan: Summarises the TEL Business Plan as included in full at Appendix I incorporating an assessment of the prospective profitability of TEL operating as an integrated bus and tram business.

9 – Financial Analysis: Gives details of the process by which capital costs for Phase 1 of the project were estimated, assesses the affordability of the project in light of available funding and examines the benefits of maintaining flexibility and managing risk through a stages construction of Phase 1a and Phase 1b.

10 – Risk Management: Explains the type of risk the project faces and the management processes by which they are identified, quantified where possible and managed/mitigated.

11 – Programme Summary: Summarises the key milestones in the programme for delivery of the project which is in turn based upon Phase 1a opening in December 2010 and Phase1b opening in December 2011. Detailed Gantt charts are provided at Appendix V.

3. PROJECT DEVELOPMENT AND PHASING

History of project development

3.1 Substantial road traffic growth across the Edinburgh area combined with forecast population and employment increases will lead to significant growth in road congestion and demand for transport solutions. To support the local economy, the City of Edinburgh Council (CEC) identified trams as the preferred way to provide the backbone for a comprehensive, higher quality public transport network to support the local economy and to help to create sustainable development. The key milestones in the development of the project to date are summarised in Table 3.1 and detailed in the text that follows. Progress to date on the procurement and implementation of the project is detailed in section 7.

Table 3.1 – Key development milestones to date

1998	<ul style="list-style-type: none"> • White Paper – “Scotland’s Transport Future”
1999	<ul style="list-style-type: none"> • City of Edinburgh Council Integrated Transport Initiative (ITI) – Inception • City of Edinburgh Council Local Transport Strategy (LTS) - Interim
2000	<ul style="list-style-type: none"> • City of Edinburgh Council LTS 2000 – Published • Waterfront Edinburgh Limited (a Joint venture between City of Edinburgh Council and Scottish Enterprise Edinburgh and Lothian) commissions the ‘Feasibility Study for a North Edinburgh Transit Solution’
2001	<ul style="list-style-type: none"> • Feasibility Study for a North Edinburgh Transit Solution – Published • City of Edinburgh Council commissions the ‘Edinburgh LRT Masterplan Feasibility Study’
2002	<ul style="list-style-type: none"> • Transport Initiatives Edinburgh Limited (now tie) incorporated • Scottish Executive ‘Approval in Principle’ of the City of Edinburgh Council’s ITI • Scottish Executive funding grant awarded to support the introduction two Bills into Parliament - Tram Line 1 and Tram Line 2
2003	<ul style="list-style-type: none"> • Edinburgh LRT Masterplan Feasibility Study - Published • Transport Minister announces £375million ‘available in principle’ for the Edinburgh Tram’.
2004	<ul style="list-style-type: none"> • Tram Line 1 and Tram Line 2 Bills submitted to Parliament • City of Edinburgh Council LTS 2004 – Published
2005	<ul style="list-style-type: none"> • Tram Line 1 and Tram Line 2 Bills Preliminary Reports heard by Parliament and proceed to Consideration Stage
2006	<ul style="list-style-type: none"> • Both Bills passed by Parliament following Final Stage debate and receive Royal Assent

- 3.2 The tram scheme was first considered in the White paper entitled “Scotland’s Transport Future” which was published in 1998. In line with the aspirations of the White Paper, CEC included the development of a rapid transit network in its Local Transport Strategy (LTS) Interim Report published in 1999. This was followed in 1999 by CEC’s New Transport Initiative (now known as the Integrated Transport Initiative or ITI). The ITI was aimed at making a significant contribution to meeting national, regional and local transport objectives and supporting long term economic prospects and quality of life offered by South East of Scotland through the introduction of a congestion charging scheme with a supporting package of major transport investment.
- 3.3 In 2000 CEC’s LTS was published which confirmed that the development of a tram network was central to its transport policy. In addition, Waterfront Edinburgh Limited commissioned a feasibility study for a North Edinburgh Rapid Transit Solution. This study which was published in 2001 examined the technical and economic case for a rapid transit system serving North Edinburgh and concluded that a loop which connected North Edinburgh with Haymarket and the City Centre using Light Rapid Transit (LRT) or tram based technology offered the best potential. Further details of the findings of this study are provided at 3.29 et seq. below.
- 3.4 In October 2001, CEC approached the Scottish Ministers with an “Application in Principal for an Integrated Transport Initiative for Edinburgh and South East Scotland” (the Application) setting out the underlying rationale for their ITI. Before reaching a final ministerial decision on the Application, the Minister for Enterprise, Transport and Lifelong Learning proposed that an arm’s length company should be established to further review and develop the Application and the scope of the ITI and to deliver the ITI.
- 3.5 On 30 April 2002 Transport Initiatives Edinburgh Limited (now ~~tie~~ limited) was incorporated. Thereafter on 18 December 2002, the Application was approved by the Scottish Ministers and as a result the Scottish Executive awarded a funding grant to support the introduction of the Edinburgh Tram (Line One) Bill and the Edinburgh Tram (Line Two) Bill to the Scottish Parliament.
- 3.6 The case for the tram was further considered in the Edinburgh LRT Masterplan Feasibility Study commissioned by CEC in 2001/2002 and produced and published by Arup in 2003 (the Arup report). It confirmed that the northern loop should receive the highest priority followed by the western and south eastern lines. The Arup report also concluded that LRT or tram was the appropriate choice for a city of Edinburgh’s size. Further details of the findings of the Arup Report are provided at 3.35 et seq. below.
- 3.7 The recommendations in the ‘Feasibility Study for a North Edinburgh Rapid Transit Solution’, ‘Edinburgh LRT Masterplan Feasibility Study’, CEC LTS and the CEC ITI culminated in funding support in June 2002 from the Scottish Executive to develop the North Edinburgh Loop (Line 1) and the Western Route (Line 2) for Parliamentary submission.
- 3.8 In March 2003 the Transport Minister announced that there was £375 million ‘available in principle’ for the Edinburgh Tram.
- 3.9 In respect of Line 1, the option development process was revisited in 2002 and 2003 through the work carried out by Mott Macdonald in the Work Package One Report. The preferred option was broadly confirmed subject to potential alignment variants at George Street/Princes Street and Telford Road/Roseburn Railway Corridor. These options were taken forward to public consultation.
- 3.10 As for Line 2, the starting point was to examine and select the preferred route corridor through west Edinburgh. Over thirty route options were defined and three basis corridors identified. The preferred route corridor was carried forward to public consultation as were various sub-options – George Street/Princes Street; Roseburn to Carrick Knowe section; Gogar Roundabout and the alignment at the airport.

- 3.11 Public consultation took place on the preferred route alignments for both lines during May – July 2003 and as a result of the consultation responses and comments, a single preferred route alignment for each line was identified and the necessary Private Bill and accompanying documents developed.

Parliamentary approval

- 3.12 On 23 December 2003 the Edinburgh Tram (Line One) Bill and the Edinburgh Tram (Line Two) Bill were submitted to the Scottish Parliament. CEC approved its LTS 2004 – 2007 on 22 January 2004 which reconfirmed that the development of a tram network was central to CEC's transport strategy. Thereafter both Bills were formally introduced to the Scottish Parliament on 29 January 2004.
- 3.14 The Bills, as drafted, proposed two lines which could be operated as part of a network.
- Line 1: a loop from St Andrew Square along Leith Walk to Leith, west to Granton, South to Haymarket via the Roseburn Railway Corridor and back to St Andrew Square via Princes Street. The overall route length is 15.6km with tramstops at 22 locations.
 - Line 2 follows a western direction from St Andrew Square via Princes Street, Haymarket, Murrayfield and South Gyle to Edinburgh Airport and with a shuttle extension from the Airport to Newbridge. In total the line covers 17.8km and has tramstops situated at 18 locations.
- 3.15 The section of tramway between St Andrew Square and Roseburn is common to both Line 1 and Line 2.
- 3.16 Both Bills were considered by separate Committees. The Edinburgh Tram (Line One) Bill Committee published its preliminary stage report on 16 February 2005, which was debated by the Scottish Parliament on 2 March 2005. The Edinburgh Tram (Line Two) Bill Committee published its preliminary stage report on 9 February 2005 and it was debated on 23 February 2005. Both Bills received unanimous but qualified support to proceed to the consideration stage.
- 3.17 During the consideration stage, the promoter (CEC) sought to amend the route alignment of both Bills. In relation to Line 1, there was a small amendment at Leith. In relation to Line 2, there was an amendment at the Gyle to pull in the limits of deviation so that the alignment runs along the edge of, rather than through, the Gyle car park. In relation to the common section there was an amendment at Haymarket which moved the alignment from between Citypoint and Elgin House to a line in front of Elgin House along the reserved public transport corridor. These changes were assessed using the STAG appraisal guidance and supplementary accompanying documents were submitted with the proposed amendments to the Bills.
- 3.18 The Edinburgh Tram (Line One) Bill Committee published its consideration stage report on 1 March 2006 and this included a recommendation that the route be amended as sought by the Promoter. The Edinburgh Tram (Line Two) Bill Committee published its consideration stage report on 21 December 2005. Again this included a recommendation that the route be amended as sought.
- 3.19 The Final stage debate for the Edinburgh Tram (Line One) Bill took place on 29 March at which time the Bill was passed. It subsequently received Royal Assent on 8 May 2006. The Final Stage debate for the Edinburgh Tram (Line Two) Bill took place on 22 March at which time the Bill was passed. It subsequently received Royal Assent on 27 April 2006.

National transport policy

- 3.20 National planning policy is shaped by the National Planning Framework. This document supports the integrated planning of land-use and transport as exemplified by the Edinburgh and the Lothians Structure Plan.
- 3.21 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.
- 3.22 In terms of delivering the vision, the White Paper specifically states

“We [the Scottish Executive] 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.”

Regional and Local Transport Strategy

- 3.23 SESTRAN is one of 7 Regional Transport Partnerships in Scotland. Within the SESTRAN area there is a huge diversity of transportation issues from urban congestion to rural public transport and from ferry ports to Airports. SESTRAN aims to address these issues and work towards a more sustainable and efficient transport network. Under the Transport (Scotland) Act 2005, SESTRAN has a statutory obligation to prepare a Regional Transport Strategy (RTS). A Draft RTS was published for consultation in November 2006, with delivery of the final document expected in March 2007. The purpose of this RTS is to address transport issues in the region over the next 10-15 years. The Draft RTS is supporting of the tram and under the Strategy Framework section covering network-based initiatives dealing with carefully targeted physical infrastructure schemes and public transport supply on the principal corridors, the RTS states that “proposed measures include new / more bus services, greater bus priority, new interchanges, support for new tram and rail schemes, traffic management and improved public transport quality”.
- 3.24 CEC resolved in October 1998 to prepare its Local Transport Strategy (LTS), and this was published in 2000. An update of the LTS was approved by CEC in January 2004. It sets out a vision for transport in Edinburgh as follows:

“Edinburgh should be a city with a transport system which is accessible to all and serves all. Edinburgh’s transport system should contribute to better health, safety and quality of life, with particular consideration for vulnerable people such as children, the elderly and disabled people; it should be a true Citizen’s Network. The transport system should support a strong, sustainable local economy.”

“People should be able to meet their day to day needs within short distances that can easily be undertaken on foot, by bicycle, or by public transport. Choice should be available for all journeys within the city. The city should develop and grow in a compact form that minimises the need for travel, especially by car.”

- 3.25 The aims of the LTS are to improve safety for all road and transport users; reduce the environmental impacts of travel; support the local economy; promote better health and fitness; reduce social exclusion; and maximise the role of streets as places to meet and play. The

LTS also sets out the schemes to be pursued in the longer term, dependent on funding, including “a light rapid transit system for the city”.

- 3.26 The LTS included identifying and implementing a series of measures (the ‘New Transport Initiative’, and subsequently the ‘Integrated Transport Initiative’ (“ITI”)), which was presented to CEC’s Transportation Committee in May 1999. The Committee authorised implementation of Phase 1 of the strategy, which was to identify major improvements needed to the city’s transport system. The measures that were identified were a congestion charging scheme, together with a package of improvements to public and private transport.
- 3.27 In May 2000, CEC considered the results of Phase 1 of the ITI and agreed to embark on Phase 2, an examination of the ways of achieving the measures that had been identified. The CEC Executive considered Phase 2 in September 2001. The package of suggested improvements to public and private transport was divided into five areas: rail, tram and guided bus; integrated transport including park and ride; bus improvements; road maintenance; and quality of life and environmental improvements.
- 3.28 The report concluded that the best way to deliver the improvements was to set up a wholly-owned subsidiary to implement such elements of the ITI. CEC established **tie** as a wholly-owned subsidiary company in 2002 with the role of project management, procurement and implementation. **tie** was established with its own staff, a majority of private sector board members and the remit to develop the ITI and to take forward the development of three tram line projects. CEC retained the transport strategy function and once agreed projects move to the detailed development and procurement stage, **tie** takes responsibility for these.

Feasibility Study for a North Edinburgh Rapid Transit Solution

- 3.29 In support of the development of CEC’s LTS, a potential Rapid Transit Solution (RTS) for linking the Waterfront development in the North of Edinburgh to the City Centre was commissioned. This work was performed by a partnership of Andersen, Steer Davies Gleave and Mott MacDonald and published in July 2001.
- 3.30 The ‘Waterfront Report’ as it came to be known, examined potential technical solutions for a RTS, the options considered were initially:
- Bus Based - Quality Bus, Alternative Fuel;
 - Guided Bus Based - Kerb Guided and Electronic Guided;
 - Light Rapid Transit - Light Rail; and
 - Automated Guideway - Monorail, People Mover and Maglev.
- 3.31 After initial assessment of the relative merits and demerits of each transport mode they were judged against 4 key questions:
- Will the technology work in the available corridor?
 - Does it achieve the overall quality desired of the system?
 - Does the technology match the scale and form of network proposed, including future developments?
 - Will the technology attract the anticipated patronage or have adequate capacity?
- 3.32 Leading on from the above assessment the following options, as discussed in the ‘Waterfront Report’, were discounted:
- Transitional Bus;
 - Monorail;
 - Guideways;
 - Magnetic Levitation; and
 - People movers.

- 3.33 Two remaining options - Guided Bus and Light Rail, were taken forward for detailed assessment against the criteria in Table 3.2 below:

Table 3.2 – “Waterfront Report” – assessment of Guided Bus and Light Rail Transit options

Criterion	Guided Bus	Light Rail Transit
Alignment	If segregated similar issues to LRT, otherwise easier to design.	Dedicated alignment design required whether segregated or not.
Public Utilities Impacts	If segregated similar issues to LRT, otherwise no relocation required.	All longitudinal services beneath swept path must be relocated.
Traffic Impact	Will need to contend with existing bus service on street.	Greater priority afforded thus reduced impact if properly policed.
Modal Interchange	No major benefit over existing bus services.	Benefit of incorporating new mode of transport at interchange.
Journey Time	Guided bus will not receive any greater priority than normal buses if un-segregated.	Greater priority afforded to LRT on un-segregated sections thus reducing journey times.
Patronage	Not perceived as significantly different from conventional bus thus reduced patronage.	Reduced journey times, improved reliability and comfort will result in increased patronage.
Carrying capacity	Would require additional vehicles for the same peak capacity.	Increased carrying capacity with peak capacity of 2500 persons per hour.
Depot Site	No dedicated infrastructure required.	Dedicated infrastructure required.
Capital Cost	Reduced capital costs.	Increased capital costs.
Operating costs	Comparable to LRT but increased lifecycle replacement costs.	Comparable to guided bus but fewer lifecycle replacement costs.
Revenue	Less revenue.	More revenue.
Construction Programme	Programme contracted due to works extent being significantly reduced.	Programme lengthened due to works extent being significantly increased.
Accessibility	More difficult access for disabled persons, push chairs etc.	Greater accessibility for all including disabled persons with level access.
Comfort/Ride Quality	Inferior comfort levels due to irregularity of road surface.	Superior comfort levels with Light Rail Vehicles (LRV's) fitted with resilient wheels and high spec. suspension on rails.
Frequency/Reliability	More frequent but not as reliable due to reduced priority traffic impacts.	Improved frequency/reliability mainly due to given priority.
Image	Perceived by public as normal bus.	Improved public image over buses.
Safety	Reactionary operation therefore path not as easily perceived.	Improved safety due to fixed path easily perceived (pedestrian/driver).
Air Quality/Noise Impacts	Increased air quality and noise impacts due to the bus vehicles generally being diesel powered. These	Reduced impact as LRV's being electronically powered do not discharge noxious emissions and equipped with

	impacts can be reduced by adopting dual powered buses.	resilient wheels and skirting, as well as, using continuously welded rail, means noise is minimised.
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* Highlighted cells denote which option is better against each criteria.

3.34 Following this detailed analysis Tram was selected as the preferred transport solution. Three route options were derived from a long list of twenty six configurations. Following the detailed assessment and consultation the preferred solution of a Light Rail system was identified and the route configuration now known as the North Edinburgh Loop was proposed. This proposal was submitted to full City of Edinburgh Council and has been incorporated in the LTS 2000 and 2004.

Edinburgh LRT Masterplan Feasibility Study

3.35 This report was commissioned (December 2001) by CEC to build on the initial work proposed under the 'Waterfront Report'. The specific remit for Ove Arup and Partners was to develop:

- A "viable network" of LRT routes which, in conjunction with other modes, will best meet LTS and other project specific objectives;
- An outline of Capital costs, Revenue and Operating costs for the LRT lines;
- Sufficient data on LRT routes for use in overall assessment and prioritisation of scheme with the ITI; and
- Inputs to the development of the road user charging scheme business case and to support applications to the government for approval and funding of the ITI.

3.36 The approach taken was in two phases. Phase 1 comprised a comparison of the nine identified transport corridors and their appraisal against preliminary criteria based on Scottish Transport Appraisal Guidance (STAG) 1. This comparison led to the recommendation of seven schemes (see table below) for a more detailed assessment at Phase 2, which formed the basis of the recommendation on priorities for LRT implementation.

Table 3.3 – Edinburgh LRT Masterplan Feasibility Study – Ranking of possible LRT corridor options

Corridor	Scores	Ranking
Queensferry	+9	4
North Edinburgh Loop	+22	2
West Edinburgh	+24	1
South Edinburgh	+6	5
South East Edinburgh	+17	3
South Suburban	+4	7
South Orbital	+5	6

3.37 Following the detailed appraisal it was recommended the top three were taken forward for further detailed consideration. This further analysis resulted in the conclusion that the North Edinburgh Loop (Line 1) be accorded the highest priority among the corridors tested and that the Masterplan should include both the West (Line 2) and South East (Line 3) lines as high priority schemes. This proposal was submitted to CEC and was incorporated in the LTS 2000 and 2004.

Establishment of Transport Edinburgh Limited (TEL)

3.38 CEC has established TEL as the single economic entity under which both the Tram and Lothian Buses would operate in an actively planned and managed integrated transport network. TEL is taking full advantage of the continuing engagement of Transdev as the

intended operator of the Tram network who bring to bear their experience and expertise in the design and operation of tram and other public transport system systems.

- 3.39 TEL has now developed its presence with the appointment of its Board of Directors including two independent non-executives. The Chief Executive of Lothian Buses has been appointed as Chief Executive of TEL. The governance structure of the Tram project has now been amended such that TEL has clear accountability for planning and implementing the integrated transport business with **tie** (advised by Transdev) charged with delivery of the tram project. This structure has been implemented such that clear and full accountability to the Council as Promoter of the Tram project and majority owner of Lothian Buses is sustained and that the interests and influence of SE as the principal provider of funding for the project are preserved. The governance structure is further considered in section 6.
- 3.40 TEL has played a leading role in the preparation of this Draft Final Business case with particular contributions in the following areas:
- Development of the adopted phasing strategy as described in 3.41 et seq. below
 - Development of future integrated service patterns for tram and buses working together
 - Validation of the prospective economic benefits delivered by the introduction of tram as summarised in section 4
 - Validation of modelled patronage and revenue forecasts for tram and for TEL as a combined tram and bus business and incorporation of same into a 'TEL Business Plan' which encapsulates the operational plans for the tram as detailed in section 8.

Project phasing

- 3.41 During 2005 the key funding and affordability issues were addressed with respect to the funding of the Project in the context of an SE grant of £375m and the financial risks which will have to be borne by either CEC or SE. Four possible configurations of the Tram network were addressed as follows:
- a) Line 1 only
 - b) Line 2 only
 - c) Line 1 and 2
 - d) Line 1 and 2 less the Newbridge Shuttle
- 3.42 A great deal of work was carried out to ensure that capital cost estimates available at the time were as accurate as possible and were benchmarked against outturn costs on completed tram projects and other third party comparators. It was recognised that on a project of this scale and complexity, there will remain a degree of uncertainty (including that relating to construction market prices generally) up to the point where tender prices are negotiated. It is therefore important to achieve as much certainty as possible on the likely costs before procuring the major contracts for the tram infrastructure and vehicles.
- 3.43 The conclusion reached was that although Line 1 only or Line 2 only had a high degree of deliverability within the constraint of a fixed SE grant of £375m, a complete network of Lines 1 and 2, with or without the Newbridge Shuttle, was unlikely to be affordable in one phase of construction and that a phased approach to procurement and delivery would be implemented.
- 3.44 CEC's identification of a phased approach was welcomed and discussions with officials of CEC and senior civil servants in Transport Scotland focused on the capital funding available and which sections of the tram network could realistically be afforded as a first phase of the network. As a result the Transport Minister indicated a willingness to consider indexation of the original £375m grant (i.e. to increasing the amount of the grant to take account of inflation) provided that a substantial capital contribution was made by CEC and subject to the submission of a Final Business Case demonstrating the benefits and viability of the phased scheme.

- 3.45 Concurrent with development of the in-principle revised funding contribution from SE and CEC above, the analysis of the phasing options progressed. Taking a prudent view on capital cost estimates and funding sources, an examination was undertaken by a number of parties — **tie**, CEC, TEL, Lothian Buses and Transdev — to assess the optimum construction phasing of a complete network of Lines 1 and 2. This work was validated by SE. The parties determined through reasoned argument and professional judgement which phases within the totality of lines 1 and 2 would be the best to proceed with.
- 3.46 Consideration was given to a range of options for first phase network construction and to the pattern of construction of subsequent phases. This work indicated that the core of the network would be the line from Leith Waterfront to Edinburgh Airport (Phase 1a), via Haymarket and Princes Street, would give a good balance of costs and benefits and would present a high probability of being financially viable when integrated with Lothian Buses services. In addition, the first phase of the tram development was extended to include the section from Roseburn to Granton Square (Phase 1b) serving the development area in Granton. The assumed Phase 1 of Leith waterfront to Edinburgh Airport (Phase 1a) and Roseburn to Granton (Phase 1b) has been adopted by all parties.
- 3.47 Phase 1 will provide the core support for the city economy and would directly link the major growth centres at the Airport, Gogarburn, The Gyle, Granton and Leith Waterfront with the City Centre. It would provide access to the major housing and commercial developments under construction and planned for the medium to long term and would underpin the role of these developments in sustaining the Edinburgh's role as a growing successful capital city.
- 3.48 The link to Leith will serve two thirds of the waterfront development contained in the area that runs across the Leith waterfront between Newhaven and the eastern end of the Victoria dock in Leith. Two thirds of the totality — approaching 20,000 residential units plus retail and commercial development — is within that arc. The tram will serve that area extremely well. Under the latest proposals from Forth Ports, a community the size of Bathgate will be built in Leith docks.
- 3.49 The advantages to CEC in achieving its vision for the city and in securing transport infrastructure stemming from this first phase of the tram include:
- A world class gateway to the city for visitors arriving at the Airport, providing access to all modes of transport
 - Direct access to the major shopping destinations of the Gyle, Ocean Terminal and the City Centre and to the Royal Bank of Scotland's new international headquarters at Gogarburn
 - Access for existing communities to employment, leisure, shopping and other opportunities
 - A link with existing transport hubs at Edinburgh Park, Haymarket and Waverley Railway Stations and at the Bus Station in St Andrew Square to give first class interchange for local and long distance trips
 - Serving an expanded 'Park and Ride' at Ingliston increasing the catchment area of the tram and further reducing the demand for car travel in the city
 - Serving Murrayfield, Tynecastle and Easter Road stadia, giving access to international and national sporting and other events
 - Providing the core infrastructure on which expansion of the network would be built and could include in the future the proposed Line 3 linking the City Centre with the new Royal Infirmary and the key development areas in South Edinburgh.
- 3.50 The development of this core section of Lines 1 and 2, as a first phase, is fully supported by TEL and Transdev, the proposed tram operator. The resulting Phase 1 is a good fit with the Structure and Local Plans and reflects long-term objectives.

- 3.51 In considering Phase 1b in particular, the key 'driver' was the need to link the Granton waterfront with the rest of the network and the rest of the city-region. Granton is linked to the network at Haymarket via the Roseburn corridor, which also serves the new Telford College, the Western General Hospital, Craighleith Retail Park and other key destinations. This section remains an important priority in social inclusion and economic development terms.
- 3.52 CEC remains committed to seeking future funding for the subsequent phases which would complete the full network of Lines 1 and 2 as depicted in Figure 3.1 below. These have been defined as:
- Phase 2 - Granton to Leith section along the waterfront, enabling through running of trams past Ocean Terminal and onto central Leith
 - Phase 3 - Ingliston to Newbridge section which opens development opportunities in west Edinburgh under the West Edinburgh Planning Framework. Future funding will be closely linked with the continued expansion of the city and the associated opportunities for private sector contributions.

Figure 3.1 – Line 1 and Line 2 phasing plan



- 3.53 In January 2006 following consideration of the phasing proposals, CEC made a commitment to contribute £45m towards the capital cost of Phase 1 of the project, to be structured in a manner which minimises financial risk.
- 3.54 In February 2006, the Transport Minister made an in principle commitment to increase the grant originally offered in March 2003 in line with inflation, estimated at the time as up to £500m. Indexation is the step that the SE has taken with other transport capital projects to provide for inflation. The final level of the grant will depend upon the actual level of cost inflation in the construction industry.

Implementation of Phase 1

- 3.55 **tie's** procurement strategy as described in section 7 is entirely compatible with a phased approach. Since the network scope guidance provided in early 2006, tie has prioritised its design and other implementation activities toward Phase 1 and in particular the most complicated section from Leith to Haymarket.

4. PROJECT JUSTIFICATION

STAG appraisal process

4.1 Scottish Transport Appraisal Guidance (STAG) is the official appraisal framework to aid transport planners and decision-makers in the development of transport policies, plans, programmes and projects in Scotland. STAG has two parts:

- **STAG1:** initial appraisal and broad assessment of impacts, designed to decide whether a proposal should proceed, subject to meeting the planning objectives and fitting with relevant policies; and
- **STAG2:** detailed appraisal against the scheme and Government's objectives.

4.2 As part of the supporting documentation submitted to Parliament, full STAG1 and STAG2 appraisals were developed for each of Line 1 and Line 2 by Mott MacDonald and Faber Maunsell respectively. This detailed work assessed the projects against the key STAG criteria and confirmed that both lines met or exceeded the Scottish Executive criteria. The documents were submitted to CEC Executive for approval and final versions were submitted to Parliament in September 2004. A separate, but parallel, network study providing the overarching framework for the development of trams in Edinburgh was developed by Faber Maunsell and reported to the Line 2 committee.

4.3 Following the decision to proceed with Phase 1 of the project as described in section 3, **tie** has commissioned the preparation of an updated report from Steer Davis Gleave setting out the STAG2 appraisal of Phase 1 of the tram only. The resultant report is included as Appendix II to this Draft Final Business Case. Given that Phase 1 is essentially a hybrid of Lines 1 and 2, the appraisal has built upon the work undertaken on the previous appraisals for these individual lines, with much of the existing material updated and reconfigured for the appraisal of Phase 1. Where the appraisal is based on the use of transport modelling outputs, such appraisal has been reworked from first principles using the transport modelling undertaken under the Joint Revenue Committee (JRC) contract, again led by Steer Davis Gleave, and presents an assessment of the benefits and costs to Government of constructing Phase 1 only.

4.4 This summary of the justification for Phase 1 of the tram encapsulates the STAG2 report at Appendix II in respect of the planning objectives established by the planner (planning strategy) and the Government's five objectives for transport:

- Environment
- Safety
- Economy
- Integration
- Accessibility

Planning objectives

4.5 Development of planning objectives is fundamental to development and appraisal of transport proposals. Planning objectives were developed with reference to the Scottish Executive's national objectives and incorporate the relevant policies in local planning documents. They were based significantly on the opportunities, problems and constraints in the Waterfront – City Centre – Airport corridors.

4.6 The planning and policy context at national, regional and local levels was used as the basis to develop the following Transport Planning Objectives:

- To support the local economy by improving accessibility;

- To promote sustainability and reduce environmental damage caused by traffic;
- To reduce traffic congestion and encourage mode shift;
- To make the transport system safer and more secure; and
- To promote social benefits.

Economic regeneration

- 4.7 In the parts of Edinburgh served by tram such as Leith Docks, Granton Waterfront and Sighthill, regeneration is a key priority. Phase 1 of the tram will connect these Core Development Areas (CDA) across the City and minimises the need for dependence on private car to access employment, residential and retail areas.
- 4.8 Edinburgh Waterfront is the largest brownfield development in Scotland, equivalent to a new town in scale. Phase 1 of the tram will support and catalyse this development by providing sustainable transport connections to areas where public transport service could be improved or which are or will experience congestion, particularly at peak times. This can significantly contribute to City regeneration. The major developments at Leith Docks and in the Granton area will be more likely to succeed, and do so in a shorter timescale, with Phase 1 of the tram. These developments will bring high quality living, leisure and employment opportunities.
- 4.9 As part of the demand forecasting and appraisal process for Phase 1 of the tram, a thorough and robust review of planning opportunities has been undertaken involving CEC planners. This has considered the likely range of new development possible at the various sites identified and the potential impact that the tram might have on the overall scale of development. The following table sets out the most likely considered level of development up to 2020 with Phase 1 of the Tram in place. Given the already dense nature of much of the central area of the City, the opportunities in that area are relatively modest in scale. The biggest development opportunity in Edinburgh is the redevelopment of the Granton and Leith Docks areas. Whilst substantial development has already taken place, notably at Leith, the overall aspirations for these areas are considerable. The development potential is focused on residential use, with some 25,800 units envisaged in the Leith and Granton areas. Nearly 350,000 square meters of other uses complete the development potential. The significant development planned in the West Edinburgh office/business sector would also have a considerable impact on Tram patronage levels.

Table 4.1 – Most likely new development to 2020 with Phase 1 of the tram in place

Location	Residential (Units)	Office/Business (Sq m)	Retail (Sq m)	Hotel (Rms)	Commercial (Sq m)	Leisure (Sq m)	Other (Sq m)
City Centre	2,719	141,390	91,705	450	4,800	5,750	5,100
Leith Docks	18,000	30,000	26,000	0	41,500	0	0
Granton	7,800	0	40,400	0	130,000	8,800	65,000
West Edinburgh	0	253,350	0	168	50,000	14,300	174,000
Total	28,519	424,740	158,105	618	226,300	28,850	244,100

- 4.10 Without Phase 1 of the tram it is unlikely the large scale redevelopment of Leith Docks (on Phase 1a) or Granton (on Phase 1b) could go ahead in the same timescales or to the same extent. These new developments will bring with them high quality living, leisure and employment opportunities. In addition to opening up brownfield land for redevelopment, it is highly 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 should 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, the tram will be assisting with maintaining the economic viability of North and West Edinburgh.

- 4.11 In order to compete in an increasing competitive marketplace, and to further stimulate economic regeneration, it is important to maintain and improve upon the City's wider streetscape. In spite of its historical and cultural 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 a catalyst for improvements to the streetscape and environmental amenity in general, bringing both economic and social benefits. In recognition of this important role of tram, the planning authority (CEC) has developed and approved a Tram Design Manual which is supplementary planning guidance which must be taken in to account when the necessary prior approvals for the tram are being considered.

Environment

- 4.12 The tram will need to address the effect on the World Heritage Status of Edinburgh and **tie** is seeking to minimise or eliminate any adverse impact the tram may have, by working closely with the CEC Planning Committee to develop complementary solutions. Design work is targeted on the most sensitive sections of the route, with the aim of facilitating planning solutions in these areas. The topography, layout, numerous ancient monuments and Sites of Special Scientific Interest, have all been evaluated and have shaped the routing of the tram system. **tie** is committed to minimising any adverse impact on these areas. Mitigation is set out in the Tram Design Manual. This will provide specimen designs for key areas, including the whole of the World Heritage Site. Contract requirements will ensure that the final design complies with the Tram Design Manual.
- 4.13 There are also some areas of contaminated ground along the route, including disused railway land and a former landfill site. Temporary impacts from the construction works will cause minor negative impacts on the land here, but with effective mitigation, the permanent impacts during the operation of the tram will be minor. There are also several protected species present in the corridor, including bats, otters and badgers. However, mitigation measures will be implemented to ensure that works undertaken in close proximity to badger setts and foraging habitat comply with the requirements of relevant legislation, in consultation with Scottish Natural Heritage (SNH) and the Scottish Executive's Countryside and Natural Heritage Unit (CANHU). Details of mitigation measures for this, and the retention, protection and enhancement of existing plantings and habitats, and replacement of those lost as a consequence of the development can be found in the Landscape and Habitat Management Plan (LHMP).
- 4.14 Assessment of the environmental aspects of Phase 1a show that it would make a positive contribution towards objectives of reducing emissions and improving air quality in the Air Quality Management Area (AQMA) set up by City of Edinburgh Council (CEC). Phase 1a passes through the heart of the City Centre would specifically contribute to these issues which CEC is addressing through an Air Quality Action Plan (AQAP). Vehicles within the City have been shown to account for up to 88% of emissions of nitrogen oxides. 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 are also relatively quiet compared to other modes of road transport providing a higher quality environment for those living, working and travelling in the area.
- 4.15 The tram's contribution to mode shift would enable further progress towards objectives set in the Air Quality (Scotland) Amendment Regulations 2002 and to national objectives to reduce emissions of greenhouse gases. CEC have identified air quality issues in the western corridor of the city leading to the airport area, with a particular focus on Corstorphine Road, St Johns Road and Drumbrae Roundabout, monitoring of this is being carried out with a view to

determining it a second AQMA. Phase 1a would pass directly through this corridor, as a result contributing to air quality improvements in the area.

Safety and reliability

- 4.16 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 high use of inspectors on vehicles will also assist this objective.
- 4.17 Trams will improve the overall reliability of public transport as they generally benefit from greater segregation from general traffic and priority at junctions and present an opportunity to significantly reduce the variability of dwell time at stops compared to a bus only public transport service. 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 in the absence of trams. Despite continuing implementation of a wide range of bus priority measures, buses remain vulnerable to the effects of increasing congestion across the City.
- 4.18 This analysis remains valid notwithstanding that bus operations and the junction priorities afforded to buses could be modified to provide an increased level of reliability in the future. Implementation of a wide range of bus priority measures has improved or maintained bus services in the past, but they remain vulnerable to the effects of increasing congestion across the city

Accessibility and social inclusion

- 4.19 An integrated, efficient, accessible and high quality public transport system is vital to promoting economic growth in the local community and to improving its performance and competitiveness. Following the redevelopment at Granton, Phase 1b of the tram in particular will achieve this by increasing the number of people with access to the public transport network and with access to employment opportunities at the new development areas in Granton Waterfront and Leith Docks and in the west of the city at Edinburgh Park, the Gyle and the Airport.
- 4.20 Phase 1 of the tram scheme improves accessibility to identified key trip attractions and destinations from a substantial portion of Edinburgh e.g.:
- George Street / Frederick Street junction – representing the City Centre (employment, shopping, leisure and access to Waverley rail station with integration with bus and rail)
 - Haymarket rail station (integration, interchange with bus and rail)
 - Leith Ocean Terminal (leisure / shopping / employment)
 - Edinburgh Airport (employment, transport interchange)
 - Gyle Centre / Edinburgh Park (shopping / Employment).
- 4.21 Mapping of the levels of economic deprivation, employment levels and levels of educational attainment show a considerable variance across the city. A number of trends are evident which make it possible to identify a range of pockets and corridors which are less affluent than others. Areas of Granton and Pilton to the North and a zone around Leith Walk, as well as around Saughton and Balgreen in the West are identified as areas where socio economic status is considerably less affluent than surrounding areas. Employment, income levels and car ownership tend to be comparatively low in these areas.
- 4.22 Direct connection to the City Centre and other employment areas which would be facilitated by Phase 1 of the tram will undoubtedly improve the situation for these areas. Despite the high levels of car ownership at the city wide level, pockets of low car ownership exist, broadly correlated to areas of high population density. Phase 1 of the tram would offer an attractive

service to those areas which include Granton, Newhaven, Leith and Leith Walk, as well as Haymarket and Gorgie near the City Centre and Saughton and Balgreen in the west.

- 4.23 The design of tram vehicles and tramstops will ensure that the trams and tramstops are fully accessible by people with mobility impairments, those travelling with small children and the elderly. For these groups, and notwithstanding continuing improvements in access for people with mobility impairments on Lothian Buses, there is a relative advantage for trams in terms of design specifications, ride-quality and reliable accessibility for a significant section of Edinburgh's population. Where the distance between tram stops presents a challenge to accessibility the service integration patterns with buses have been designed to maximise the continuing accessibility of Lothian Buses for these groups.

Transport and land use integration

- 4.24 Phase 1 of the tram would connect the residential developments at Leith Docks and Granton Waterfront with the City Centre, West Edinburgh and the Airport. The City Centre and West Edinburgh represent the second and fourth largest concentrations of employment in Scotland and West Edinburgh in particular is forecast to grow considerably.
- 4.25 At the core of this growth is the West Edinburgh Planning Framework area, South of the Airport and identified by the Scottish Executive as a national growth point. Phase 1 will be core infrastructure for this development area; without investment in new transport, it is unlikely that this major national opportunity can be realised. The tram will be particularly vital in responding to the expected growth in travel demand arising from the development. Without this development, major greenfield and greenbelt releases would be required. This not only has planning implications but would result in a settlement pattern that would be more difficult to serve by public transport.
- 4.26 In the absence of Phase 1 of the tram the new development underway in North Edinburgh may contribute significantly more to city wide congestion as a direct result of the failure to integrate land use and transport policies. It is also possible that the new development will be diverted to less sustainable locations with less potential for effective transport integration.
- 4.27 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 interchange at Haymarket and close proximity to Waverley Station and Edinburgh Park Station mean integration with heavy rail will be effective. These interlinking services, along with the proposed frequency of the service, means tram will afford easier access to employment and service areas. The tram will also facilitate enhanced integration between public transport and travel by air by serving Edinburgh Airport. The integration of the bus, rail, air and the tram services to and from the Airport 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 integrated public transport usage and inclusion.
- 4.28 A detailed description of the planned integration of service patterns between tram and buses is provided in section 8.
- 4.29 Phase 1 of the tram will enhance the opportunity to make journeys on the public transport network through bus-tram service integration plans and ticketing arrangements, reflecting specifically designed stops and interchange facilities for effective integration with the bus and rail networks, most notably at:
- Edinburgh Airport
 - Waverly, Haymarket and Edinburgh Park rail stations
 - The foot of Leith Walk, St Andrews Bus Station, and the bus hubs at Ocean Terminal, Gyle Shopping Centre and Crewe Toll

- Expanded Park & Ride at Ingliston and potentially other locations

4.30 A fuller analysis of the existing and potential opportunities for transport interchange is provided in section 5.

4.31 In relation to land-use policy and proposal integration, Phase 1 of the tram integrates positively with land-use policies and proposals as detailed in:

- National Policy – National Planning Framework (NPF) and Scottish Planning Policy (SPP17)
- Regional Policy – Developing SESTRANS Regional Transport Strategy and Edinburgh and Lothians Structure Plan 2015
- Local Policy – Edinburgh Local Plans and associated development proposals, most notably Leith Docks Western Harbour development, Granton Waterfront and Haymarket-Airport including Edinburgh Park/Gyle.

Patronage and mode shift

4.32 Phase 1 of the tram will permit further development without creating additional congestion on key urban routes. The tram 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 new development is constructed and travel patterns 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. Modal shift is fundamental to achieving the environmental, sustainability, health and traffic aspirations of the tram.

4.33 Extensive work has been undertaken to build new demand forecasting models to predict use of the tram and the impact upon use of other transport: bus, rail and car. Annual demand for Phase 1 is predicted to be **13.2m** tram passengers in 2011 (**10.6m** for Line 1a only) assuming that 75% of modelled demand occurs in the first year. This rises to **31.6m** in 2031 (**24.3m** for Line 1a only). 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 car in the City is forecast to increase by **37%** (1.2% p.a.) and demand for journey by public transport is forecast to increase by **61%** (1.8% p.a.)

4.34 The introduction of the tram is forecast to generate a sizeable shift from car to public transport, with the biggest impacts in areas directly served by the tram. However, the proportion of people moving to public transport in the wider Edinburgh area is limited by the fact that Phase 1 of the tram has a limited influence in other areas of the City.

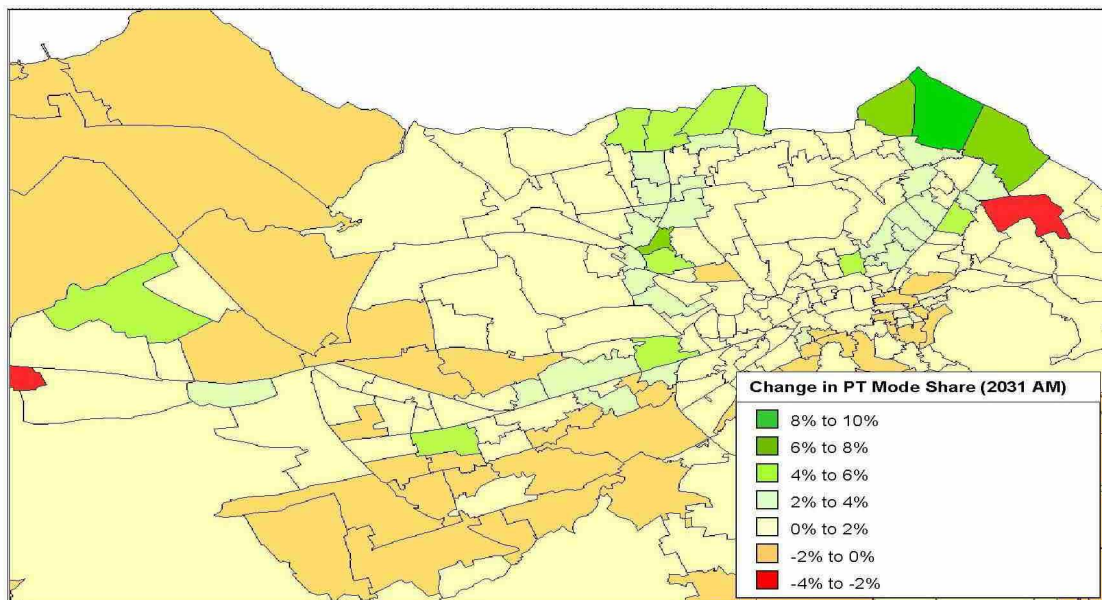
4.35 Table 4.2 below presents the total forecasted reduction in private vehicle (car) trips arising from the introduction of Phase 1 of the tram. The data is for all trips into, out of and within Edinburgh in the daily morning (AM) peak from 0700-0900 and the inter-peak (IP) from 1000-1200. Figures are provided for forecast years 2011 and 2031. The numbers of trips forecast to move to public transport are significant. The shift to public transport as a percentage of the total number of car trips is in keeping with what would normally be anticipated for such a scheme in the context of an entire car travel market for the city including those areas outwith the market for Phase 1 of the tram.

Table 4.2 – Mode shift to public transport with Phase 1 of tram

Year and Time Period		Car		Public Transport		Shift to PT	
		Trips	Mode Share (%)	Trips	Mode Share (%)	Trips	%
2011 AM	No tram	114,360	54.6	95,066	45.4	2,188	+0.6
	Tram	113,979	54.0	97,254	46.0		
2011 IP	No tram	72,732	57.0	54,786	43.0	933	+0.4
	Tram	72,770	56.6	55,719	43.4		
2031 AM	No tram	140,106	50.8	135,906	49.2	4,141	+0.8
	Tram	139,818	50.0	140,048	50.0		
2031 IP	No tram	100,749	55.5	80,720	44.5	2,106	+0.6
	Tram	100,992	54.9	82,825	45.1		
2011 Annual	No tram	195.50m	56.0	153.75m	44.0	3.04m	+0.5
	Tram	195.29m	55.5	156.79m	44.5		
2031 Annual	No Tram	257.50m	53.5	223.51m	46.5	6.26m	+0.6
	Tram	257.67m	52.9	229.77m	47.1		

4.36 The impact of the tram on mode shift is proportionately higher in areas that it will directly serve and where it is appropriate to anticipate achieving mode shift. Figure 4.1 below presents the percentage change in mode share by area of trip origin for the AM peak period in 2031.

Figure 4.1 – Geographical change in public transport usage with Phase 1 of tram (2031)



4.37 From Figure 4.1 it is apparent that changes in mode share from car to public transport up to 10% will be generated for trips from certain areas directly served by the tram. Areas exhibiting mode shift of greater than 5% (encompassing significant areas of development and growth which otherwise would be associated with higher levels of car travel) include:

- Leith/Newhaven
- Granton/Muirhouse
- Craigleith
- Roseburn
- Sighthill

- Edinburgh Airport

4.38 Tram patronage and revenue in the context of overall TEL patronage revenue and the analysis of risks thereto is summarised in section 8.

4.39 Abstraction from buses to the Phase 1 tram is predicted to be **10.3m** annually in 2011 (**8m** for Phase 1a only), rising to **23.6m** by 2031 (**16.7m** for Phase 1a only). About **17%** of tram patronage is attracted as new public transport patronage in 2011, rising to **20%** in 2031. The expected reduction in person car trips would be **2.3m** in 2011 (**2.0m** for Phase 1a only) rising to **6.4m** by 2031 (**6.0m** for Phase 1a only). The proportion of tram patronage new to the public transport market is significant and in keeping with that achieved on successful tram schemes such as Croydon Tramlink, Nottingham and Dublin.

4.40 The sources of demand for Phase 1 of the tram are set out in Table 4.3 below. The increasing share from car is consistent with the higher congestion levels and hence attractiveness of tram expected and forecast in the later year.

Table 4.3 – Sources of Phase 1 tram patronage

Millions of passengers	2011	2031
From bus	10.3	23.6
From rail	0.6	1.7
From cars or new generated trips	2.3	6.3
Total Phase 1 tram patronage	13.2	31.6

Economic Activity and Locational Impacts (EALI)

4.41 The key EALI impacts of introducing Phase 1 of the tram are projected to be:

- **Employment development:** In 2011, more than 40,000 sq.m. of employment development is anticipated to be advanced as a result of the Phase 1 of the tram (22,500 sq.m. Phase 1a only). This rises to more than 114,000 sq. m. by 2015 (48,950 sq.m. Phase 1a only) but drops back to an additional 96,000 sq.m. by 2020 (52,850 sq.m. Phase 1a only) as the development pipeline catches up in the “without tram” scenario. Post 2020, the development pipeline recovers further, resulting in a net gain of 34,000 sq.m with tram.
- **Residential development:** The construction and occupation of more than 900 additional residential units are anticipated to be advanced as a result of Phase 1 of the by 2011, rising to 5,250 by 2015 and 5,600 by 2020. The majority of these would be in Granton and therefore dependent on Phase 1b. Post 2020, the development pipeline recovers in the “without tram” scenario, resulting in a net gain of 2,800 units with tram.
- **Employment generation:** More than 930 jobs, in present value terms, are expected to be generated or brought forward by the development impact of Phase 1 of the tram, after allowing for displacement of jobs elsewhere in Scotland. 590 of these can be attributed to Phase 1a alone.

Benefits and Costs to Government (TEE Analysis)

4.42 As required by STAG, the economic welfare impacts of delivering Phase 1 of the tram have been assessed as part of a Transport Economic Efficiency (TEE) assessment. The appraisal provides a review of what users are willing to pay in order to use the tram line; the financial

impact on private sector transport providers; and impacts arising from land use or other impacts of the tram line.

4.43 Phase 1 of the tram project has been appraised against a 'reference case' as well as a conventional 'do minimum'. The 'reference case' sensibly reflects the traffic management and bus policies that it would be necessary to introduce to cater for travel demand growth, should the tram scheme not be implemented. This includes, for example, the closing of Shandwick Place to through traffic (private cars) both with and without the tram as well as priority signalling for buses at major junctions. The appraisal against the 'reference case' assumes that the Edinburgh Airport Rail Link (EARL) is developed as planned both with and without the Tram reflecting wider transport planning in Scotland. The rationale for the reference case rather than a conventional do minimum is further explained at 4.50 below.

4.44 The benefits and costs of Phase 1 of tram, appraised against the 'reference case' and calculated over a 60-year period in accordance with STAG requirements, are summarised in Table 4.3 below.

Table 4.3 – Benefits and Costs to Government from Phase 1 of tram

£m Present Value, 2002 prices	Phase 1	Phase 1a	Incremental Phase 1b
Public transport user benefits	657	395	262
Other road user benefits	72	34	38
Private sector provider effects	(15)	(44)	29
Accident effects	(5)	(12)	7
PV of scheme benefits (incl. accidents)	709	373	336
Investment costs	460	390	70
Public sector provider effects	(24)	(50)	26
PV of scheme costs	436	340	96
Net PV	273	33	
Benefit Cost Ratio to Government	1.63	1.10	

4.45 For comparison, the Benefit Cost Ratio determined by the previous STAG reports presented during the Parliamentary process was calculated as 1.21 for Line 1 and 1.40 for Line 2. The parallel study of Lines 1 and 2 operating together as a network assessed the Benefit Cost Ratio as 1.51.

4.46 There is a healthy NPV of **+£273m** and **£1.63** of benefits for each £1 of costs, for the Phase 1 scheme, indicating a scheme that offers good value for money in transport economic efficiency terms. The economic case for Phase 1a alone is also positive at **+£33m NPV** and it delivers **£1.10** for each £1 of expenditure. It should be noted that Line 1a creates the spine of tram scheme through the city centre area that can be extended on an incremental cost basis and therefore bears a heavier burden of fixed costs.

4.47 Total transport benefits are weighted heavily in favour of those to public transport users. The case is not reliant on benefits to other road users. The relatively conservative level of other road user benefits reflects the increase in development and therefore traffic growth in the 'with tram' scenario compared to the 'without tram scenario'.

4.48 The principal reasons for the disproportionate level of net benefits afforded by construction of Phase 1b at the same time as Phase 1a are as follows:

- The assessed value of time benefits to public transport users arising from Phase 1a is limited by the existing high quality and frequency bus services provided on this corridor and the 'reference case' assumption that the application of CEC policy would seek to maintain as far as possible the existing level and travel time of the bus

services by the introduction of bus priority measures. The Phase 1a tram provides the capacity on this corridor to deal with the predicted increases in public transport users.

- In relative terms the Phase 1b corridor is not currently as well served by existing bus services, particularly for users travelling to Haymarket and to the west of the city, including the new employment opportunities at Edinburgh Park and the Airport. For these users it is predicted that the Phase 1b tram will provide very positive time benefits compared to the situation without the tram.
- Phase 1b is predicted to deliver relatively higher benefits to other road users because it has relatively few interfaces with the road network, being aligned for the most part on the Roseburn railway corridor and on the reserved tram corridor in the Granton development area.
- The investment costs associated with Phase 1b are relatively low reflecting the significant economies of scale which will be realised from the construction of this section of the tram. In addition Phase 1a presents many complexities in terms of on-road running, including utility diversions, which are not so significant in the construction of Phase 1b.

4.49 The scenario and sensitivity testing detailed in the full STAG2 report and Revenue & Risk Report in the appendices suggests that the planned development and forecast economic growth being achieved is central to maximising benefits and patronage.

'Reference case' compared to 'do-minimum'

4.50 The main appraisal of the tram is undertaken against a 'reference case' rather than a 'do minimum'. The reference case assumes that EARL is implemented as planned both with and without tram. The use of a 'reference' case rather than a conventional 'do minimum' relates only to the second forecast year (2031) and is necessary because of the scale of growth in trip demand that is forecast. Very significant increases in the level of bus service provision would be necessary to accommodate the increased demand and it is considered that the performance of these services (in terms of journey time and reliability) would considerably reduce unless significant measures were taken to accommodate them on the road network.

4.51 The 'reference case' includes a representation of measures which might be required to maintain bus service performance at current levels. The 'reference case' therefore reflects the likely 'real world' application of CEC's policies to support public transport if there were no tram. These measures were represented by introducing to the 'reference case' some of the impacts on car traffic designed to accommodate the tram – a mode of transport capable of conveying many more passengers per vehicle than buses.

4.52 In addition to appraisal against the 'reference case' as summarised above, Phase 1 of tram has also been appraised against a conventional do minimum which also assumes EARL is not present as it not yet a scheme with Parliamentary powers or committed funding. This appraisal resulted in a Benefit Cost Ratio of **3.01** for Phase 1 (**2.32** for Phase 1a only), reflecting additional public transport user benefits of the tram (relative to very poorly performing buses in 2031), as well as increased highway decongestion benefits of restoring some of public transport's modal share.

Interaction with EARL

4.53 A qualitative market-based assessment of how EARL and the tram interact reveals the following:

- EARL would provide direct routes to the national railway network and therefore be well placed to capture a good share of the public transport market for regional and

national travel to/from the airport. This is a quite different market to that for travel by tram.

- Although both EARL and the tram provide links to Haymarket and Waverley, EARL has the potential to capture a significant proportion of public transport trips between the airport and the City Centre.
- The tram, however, has the advantage of providing links to a wider range of destinations within the City of Edinburgh, as well as more wide-spread opportunities for transfer connections to bus services.

4.54 This Draft Final Business Case assumes that EARL will be implemented as planned reflecting the wider strategic planning for transport in Scotland. Sensitivity testing of patronage and revenue for the tram in the absence of EARL shows that the tram would gain market share, particularly in respect of those travelling between the Airport and the City Centre where EARL would provide a shorter journey time. Additional tram patronage in the absence of EARL is forecast to be 0.5m in 2011 and 1.6m in 2031.

4.55 In terms of Transport Economic Efficiency (TEE), again the Benefit Cost Ratio for tram appraised against the 'reference case' assumes EARL is implemented. Sensitivity testing shows that in the absence of EARL the Benefit Cost Ratio for Phase 1 of the tram would be increased from 1.63 to 2.31 (from 1.12 to 1.58 for Phase 1a only). The increases reflect significant increased decongestion benefits to other road users (including cars) as a result of the tram in the absence of EARL rather than a marked increase in benefits to public transport users. Further into the future, this relative increase in economic benefits due to decongestion become increasingly uncertain due to the unstable behaviour of a saturated road network.

4.56 Beyond this assessment, there remains potential to influence the market shares of EARL and the tram through fares policy and ticketing systems. There is reason to believe that Tram and EARL can serve different market demands, tram serving the local price sensitive and time insensitive market and EARL the national, relatively price insensitive and time sensitive market. In addition, there could be scope to encourage the opportunity for interchange trips at the airport, between rail and tram, which would boost demand for both systems, providing inter-urban links via rail with local Edinburgh access via the tram. Attracting patronage to such interchange journeys, while still optimising yields from the direct airport market will very much depend on effective fares policy and ticketing systems.

4.57 As part of the overall strategy for ticketing, TEL sees the inclusion of multi modal through ticketing as a key element of adding to the flexibility and usability of the public transport systems. The forecasts currently available do not represent the additional synergies which might be created by through fares between TEL services and heavy rail services.

5. PROJECT SCOPE

Purpose

- 5.1 This section provides a succinct reference within which the strategic functionality of Phase 1 of the tram project is captured. This document also defines the baseline scope of the project from which any changes will be identified, considered and measured. Reference should also be made to the phasing plan for the project as described in section 3

Summary of Act powers

- 5.2 The Edinburgh Tram (Line One) Act 2006 and the Edinburgh Tram (Line Two) Act 2006 (the Acts) give the authorised undertaker various powers including:

- The power to construct the tram line as authorised by the Acts or any part of it and to operate it as a stand alone line or as part of a network.
- Compulsory purchase powers.
- The power to construct relates to works both within the Limits Of Deviation (LOD) and outwith the LOD. Within the LOD there is the power to construct the authorised works i.e. the tram works. Outwith the LOD there are limited powers mainly restricted to ancillary road works required to amend kerb lines for example. There is also the power to carry out specific works within the Limits of Land to be Acquired or Used (LLAU) – e.g. the construction of a substation or landscaping.
- The powers to operate include provisions in relation to fares, penalty fares, removal of obstructions along the tram line, the power to create byelaws.
- The powers are to be exercised so as to comply with the Code of Construction Practice and the Noise and Vibration Policy and to ensure the residual impacts are no worse than those predicted in the Environmental Statements.

- 5.3 Despite the wide powers conferred on the authorised undertaker by the Acts, various other consents still require to be obtained including:-

- Prior approvals – for structures, buildings including substations, tramstops; overhead line equipment (OLE) poles and fixings
- Temporary traffic regulation orders for construction
- Traffic Regulation Orders for operation – extent still to be determined and will be informed by the modelling outputs
- Building Fixings Agreements with owners
- Listed Building consent (there are some powers in the Acts in this regard but this does not cover all listed buildings)
- Scheduled Ancient Monument consent
- Environmental consents e.g. badger licences
- Approval of the planning authority to the Landscape and Habitat Management Plan (LHMP)
- Her Majesty's Railway Inspectorate (HMRI) consents

- 5.4 The LOD and the LLAU, as approved by the Scottish Parliament and as restricted by side agreements entered into with various objectors are shown on the baseline drawings produce by the System Design Services (SDS) designers and set out the geographical boundaries of the project.

Route alignment

Newhaven to Constitution Street

- 5.5 From the centre island platform at Newhaven on Lindsay Road to Ocean Terminal the tram will run segregated parallel to the street then on-street for a short section. A new retaining

wall structure, approximately on the line of the existing pedestrian ramp, will provide access from the Lindsay Road to Dock Road. The alignment runs parallel to the existing road, segregated running to the tramstop at Ocean Terminal, which comprises both a centre island and side platform, where a turnback facility is provided. From Ocean Terminal, the tramline runs on-street along Ocean Drive, over the existing bridge at the Victoria Dock entrance and the existing Tower Place bridge, both of which will be modified to accommodate the tramway. A two side tramstops will be provided off-street on Ocean Drive near the new casino and proposed residential developments, from where the alignment runs off-street as far as Tower Street. From Tower Street to Foot of the Walk, the tramway runs on-street, a mixture of segregated and non-segregated. Two side platforms will be provided at either end of Constitution Street.

Foot of the Walk to York Place

- 5.6 The tramlines will run on-street (centre running) for the length of Leith Walk from Foot of The Walk to Picardy Place. Platform stops, located centrally between tram lanes, are proposed at Foot of The Walk, Balfour Street, and McDonald Road. The London Road and Picardy Place junctions will be modified as necessary. There will be gyratory at Picardy Place with two side platforms. The tram will cross the junction of Broughton Street, and will be centre running along York Place, to the northeast corner of St Andrew Square

City Centre

- 5.7 The layout of the tramline through St Andrew Square will consist of a twin track running along North St Andrew Street, along the east side of the square and down South St Andrew Street. There will be a bi-directional stop close to the Bus Station.
- 5.8 From the junction of South St David Street and Princes Street the tram will continue along Princes Street. In order to allow for future extensions to the network, provision is to be made for a centre platform tramstop at Waverley Bridge. In addition there will be a stop located between Hanover Street and Frederick Street. The alignment will continue to the west of Princes Street across the junctions with South St. Charlotte Street and Lothian Road. From the West End the route will continue on a central alignment along Shandwick Place, with an island stop located between Atholl Crescent and Coates Crescent.
- 5.9 Continuing towards Haymarket along West Maitland Street the tram will be centre running reaching Haymarket Junction, where there will be a revised junction/crossroads configuration. The roads around the junction, such as Morrison Street, Dalry Road and Grosvenor Street will also be re-configured. The tram will continue through the junction and through the Caledonian Alehouse, which is to be demolished, towards Haymarket Yards. A stop is proposed on a viaduct structure in front of Rosebery House which will carry the tram off street parallel to Haymarket Terrace. The stop will provide an interchange with the Haymarket heavy rail station and for buses. West of this stop the alignment will make its way down through Haymarket Yards between Verity House and Elgin House to run parallel to the heavy rail track alongside Haymarket Yards and Balbirnie Place.

Roseburn to Carrick Knowe

- 5.10 The alignment continues parallel to the railway line and crosses Russell Road. From here the tramline skirts around the northern boundary of the ScotRail depot. The tram alignment will be supported by a retaining wall to the rear of the business properties fronting onto Roseburn Street. An elevated stop is proposed immediately opposite the Murrayfield turnstiles, which will service the stadium and the surrounding area.
- 5.11 The tram will cross Roseburn Street on a viaduct and then continues to the south of the rugby stadium on a viaduct, which will extend the existing rail embankment. The tram route continues to the south of the training pitches where the increased space allows for a steep grassed embankment in preference to a vertical wall. A new bridge will be provided over the Water of Leith, and to the west the tram continues on a grassed embankment. The residents of the adjacent properties in Baird Drive will be screened from the operation of the tram by

planting at the foot of the embankment and noise barriers at the top. The tram will cross Balgreen Road on a bridge at the same level as the railway. A tramstop to the west will be accessed by a ramp from Balgreen Road. The tram will continue along the south of Carrick Knowe Golf Course in the area reserved for a dedicated transport corridor, and then will rise to cross to the south of the railway on a new bridge at the west end of the golf course.

Carrick Knowe to Edinburgh Park

- 5.12 Between Carrick Knowe and South Gyle Access the tram will follow the alignment of and will replace the guided busway, which currently runs parallel to the railway. The existing guided busway will be adapted to allow the tram to use it. Two existing bridges over Saughton Road and Broomhouse Drive will also be converted for use by the tram. Stops will be provided adjacent to Saughton Road (two side platforms) and South Gyle Access (two side platforms). The tram will cross South Gyle Access on a new bridge and then run in the verge beside Bankhead Drive and the railway.
- 5.13 A tram stop, consisting of two side platforms, will be provided at Edinburgh Park Station to allow for interchange for passengers between light and heavy rail. The tram alignment will then rise onto a viaduct and turn north to recross the railway and enter Edinburgh Park. The tram will run in a reserved public transport corridor, which has been included in the business park masterplan, and a tram stop, consisting of two side platforms, will be provided at the centre of the park.

Gogar Junction

- 5.14 The alignment crosses Lochside Avenue and South Gyle Broadway at signalised junctions and a tram stop comprising two side platforms and located at the edge of the car park, will provide access to the Gyle shopping centre. The tram will pass underneath the A8 and the roundabout slip roads in a new tunnel structure.

Depot

- 5.15 A depot site has been identified between the Fife Rail Line and Gogar Roundabout. This utilises a small triangle of waste ground and some agricultural land at the edge of the greenbelt. The depot site is bounded to the north by the line of the proposed Edinburgh Airport Rail Link (EARL). The depot will be constructed at a low level in order to minimise visual impact and to avoid disruption to the airport runway flight path, hence a significant amount of excavation will be required to lower the existing ground level by approximately 6 metres. A depot building will house staff accommodation and control room for the system, together with maintenance facilities and storage. Stabling will be provided for the tram fleet, with an allowance for future fleet expansion. There will also be a tram stop for staff only.

Gogarburn

- 5.16 The alignment continues west parallel to the A8 to a new stop at Gogarburn, which will serve the Royal Bank of Scotland plc's World Headquarters. The Gogar Burn will be crossed on a new bridge.

Ingliston and Airport

- 5.17 The alignment will run west through farmland to Ingliston, crossing the proposed EARL line on a bridge. The existing Park and Ride facilities at Ingliston will be extended and a tram stop consisting of two side platforms will be provided. To the north the tram will run alongside the Gogar Burn, through the rear of the airport hotel car park and cross the airport service road. The terminus stop, which will be a centre platform, will be on the site of Burnside Road and will allow for future inclusion within a transport interchange hub for the heavy rail link, the tram, buses and taxis.

Granton Square to Ferry Road – Phase 1b

- 5.18 The tram will run through the Granton Waterfront development area from Granton Square to the junction of West Granton Access and West Granton Road, at the northern edge of Pilton. Much of tram in this area will form part of a transport boulevard along the new spine road. This area is currently undergoing comprehensive redevelopment and as such the tram alignment has been determined primarily through the development master-planning process. The tram alignment continues along West Granton Access and through the junction at Ferry Road.
- 5.19 Stops are planned at Granton Square (centre platforms), Granton Waterfront (two side platforms) Caroline Square (two side platforms), midway along West Granton Access (two side platforms), and Crewe Toll (two side platforms). The Crewe Toll stop located next to the junction between West Granton Access and Ferry Road will form a bus - tram interchange between the north-south orientated tramway and the main road extending east-west.
- 5.20 The tram route through Pilton is along a reserved corridor on the west verge of the newly constructed West Granton Access from West Granton Road to Ferry Road. The tram will be constructed along the broad grass verge to the new road, temporary infill opened up under part of the span of the bridge carrying Crewe Road Gardens over West Granton Access. The track-bed will be in-filled with grass and the route will be landscaped with any vegetation removed during construction replaced with areas of trees and decorative shrub planting.

Ferry Road to Haymarket – Phase 1b

- 5.21 The tram will follow the former railway corridor on a fully segregated alignment from Ferry Road to the point where it meets the existing heavy rail corridor just west of Haymarket. Stops are planned at Telford Road (two side platforms), Craighleith (two side platforms), Ravelston Dykes (two side platforms) and Roseburn (two side platforms). Alterations will be required to all the smaller bridges that the tram runs over, including the bridge over the A8 at Roseburn. Works will be required to widen the Groathill Avenue and Craighleith Drive underbridges, and also the Coltbridge viaduct.
- 5.22 The tram and the replacement cycleway/footpath will be constructed on the line of the old trackbed. The tram will run on the east side of the track-bed and the cycle and foot path to the west, with formal crossings as required to allow public accesses to the east. The combined width of the tram tracks and the cycleway and footpath will be approximately 11 metres, compared to the original railway of 8 metres and the current cycleway of 3 metres. Through the majority of the existing cutting and embankments retaining structures will be required to accommodate the required widening.
- 5.23 Where the railway corridor passes under narrow and low arched bridges, the track bed will be lowered to allow the tram tracks to be offset from the bridge centre-line and thus allow room for a narrower cycleway/footpath. The cycleway and footpath will be surfaced in a fine grade blacktop as existing, while the tram track, with the exception of crossings, incorporating a grass finish.

Interchange

- 5.24 The integration with buses, achieved through Service Integration Plans is dependent on successful physical integration of bus and tramstops at key locations which have been identified as being critical for an effective interchange infrastructure and these now form part of the scope of the project.
- 5.25 Since Royal Assent, various options have been developed for interchanges. The base assumption for all interchanges is that where possible, interchange should strive to be cross platform, under cover, timetabled and simple. It should seek to avoid the necessity for passengers to cross roads, walk distances greater than 50 metres or have gradients greater

than 2.5%. However, specific characteristic of the location and/or design constraints may make it impossible to comply with this. The principal bus/tram interchanges for Phase 1 and other opportunities for interchange are:

Foot of Leith Walk (Phase 1a)

- 5.26 This interchange is the key to being able to curtail bus routes at the northern end of Leith Walk. As the numbers of passengers involved in what will be enforced modal interchange is significant, a high quality of design, minimising both walking distances and waiting times, must be achieved. Some provision for terminating buses has to be built into the design, however, the network design will address the issue in such a way as to minimise the total number of terminating buses. The details of the interchange solution for the Foot of Leith Walk are being developed as part of the detailed design. Space available, road layout and traffic movements constrain the area and key design issues identified are in relation to Traffic Management, use of tram lanes by buses and whether the tramstop location is north or south of the Foot of Leith Walk.

St Andrew Square (Phase 1a)

- 5.27 An interchange at the east end of the city centre is essential to accommodate buses reaching the city centre from points west and south of the West End which currently continue via Leith Walk. These are the routes which need to be truncated in order to achieve modal transfer on Leith Walk. In addition, there will be certain “through” bus services.
- 5.28 The design proposal involves reopening of South St. David Street for buses to run south - north and north – south, with trams accommodated in St. Andrew Street and the east side of the Square. Interchange stops will be located on the north side of St. Andrew Square (buses) and close to the bus station (trams). The design proposals meet the basic operational requirements of both bus and tram, gradients and distance requirements for passengers.

Crewe Toll (Phase 1b)

- 5.29 The interchange at Crewe Toll is essential to meet the commitment given during the parliamentary process to provide a feeder service linking the tram route with the Western General Hospital. The location has sufficient space to maximise the potential for good tram/bus interchange. All bus and tram movements into and inside the interchange are required to be controlled by traffic signals.

Haymarket

- 5.30 Interchange between tram and bus, and, in some cases, heavy rail is a key function to be taken into account in the design of all tramstops. Locations other than those referred to above are not, however, crucial to any alterations to bus services which are entailed in the service integration plans in section 8. While not a critical factor in relation to planned alterations to bus services, one interchange in particular is highly significant in regard to interchange between heavy rail and TEL bus and tram, namely, Haymarket.
- 5.31 In this case, there are no plans to curtail bus services to feed into trams but the separate objective of ensuring the best possible opportunity for interchange between heavy rail and both trams and buses necessitates the provision of appropriate interchange infrastructure at Haymarket. It is essential, therefore, that tramstop and bus stop locations at Haymarket are at the core of plans developed by CEC under the Haymarket interchange project. It is also vital that tram project work takes account as far as is possible, bearing in mind the geographic constraints of the limits of deviation, of future plans for Haymarket redevelopment.

Ingliston Park & Ride

- 5.32 The tram service from/to Ingliston will be a direct replacement of the existing bus service X48. The approved extension of the existing Park and Ride and potential future integration opportunities with regional bus services, necessitate high quality interchange facilities.

Edinburgh Park Station

- 5.33 The design proposes a tramstop directly outside the rail station, thus allowing for interchanging between tram and heavy rail. However, if the proposed Park & Ride facility at Hermiston Gait is approved, a high quality interchange would be essential at this location.

Granton Square & Newhaven

- 5.34 Following on from the decision for phased construction of the tram, there is an opportunity to provide quality interchanges with bus at the end of Phase 1a in Leith and at the end of Phase 1b in Granton, thus linking the ends of the network along the seafront.

Interfaces with other projects and functional boundary

- 5.35 In addition to the interchange considerations above, the tram has important interfaces with other projects as follows:

Edinburgh Airport Rail Link (EARL)

- 5.36 The proposed alignment of EARL runs close to the section of Phase 1a between the tram depot at Gogar and the new airport station and careful interface will be required between the two projects particularly in relation to the requirement for electrification and signalling control of the heavy rail system. **tie** is also managing the development of the EARL project for Transport Scotland.

Edinburgh Waverley Infrastructure Enhancement

- 5.37 This project commenced on site in January 2006 and will construct a new bay platform at Haymarket Station which will be parallel to the alignment through Haymarket Yards and will be adjacent to the access to be created as part of Phase 1a to the Haymarket Station car park. There has been close interaction between the two projects to date and this will need to continue to ensure that both projects can be implemented.

Edinburgh Airport Outline Masterplan

- 5.38 Commitments have been made to Edinburgh Airport Limited, New Ingliston Limited and Meadowfield Limited regarding the need to ensure that any future access road to the airport can be accommodated alongside the tram depot at Gogar. The depot has been designed to ensure that this commitment can be achieved. In addition the tramstop location at the airport and the interaction with the EARL hub needs to be coordinated to ensure that an integrated transport hub is created.

Ingliston Park and Ride Phase 2

- 5.39 Phase 2 of Ingliston Park and Ride lies adjacent to the Ingliston Park and Ride tramstop on Phase 1a, the future Phase 3 of the tram (the Newbridge Shuttle), the existing Phase 1 of the Ingliston Park and Ride site and EARL. Due to these significant interfaces, careful consideration is being undertaken in the detailed design in order to ensure all of these projects benefit from the park and ride extension. In order to facilitate this, CEC has instructed **tie**, which is also delivering the tram project and EARL, to undertake the design with a view to commencing construction as part of the advanced works required for the tram project. This

will allow park and ride patronage to increase in advance of the tram coming into service. The design will have regard to and will respond to the needs of both EARL and tram. However there will need to be continued interaction between all three projects as the extension to the park and ride progresses.

Haymarket Masterplan

- 5.40 Given the potential for interchange at Haymarket, CEC needs to have regard to the tramstop locations when developing the Haymarket Masterplan. It is also vital that the tram project takes account of, as far as is possible, the future plans of the Haymarket area. To this end a representative of the tram project team attends all of the Haymarket Interchange Masterplan Steering group meetings.

Granton Masterplan

- 5.41 This sets out the development aspirations for this area in North Edinburgh. There will need to be close interaction between the CEC Planning Authority and the tram project so that the project can help to maximise the redevelopment and regeneration of this area.

Waterfront Masterplan

- 5.42 Similarly to the Granton Masterplan, this sets out the development aspirations for the Waterfront area. Some of the development is underway and has been completed however to ensure that the Masterplan can be implemented in full, there will again need to be close interaction between the CEC Planning Authority and the tram project.

Leith Docks Development Framework

- 5.43 This Framework sets out the development aspirations of the Leith Docks areas which is one of the biggest development opportunities in Edinburgh. CEC has already been working closely with Forth Ports, the largest landowner in this area in relation to the redevelopment of this area. The tram project will require to continue to work closely with both CEC and Forth Ports.

St Andrew Square Capital Streets Plan

- 5.44 Given the status and importance of the St Andrew Square and the plans to improve the streetscape and setting of this area in advance of the tram works, the project and CEC will require to work closely together, to try to co-ordinate the works required for both project and minimise any unnecessary work. The aim of CEC is to create a public realm space and the aim of the project is to create a transport interchange. These aims are not mutually exclusive and accordingly careful interface will be required.

City Centre Management

- 5.45 Given the tram runs through the city centre, the project will continually consult and work with the City Centre Management Company to minimise any impacts to retailers from the construction of the tram and to continue to ensure buy-in for the project from the retailers.

Road Network/Road Traffic Management Interfaces

- 5.46 A large section of the tram network runs along/within the road network within the City Centre. To avoid this resulting in an unacceptable impact on road users and the road network, there will need to be close liaison with the roads authority both in respect of the impacts of construction and the operation of the tram. Traffic management plans will require to be agreed with the roads authority and both temporary traffic regulation order and traffic regulation orders will be required in respect of the construction and operation phases respectively.

Network Rail Interfaces

- 5.47 A large section of the tram runs alongside the main Edinburgh to Glasgow heavy rail main line. Given the differences in the currents used to power a light rail scheme compared to a heavy rail scheme, there will be a need to carry out immunisation works to the heavy rail system. Accordingly, there will need to be close interaction with Network Rail and due cognisance taken of the various other heavy rail schemes and development which are either committed or in the process of being consented to try to ensure all of the necessary works are carried out as efficiently in terms of time and money as possible.

Vehicle capability

- 5.48 The supply of trams is within the scope of this project. The tram must comply with specific design criteria including the following:

- High safety standards, compliance with Railway Safety Principles and Guidance
- High reliability, minimum maintenance required and ease of repair
- Proven design and technology and industry standard technology
- Operable in conjunction with a track gauge of 1435mm
- At least 230 passenger total carrying capacity with standees @ 4 passengers/ m²
- At least 80 seats, of which a minimum of 16 seats must be accessible to passengers without using steps
- Up to 10 m² of floor area to be allocated to full height luggage racks
- Trams nominal 40m in length in order to be able to meet the passenger and luggage carrying capacity identified above
- Nominal width of 2.65m externally
- At least 70% of the floor area will be low floor with a height above rail level of between 300mm and 400mm
- Passenger doors will be situated within the low floor areas and on both sides. All doorways will allow for level boarding access at 300 – 350mm above the top of the rail.
- The slope of the floor at the entrance shall be less than 5%
- Double door clearance width of no less than 1300mm and clearance height of no less than 2050mm
- In line with the Rail Vehicle Accessibility Regulations 1998, wheelchair spaces will be accessible directly from these doorways without steps.
- Maximum operating speed of 80kph
- Operable from a nominal 750dc overhead power supply
- Modular construction (ease of maintenance)
- Minimum operating capability of at least 100,000km per year
- Bi-directional
- Fitted with equipment to automatically indicate the trams position to and communicate with a central control centre
- Provision for wheel chairs
- Capable of supporting a 600kN buffing load
- CCTV equipment to provide rear views
- Seats will be at least 450mm wide
- Headroom through the seating area will be at least 2.3m to ceiling in the low floor areas and where uneven floor height is proposed, 2.1m to the ceiling in the high floor areas
- If loss of overhead supply, batteries will allow all essential systems to operate for a minimum of 30 minutes
- Door performance – 12 seconds for the doors to open and close which includes DDA requirements and passenger and driver reaction times
- Single roof mounted pantograph with maximum and minimum operating heights of 6.7m and 3.8m respectively

- The pantograph will comprise a base frame, frame, horned slipper holder, pantograph spring and electrical raising/lowering device

Route capability

- 5.49 The performance criteria of the route include the following:
- Phase 1a has a target journey time (including layover and dwell times of 25 seconds at each stop) of 44 minutes and 30 seconds in each direction.
 - Phase 1b has a journey time of 16 minutes and 30 seconds (including layover and dwell times of 25 seconds at each stop)
 - The design of the network will enable 99% of all tram journeys to be no earlier than 1 minute and no greater than 2 minutes late. The reliability of the service will be measured at Edinburgh Airport (arrival and departure), Edinburgh Park Station (arrival), Haymarket (arrival), Foot of the Walk (arrival), Leith (arrival), Picardy Place (arrival), Crewe Toll (departure), Granton Square (departure)
- 5.50 The scheme has been designed to allow a service frequency of up to eight trams per hour in each direction for each of the two services, giving a frequency of up to 16 trams per hour on the common section. Further details of the proposed tram service patterns are provided under 'Tram operations' below.
- 5.51 The general design principal is to provide the optimum segregation for the tram way, which will allow for consistency of run time and reduced interaction with other road traffic and which in turn should lead to increased patronage and benefits. The route is all double track. There will be one depot which will provide maintenance and stabling facilities for the entire fleet of trams on the initial network. There will be turnback facilities at:-
- Edinburgh Park Station
 - Balgreen Road
 - Haymarket
 - Shandwick Place
 - York Place
 - Foot of the Walk
 - Ocean Terminal
 - Crewe Toll
- 5.52 A tram must always be present at the Airport tramstop
- 5.53 The layover will be 4 minutes minimum or 10% of the timetabled runtime, whichever is the greater. There will be layover facilities at the airport, Ocean Terminal and Granton Square. The depot halt at Gogar will be the location where drivers changeover.
- 5.54 The system will operate as a "line of sight" tramway with tramway signalling provided at road junctions and at tram crossings as appropriate. The following assumptions have been made as part of the run time simulation model, however it should be noted that these are for design purposes only and that the eventual speeds will be agreed with HMRI prior to [shadow running]:-
- maximum speed of 80 kph
 - assumed deductions in speed to reflect horizontal and vertical alignment
 - assumed deductions in speed to reflect line of sight conditions
- 5.55 Provision will be made in the design for a delta junction at Roseburn to allow flexibility in operations.

Operations and Control functionality

- 5.56 The Control Room shall be the focal point for the control and operation of the Edinburgh Tram Network. Its purpose shall be to provide a working place for the Operational employees to manage and coordinate day-to-day activities associated with system operations. The control room shall be located on the first floor of the Depot building.
- 5.57 The Control Room comprises of a number of workstations, at which Control Room staff sit and use equipment to remotely control or retrieve data from the system. The operator interface shall be designed to carry out control functions in an ergonomically efficient manner.
- 5.58 The Control Room Workstations shall provide indication and control of auxiliary systems and services as follows: -
- Operation of Passenger Help / Passenger Emergency Help Point System;
 - Tram Position and Detection System status and alarms;
 - Public Address announcements, volume level control and indications;
 - 'No-Break' power supply status and alarms;
 - Intruder alarms;
 - Communications Systems Status and Alarms;
 - Ticket Vending Machine and Validator alarm indications;
 - Closed Circuit Television;
 - System Plant / Services status indications and alarms;
 - Supervisory Control and Data Acquisition System;
 - Traction Power System;
 - Operational Radio System;
 - Emergency telephones;
 - Performance Monitoring System;
 - Central data recording and storage;
 - Central time;
 - Security;
 - Passenger Information Display management;
 - Communications network management;
 - Video / Closed Circuit Television image printing; and
 - Fire alarm system.

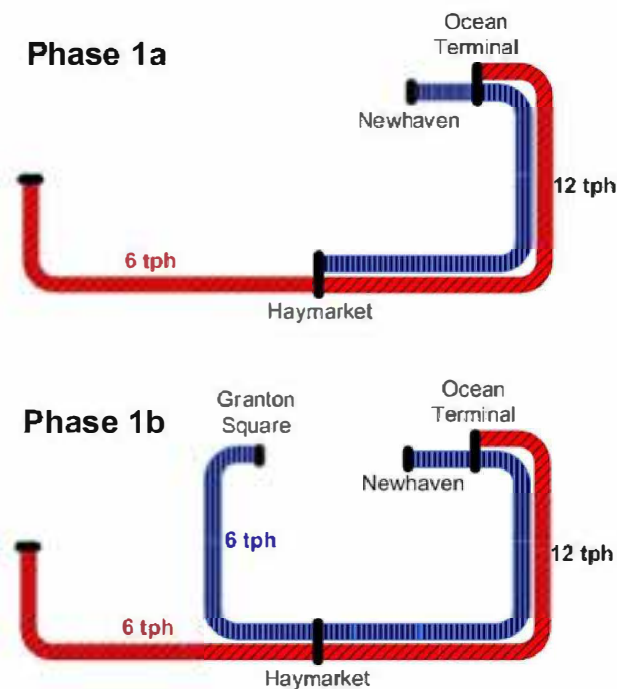
5.59 Equipment at or near tramstops and at road crossings will be needed to facilitate tram signal and traffic controls. This will include poles and signs, together with control boxes and a small electrical supply pillar. Small control cabinets will be required close to all signals. Stop equipment cabinets will house all other control equipment. The tramline will be signalled using road type signals. The road signals will interface with the urban traffic controls and will require small pillars or cabinets to house the vehicle recognition system.

Tram operations

5.60 The JRC modelling work in conjunction with the service integration plan has produced the latest patronage forecast for the tram and for buses. This has allowed the tram and bus service plan to be validated and adjusted to ensure sufficient capacity is provided at an affordable level throughout the network. The service integration plan seeks to provide an integrated public transport network upon introduction of the tram.

5.61 The tram service provision is based upon the number of trams per hour (tph) necessary to carry the demand predicted by the model in the AM peak hour in the busiest direction. This tram service frequency is applied in 2011 when the tram opens and for the first four years of operation. It operates as shown in Figure 5.1 below (presented for Phase 1a on its own and for Phase 1 in its entirety) with the services on the common section terminating at Newhaven and Ocean Terminal to ensure services can be turned back efficiently and consistently.

Figure 5.1 – 2011 tram services for Phase1a only and for complete Phase 1

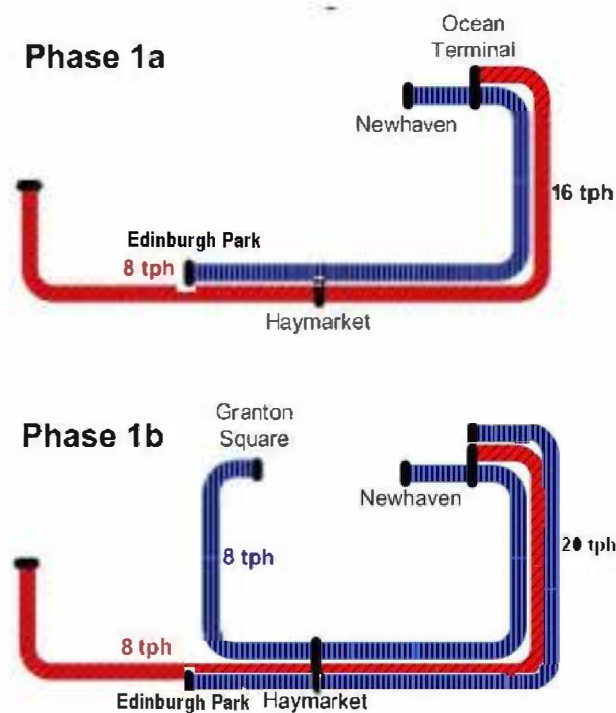


5.62 The modelling process indicates that after the initial four year 'build-up' period the tram services will require to be strengthened to provide sufficient capacity primarily to serve demand on the Ocean Terminal to Haymarket section of the tram network. On that basis, the services will increase to 8tph instead of 6 tph on each of the service routes in 2016.

5.63 The modelled passenger projections indicate that after the year 2027 the tram services will require to be strengthened further to provide sufficient capacity to serve demand on the Haymarket to Edinburgh Park section of the tram network. Consideration of this has led to a potential solution of extending, for Phase 1a, the Newhaven to Haymarket service to Edinburgh Park providing 16 tph between Ocean Terminal and Edinburgh Park. For the

Phase 1a and 1b scenario, the demand could be met by overlaying an additional service operating between Ocean Terminal and Edinburgh Park at a frequency of 4 tph which would raise the tram service on Ocean Terminal to Haymarket to 20 tph and Haymarket to Edinburgh Park to 12 tph as shown in Figure 5.2 below. (Note that, notwithstanding the consideration given to service patterns in the longer term, for TEE and appraisal purposes, the 8/16 tph regime has been used as the central case assumption in 2031.)

Figure 5.2 – 2027 indicative tram services for Phase1a only and for complete Phase 1



5.64 The first and last tram services and frequencies for 6 & 12 tram per hour scenario are shown in Tables 5.1 and 5.2 below. These scenarios are based upon the following assumptions and conditions:

- A basic frequency of 6 or 8 trams per hour per service (combined to give a total of 12 or 16 trams per hour) is required during the daytime to replace withdrawn bus services (and therefore demand and capacity) on Leith Walk.
- Short workings between Edinburgh Airport/Granton Square and St. Andrew Square are based on the ability to turn trams at St Andrew Square. The precise location and feasibility of the turnback is currently under review.
- Edinburgh Airport service tram frequency is ramped up/down from Ocean Terminal. Granton Square or Haymarket service tram frequency is ramped up/down from Newhaven.
- Trams going into service between Gogar depot and Ocean Terminal / Newhaven will run "in service" from the Gyle (first tram Gyle to Ocean Terminal approx. 05:15).
- Haymarket or Granton Square service trams going out of service running between Newhaven and Gogar depot will run "in service" as far as the Gyle.
- Edinburgh Airport service trams going out of service will run "in service" from Ocean Terminal to Edinburgh Airport with a short "dead run" from Edinburgh Airport to Gogar depot.
- The period of time between the last tram returning to the depot at night and the first tram leaving the depot in the morning is about 4hrs 30 min. Consequently the maintenance window will allow work on the system infrastructure for about 3 hours

and 45 minutes, depending on location each night and allowing time for the implementation and withdrawal of isolations.

- Service proposals are based on the requirement to always have a tram present at the Airport tramstop.

Table 5.1
First & last tram services and frequencies for 6 & 12 tram per hour scenario

Network / Phasing		Monday - Friday (trams per hour)					
		first tram 06:00	06:45	07:00	07:20	23:15	last tram 23:59
1a	Airport to Ocean Terminal	0	6	6	6	6 ^a	0
1a	Ocean Terminal to Airport	6	6	6	6	6	0
1a	Haymarket to Newhaven	0	0	6	6	0	0
1a	Newhaven to Haymarket	0	0	0	6	0	0
1b	Airport to Ocean Terminal	0	6			6 ^a	0
1b	Ocean Terminal to Airport	6	6			6	0
1b	Granton to Newhaven	0	6			6 ^b	0
1b	Newhaven to Granton	6	6			6 ^c	0
Network / Phasing		Saturday (trams per hour)					
		first tram 06:00	06:45	07:30	07:50	23:15	last tram 23:59
1a	Airport to Ocean Terminal	0	6	6	6	6 ^a	0
1a	Ocean Terminal to Airport	6	6	6	6	6	0
1a	Haymarket to Newhaven	0	0	6	6	0	0
1a	Newhaven to Haymarket	0	0	0	6	0	0
1b	Airport to Ocean Terminal	0	6			6 ^a	0
1b	Ocean Terminal to Airport	6	6			6	0
1b	Granton to Newhaven	0	6			6 ^b	0
1b	Newhaven to Granton	6	6			6 ^c	0
Network / Phasing		Sunday (trams per hour)					
		first tram 06:00	06:45	08:00	08:20	23:15	last tram 23:59
1a	Airport to Ocean Terminal	0	6	6	6	6 ^a	0
1a	Ocean Terminal to Airport	6	6	6	6	6	0
1a	Haymarket to Newhaven	0	0	6	6	0	0
1a	Newhaven to Haymarket	0	0	0	6	0	0
1b	Airport to Ocean Terminal	0	6			6 ^a	0
1b	Ocean Terminal to Airport	6	6			6	0
1b	Granton to Newhaven	0	6			6 ^b	0
1b	Newhaven to Granton	6	6			6 ^c	0
Notes:							
^a from approx 23:15 trams run from Airport - City Centre only							
^b from approx 23:15 trams run from Granton - City Centre only							
^c from approx 23:15 Granton trams run from New haven - Haymarket continuing in service on TL2 to Gyle							

Table 5.2
First & last tram services and frequencies for 8 & 16 tram per hour scenario

Network (phasing) and service frequency commencing at:		Monday - Friday (trams per hour)									
		06:00	06:45	07:00	07:20	07:45	19:00	19:20	19:45	23:15	last tram 23:59
1a	Airport to Ocean Terminal	0	8	8	8		8	8		8 ^a	0
1a	Ocean Terminal to Airport	8	8	8	8		8	8		8	0
1a	Haymarket to Newhaven	0		8	8		8	8			0
1a	Newhaven to Haymarket	0		0	8		8	8 ^d			0
1b	Airport to Ocean Terminal	0	8	8		8	8		8	8 ^a	0
1b	Ocean Terminal to Airport	8	8	8		8	8		8	8	0
1b	Granton to Newhaven	0	4	4		8	8		4	4 ^b	0
1b	Newhaven to Granton	4	4	8		8	4		4	4 ^c	0
Network (phasing) and service frequency commencing at:		Saturday (trams per hour)									
		first tram 06:00	06:45	07:30	07:50	08:15	18:30	18:50	19:15	23:15	last tram 23:59
1a	Airport to Ocean Terminal	0	8	8	8		8	8		8 ^a	0
1a	Ocean Terminal to Airport	8	8	8	8		8	8		8	0
1a	Haymarket to Newhaven	0		8	8		8	8			0
1a	Newhaven to Haymarket	0		0	8		8	8 ^d			0
1b	Airport to Ocean Terminal	0	8	8		8	8		8	8 ^a	0
1b	Ocean Terminal to Airport	8	8	8		8	8		8	8	0
1b	Granton to Newhaven	0	4	4		8	8		4	4 ^b	0
1b	Newhaven to Granton	4	4	8		8	4		4	4 ^c	0
Network (phasing) and service frequency commencing at:		Sunday (trams per hour)									
		first tram 06:00	06:45	07:50	08:00	08:45	18:00	18:20	18:45	23:15	last tram 23:59
1a	Airport to Ocean Terminal	0	8	8	8		8	8		8 ^a	0
1a	Ocean Terminal to Airport	8	8	8	8		8	8		8	0
1a	Haymarket to Newhaven	0		8	8		8	8			0
1a	Newhaven to Haymarket	0		0	8		8	8 ^d			0
1b	Airport to Ocean Terminal	0	8		8	8	8		8	8 ^a	0
1b	Ocean Terminal to Airport	8	8		8	8	8		8	8	0
1b	Granton to Newhaven	0	4		4	8	8		4	4 ^b	0
1b	Newhaven to Granton	4	4		8	8	4		4	4 ^c	0
Notes:											
*from approx 23:15 trams run from Airport - St Andrew Sq only											
*from approx 23:15 trams run from Granton - St Andrew Sq only											
°from approx 23:15 Granton trams run from Newhaven - Haymarket continuing in service on to Gyle											
°from approx 19:20 (18:50 Saturdays and 18:20 Sundays) Haymarket trams running from Newhaven - Haymarket continue in service to Gyle											

Operational integration with bus

- 5.65 It is a critical element of planning for the tram system that the operation of bus and tram (and other modes) should be as fully integrated as possible. The principal bus operator in Edinburgh is Lothian Buses, which is majority owned by the public sector. To facilitate tram/bus integration and maximise the operational and service opportunities this presents, CEC established TEL.
- 5.66 The objective is to deliver an integration plan which:
- creates a combined bus and tram network which will be financially viable from the start of tram operation
 - avoids unnecessary duplication of provision, and thereby maximises operating efficiencies
 - minimises enforced passenger interchange between modes, except where interchange infrastructure is assumed to be deliverable
- 5.67 TEL will actively plan and manage the two operations as a single economic unit to provide an integrated transport network. Operationally, TEL will retain its bus set-up and take full advantage of the appointment of Transdev as the operator for the tram system. Key areas for integration and key strategies for TEL will be set out in the TEL Business plan:
- Fares strategy
 - Ticketing strategy & systems
 - Revenue protection
 - Service integration & service patterns
 - Interchanges
 - Operational support systems
 - Safety and Quality management
 - Risk management and Insurance
- 5.68 A summary of the TEL Business Plan and the planned bus services to integrate with the tram service patterns above are provided in section 8.

Project Constraints

- 5.69 The tram will need to address the effect on the World Heritage Status of Edinburgh and **tie** is seeking to minimise or eliminate any adverse impact the tram system may have, by working closely with CEC Planning Authority to develop complementary solutions. The initial design work proposed as part of the recommended procurement option is targeted on the most sensitive sections of the route, with the aim of facilitating planning solutions in these areas. The topography, layout, numerous ancient monuments and Sites of Special Scientific Interest, have all been evaluated and have shaped the routing of the tram system, **tie** is committed to minimising any adverse impact on these areas.
- 5.70 During the construction phase there will be periods where 'restricted' or 'no construction' can be achieved in certain areas, primarily during the Edinburgh Festival and the run up to Christmas. **tie** will need to ensure that the scheduling of construction takes into account when areas will be curtailed, and minimise any potential down time by pragmatic targeting of resources.
- 5.71 In addition, various documents were prepared during the Parliamentary process, which impose constraints on the construction and operation of the tram. These include:
- **Code of Construction Practice** – this was developed during the parliamentary process and the Bill amended to provide that the authorised undertaker must use all

reasonably practicable means to ensure that the works are carried out in accordance with the Code of Construction Practice. This document sets out the working hours, noise levels during construction, methods of minimising dust, vibration, and the like during the construction period, consultation requirements etc.

- **Noise and Vibration Policy** – again this was developed during the parliamentary process and the Bills were amended to provide that again the authorised undertake must use all reasonably practicable means to ensure that the Noise and Vibration Policy is applied to the use and operation of the tram. This imposes operational requirements on the tram and infrastructure contractors and thereafter the operator and maintainers. The scheme must be designed and constructed so as to endeavour to comply with the policy failing which there will be a need for further mitigation measures e.g. noise barrier following the operation of the tram. The policy also sets out monitoring requirements and the basis of an insulation scheme. Generally the provisions reflect the provisions of the 1996 Regulations which apply in England and Wales.
- **Landscape & Habitat Management Plan** – this was also developed during the parliamentary process in response to the objectors along the Roseburn Corridor. This sets out the likely impacts on the Corridor, the mitigation and the ongoing management of the Corridor once the tram is constructed and is operational. This requires the approval of the planning authority prior to the works along the Roseburn Corridor commencing.
- **Environmental Statement** – the Bills were amended so as to provide that the residual impacts of the scheme must be no worse than as assessed in the Environmental Statements.
- **Tram Design Manual** – this has been developed and approved by the Planning Authority as supplementary planning guidance which will be a material consideration in the assessment of all the prior approval application.
- **Side Agreements** – various agreements have been reached with objectors (in exchange for an objector withdrawing its objection) which contain provisions which will constrain the construction of the tram. For example in relation to the SRU, the LLAU has been redefined; working hours on event days have been restricted and there is a requirement to pass through the area within 18 months.

5.72 There are various programme restrictions which may affect the construction of the tram network which include the following:-

- The August Festival period will run from the first Sunday in August to the first Sunday in September
- The area affected by the August Festival restrictions will be from Haymarket to Picardy Place
- The December Christmas market restriction will run from first December to the first working day of the New Year inclusive
- No work can commence at Haymarket Station prior to 17 November 2007
- Edinburgh Park has an 18 month construction window on the north site and a 24 month construction window on the south site (which includes the bridge) from the commencement of the works
- Seasonal constraints on site clearance of trees and shrubs
- Constraints associated with badger and other protected species
- CEC has requested that the Fastlink guided busway is kept operational as long as possible in the construction programme
- There is an 18 month window to complete the main civils work adjacent to Murrayfield

Project Workscope

Track

- 5.73 The nature of tramline surfacing (track, swept path, affected roads and footpaths) is dependent upon its environment. The various track finishes will include the following:-
- Tar macadam or other similar road surfacing
 - Block paviers, stone setts or the like
 - Grass eg the Roseburn Corridor
 - Ballast eg depot area and off street sections
 - Concrete or similar hard surface eg on a bridge or other structure, an apron or special surface in the depot, sidings and tramstops
- 5.74 On street, trackslab construction (reinforced concrete) must provide strength to support the traffic / tram loads (including risk of voids beneath) together with appropriate stray current protection. Steel rails pre-coated with a resilient material are fixed within the trackslab. The trackslab may also be designed for specific circumstances to mitigate ground borne vibrations and noise. Off-street the rails may be fixed within "grasstrack" (usually a "lawned" type slab or unit construction) or traditional ballast and sleeper type arrangement.
- 5.75 The different track forms will comprise the following:-
- Street running track (integrated and segregated)
 - Grass track
 - Direct fixation track
 - Ballasted track
 - Special trackforms in the depot and tramstops
- 5.76 The trackform provided shall:
- Facilitate ease of construction and minimise disruption to other road users and the public during the construction phase on all roads and across all junctions between Haymarket and Ocean Terminal via Princes Street;
 - Minimise the potential for stray current and be in accordance with the requirements and codes of practice for stray current and the tie Earthing and Bonding Policy document;
 - Ensure simplicity of overall maintenance and ease of rail replacement and relaying. Minimise the disruption to other road users caused by the future repair or replacement;
 - Comply with the operational noise and vibration requirements as stated in the Noise and Vibration Policy;
 - Integrate fully with roads, such that differences in roads surfaces, specifically finished levels and skid resistance, are minimised as far as is reasonably practicable;
 - Take account of the potential vandalism risk posed by the type of trackform, e.g. ballast which could be thrown at trams;
 - Integrate fully with surrounding area functionality and appearance, to ensure that hazards to pedestrians, the mobility impaired and cycle users are minimised as far as is reasonably practicable, and such that track surface finishes are in accordance with all design requirements and guidance.
- 5.77 The following track elements shall be determined in the study in order to ensure compatibility between the wheels and rails of all operational and maintenance vehicles using the system in

terms of sufficient adhesion and the mitigation against the risk of derailment, wear, noise and vibration:

- Various track alignment criteria
- Rail sections
- Points and crossing configurations including checking of wheels adjacent to and on approaches to rail crossings
- Provisions for checking of wheels on small radius curves, adjacent to and on approaches to discontinuities in the rail, such as at rail movement joints
- Possible provision for flange running at rail crossings and other discontinuities in the rail
- Rail grades.
- Consideration of all parameters against full defined construction and maintenance tolerance including the interface between new wheels and worn rails and vice-versa
- Rail inclination
- Rail lubrication

5.78 Track will be a standard tramway track with steel rails set to standard gauge (1.435m).

5.79 Trackwork components to be provided include but are not limited to the following:-

- Rails;
- Sleepers and points and crossing bearers;
- Turnouts;
- Points and points motors.
- Points baseplates and slippers;
- Points rollers;
- Crossings;
- Check rails and check rail fastening systems;
- Guard rails and guard rail fastening systems;
- Transition rails;
- Rail joints (fishplated and welded);
- Insulated rail joints;
- Isolatable rail joints and provisions for access to associated rail/cable connections;
- Rail movement joints;
- Rail fastening systems;
- Rail pads;
- Baseplates;
- Resilient baseplate systems;
- Rail embedment for street running track;
- Paved trackbed and concrete trackbed systems;
- Grooved rail drainage systems (including boxes);
- Buffer stops and vehicle arrestor systems;
- Ballast;
- Granular filtering;
- Granular blanketing;
- Geotextile membranes;
- Plastics membranes;

- Geosynthetic reinforcement;
- Provision and installation of signs and markers; and
- Grasstrack.

5.80 The track will be double track.

Depot

5.81 The depot is to be located at Gogar and will require to comply with the Civil Aviation Authority regulations in relation to bird strike given the site's proximity to the emergency runway at Edinburgh Airport.

5.82 There will be road access from the A8 Gogar Roundabout. All existing utilities and services will be relocated. The depot will be secured by a continuous 2.4m high security fence and will have a CCTV system.

5.83 The depot will accommodate a minimum of thirty two 40 metre births. Staff and visitor parking is to be provided.

5.84 The main tram workshop, other workshops, stores, management, administration, operations and maintenance offices and staff welfare facilities (support accommodation) and the control room for the complete Edinburgh Tram Network, shall be contained within a steel framed building clad in an insulated panel cladding system. The roof of the building shall be insulated to a suitable standard with the minimum number of penetrations.

5.85 The building workshop shall accommodate a minimum of two tram maintenance roads, a wheel lathe road and a further tram service road.

5.86 The support accommodation shall be arranged on two floors set to one side of the main tram maintenance workshop. The Control Room shall be located at first floor level with the Equipment Room set below. A view of the depot external stabling area and tram entry/exit point shall be provided to control room staff from within the Control Room.

5.87 The depot shall be provided with the appropriate electricity supplies including 400V/415V for individual items of workshop equipment both inside and outside the building, 230V for internal domestic use and 110V for small tools.

5.88 Natural light in offices shall be maximised and all rooms shall be placed within the building in locations appropriate to their function.

5.89 Additional service space shall be provided for the accommodation of gas, compressed air and battery charging equipment as well as for the accommodation and systems directly linked to the tram operations.

5.90 Full heating and ventilation will be provided throughout the building with air conditioning to the Control Room, Equipment Room, training and meeting rooms.

5.91 The plant and equipment to be provided and installed will include the following:-

- Vehicle shunter
- Vehicle lifting jacks/stands
- Tram cleaning equipment
- Air-con repair
- High-level access platforms
- Wheel hub removal/press
- Tyre splitter
- Depot furnishings
- Cleaning (shot blast/wet spray)

- Workshop cranes
- Craneage (general)
- Underfloor wheel lathe
- Tram washing plant
- Bogie maintenance area
- Body shop
- General tool shop, welding/cutting, machining etc
- Re-railing equipment
- Pan maintenance and load-test jig
- Permanent way/track-way maintenance vehicles/ancillary engineering vehicles
- Stores (computerised/inventory and maintenance linked software)
- Small tools
- Spares/consumables
- Fork lift truck
- Temporary lighting stands/equipment
- Mobile/fixed staging for tram and end of tram inspections
- Road/rail vehicle
- Accommodation bogies
- Mobile generators
- Rail groove cleaning equipment
- Mobile platforms (road/rail based)
- Rail grinding equipment
- Track measurement equipment
- Sand plant
- Mobile paint shop booth

Tramstops

- 5.92 Tramstops will be either platform stops, side platform stops or combined side and island platform stops. The tramstops must be long enough to cater for a 40m tram.
- 5.93 Side platforms are to a minimum of 3m wide. Island platforms will be a minimum of 4 metres wide. The platform height must match the requirements of the tram to ensure level access in accordance with the Rail Vehicle Accessibility Regulations.
- 5.94 Tramstops shall be compliant with:
- The requirements of the Tram Design Manual;
 - Her Majesty's Railway Safety Principles & Guidance;
 - Disability Discrimination Act requirements;
 - Rail Vehicle Accessibility Regulations;
 - The Mobility and Access Committee for Scotland (MACS);
 - The Department for Transport Inclusive Mobility Guide to Best Practice on Access on Pedestrian and Transport Infrastructure; and
 - The Building Regulations (Part M).
- 5.95 In addition the tramstop must comply with the following:-
- Mobility-impaired access and egress to and from each platform. The minimum width of ramps provided on the Edinburgh Tram Network System shall be 2m between handrails;
 - Ramps, if required, shall have a maximum gradient of 1 in 20;
 - No ramp shall be longer than 10m without the incorporation of a landing;
 - Landings shall be no shorter than the width of the ramp; and
 - Mobility impaired tram access/egress points shall be clearly defined within the platform finish if required by the tram design and consistent with tram stopping tolerances.

- 5.96 Tramstop finishes are to be in accordance with the Tram Design Manual. Provision is to be made for 400mm wide tactile strips. The platform edge is to have a 65mm wide white inset line to the leading edge of the line-side coping. Disabled boarding points will be indicated.
- 5.97 Each tramstop will be equipped as is appropriate for the location of the stop. Such equipment may include any of the following:-
- Shelters and canopied waiting areas
 - Tramstop lighting columns
 - Public address
 - Tramstop CCTV
 - Passenger help points and emergency points
 - Braille assistance
 - Tramstop name signs
 - Advertising/information signs and displays including real time passenger information displays
 - Litter bins
 - Guardrails, handrails and cycle racks
 - A perch rail/seating
 - Ticket vending machines
- 5.98 Each stop will be provided with a Stop Equipment Cabinet, which will house the majority of the control equipment such as communication and signalling equipment. Where practicable, this would be co-located with a sub-station. Such cabinets are generally metal units with a 1-2m frontage, up to 1m depth and 1.5m high.

Structures

- 5.99 The project requires the construction or modification to a number of structures along the route:-

Phase 1a

- Lindsay Road Retaining wall
- Victoria Dock Entrance Bridge
- Tower Place Bridge
- Leith Walk Railway Bridge
- Haymarket Station Viaduct
- Russell Road Bridge
- Russell Road Retaining Wall One and Two
- Water of Leith Bridge
- Baird Drive Retaining Wall
- Balgreen Road Bridge
- Balgreen Road Retaining Wall One
- Carrick Knowe Underbridge
- Saughton Road Bridge
- Broomhouse Road Bridge
- South Gyle Access Bridge
- Edinburgh Park Station Bridge
- A8 underpass
- Gogar Burn Bridge
- Gogar Burn Culverts
- Gogar Burn Retaining Walls
- Murrayfield Tramstop Retaining Wall
- Roseburn Street Viaduct
- Murrayfield Stadium Retaining Wall
- Murrayfield Stadium Underpass
- Murrayfield Training pitches retaining wall
- Bankhead Drive Retaining Wall

- Gyle Stop Retaining Wall
- A8 retaining wall
- Depot Internal Retaining Walls
- Depot Access Bridge
- EARL underbridge

Phase 1b

- Roseburn Corridor Retaining Walls
- Roseburn Terrace Bridge
- Coltbridge Viaduct
- St George's School Access Bridge
- St George's School Foot Bridge
- Ravelston Dykes Bridge
- Craigeith Drive Bridge
- Holiday Inn Access Bridge
- Queensferry Road Bridge
- Groathill Road South Bridge
- Telford Road Bridge
- Drylaw Drive Bridge
- Ferry Road Retaining Wall
- Crewe Road Garden Bridge

- 5.100 Due cognisance will be taken of the historical status of any of the structures affected by the works.
- 5.101 The structures are to be designed and constructed to comply with the Noise and Vibration Policy.
- 5.102 The design is to minimise the need for bearings and movement joints within the structures. Where bearings are used either elastomeric or pot type bearings will be used to accommodate longitudinal and transverse translations and rotations while minimising lateral loads on sub-structures. All bearing must be replaceable under full live loading.
- 5.103 The structures are to be designed to comply with the loadings imposed by construction and maintenance vehicles.
- 5.104 All elements are to be designed and provided to cater for tensile breakage of one rail at any location at ultimate limit state only. Clearances will be to HMRI requirements.
- 5.105 Finishes to all concrete components of the works shall comply with the following:-
- All buried and permanently submerged surfaces
 - Pier tops, bearing shelves and hidden surfaces
 - Parapet coping, exposed surfaces
 - Main Bridge deck
- 5.106 The structures are to be designed for minimal maintenance requirements.

Roads and Utilities

- 5.107 The majority of the works required to divert or protect utilities will be carried out by the contractor appointed under the Multi Utilities Diversionary Framework Agreement (MUDFA).
- 5.108 In addition the roads and utilities works will include the following:-
- Road and junctions (including all necessary off-alignment works);
 - Site clearance;
 - Safety barriers and fencing;
 - Drainage works including track drainage;

- Earthworks;
 - Surfacing;
 - Road lighting;
 - Traffic signage and road markings;
 - Traffic signals and tram signals;
 - Landscaping;
 - Temporary and permanent traffic measures;
 - All associated cable ducting required for the works;
 - Depot access and utilities, including within the depot;
 - Utility diversion works whether carried out by MUDFA, Infracore or otherwise; and
 - Removal of all redundant services and apparatus affecting the works.
- 5.109 The tram network shall be segregated from the road wherever feasible using a variety of means as appropriate to the features and constraints of the individual locations. These include the use of road markings and varying surface types for visual or textural delineation. The design of the segregation details shall optimise their effectiveness without significantly compromising safety and operational factors, including the operation of junctions and emergency and maintenance access.
- 5.110 Wide-area modelling of traffic impacts consequent to the design shall be provided as a pre-requisite to approval, and prior agreement with the City of Edinburgh Council on the Traffic Regulation Orders and Temporary Traffic Regulation Orders necessary to implement the design and complete the works.
- 5.111 The roads design will meet the standards set out in the Design Manual for Roads and Bridges (DMRB), City Development Transport – Development Quality Handbook – Movement and Development and the Tram Design Manual.
- 5.112 Where cycleways are provided, for example along the Roseburn Corridor, these shall be design and constructed in accordance with the relevant guidelines including:
- Design Manual for Roads and Bridges;
 - City of Edinburgh Council “Roads Development Guidelines”;
 - Scottish Executive’s “Cycle by Design”; and
 - Sustrans “Cycle Friendly Infrastructure Guidelines for Planning and Design”
- 5.113 All surfacing materials and drainage will comply with the DMRB. Road signs will comply with the Traffic Signs Regulations and General Directions 2002 and Chapter 8 of the Traffic Signs Manual. The works are to be consistent with “Edinburgh Standards for Streets”.
- 5.114 The traffic and tram signalling systems shall support the run-time of the tramway whilst minimising the impact on other road users. It shall be fully integrated with the City of Edinburgh Council’s urban traffic control system. A protocol will require to be developed with the City of Edinburgh Council regarding the installation and integration of the traffic and tram signals. The signalling system shall incorporate recent/current technological developments as appropriate, to optimise the combined efficiency of the tram and traffic signals.
- 5.115 The traffic management system shall accommodate the direct and consequential impacts of the Tram system and will be subject to approval by **tie** and CEC.
- 5.116 Road lighting will conform with CEC policy and with the Tram Design Manual. The lighting columns and Overhead Line Equipment (OLE) poles will be rationalised to minimise road clutter.
- 5.117 Road User Safety Audits shall be carried out when they are required by the Roads and sufficient to demonstrate the integrity of the design process to HMRI.

Substations

- 5.118 Eleven new 11kV substations will be built along the route to accommodate the traction power supply:-
- Cathedral Substation
 - Craigleith Substation
 - Granton Mains East Substation
 - Granton Road Substation
 - Haymarket Terrace Substation
 - Leith Sands Substation
 - Leith Walk Substation
 - Russell Road Substation (initially to be a track paralleling hut)
 - Bankhead Drive Substation
 - Ingliston Park and Ride Substation
 - Jenner's Depository Substation
- 5.119 There will also be a substation at the depot. The substations will be spaced along the route at approximately 2km spacing, as dictated by the needs to supply power to the system. The substation buildings will be approximately 15m by 4 m plan area, which includes a provision for DNO supply.
- 5.120 Each Edinburgh Tram Traction Power Substation shall include:
- The traction substation enclosures (where substations are containerised);
 - The associated Scottish Power HV (11 kV) three-phase power supplies with associated HV switchboard, metering and local emergency tripping facility;
 - 230V LV services with associated metering and distribution equipment for substation services i.e. Lighting, small power etc;
 - Traction substation transformer-rectifier/s and equipment;
 - Traction dc switchboards;
 - Feeder and bypass isolators;
 - Substation earthing;
 - Negative busbars;
 - Batteries / chargers;
 - SCADA interface marshalling panels;
 - Associated internal power and control cabling; and
 - Miscellaneous items to complete.
 - Provision for a 11 kV supply to the Depot services transformer.
- 5.121 The Russell Road Track Paralleling Hut shall be provided with similar equipment as all other substations, however an HV supply from Scottish Power will not be provided and the substation shall be used as a Track Paralleling Hut in the first instance.
- 5.122 The equipment at the Depot traction and services substation shall comprise three HV supply cables from three Scottish Power circuit breakers, or ring main units feeding two indoor transformer-rectifier units for depot stabling traction and main line traction, and the other to the services transformer in the Depot building.
- 5.123 One four-panel 750 V dc switchboard, with direct acting overcurrent protection, relay overcurrent protection, thermal image, earth fault protection on three (two for the yard and one for the workshop) track feeder circuit breakers and direct acting reverse current protection on the Rectifier circuit breaker will be fed from one rectifier transformer; a three panel 750V dc switchboard feeds the main line in the usual way described above.
- 5.124 The whole of the depot yard shall be earthed on the negative side including the workshop traction supplies.

- 5.125 The enclosure of the yard and workshop circuit breaker shall be solidly earthed, and also connected to the rectifier negative pole.
- 5.126 Two negative busbar cubicles (one for the yard rectifier and the other for the main line rectifier), a tripping and closing battery and charger, all associated internal power and control cabling, and earthing shall be provided.
- 5.127 In an annex segregated from the main enclosure for fire protection, two motorised track feeder isolators with motorised earthing function and a motorised load break bypass isolator with over-current detection and tripping relay shall be provided.
- 5.128 At all substations, control and indication multi-pair cabling shall be provided and connected to a SCADA remote terminal unit (RTU).
- 5.129 Subject to the agreement of Scottish Power, the 11 kV feed to each traction substation shall be derived from and form part of the local Distribution Network Providers (Scottish Power) Network ring with a dedicated ring main unit or switchboard feeding the Edinburgh Tram Network rectifier of the traction substation. In the event Scottish Power is unable to agree to this electrical arrangement then additional HV switchgear shall be provided in series with the Scottish Power switchgear.

Overhead Line Equipment

- 5.130 The OLE will be energised at a nominal 750v in accordance with BS EN 50163:2004:Railway Applications – Supply voltage of traction systems.
- 5.131 The Overhead Line Equipment shall utilise a single contact wire system, with additional parallel (buried) feeders. Standard materials will be used with the exception of the route sections from Newhaven Road to Ocean Drive and Caroline Park to Granton Square tramstops where stainless steel material (for tubes and fittings) shall be provided. The contact wire will be supported by either side poles, centre poles or building fixings as appropriate to the particular location.
- 5.132 For safety considerations in areas where tram path is shared with the public traffic the contact wire height and the profiling of the wire shall take into account the interface with the public buses (open-top buses in particular).
- Her Majesty's Railway Inspectorate's requirement for minimum wire heights where a support has failed;
 - Minimise the risk of contact with wire from open top double decker buses, over-height road vehicles, window cleaners carrying ladders and any third party work;
 - Activities associated with the Edinburgh festival, Christmas fun-fair on Princes Street, and similar public events; and
 - Provide the necessary clearance for designated high-load routes.
- 5.134 Aerial parallel feeders shall not be permitted. All parallel feeders shall be buried, located in suitable ducts running along the tracks, with cross feeding to the Overhead Line Equipment conductors at suitable intervals.

Communications and signalling

- 5.135 The Tram Position and Detection System shall monitor the efficient and effective movement and overall regulation of trams running on the Edinburgh Tram Network. The Tram Position and Detection System shall include both tram borne and trackside equipments.
- 5.136 The Tram Position and Detection System shall collect in real time the following from each tram for transmission to the Control Centre:

- Tram number;
- Tram run number;
- Tram destination;
- Driver staff identity number;
- Driver duty number; and
- Tram in service/out of service.

5.137 The Tram Position and Detection System shall provide a number of functions which shall include:

- Tram identification;
- Tram position on network (outside of depot);
- Tram progress monitoring;
- Route setting;
- Processing of manual and automatic 'Tram ready to start' and advance signal demands requests from trams;
- Permit trams to safely transverse tram/road crossings;
- Provide controlled entry to and exit from the depot berthing & maintenance facilities.

5.138 The systems to be provided includes the following:-

- Tram position, route setting and detection system
- Passenger information display systems
- Telephone network
- Public address system
- Operational radio system
- Passenger help/passenger emergency help points
- Closed circuit television
- Supervisory control and data acquisition (SCADA)
- Operational data network

5.139 There will be a Control Room which shall be the focal point for the control and operation of the Edinburgh Tram Network. Its purpose shall be to provide a working place for the Operational employees to manage and coordinate day-to-day activities associated with system operations.

Maintenance effects and requirements post –completion

5.140 Following completion, commissioning and acceptance by the operator, it is assumed that the system will be maintained over its expected life to a high standard which includes refurbishment and /or renewal of major system components during the life cycle of the system.

5.141 High level requirements for maintenance and renewals for the whole network are outlined in the Life Cycle Costs report prepared as part of the Draft Final Business Case and TEL Business Plan development. The underlying systems and operations requirements are based on the draft Operations and Performance Requirements Specification document which is part of a suite of documents being developed in line with the ongoing design of the system.

5.142 Life expectancy for key system components are summarised in Table 5.3 below and achieving these will depend on the delivery of a robust maintenance and renewals regime. The regime will comprise day-to-day maintenance (daily maintenance and operational maintenance of systems / sub-systems), planned refurbishment of major systems for the Tram fleet (including e.g. livery, upholstery, motors, pantographs) and planned renewals as dictated by the specified performance criteria of the individual system.

Table 5.3 - Anticipated System Life Expectancy

System Element	System life expectance (replace at end of year)
Trams – refurbishment	15 years
Trams – replacement	30 years
CCTV	15 years
Ticket Vending Machines	15 years
Passenger Help Points	15 years
Passenger Information Displays	15 years
Public Address	10 years
Radio Communication Systems	15 years
Control Room Equipment	15 years
Signalling	20 years
Overhead Line Equipment	40 years
Traction Power Equipment	35 years
Track – off street locations	30 years
Track – on street locations	50 years
Buildings	50 years
Structures	120 years

- 5.143 The details of the maintenance to be performed by Tramco and Infraco are set out in the contract documents and are explained in section 7.

Performance effects and requirements post-completion

- 5.144 Post completion performance effects and requirements form part of the sensitivities considered in the TEL business plan. An operational performance regime will be established between TEL and the operator and maintainer. Key performance indicators are likely to include tram punctuality, systems availability, systems reliability as well as qualitative measures for cleanliness, appropriateness of passenger information provision, helpfulness of staff.
- 5.145 In addition the impact which the tram has on the wider area road network will have to be monitored to ensure that any adverse impacts can be addressed through the use of various traffic management measures including traffic regulation orders, signage, changes to traffic light sequencing

Safety and environmental effects and requirements post-completion

- 5.146 Project Design will consider safety risks to those who maintain and operation the completed project as required by the CDM regulations. To do this a safety assessment will be undertaken to identify such risks and develop project specific risk control measures if such risks are not adequately addressed in company standards. These safety risks are referred to as Hazards. Reference should be made to the Hazards Log. Areas of known or potential vandalism and route crime should be identified, particularly at overbridges.

- 5.147 Post completion environmental impacts and mitigation measures are identified in the project Environmental Management Plan. In particular, noise, vibration and visual impact are considered. There is an obligation in the Acts to use reasonably practicable endeavours to ensure that the residual impacts are no worse than as predicted in the Environmental Statements.

6. Governance

Background

6.1 The delivery of Edinburgh's integrated transport system has the following key players:

- CEC was the Promoter of the Tram Bills, will be the user of the output from the project and is part-funder of the project.
- TEL was created by CEC to deliver an integrated bus and tram system.
- tie is the delivery agent for the tram as specified by its client CEC acting through TEL
- Transport Scotland (TS) is the principal funder.

6.2 This section describes the project governance structure through to Financial Close. It is anticipated that a revised structure will be required to execute the construction phase of the project.

Governance structure

6.3 The structure highlights the following four key bodies, the roles of which are represented in figures 6.1 and 6.2 below:

- TEL Board
- Tram Project Board (an independent body with authority delegated to it by CEC (through TEL) and by TS ("TPB"))
- TPB sub-committees : 1) Business Planning, Integration and Commercials ("BPIC") ; and 2) Design, Procurement and Delivery ("DPD")

Figure 6.1 – Governance to Financial Close

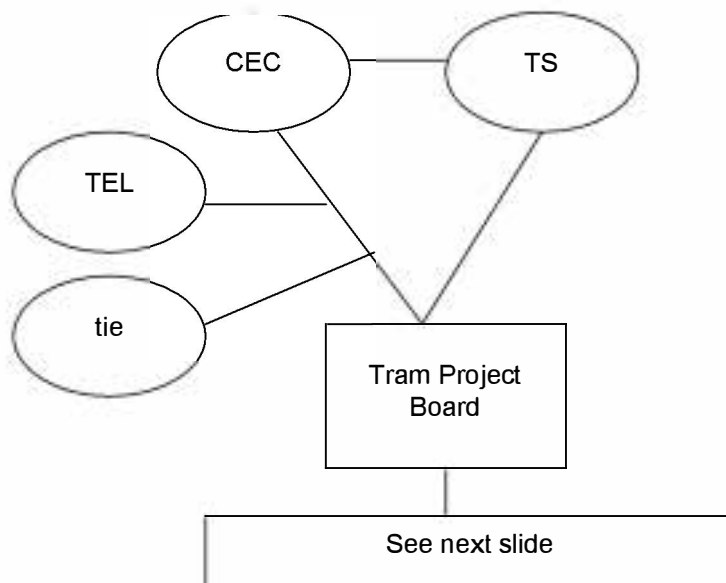
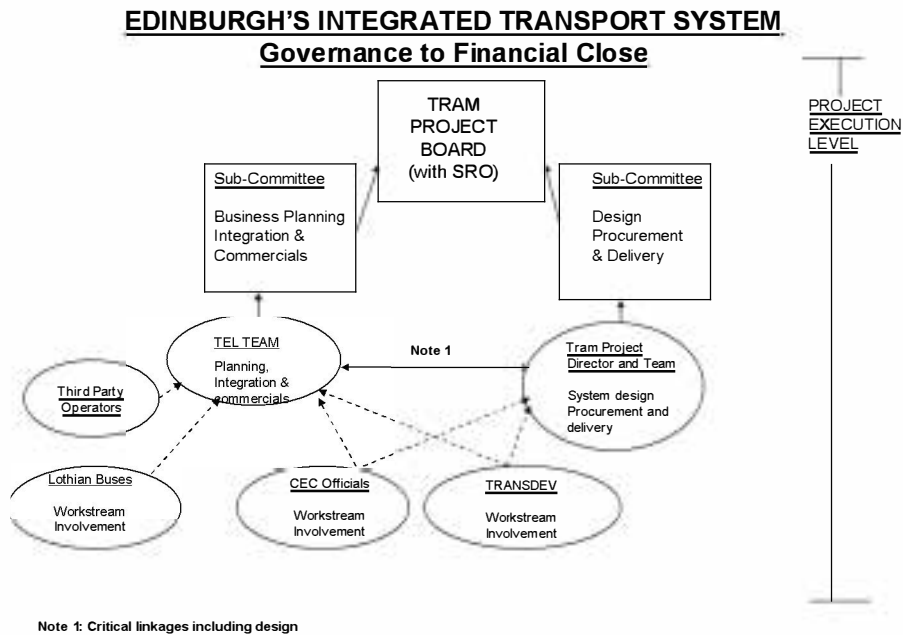


Figure 6.2 – Governance to Financial Close – Project Execution Level



6.4 The role of each body is as follows:

TEL Board

6.5 The role of the TEL Board is focussed on its statutory stewardship role and on its overall responsibility to deliver an integrated tram and bus network for Edinburgh, on behalf of CEC. It will make the formal recommendations to CEC on key aspects of the project including business plan and business case approval, contractual commitment and matters which have a political dimension. Attendance will be restricted to Directors other than additional attendees at the discretion of the Chairman. The TEL Board will also address any matters outwith the direct arena of Integrated Bus and Tram systems and any statutory TEL considerations.

Tram Project Board (TPB)

6.6 The TPB is established as an independent body with full delegated authority from CEC (through TEL) and TS to execute the project. In summary, the TPB has full delegated authority to take the actions needed to deliver the project to the agreed standards of cost, programme and quality. The TPB also exercises authority over project design matters which significantly affect prospective service quality, physical presentation or have material impact on other aspects of activity in the city. Certain matters are reserved by TS and CEC, as described below.

6.7 The membership of the TPB is 6 people (Office of Government Commerce constituency definitions “highlighted”):

- Chair
- Senior TS Representative
- Senior CEC Representative - “Senior User Representative”
- TEL CEO and Project “Senior Responsible Owner”
- “Senior Supplier” representatives (tie Executive Chairman and TEL Operations Director)

- 6.8 The Chair is the TEL Non-executive Chairman, rather than the Project SRO. Other parties, principally senior project management and advisers, will be called to attend as required, though a common group including the Tram Project Director attend most meetings.
- 6.9 The empowerment of Senior Representatives of TS and CEC enables the TPB to act with appropriate efficiency.
- 6.10 The Senior TS Representative is empowered by TS to support all decisions made by the TPB except those matters reserved by Scottish Ministers and set out below. In particular, the milestone approval requirements set out in the grant award letter are within the approval powers of the Senior TS Representative. The Senior CEC Representative is empowered by CEC to support all decisions made by the TPB except those matters reserved by CEC.
- 6.11 Exceptionally, the TS or CEC Senior Representatives may withhold approval of matters within their powers for further reference in their respective organisations.

TPB Sub-committees

- 6.12 Execution workstreams are categorised as either “Business Planning, Integration and Commercials” (“BPIC”), or “Design, Procurement and Delivery” (“DPD”). The BPIC programme is under the direction of TEL management. The DPD programme is under the direction of the Tram Project Director. There are critical linkages and dependencies which the two programme directors must manage effectively. At operational level, CEC, TS and Transdev have key involvement in many of the workstreams. This structure should encompass all workstreams and approvals needed to deliver the integrated system. In particular, the two programme leaders must ensure that all other project-related activities (“influencing groups”) are fully aligned with the governance structure documented in this paper, or bring any parallel activities to the attention of the TPB for action to be taken.
- 6.13 The role of the sub-committees is to challenge and filter workstream outputs and provide recommendations to the Tram Project Board. Membership of sub-committees is partly sub-set of the TPB and partly additional advisers and stakeholder representatives. Membership varies according to the subject-matter on the table. The sub-committees have no delegated decision-making authority (except as specifically delegated by the TPB) but make recommendations to the TPB.

The tie Board

- 6.14 In addition to the four primary bodies, the **tie** Board retains a specific role, in line with its previous responsibilities. These are 1) to apply quality assurance to the execution by the Tram Project Director and his team ; 2) to make formal funding requests to TS and be accountable for expenditure ; and 3) to enter into contractual arrangements necessary to execute project delivery. The tie Board places reliance on the governance processes executed by the TPB in assessing the work required to execute its own responsibilities under 2 and 3.

Scottish Ministers’ Reserved Matters

- 6.15 The following matters cannot be determined by the Transport Scotland Senior Representative without further consultation within Transport Scotland and the Scottish Executive.
- Those of City of Edinburgh Council’s reserved matters set out below which may be referred to the Scottish Ministers for determination.
 - Approval of the Business Case.
 - Commencement of physical works under the Multi Utilities Diversion Framework Agreement

- Entering into contracts for the delivery of tram vehicles (Tramco) or system infrastructure (Infraco)
- Increases in Scottish Ministers' funding beyond the total of grant already offered to City of Edinburgh Council
- Decisions in relation to the application of concessionary fares to the Edinburgh Trams scheme

CEC Reserved Matters

6.16 The following matters cannot be determined by the CEC Senior Representative without further consultation within CEC :

- Those of Transport Scotland's reserved matters set out above which may be referred to the Council for additional determination.
- Approval of the Business Case.
- Commencement of physical works under the Multi Utilities Diversion Framework Agreement
- Commencement of physical works for Infraco
- Entering into contracts for the delivery of tram vehicles (Tramco) or system infrastructure (Infraco)
- Changes to contractual costs or budgets from that previously agreed by the Tram Project Board. The formal mechanism for informing the Council will be through the Tram Project Board on which the CEC Director of Finance (or his delegate) sits. Depending upon the scope and scale of financial change, it may be necessary to seek approval from the Council Executive or full Council.
- Matters of substantive public interest which require political involvement, as are determined by the CEC Senior Representative.
- Decisions in relation to the application of concessionary fares to the Edinburgh Trams scheme
- Statutory processes:

Prior Approvals - All Prior Approvals are to be approved by CEC, through the planning process.

Land Acquisition - The land acquisition process where it depends upon Council agreement or use of powers must be authorised by the Council either under delegated or direct Council approval procedures (i.e. GVD, CAAD etc).

Traffic Management - Traffic Management will be facilitated by the production of both TROs and TTROs that will emerge from the approved roads design. Both TRO's and TTROs will need to be approved and made by the Council.

Roads and Structures design - Facilitated through the design approval process.

Roads Demarcation Agreement - The Roads Demarcation Agreement will detail the ownership and maintenance liabilities for future operation of the tram and its associated infrastructure. It will also detail the agreed associated financial arrangements between the operator, the maintenance contractor, tram and CEC, and may include a transfer of obligations/risks.

7. PROCUREMENT & IMPLEMENTATION

7.1 This section of the Draft Final Business Case sets out details of the Procurement Strategy being followed by tie, how this aligns with delivery of value for money benefits and in particular details the various contract packages, incentives and sanctions that deliver these benefits. This section should be read in conjunction with the section 10, Risk Management, which refers also to the allocation of risk between the public and private sectors.

Background to Procurement Strategy

7.2 The Procurement Strategy for the tram addresses both the issues experienced on other light rail procurements in the UK and the specific circumstances affecting Edinburgh. The resultant structure is a series of contracts which, managed as a group, will transfer risk effectively to the private sector, advance the scheme as quickly as possible and provide strong value for money.

7.3 The UK Light Rail sector has encountered difficulties in the last six years. These have affected both existing projects and those in procurement. On the earliest schemes, it appears that the private sector showed over-confidence in respect of the risks it faced, and in some cases, the public sector showed a lack of foresight. This may have been related to a lack of understanding of the flexibility which is required to run a public transport system under a long term contract, and the risks in forecasting public transport revenues for a specific service over the long term.

7.4 The result is that on many of the projects that have been completed, neither the public nor private sectors are happy with the outcome. Contractors have lost significant amounts of money on the underlying construction projects due to changes in scope over which they have little control. Tram operators are facing escalating costs, competition from buses and revenues which fall short of what is required to cover fixed costs. Meanwhile the public sector has realised that it has little ability to control the behaviour of the tram operators due to the lack of suitable sanctions available under their project agreements.

7.5 This outcome has made the private sector extremely wary of light rail projects. This is documented in the National Audit Office report of 2004 commenting on the effectiveness of light rail schemes. Unfortunately, this industry feedback arrived too late to inform the development of a number of procurements in England, which have encountered significant affordability problems, with costs increasing due to bidders factoring in significant margins to deal with the risks that they have difficulty pricing accurately. These affordability issues have led to significant delays and in several cases the cancellation of the projects affected. However, schemes which are not yet in procurement have the opportunity to learn from the issues which have arisen on both existing schemes and the stalled/cancelled procurements. The Procurement Strategy for the Edinburgh tram addresses this.

7.6 tie has sought to harness first hand experience from key individuals involved in those schemes. tie has successfully achieved this by:

- Recruiting individuals into the project team with breadth and depth of experience of other light rail projects
- Engaging with TEL who will be responsible for integrating the tram with bus services
- Appointing an operator, Transdev, with experience of procuring and operating light rail schemes in the UK and overseas
- Selecting advisers with a broad experience of light rail and other public/private procurements
- Engaging with the bidder market in a consultation exercise.

7.7 tie's Procurement Strategy has resulted in it taking a greater degree of control over the process during the early 'development' phase compared to what the public sector has done on other projects. This has resulted in tie progressing the overall project sufficiently in advance of seeking bids from Infracore bidders such that it will be able to offer the private

sector a better defined basis on which to bid and a less onerous risk allocation (and in particular reducing the extent of design and approval uncertainty at bid stage). Therefore the private sector will be able to price their bids with a greater degree of accuracy and certainty than has been achieved on other projects. In this way, **tie** believes it will significantly reduce the cost of the overall project having significantly de-risked certain of the elements of the project that fall to the private sector to deliver.

Market consultation

- 7.8 In October 2005, following the issue Prior Information Notices (PINs) in the Official Journal of European Union (OJEU) **tie** selected a shortlist of six potential Infraco bidders, and five potential vehicle suppliers who were then invited to Edinburgh for discussions. The overall conclusions were that there were certain areas that merited further consideration and these have been reflected in the principles of the Procurement Strategy.

Objectives of Procurement Strategy

- 7.9 The objectives of the Procurement Strategy are summarised as follows:
- Transfer 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).
 - Gain the early involvement of the operator to mitigate risks on takeover of the operation Tram Network

Key elements of Procurement Strategy

- 7.10 The Procurement Strategy that **tie** is following for this project has been developed to address the common challenges faced by all light rail procurements and the specific issues associated with Edinburgh. It is a unique approach and this section sets out the main ways in which the Procurement Strategy differs from market norms. However, it is also important to understand that most of the differences relate to the process of procurement and not the outcome of the procurement.
- 7.11 The outcome of the Procurement Strategy will be two contracts with different private sector entities: an operating contract, the Development Partnering and Operating Franchise Agreement (DPOFA) and an infrastructure (Infraco) contract. The Infraco contract will act as a "holding contract" with the intention that the design, vehicle provision (including maintenance contract) will all be novated to the infrastructure provider (under the Infraco contract) at financial close as described at below. This outcome is not dissimilar to the approach adopted on, amongst others, Docklands Light Railway.
- 7.12 Whilst the light rail market does not have a fixed template for how transactions should be undertaken, there has been a general approach on projects to date whereby a single contract has been let for all key activities in providing the tram service. **tie's** approach clearly differs from this, in the ways set out below. The entire Procurement 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. deliver value for money.

7.13 In summary the key attributes of the Strategy are:

- The separation of system delivery and operation to focus organisations on their strengths minimising margin on margin and risk premiums.
- Early introduction of the operator – to ensure effectiveness of design, construction and commissioning ready for operation.
- Early commencement of design by SDS – to reduce scope and pricing risk in infrastructure and tram vehicle bids together with a reduction in overall programme.
- Separate procurement of the tram vehicle – to enable the selection of the optimum combination of the tram and infrastructure suppliers.
- Re aggregation of the supply chain – by novation of the design (SDS) and tram vehicle (Tramco) contracts to the infrastructure provider (Infraco) to create single point responsibility for design, construction, commissioning and subsequent maintenance of the tram system, with the 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 – to incentivise selection of components with ‘whole life’ cost in mind and to incentivise Infraco to mitigate the risk of latent defects arising during the operational phase.
- Separate procurement of utilities works to enable completion of the utilities diversions before commencement of infrastructure works thus reducing risk to 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 TSS – to provide comfort that the designs produced will deliver the required performance.
- Incentivise completion in accordance with programme by adopting a milestone payment mechanism in SDS, Tramco and Infraco contracts, with a significant element of the price withheld pending completion of system reliability tests.
- Bonds and Warranties in the SDS, Tramco and Infraco contracts to provide recourse in the event of failure.

7.14 These arrangements provide:

- Early involvement of the tram system Operator
- Risk transfer to the private sector at an affordable level
- A shorter overall programme
- A single point of responsibility for the delivery of the operating tram system and subsequent maintenance

Introduction of operator at early Stage

7.15 A key strand of the Procurement Strategy was the decision to select the operator for the system in advance of completing the Parliamentary process which is a pre-requisite to the letting of contracts for the fabric of the system. The principal reasons for early involvement of the operator were that it:

- Has allowed **tie** to use the operator’s knowledge and experience during the Parliamentary process, business case development, planning, design, and commissioning phases, to ensure that the system will be capable of being operated effectively.
- Facilitates input from an experienced operator on issues such as
 - fares and ticketing policy
 - review of designs from an operational perspective
 - input into the procurement process
- Has, in partnership with TEL, assisted in the proper planning of an integrated service network with the existing Lothian Bus operations.

Separation of operations and system delivery

- 7.16 The separation of the day to day operation of the tram network from the initial construction of the tram system is a further characteristic or consequence of early operator involvement. This allows those parties responsible for providing vehicles and infrastructure to concentrate on their strengths, which ought to be reflected in more competitive contract pricing from those parties as they will not need to consider procedures and risks that they do not necessarily understand.

Establishment of Joint Revenue Committee

- 7.17 Edinburgh is in an almost unique position, in that the main bus operator in the city is owned by the public sector. Recognising the unique opportunity this presented, the CEC decided to establish Transport Edinburgh Limited (TEL), to take on the responsibility for integrating the services of Lothian Buses and the tram and to seek appropriate arrangements with third party transport operators.
- 7.18 As part of the process of coordination and integration of buses and tram, a Joint Revenue Committee (JRC) contract was established with the objective of the development, testing and successful commissioning of a Modelling Suite to support the viability of the tram alone and the TEL Business Plan including Lothian Buses and to provide ongoing revenue forecasting for TEL. The JRC contract was awarded to a joint team of Steer Davies Gleave and Sir Colin Buchanan & Partners in September 2005.
- 7.19 A Modelling Revenue Stakeholder Group (MRSG) was established to assist JRC to define the parameters and inputs which allows them to deliver the scope of services under their contract. The members of this group comprising representatives of tie, TEL, CEC, Transdev and Transport Scotland have ensured the inputs to the modelling process are appropriate and that the outputs from the model are robust. tie remains the contractual client for JRC.
- 7.20 The JRC modelling and Service Integration Plan have now reached conclusions as reported in detail in sections 4 and 8 of this Draft Final Business Case. The models have already proved to be a useful iterative tool to optimise the bus and tram network service integration.

Procurement of Technical Support Services (TSS) provider

- 7.21 The resources provided under this contract facilitate validation of the SDS design to assure compliance with the performance objectives for the tram, provide cost estimate validation and the sourcing of technical personnel to support the management and control of the project.

Early involvement of designer

- 7.22 Another key strand of the Procurement strategy was the early involvement of the design contractor. The System Design Services (SDS) contract was awarded in September 2005. This contract has allowed tie to advance design work for of the tram, thereby reducing the planning and estimating risks in respect of scope to which bidders for the Infraco contract are otherwise exposed. It has also facilitated the opportunity to procure advanced works on utility diversions and identify at an earlier stage the land requirements and traffic regulation requirements, both temporary and permanent, of the identified tram project scope.

Utilities diversions undertaken in advance of infrastructure

- 7.23 A significant benefit arising from having undertaken early design work is that tie is able to procure the necessary utility diversions to enable delivery of the permanent infrastructure work prior to commencement of the system construction. This provides very significant construction programme benefits and therefore cost benefits, due to reduced risk exposure of the infrastructure provider, creating the best opportunity to minimise disruption and maximise infrastructure construction productivity.

Separate selection of infrastructure and vehicle providers

- 7.24 tie's approach of having separate competitions for infrastructure and vehicle provision means that it will have flexibility to select the optimum tram vehicle. There are a relatively small number of vehicle providers in the light rail market, compared to the number of potential infrastructure contractors. Had tie adopted the conventional approach and asked the infrastructure providers and vehicle providers to team up and present a single proposal covering both, this would have restricted the range of choice available to tie and hence the effectiveness of the tram system procurement.

Land assembly process and third party interface agreements

- 7.25 Using the powers under the Acts, tie will project manage the acquisition of all land and rights in land, temporary and permanent, required to construct, operate and maintain the tram. tie and its advisers will identify all parties with an interest in each parcel of land, identify the compensation payable, consult with interested parties as part of an overall communications strategy and give appropriate notification to enable CEC to take title in the land prior to the appointment of Infraco. This approach also reduces risk to the infrastructure works programme by bringing certainty to land acquisition at an early stage thereby reducing the lead in time to commencement of construction works.

Summary of key contracts

- 7.26 Below is a detailed description and explanation of tie's approach to the key contracts that it has or will enter into. The key contracts are as follows:
- Development Partnering and Operating Franchise Agreement (DPOFA)
 - System Design Services (SDS)
 - Joint Revenue Committee (JRC)
 - Multi Utilities Diversion Framework Agreement (MUDFA)
 - Infrastructure provider and maintenance (Infraco)
 - Vehicle supply and maintenance (Tramco)

- 7.27 tie is developing a nested set of contracts for Infraco, SDS and Tramco (including associated maintenance) using legal advisors experienced in this area and tailored to the Edinburgh tram project's specific needs.

Development Partnering and Operating Franchise Agreement (DPOFA)

- 7.28 tie believe many previous tram procurements have suffered from insufficient operator engagement throughout the Parliamentary and development phases of these projects. On this basis, tie decided to separate the operation of the system from its construction, and, following a competitive tender, appointed Transdev as the future operator in May 2004, under the terms of the DPOFA.
- 7.29 Transdev representatives are part of tie's core team for the project, and have played an active role in the development of the subsequent contracts. It was tie and TEL's primary objective that this process would form the foundations for a strong and mutually beneficial long-term partnering relationship with Transdev for the later operation of the tram in Edinburgh.

Procurement Approach

- 7.30 The principal attributes of the procurement approach for this contract are:
- Scope – Provision of consultancy advice during the design and construction phase, system operational support during the commissioning and trial running stages and subsequent operation of the tram system.
 - 15 year contract duration

- Performance reviews at three yearly increments, with provisions to reset the performance regime and an option for tie to terminate the contract where there is failure to agree a revised performance regime.
- Reimbursable up to an agreed cap level based on demonstrated actual costs plus an agreed profit level for agreed specified personnel at agreed rates up to the commencement of the operating phase.
- During the operating phase the contract will move to a target cost incentivisation mechanism whereby actual costs are reimbursed with any saving or excess of expenditure against the target shared between Transdev and tie. Payment will also be adjusted for performance against set quality criteria. Certain elements of the cost are fixed for the first three years after which they are adjust under the performance reset mechanisms.
- Performance bond to provide financial recourse in the event of default by the supplier.
- Facility to novate the agreement to TEL at commencement of system operation.

Operation and performance risk

- 7.31 Transdev have been awarded the contract to operate the tram and ultimately will be in day to day control of the quality of service provided to the public. However, responsibility for project development and delivery lies with TEL, tie and their advisors. One of the main advantages of involving an operator during the early phases of the project is to inject their perspective into the development of the network, and hence to facilitate the development of the tram network operating at optimum performance level. This approach, which was endorsed by CEC, has helped facilitate the successful delivery of the project to date and will continue to do so.
- 7.32 To address performance issues during the operating phase of the contract, the DPOFA incorporates a payment mechanism which offers the operator an appropriate risk/reward balance. In summary, the operator will be incentivised under a regime based upon clearly defined and understood Key Performance Indicators (KPIs) to measure performance against the required service specification, and an agreed pain/gain sharing mechanism designed to minimise costs and maximise performance. The final element of the payment mechanism, namely the Vision Achievement Incentive (VAI), reflects a longer term goal to which the operator should aspire. This payment will only be made in circumstances where the tram project's financial performance exceeds defined expectations, and where the quality of service delivery has been consistently maintained after an extended period to match a pre-agreed challenging target level.
- 7.33 The scope of cost responsibilities and the definition of the gain/pain share mechanism in the context of an integrated bus and tram system are under review to be resolved before the commencement of the Infraco negotiations phase.

Pricing and Revenue Risk

- 7.34 A key element of retained risk for the public sector relates to ongoing farebox revenue and operating costs. One of the factors influencing the decision to proceed with separate procurement of DPOFA and Infraco contracts was the past underperformance of a number of full PFI/PPP structures where 100% farebox risk was transferred to the private sector. In more recent deals, financiers have applied a heavy discount to revenue projections as a result of recognising that revenue is affected by many factors outside the operator's control and that operators therefore have great difficulty in forecasting it reliably and pricing the risk economically. The Procurement Strategy proposes the retention of all of the farebox revenue and a proportion of operating cost risk with the public sector. In a scenario where integration with Lothian Buses is a primary consideration, the approach of tram specific revenue incentivisation is less valuable and the terms of the arrangement will be adopted to reflect the proposed integrated plan.
- 7.35 The means to manage the public sector's exposure to operating costs has been built into the DPOFA approach in the form of the development of a pain/gain sharing mechanism. This mechanism, which rewards the operator for the degree to which actual costs outperform pre-

agreed targets, has the joint benefit of incentivising the operator to minimise costs and maximise performance.

- 7.36 The scope of cost responsibilities and the definition of the gain/pain share mechanism in the context of an integrated bus and tram system are under review. Critically the management of the public sector's exposure to revenue risk is facilitated by the development of an integrated tram and bus business under TEL.

Activities under DPOFA

- 7.37 During the development and procurement of the tram project, Transdev bring their wider commercial and practical experience of operating and maintaining tram (and bus) networks in the UK and elsewhere. During this phase of the project, supporting TEL and tie, Transdev assists in all aspects of design, procurement and operational planning including:

- Assisting the development of integrated service and interchange plans between for tram and bus
- Generation of inputs and validation of outputs from the JRC modelling process
- Reviewing and advising on the design outputs from the SDS contractor
- Assisting and advising on the development of the contractual arrangements for the Tramco and Infraco procurements.
- Reviewing and advising on the documentation for the Tramco and Infraco tender processes.
- Participating in the Tramco and Infraco tender evaluations
- Considering and advising on the underlying operational aspects of the tram project and including underlying demand assumptions and issues.
- Considering and advising on the operational implications of the Procurement Strategy
- Assisting in the preparation of the TEL Business Plan.

- 7.38 Throughout the Infraco and Tramco procurement Transdev are providing continuity and assist tie by being a key component of a group of advisors acting as the 'Intelligent Customer', assisting with the shaping and preparation of information for the market to ensure that tie creates the optimum offer for the market, thereby maintaining a healthy competition and consequent value for money.

- 7.39 During the construction and testing and commissioning stages Transdev will be a member of tie's project management team and will mobilise to provide support to operate the tram system enabling Infraco to deliver the commissioning and trial running stages of their works. Such support will include driver training, depot security, control room manning, safety and establishment of operating procedures.

- 7.40 During the trial running stage Transdev will fully mobilise, training drivers and other personnel to prepare for full operation and complete arrangements for service integration. Post commencement of Phase 1 operations Transdev will continue to fulfil a project development and procurement role, as required, in relation to any further expansion.

Payment mechanism and incentivisation structure

- 7.41 Prior to commencement of operations, Transdev receives a time based fee subject to an agreed cap and a retention. During tram operations they will receive a payment comprising:

- Actual operating costs and an agreed fixed profit
- A share of over/underperformance against target operating costs against independently set targets reviewed every 3 years
- A performance regime payment calculated to incentivise performance against a set of KPIs including tram punctuality, reliability and qualitative measures.

- 7.42 These arrangements reflect the fact that operating costs are determined by a mixture of factors only some of which are controllable or capable of influence by the operator. This

approach therefore avoids the risk premium that has been included in the pricing of other tram projects due to start up uncertainty and other economic factors.

- 7.43 Finally, Transdev may be entitled to the VAI if it satisfies certain longer term requirements. The VAI is a financial incentive dependent on achieving consistently high standards of performance as measured against KPI's over a 3 year period from commencement of operations. The scope of cost responsibilities and the definition of the VAI mechanism in the context of an integrated bus and tram system are under review with the objective of ensuring alignment in the commercial interests of the parties.

Benefits and risk allocation

- 7.44 The 2004 NAO report strongly supports early operator involvement as a means of improving the execution of tram procurement and achieving a stable and affordable system. This will be delivered by early operator involvement in areas such as:

- Service specification and timetable.
- Specification and design of tram vehicles and maintenance facilities.
- Specification and design of infrastructure.
- Operational requirements and specification of the tram system.

- 7.45 Early involvement in such areas ensures that the operator who will ultimately take 'ownership' of operation of the tram system is able to influence the system design and configuration to optimise the system for operations. This mitigates a key interface risk that under PFI type procurement arrangements would be priced at a premium.

- 7.46 Risks remaining with the public sector are as follows:

- 100% of revenue risk and an element of operating cost risk will remain with the public sector, albeit this is mitigated by the incentivisation regime in place with Transdev. Critically revenue risk is mitigated by the development of an integrated tram and bus business under TEL.
- The risk of Transdev not being ready to operate the system when Infraco and Tramco commissioning is complete will remain with the public sector to the extent that losses incurred are not covered by Transdev's liability under the provisions of the DPOFA contract.
- The risk of Transdev not fulfilling their obligations pre or post commissioning resulting in the need to replace them as operator. Again the public sector's protection against costs incurred in replacing the operator would be limited to the liability provisions in Transdev's contract and calling the DPOFA performance bond.

System Design Services (SDS)

Procurement Approach

- 7.47 The principal attributes of procurement approach for this contract are:-
- Scope – provision of design work up to detailed design stage including obtaining all necessary approvals
 - Approximately 3 year contract duration
 - Lump sum price with the supplier taking the inflation risk
 - Milestone payment regime to incentivise completion to time
 - Provisions to novate the contract to Infraco
 - Performance bonds and warranties to secure redress in the event of major default

Introduction

- 7.48 Commencement of design early in the procurement process, followed by a novation of the contract to the Infraco at financial close (as described below) is a key element in delivering

the objectives of tie's Procurement Strategy objectives of reducing construction contractor risk premiums, reduced delivery programme and single point responsibility for delivery of the tram system. The SDS contract was awarded to Parsons Brinkerhoff in September 2005 following a competitive tender.

- 7.49 Development of the design ahead of and during the Infraco tender is helping to create scope and cost certainty and is significantly reducing the overall project programme and in particular the lead time between approvals and commencement of construction. It also reduces or substantially removes the risks associated with planning approvals, Traffic Regulation Orders, Network Rail and other key stakeholder interfaces. As a result the work of the SDS contractor substantially reduces this risk for which the Infraco bidders would otherwise include significant risk pricing.
- 7.50 The novation of the SDS Contract to the Infraco will mean that responsibility for the design and all risks arising are transferred to the private sector system integrator (Infraco) without the normal disadvantage of an increased risk premium which bidders would apply due to uncertainty if they had to carry out all of the design work post contract award.
- 7.51 It is expected that the Infraco will benefit significantly from the SDS Provider's work and its experience of the planning and utilities diversion processes. The planned novation will mean that the SDS Provider will consider issues of practicality, cost and 'constructability' more than if it were simply tie's consultant. Infraco bidders will prepare their bids on the basis of the emerging SDS designs and the successful bidder will be required to adopt the SDS Provider's design as at the date of Infraco contract signature. Variations to this design could be introduced with the agreement of tie, but at the risk of the Infraco.
- 7.52 tie will take account of the Infraco bidders common preferences for the extent of design work to be undertaken by SDS prior to novation and adjust the contract scope accordingly. This will:
- Avoid the cost of unnecessarily duplicated design effort
 - Maintain Infraco's flexibility in obtaining best price from their supply chain by avoiding undue constraints on design of performance specified systems e.g. communications and tram position indication system

Activities under the SDS contract

- 7.53 It is expected that the overall design work to Detailed Design will be 100% complete when the Infraco contract is signed. However by identifying key risk areas and prioritising SDS activities, tie is seeking to complete the key elements of the Detailed Design prior to selecting the successful Infraco bidder in summer 2007. This will enable Infraco bidders to firm up their bids based on the emerging Detailed Design and thereby reduce the scope and design risk allowances that they would otherwise include.
- 7.54 The status of SDS's work is as follows:
- Completion of the *Requirements Definition* phase of the design in early 2006, the key elements of which were the development of full system requirements specifications, and the production of Management Plans and Technology Reviews.
 - Completion of much of the survey and site investigation works including ground penetrating radar, geotechnical surveys, surveys of existing structures, noise and vibration baseline surveys, environmental and ecological surveys.
 - Provision of utility diversion Preliminary Designs to support the procurement of the MUDFA contract.
 - Establishing an interface and programme for submission of consents with CEC
 - Stakeholder management support and development of traffic/transport modelling in conjunction with the Joint Revenue Committee (JRC).
 - Completion of *Preliminary Design* (Stage 1) in mid 2006 including clarification, verification and update of the existing STAG drawings, route plans, sub-system

specifications, outline system testing regimes, critical civil engineering specifications and trackwork specifications. This information was issued to Tramco and Infraco bidders as part of the ITN's issued in July and October 2006 respectively. It is intended that further design information will be released to the bidders during the tender process as appropriate to reflect further development of the design during the tender period.

- Provision of quantified estimates for the Infraco and Utilities diversion works based on the Preliminary Design outputs.
- Commencement of the *Detailed Design* phase which will develop the Preliminary Designs to the next level of detail, fully defining the scope of the project and enabling more accurate pricing of the works by Infraco bidders and the process for obtaining the various approvals required before commencement of construction.

Control and management of activities under SDS

- 7.55 tie is monitoring the quality of the solutions being developed by the SDS Provider with the assistance of the Technical Support Services (TSS) provider and Transdev, and drawing on the significant experience of other schemes gained by the tie team members. In particular TSS will validate that SDS have delivered their contract obligations, including verifying that the designs will deliver the specified tram system performance.
- 7.56 This process together with value engineering exercises will mitigate the risk of 'gold plating' the design of the system, and any tendency towards low risk / high cost solutions which do not provide the overall best value for money that tie is seeking. tie is tracking the estimated cost of the system throughout the design period, so that cost overruns can be identified quickly and mitigating actions taken while there is still scope to change the solution.

Payment mechanism and incentivisation structure

- 7.57 Payment of SDS is contingent on the completion of 'fine grained' programme milestones within each phase of the service, these phases being Requirements Definition, Preliminary Design and Detailed Design. The payment mechanism operates as follows:
- The contract defines:-
 - programme sub milestones for each phase of the work
 - general management activities to support delivery of design
 - the proportions of the contract sum allocated to management activities and to each sub milestone
 - Payment is made monthly for
 - Completed management activities
 - 80% of the value of completed sub milestone.
 - The remaining 20% of completed sub milestones where the sub milestone output has been accepted by **tie**
- All as assessed by **tie**

This arrangement strongly incentivises SDS to:

- Complete designs to programme, otherwise their cashflow is adversely affected
- Submit designs to that are complete and to the required quality otherwise again their cashflow is adversely affected.

Benefits and risk allocation

- 7.58 The risk transfer to the SDS is substantial and the separation of designer from the delivery contractor during the procurement phase affords **tie** control over scope definition that would not otherwise be achieved where design is undertaken by the delivery contractor after contract award under more conventional procurement approaches.

7.59 Following novation of SDS, the design risks pass to Infraco (although tie will retain a collateral warranty over the work of the SDS provider) but without the disadvantage of substantial risk premiums applied by Infraco bidders where design works are executed post contract award. Therefore, tie's approach will provide the benefits of having a designer involved in the project from an early stage, whilst retaining full risk transfer to the private sector.

7.60 In more detail the key benefits of the SDS strategy are as follows:

- Shorter period from letting Infraco contract to completion of the system – this should also reduce the overheads incurred by the Infraco.
- Substantially reduced planning consents and Traffic Regulation Order risk for the Infraco bidders to price. This should be reflected in a reduction in the pricing premiums that bidders would otherwise apply to cover the risks of increase in scope, quality and construction period as a result of the approvals process.
- Early design of utilities enables commencement and completion before commencement of Infraco works which again reduces overall programme duration.
- Reduction in risks associated with utilities diversion and Network Rail Immunisation work - early completion of utilities diversions will mean a reduced likelihood that utilities works will disrupt with the main infrastructure works progress. It will also reduce pricing premiums because utilities diversion cost is a risk that the private sector has found difficult to assess and then manage.
- Greater level of support for compliance with undertakings - early SDS involvement will ensure that stakeholders have greater certainty and clarity about the plans for the tram system which may avoid disputes and delays at a later date.
- Emerging certainty of scope and design is assisted the development of traffic and transport modelling by the JRC and hence a more reliable Business Case.

7.61 Key risks remaining with the public sector are as follows:

- **Potential reduction in innovation:** Advance design could limit Infraco's ability to innovate to realise possible cost efficiencies or design improvements. tie will mitigate this risk by consulting with Infraco bidders on alternative design solutions or technical approaches which they believe might offer improved value for money. tie will also critically review the proposals of the SDS Provider, with the assistance of the TSS consultants, Transdev and the expertise within tie.
- **Risks associated with novation:** This strategy requires the Infraco to take over responsibility for the SDS design and contractual responsibilities at the point of novation. The novation risk is mitigated by:
 - Consulting with Infraco bidders to refine SDS design scope
 - Flexibility within the SDS contract to adjust scope to suit the selected bidder's requirements prior to novation.
 - Detailed design being largely completed prior to award of the Infraco contract.
 - The absolute obligation to novate contained in the SDS contract.

Joint Revenue Committee (JRC)

Procurement Approach

7.62 The principal attributes of procurement approach for this contract are:-

- Scope – development of strategic models and their operation to provide patronage and revenue projections based on SDS tram system designs.
- Lump sum price with the supplier taking the inflation risk.
- Payment against progress and milestones.

Introduction

- 7.63 Edinburgh is in a fortunate position, in that the main bus operator in the city is majority owned by the public sector. Therefore CEC is exploiting this opportunity by establishing TEL which will have responsibility for managing and integrating the services of Lothian Buses and the tram.
- 7.64 Following a competitive tender the JRC contract was awarded to a joint team of Steer Davies Gleave and Sir Colin Buchanan & Partners in September 2005. In the ensuing year the JRC have developed a comprehensive and interdependent hierarchical modelling suite including a strategic model, a public transport model, a network assignment model and a micro-simulation model to support the development of the tram. The JRC is responsible with the SDS Provider on a jointly and severally liable basis, for the elements of the modelling suite related to the design process.
- 7.65 The public transport model has been used by JRC to develop the patronage and revenue projections for TEL, including both tram and bus projections, which are detailed in this Draft Final Business Case. The JRC has also completed the STAG2 appraisal of the economic benefits and costs projected for Phase 1 of the tram project.

Further Work by JRC

- 7.66 In future the JRC will provide advisory support to tie and TEL in respect of modelling and advising:
- Both the short term and longer term target revenues for the tram
 - The impact of specific system design features, interchange facilities and of service and frequency changes on revenue predictions
 - The effect of changes in passenger numbers and fare structures on revenue
 - The impact of the introduction and promotion of different fare and ticketing strategies, including integrated ticketing; and
 - The likely benefits and disbenefits of integration with other public transport modes and the likely short term and longer term revenue impacts of competition from other public transport modes.

Multi Utilities Diversion Framework Agreement (MUDFA)

Procurement Approach

- 7.67 The principal attributes of procurement approach for this contract are:
- Scope – Delivery of multi service utilities diversions, including pre construction phase programme development, design and constructability advice.
 - Approximate two year contract duration
 - Priced bills of approximate quantities with work remeasurable on completion
 - Prices include for inflation over the duration of the contract
 - Interim payments made each month based on the prices contained in the bills of approximate quantities applied to the completed volume of work.
 - Liquidated damages for to provide cost recovery in the event of delay to completion due to default on the part of the contractor.

Introduction

- 7.68 It is clear from other light rail projects that the risks associated with utilities diversions are among the most difficult for the private sector to manage and price and have been a barrier to progressing with light rail schemes as highlighted by the NAO. One of the underlying reasons for this is that utility companies are not usually willing to negotiate with the private sector while there remain several competing bidders. However in situations where utility diversions are included in the scope of the Infracore (or equivalent) all bidders still need to price utility

diversions for their specific solutions, making suitable allowance for significant uncertainty of scope and the uncertainties of the prices that statutory utilities companies may subsequently charge.

- 7.69 This means that much of the work related to utilities is delayed until after a contract is signed. The process of agreeing a programme, designing the solution and carrying out the utility diversion works adds significant cost, time and risk to the development programme. A consequence of this is that there is a risk that utilities work can delay the scheduled construction works, and that the works are priced at a premium at bid stage. Increased forecasts of the costs of utilities diversions have been one of the significant reasons for cost overruns on other tram procurements.
- 7.70 The scope of this contract was determined by tie based on advice from the SDS provider, the TSS provider and input on scope from the utility companies themselves. The SDS determined the area of the track bed and which utilities apparatus underneath it will need to be replaced elsewhere, diverted or protected. The utilities affected are waste water, potable water, gas, telecommunications and power.
- 7.71 Diversion and protection of high pressure gas, high voltage power and certain BT and other telecommunications utilities are outside the scope of the MUDFA contract and will be separately procured by tie direct with the relevant utilities.

Activities under MUDFA

- 7.72 tie and CEC have already used their powers under the tram acts and as the roads authority to negotiate with the utilities, with the objective of securing their participation in MUDFA. Under the agreements the utilities companies have consented to the MUDFA contractor carrying out diversionary works on their respective utility apparatus which will be affected by the construction of the Tram. These agreements also deal with the payment of costs and require the utilities companies to work with the MUDFA contractor and the SDS Provider.
- 7.73 These negotiations have resulted in a number of positive solutions for utility issues, highlighting the benefits of early engagement with the utilities companies which would have been impossible if utility diversions had been left to the Infraco. The overall strategy of trying to achieve the utility diversion works under one contractor, digging one trench and securing one set of temporary traffic regulation orders is highly innovative and maximises the opportunity to achieve the least disruptive and most productive solution with consequential cost efficiency.
- 7.74 tie is retaining and managing the significant risks associated with utilities diversions and is implementing the utilities diversions through a single framework agreement. Following a competitive tender the MUDFA contract was awarded to Alfred McAlpine in October 2006.
- 7.75 The practicalities of construction sequencing mean that certain utilities diversion work will remain the responsibility of the Infraco (e.g. relocation or protection of utilities where road kerb lines are to be cut back, re-siting of or working around utilities as a consequence of the location of supports for overhead line equipment). This presents a number of interfaces which would be a major risk for the Infraco, and this would be reflected in risk margins applied by Infraco bidders as they would not be in a position to manage this risk until after their appointment.
- 7.76 In the period between award of the MUDFA contract and commencement of physical work in spring 2007, the contractor will undertake a series of pre-construction activities including working with the SDS Provider to optimise the design of the utilities, minimise disruption to the City of Edinburgh and maximise construction productivity. No actual utility diversions will take place until an instruction to mobilise is given to the MUDFA contractor by tie. This instruction will follow the approval of this Draft Final Business Case, anticipated in the first quarter of 2007.

- 7.77 The majority of utilities work is scheduled to commence in 2007 and end in summer 2008.. This will result in significant utilities diversion works being completed prior to commencement of 'on street' works by Infraco so potential conflicts between the utilities and infrastructure works will be minimised; any remaining time overlap can be managed so as to avoid programme conflicts on the ground.

Payment mechanism and incentivisation structure

- 7.78 The MUDFA contractor is paid the value of the final scope of work delivered based on the prices contained in the approximate bills of quantities. Interim payments will be made each month by tie valuing the work in this way.
- 7.79 Incentivisation is difficult where the scope of the work cannot be defined in advance. To mitigate the consequential risk to programme and price tie will adopt an intrusive management and supervision regime to ensure control to deliver the works within budget and programme thus mitigating the risks to the commencement of Infraco works by the due date.

Benefits and risk allocation

- 7.80 The key benefits of the MUDFA strategy are as follows:
- **Cost and disruption minimised** - allows the public sector to use its greater negotiating power to develop single contract solutions for all utilities in an area - thereby reducing cost and disruption to the public.
 - **Increased confidence in overall programme** - removes design of diversions, negotiations with utilities and carrying out of diversion works from being critical path activities for the Infraco – thereby removing substantial time related risk from the overall programme. Also allows utilities work to progress in advance of the Infraco appointment.
 - **Price uncertainty for Infraco significantly reduced.** Removes a large source of cost uncertainty and therefore risk premium from the Infraco Contract.
 - **Allows better forward planning for utilities.** This avoids the utilities having to make difficult decisions about whether to tackle problems now or wait and see whether there will be a diversion required on the problem area later.
- 7.81 Key risks remaining with the public sector are as follows:
- **Potential reduction in innovation** - if utilities were the Infraco's responsibility then they would have the opportunity to propose an alternative approach to utilities which could potentially be more cost effective. However tie believe the scope to innovate with regard to utilities under the swept path of the tram line is very limited and the SDS provider has the specific remit to devise innovative but robust solutions to utilities diversion issues; this, coupled with the appointment of the MUDFA contractor (who are specialised in utility diversions) should effectively eliminate this risk.
 - **Scope and Time** – these risks will remain with tie under this approach; therefore tie's ability to manage these risks will be critical. The MUDFA Contractor and SDS provider will be carrying risks under the terms of their respective contracts. However, the cost of the risk to tie under this approach is considerably lower than would be the case had Infraco managed the utility diversions directly because Infraco would have found it difficult to quantify the risks in advance of bidding, and the knock-on effects of those unquantifiable risks to Infraco's programme would be considerable.
 - **Price risks** – MUDFA is essentially a remeasurement contract and there are a number of areas in which there is a risk of price increase including extension of time, unforeseen obstructions and work which was unquantifiable at the time of tendering

but is reasonably foreseeable. These risks are managed in a number of ways:

- The use of prime cost sums in the bill of quantities to make a provision for foreseeable but unquantifiable work.
- The use of provisional items in the bill of quantities. These work in a similar way to prime cost sums, but are used where there is more doubt about whether or not the work in question will be required.
- A contractor incentivisation scheme (“value engineering incentive”). In the MUDFA contract under which the contractor will share benefits arising from efficient delivery. This will help to ensure that it is in the contractor’s interest as well as **tie**’s that the contract outturn cost be minimised.

Vehicle supply and maintenance (Tramco)

Procurement Approach

7.82 The principal attributes of procurement approach for this contract are:

- Scope – Detail design, manufacture and commissioning into service of tram vehicles (capital works) and subsequent maintenance.
- Approximately 4 ½ year contract duration for capital works and duration of up to 15 years for maintenance.
- Lump sum price for delivery of vehicles for Phase 1a, with options for the supply of further vehicles for Phase 1b and to meet the 8/16 trams per hour operating service pattern. Lump sum payments for maintenance.
- Prices include for inflation over the duration of the contract
- Prices include for exchange rate risk from award of contract (**tie** takes the exchange rate risk up to contract award)
- Milestone payment mechanisms for capital works with performance related payment mechanism for maintenance.
- Liquidated damages for delay to completion
- Performance bonds and warranties to secure redress in the event of major default
- Contractor’s liabilities capped at predetermined levels

Introduction

7.83 The key objective is to select the vehicle and vehicle supplier which best suit Edinburgh’s needs. This contrasts with other light rail procurements, where vehicle suppliers and infrastructure contractors have bid as consortia, and the public sector has been unable to separately select both the best vehicle and the best contractor resulting in a sub-optimal compromise.

7.84 Bids to supply vehicles are being evaluated based on the whole-life price, including maintenance as well as the vehicles’ qualitative features. Therefore the cost of spare parts, special tools and specific maintenance programmes, both annual and periodic, will be considered, in addition to the upfront costs.

7.85 Two separate but related agreements will be procured with the successful bidder: the Vehicle Supply Contract and the Vehicle Maintenance Contract. These contracts will be executed simultaneously. The Vehicle Supply Contract will cover the design, manufacture and supply of vehicles, capital spares, special tools and associated equipment. It will also include, as necessary, option prices for additional rolling stock should the anticipated further phases of the system take place and to facilitate the proposed phased approach to the procurement.

7.86 The maintenance element of the contract will be subject to variant bids similar to the Infraco maintenance contract. The reference case will be to provide tram vehicle maintenance for an initial 15 year operating period. Shorter maintenance periods with the option to extend in 3 yearly increments up to a maximum of 15 years will also be considered. This approach both

maintains flexibility in terms of future maintenance provisions and tests the value for money of the reference case. At this stage it is envisaged that the vehicle supplier and vehicle maintainer, for the initial 6 years at least, will be the same company. However this policy remains the subject of further discussion and development within tie and TEL.

- 7.87 It is intended that both the Vehicle Supply Contract and the Vehicle Maintenance Contract will each be novated to Infraco as at financial close. The Vehicle Supply Contract is expected to have a warranty/defects liability period post full service commencement matched to the Vehicle Maintenance Contract duration. The intention is that on expiry or termination of the Infraco Contract, the Infraco will be contractually obliged to assign the Vehicle Maintenance Contract (and also the Infrastructure Maintenance Contract, assuming that neither have expired) to TEL or another suitable party.

Tramco procurement progress to date

- 7.88 The current status of the Tramco procurement is:

- Four bidders have been prequalified
- Four bids were returned in the 9th October
- Bids are currently being evaluated

Payment mechanism and incentivisation structure – Vehicle Supply

- 7.89 Payment of Tramco for vehicle supply is contingent on the completion of 'fine grained' programme milestones. The principal milestones are:

- Completion and approval of production design work
- Supply of vehicles
- Successful commissioning into service
- Successful system reliability tests

- 7.90 The payment mechanism operates as follows:

- The contract defines:-
 - programme milestones for each element of the work
 - the proportions of the contract sum allocated to each programme milestone
- Payment is made monthly for the value of completed milestone up to 85% of the contract sum.
- The remaining 15% as follows:-
 - 5% on completion of the successful commissioning of the vehicles into the tram system
 - 5% at the successful completion of trial running
 - The remaining 5% on successful completion of System Reliability Tests
- All as assessed by tie

- 7.91 This arrangement strongly incentivises Tramco to:

- Complete vehicle design, supply and commissioning to programme, otherwise their cashflow is adversely affected
- Deliver vehicles to the required standard that are capable of being commissioned and integrated into the tram network, otherwise again their cashflow is adversely affected.

As a further incentive liquidated damages provisions are included in the contract. These represent the costs to tie of any delay to delivery and which may be applied in the event of default by the tram supplier.

Payment mechanism and incentivisation structure – Vehicle Maintenance

- 7.92 The tram fleet reliability and availability are crucial to provision of the high quality tram service required to encourage modal shift from private car to public transport. The Tram Maintainer is being procured under a Tram Maintenance Contract that covers vehicle maintenance services and vehicle spare parts.
- 7.93 The Tram Maintenance Contract has 30% of the annual maintenance services fee as a performance related payment based upon a punctuality and availability monitoring regime. Deductions in payment are proportional to the number of late departing trams compared to those timetabled to operate and tram availability including a 'hot spare' offered for service each day. There are two elements which will be used to determine the amount of each Tramco Maintenance Services Payment and incentivise the Tramco as follows:
- A guaranteed minimum payment - 70% of the monthly payment
 - Tram Service Punctuality and Availability Service Element - 30% of the Maximum Performance Payment, electronically monitored actual tram departure times checked against scheduled departure times and availability.

Benefits and risk allocation

- 7.94 The key benefits of the vehicle procurement and maintenance strategy are as follows:
- No restrictions on the choice of vehicle **tie** can choose
 - Value for money of maintenance contract market tested through variant bids.
 - Creates the opportunity to match the best tram vehicle supplier with the best infrastructure and system integration supplier.
- 7.95 Risks remaining with the public sector are as follows:
- Maintenance and lifecycle risks beyond the chosen maintenance contract period
 - All other risks associated with the cost (initial and ongoing) and on time delivery of the vehicles will pass to the private sector via the novation of the vehicle supply and maintenance contracts to Infraco.
 - Costs in excess of the liability caps specified in the contract.
- 7.96 The procurement phase for this contract is ongoing and the arrangements outlined above may be adjusted to achieve the optimum value contract arrangement with the successful Tramco bidder.

Infrastructure provider and maintenance (Infraco)

Procurement Approach

- 7.97 The principal attributes of procurement approach for this contract are:
- Scope – Single point responsibility for detail design, construction, integration and commissioning into service of Phase 1a of the Edinburgh Tram Network (capital works) and its subsequent maintenance. Options included for Phase 1b and subsequent Phases.
 - Design liability and capability transferred by novation of SDS contract into Infraco
 - Tram vehicle supply, commissioning and subsequent maintenance liability and capability transferred by novation of Tramco contract into Infraco
 - Approximately 4 ½ year contract duration for delivery into service of Phases 1a and 1b. Maintenance duration of up to 15 years.
 - Lump sum price for delivery into service of the tram system. Lump sum payment for maintenance works, subject to performance adjustment.

- Price adjusted for inflation by applying RPIx (Retail Price Inflation index excluding mortgage payments).
- Prices include for market price change over the duration of the contract
- Milestone payment mechanisms for capital works with performance related payment mechanism for maintenance.
- Liquidated damages for delay to completion
- Performance bonds and warranties to secure redress in the event of major default
- Contractor's liabilities capped at predetermined levels (yet to be negotiated)

Introduction

- 7.98 The Infraco will be responsible for integrating the outputs of SDS, Tramco under the novated contracts, and its own subcontracts. The Infraco will be required to carry out and/or manage a comprehensive turnkey contract including the design (effectively only any remaining detailed design and installation/fabrication design), construction, installation, commissioning, vehicle procurement, system integration, infrastructure maintenance, vehicle maintenance and supply of related equipment and materials in respect of the tram system, the tram vehicles and related infrastructure. Certain of the system performance obligations will persist for the duration of the maintenance contract period.
- 7.99 The evaluation of bids to construct the infrastructure will be evaluated based on the price for the delivery of the infrastructure together with maintenance and lifecycle costs, as well as qualitative features. Unlike the vehicles contracts, tie proposes to procure the initial construction and the ongoing maintenance under a single contract with the successful bidder.
- 7.100 The maintenance element of the contract will be subject to variant bids similar to the vehicle maintenance contract. The reference case will be to provide infrastructure maintenance for an initial 15 year operating period. Shorter maintenance periods with the option to extend in 3 yearly increments up to a maximum of 15 years will also be considered. This approach both maintains flexibility in terms of future maintenance provisions and tests the value for money of the reference case. However this policy remains the subject of further discussion and development within tie and TEL.

Infraco procurement progress to date

- 7.101 The current status of the Infraco procurement is:
- The Infraco bid document was issued on 3rd October 2006
 - Final bids are due back in the Spring of 2007
 - Concurrent award of Infraco and Tramco proposed for October 2007.
- 7.102 tie will be adopting a robust negotiation strategy to press for the optimum price and by benchmarking prices returned against those received on other tram projects.

Payment mechanism and incentivisation structure – Capital Works

- 7.103 Payment of Infraco for capital works is contingent on the completion of 'fine grained' programme milestones. The principal milestones are:
- Completion and approval of production design work
 - Successful commissioning of the system into service
 - Successful system reliability tests
- 7.104 The payment mechanism operates as follows:
- The contract defines:-
 - programme milestones for each element of the work
 - the proportions of the contract sum allocated to each programme milestone

- Payment is made monthly for the value of completed milestone up to 85% of the contract sum.
- The remaining 15% as follows:-
 - 5% on completion of the successful commissioning of the Edinburgh Tram Network into operation
 - 5% at the successful completion of trial running
 - The remaining 5% on successful completion of System Reliability Tests
- All as assessed by **tie**

7.105 This arrangement strongly incentivises Infraco to:

- Complete system construction, commissioning and delivery into service to programme, otherwise their cashflow is adversely affected
- Delivery of the system to the required standard and performance, otherwise again their cashflow is adversely affected.

7.106 Additionally as a further incentive liquidated damages provisions are included in the contract. These represent the costs to tie of any delay to delivery and which may be applied in the event of default by the Infraco, including any default by Tramco or SDS under the novated contracts.

Payment mechanism and incentivisation structure – Infrastructure Maintenance

7.107 The Infrastructure Maintenance Contract has 40% of the annual maintenance services fee as a performance related payment to incentivise the Infrastructure Maintainer to provide and present the tram system to a high standard, In addition a team of inspectors making qualitative assessments against established criteria will check items such as cleaning, tram system repairs and maintenance, cctv, passenger information displays, poster and information cases and signage and public address and help points. In order to incentivise timely fault correction for items of the tram system that are not covered by the punctuality or the qualitative regimes a part of the annual maintenance fee is made based upon actual fault correction against target correction times.

7.108 The regime allows for positive and negative performance points to be awarded each period in order to both incentivise good performance and penalise bad or deteriorating performance. The regime is based upon an existing arrangement on a tram system. The four elements used to determine the amount of each Infrastructure Maintenance Services Payment and incentivise the Infraco are:

- Guaranteed minimum payment - 60% of the Maximum Performance Payment
- Tram Service Punctuality Service Element - 30% of the Maximum Performance Payment, measured electronically comparing actual tram departure times checked against scheduled departure times.
- Equal Service Element - 7.5% of the Maximum Performance Payment covering , tramstops, the depot, car parks and/or any other part of the tram system (including areas adjacent to it) assessed against documented criteria by inspectors.
- Fault Correction Service Element and Information Provision Service Element – together 2.5% of the Maximum Performance Payment. The Infrastructure Maintainer provides a record of faults reported, the action required and time taken to correct. If the time taken to correct the fault exceeded the correction time limit then a penalty is levied.

Poor performance 'ratchets' are included for repeated periods of poor performance and increased monitoring and remediation plans by the contractor.

Benefits and risk allocation

- 7.109 The key benefits of the Infraco procurement strategy are primarily in the novation of the SDS and TRAMCO contracts and the transfer of risks to the Infraco which are difficult to quantify. The benefits include:
- Single system integrator responsible for implementation of design, construction and of Edinburgh Tram Network and its subsequent maintenance
 - Full design risk passed to Infraco post contract award, including critically the deliverability of the design
 - Full vehicle risk passed to Infraco post contract award, including the deliverability of the vehicle design
 - Reliability of Infraco supply chain and products to be supplied within it
 - Infrastructure and vehicle maintenance risk passed to Infraco
 - Value for money of maintenance contract market tested through variant bids.
 - Enables the Infraco bidders to minimise risk pricing
 - Enables delivery of the tram system within the optimum programme
- 7.110 Risks remaining with the public sector are as follows:
- Maintenance and lifecycle risks beyond the chosen maintenance contract period
 - Costs incurred above the Infraco contract liability caps in the event of default
- 7.111 The procurement phase for this contract is ongoing and the arrangements outlined above may be adjusted to achieve the optimum value contract arrangement with the successful Infraco bidder.

Novation strategy

Rationale for novation

- 7.112 A key element in achieving value for money through the Procurement Strategy is the disaggregation of the procurement of the separate contracts required to deliver the tram into service. This enables:
- Early commencement of design for both utilities diversions and infrastructure thus reducing overall programme.
 - Improved certainty of scope definition minimising risk pricing by Infraco bidders.
 - Selection of the optimum combination of vehicle and infrastructure providers.
- 7.113 However, tie also recognises the benefit of single point responsibility delivered by a consortium structure which would normally be achieved through a single integrated procurement process. tie therefore aims to retain as many of these benefits as possible by reaggregating the structure within the Infraco contract.
- 7.114 It is intended to achieve this by novating the SDS and Tramco contracts to the Infraco. While this carries risks, tie believes that these can be managed through a robust procurement process. This concept has been tested during extensive market consultation and received positive feedback. The proposed structure will transfer all of the systems integration and interface risks to the Infraco, with the exception of such risks associated with MUDFA, JRC and DPOFA which remain with the public sector. This approach is entirely analogous to that taken on the Docklands Light Railway projects.

Novation of SDS to Infraco

- 7.115 The terms of the SDS contract provide for full novation of the contract to the successful Infraco bidder and consultation with Infraco bidders has been positive in this regard. tie retains the right but not the obligation to enforce the novation and there are a number of

mitigating actions which can be taken in the event of difficulty. The benefits of novation of the SDS contract accrue in the main to the Infraco and this should be reflected in the pricing of tenders.

Novation of Tramco (supply and maintenance contracts) to Infraco

- 7.116 During consultation with bidders it became clear that the Infraco bidders would have a strong preference for the identity of the vehicle manufacturer to be known prior to the tendering process for the Infraco contract being complete as it could have a material impact on the integrity of the delivery of their contract obligations. In particular the technical aspects, commercial terms and programmes of both the Infraco and Tramco preferred suppliers will need to be aligned and agreed prior to novation. It is proposed that this alignment will be created by **tie** facilitating negotiations between the two preferred bidders.
- 7.117 Additionally, any issues that Infraco or Tramco bidders may have with each other which could prejudice a successful novation will be identified in early stage negotiations with all bidders. These will either be practical issues capable of resolution through exchange of information or tactical commercial positioning in which case **tie** will, at an early stage, apply pressure through negotiations to overcome this. This will mitigate the risks of the novation process failing due to material objections on the part of either the Infraco or Tramco preferred bidders. Nonetheless a risk remains that this novation could fail or become expensive to implement. **tie** will monitor this aspect closely through the early evaluation and negotiation phase of the tender evaluation process.

Procurement process to financial close

- 7.118 The key steps to concluding the procurement process to financial close and award of the Infraco contract are:
- Initial evaluation and clarification of Tramco bids
 - Provision of key detailed design information to Infraco bidders early in the new year
 - Return of Infraco bids
 - Initial negotiations with Tramco bidders
 - Initial evaluation and clarification of Infraco bids
 - Initial negotiations with Infraco bidders
 - Selection of preferred Infraco and Tramco bids
 - Release of detailed design information to preferred bidders
 - Facilitated Infraco/Tramco negotiations (facilitated by **tie**)
 - Facilitated Infraco/SDS negotiations (facilitated by **tie**)
 - Due diligence by Infraco on key elements of the SDS detailed designs
 - Final negotiations with Tramco and Infraco
 - Conclusion of the basis for contract award with both Tramco and Infraco
 - Preparation and review of contract award recommendations
 - Award of Infraco and Tramco contracts and concurrent novation of SDS and Tramco to Infraco

Stakeholders will be briefed and consulted throughout the above process with a view to awarding contracts in October 2007.

System integration strategy

- 7.119 The principal reason for procuring a consortia Infraco contractor is to provide the vehicle with the demonstrable capability to deliver system integration. Bidders will be required to provide a project specific integration plan as part of their bid. These plans will be reviewed and validated by **tie** and its technical advisers TSS to ensure the robustness and reliability.
- 7.120 **tie**'s Employers Requirements embodied within the Tramco and Infraco contracts set out the requirements for proving the key stages of integration to conclusion of tram system delivery.

7.121 These requirements include:

- Test and inspection plan requirements
- Factory Acceptance Test Requirements
- System Acceptance Test Requirements
- Commissioning plans and records

7.122 These tests will need to be successfully completed and requirements complied with in order to commence the trial running phase. The trial running phase and the subsequent system reliability tests will prove the system in operation. The payment mechanisms for Infraco and Tramco incentivise the contractors to successfully deliver a fully integrated system.

Value for money assessment

7.123 The value for money case for adopting tie's Procurement Strategy has been demonstrated based on a preliminary qualitative VfM assessment of the option to procure the Tram via a PFI route prepared during the spring of 2005 together with the subsequent further work consisting of:-

- A comprehensive qualitative and quantitative **ETN Procurement Route VfM assessment** comparing the Procurement Strategy being followed by tie to a PFI route.
- Confirmation that the conclusions drawn in the above assessment are still valid in light of the truncation of the initial scope of the project.
- A series of value for money risk transfer mechanisms to be implemented for the Tramco and Infraco contracts to incentivise the private sector in a manner similar to PFI whilst minimising the funding costs and risk premia which might be borne by the public sector in a PFI arrangement.

7.124 The key driver for tie's Procurement Strategy is the need to construct a procurement arrangement that delivers an affordable scheme cost with significant risk transfer to the private sector.

Value For Money risk transfer mechanisms

7.125 Consistent with the principals of tie's Procurement Strategy, value for money risk transfer mechanisms have been incorporated into the principal contracts, namely Tramco and Infraco. In summary these mechanisms are:

- a) The creation of a single point contract, Infraco, with responsibility for the design, construction, system integration, commissioning and subsequent maintenance of the Edinburgh Tram system, including tram vehicles. This transfers the following responsibilities and hence risks to the private sector:
 - System integration – that all components, subsystems and systems are integrated together such that Edinburgh Tram Network delivers the specified performance and maintenance delivered such that level of specified performance is delivered during operation.
 - Design – that the design completed by SDS prior to contract award delivers the required Tram Network performance
 - Interface management – The effective management of the interfaces between suppliers and sub contractors to deliver the specified performance within the agreed programme.
- b) The creation of the Infraco contract as a lump sum contract transfers the pricing risk to the private sector. Finalisation of the Infraco contract price on the basis of SDS Detailed Design significantly reduces their scope and performance risk pricing premium that would otherwise be necessary under conventional design and construct or PFI approaches.

- c) Incentivisation to deliver the operating tram system into revenue service to programme and to the required performance and standard by:
- 'Fine grained' milestone schedule payment mechanisms in Infraco and the two contracts novated into it. Critically in the Infraco contract:-
 - Retention of the final 10% of value pending demonstrably successful completion of trial running and subsequent successful completion of system reliability tests on the operating Tram Network during revenue service.
 - Liquidated damages for over run on completion due to default by the contractor.
 - An ongoing maintenance obligation of up to 15 years such that any oversight or skimping on the quality of components and system integration is likely to result in a financial penalty during the operating phase.
- d) Incentivisation to deliver maintenance services during tram operation via the performance payment mechanism in the Infraco and Tramco contracts. These will penalise the contractor financially should performance fall below the specified thresholds.
- e) The Infraco's obligations are underwritten by bonds to the value of 15% of the underlying contract during the construction phase, stepping down during the operating phase in line with confidence in the integrity of the Tram Network. In addition the Infraco's obligations are underwritten by Parent Company Guarantees with each Infraco consortia party.
- f) Early involvement of the operator under the DPOFA contract ensures that the operator is content with the system proposed and delivered and provides operational expertise to the design and procurement phases and resources to support the commissioning and trial running phases.

7.126 The above mechanisms provide value for money through a sensible risk allocation with the private sector with the requisite incentivisation and sanctions. In addition tie's strategy of the separate procurement of the principal elements of the supply chain and their subsequent reaggregation further improves value for money by reducing overall programme duration, and hence cost, plus avoiding the risk premia that bidders would inevitably otherwise include under PFI style arrangements. This is achieved by:

- Procuring the design early via the SDS contractor thereby reducing scope uncertainty at the close of the Infraco and Tramco bids.
- Procuring the tram vehicle separately enabling the optimum combination of vehicle and infrastructure suppliers and maintainers.
- Procuring the utilities diversion work separately (predominantly under the MUDFA contract) avoiding the time delay whilst diversions are scoped and designed and prices agreed with utility companies.

7.127 In summary tie firmly believe that the structure outlined above will deliver the required risk transfer provisions to maintain a high level of incentivisation throughout the contract period. tie also believes that the cost of the incentives package will compare favourably to the cost of finance incurred in PPP projects.

Approvals and 3rd party works strategy

Approvals

- 7.128 The Edinburgh Tram (Line One) Act 2006 and the Edinburgh Tram (Line Two) Act 2006 (the Acts) gave the authorised undertaker (i.e. CEC) various powers including the powers to construct and operate the tram lines or any part of them either as a stand alone line or as part of a network. However despite these wide ranging powers, various other consents and approvals are still required to ensure that all of the works have the necessary consents and to ensure that the tram can operate successfully.
- 7.129 Many, but not all of the consents will be required from the planning authority of the CEC. However other consents may also be required from other statutory bodies, for example the roads authority or Scottish Natural Heritage and from other third parties. Table 7.1 below lists the consents required, likely extent, consenting authority for each and an indication of the likely timescale for obtaining the consent.
- 7.130 The process of prior approval is explained below.

Table 7.1 – Consents required

CONSENT	LIKELY EXTENT OF REQUIREMENT	AUTHORITY	TIMESCALE
Rail	HMRI and Network Rail Consents	HMRI Network Rail	Iterative process through preliminary and detailed design stages
Aviation	Aviation and BAA Approvals	Planning Authority BAA	Iterative process through preliminary and detailed design stages
Planning	Prior Approvals for buildings and OLE fixings Listed Building Consent for OLE fixings Advertising Consent. Full Planning Permission will be required for works not scheduled in the Bills. Conservation Area Consents - not required Scheduled Monument Consent (eg Victoria Bridge)	Planning Authority Scottish Ministers & Historic Scotland	8 weeks minimum Plus 8 weeks – application can be dealt with through delegated powers or by Planning Committee Plus Further time required if called in by Scottish Executive.
Traffic	Traffic Regulation Orders Temporary Traffic Regulation Orders	Roads Authority	Minimum of 12 months 8 weeks

	Road Construction Consent	Roads Authority	28 days
Environment	Water and Waste Water Connection	Scottish Water	28 Days
	Controlled Activities Regulations Compliance	SEPA	Not applicable
	Controlled Activities Regulations Approval	SEPA	
	Controlled Activities Regulations License	SEPA	
	SPA Notifications/Consents	SNH/Scottish Executive	Not Applicable
	Protected species notifications/consents		
	Landscape and Habitat Management Plan	Planning Authority	Prior Approval of this is required in accordance with Acts of Parliament.
Structures and Construction	Building Warrant for Depots	Building Standards	2 weeks minimum
	Technical Approval	CEC Building Standards, Roads, Bridges	8 weeks
	Works to safeguard buildings	Owner/occupier	14 days notice
Radio	Business Radio License	OFCOM	None Given
Agreements and Undertakings	Third Party Agreements entered into will require to be met and the preliminary design phase will need to ensure these are fulfilled.	Agreement between tie and party	Details passed to designers as tracked through the programme
	Parliamentary Undertakings will require to be met and the preliminary design phase will need to ensure these are fulfilled.	Parliament	Details passed to designers as tracked through the programme
Survey Work	Access Rights for survey purposes	Owner/occupier	First time for a site requires 7 days notice, then 3 days thereafter

Planning Approvals

7.131 The bulk of the planning consents are expected to be applications for prior approval. Table 7.2 below sets out the type of planning consents which may be required.

Table 7.2 – Planning consents required

Proposal (A-Z)	Type of Planning Application Required
Access Roads	Prior Approval.
Advertisements on Tram Stops or other Buildings/structures.	Express Consent to Display an Advertisement required for commercial advertising. Directional signs and information notices enjoy “deemed consent” and so do not require express consent.
Advertisements on Trams (inside and out)	No Consent Required.
Bridges (Erection of new bridges and extensions to existing)	Prior Approval.
Buildings (Erection of new building or extensions to existing)	Prior Approval.
CCTV within Limits of Deviation	May require Prior Approval (any building or pole on which they are fixed may require prior approval). Listed Building Consent where attached to Listed Building specified in Schedule 10.
CCTV outwith Limits of Deviation	None usually, but consent needed in Conservation Areas and consent also needed if preconditions contained in General Permitted Development Order are not met. Listed Building Consent likely to be needed to attach CCTV cameras to listed buildings.
Construction compounds within Limits of Deviation or adjacent to Limits of Deviation land	None.
Demolition of buildings/ structures within a Conservation Area	Conservation Area Consent (unless only partial demolition, or the building or structure is very small - 115 cu m or under - or was not in a conservation Area at the time the Bill was introduced to Parliament).
Fences (means of enclosure only - see below for “sound barriers”)	None within Limits of Deviation. Outwith Limits of Deviation - consent required only in the conservation areas unless over 1 m high (and other General Permitted Development Order preconditions).
Footbridges	Prior Approval.
Embankments	Prior Approval.
Landscaping - Hard & Soft	None. However, link with Environmental Statements and the Landscape Habitat Management Plan for Roseburn Corridor.
Lighting	May require Prior Approval if attached to a building or placed on a pole.
Listed Building alterations (for tram related works)	Prior Approval. Listed Building Consent where attached to Listed Building specified in Schedule 10.
Overhead Line Equipment Poles	Prior Approval.

Prior Approval	Prior Approval. Listed Building Consent where attached to Listed Building specified in Schedule 10.
Overhead line fixings to non-listed buildings	Prior Approval.
Park & Ride Site at Ingliston	None (except for any formation or alteration of a means of access to a road used by vehicular traffic and any buildings/shelters).
Park & Ride Sites - Others	Full Planning Permission.
Retaining walls	Prior Approval (unless retaining wall is considered to be solely a means of enclosure).
Scheduled Ancient Monument	Scheduled Monument Consent required for almost any type of work to Victoria Swing Bridge (including temporary storage on the surface of the Scheduled Ancient Monument). Application must be made direct to the Scottish Ministers. Dealt with by Historic Scotland (who has indicated that a form of in principle Scheduled Monument Consent could be given).
Signs	Traffic and other functional signs generally enjoy "Deemed Consent" providing any illumination is for purposes of warning.
Signalling	May require Prior Approval if attached to a building or placed on a pole Listed Building Consent would also be needed if attached to Listed Building specified in Schedule 10.
Sound Barriers	Prior Approval. Sound barriers by definition are not considered a means of enclosure. Hence they fall within the definition of "building" in the 1997 Act and require prior approval.
Street lighting	None usually, but may need consent in Conservation Area with Article 4 Direction in force.
Substations	Prior Approval - within definition of "building".
Trackside Equipment Cabinets	None. Plant and equipment is exempt from the definition of "building" in General Permitted Development Order.
Trams	None.
Tram tracks & associated surfacing within existing roads	None.
Tram stops & associated equipment	Prior Approval for those parts defined as a building (eg Shelter). While not all parts of the tram stop require prior approval, it is tie's intention to lodge applications for tram stops as a whole so that those parts which need approval can be judged in context.
Trees - removal of, or works to	None.
Vehicle access to road used by vehicular traffic (formation of or alteration to)	Prior Approval.
Viaducts (Erection of new one or alteration to existing one)	Prior Approval.

Walls (means of enclosure only – see above for “sound barriers” and “retaining walls”)	None within Limits of Deviation. Outwith Limits of Deviation consent required only in the conservation areas or if more than 1 m high.
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7.132 In addition to those consents identified in the table above, it should be noted that in some cases, for example in respect to the depot and substations, building warrants may also be required.

Prior Approvals

7.133 In terms of Section 74 of the Edinburgh Tram (Line One) Act 2006 and Section 73 of the Edinburgh Tram (Line Two) Act 2006, the Town and Country Planning (Scotland) Act 1997 still applies to the works authorised by the Acts and therefore despite the general planning permission granted by the Acts, some elements of the works require prior approval under Class 29 in Part 11 of Schedule 1 to the Town and Country Planning (General Permitted Development)(Scotland) Order 1992. As can be seen from the table above, these include:-

- Any buildings or structures including substations, bridges, tramstops and poles; and
- Any extensions to buildings including any building fixings

It should be noted that prior approval applies where these elements of the works are either within the limits of deviation or within the limits of land to be acquired or used.

7.134 Any application for prior approval can be refused on the following grounds:-

- The works ought to be and could reasonably be carried out elsewhere on the land designated specifically in the Act i.e. within the limits of deviation; and/or
- The design or external appearance of the works would injure the amenity of the neighbourhood which is deemed to include the desirability of preserving the building or its setting or any features of special architectural or historic interest which it possesses. It should be noted that this second ground has been extended by virtue of the Acts in order to recognise that the tram runs through a World Heritage Site.

7.135 Under the SDS contract, the obligation to obtain all consents and approvals has been passed to SDS and as part of the detailed design process, applications for prior approvals will be made to the planning authority. While it is appreciated that neither tie, CEC as the promoter or TEL can fetter the discretion of the planning authority, SDS has tried to minimise the risk that the need for prior approval adds to the project.

7.136 SDS has prepared an Approvals and Consents Management Plan (ACMP). SDS recognises that the success of the design process is ultimately dependent on achieving the necessary approvals and consents and the ACMP provides an overarching strategic document that defines all approvals and consents. It also allows the applications for the approvals and consents to be tracked from design development and pre-application discussions to the conclusion of the approvals and consents process.

7.137 In addition the prior approval process for tram submissions was approved as an addition to CEC's Scheme of Delegation on 18 May 2006 by its planning committee. The report was approved by the full Council in June 2006. Further, SDS and the planning authority have agreed a protocol setting out the roles of both parties during the prior approval process, including the timescales for obtaining the consent, the deliverables and the criteria for referring an application to the planning committee for determination rather than it being considered under delegated authority. Template submissions and committee report have also been developed.

7.138 The Tram Design Working Group, which includes representation from Historic Scotland and the World Heritage Trust, is a forum where pre-application discussions can take place, again without fettering the discretion of the planning authority. This group was set up as part of the

agreement reached with Historic Scotland to allow them to withdraw their objection to the Bills and is intended to minimise the risk of objections from Historic Scotland and the World Heritage Trust to the prior approval applications. It is also ensuring that CEC, Historic Scotland and the World Heritage Trust have an opportunity to participate in the delivery of a tram system which is integrated with the public realm and reflects the identity of Edinburgh. The Tram Design Manual will be a key consideration in respect of each prior approval application.

Planning permissions

- 7.139 Where any element of the works is to be constructed outside of the limits of deviation, full planning permission must be obtained. It should be noted that the project is proceeding, and SDS has been instructed, on the premise that all of the works will be within the limits of deviation.
- 7.140 Again, in order to minimise the risk of this, SDS has been having ongoing discussions with the planning authority in relation to the planning applications. In addition it is anticipated that given that the scheme is being designed within the LOD, there will be very few planning permissions required for the tram works. However planning permissions may be required for third party works, in particular the work required to the Wanderer's Clubhouse at Murrayfield.

Listed Building Consents

- 7.141 There are many listed buildings abutting the limits of deviation. When the Bills were drafted a balance was struck between protecting listed buildings and allowing the works to be constructed without the need for further consents. Accordingly Schedule 10 Part 1 to each of the Acts lists the listed buildings/monuments and specifies the works which can be carried out to those buildings/monuments without the need for further consents.
- 7.142 In addition it was recognised that affixing a building fixing to a listed building may be unavoidable given the number of listed buildings with the city centre and down to the Foot of the Walk and Constitution Street. Schedule 10 Part 2 to each of the Acts lists those buildings to which building fixings cannot be affixed without Listed Building Consent.
- 7.143 SDS has been carrying out the design in accordance with these constraints. However listed building consents may be required as the design is progressed. In particular, given that building fixings also require building owner consent there may be no alternatives in some locations but to affix to a listed building.
- 7.144 The timescale for obtaining listed building consent is similar to the timescale for obtaining a prior approval. However the Scottish Executive must be informed once a decision has been made and there is a further 28 days during which the Scottish Executive may call in the application.

Scheduled Ancient Monument Consent

- 7.145 Any works which would mean physical works to a Scheduled Ancient Monument will require consent from the Scottish Ministers i.e. Historic Scotland, prior to those works being carried out, in accordance with the Ancient Monuments and Archaeological Areas Act 1979. It is not envisaged that any of the works will physically impact on a Scheduled Ancient Monument.

Landscape and Habitat Management Plan

- 7.146 Under the Edinburgh Tram (Line One) Act 2006, the planning authority must approve the Landscape and Habitat Management Plan (LHMP) before any of the works along the Roseburn Corridor can be commenced. There are detailed provisions in the Act regarding the LHMP, in particular in relation to its content and to what consultation must take place as the plan is evolving.

Roads Authority Approvals

Temporary Traffic Regulation Orders

- 7.147 In respect of the Temporary Traffic Regulation Orders (TTROs) a strategy has been developed by tie and SDS to ensure that the necessary orders are in place for both the MUDFA and Infraco works. The strategy aims to maximise flexibility during the construction period and to minimise the risk of public confusion given the scale of the works.
- 7.148 Given that the construction methodology to be adopted by the Infraco is unknown at this stage and that the detailed design for the utility diversions is not yet complete, if individual TTROs for specific works on specific roads at specific dates were obtained at this stage by SDS, it is likely that the TTROs would require to be significantly altered or even remade by CEC in order to cover, and be in place for, both MUDFA and Infraco at the necessary time.
- 7.149 For this reason, it is intended that one master TTRO is made for all tram works, including the utility diversion works. That order would specify:
- All of the roads likely to be affected;
 - All of the measures likely to be imposed;
 - That any particular measure will be in force when signed on street; and
 - The date on which the order will come into force and that it will remain in force for more than 18 months i.e. it will cover both the MUDFA and Infraco works.
- 7.150 This master TTRO would go through the statutory process once rather than having a series of street specific orders going through the process over several months or even years. It is anticipated that the master order would cover the vast majority of the measures. This approach has already been used in Edinburgh by major utilities' companies. However this approach would have to be underpinned by effective lines of communication between MUDFA, Infraco, tie and the roads authority. This would allow a rolling programme of works to be agreed in advance within the terms of the master order and taking account of current circumstances especially other competing demands for road occupation or other utility works.
- 7.151 As the rolling programme is agreed between the parties, details of the proposed works/measures would be publicised in accordance with pre-agreed communication and publication protocols to ensure that the public had reasonable advance notice of all measures and diversions. That is, not too late, nor too far in advance to be useful. For instance, measures may be agreed in one month slots, two months in advance so that the public could be given one month's notice.
- 7.152 An effective communication and publication process is an essential pre-requisite of this approach to ensure that road users are given adequate and reasonable notice of temporary road works and diversion measures in the interests of procedural propriety and road safety. Accordingly there will need to be a protocol developed as part of the tender process to deal with the communication strategy. It is intended that the TTRO would be in place by the end of February 2007.

Traffic Regulation Orders

- 7.153 In respect of the Traffic Regulation Orders (TROs), SDS is again responsible for obtaining the necessary orders. The TROs will be categorised into three types - core measures, direct consequential measures and indirect consequential measures.
- 7.154 Core measures are those measures that fall within the tram line envelope and, if that line is within a lane width of the kerb, then also those measures that fall within that lane. (The width of the lane will vary depending on its current function: (1) Parking up to 2m, (2) loading up to 2.7m, (3) bus lane between 3m to 4.7m). Direct consequential measures are those measures that fall outwith the core measures but within the LOD (excluding any 'showstopper' which would be considered core). Indirect consequential measures are all other measures

- 7.155 Given that core measures are essential for the successful operation of the tram, discussions are ongoing with the Scottish Executive and the CEC regarding the appropriateness of a hearing process where a major scheme has been approved by the Scottish Parliament. Subject to timescales, there may be an opportunity to amend the Local Authorities Traffic Orders (Procedure) (Scotland) Regulations 1999. A meeting has already been taken place with the Scottish Executive to discuss this. Based on the programme at that time, **tie** was advised that there was insufficient time to amend the legislation.
- 7.156 The process to amend the legislation is as follows:-
- There would need to be agreement from the Scottish Executive to prepare a paper for the Transport Minister;
 - The Minister would need to agree to take forward the amendment;
 - A draft consultation paper would need to be prepared;
 - There would be a three month consultation period with roads authorities and others;
 - All responses would require to be analysed and then the Scottish Executive would need to decide whether to proceed with the amendment;
 - If the amendment proceeded, OSSE (legal) would need to draft the amendment (OSSE has 1 solicitor for drafting roads legislation with extremely high current workload); and
 - Once drafted the amendment would be made.
- 7.157 Given the current programme **tie** will continue to have discussions with the Scottish Executive about the possibility of amending the legislation following the elections next year.
- 7.158 That said, CEC has advised that the construction of the Infraco Works cannot commence prior to all or any of the permanent traffic regulation orders in respect of the core measures being in place. Accordingly, the programme and the variant have both been developed on the assumption that the on street works cannot commence until the TROs in place; the off-street sections can however commence ahead of the TROs being in place.
- 7.159 The rationale behind this assumption is as follows. A TTRO authorises temporary works on a road. It has the effect of suspending any permanent order whilst the works are underway. After completion of the works, the TTRO is 'revoked' and the permanent order is reinstated. So there is no change in the permanent measure as a result of its temporary suspension for road works. Because there is no permanent change as a result of a TTRO, there is no right to object to TTROs. In this case, some measures will be necessary for the tram works *and* for the subsequent tram operation. They will therefore remain in place after the works are complete.
- 7.160 CEC have said that they do not want to construct what will be a permanent measure under a TTRO. Public money will have been spent on a measure that has not been through due statutory process and could be seen as prejudging the outcome of that process. They have had senior counsel's opinion endorsing this approach in a previous case.
- 7.161 There is merit in CEC's argument. However, senior counsel has not been asked to consider the circumstances in this case where the scheme has already been endorsed by the Scottish Parliament and the Council is exercising powers under Acts of Parliament. It is arguable that in such circumstances no further consenting processes should thwart the will of Parliament. CEC will not authorise action that is contrary to advice given by senior counsel so he should

be asked to consider this issue in the circumstances of tram. Accordingly senior counsel's opinion is being sought as a matter of urgency.

7.162 Working on these assumptions a programme has been developed which shows that the TROs can be obtained at the earliest by July 2008. The key milestones are:-

Description of Milestone	Date
Submit the draft orders, schedules, plans statement of reasons and other documents to the CEC for approval	13 March 2007
Commence statutory consultation process (21 days)	30 March 2007
Report to Council on consultation process and request approval to commence public consultation	July Council meeting
Commence public consultation process (28 days)	1 August 2007
Report to Council on the objections and whether to proceed to a public hearing	September Council meeting
Hearing commences	8 January 2008
Hearing ends	15 February 2008
Receipt of reporters report	28 April 2008
Report to Council	May Council meeting
Orders are made	June/early July Council meeting
Orders advertised	16 July 2008
First permanent measures able to take place	17 July 2008
End of six week judicial review period	27 August 2008

7.163 There is potentially a variant to this programme which would mean that some of the core measures would be advanced and made by the Council without a public hearing of objections to the measures. The remaining measures would be made in accordance with Option 1.

7.164 This may have two potential advantages:

- To secure approval of some of the critical measures should reduce the risk for Infracore of obtaining these approvals.
- To secure approval of some of the critical measures could allow Infracore to start construction on the back of the approval.

7.165 If it was felt that accelerating some of the measures was beneficial for the project, it would be necessary to identify which measures could or should be advanced without a public hearing.

That would depend on whether or not the measure triggered a mandatory hearing, on the assumption that there is insufficient time to change the regulations; the number and scope of objections to it and importantly, the decision of the Council as road traffic authority on the need for a discretionary hearing.

- 7.166 If the advanced orders are to be of use to Infraco, they presumably have to reflect all of the proposed works in any section. It is assumed that the advanced orders would have to contain all of the measures within the LOD in any given section and that the Infraco will not go onto a section and do whatever it can under the advanced orders and then go back some months later to complete works under the remaining orders.
- 7.167 The difficulty is that in order to minimise any challenge to the decision not to have a hearing, the core measures must be defined as narrowly as possible. They must be measures in respect of which there will be little, if any, scope to vary core measures. In contrast, for the purposes of the construction works, core measures might have to be defined as widely as possible to ensure that they reflect the proposed works.
- 7.168 As acceleration means no public hearing of objections to the relevant measure, the decision on whether or not to hold a discretionary hearing rests with the roads authority and cannot properly be taken in advance of a report on objections. That report will be available in July 2007.
- 7.169 In addition, there may be a significant number of objections to core measures and the CEC may be reluctant to make these orders without the benefit of a hearing of the objections. Again this decision cannot be taken in advance. It can only be taken at the stage of the consideration of the report into objections which will be considered at the September Council meeting. If there are significant objections, a decision not to hold a hearing could be susceptible to judicial review. However that has to be balanced against the fact that there is little, if any, scope to vary them and as such there is little value or merit in having a hearing.
- 7.170 If this variant was considered to have merit then following the council meeting in September 2007, the programme would be as follows:-

Description of Milestone	Date
Report to Council to make orders	October/early November Council meeting
Orders advertised	29 November 2007
First permanent measures able to take place	30 November 2007
End of six week judicial review period	10 January 2007

- 7.171 In order to mitigate the risks of not being able to commence works on street and of not getting the necessary TROs by July 2008, **tie** will continue to engage with the Scottish Executive and will obtain senior counsel opinion. Further discussions will take place with CEC in order to refine and finalise the programme having regard to the possible variant.

Roads Authority Consents

- 7.172 Any modified junctions and new roads will require the consent of the Roads Authority. In order to show that such modified junctions are safe, modelling will be required as will Roads Safety Audits.

- 7.173 There has been significant input from the Roads Authority to the section of tramway from Haymarket to the Foot of the Walk/Constitution Street and the initial preliminary designs have been amended and reworked to deal with their concerns. The junctions in the preliminary design have already been modelled to demonstrate that there is sufficient capacity and further modelling will be done on the modified preliminary design, again to show that there is sufficient capacity.

Third Party Consents

Side Agreements

- 7.174 Throughout the Bills' passage through the Scottish Parliament, various agreement were entered into between CEC and either private individuals or commercial interests who had objected to the Bill in order to give them sufficient comfort to allow them to withdraw their objections.
- 7.175 Some of these agreements give these third parties the right to agree or approve for example site specific method statements, the design or the programme before the works commence. All of the obligations in the Side Agreements have been passed down to MUDFA and the Infraco as appropriate to ensure compliance with the Agreements.

Network Rail

- 7.176 As the Acts do not contain any provisions which would protect Network Rail's assets – a position supported by the Scottish Parliament – tie agreed a set of protective provisions with Network Rail. In common with other light rail projects that have interfaces with Network Rail, the protective provisions were a prerequisite to Network Rail removing their technical objection on the basis that they were satisfied that their assets will be safeguarded.
- 7.177 tie has a dedicated Network Rail Interface Manager and TSS acts as the third party representative. The following agreements have already been entered into:-
- Basic Services Agreement (“BSA”) which permits the formal, commercial and technical engagement of NR on the project at **tie's** cost;
 - Basic Asset Protection Agreement (“BAPA”) which sets the conditions under which **tie** may have access to NR operational railway property; and
 - Development Services Agreement (“DSA”) which will engage NR in the process of reviewing and agreeing the tram scheme design in relation to interface with the railway network.
- 7.178 There are ongoing negotiations in relation to the Asset Protection Agreement (“APA”) which will ultimately be passed down to the Infraco. While negotiations are progressing well, and it is anticipated that tie will conclude negotiations by the end of the year and will achieve a more favourable position than has previously been achieved on heavy rail schemes, there are four important issues which will require management in relation to Network Rail:-
- The time that it will take for any decision, negotiation and agreement with Network Rail to be achieved if Network Rail deviates even slightly from its codified approach;
 - The effect of any Network Rail policy change;
 - The generally risk averse nature of Network Rail to all projects which affect their operations; and
 - The interaction between the tram project and the various heavy rail schemes already committed or being promoted for example EARL, Airdrie to Bathgate improvements, the Waverley redevelopment.

Scottish Executive assistance and oversight on this matter will be important, given the new relationship between the Scottish Executive (through Transport Scotland) and Network Rail.

First ScotRail

- 7.179 tie secured agreement with First ScotRail not to object to the Bills in exchange for agreed protection of its interests at the Haymarket Depot (primarily access during, and reinstatement after tram construction works). A procedure is also required in relation to the physical reconfiguration necessary at Haymarket Station to accommodate the integration of the new tram stop. This involves not only ScotRail but other Train Operating Companies: GNER and Virgin and possibly Freight Operating Companies.

BAA

- 7.180 An agreement was reached with Edinburgh Airport Limited, BAA's operating subsidiary in September 2005. In terms of this agreement, BAA require to be consulted on various aspects of the project and have the right to approve some aspects, for example, method statements. This has already been undertaken in relation to the surveys, the MUDFA contract and the Infracore ITN. There are regular meetings with BAA which are attended by both tie and SDS to ensure that all of the issues which require their consent or in respect of which tie requires to consult are being dealt with.

Forth Ports

- 7.181 An agreement was reached with Forth Ports in June 2005. Forth Ports are entitled to be consulted on and agree on various matters including the construction programme, the site specific method statements and the finishes in the vicinity of Ocean Terminal. Again there is a good working relationship between the parties to ensure that all matters are dealt with timeously.

Building Fixing Agreements

- 7.182 As well as requiring prior approval from the planning authority, consent of the building owner, or in the case of a tenement building, the owners is also required before a building fixing can be affixed to a building. Under Section 16 of the Acts, if the owner does not respond within 28 days of notification, it is a deemed consent. Consent cannot be unreasonably withheld. If it is viewed that consent is being unreasonably withheld or issued subject to unreasonable conditions the method of determining the issue is by reference to the Sheriff Court.

Environmental Consents

- 7.183 Specialist ecological consents are being obtained through the auspices of the Environmental Management Plan and the Landscape and Habitat Management Plan. Licenses such as badger licenses will require to be in place prior to the works commencing and in some cases badger setts will require to be relocated at least six months in advance of the construction works. In addition, consents may be required from both SEPA and Scottish Water in order to control pollution and discharges.

Operation Consents

Her Majesty's Railway Inspectorate

- 7.184 SDS are responsible for preparing the Case for Safety and obtaining all the necessary consents from the HMRI. This will be an iterative process throughout the design process and will culminate with a certificate of compliance at the end of the detailed design work. There have already been various site visits with HMRI and ongoing meetings and workshops with representatives from HMRI.

Third Party Works

Side Agreements

- 7.185 Some the Side Agreements provide that certain ancillary works must be carried out, often in advance of the tram works authorised under the Acts. In some cases these works are in fact essential to allow the tram works to commence.
- 7.186 Work is currently ongoing to establish the scale of these works and their likely cost. The critical path is also being established so that the works can be programmed to ensure that they do not hold up the Infracore works. In some cases these works will require to be carried out in advance. However some will be able to be accommodated within the programme for the Infracore works. Where the works need to be carried out in advance, tie has already started to consider the best procurement strategy for each package of work.

Accommodation Works

- 7.187 As part of the process of compulsorily acquiring land, it may be that land owners require, by way of compensation, certain boundary treatment works. At this stage it is unknown what the extent of these works will be as the compulsory purchase process has not yet commenced. (See Land assembly below).

Land assembly

Powers under the Acts

- 7.188 The Acts confer rights on CEC, as the authorised undertaker, to compulsorily acquire land and rights in land, both temporarily and permanently, as required for the construction and operation of the tram. The powers under the Acts include the following:-
- The right to carry out road works both within and outwith the limits of deviation
 - The right to take temporary possession of land, as identified in the Acts, and subject to giving the necessary notification as prescribed in the Acts for both survey and construction works
 - The right to permanently acquire land within the limits of deviation or the limits of land to be acquired or used respectively for the authorised works or for the purposes specified in the Acts
 - The right to affix building fixings
 - The right to temporarily enter land to carry out maintenance works
- 7.189 Notwithstanding the powers conferred by the Acts, Side Agreements have been entered into with various parties which limit these powers either in respect of the extent of the limits of deviation or the timing of the exercise of these powers or which impose additional obligations on CEC particular in relation to temporary possession of land.
- 7.190 Although tie will project manage the land acquisition process, title in the land will be taken by CEC.

Key Activities and Assumptions

General

- 7.191 The Land Assembly team at tie has prepared a Land Assembly Management Plan (LAMP). It focuses on the procedures, processes and resources required for achieving requisite land ownership and rights (permanent and temporary). The LAMP is based on various assumptions and outlines key activities including the following:-
- As land assembly is a design led process, the extent of land and rights required for the construction and operation of the tram will be established through liaison between tie and SDS.

- A database has been developed based upon refreshed and updated books of reference for the whole of line 1 and 2.
- The value of land and rights to be acquired will be determined independently by the Valuation Office Agency of the Inland Revenue Service (known as the District Valuer or DV)
- There will be full cognisance of the terms of Side Agreements, Letters of Comfort, Letters of undertaking and position statements entered in to between CEC or tie and the affected landowners. Agreements have been reached with Network Rail, Edinburgh Airport Limited, Forth Ports, New Ingliston Limited and Waterfront Limited.
- The merits of advance purchase will be considered where appropriate in accordance with a set of specified criteria agreed with Transport Scotland.

7.192 The recommended method of securing title is for the CEC to use the General Vesting Declaration (GVD) Procedure and this has been agreed by both the Tram Project Board and the full Council. Upon commencement this process can be completed within a minimum period of 3 months.

7.193 It is assumed that the CEC will make the GVD at a meeting of the full Council and again this has been agreed by both the Tram Project Board and the full Council. The timing of the GVD will be linked to the approval of this DFBC. Accordingly it is assumed that the GVD will be made at the full council meeting on 1 February 2007 to coincide with the presentation of the DFBC to the full council.

7.194 The first set of GVD notices, which outline the intention to secure title under compulsory purchase powers, will be sent out by the end of November 2006. This does not oblige the CEC to purchase the land at that stage. That will only occur once the GVD is made by the full Council. Based on the assumptions above, all permanent land will be acquired by mid March.

MUDFA

7.195 It is assumed that all rights and wayleaves in relation to the diversion of utilities will be secured on a "just in time" basis. Where required, licence agreements will be agreed in advance and taken up in line with the requirements of the MUDFA programme. This will be undertaken by SDS. It is anticipated that given the powers under the Acts and also under the New Roads and Street Works Acts 1991, it is unlikely that any additional wayleaves will be required in relation to the on-street sections. In relation to the on street sections, the utilities designers are minimising the need for any wayleaves outwith the limits of deviation. If necessary wayleaves and servitudes can be acquired within the limits of deviation by virtue of Section 24 of the Acts.

Infraco

7.196 The primary assumption is that unencumbered title and other rights in relation to land and property as well as vacant possession will be obtained in advance of the award of the Infraco contract or any advance works contracts. This should mean that the Infraco bidders (or advance works contactors) do not factor in the risk of land availability into their pricing of the contract. In addition it should give the Infraco maximum flexibility when determining their construction programme as the land is available for all of the works.

7.197 Section 23 of the Acts provides the statutory basis for the exercise of compulsory purchase powers to acquire the land. Generally the GVD process will be used to acquire land. Any short term leases will be terminated using the Notice to Treat method which can be used along side the GVD process.

7.198 Notwithstanding the assumption that all land will be acquired using the GVD Process, due to the terms of the Side Agreements entered into with Edinburgh Airport Limited and Network Rail, any land to be acquired from these parties will be acquired by way of a long lease of 175 years rather than by compulsory purchase.

Building Fixings

- 7.199 Building fixings may be required at a number of locations along the tram route. Consent from property owners, which is required under the Acts (Section 16 of the Acts), and prior approval (and where relevant listed building consent) will be required for each fixing. SDS are responsible for obtaining all these consents.

Operator

- 7.200 A licence will be granted by CEC to the operator to allow the operator to carry out its obligations under the DPOFA.

Compensation

- 7.201 A robust estimate of the compensation payable for land, whether acquired permanently or only possessed temporarily, has been compiled. Valuations of each parcel of land have been conducted by the District Valuer. These valuations have been factored up to add in tie management costs and land owner legal costs. Finally all costs have been inflated to the appropriate time. Other aspects of compensation have been accommodated in the cost estimates.

Communications Strategy

- 7.202 The acquisition of rights and title to land, especially through the use of compulsory purchase powers, will be most effectively if all formal letters are preceded by a “plain English” letter giving details of the process. This has already been done in relation to the surveys where all notifications required under the Acts were preceded by an information letter or briefing note, explaining the nature and extent of the surveys, the methodology and the likely impacts. Similar “plain English” letters were also sent at the end of October to all parties who may be affected by the GVD process. In addition, a plain English Guide to Compulsory Purchase and Compensation has been produced and is available on the **tramtime** website.

Environmental management plan

Background

- 7.203 When the Edinburgh Tram (Line One) Bill and the Edinburgh Tram (Line Two) Bill (the Bills) were submitted to the Scottish Parliament, each of the Bills was accompanied by an Environmental Statement in accordance with the standing orders of the Scottish Parliament, which require that projects approved by private act of Parliament must be subject to an Environmental Impact Assessment (EIA). In addition, a supplementary Environmental Statement was submitted in June 2005 for each of the proposed route amendments to each Bill.
- 7.204 EIA in Scotland is governed by the Environmental Impact Assessment (Scotland) Regulations 1999. The EIA is a systematic process by which the environmental impacts of a proposed development, both during construction and operation, are assessed, reported in an Environmental Statement, made available for comment from statutory environmental authorities and the public, and taken into account in the decision making process. In addition, as part of the preliminary stage of the Private Bill process, the Environmental Statement and the supplementary Environmental Statement was subject to a peer review by Bond Pierce. In each case they were found to be adequate.
- 7.205 During Phase 2 of the Consideration Stage when amendments are made by the Committee, the Committee for each Bill amended the Bills to ensure that there was a statutory link between the Environmental Statement, the carrying out of the works authorised by the Acts and the likely residual impact of the works.

- 7.206 Accordingly Section 67 of the Acts provides that the authorised undertaker is to employ all reasonably practicable means to ensure that the environmental impacts of the works are no worse than the residual impacts identified in the Environmental Statement and the supplementary Environmental Statement and that either the additional environmental mitigation measures identified in undertakings given to objectors or to the Committee are carried out or that the environmental impacts of the construction or operation of the authorised works are no worse than they would have been had the mitigation identified in the undertakings been carried out.

Proposed Mitigation

General

- 7.207 Various documents have been developed in order to mitigate the likely impacts of both the construction and operation of the tram. These have either been subject to public consultation or tested and considered through the parliamentary process. Indeed some of the documents were amended as a result of the evidence given to the Parliamentary committees to address concerns of the objectors.

Tram Design Manual

- 7.208 Given that the tram runs through various sensitive environments including the World Heritage Site and conservation areas, the Tram Design Manual has been prepared by the planning authority. It was the subject of extensive public consultation and was subsequently approved by the planning authority in September 2005.
- 7.209 The Tram Design Manual is supplementary planning guidance which will be a material consideration in respect of each prior approval application. Both SDS and the Infraco are contractually required to comply with the terms of the Tram Design Manual.
- 7.208 In conjunction with the aims of the Tram Design Manual, the types of works which require prior approval was extended to give greater protection to the built heritage within the city centre and in particular within the World Heritage Site. For example poles and building fixings require prior approval given their potential impact on listed buildings.
- 7.210 In addition, the grounds for refusing a prior approval, which are derived from the Town and Country Planning (General Permitted Development) (Scotland) Order 1992, are strengthened within the Acts again to try to give additional protection to the built heritage within the city centre This recognises the sensitive nature of the World Heritage Site and the townscape of Edinburgh.

Code of Construction Practice

- 7.211 To minimise the likely adverse impacts of the construction, a Code of Construction Practice (CoCP) was developed and the Bills were amended to provide that the authorised undertaker must use all reasonable practicable means to ensure that the works are carried out in accordance with the CoCP. This obligation also includes any local construction practices which may be developed for particularly sensitive locations such as Murrayfield.
- 7.212 The CoCP governs many aspects of the construction including working hours, noise levels during construction, methods of minimising dust, vibration and other nuisance during the construction period, consultation requirements, how species and wildlife should be protected during the construction and traffic management.
- 7.213 Both the MUDFA contractor and the Infraco are contractually obliged to comply with the CoCP. In addition while the Acts allow the CoCP to be amended, any amendments cannot reduce the standards of mitigation and protection contained in the CoCP dated 6 March 2006.

Noise and Vibration Policy

- 7.214 Again this was developed during the parliamentary process and the Bills were amended to provide that the authorised undertaker must use all reasonably practicable means to ensure that the Noise and Vibration Policy (the Policy) is applied to the use and operation of the tram.
- 7.215 The philosophy behind the Policy is that, rather than relying on external mitigation like noise barriers, mitigation should be provided at source. The design of both the tram and the infrastructure should therefore incorporate suitable measures from the outset to mitigate against noise and vibration, for example the type of track slab, the wheel/rail interface all require to be carefully considered and designed. The design work is also being informed by noise and vibration surveys which are being carried out at sensitive areas.
- 7.216 SDS, Tramco and Infraco are all contractually obliged to comply with the Policy. Further, the Tram Maintainer, the Infraco Maintainer and the Operator will also be required to comply with the Policy.

Landscape and Habitat Management Plan

- 7.217 The Landscape and Habitat Management Plan (LHMP) was developed during the Parliamentary process and this will continue to evolve as the project progresses. This relates to the Roseburn Railway Corridor only and was developed in recognition of the likely significant environmental impacts on the Roseburn Corridor and the change in its character.
- 7.218 The LHMP will include the following:-
- Details of the trees to be removed and retained including any proposed pruning, lopping and topping of trees to be retained and the species, specification and location of any replacement trees;
 - Details of the proposed accesses and finishes to the accesses;
 - The locations of noise barriers, fences, lighting and other street furniture;
 - The location and species of existing planting to be retained;
 - Schedule and plans of proposed planting, including details of species, sizes, proposed numbers, planting density and location;
 - Proposals for maintaining the landscaping; and
 - A badger mitigation plan.
- 7.219 In addition the authorised undertaker is to employ all reasonably practicable means to ensure that not less than one tree is planted for each tree that is removed and that the track is constructed of a track form having a significant proportion of its surface finish in grass or similar.
- 7.220 The Act also prescribes who should be consulted during the evolution of the LHMP (see Section 68 of the Edinburgh Tram (Line One) Act 2006. These parties include local residents, emergency services and Scottish Natural Heritage.

Badger Mitigation Plan

- 7.221 As the LHMP only applies to the Roseburn Corridor, there will need to be a badger mitigation plan developed for the badgers at Gogar. These badgers are likely to need to be relocated and a new sett constructed. There is ongoing consultation with both Scottish Natural Heritage and Edinburgh and Lothian Badger Group to determine the necessary mitigation. Further survey work has also taken place to establish the location of the setts, the nature of the setts and the foraging areas of the badgers.

Site Specific Mitigation

- 7.222 There are various locations around the route which will require specific mitigation. The authorised undertaker is to consult with the residents at Baird Drive and is to try to ensure that the proposed landscaping and screening is as effective as practicably possible from day one.
- 7.223 At the depot, any landscaping has to comply with the guidance issued by the Civil Aviation Authority on planting in the vicinity of airports so as to avoid bird strike. This is due to the proximity of the depot to the airport and the flight envelope. The agreement with Edinburgh Airport Limited sets out what is required by way of compliance.

Employer's Requirements in the Infraco Contract

- 7.224 The Employer's Requirements, which have been developed for the Infraco Contract, include a section on the environmental requirements which are applicable to the construction and operation of the tram. Primarily, these requirements ensure that the Infraco complies with the documents mentioned above.
- 7.225 In addition, the Infraco must prepare the Ecological Design which builds on the ecological mitigation proposals set out in the Environmental Statements. It will include information on construction, aftercare maintenance and monitoring. In preparing this document, the Infraco will be required to update all of the ecological surveys prior to commencing the works in that area and the findings of these surveys will be incorporated in to the LHMP and the Environmental Management Plan.
- 7.226 The Infraco is also to prepare a Construction Environmental Management Plan which will include method statements and will include information on drainage, working times, noise reduction and abatement, pollution control, protection of retained vegetation, waste disposal, topsoil handling and site compounds. This will build on the CoCP and will reflect the Infraco's construction methodologies.

8. OPERATIONAL PLAN

- 8.1 As an integral part of the preparation of this Draft Final Business Case, Transport Edinburgh Limited (TEL) have prepared a Strategic Business Plan which details the Company's objectives, its modus operandi, its relationship with CEC and with tie and analyses the opportunities and threats TEL will face in operating an integrated tram and bus business.
- 8.2 At the core of the TEL Business Plan is an assessment of how TEL will integrate the tram into its operations and a detailed assessment of TEL's prospective revenues and profitability operating with Phase 1 of the tram in place. This analysis is firmly grounded in TEL's involvement in the development of prospective integrated service patterns for tram and bus for the Joint Revenue Committee (JRC) models and validation of the patronage and revenue projections which have flowed from the modelling process. What follows is a summary of the TEL Business Plan included at Appendix 1.

Rationale for TEL

- 8.3 Experience gained from a wide range of tram schemes has shown that integration with other modes of public transport, particularly bus, will greatly contribute to the success of trams as part of an integrated transport network. The principal bus operator in Edinburgh is Lothian Buses (LB), which is wholly owned by the public sector and 91% owned by CEC. LB's operations are currently very successful, holding a share of approx. 85% of Edinburgh bus patronage and having experienced patronage growth of more than 25% since 1998.
- 8.4 CEC has charged TEL with the delivery and management of an integrated bus/tram network that optimises service provision while maximising operational synergies. With the establishment of TEL, CEC are implementing their commitment to continuing to provide first class public transport in Edinburgh
- 8.5 The approach to integration of the key local public transport modes, bus and tram, sets Edinburgh apart from other UK tram schemes. The integration of high quality bus and tram services will improve the attractiveness of the combined network to something greater than the sum of its constituent parts. The levels of demand projected by the JRC transport model (an increase of 61% (1.8% p.a.) between 2005 and 2031) indicate a significant profit potential for TEL operating with Phase 1 of the tram. This places TEL in a unique position of strength to capture and provide for the predicted overall growth in the travel market.

Financial forecast highlights

- 8.6 Table 8.1 below provides a summary of the financial highlights from the forecast of TEL's profitability operating with bus and tram. This summary reflects the following:
- Figures for 2011 are presented on two bases; that Phase 1 of tram will be operating in its entirety in 2011 (the assumption reported on by JRC) and separately that Phase 1a of the tram will operate in 2011 with Phase 1b coming onto service in 2012.
 - The overall operational cash flow profile will be positive once the tram and bus patronage has stabilised after a "ramp-up" period. On this basis the requirement to demonstrate that, over time, the integrated service will not require subsidy has been fulfilled.
 - The financial forecast reflects the increase in pension contributions required to meet the recommendations contained in the 2006 actuarial valuation of the LB pension scheme. This has the effect of eliminating the £20m net deficit and predicted future service costs and is unrelated to the introduction of the tram.

- The financial forecast includes taxation on forecast profits calculated at the prevailing rate of corporation tax. However, TEL will continue to examine opportunities for tax efficient cash flow planning.

Table 8.1 - TEL profitability with Phase 1 of tram (All £ figures inflated)

Tram in service	Pre-tram		Ph1a Only	Phase 1a plus 1b				
	n/a	n/a		6/12	6/12	6/12	8/16	8/16
Tram service pattern	2006	2010	2011	2011	2012	2016	2021	2031
Patronage (Pax m)								
Bus	108	117	112	110	112	121	128	142
Tram	-	-	11	13	16	23	26	32
Total TEL Patronage	108	117	123	123	128	144	154	174
Bus Revenues (£m)								
Farebox	82	102	101	99	104	132	169	279
Other	6	7	7	7	7	9	10	13
Total Bus Revenues	88	109	108	106	111	141	179	292
Tram Revenues (£m)								
Farebox	-	-	10	12	16	26	36	63
Other	-	-	1	1	1	1	1	2
Total Tram Revenues	-	-	11	13	17	27	37	65
Total TEL Revenues	88	109	119	119	128	168	216	357
Operating Costs (£m)								
Bus			103	102	107	131	164	267
Tram			17	19	20	26	31	45
Total TEL operating costs			120	121	127	157	195	312
Pre-tax operating profit/(loss)			(1)	(2)	1	11	21	45
Tram lifecycle costs			-	-	-	1	2	2
Notional taxation			-	-	-	3	6	14
Dividend payment			-	-	-	3	3	5
Net TEL cash surplus/(deficit)			(1)	(2)	1	4	10	24

8.7 The table above reflects that following an initial period of tram patronage build up, the TEL business as a whole will be profitable after one year of tram operations and will thereafter experience significant growth in profits. The forecast has been developed using the patronage forecast for both tram and bus developed under the JRC contract. The key assumptions used to develop this forecast with respect to fares strategy and the development of cost estimates are detailed throughout this section.

8.8 The forecast of patronage and revenues presented above remains very sensitive to the quantum and timing of new development in North and West Edinburgh as detailed in section 4. The sensitivity of the forecast to this and other factors is considered at 8.99 below.

TEL's objectives

- 8.9 The public sector ownership of TEL presents opportunities and challenges which are different to most public transport organisations. Although achieving profitable operations and payment of dividends are key objectives, profit maximisation is not the primary objective. The majority shareholder, CEC, seeks a 'social dividend' in terms of fare and network / service strategies. CEC requires TEL to maintain lower fares and a more comprehensive level of service provision than would normally be the case for a transport operator seeking to maximise profit
- 8.10 CEC promotes alignment of TEL's corporate objective to return sufficient post-tax profits to meet its investment and dividend obligations, with CEC's planning objectives and the Government's five key objectives for transport as detailed in the STAG2 report at Appendix 2. These can be broadly summarised as:
- To support the local economy by improving accessibility;
 - To promote sustainability and reduce environmental damage caused by traffic;
 - To reduce traffic congestion and encourage mode shift;
 - To make the transport system safer and more secure; and
 - To promote social benefits.
- 8.11 The future challenge for TEL is to integrate the tram into its business in a manner which maintains long-term profitability, thereby allowing the economic, environmental, development and urban regeneration, social inclusion and transport objectives of the tram scheme to be achieved. 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.

Parameters under which TEL operates

- 8.12 The statutory parameters under which TEL will operate are prescribed by the Transport Act 1985. TEL will carefully monitor any developments in the regulatory and legislative environment between now and 2011 which could impact on LB's (and thus TEL's) market position. TEL, with its integrated bus/tram system and public ownership, may be in a unique position to mitigate the risks or maximise the opportunities arising from such regulation.
- 8.13 Fares and route planning are currently determined by LB with reference to its financial targets and the 'social dividend' objectives outlined above. TEL will continue this approach in the form of integrated ticketing for bus and tram under a common fare structure. With the introduction of the tram, TEL will carefully consider the varying requirements of its patronage base, bearing in mind the specific customer service responsibilities which flow from the high level of public transport demand experienced in Edinburgh to date and forecast for the future. The JRC modelling output predicts that 83% of year 1 tram passengers will have transferred from existing public transport, predominantly LB, with the remaining 17% being new to public transport, transferring predominantly from car. To meet this requirement, service integration plans have been developed and the structure created for bus and tram to operate within a single economic entity in which both modes play complementary roles.
- 8.14 Building on LB's current market position, the common control of LB and tram means TEL will hold a majority share of the public transport market in Edinburgh. This provides a solid basis for capturing significant portions of the projected demand increases. The JRC modelling suggests that in a non-regulated market the proposed bus/tram service integration plan limits opportunity for a commercially viable competitive challenge. LB services in the period prior to the introduction of tram and the envisaged TEL bus and tram services thereafter will be continuously reviewed and optimised to meet emerging demand and passenger requirements, especially in light of the significant growth projected to arise from West Edinburgh and the Airport and development areas in Leith Docks, Western Harbour and Granton Waterfront.

TEL governance structure and operational arrangements with CEC

- 8.15 Governance and operational arrangements for TEL have evolved since its inception in 2005. The process is driven by the desire to establish a strong leadership function for TEL and the need to clarify and codify the roles of the principal parties involved in the development of the tram project (CEC, Transport Scotland, TEL, tie and LB). Details of how governance will evolve during the phases of the project are detailed in section 6 of this Draft Final Business Case.
- 8.16 TEL has appointed a Board of Directors including two independent non-executives (including the Chairman). The Chief Executive of Lothian Buses has been appointed as Chief Executive of TEL. The governance structure of the Tram project has now been amended such that TEL has clear accountability for planning and implementing the integrated transport business with tie (advised by Transdev) charged with delivery of the tram project. The central forum of project governance is the Tram Project Board on which all TEL directors sit alongside representatives of CEC and Transport Scotland. This structure has been implemented such that clear and full accountability to the Council as Promoter of the tram project and majority owner of Lothian Buses is sustained and that the interests and influence of Transport Scotland as the principal provider of funding for the tram project are preserved.
- 8.17 The role of the TEL Board is focused on its statutory stewardship function and its overall responsibility to deliver an integrated public transport network for Edinburgh. In this role, the board has fiduciary duties to its shareholders and stakeholders with clearly defined responsibilities to fulfil these. They include matters relating to board membership, statutory reporting, internal controls, health & safety, and oversight and management of operational risks.
- 8.18 The operational relationship of TEL with CEC will in time be governed by an Operating Agreement between these two parties. The focus of this agreement will be the continued cooperation of CEC and TEL to further the integration of bus and tram services. It will emphasise the need for TEL to act commercially within the framework of its public ownership and sets out the parameters for CEC's support to TEL in terms of policy implementation.

Patronage targets

- 8.19 Public transport patronage is the key driver for TEL's revenue forecasts. The projected patronage is fundamentally dependent on growth in the existing public transport market and the assumptions about future residential and commercial developments at key regeneration sites in Edinburgh. In addition, certain aspects of the service provision which affect the transport experience of the travelling public will also impact on the levels of patronage that can be achieved.
- 8.20 Significant residential and commercial development is planned at key sites in North and West Edinburgh. Assumptions about scale and rate of these developments, developed in consultation with CEC, underpin the JRC model, which allocates the resulting travel demand to the most appropriate mode of transport. Based on this allocation, forecasts for TEL patronage were estimated. Using the geographical analysis of where this forecast demand is likely to originate / terminate, TEL has developed a flexible service integration plan reflecting planned tram services and bus services beyond the introduction of the tram.
- 8.21 The patronage forecasts have been reviewed in light of known public transport patronage growth and an economic assessment of the uptake of planned developments. The starting position for the patronage projects have been validated against LB's recent experience which has been consistently above 2% growth per annum.
- 8.22 The JRC's forecasts for the period 2011 to 2021 reflect demand arising from planned developments as per the CEC Structure Plan. The assumptions for the phasing of this new development have been reviewed by independent commercial property advisors. The CEC

Structure Plan covers the period to 2021. The period from 2022 to 2031 is based on an assumed growth rate of 2% pa, which is in line with LB’s historical experience and with a reasonable expectation of future economic growth for the City as validated by Scottish Executive economists. Given the inherent uncertainty of growth in demand, especially with a relatively distant planning horizon, the TEL Business Plan assumes 1.5% per annum growth in patronage from 2031 to 2041.

8.23 Table 8.2 below summarises the projected TEL patronage levels for key years:

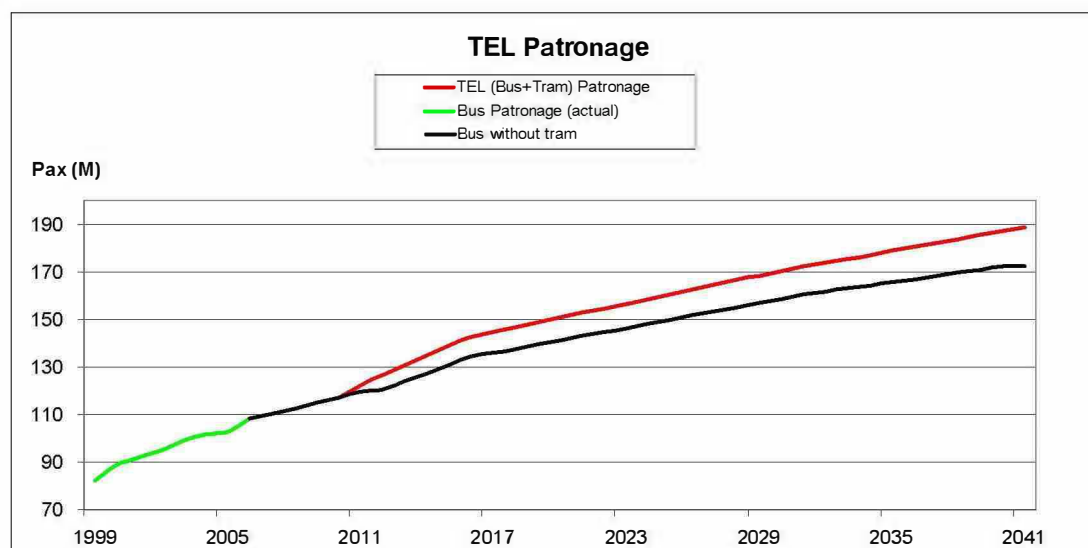
Table 8.2 TEL patronage projections with Phase 1 of tram

Tram in service	Pre-tram		Ph1a Only	Phase 1a plus 1b				
Tram service pattern	n/a	n/a	6/12	6/12	6/12	8/16	8/16	8/16
Year	2006	2010	2011	2011	2012	2016	2021	2031
Patronage (Pax m)								
Bus	108	117	112	110	112	121	128	142
Tram	-	-	11	13	16	23	26	32

8.24 A considerable proportion of the projected tram patronage projections is expected to come from those not currently using public transport. 17 % of total tram patronage in 2011 (rising to 20% in 2031) is anticipated to arise either through mode shift from car or from new trips generated as a result of the improved opportunity to travel. Experience with other UK tram schemes and more recently, Dublin, has shown that such a level of modal shift can reasonably be achieved, even within the context of Edinburgh’s already high public transport usage. Mode shift from car is directly linked to reducing congestion and associated environmental benefits, and is one significant benefit associated with the introduction of the tram. TEL’s tactical, operational and marketing strategies are all aligned to facilitate achieving the predicted targets for patronage and mode shift.

8.25 Ultimately, the introduction of the tram and its integration with LB’s bus services will result in greater numbers of passengers than either bus or tram could hope to achieve independently. Figure 8.1 shows the predicted levels of patronage in a “with” and “without” tram future.

Figure 8.1 - TEL patronage with and without Phase 1 of tram



Service patterns & interchange

8.26 A key element of the strategy to realise the above patronage forecasts is the implementation of optimised service patterns for both bus and tram and maximising the opportunities for effective interchange between bus and tram and between other modes of transport.

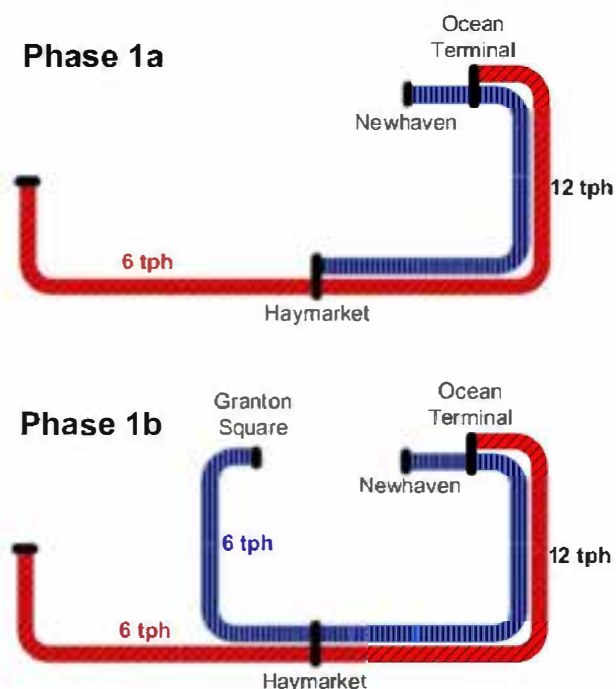
Tram service patterns

8.27 The tram network will serve major high-volume transport corridors in Edinburgh and thus build upon on existing high levels of public transport usage. Providing sufficient capacity to meet the demand is vital. Providing sufficient capacity is also vital to ensure overcrowding does not dissuade passengers from using public transport or lead to longer journey times and reduced reliability.

8.28 The planned service patterns for opening of Phase 1 of the tram are detailed in section 5. In summary these services, depicted in Figure 8.2 below, are as follows:

- **Phase 1 in its entirety** – From opening in 2011, 6 trams per hour in each direction between the Airport and Leith (a tram every 10 minutes) plus 6 trams per hour in each direction between Granton Square and Leith via Haymarket. This will provide 12 trams per hour in each direction between Haymarket and Leith (a tram every 5 minutes).
- **Phase 1a only** – From opening in 2011, 6 trams per hour in each direction between the Airport and Leith plus 6 trams per hour in each direction between Haymarket and Leith. Again This will provide 12 trams per hour in each direction between Haymarket and Leith.

Figure 8.2 – 2011 tram services for Phase1a only and for complete Phase 1



8.29 The forecast of demand indicates that after the initial five years of growth, tram services will require to be increased to provide sufficient capacity primarily to serve demand on the Leith to Haymarket section. Therefore the TEL Business Plan assumes that from 2016, the 6/12 trams per hour service patterns above will be increased to 8/16 trams per hour. A further

strengthening 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.

- 8.30 Phase 1b sees trams, which are planned to terminate at Haymarket under Phase 1a, extend to Granton Waterfront. It will provide an essential transport link for the planned developments at this important development site with other parts of the city. Regeneration of brownfield sites and protection of the greenbelt around the city boundaries form part of key planning strategies for Edinburgh. The likely success of the development in Granton and thus the CEC strategy will be strongly influenced by the provision of reliable, sustainable public transport network, of which tram plays an essential part.
- 8.31 Phase 1b does not run parallel to any bus routes and is designed to cater for demand from future developments at Granton; therefore, introducing tram here does not lead to reductions of current bus services or cost savings. During the parliamentary process a commitment was given to the effect that feeder buses would be provided linking Crewe Toll with the Western General Hospital and existing services to the area would be maintained. Implementation of Phase 1b at the same time as Phase 1a is dependent on capital funding availability and the assessment of the potential risks to patronage forecasts for this route due to the high degree of reliance on future developments being realised within the planned horizon.
- 8.32 Being able to identify the routes and frequencies of services necessary to cater for demand is fundamental for TEL's success. The JRC modelling work in conjunction with the service integration plan provides patronage forecasts for the tram network and for TEL in terms of geographical area and peak/off-peak requirements. This allows the tram and bus service plans to be validated and adjusted to ensure sufficient capacity is provided at an affordable level throughout the network.
- 8.33 The first and last tram services and initial frequencies for 6 & 12 trams per hour are based on the following assumptions and conditions;
- The provision of a total of 12 trams per hour in 2011 is required during the daytime to match demand on Leith Walk.
 - Short workings between Edinburgh Airport/Granton Square and St. Andrew Square are dependent on the ability to turn trams at St. Andrew Square. The precise location and feasibility of the turnback is currently under review.
 - Service proposals are based on the requirement of always having a tram present at the Airport.
 - Operating hours for the tram result in a maximum overnight servicing window of 3hrs 45min. Future demand on the early and late services will be reviewed to allow greater optimisation of this service window.

Bus service patterns

- 8.34 Full details of the planned bus service patterns operating in an integrated manner with Phase 1 of the tram are provided in the TEL Business Plan at Appendix 1 to this Draft Final Business Case. Where the tram runs parallel or close to an existing bus route, amendments are envisaged to bus services to prevent unnecessary overlap of services. Where the tram route follows a different alignment with no bus routes running parallel or in close proximity, no reductions are anticipated, the principle being that bus service reductions are only applied where the tram offers an acceptable alternative level of travel. This approach allows TEL to match the most effective mode of transport to levels of demand and avoid competition between bus and tram, while the travelling public continues to benefit from high quality public transport provision.

8.35 Key areas where bus services are planned to change are:

- Foot of Leith Walk – St Andrew Square: significant reduction planned, however services are retained to cater for those passengers for whom interchanging and the greater distance to the tram stop pose a deterrent to using public transport.
- St. Andrew Square – Haymarket: limited reductions as the tram route does not offer an alternative to most cross-city links provided by bus.
- Haymarket – Airport: significant reduction on Airlink although some service will be retained for the intermediate stops not served by tram.
- Broomhouse – Saughton Mains, including Fastlink service: some frequency reduction and curtailment while maintaining services where no tram in parallel or stop is too far to walk.

Interchange between bus and tram

8.36 In order to achieve TEL's objective of providing a truly integrated public transport system a small number of bus/tram interchanges are essential. It is TEL's aim to protect its patronage by offering as near seamless a journey through the network as possible. By minimising the requirement for interchange for the maximum number of passengers making short to medium length journeys, the inconvenience of interchanging, where necessary, will be eliminated. Further, the integration plan for bus and tram seeks to achieve optimal alignment of service frequencies at interchanges thus making interchanging as simple as possible. This will ensure that entry to and use of the TEL network is as easy and convenient as possible and the risk of loss of patronage is minimised.

8.37 The design of first class interchange facilities is critical to minimising any potential negative impact of interchange. The JRC has analysed the sensitivity of the patronage and revenue targets to the provision of effective bus /tram interchange (in 2005 prices), and has forecast that the impact of optimising the interchanges can improve revenue by approx. £0.5M pa in 2011, rising to £1.1m by 2031. The following locations have been identified as requiring first class interchange to allow TEL to meet these aims:

- Foot of Leith Walk: key to allow the curtailment of buses from Great Junction Street or Duke Street.
- St Andrew Square: required to accommodate buses reaching the city centre from points west and south of the West End.
- Crewe Toll: interchange necessary for Phase 1b to accommodate the provision of feeder buses linking the tram route to the Western General Hospital.

Interchange between air travel and TEL services

8.38 Edinburgh Airport provides the opportunity for interchange for passengers arriving and departing by air with local public transport. Tram, together with reduced frequency Airlink bus will provide air passengers with a first rate option for travelling to/from the city centre, thus promoting a favourable first impression of Edinburgh. Further, enhancing the option to use public transport to and from the airport reduces the reliance of air passengers on taxi and private car travel.

Interchange between heavy rail and TEL services

8.39 Facilitating easy interchanges between heavy rail with bus and tram supports national and local objectives of reducing the reliance on private car travel. Rail patronage has increased significantly over the last few years, which offers a great opportunity for TEL to increase revenues by providing onwards travel to rail passengers. Key opportunities for integration between heavy rail and bus/tram are:

- Haymarket
- Edinburgh Park

- Princes Street / Waverley
- Airport now + when EARL is constructed

Park and Ride

- 8.40 Interchanges between private car and bus / tram are vital to the patronage and revenue projections for TEL, especially in terms of modal shift. With the right facilities, Park and Ride can offer an attractive alternative to bringing cars into the city. Such facilities include information provision, public safety features and comfortable customer amenities, as well as frequent and reliable public transport services to and from the sites. All new Park and Ride sites in Edinburgh (existing or planned) will feature high quality facilities which support the current positive achievements and future success expectations.
- 8.41 Key Park and Ride sites for TEL services are located at Hermiston and Ingliston. These sites are ideally situated to cater for cars travelling to Edinburgh from West Lothian, where significant residential growth is predicted. There is also an interchange between private car, rail and bus at Newcraighall, managed and maintained by ScotRail and CEC. CEC are currently assessing the opportunities for additional potential Park and Ride sites, particularly at Hermiston Gait Retail Park and Saughton House. Further potential sites are under investigation.

Information provision

- 8.42 Integrated transport needs integrated information; the right information, provided at the right time, by the most appropriate means, puts the needs of the user first. TEL will ensure that the information it makes available to the public results in reliable and straightforward travelling experiences. Well presented information is of essential value to transport users – it helps them to complete their journey efficiently and in greater comfort. Well informed customers will ultimately lead to increased patronage and revenues.
- 8.43 Multi-operator information is provided by telephone and internet through Traveline, the national travel information system. TEL will also maintain its own in-house telephone and web-based information services. LB's existing travel shops will provide information not only on TEL products and services but on One-ticket and services provided by other public transport providers. Further opportunities for combination of road-side information in the form of real time information, Passenger Information Displays and other information at stops are regularly reviewed at the quarterly integration meetings with public transport providers in Edinburgh, ensuring that any future benefits that may arise from a more integrated approach are captured.

Integrated ticketing with other operators

- 8.44 TEL is committed to promote wider use of public transport within Edinburgh, a key to which is integration with other operators. Aside from TEL's fare & ticketing strategy for 'red buses' and 'red trams', a number of product offerings exists to facilitate integration of public transport throughout Edinburgh, and indeed, across Scotland. Key ticket products offering an element of integration are:
- One-ticket: South-East Scotland region wide ticket offering travel on FirstBus, TEL, Stagecoach and some smaller operators plus rail service in East Lothian and Edinburgh
 - Plus Bus & Tram: Rail+Bus ticket currently available from any UK rail station, combining special rail tickets to / from Edinburgh with unlimited travel on TEL services on day of validity.

3rd party responses

8.45 Good relations between TEL and 3rd party operators are considered essential. Integration with 3rd party operators may offer potential opportunities for TEL if the combined network is perceived by the public as part of a wider public transport provision within Scotland

Revenue targets

8.46 TEL's target revenue levels are directly correlated to the outputs from the JRC model in terms of patronage on TEL services. JRC have prepared revenue forecasts based on the current yield per passenger being achieved by LB, discounted to take account of an increased risk of fare evasion on trams compared to buses and inflated in accordance with the principles of TEL's fare and ticketing strategy as explained below. The fares underlying the yield calculation are based on a flat fare structure; the same fare applies regardless of the distance travelled. A pro-active management of the revenue yield per passenger will provide further opportunities for increased profitability for TEL in the future.

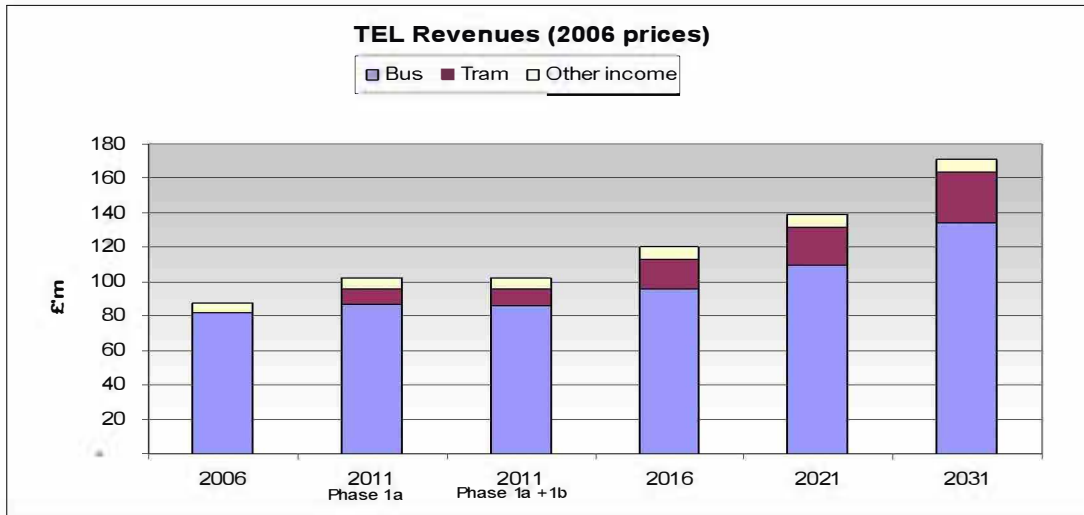
8.47 Table 8.3 below summarises projected TEL revenue levels for key years:

Table 8.3 TEL revenue projections with Phase 1 of tram (All figures inflated)

Tram in service	Pre-tram		Ph1a Only	Phase 1a plus 1b				
	n/a	n/a	6/12	6/12	6/12	8/16	8/16	8/16
Year	2006	2010	2011	2011	2012	2016	2021	2031
Bus Revenues (£m)								
Farebox	82	102	101	99	104	132	169	279
Other	6	7	7	7	7	9	10	13
Total Bus Revenues	88	109	108	106	111	141	179	292
Tram Revenues (£m)								
Farebox	-	-	10	12	16	26	36	63
Other	-	-	1	1	1	1	1	2
Total Tram Revenues	-	-	11	13	17	27	37	65
Total TEL Revenues	88	109	119	119	128	168	216	357

8.48 The forecasted patronage and revenues for 2011 to 2014 has been reduced to take account of a ramp-up period as it is common practice to assume that new services will take some time to be fully adopted by users. However, it may be expected that a significant proportion of the forecast patronage discounted in the ramp-up adjustment would otherwise travel by bus, therefore effect of ramp-up on tram revenues may be slightly understating the potential total TEL revenues during those years. Figure 8.3 below outlines how revenue contributions from tram increase in total over time as well as in percentage terms of the total TEL revenue.

Figure 8.3 - TEL revenues with Phase 1 of tram (2006 prices)



Fares and ticketing strategy

- 8.49 TEL's fare and ticketing strategy is driven by its objective to achieve a balance between the attractiveness of price, flexibility and simplicity of use. This planned degree of integration between tram and bus is rare in the UK outside London and the exceptional experience it offers will further enhance the public transport image in Edinburgh.
- 8.50 TEL will set fares at a level necessary to allow it to cover network operating and lifecycle costs and pay any required dividends to shareholders. The fare structure will be a single, fully integrated, flat fare regardless of the distance travelled (with the exception of journeys to and from the Airport and night services) and will be common to both bus and tram. The principles of the existing LB fares structure which will migrate to form the TEL combined network fare structure are:
- Child, adult and concessionary travel categories
 - Fares products paid for at time of travel, or Ridacards purchased in advance
 - Premium fares levied for journeys when the value of service provided is discernibly higher, or the cost of service provision is discernibly greater.
- 8.51 The yield per journey resulting from this fare structure forms the basis of the revenue projections for TEL. The yield will be managed by TEL to achieve revenue targets based on patronage projections and the current assumption is that the average yield for TEL will be increased at the rate of the Retail Price Index (RPI) +1% growth per annum, which translates into average annual fare increases of no more than RPI + 1%. 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. The impact on individual fares will vary year on year due to necessary considerations of public demand of specific tickets, practicality of applying specific fare increases, and the history of increases on a particular ticket product.
- 8.52 TEL's ticketing strategy is based on the principle of providing services through a single ticketing system, where all tickets are fully interoperable on TEL bus and tram. This means no additional costs of travel arise from any interchange between bus and tram or vice-versa and will enhance the perception of a fully integrated transport network. Tram tickets are to be purchased off-board and ticket machines will be provided at all trams 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 from ticket vending machines.

- 8.53 The ticket machines themselves will be based on a parking meter style, which are simple to use and have been shown to be very reliable and possess high resilience to vandalism. Reliable ticket machines are essential for TEL to promote customer confidence and to the principle of enforcing on-board premium fares. Administration of the ticketing system, including collection, counting and banking of the revenue is part of TEL's forecast overhead costs.
- 8.54 LB's current ticketing strategy encourages wide use of pre-paid and/or multi-journey types of tickets by offering discounts to the standard fare and TEL is committed to continue and further enhance this approach. Advance payment for ticketing products has benefits from a financial perspective (income is secured, risk of fare evasion / ticket fraud is reduced), whilst improving customer loyalty and delivering operational benefits such as reduced boarding times.
- 8.55 It is a fundamental assumption that TEL bus and tram will both participate in the national concessionary ticketing scheme. The relevant agreement has not yet been finalised although Transport Scotland have given support for this assumption in the preparation of the TEL Business Plan. 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 Lothian Buses patronage. This level of recompense is assumed to continue.
- 8.56 LB currently participates in multi-operator ticket offerings PlusBus and the One-Ticket. These products encourage greater use of public transport through ticket integration across a number of operators and modes (Bus & Rail). The TEL Business Plan assumes that both products will be expanded to include tram in due course and the current level of recompense received by LB will be receivable by TEL.

Revenue protection

- 8.57 In devising a revenue protection strategy, TEL aims to achieve a balance between attractiveness of price, flexibility and simplicity of use. Applying a strict and consistent fare enforcement policy will allow TEL to provide a safe, secure, positive and equitable travelling environment, thereby encouraging increased patronage through modal shift and minimising the revenue loss arising from fare evasion.
- 8.58 Fare evasion and fraud on the existing LB bus network has been limited following the decision to remove centre doors from buses, the introduction of smartcard period tickets, the simplification to a flat fare regardless of journey length and the elimination of cash handling by all but Airlink drivers and travel shops. 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.
- 8.59 The principal elements of the revenue protection regime which will be adopted by TEL for the 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. This provides the advantage of achieving a high level of ticket compliance supported by the necessary infrastructure for providing passengers with both the opportunity and financial incentive to pay before boarding the tram.
- 8.60 In addition to the quantified benefit associated with ticket inspection, the presence of a member of staff on board has been shown to promote a sense of security for passengers and be an effective deterrent to anti-social behaviour. The additional costs of providing inspectors on all trams is therefore off-set not just by increased revenues but also by reduced costs for graffiti / vandalism damage repairs and increased patronage due to a heightened sense of security in passengers. The revenues reflected in the TEL Business Plan have been adjusted to reflect an assumed 3% fare evasion rate.

Other income opportunities

- 8.61 The experience of LB and other UK transport operators, including existing UK tram schemes, is that attractive additional income may be derived from other activities in addition to patronage driven revenues. TEL with its combined bus / tram network offers attractive opportunities to generate additional revenues in the following categories:
- Advertising;
 - Small scale commercial development; and
 - Marketing and tourism driven revenues
- 8.62 A key target for the tram and TEL is to achieve modal shift away from cars through the provision of an efficient, affordable and high quality public transport system. A system which takes account of the demands of its users will stand a better chance of being successful. TEL will therefore assess any opportunities for other income source being mindful of the added customer service benefits they may provide. In pursuing these opportunities, it is recognised that TEL's first and foremost purpose is to provide public transport services, and as such TEL will only engage in activities which are complementary to its core-activities. Consequently operational requirements for all activities are limited and carry minimal operational risks.
- 8.63 The financial projections in the TEL Business Plan include a prudent assessment of the income which might be earned from these additional sources based primarily upon the existing experience of LB.

Benefits realisation plan

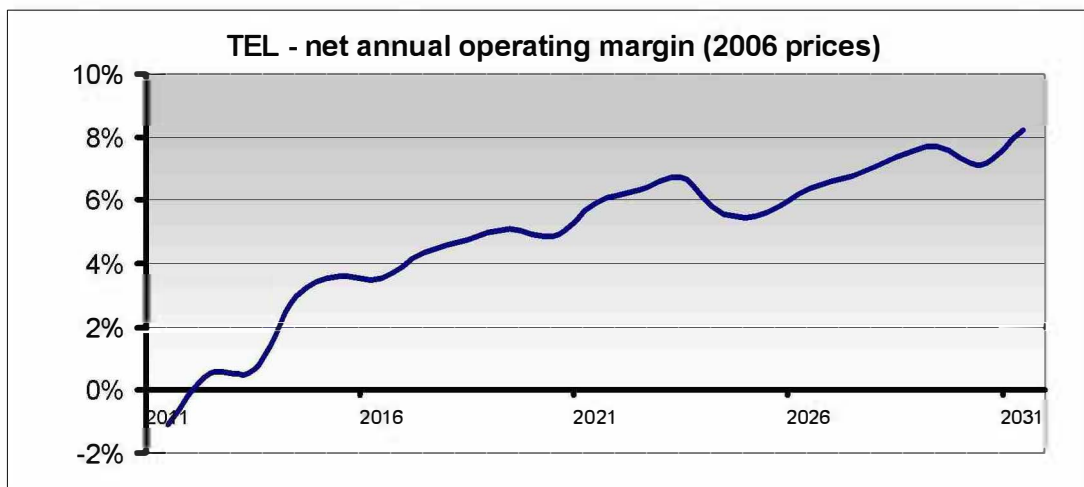
- 8.64 The benefits realisation plan is concerned with the way TEL will contribute towards realising both the financial and wider benefits associated with the introduction of tram where TEL is able to exert an influence. TEL's corporate focus is determined by its unique ownership structure as well as by the commercial environment in which it operates. Considering how these benefits can be realised at the planning stage is sound business practice as it promotes alignment of operational strategies with the goals of the business.
- 8.65 Many of the benefits associated with the introduction of tram and the establishment of TEL essentially depend on achieving the target patronage levels, particularly through mode shift from car and the generation of new journey opportunities. This is true of the financial and operational benefits as well as the wider benefits such as social inclusion, support to economic development and environmental benefits as outlined at 8.10 above.
- 8.66 Closely aligned to the provisions of the Operational Performance regime below, the benefits realisation plan outlines the strategies and practical measures which TEL will adopt in order to achieve the highest levels of patronage. Specifically, this relates to how TEL will ensure:
- The highest quality of transport offering in terms of frequency, affordability, reliability, cleanliness and comfort.
 - Comprehensive geographical accessibility
 - Optimal physical accessibility for all passengers
 - Maximum integration of modes, services, fares and tickets
 - Enhanced actual security of the TEL public transport network and passengers' perception thereof.
- 8.67 Key Performance Indicators (KPIs) will be adopted with which the success of TEL in realising these benefits can be measured. These KPIs will be incorporated into the relevant contracts and operating agreements with service providers to TEL, primarily with the operator of the trams (Transdev) and with the maintenance providers for the infrastructure and tram vehicles.

- 8.68 The benefits realisation plan is strongly supported by TEL’s strategic marketing, communications and stakeholder management strategies. Effective initiatives in these areas will foster dialogue and, most importantly, ensure that the integrated bus / tram services are understood by the travelling public. The strategic marketing approach will raise and cultivate awareness of the TEL network through advertising and promotional initiatives. These will be combined with targeted communications and stakeholder management activities which will pro-actively engage Edinburgh’s public, media and stakeholders at every opportunity. Effective communication will have significant influence over the public perception of the integrated services and therefore will be critical in creating a positive image to assist increasing patronage, particularly from those who are not currently users of public transport.
- 8.69 TEL will not be a brand visible to the general public. Instead, TEL will be the background legal entity, fulfilling its legal and statutory obligations as a public transport provider whilst all branding, marketing and communications activities will focus on “Trams for Edinburgh” and “Lothian Buses”.
- 8.70 The approach to strategic marketing and communications builds on the successes of the existing marketing function within LB and the comprehensive and consistent strategies developed by tie for media, stakeholder and community engagement. In period leading up to and post commencement of tram operations, TEL will provide integrated marketing and communications support for both tram and bus to ensure consistency of messages and to maximise synergies.

Operational targets and strategies

- 8.71 TEL’s operating cost projections are based on
- The current experience of LB for buses, scaled for the planned future level of bus services with Phase 1 of the tram and the number of bus vehicles that will require
 - A detailed assessment of tram operating costs based upon the planned service patterns and required number of tram vehicles, validated by Transdev and subjected to a thorough review and benchmarking process.
- 8.72 The forecast combined operating margin for TEL as shown in Figure 8.4 reflects the significant opportunity which TEL has to operate as a highly profitable business.

Figure 8.4 - TEL annual operating margin with Phase 1 of tram (2006 prices)



Operational performance regime

- 8.73 Transdev, the future operator of the tram under the Development Partnering and Operating Franchise Agreement (DPOFA), will operate the tram and ultimately will be in day to day control of the quality of service provided to the public. Similarly, the day to day management of LB will rest with its management team. However, certain elements, such as fare and ticketing strategies as well as strategic marketing will be retained by TEL as the overarching body.
- 8.74 To address performance issues for the tram, the DPOFA contract incorporates a payment mechanism which offers the operator an appropriate risk/reward balance. In summary, the operator will be incentivised under a regime based upon clearly defined and understood Key Performance Indicators set against the required service specification.
- 8.75 The reliability and availability of the tram fleet are crucial to provision of the high quality tram service required to encourage modal shift from private car to public transport. Maintenance of the tram vehicles is being procured under a Tram Maintenance Contract which covers vehicle maintenance services and vehicle spare parts. This contract provides that 30% of the annual maintenance services fee is a performance related payment based on a punctuality and availability monitoring regime.
- 8.76 An Infrastructure Maintenance Contract is currently being tendered which covers the infrastructure maintenance services including lifecycle maintenance. Similar to the Tram Maintenance Contract, it provides that 30% of the annual maintenance service fee is at risk based on performance in relation to punctuality and availability. To incentivise the service provider to maintain high presentational standards, an additional 7.5% of the annual maintenance fee is calculated based upon inspectors making qualitative assessments against established criteria, such as cleanliness, display presentation, CCTV functionality, public address and help points. A further 2.5% of the annual maintenance fee is dependent on fault correction times and performance reports being delivered in a timely manner
- 8.77 Detailed requirements of the operational performance regime are included in the relevant reference bids currently being tendered and are detailed in section 7 of this Draft Final Business Case.

Operating costs

- 8.78 Table 8.4 below summarises TEL's projected operating costs with Phase 1 of the tram in operation

Table 8.4 TEL operating cost projections with Phase 1 of tram (2006 prices)

		£'m (2006 prices)					
			Phase 1a	Phase 1a+1b			
		2006	2011	2011	2016	2021	2031
OPERATING COSTS							
	Bus	68.4	88.4	87.7	97.2	105.2	127.7
	Tram	0.0	14.8	16.5	20.0	20.0	21.5
	TEL total	68.4	103.2	104.3	117.2	125.3	149.1
	Bus costs / mile	2.76	3.76	3.72	4.12	4.29	4.94
	Tram costs (equal capacity) / mile	-	4.23	3.81	3.82	3.83	4.10
	Tram costs (absolute) / mile	-	11.00	9.91	9.92	9.95	10.67

- 8.79 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.

- 8.80 Operating cost projections have been developed for TEL's bus and tram operations based on current experience and benchmarked against other schemes. The primary driver for these estimates has been capacity required to meet demand based on the patronage growth projected by the JRC modelling. An iterative review process has allowed TEL to take an overarching view of the projections, avoiding cost duplications in the operational set-up and a number of opportunities for synergies have been identified. The resulting cost projections are a reflection of the integrated system which TEL will operate, and an attempt has been made to merge activities where possible. Areas where significant synergies may be further explored include administration, marketing, cash collection and security as well as other back office functions.
- 8.81 The majority of tram operating costs have been estimated by Transdev based on the cost model prepared for the DPOFA contract. Key operating costs outside the scope of that model which must be paid by TEL include electricity, Insurance and Marketing costs. All of the estimates have undergone an iterative process of evaluation, involving input from TEL and are benchmarked against other schemes to gain a high degree of confidence in their reasonableness. Tram operating costs include an element of regular, annual maintenance of the trams and the infrastructure. These estimates have been prepared by tie's professional advisors and the underlying assumptions have been supported by knowledge derived from benchmarking against other schemes already operational in the UK and Ireland as well as the previous experience of individuals within tie and its contractors and engineering judgement.
- 8.82 Bus operating costs projections are based on current LB experience and take into account the requirements of the service integration plan for the introduction of tram, from which reductions in bus services are assumed to flow. Bus patronage is a variable in the cost projections that will flex with the peak number of bus vehicles, operating hours and miles required to meet demand.
- 8.83 LB's management and administration costs are combined with TEL's overheads and reflect the assumption that most of TEL's corporate management activities will be performed by the current LB head office functions.

Human resources, industrial relations and succession planning

- 8.84 TEL has created an outline human resource strategy to maintain and develop the bus operating division, to meet the resource requirements of TEL itself and to develop the tram operating division in partnership with Transdev.
- 8.85 The recruitment plan and terms and conditions are one of the primary drivers of the labour cost contained within the individual tram and bus operating costs. Maintaining and developing good industrial relations is essential to ensure the ongoing success of the TEL business. The TEL Business Plan assumes that recruitment within the bus division can be readily scaled down prior to the introduction of the tram so that natural staff turn-over will result in appropriate staffing levels.
- 8.86 The human resources strategy has further identified a number of areas where inclusion in common training of tram staff with bus staff would be beneficial from an integration perspective as well as offering opportunities to secure cost savings.

Safety Management and Quality Assurance

- 8.87 TEL will implement a Safety Management System to assume its duties in relation to Health & Safety requirements as the majority owner of Lothian Buses, and to monitor the Health & Safety and Quality management of the tram operator, Transdev. TEL's responsibilities with respect to monitoring health and safety management the tram and infrastructure maintenance

providers will depend upon on the final contractual arrangements with those entities, but it is anticipated that the tramway operator will play a pivotal role in determining the safety of the tramway system at all times during the operational phase.

Risk and Insurance provision

- 8.88 Appropriate risk allocation is fundamental to achieving value for money for the tram system. As part of the risk management approach developed by **tie** during the design, construction and commissioning phases of the tram project, risks are being allocated to the parties best placed to manage and/or bear them and can be used as a basis to incentivise the private sector to help ensure that CEC's objectives for tram and TEL are met.
- 8.89 The risk analysis has considered the historical risks affecting light rail schemes as identified in industry best practice and government guidance. A comprehensive risk management strategy has been developed by **tie** which will be carried forward during the project phases and into commencement of operations of tram. The aim is to combine approaches to risk analysis and management for the tram and LB, thereby providing TEL with a sound foundation from which to assess and, where possible, mitigate risks to the business.

Capital assets and investment strategy

- 8.90 The proposed legal ownership structures for the tram assets are quite distinct from the operational use of these assets in the integrated system. Important drivers for the decision on the optimum ownership arrangements are direct and indirect tax implications during and post construction of tram for TEL, CEC and **tie**. These are balanced with the legal obligations arising from the creation of the tram assets and the subsequent operational implications. Investigations are currently underway to identify opportunities to minimise future tax burdens while maintaining operational flexibility. The financial projections in the TEL Business Plan assume that corporation tax will be payable at the prevailing rate on TEL's forecast operating surpluses.
- 8.91 It is intended that ownership of CEC's majority shareholding in LB will transfer to TEL prior to the commencement of tram operations. Upon the transfer of ownership of LB from CEC, TEL will acquire LB's assets which consist primarily of passenger vehicles and properties. All of these are fully utilised in the operations of LB's business and the day-to-day management of these assets will remain with LB's executive management team.
- 8.92 The assets created during the construction of the tram will not be legally owned by TEL but remain in the ownership of CEC. This includes all compensation paid in respect of land and properties acquired as well as the tram vehicles and infrastructure assets. In effect this means that CEC will hold the assets on their books and account for depreciation according to local authority rules, whereas TEL will account for maintenance expenditure as and when it is incurred as part of its ongoing business. Operational management of the assets will lie with TEL and its contractors.

Lifecycle costs and replacement costs

- 8.93 The capital investment and lifecycle costs provided for in the TEL Business Plan relate primarily to the purchase of new buses to renew and/or expand the existing bus fleet and to the heavy maintenance expenditure on the tram (infrastructure and vehicles) necessary to ensure the tram assets reach the end of their useful lives.
- 8.94 Based on LB's current experience, bus fleet renewals and additions range between £7m - £8m per annum (2006 prices) which represents approx. 10% of total bus costs in any given year. This cost reflects TEL's targets to maintain an average fleet age of 6 years.
- 8.95 The projected life of the elements of tram system will vary. Replacement of many of the major elements, including the tram vehicles will be required soon after it has been in operation for

30 years. The TEL Business Plan provides specifically for the expenditure required to achieve the life expectancy of the system over the first 30 years of operation and to ensure the system performs effectively throughout. During this period, regular heavy maintenance and renewals must be implemented and will take place at pre-determined time intervals dictated by the specified performance criteria for the individual elements of the system. These costs are significant and particularly the half-life refurbishment of tram vehicles after approximately 15 years will require careful planning to balance cash flow availability with servicing needs.

- 8.96 The TEL Business Plan does not specifically provide for the major replacement expenditure which will be required after 30 years, including replacement of the tram vehicles, and the options for funding this expenditure will need to be kept under review in light of the operating surpluses which TEL achieves and in consultation with CEC and Transport Scotland.

Distribution policy

- 8.97 CEC currently receives a dividend of c£2m per annum in respect of its 91% shareholding in LB. The TEL Business Plan adopts the payment of this level of dividend by TEL as a continuing requirement in the period beyond the commencement of tram operations when TEL will become the majority shareholder in LB.

- 8.98 The TEL Business Plan assumes this dividend policy 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.

Risks to patronage and revenues

- 8.99 In consultation with TEL, **tie** and other stakeholders, JRC has carried out a series of tests on the sensitivity of the forecast TEL patronage and revenues to changes in key assumptions. The results are detailed in the Revenue & Risk report at Appendix III and are summarised below.

Development and economic growth

- 8.100 Phase 1 of the tram is an investment to encourage and facilitate the new development planned in north and west Edinburgh and to stimulate economic growth in the City. However it is important to recognise that the forecast of future TEL patronage and revenues, both for bus and tram, is highly sensitive to the level and timing of new development and the underlying level of economic growth. Two tests have been carried out as follows:

- **Lower and delayed new development** – new development at Granton is 25% of that in the central case and in other areas, including Leith and Edinburgh Park, is delayed by 5 years.
- **Lower underlying economic growth** – long-term background patronage growth is 50% of that reflected in the central case.

- 8.101 The results are shown in Table 8.5 below:

Table 8.5
Sensitivity of TEL revenues to development and economic growth (2005 prices)

2005 Prices	2011 Shortfall		2031 Shortfall	
	£m	%	£m	%
Lower and delayed new development				
- Reduction in total TEL revenue	3.1	3%	20.7	13%
- Reduction in revenue uplift due to tram	0.4	16%	4.0	54%
Lower underlying economic growth				
- Reduction in total TEL revenue	7.2	8%	40.0	25%
- Reduction in revenue uplift due to tram	0.6	22%	4.6	61%

8.102 In the event of slower than expected development or a general economic downturn, TEL would plan and implement services to match the reduced demand.

8.103 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.

- Approximately 30% of forecast demand between Leith and Haymarket will be directly dependent on new development
- Approximately 50% of forecast demand between Haymarket and the Airport will be directly dependent on new development although there is potential to adjust bus and tram service provision to mitigate shortfalls in demand.

8.104 On Phase 1b the opportunities to mitigate the impact of lower demand are lower than on Phase 1a as a greater proportion of the patronage will be carried by the tram. Opportunities will however exist to reduce the planned level of tram services to mitigate the negative impact. Although patronage on Phase 1b amounts to c30% of total tram passengers, nearly 70% of that demand will be directly dependent on the new development at Granton waterfront. In context however this represents a relatively small proportion of TEL's total revenue.

Other risks and sensitivities

8.105 Other sensitivities tested included:

- **Attractiveness of tram to the public** - To realise the incremental revenue and wider economic benefits from the introduction of tram, TEL will strive to meet and exceed targets with regard to travel times and environment, comfort of seating, accessibility and reliability of the tram. These factors represent an opportunity as well as a risk and the analysis shows that tram revenues could be influenced by as much as +/- 10% by relative success or failure to achieve these targets.

Revenue yield – TEL will have the same opportunity as any other public transport operator to influence its revenues by managing its revenue yield per passenger in a relatively inelastic market. Increasing the target revenue yield per passenger by RPI + 1.5% each year (instead of RPI + 1% used as the base assumption in the revenue forecasts) results in an uplift of £4.3m (3.4%) of total TEL revenue forecast for 2012. However the TEL Business Plan reflects TEL adoption of the fares strategy at 8.51 above.

9. FINANCIAL ANALYSIS

Background

- 9.1 Section 3 of this Draft Final Business Case details the analysis which has been carried out to demonstrate that Phase 1 of the tram (and Phase 1a on it own) can deliver significant economic benefits in return for the proposed investment. Phase 1b will make a very positive contribution to the economic case. The analysis in Section 8 demonstrates that TEL can operate as a viable integrated bus and tram business with Phase 1 of the tram.
- 9.2 However it is still necessary to demonstrate the affordability of Phase 1 of the tram in the context of existing visible funding and the risks being borne by CEC and Transport Scotland as the principle funders. It is also sensible that decision making remains flexible and can consider prospective additional sources of funding and the likely evolution and firming up of capital cost estimates.
- 9.3 The tender processes for the Tramco and Infraco contracts have commenced and disclosure in this Draft Final Business Case must respect the commercial sensitivity of the tender processes. Reference to cost estimates is therefore restricted to totals only.

Cost estimates for Phase 1

Evolution of cost estimates for the project

- 9.4 The original estimates of capital costs for Line 1, Line 2 and for the full network of Lines 1 and 2 were prepared by tie's technical advisors in 2003 and formed the basis of the submissions to parliament in 2003. In common with the presentation of costs on other capital projects these cost estimates were base dated to a particular point in time (second quarter of 2003) and did not include inflation.
- 9.5 In 2005 the estimates were reassessed and found to be robust for the stage of development of the project. Extensive work was done to support the robustness of the underlying cost estimates which were predicated on the execution of the Procurement Strategy being followed by tie. At that time the costs were re-presented to include estimated inflation such that the total reflected the estimated cash which would be spent on the project. The inflated estimates as reported to the City of Edinburgh Council in January 2006 were:

Line 1 plus line 2	£715m
Leith to Airport plus Roseburn to Granton (Phase 1)	£570m
Leith to Airport (Phase 1a)	£484m

- 9.6 These estimates were presented concurrent with the adoption of Phase 1 as the first phase of construction of the tram as described in section 3 and included contingencies (allowances for risk) at 24% calculated in accordance with HM Treasury guidelines for consider the impact of 'Optimism Bias' on required funding. The requirement to address Optimism Bias has arisen from a historical trend of underestimating the cost of public works in the UK. CEC and the Scottish Executive (now operating through Transport Scotland) determined that there should be visible funding in respect of Optimism Bias when assessing the affordability of the Phase 1 of the project.

November 2006 cost estimate

- 9.7 In November 2006, tie and its advisors completed a further detailed review of the cost estimate for the project to reflect the agreed scope of Phase 1 as described in section 5 and to reflect a programme for delivery of Phase 1 into service by Mid 2011.

9.8 The 'updated estimate' for Phase 1 is:

Phase 1 in total	£592m
Phase 1a only	£500m
Phase 1b incremental cost	£92m

The estimated total inflated cost of Phase 1 has increased by approximately 4% compared to the estimates reported in January 2006, reflecting clarification with regard to scope, progress on design and an extension to the target opening date.

9.9 Based on the estimating methodology used, the level of certainty and confidence associated with the updated estimate is considered to be relatively high. Nearly 98% of the costs have been estimated based on rates and prices from firm bids received, known rates applied to quantities or based on market rates applied to quantities derived from Preliminary Design. The level of confidence is reinforced by the benchmarking exercises completed and the relatively high allowance for risk included in the estimate as explained below.

9.10 The updated estimates comprise base costs and an allowance for risk and uncertainty. As part of the project estimate update, the Project Risk Register was updated, with cost impacts and risks re-assessed. As explained in section 11, a rigorous Quantitative Risk Assessment was then applied to the risk and cost impacts to derive a risk allowance for 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).

9.11 The level of risk allowance so calculated and included in the updated estimate represents 12% of the underlying base cost estimates. This is considered to be a prudent allowance to allow for cost uncertainty at this stage of the project and reflects the evolution of design and the increasing level of certainty and confidence in the costs of Phase 1 as procurement has progressed through 2006.

9.12 tie has continued to comply with the HM Treasury recommendations for the estimation of potential Optimism Bias and has determined, in consultation with Transport Scotland, that no allowances for Optimism Bias are required in addition to the 12% risk allowance above. tie will continue to analyse, quantify and mitigate risks during the period through to final negotiation and award of the Tramco and Infraco contracts and during construction with the objective of reducing or eliminating the impact of quantified risks and thereby the element of the allowance for risk which crystallises into actual costs.

9.13 The base cost estimate comprises:

- External costs borne under contract with third party contractors and suppliers, the principle elements of which are utility diversions (mostly under MUDFA), the tram vehicles (Tramco), infrastructure works (Infraco) and compensation payments for land.
- Internal costs including management, supervision, design and legal costs, accommodation and support costs.

The base cost element of the updated estimate was derived using robust management and estimating tools to optimise the certainty of the estimate and to ensure that due allowance is made for all elements of the scope of Phase 1.

9.14 The MUDFA contract was awarded in October 2006. Tender pricing was based upon drawings from the Utility Companies and Preliminary Design drawings and specifications prepared by SDS. Design development of utility diversions is ongoing and is due for completion prior to commencement of physical utility diversion planned in early 2007. The MUDFA contract is based on remeasurement and the rates, prices and allowances in the contract have been used as the basis for the updated estimate.

- 9.15 Certain utilities works are outwith the scope of the MUDFA contract including high pressure gas, high voltage electricity and some aspects of telecoms. Price estimates have been obtained from the utilities and form the basis of the updated estimate.
- 9.16 Tenders were received for the tram vehicles (Tramco) in October 2006 and the updated estimate reflects an appraisal of the prices received.
- 9.17 The system designer (the SDS contractor Parsons Brinckerhoff) has prepared quantified estimates for the Infrastructure works (the Infraco contract) and the utilities works based upon their Preliminary Design submission which formed the basis of the Tramco and Infraco ITN's. Cyril Sweett have produced independent estimates for both the infrastructure and utilities works. Estimates from both parties have been reviewed and reconciled by the TSS consultant (Turner & Townsend).
- 9.18 Previous cost estimates for the Edinburgh tram were established on the basis of a "first principles" approach as well as benchmarking against other comparable tram schemes. This has enabled a greater degree of certainty and confidence to be obtained in respect of the infrastructure (Infraco) element of the updated estimate. The tender documents for the Infraco contract were issued in October 2006 and initial pricing information is due to be returned in January 2007.
- 9.19 Land compensation estimates have been provided by the District Valuer and it is intended to commit to certain of the acquisitions required for Phase 1a using a General Vesting Declaration procedure by March 2007.
- 9.20 Internal costs have been estimated on the following basis:
- **tie** project management - A Project Management team structure and Management Plan has been developed for the duration of project from which a resource schedule has been prepared. The cost allowed in the updated estimate has been built up by applying known resource rates to this resource schedule. These costs include those relating to the support of Transdev as part of the DPOFA contract.
 - Design costs - SDS design costs are included on the basis of the SDS contract sum adjusted for known changes.
 - Legal costs – Procurement costs are largely complete with the exception of those related to the negotiation phase of the Tramco, Infraco and maintenance contracts. Costs to support land acquisition and the TTRO and TRO consent processes have been assessed using resourcing plans and rates.
- 9.21 The Tramco contract cost and MUDFA contract rates are fixed price at outturn cost levels. The base estimate costs for remaining items were estimated at current (2nd Quarter 2006) price levels and have been inflated over the duration of the works at an annualised rate of 5% with a further 1% allowed for in the calculation of risk allowances given the uncertainty of forecasting future market price levels. This allowance is consistent with the forecasts assessed by the RICS Building Costs Information Services (BCIS) and indices prescribed by Transport Scotland.
- 9.22 Design will continue to be refined as part of the Detailed Design process. Risk mitigation is a priority and a number of value engineering opportunities are being examined.

Measuring affordability

Existing funding package

- 9.23 In January 2006, and in conjunction with the adoption of Phase 1 as the first phase of the project as detailed in section 3, CEC made an in-principle commitment to make a contribution of £45m towards the capital cost of Phase 1, to be structured in a manner which minimises financial risk.
- 9.24 In early February 2006, Scottish Ministers announced an increase, in line with indexation, of the grant of £375m originally offered in March 2003 up to £500m. Indexation is the step that has been taken with other transport capital projects. The final level of the grant will depend upon the actual level of cost inflation in the industry and the programme over which Phase 1 of the tram project is built.
- 9.25 The commitment by both parties was an in-principle commitment and subject to approval of this Draft Final Business Case, including a careful analysis of the benefits, costs and risks associated with the delivery of Phase 1, and the receipt and negotiation of tender prices for Tramco and Infraco.
- 9.26 Both Transport Scotland and CEC have stipulated that approval will not be given for the commencement of physical utility diversion until this Draft Final Business Case has been approved as providing sufficient comfort as to the robustness of the capital cost estimates (and therefore the affordability of the project) and confirmation of the economic and financial viability of Phase 1 of the project.
- 9.27 The benchmark total funding package is therefore £545m. The updated cost estimates above reflect that Phase 1a, at a cost of £500m, is affordable within this level of funding with 9% headroom over and above the 12% risk allowance provided for in the cost estimate. However a complete Phase 1, at a cost of £592m, is £47m or 9% in excess of the benchmark.
- 9.28 In considering the affordability equation, there are a number of variables which may change the final picture:
- The receipt and final negotiation of Infraco tender prices. Initial pricing information is due to be received in early 2007 but final prices will not be known until the contract has been negotiated in mid 2007. In the intervening period the progression of Detailed Design would serve to further mitigate the pricing of risks by Infraco bidders and to reflect further examination of value engineering opportunities.
 - The effectiveness of **tie** and others in mitigating the risks which have been quantified in the cost estimates at 12% of base costs. Effective risk mitigation is embodied, inter alia, in the process for obtaining planning consents and Traffic Regulation Orders.
 - The application of Transport Scotland's indexation proposals to the final contracted capital costs.
 - Examination and execution of opportunities to secure contributions from property developers over and above the levels of contribution which were assessed by CEC as necessary for the delivery of their existing £45m contribution.
 - Further consideration of financing options such as an element of tram vehicle leasing.
 - Examination of the cost savings which may be derived from truncating Phase 1a at Ocean Terminal rather than Newhaven, together with an appraisal of the loss of benefits and operational flexibility which would result from such a truncation.
 - Updated assessment of the pace and scope of development at the Granton Waterfront
 - Final determination by CEC and Transport Scotland of the level of funding which can be made available by each party for Phase 1 of the tram in the context of the economic and public transport benefits assessed in this Draft Final Business Case.
- 9.29 The MUDFA contract is already awarded and the procurement for Tramco and Infraco is underway. In order to maintain momentum on the project and to realise the benefits forecast

for the project, it is critical that construction commences as soon as possible in 2007 with early commitment to mobilisation of the contractor and to the procurement of long lead items. It is therefore appropriate to adopt an approach to construction commitment which manages overall affordability risk.

Phased 1a then 1b approach

9.30 As a response to the affordability constraints above, the programme at section 11 assumes that a phased approach is adopted such that construction of Phase 1a proceeds with a target opening date of end December 2010 and construction of Phase 1b, if approved, would commence in mid 2009 with a target opening date for Phase 1b for December 2011.

The principal advantages of adopting the phased approach would be:

- Phase 1 is maintained as the preferred first phase of the tram as supported by the tests of economic viability in section 4 and financial viability in section 8. The economic benefits to be derived from Phase 1 are diluted by the adoption of the phased approach but Phase 1a is economically viable in its own right and carries greater certainty of financial viability.
- If approved, elements of the construction of Phase 1a as the 'spine' of Phase 1 can commence immediately as it is currently comfortably within the affordability envelope, currently assumed to be £545m.
- Phase 1a could be delivered into operation earlier – potentially by the end of December 2010 – and with greater certainty
- Detailed design activities could in the short term be more focussed on the challenges of Phase 1a and thereby on the project risks associated with that section.
- It reflects a prudent, risk-controlled approach to managing the financial impact on TEL if the scale of development assumed for Granton in particular does not materialise in the timescales currently envisaged. In addition this approach would provide TEL with an increased focus on the integration of Phase 1a with the bus services in advance of integrating Phase 1b.
- Decisions regarding the timing of commitment to Phase 1b can be made with the benefit of greater clarity with respect to the variables which still exist as explained above. In addition, there would be significant construction progress on Phase 1a providing greater capital cost certainty for that phase and therefore the whole of Phase 1

9.31 A review of the updated cost estimates by tie indicates that, if contracts can be appropriately concluded, adopting the phased approach to implementing Phase 1a and then Phase 1b would not materially increase the overall cost estimate for Phase 1 compared to simultaneous construction, assuming that construction of Phase 1b does not commence significantly later than Mid 2009 as reflected in the programme. .

9.32 The Procurement Strategy being followed by tie has the flexibility to deal with a phased approach. The tender documents for the Tramco and Infraco contracts have been structured such that separate prices can be derived for the delivery of Phase 1a and Phase 1b subject to clarification and negotiation with the bidders of the commercial implications, if any, from the adoption of a phased approach and to provide CEC with contractually priced and committed options to proceed with Phase 1b if approval were given.

9.33 However, any decision to adopt a phased approach must be taken in light of the disadvantages such an approach might bring. The redevelopment at Granton which is facilitated by Phase 1b is very likely to be delayed as a result of a later introduction of the improved transport infrastructure which is required to encourage and serve the new development. The wider economic benefits which can be delivered by Phase 1b as detailed in section 4 would be realised later even if they not materially reduced in total.

9.34 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.

Application of available funding

Expenditure profiles

9.35 Payment for capital costs will be made by tie in accordance with principles of the contractual payment mechanisms for each contract as detailed in section 7. Table 9.1 below presents tie's current best estimate of the profile by which expenditure will be incurred based upon a phased approach to the implementation of Phase 1a (opening at the end of 2010) followed by Phase 1b (construction starting in 2009 and opening at the end of 2011). The programme is detailed at section 11.

Table 9.1 – Estimated capital expenditure profile (fully inflated)

Estimated capital expenditure	Phase 1
Cumulative expenditure to March 2007	£58m
April 2007 to end September 2007 - award of Tramco and Infraco	£61m
Cumulative up to award of Tramco and Infraco	£119m
October 2007 to March 2008	£47m
Year to March 2009	£204m
Year to March 2010	£154m
Year to March 2011	£65m
Year to March 2012	£3m
Total capital expenditure	£592m

9.36 The following should be noted with regard to the expenditure profile outlined above:

- It is prepared on the basis of the estimated value of work done during the period concerned and does not reflect the final negotiation of milestone schedules upon which payment to Tramco and Infraco will be based.
- It is stated inclusive of the 12% risk allowance included in the updated cost estimates and reflects an assessment of when that risk allowance would be expended, if it were required, with reference to the nature and incidence of the underlying quantified project risks.
- tie's contractors will require comfort as to the availability of funding (and therefore tie's ability meet its obligations as they fall due) for all committed work at the point of signing the contracts, most notable at the point utility diversions commence under MUDFA in April 2007 and at the point of signing the Infraco and Tramco contracts, currently planned for early October 2007.
- The cumulative expenditure at any point in time does not include the payments which would be required to extinguish outstanding contractual obligations in the unlikely event that the project was cancelled.

Funding agreement between CEC and Transport Scotland

- 9.37 As part of the process of developing this Draft Final Business Case, CEC and Transport Scotland have developed the principles of a funding agreement which governs the way in which the two parties will apply agreed funding to the project. The agreement deals with potential eventualities around the following:
- The value of contributions from Transport Scotland and CEC
 - The timing of contributions from Transport Scotland and CEC
 - Measures to prevent scope creep and cost overruns
 - Residual risk and how it is shared
 - Procedures to govern the event of project termination
 - Procedures in the event of failure of either party to meet periodic payments
- 9.38 Funding from Transport Scotland 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 all 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 to the private sector as part of the Procurement Strategy.
- 9.39 Transport Scotland and CEC will continue to review the 'headroom' between capital cost estimates for the project and the level of funding available to ensure the overall risk of costs exceeding funding available is understood by all parties and is minimised. This analysis will take account of the prudent level of contingency included within the updated cost estimates. The stage-gate points at which headroom will be reassessed will be:
- At the point this Draft Final Business Case is considered (December 2006)
 - Following evaluation of initial pricing information received for the Infraco contract and before commencement of utility diversions (March 2007)
 - Prior to award of the Tramco and Infraco contracts (Autumn 2007)
- 9.40 Each re-evaluation of headroom would necessarily include an examination of whether there are any additional future sources of funding including contributions from developers. CEC and Transport Scotland will keep Ministers and Elected Members informed of the residual risk of costs increasing above the affordability limit.
- 9.41 The timing of contributions will be linked to the expenditure profiles in Table 9.1 above as amended on an ongoing basis to reflect inter-alia, any decision to implement Phase 1a and Phase 1b in a phased manner and the negotiation of the contractual payment profiles for Tramco and Infraco. The overall agreed principle is that CEC and Transport Scotland will deliver the funding required proportional to their respective agreed contributions, at this stage up to £500m by Transport Scotland and £45m by CEC.
- 9.42 CEC must balance its desire to support the project with its fiduciary responsibility and limited resources. CEC's contribution, therefore, 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 in the vicinity of the tram
 - Section 75 planning agreements already negotiated and anticipated future agreements.
 - Third party developments around the tram route.
 - Anticipated capital receipts from tram related Council owned sites.
- 9.43 It is recognised that the sources of CEC funding may be received after key milestone payments are required, which could cause CEC to suffer cash flow difficulties and, in the

event any element of the contribution were borrowed, additional interest payments. In these circumstances, Transport Scotland will consider whether there is scope to relax the strict proportion in the early years, without reducing the binding commitment on CEC to make its overall agreed contribution. Transport Scotland and CEC agree to work together to regularly review and revise (as necessary) the contribution schedule, as required by the Grant process.

- 9.44 Certain other aspects of the funding structure remain to be agreed between CEC and SE in the period up to the award of the Tramco and Infraco contracts, most importantly the mechanism by which increases in capital costs would be managed, funded, or shared in the unlikely event that the forecast outturn costs for the project at any time exceeded the funding available.
- 9.45 TS and CEC have delegated the responsibility of managing Project Risks to the Tram Project Board (as set out in the Governance arrangements in section 6). These should be managed within contingencies included within the updated cost estimates produced by tie and its advisors.
- 9.46 A number of non-project risks have been identified and are reported in the Project Risk Register, most notably in relation to political processes and the 'approvability' of the project including the process of obtaining necessary Planning Consents and Traffic Regulation Orders. Where possible these risks have been assigned to CEC or Transport Scotland who have each undertaken to manage the risks assigned to them in order to mitigate the possible impacts of cost overrun or delays or both.
- 9.47 CEC, as promoter, undertakes to deliver the scheme efficiently, avoiding scope creep by applying a robust approach to change control and specification.
- 9.48 In the unlikely event that either party withdraws from the scheme, that party will be liable for the total cost of cancellation. Cancellation costs would comprise:
- Compensation payments to Contractors
 - Costs of disposing of any land acquired
 - Redundancies at tie
 - Other associated costs of closing down the project
- 9.49 In the event of termination, there will be no clawback of costs incurred in good faith prior to the decision to terminate the project.

Lifecycle costs and funding of major renewals

- 9.50 As detailed in section 8, TEL (and therefore CEC) will assume responsibility for paying for the regular heavy maintenance and renewals in respect of the tram vehicles and infrastructure during the first 30 years of operation. These costs will be incurred at pre-determined time intervals dictated by the specified performance criteria for the individual elements of the system and will include the half-life refurbishment of tram vehicles after approximately 15 years. The nature of this expenditure is to protect the investment by Transport Scotland and CEC by ensuring the tram assets reach the end of their useful lives and that the tram system will operate effectively throughout.
- 9.51 This means that TEL (and CEC) will be assuming the risks in relation to this expenditure insofar as it is not passed to the private sector through the provisions of the Tramco, Infraco and maintenance contracts.
- 9.52 The TEL Business Plan does not specifically provide for the major replacement expenditure which will be required after 30 years, including replacement of the tram vehicles, and the options for funding this expenditure will need to be kept under review in light of the operating surpluses which TEL achieves and in consultation with CEC and Transport Scotland.

Immediate funding requirements

- 9.53 To date, Transport Scotland and CEC have approved sufficient Grants to meet forecast expenditure up to 31st March 2007. This includes funding of payment of compensation under a General Vesting Declaration process to secure land required for the construction of Phase 1a insofar as it is not already owned by CEC or contributed under section 75 agreements.
- 9.54 Upon approval of this Draft Final Business Case, tie will require approval of additional funding amounting to £61m for forecast expenditure in the period from April 2007 to the planned award of Infracore and Tramco in October 2007. This additional funding will provide c£30m for all scheduled utility diversion activities (including those under MUDFA) and certain other ancillary and advance works required to be undertaken prior to the commencement of Infrastructure works. The balance will be utilised for continuing design, project management and progression of approvals and consents.

10. RISK MANAGEMENT

Introduction and background

- 10.1 Appropriate risk allocation is fundamental to achieving value for money for the tram system. Risks are being allocated to the parties best placed to manage and/or bear them and can be used as the basis for an incentive to the private sector to help ensure that CEC's objectives for the project are met. The purpose of this section of the Draft Final Business Case (DFBC) is to address the following aspects of risk analysis:
- Types of risk that need to be considered from development to residual value for the tram system;
 - Extent of identification, analysis and management of risk undertaken;
 - Effect of **tie's** procurement strategy and intended risk allocation; and
 - Overall contingencies including Optimism Bias and their consideration in the cost estimates for Phase 1 of the project.
- 10.2 **tie's** approach to developing the tram has been heavily focused on the identification and management of risk. The methodology applied to the risk analysis is set out in more detail below. **tie** have maintained a full register of risks identified in respect of the project throughout its development.
- 10.3 **tie** has developed a sophisticated approach to risk management. Central to this has been the appointment of a Risk Manager, and the establishment of a comprehensive risk management process including both a highly detailed risk matrix for the overall project, and detailed risk matrices for individual contracts within the procurement strategy. These risk matrices have been used effectively to influence the development of the Procurement Strategy as detailed in section 7.
- 10.4 The background to risk analysis in terms of historical risks affecting light rail schemes has been identified in various industry reports. Risk analysis for the Edinburgh tram scheme can be traced to the original Feasibility Study published in July 2001 and continues on the project to date. Industry best practice and government guidance from HM Treasury, National Audit Office, Department for Transport, Audit Scotland and the Holyrood Inquiry have been considered by **tie** during the development, to ensure the application of risk management best practice.
- 10.5 This DFBC is being submitted prior to conclusion of the negotiation of the price sensitive aspects of the Infraco/Tramco contracts. We have received initial feedback from Infraco bidders and a 'mark-up' of the Tramco and Infraco contracts on the detailed risk transfer of our proposed contracts and this has been taken into account in our Procurement Strategy.
- 10.6 Risk allocation and the pricing thereof will be kept under review during negotiations to finalise the Infraco contract. The risks affecting the economic case have been examined and reported on within the updated STAG2 appraisal included at Appendix II.

Project Risks

- 10.7 The risks to the scheme have been allocated to the following four principal risk categories:
- **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 during and post-construction; and
- **Operation risk** : repair and replacement risks impacting the scheme during operation of the system (outwith DPOFA Operator risks).

10.8 **tie** has identified key project risk areas to the infrastructure components as detailed in Table 10.1 below.

Table 10.1 – Key risks relating to tram infrastructure

Development risk	Construction risk	Performance risk	Operation risk
Failure to acquire land Delays in obtaining Temporary Traffic Regulation Orders, Traffic Regulation Orders, Prior Approvals, etc Cost and delays due to utility diversions Poor contractual interface between infrastructure contractor, vehicle supplier and system integrator Incomplete definition of scope to implement the operational tram system Failure to design to brief Continuing design development Delays in advance works Changes in design required by the Operator Changes in design required by stakeholders Insufficient powers Low market appetite for procurement approach	Incorrect cost estimates Incorrect time estimates Unforeseen ground / site conditions Unforeseen ground / site conditions under existing buildings / structures Failure to build to design Delay in gaining access to the sites Responsibility for maintaining on-site security Responsibility for maintaining site safety Third party claims Compensation events Delay Force Majeure Termination Legislative / regulatory change Changes in taxation Changes in VAT Contractor default Poor project management Contractor / Sub-contractor industrial action Adverse weather Protestor action Changes in inflation during construction Incorrect time and cost for commissioning new tram	Competition Latent defects to infrastructure Performance of sub-contractors Default by sub-contractors Industrial action Failure of system integration Failure to meet performance standards Incorrect choice of tram vehicles Availability of tram infrastructure Relief events Force Majeure Termination Failure to upgrade to new technology resulting in obsolescence	Legislative / regulatory change Changes in taxation Changes in VAT Incorrect estimate of maintenance costs Incorrect estimate of lifecycle costs Residual value Service integration Wage inflation Quality of equipment Accidents Vandalism Terrorism

Impacts of Project Risks

10.9 **tie** maintain a project risk register to ensure ongoing management of risk. Table 10.2 below categorises the impact of the four principal risk areas identified above:

Table 10.2 – Categorised impact of project risks

	Capital costs	Operating costs	Revenue	Programme	Quality	Functionality	Approvability
Development Risk	✓	✓	✓	✓	✓	✓	✓
Construction Risk	✓			✓	✓		✓
Performance Risk	✓	✓	✓	✓	✓		
Operations Risk	✓	✓	✓	✓			✓

10.10 **tie** have assessed the multiple primary and secondary impacts of the identified project risk register entries. Although the impact of each risk is being assessed against these impact areas, it is considered that the primary potential impacts for consideration are in relation to capital expenditure, operating expenses and profit and achieving delivery programme. Each of the identified risks is allocated to the most appropriate Functional or Project Manager in the tram delivery team who have the responsibility for developing and implementing a risk mitigation strategy.

Overall Project Risks

10.11 **tie** have recognised a number of overall project risks that require to be considered. These include the project affordability, approvability and market appetite, any of which could lead to suspension, curtailment or significant delays being imposed. **tie** has mitigated these risks through development of robust cost estimates and adopting a plan to phase the introduction of the tram. Additionally, through application of the Procurement Strategy, the risk relating to market appetite has been mitigated. **tie** considers that the submission and subsequent approval of this Draft Final Business Case will significantly mitigate the 'development' risks.

10.12 **tie** have significantly mitigated risks affecting the quality of the scheme through regular consultation with the CEC as the Planning Authority. The potential of delay and cost increases due to planning requirements from scheme development have been managed during the Preliminary Design phase of the SDS contract and will continue to be managed through Detailed Design development. **tie** and CEC have further mitigated this risk through the development of a Tram Design Manual that identifies principles of the tram system design, provides supporting design guidance and states the design requirements for the main components of the tram vehicles and infrastructure. **tie** is additionally supported by the TSS contractor who is undertaking reviews on behalf of **tie** to ensure that SDS and the Infracore will comply with project specifications and performance requirements. In this respect TSS performs a significant risk mitigation role for **tie**.

10.13 Service integration risk is significantly mitigated by the delivery of a TEL Business Plan. TEL and **tie** will consider the influence of other transport initiatives. The following risks will be managed throughout the remainder of the development and construction period:

- Development of Edinburgh Airport Rail Link;
- Waverley and Haymarket Station developments;
- Inclusion of other transport schemes;

- Ticket integration; and
- Future phases and potential future expansion of the system.

10.14 A number of key areas with the potential to delay the project programme (with consequential cost impact) have been identified. These risks and the mitigating actions implemented or planned are as follows:

- Failing to reach agreement with Network Rail: has been managed through the appointment of a Project Manager to deal specifically with this interface. Network Rail possession requirements have been advanced as far as possible and an Asset Protection Agreement is reaching closure. Additionally, a design submission and approvals process has been established and is being managed and will ultimately lead to final approval of the design.
- Possible consequences of poor communications with Transport Scotland: have been mitigated through ongoing liaison by project staff at all levels with Transport Scotland and their representation on the Tram Project Board and its sub committees.
- Possibility of delays in funding availability or of an unexpected affordability concern: is being resolved through robust financial modelling and continuing communication with the funders, CEC and Transport Scotland. Additional mitigation has been applied by benchmarking the capital cost estimates for Phase 1 of the project against other tram schemes.
- Lack of market appetite for the scheme: is being mitigated through frequent consultation with the bidders for the Infraco contract and response to their concerns (the MUDFA utilities diversion contract has already been awarded and tenders for Tramco (vehicle supply and maintenance) have been returned and now being assessed).
- Archaeological finds: investigations are nearing completion with preliminary reports indicating that there is little affecting the project.
- Ineffective integrated service patterns for tram and bus: has been significantly mitigated by the testing of planned service patterns through the JRC modelling and by the preparation of the TEL business plan.
- Protracted bidder negotiation: is mitigated by building a significant in-house team of experienced personnel with the ongoing support of advisors. The practical skills necessary to negotiate effectively and avoid delays have been demonstrated through closure of MUDFA utility diversion contract, the negotiation of improvements to the Tramco tender process and continual enhancement of the Procurement Strategy.
- Land and property acquisitions and utility diversion (MUDFA) delays impacting the planned dates for commencement of Infraco activities: Land assembly is due to commence in earnest with issue of notices in November 2006 following agreement with CEC on protocols. MUDFA has been appointed and will liaise directly with SDS during PU diversion design providing early contractor involvement.
- Obtaining planning consents: the development of the Tram Design Manual and Construction Code of Practice in conjunction with CEC Planning has significantly mitigated this risk. The SDS contractor has completed Preliminary design and the Detailed Design necessary to achieve the key consents is progressing.
- Competing local and national projects for resources: The project team has been successfully resourced during the development phase. **tie** now has the support of a highly experienced Human Resources Director who is implementing a strategy to secure the necessary resources to manage construction. The resource deployment proposed by contractors is closely scrutinised during the tendering process and **tie** will continue to monitor the implications of market activity.
- Successful commissioning and obtaining a licence to operate the tram: **tie** will examine this risk through the evaluation of Infraco tender returns and ongoing assessment of programme. The Infraco payment mechanism will incentivise performance in this regard.
- Lack of political will to implement the scheme: is being mitigated through intensive communication of the benefits of the scheme to politicians and intensive Stakeholder engagement. In addition, a well managed publicity campaign under the slogan Trams for Edinburgh is ongoing to generate public anticipation for the scheme.

- Poor project Governance resulting in unclear decision making or poor planning of procurements and project controls leading to cost creep; This has been mitigated by forming a Tram Project Board with representation from principal stakeholders – CEC, Transport Scotland and TEL, together with the development and agreement of project Governance arrangements that includes the protocols for approving additional expenditure.
- Infraco tenders are unaffordable, bidders withdraw or bids are late requiring delays to the approval process: Affordability risks are being mitigated by developing and updating the estimate of capital costs for Phase 1 of the project with independent validation of the estimate by TSS and benchmarking of costs against those of other comparable tram systems.
- SDS deliverables are below the desired quality levels leading to delays to approval of Planning Consents and issue of design information to Infraco bidders: This is mitigated by applying effective project and contract management together with independent validation of designs information by TSS.
- Failure of **tie** to deliver required resource plan leads to missed project milestones: This has been mitigated by securing key resources with knowledge and experience of delivering similar projects.
- Uneconomic and/or unrealistic levels of risk transfer to the private sector. Bidders have been consulted in respect of the procurement approach and **tie** will consider the utility of risk premiums compared to the value of risk transfer during the tender evaluation and negotiation phase.

10.15 As the Development Phase of the project comes to an end and construction of the tram takes place over the next four years of the project, the majority of the above risks that are inherent in the development and construction process arise during the early stages of the Infraco contract and will have been resolved or become actual costs by end of commissioning.

Risk impacts - Capital costs

10.16 The most significant capital expenditure risks are in the areas listed below because the eventual cost is largely determined by third parties and may significantly impact the total outturn cost of the scheme. These risks have been significantly mitigated through the considerable amount of work undertaken to date by **tie**'s Project Team to generate a robust cost estimate including prudent contingencies. Further mitigation is proposed through the 'phased' construction methodology adopted to ensure deliverability of a feasible core network.

- Finance charge costs if insufficient public sector capital;
- Utility diversion costs;
- Land costs associated with acquisition, temporary disruption during construction and compensation;
- Network Rail costs for interchange design, 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;
- Poor interface and integration management of the scheme;
- Compliance with Planning Authority requirements;
- Poor project, interface and integration management;
- SDS and Infraco resource shortages resulting in increased premia for staff; and
- Stakeholder initiated changes to the scheme specification.

10.17 Risks have been identified in relation to the progress of Detailed Design and the progression of Traffic Regulation Orders (TRO) which could affect the overall programme. **tie** have mitigated these risks as follows:

- Progress of Detailed Design - through a staged release of design information to Infraco bidders, maintaining the flexibility for Infraco to take a greater role in design development and by applying effective project and contract management to the design process;

- Progression of TRO's – by consultation with CEC on detailed traffic modelling and close alignment of TRO programme with the construction programme.

10.18 The main risks that have been analysed relate to third parties. Of these the majority relate to Development and Construction risks. The majority of risks which are inherent in the development and construction process occur over the first four years of the project.

Risk impacts - Operating costs

10.19 The most significant operating expenditure risks which will require to be managed with the support of CEC are those set out below. It is noted that these have been significantly mitigated, through proceeding with early operator involvement and the leading role of TEL in service integration planning and the preparation of a robust and prudent TEL Business Plan.

- Inclusion of potentially loss making sections of route;
- Slower run-times than anticipated;
- Lack of priority to schemes in rail/road network with proposed transport developments;
- Robustness and detail of modelling along tram corridor;
- Specification issues including staffing levels;
- Variability of global market conditions impacting on insurance costs;
- Long term increases in operating costs e.g. energy, labour escalation & insurance;
- Maintenance and lifecycle replacement costs; and
- Stakeholder initiated changes to the scheme specification.

10.20 The Infraco and Tramco maintenance contracts are currently planned to be for 'hard' facility management services (e.g. heavy maintenance) only and the DPOFA operator contract covers all the operating risks relating to 'soft' facility management (e.g. cleaning of vehicles). **tie** consider that these risks will be appropriately transferred to or shared with the private sector.

10.21 Lifecycle maintenance and replacement costs have been estimated by **tie's** technical advisers. A major risk in this process is market pricing for the risks in maintaining the tram infrastructure e.g. depot buildings. Tramco maintenance costs are currently being assessed and are being sought from Infraco bidders to secure certainty of costs for 15 years initial years of operations with variants based on extent of scheme, tram frequencies and reduced period to 3 years. This operating risk is present through operations following the commissioning of a full or phased system.

Risk impacts - Revenue

10.22 A robust revenue analysis for Phase 1 of the tram has been conducted using the JRC modelling and in the context of an integrated service network with Lothian Buses and the planned phasing of the project. The Joint Revenue Committee (JRC) is responsible for supporting analysis of ticket integration and fare strategy for the purposes of the TEL Business Plan. Revenue yield has been shown to be both underestimated and overestimated in previous light rail schemes. Benchmarking of revenues has demonstrated the credibility of the estimates. The following key risks are being actively managed by TEL, **tie** and their advisers including the JRC whose report on revenue risks is included at Appendix III:

- Quality control and reliability of model development including interchange design;
- Slower run-times than anticipated making the system less attractive;
- Lower level of bus/tram integration than expected including different revenue apportionment;
- Customer attractiveness including fare strategy;
- Emerging competitive responses from bus operators;
- Interface with EARL as regards patronage and revenue;

- Public response during early years (i.e. slower than planned ramp up in demand);
- Failure of ticket machines or vehicle breakdowns; and
- Unplanned long-term demographic, lifestyle or land use changes.

10.23 **tie's** advisors have additionally taken account of the above risks which have previously resulted in an overestimation of tram revenues on some other light rail schemes. TEL have examined the balance and sensitivity of costs and revenues in the development of service integration plans in conjunction with JRC. The timing of the above risks is annual throughout the operational period of the project. There will be ongoing analysis to examine the reliability of forecasts and thereby refine service specifications and traffic management plans to further optimise the system.

10.24 Performance risk (i.e. the potential for deductions due to poor performance against a number of Key Performance Indicators) is passed to the provider and impacts monthly against payment of operating costs for system availability.

Procurement Strategy Risks

10.25 The Procurement Strategy has number of key objectives, including the following:

- To deliver a performing tram system for Edinburgh
- Meet Run-time and Capacity Performance Requirements;
- Achieve effective (economic) risk transfer to market within affordability;
- Minimise market risk pricing through de-risking including advance utility diversion , prioritised design to minimise design and performance risk uncertainty and to achieve key consents;
- Assemble a large D&B Contract responsible for system integration; and
- Set operation and maintenance criteria to incentivise system performance in the operating phase.

10.26 The objectives will be achieved through the assembly of contracts as summarised below:

- Procure SDS to develop Requirements Definition, Preliminary Design, Detailed Design, traffic modelling and deliver planning consents all of which contribute to achieving the specified project functional requirements (run time, capacity etc);
- Concurrent with design and modelling, procure Tramco and Infraco;
- Progressively pass design information to Infraco bidders through the tender and negotiation process to enable Infraco bidders to refine their pricing and thus minimise design and performance risk pricing through negotiation;
- Novate SDS and Tramco to Infraco at award to create a single design, construct and maintain contract;
- TSS validate that SDS design will deliver the tram system performance requirements (run time and capacity etc) to ensue discharge of SDS and tie duty of care to stakeholders; and
- Separately procure utilities diversion contracts (principally MUDFA) to enable **tie** to directly manage the utilities diversion risks and complete diversions in advance of Infraco works commencement thus avoiding the impact of diversions risks on Infraco delivery performance.

10.27 The Procurement Strategy has number of features which import risk and will require close management as further explained in section 7.

- Detailed programme to reach financial close;
- Novation of SDS and Vehicle contracts at Infraco award;
- Clarity of scheme definition for Phase 1;
- Default, expiry or early termination;
- Partial handovers and staged commissioning due to incremental construction;
- Calibration of payment mechanisms and potential retentions/compensations; and

- Change control.

Stakeholder risks

10.28 Management of the following stakeholder risks is recognised as critical to progression of the tram scheme. Risk Owners have been identified and monitoring of the mitigation progress on these matters is taking place at Tram Project Board level

- Political and stakeholder support for the scheme reduces due to other sector priority;
- FBC is not approved/accepted due to affordability or financial/economic viability;
- CEC/TS Funding Agreement (including bearer of any potential cost over-runs) is not delivered and/or funding package reduces in real terms;
- Negative PR results in reputational damage;
- Infraco programme and price is above current estimates;
- Challenge by unsuccessful Infraco/Tramco bidders to the procurement process; and
- Sections of the scheme implementation are delayed due to adverse TRO hearing.

Insurable risks

10.29 **tie** has developed a schedule of potentially required insurances for the main stages of the project lifecycle in conjunction with Heath Lambert Group, their insurance advisers, as shown in Table 10.3. The final decisions on the tram insurance portfolio including scope, cover and deductible will be subject to value for money, affordability and overall risk appetite of the parties concerned.

Table 10.3 – Insurable risks

Development	Construction	Operational
<ul style="list-style-type: none"> • Employer Liability • Head Office Insurances • Professional Indemnity for Design & Construction 	<ul style="list-style-type: none"> • Employer Liability • Head Office Insurances • Professional Indemnity for Design & Construct • 3rd Party Liability ** • Cargo inc Loading and Unloading ** • Construction All Risks ** • Contractor Plant & Equipment • Delay in Start-Up inc Suppliers Extension ** • Environmental Impairment Liability • Goods in Transit ** • Material Damage ** • Motor • Offsite Storage ** • Products Liability ** 	<ul style="list-style-type: none"> • Employer Liability • Head Office Insurances • 3rd Party Liability ** • Business Interruption (including Customer & Utility extensions) ** • Continuing PI until expiry • D&O • Defects Liability under CAR ** • Employee Benefits • Engineering • Fidelity Guarantee • Material Damage ** • Money in Transit • Motor RTA

*Insurances marked “***” will be bespoke project covers.*

10.30 The construction phase would include manufacture, supply, construction and testing. Traditionally, even on major construction projects, individual contractors have procured project insurance or the main contractor to insure on behalf of all. Such an arrangement would lead a multitude of different policies provided by the individual contractors expire on the contractual completion date of the each contract or annually renewable. This would leave **tie** with a complicated task of gradually insuring or being responsible for all handed over contracts until a permanent insurance programme could be put in place

10.31 It is now common practice that a project of this type is covered by a project-specific bespoke Policy Wording that would be negotiated between the broker and his client, in this case **tie**. The advantages to **tie** of procuring insurance directly for the whole project are that **tie** would

receive the best value for money afforded by scale and direct procurement, consistency of cover throughout the project period and would receive the benefit of an expiry date which coincides with the end of construction, testing and commissioning and with the start of tram operations.

- 10.32 **tie's** is adopting an Owner Controlled Insurance Programme (OCIP) and has reflected this provision in all key construction contract documents. The OCIP strategy has been successfully used on the majority of UK Light Rail Projects. Dockland Light Railway including all its extensions, Manchester, West Midland, Sheffield, Croydon, Nottingham and Dublin were all insured using the OCIP approach. Croydon also included the first two years of operational insurances within a five year project programme, as is being proposed by **tie**.
- 10.33 OCIP Insurance has also become the popular choice of many owners including BAA generally and specifically for Terminal 5, London Transport's Jubilee Line, London and Continental Railways for the Channel Tunnel Rail Link and Network Rail for the West Coast Main Line refurbishment. Evergreen 2 (Laing Rail), the first Design Build Finance and Transfer rail project, which is currently being constructed, is insured by an OCIP programme.
- 10.34 **tie** published an OJEU Notice for the commencement of the procurement of the OCIP programme on 27 October 2006 comprising Professional Indemnity, Construction All Risks, Advance Loss of Revenue, Construction 3rd Party Liability, All Risks Material Damage to cover Operational Risks, Business Interruption Insurance to cover Operational Risks and Operational 3rd Party Liability Insurances. The is to conclude the negotiation of the policy terms, cover, excess levels, limits, inclusions and exclusions in advance of the commencement of utility diversion works in Spring 2007.

Terrorism and security risks

- 10.35 **tie's** advisers have recommended that an investment in security systems is set aside as part of the overall approach to system security including CCTV coverage to evidential standards for all stop platforms, passenger emergency/help points linked to an Operations and Control Centre (OCC) together with public telephone facilities and appropriate levels of illumination via dedicated lighting. Estimated tram vehicle costs assume provision of CCTV coverage to evidential standards, passenger/driver communication facility and driver radio link to the OCC. Allowances are included within Signalling and Communication estimated costs for an automatic vehicle recognition system linked to the OCC.
- 10.36 **tie** recognise that the confidence in the security of the tram system will have a direct relationship to the overall quality of the system and therefore potential patronage. **tie** appreciates that the risk of terrorism exists both during construction and operation. However, it should be accepted that the tram could continue to operate, albeit in a reduced capacity, if part of the line or depot were damaged due to a terrorist event.
- 10.37 Under DPOFA, terrorism is treated as a Force Majeure event, however the operator is contractually responsible for the security of system operation including incident management and security management under plans which are presented to and agreed by **tie** prior to system commissioning. **tie** will define the extent of duties for the system including any requirements for anti-terrorism detection equipment or special terrorism risk reduction measures and build them in, if necessary, to the operating function.
- 10.38 Physical measures to protect the infrastructure, vehicles, interchanges and depot(s) will be a question of the supply requirements set by the output specification for the tram vehicle and infrastructure contracts, including, the responsibility of the infrastructure provider to carry out system surveillance.
- 10.39 **tie** are considering the merits of insuring key tram assets to provide Material Damage and Business Interruption coverage arising from the specific peril of Terrorism. However, it is

recognised that these covers have a large deductible and relatively low cover relative to the premium and may not be available to the sector at the time of placing.

Risk Contingencies

Specified contingencies

- 10.40 Cost estimates have been built up by the SDS contractor based upon their completed preliminary design information. These have been verified by cost consultant inputs from the TSS contractor, as well as confirmation through an independent review by Cyril Sweett. Estimates have been provided without contingency. Specified contingency has been calculated from standard industry techniques using **tie's** detailed Project Risk Register.
- 10.41 The Project Risk Register has been developed since the instigation of the project. Each item in the risk register contains a probability of occurrence and the range of minimum, most likely and maximum financial impacts, where appropriate. The financial impacts are over and above costs included in the base estimate. This has allowed a quantitative risk analysis (QRA), using Monte Carlo methodology, to be undertaken.
- 10.42 Analysis shows that a 'very high' confidence that the outturn of the project costs will be derived from the inclusion of risk contingencies as shown below. **tie** will extend this analysis in the period through to final negotiation and award of the Tramco and Infraco contracts and with inputs from the continuing design process and progress by the MUDFA contractor.

Table 10.4 – Risk allowances

Probability	Increase to Base Cost
Reasonable Confidence – P ₅₀	9%
Very High Confidence – P ₉₀	12%

Optimism Bias contingencies

- 10.43 **tie** has complied with the HM Treasury recommendations for the estimation of potential Optimism Bias in the production of capital cost estimates.
- 10.44 Optimism Bias has been shown in Mott MacDonald's Review of Large Public Procurement in the UK, to be eradicated by the current stage of FBC production, in view of greater scheme certainty and mitigation of contributing procurement, project specific, client specific, environmental and external influence risk areas.
- 10.45 There are no proposed increased allowances for Optimism Bias in addition to the above estimated risk allowances.

Risk Allocation

- 10.46 The development of the Procurement Strategy is one of the key elements of risk mitigation for the tram project. Risk has been quantified following a detailed assessment process performed by **tie** and the **tie's** advisers in accordance with industry best practice and **tie's**, and their advisers, experience.
- 10.47 There is no standard contract for use in tram schemes which embodies a settled approach to responsibility for risk and its financial implications. Bespoke forms of contract have been prepared to meet tram requirements and the proposed risk allocation and bring consistency to the legal framework on key terms e.g. dispute resolution. **tie** and their advisers are using experience from previous tram schemes and the proposed risk allocation as a basis for settling contractual provisions where appropriate.

10.48 In the development of the contracts, **tie** and their advisors have designed risk allocation matrices to reflect the allocation of risks to private sector, public sector and those that are effectively shared in order to construct contracts with clarity of those risks which the private sector will take (and allow within their bids) and those risks which the public sector will need to manage.

Allocation during the Development Period

10.49 Set out below are the key risks that **tie** will be responsible for managing during the remainder of this period (up to award of Infraco in late 2007).

- Model development, ticketing and fare strategy;
- Tram priority in highway;
- Land Acquisition and Compensation;
- Detailed Design development;
- Agreements with heavy rail parties;
- Public Utility diversions;
- Consents and approvals;
- Project Management; and
- Programme and Cost Management.

10.50 During this period, **tie** will actively manage these risks both directly and through a number of key contracts identified comprising TSS, SDS, JRC and MUDFA. In addition, **tie** has been and will be advised by the operator, Transdev and **tie**'s legal team (namely, Dundas & Wilson and DLA Piper), procurement specialists (Partnerships UK) and insurance and risk advisers (Heath Lambert Group) on issues affecting risk.

10.51 Table 10.5 below sets out the general allocation of risk during this period, and this is discussed further below. Where the table indicates risk allocated to the public sector, the risk is under the management of **tie**, but with consequences of risks being experienced by a number of participants.

Table 10.5 Development period risk allocation

Risk Allocation During the Development Period				
Risk	Public Sector	MUDFA Contractor	SDS Designer	Utilities
Land acquisition	✓			
Planning (Prior Approvals)	✓		✓	
Temporary and permanent Traffic Regulation Orders)	✓		✓	
Design Risks	✓		✓	
Major Utility diversion quantity	✓		✓	✓
Major Utility diversion cost	✓	✓		✓
Major Utility diversion delay	✓	✓		
Delays to Utilities Agreement	✓			✓
Network rail related delays	✓			
Required approvals from HMRI	✓		✓	
Incorrect cost estimate	✓			
Incorrect timetable assumptions	✓			

10.52 Of the above, land acquisition, cost estimates and timetable assumptions are clearly driven by **tie** and CEC. **tie** has and will continue to manage these risks through the experienced in-house team that it has assembled.

- 10.53 Ultimately, the SDS contractor is responsible for planning consents being appropriate for the scheme, and there are sanctions under the SDS Contract for poor performance. However, the fundamentals of the success of planning applications will be determined by **tie's** (and CEC's) preferences for the specification of the system, and therefore the risk of the success of the planning process must remain at least partially with the public sector, albeit with some of the financial risk of increased costs passed to SDS and ultimately to Infraco during the Implementation Phase.
- 10.54 Design risk covers risks of failures in the design affecting the ongoing scheme. During the development period this could manifest itself as a problem with a planning matter, a utility diversion design or the instructions to bidders for the Infraco contract. This risk is partially transferred to the SDS Contractor through their contract, although it is likely that some of the consequences of a significant problem with a design failure would be borne by the public sector. **tie** will manage and mitigate this directly with the help of TSS. Indeed, a primary function of TSS shall be to validate that the SDS design meets the system performance requirements.
- 10.55 Risk for the execution of utilities diversions will be transferred under MUDFA. The scope of work will be specified by the utilities and designed by SDS and the risk that these are significantly greater than anticipated will be covered by the public sector. **tie** have carried out and will undertake further detailed survey works under SDS to get a firmer view of the quantity of works to be required. This will provide the benefit of information to allow greater certainty to MUDFA.
- 10.56 Should MUDFA fail to complete in time to allow Infraco on to the site, then the public sector will be responsible for delay to Infraco works. **tie** will mitigate this risk by incentivisation of the MUDFA Contractor to complete on time. This risk will be minimised by (i) the early involvement of the MUDFA Contractor during design development with SDS; (ii) the early scheduling of utilities diversion works which are anticipated to be significantly advanced, by the time that the Infraco contract is signed; and (iii) release to Infraco as staged handovers of completed sections. Network Rail and HMRI will be consulted by the SDS contractor during this period.
- 10.57 Cost estimates and timetable estimates will be developed further by the Project supported by TSS and the SDS Contractor up to the date of signing the Infraco contract. The responsibility for the consequences of increases in cost and programme will be borne by the public sector. **tie** will use the TSS Contractor, the operator Transdev and its internal resource to challenge assumptions and potential cost creep throughout this process and validate scheme deliverability within affordability limits.
- 10.58 In summary, the public sector is exposed to significant but manageable risks during the remaining period of scheme development. The introduction of the SDS contractor and MUDFA contractor in the procurement strategy reduces risk to an extent, but, as in all projects of this type, the major responsibility for identifying and managing potential risks during this period will remain with the project team and their advisers. **tie** has assembled a team with significant experience in the tram industry and rail sector and, together with the TSS contractor, the operator, and its other advisers, believes that it has the necessary skills to manage risk during this period.

Allocation during the Construction Period

- 10.59 The financial risk that the Infraco contractor will be exposed to at any point in time is the amount of money that it has expended, less the amount it has been paid, along with any bonding and warranty requirements. The payment mechanism will be against fine grained milestones and subject to the achievement of those milestones there will not be a large exposure for the contractor based on the difference between income and expenditure on the contract. The specific proposals for the payment mechanism under the Infraco contract are given in section 7.

Table 10.6 Construction period risk allocation

Risk Allocation During the Construction Period				
Category	Risk	Public Sector	Infraco Contractor	MUDFA Contractor
Design	Changes in fundamental design and performance Requirements	✓		
	Changes in construction design and failure of design post award of Infraco		✓	
	Award of Prior Approval and Traffic Regulation Order consents	✓		
	Provision of adequate submissions necessary to obtain Prior Approval and Traffic Regulation Order consents		✓	
Utilities	Major Utility diversion quantity	✓		
	Major Utility diversion unit cost	✓		✓
	Major Utility diversion delay	✓		✓
	Minor Utility diversion quantity		✓	
	Minor Utility diversion cost		✓	
	Minor Utility diversion delay		✓	
Construction	Force Majeure	✓	✓	
	3rd party claims		✓	
	Ground condition		✓	
	Archaeology	✓	✓	
	Site safety		✓	
	Technology risk		✓	
	Compliance with street possessions		✓	
Commissioning	System integration failure		✓	
	Failure to meet standards		✓	
	Inappropriate vehicle		✓	
	Required approvals from HMRI		✓	
Contractual/ Financial	Weaknesses in contractual interfaces	✓		
	Incorrect cost estimate		✓	
	Incorrect timetable assumptions		✓	

10.60 **Design** – Changes in design which are required by the public sector after the signing of the Infraco contract will be at the risk of the public sector. The progress of early design including commencement of detailed design has mitigated this risk. However, a significant failure in the design would be more effectively transferred to the Infraco contractor following novation. Provision of consents for Prior Approvals and Temporary and Permanent Traffic Regulation Orders by the statutory authorities will be a public sector risk but provision of the necessary information in the required format and timescales will be at the risk of Infraco.

10.61 **Utilities Diversion** - As discussed above the risk associated with utilities diversion under the swept path of the tramway will remain with the public sector. The risk of the impact of any delays caused by incomplete utility diversions at the time of commencement of work on site by Infraco (but it is expected that they will be complete in key areas), will be carried by the public sector.

- 10.62 **Construction risks** – The strategy will transfer all of the typical risks transferred under a construction contract.
- 10.63 **Commissioning risks** – These risks represent the situation whereby once all of the assets have been delivered, they do not work properly together and need to be changed. Under the enhanced conventional approach these will be transferred to the private sector by the institution of a robust regime of acceptance tests aligned to the payment mechanisms described in section 7.
- 10.64 **Contractual risks** – It is imperative that **tie** ensures that the risk of problems arising at the interfaces between contracts is minimised. This risk has been significantly reduced by **tie**'s decision to novate the SDS and Vehicle contracts to the Infraco contractor.
- 10.65 **Financial risks** - If significant supply cost increases emerge these will generally be for the Infraco contractor to absorb, to the extent that they are not reflected in standard price escalation indices.

Allocation during the Operating Period

Under the Procurement Strategy, **tie** will seek to manage the infrastructure risks during the operating period based on contractual obligations as described in section 7.

Table 10.7 Operating period risk allocation

Risk Allocation During the Operating Period			
Risk	Public Sector	Infraco Contractor	Tram Operator
Revenue	✓		
Operating costs	✓		
Maintenance unit cost		✓	
Maintenance quantity		✓	
Latent defects		✓	
Failure of warranties on subcontracts		✓	
Supply chain failures		✓	
Operation resource provision			✓
Failure to meet standards		✓	✓
Operational safety		✓	✓
Inflation risk	✓		
Service running times	✓	✓	✓
Failure to provide promised tram priorities	✓		

- 10.66 Maintenance and latent defect risks are key risks which will be effectively transferred under the payment and incentive mechanisms as explained in section 7. Allied to these are risks associated with the supply chain and failures in warranty provisions (e.g. due to bankruptcy of original subcontractors). For a significant system maintenance period of up to 15 years from commencement of revenue service it is intended that the Infraco contractor will bear not only the costs of correcting defects but also to an element of loss of income during the period during which the system is unavailable.
- 10.67 A key driver for the eventual success of the system will be the delivery of the required service run-times. The risk of the tram system being capable of achieving the required service run times will be passed to the Infraco, subject to delivery of the planned junction priorities and provision of operating resources by DPOFA. However, all other risks associated with running times would be transferred to the Infraco contractor during the time it has a commitment to the project.

Risks Retained by Public Sector

- 10.68 The extent of public sector retained and shared risks has been assessed by **tie** and **tie's** procurement advisers. This has identified the risks that will be retained through the proposed contractual arrangements and will therefore require to be vigorously managed by the public sector. The principal retained risks are associated with the acquisition of land to allow construction to commence; the design development and advance utility diversion works; granting of Prior Approvals and Temporary and permanent Traffic Regulation Orders; the completion of all necessary advance works prior to commencement of main construction works; the procedures for processing and acceptability of potential stakeholder instructed changes during design development; care in the selection of tram vehicle supplier in achieving compatibility with infrastructure (albeit integration risk is to be taken by Infraco); and potential future VAT, tax and legislative changes that could influence the scheme.
- 10.69 In addition to the above 'development' and 'construction' related risks it is noted that the public sector will need to consider the loss of project momentum and additional costs that may be incurred through delays to the consideration and approval of the Business Case; the potential cost exposure if adviser costs are exceeded or revenues underestimated; management costs associated with the scheme; the financial governance arrangements to ensure timely and appropriate release of funds; and procurement delays.

Risk Management Strategy

- 10.70 The following section briefly summarises the risk management strategy in the 'short', 'medium' and 'long term' including planning engagement, co-ordination of risks, seeking market commitments for deliverable packages of work and reaching financial close to commence Infraco construction activities.

Key Milestones for Risk Management

- 10.71 The key material risk to **tie** post contract signing relates to requests for changes to the scheme that result in cost increases. However, **tie** has significantly mitigated the risk of operator requested change through the early involvement of Transdev through the DPOFA and through early design work by SDS. As discussed above, four potential risk areas remain with CEC relating to land, utilities diversions, highways work, planning and service integration.
- 10.72 **tie** is confident that the scheme development work undertaken to date on the tram and the procedures it intends to adopt on design sign-off will capture design innovation and cost reduction but will minimise the potential for any change which will exceed planned overall expenditure.
- 10.73 **tie** will continue to ensure that the appropriate governance controls are applied to the remaining stages of the development of the tram system. **tie** have identified the principles of and commercial implications of the Procurement Strategy for Phase 1 of the tram with details of the consequential elements of management, design, procurement and construction activities that will effectively de-risk the main infrastructure contract. The key project needs for risk management and the solutions proposed are summarised in Table 10.8 below.

Table 10.8 – Risk management solutions

Project Needs	Proposed Solutions
Continued Technical Support	TSS – technical reviewer, management and support to tie
Early System Design	SDS – infrastructure and system designer novated to Infraco
Refine Revenue Projections	JRC – assessor and estimator of revenue generation from the operating tram network

Project Needs	Proposed Solutions
Control of Infrastructure Cost Risk	SDS - Advance survey works and design development
Obtaining necessary consents	SDS - Advance design development and modelling and agreement of process protocols with CEC by the Project
Reach agreement with key 3 rd parties	Ongoing stakeholder management and Agreements e.g. Network Rail, BAA
De-risk the main infrastructure works	SDS/MUDFA Diversions - Advance design and utility single framework diversions
Select an appropriate Tram vehicle	Vehicle manufacture, design and maintenance contract(s) novated to Infraco after negotiations between preferred Tramco and Infraco bidders to resolve all issues prior to novation.
Ensure system integration	Infraco – implementation company, responsible for construction, integration and maintenance of the tram system

10.74 A number of other potential supporting contracts and agreements will be required including planning supervisor, property & land acquisition, roads Authority, Network Rail, power and policing. The risk profile of the project changes significantly when the commissioning of the system is complete and the operations commence. The Infraco contractor's role as integrator for the system means that significant elements of the project risk will transfer to it.

Deliverables to Support Risk Management

10.75 **tie** continue to hold risk management as a core value and have reflected this in the service provider contracts which include obligations to provide risk management deliverables including the following.

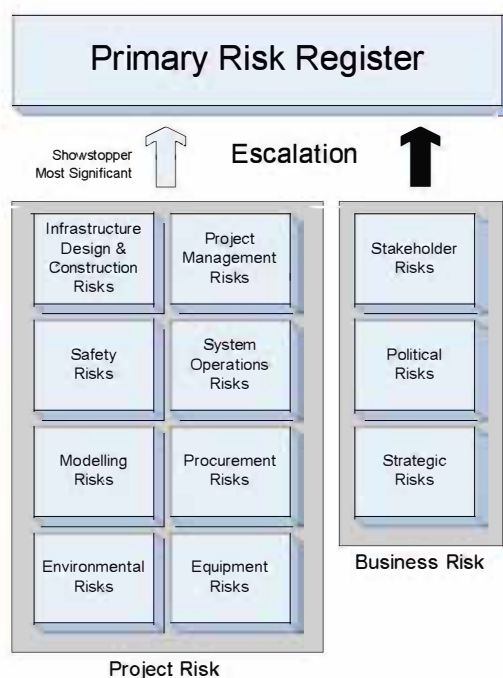
- **Project Risk Management Plan** to confirm the objectives, roles and responsibilities, definitions, risk management process and application throughout scheme development, procurement and construction phases;
- **Assumption Register** to record all capital, operating and lifecycle costs, revenue, programme, quality, functionality and approvability assumptions and consequent risks to the project throughout scheme development, procurement and construction phases;
- **Project Risk & Opportunity Register** to summarise all capital, operating and lifecycle costs, revenue, programme, quality, functionality and approvability risks to the Project and proposed mitigation;
- **Risk Progress Report** on status of risk management and mitigation indicating summary of new risks identified, new assumptions, key matters to be resolved and achievements; and
- **Project Estimate Reports** indicating the estimated capital cost and programme contingency allowances to be considered.

10.76 **tie** holds risk workshops and one-to-one meetings with those responsible for mitigating project risks. Regular risk management meetings and workshops are proposed during the remaining development and planned construction phases. The allowance for this in supporting the above deliverables has been included in all service provider remits.

10.77 **tie** reports the emerging Tram Primary Risks to the Tram Project Board comprising Stakeholder Risks based upon the severity of risk to project viability and immediacy to mitigate risks e.g. project affordability, availability of funding, approval of business case; and Project Risks based upon the magnitude of impact to cost and programme e.g. Network Rail interface costs, late submission of TRO information, unforeseen ground. Figure 10.1 below

summarises escalation drawn from the Project Risk Register. Further development will be undertaken to include System Operation and Safety related risks during the next quarter.

Figure 10.1 – Project risk register and escalation



Key Risk Mitigation Underway

- 10.78 **tie** will continue to apply significant efforts to identify, analyse, categorise and implement the planned mitigation for each identified and emerging risk including management of market commitment to clearly defined work packages. All of the risks identified have been discussed in detail between **tie** and their advisers, and are each subject to a risk mitigation strategy to minimise, where possible, their likelihood and severity of impact on project delivery and operation.
- 10.79 **tie** is seeking to substantially further mitigate risk through the ongoing involvement of Transdev (involvement commenced June 2004) and SDS through all the planned phases of project development. **tie** is mitigating the risks associated with the development of the Business Case to ensure funding issues do not delay scheme delivery; working to resolve issues raised by the objectors to the scheme; engaging with Network Rail and Public Utility providers; and development of integrated service strategy with TEL.
- 10.80 **tie's** has mitigated the risks associated with the potential market interest for the construction of the tram system by undertaking market sounding with potential Infraco consortia members; commencement of enhanced revenue model development; development of an integrated service plan with Lothian Buses; commencing early design of critical areas of the system to achieve greater price certainty; engagement with the Planning Department; procuring advance survey works under SDS; and early involvement of MUDFA Contractor.
- 10.81 **tie's** focus is now the management of Detailed Design; the MUDFA contract; procurement of the Tramco and Infraco contracts; and challenging the constructability of the scheme.

Risk Management Process Responsibilities

10.82 The project management responsibilities at Project Level are summarised in Table 10.9 below in a RACI chart.

Table 10.9 – Risk management responsibilities

Activity	Functional Roles							
	Finance Director	Commercial Director	Risk Manager	Risk Co-ordination Manager	Programme Manager	Estimating Manager	Procurement Manager	Project/Functional Managers
Development, Implementation & Maintenance of Project Risk Management Plan		A	R	C	C	C	C	C
Development of the risk management system including risk register and QRA		A	R	C				
Identification and Assessment of Risk to the Project	C	C	A	C	C	C	C	R
Development and Delivery of Risk Mitigation Plans	C	C	A	C	C	C	C	R
Update of the Project Risk Register		C	A	R	C	C	C	C
Quantitative Risk Analysis (QRA) on estimated cost impact	I	C	A	R	C	C	I	I
Programme Risk Analysis	I	C	A	C	R	C	I	C
Allocation of Risk and Allowances to Risk Owners	I	C	A	C	C	R	C	C
Update of Project Estimate for Updated QRA	I	C	A	C	C	R	C	C
Update of Project Programme for Updated QRA	I	C	A	C	R	C	C	C
Reporting on Management of Risk – workstream review	I	I	A	C	C	C	C	R
Reporting on Risk -Project Overview	I	A	R	C	C	C	C	C
Optimism Bias Estimate on Cost Estimates and Works Duration	I	C	A	R	C	C		C
Preparation and update of Contract Risk Allocation Matrices		A	C	C	C	C	R	C
Monitoring on Risk Management progress by Risk Owners	I	C	A	R	I	I	I	C
Quarterly/Milestone Risk Reviews -Risk Management Plan and Framework	I	A	R	C	C	C	C	C

RACI is an abbreviation for:

R = Responsible – owns the delivery of the Activity

A = to whom “R” is Accountable – must sign-off (approve) the output of the Activities

C = to be Consulted – has information or capability to contribute to the activity

I = to be Informed – must be notified of results

11. Programme summary

Programme development

- 11.1 The programme for the delivery of Phase 1 of the tram has been developed from a combination of SDS design and construction programmes which in turn have been based on past productivity and construction rates on other schemes in the UK, Europe and the US. To this **tie** have added and integrated activities which are driven by the Procurement Strategy and key procurement dates, other stakeholder and 3rd party influences and the time allocation for other elements of the project to provide an robust overall master programme.
- 11.2 This programme has been developed using standard Work Breakdown Structures which can be aligned to the Project Cost Breakdown Structure to facilitate good project control and management application. This programme is built on the Primavera P3e software which is generally regarded as the industry standard.
- 11.3 The programme is based on the assumption of 'right first time and on-time' delivery of activities with very little float within the programme. Many key criticalities and dependencies have been used to identify the critical path for the scheme. The criticality of much of the design activities mean the need for on-time delivery is particularly true for SDS design work and the project team are currently actively pursuing improved performance in this area and critically reviewing these elements of the programme.
- 11.4 Key risks are delivery of design for construction for the Utility Diversion works, traffic modelling and junction designs which form the basis of the Traffic Regulation Order process. Also essential is the timely delivery of Detailed Design for structures to ensure these key risk items in the Infraco contract can be de-risked and priced competitively. The full master schedule / programme is included at Appendix V to this Draft Final Business Case.
- 11.5 The programme is dependent on achievement of the programmed approval dates by the Tram Project Board, TEL and **tie** Boards, CEC and Transport Scotland and is built on the staged delivery of Phases 1a and 1b in line with the current affordability limits.
- 11.6 The programme identifies a number of key milestones as detailed below and assumes a staged delivery of Phase 1a from Edinburgh Airport through Haymarket, Princes St and Leith Walk to Newhaven and entering revenue service in December 2010, and Phase 1b from Haymarket to Granton Square via the Roseburn Corridor and Crewe Toll which will enter revenue service in December 2011.

Milestone summaries

- 11.7 The summaries of milestones and programme assumptions below are shown on a work package basis and are fully integrated in the master schedule. Below each set of work package milestones are some of the key assumptions used, and decisions required in order to successfully deliver this programme.

Business Case approval milestones	Date
Approval of Draft Final Business Case by CEC & TS	21.12.06
Confirmation of Infraco tender prices to CEC	01.02.07
Approval of Draft Final Business Case by Transport Minister	15.02.07
Approval of project (financial closure)	27.09.07

Assumptions

- Drafting of DFBC agreed by stakeholders for submission.

- DFBC is approved 21.12.06 as written.
- Stage 1 Infraco tender prices are within budgeted ranges when returned on 09.01.07
- All final contract negotiation on Tramco and Infraco are successfully concluded and are in their affordability range by 13.09.07.

Utilities milestones	Date
Completion of pre-construction period of MUDFA contract	02.04.07
Commencement of Utility Diversion Works (Phases 1a+1b)	Apr 2007
Completion of Utility Diversion Works (Phases 1a+1b)	Jun 2008

Assumptions

- Approval is given for 1a and 1b MUDFA works in line with DFBC.
- Approval of working site sequencing by stakeholders.
- Trial excavation scheduled for mid March 2007 at Crewe Toll Junction on Phase 1b.
- As a fallback, trial excavation will be in section adjacent Haymarket Yards.
- Major junctions e.g. Lothian Rd/Princes St, Picardy Place, Greenside etc can be managed over long-weekends/nightshift.
- Utility diversions at Leith Walk – approx. 200m north of London Rd roundabout to approx. 200m South of Foot of the Walk can be tackled early in the programme.
- Princes St. West to St. Andrews Square and St. Andrews Square itself are recognised as two separate workfronts that can be worked on concurrently.
- St. Andrews Square (South St. Andrews Street) can be closed-off for the duration of utility diversion works.
- Shandwick Place to Haymarket will be the last worksite under MUDFA and one tackled early under Infraco to enable Traffic Management procedures to remain in place.
- EARL scope will not impact MUDFA programme duration.

Tramco milestones	Date
Complete initial evaluation/negotiation (from 4 to 2 bidders)	19.03.07
Completion of Clarification and Refinement Process	09.04.07
Appointment of Preferred bidder	10.05.07
Facilitation of Tramco/Infraco novation negotiation complete	07.06.07
Final negotiation and appointment of Tramco	19.07.07
Award of Tramco contract following CEC/TS approval & cooling off period.	11.10.07
Delivery of Tram 1	Dec 2009
Delivery of all Trams – Phase 1a	Nov 2010
Delivery of all Trams – Phase 1b	Oct 2011

Assumptions

- Delivery of 1st Tram required 2-3 weeks prior to Depot Control Building Energisation.
- Five trams only required to complete driver training programme for combined Phase 1a and Phase 1b.
- Tram manufacture/delivery to be phased to suit overall project needs - to be firmed up by April 2007.
- Consideration being given to earlier delivery and storage of tram vehicles.

Infraco milestones	Date
Return of Stage 1 bid (Phases 1a + 1b core bid)	09.01.07

Completion of evaluation/negotiation of Stage 2 bid. (Phase 1a)	10.05.07
Appointment of Preferred Bidder.	10.05.07
Facilitation of Tramco/Infraco novation negotiation complete.	07.06.07
Final negotiation and appointment of Infraco	19.07.07
Commence depot works under pre-commencement agreement	06.08.07
Negotiation and finalisation Phase 1b complete	13.09.07
Award of Infraco contract following CEC/TS approval + cooling off period	11.10.07
Infraco mobilisation commences	12.10.07
Infraco mobilisation complete	06.12.07
Construction commences Phase 1a	07.12.07
Construction commences Phase 1b	29.06.09
Construction complete Phase 1a	08.07.10
Construction complete Phase 1b	11.07.11

Assumptions

- Construction completion includes commissioning.
- Working hours outside Code of Construction Practice can be agreed with CEC as required particularly with regard to night working and long weekend closures at major city centre junctions.
- Traffic Management and Traffic Regulation Order process is delivered to schedule.
- August Festival and Christmas Market exclusion periods apply between Haymarket and Picardy Place.
- Network Rail infrastructure is progressed to meet Infraco programme.
- No delays due to unforeseen archaeological or similar issues.
- Scottish Power 275kv cables at Leith Walk do not impact programme.

Depot milestones	Date
Completion of Construction Drawings	28.08.07
Completion of Mobilisation	03.08.07
Commence Construction Works (Earthworks)	06.08.07
Commence Building Construction	04.06.08
Commence Yard and Sidings	04.07.08
Completion construction Works (Building)	21.05.09
Commence Fit Out	22.05.09
Complete Yard and Sidings	31.08.09
Complete Fit Out	20.11.09
Commencing Substation	26.03.08
Complete Substation	24.09.08
Energise Test Track	07.12.09
Commissioning of Test Track complete	21.12.09
Test Track available	21.12.09
Complete Building Construction (Fit out)	20.11.09

Assumptions

- Depot is at reduced depth.
- Depot works to start August 2007 with a pre-commencement agreement with Infraco.
- Depot works can commence around the SGN diversions and SGN complete to programme.
- Increase initial driver/instructor ratio from 1:2 to 1:4 during initial stages.
- Only allows for a 6/12 service pattern and so no testing of an 8/16 patterns during test periods.

- First 5 trams have been type tested before driver training starts and this cannot commence until depot energised.
- Driver training in depot – total of 13 weeks.
- Driver training on Phase 1a – 22 weeks total.
- Shadow running takes 12 weeks and there is a 2 week overlap with driver training.
- Phase 1a opening Dec 2010.
- Phase 1b opening Dec 2011.
- Following decision to reduce the depth of the depot excavation, the duration to construct the Contiguous Piled Retaining wall has been reduced from 150 days as recommended by SDS to 130 days.
- Following decision to reduce the depth of the depot excavation, the duration for the mass earthworks has been reduced from 150 days as recommended by SDS to 100 days.
- Programme logic around the installation of de-watering equipment has been modified so that building construction can commence after the temporary de-watering equipment is installed and not await installation of permanent equipment.
- Programme logic around commencement of building construction is not dependant on the depot access bridge being complete, but can start 4 weeks prior to the completion of the 30 week construction period for the bridge.
- Planning approvals are granted in the timescales anticipated

Design and Traffic Regulation Orders milestones	Date
Completion of Detailed Design Phase 1a	04.09.07
Completion of Detailed Design Phase 1b	04.09.07
Completion of Planning Drawings Phase 1a	25.06.07
Completion of Planning Drawings Phase 1b	21.06.07
Completion of Construction Drawings – MUDFA	15.06.07
Completion of Construction Drawings – Phase 1a Infraco	04.09.07
Completion of Construction Drawings – Phase 1b Infraco	04.09.07
Completion of Approvals + Consents – Phase 1a	04.09.07
Completion of Approvals & Consents – Phase 1b	04.09.07
T.R.O. process commences (Phases 1a + 1b)	13.03.07
T.R.O. process complete (Phases 1a + 1b)	27.08.08
Facilitation of SDS Contract/Infraco novation negotiation complete	07.06.07

Assumptions

TRO Process

- SDS produce the TRO schedules and plans on time.
- The TRO schedules and plans are right first time.
- The modelling is fit for purpose.
- There is sufficient modelling to satisfy the Roads Authority and to justify the measures.
- CEC can review the TRO package within 2 weeks and agree with the measures being sought.
- There is political buy-in after the elections.
- The Council reconstitute quickly after the election and is prepared to make decisions on the TROs.
- CEC is prepared to have the objection period over the summer holidays.
- There is a limited number of objections to allow the objections to be reviewed, any technical assessments/changes to be made, a report to be prepared and the Council to be briefed within a three week assessments/changes to be made, a report to be prepared and the Council to be briefed within a three week period. The congestion

charging scheme received around 1500 which were reviewed over a weekend, tram received around 300 objections which were reviewed over a weekend.

- There is a limited time to prepare for the hearing – good use should be made of the time available now to prepare witness etc.
- The hearing lasts for 6 weeks only – this dictates the timescale for the reporters report (the reporter gets 3 writing days for each hearing day).
- CEC will convene special Council meetings if required.
- If referred to the Scottish Executive, they will respond within a month.
- There is no judicial review.

Commissioning & Training & Overall Completion	Date
Tram delivered Phase 1a	Dec 2009
Driver training commences for Phase 1a in Depot	05.02.10
Energisation Phase 1a off street	04.05.10
Infrastructure commissioning complete for Phase 1a off street	17.05.10
Driver training commences for Phase 1a off street	18.05.10
Energisation Phase 1a total – on street	24.06.10
Infrastructure commissioning completion for Phase 1a	08.07.10
Driver training commences for Phase 1a on street	10.08.10
Driver training completion for Phase 1a (excludes Shadow Running)	11.10.10
Tram Commissioning complete for Phase 1a	Nov 2010
Trial Running Complete for Phase 1a + HMRI approval	Dec 2010
Revenue Service commences Phase 1a	Dec 2010
Tram delivered Phase 1b	TBA
Driver training commences for Phase 1b in Depot	05.01.11
Energisation Phase 1b total – on street	01.07.11
Driver training commences for Phase 1b off street	11.07.11
Tram Commissioning complete for Phase 1b	TBA
Infrastructure commissioning completion for Phase 1b	11.07.11
Driver training completion for Phase 1b (excludes Shadow running)	03.10.11
Trial Running Complete for Phase 1b + HMRI approval	Nov 2011
Revenue Service commences Phase 1b	Dec 2011

Assumptions

- Driver training programme can meet programme requirements. (see assumptions under Depot Leading above)
- Control room, sidings yard and substation complete to allow Energisation of test track.
- Tram delivery programme still for combined Phase 1a and Phase 1b programme, split, to be confirmed in April 2007 and revised delivery dates.
- HMRI approval will still be required, will be dependent on proposed changes in legislation in 2010.

GLOSSARY

APA	Asset Protection Agreement
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
BAFO	Best and Final Offer
BAPA	Basic Asset Protection Agreement
BCIS	Building Costs Information Services
BPIC	Business Planning Integration Committee
BSA	Basic Services Agreement
Capex	Capital Expenditure
CDA	Core Development Areas
CEC	The City of Edinburgh Council
CETM	Central Edinburgh Traffic Model
CoCP	Code of Construction Practise
DAM	Detailed Assignment Model
DfT	Department for Transport
DLR	Dockland's Light Railway
DPD	Design Procurement and Delivery
DMRB	Design Manual for Roads and Bridges
DPOFA	Development Partnering and Operating Franchise Agreement
DSA	Development Services Agreement
DV	District Valuer
EALI	Economic Activity and Locational Impacts
EARL	Edinburgh Airport Rail Link
EIA	Environmental Impact Assessment
GVD	General Vesting Declaration
HMRI	Her Majesty's Rail Inspectorate
Infraco	Infrastructure Contract
ITI	Integrated Transport Initiative
ITN	Invitation to Negotiate
ITT	Invitation to Tender
JRC	Joint Revenue Committee contractor
KPI	Key Performance Indicator
LAMP	Land Asset Management Plan
LB	Lothian Buses
LHMP	Landscape and Habitat Management Plan
LLAU	Limits of Land to be Acquired or Used
LOD	Limits of Deviation
LRT	Light Rapid Transit
LTS	Local Transport Strategy
LUTI	Land-Use and Transport Interaction
MUDFA	Multi Utilities Diversion Framework Agreement
NAO	National Audit Office
NPF	National Planning Framework
NPV	Net Present Value
NR	Network Rail
OBC	Outline Business Case
OCC	Operations and Control Centre
OCIP	Owner Controlled Insurance Programme
OFT	Office of Fair Trading
OGC	Office of Government Commerce
OJEU	Official Journal of the European Union
OLE	Overhead Line Equipment
Opex	Operating Expenditure
PFC	Preliminary Financial Case
PFI	Private Finance Initiative
PIN	Preliminary Information Notice

PP	Protective Provisions
PPP	Public Private Partnerships
PT DAM	Public Transport Detailed Assignment Model
PU	Public Utilities
PUK	Partnerships UK
QRA	Quantitative Risk Analysis
RPI	Retail Price Index
RTS	Rapid Transit Solution
SDS	Systems Design Services contractor
SE	Scottish Executive
SESTRAN	South East of Scotland Transport Partnership
SNH	Scottish Natural Heritage
STAG	Scottish Transport Appraisal Guidance
TEE	Transport Economic Efficiency
TEL	Transport Edinburgh Limited
The Executive	Scottish Executive
tie	tie Limited
TPB	Tram Project Board
TRO	Traffic Regulation Order
TTRO	Temporary Traffic Regulation Order
Tramco	Tram Vehicle Supply and Maintenance Contract
TS	Transport Scotland
TSS	Technical Support Services contract
VAI	Vision Achievement Incentive
VAT	Value Added Tax
VFM	Value For Money