Supply and Tram Maintenance Agreements and Candidates' completion of the Insurance Questionnaires.

The initial consideration of proposals will focus on the Candidates' capability to deliver a tram system that operates to **tie's** requirements. Next we will then rank the Candidates in terms of price (the financial element of their bid) and the non financial aspects will then be reviewed and the incremental benefits between Candidates, one relative to the other, assessed. Finally will assess these incremental benefits against the differences between the prices in order to determine whether the utility of the incremental benefits changes the ranking of Candidates.

As part of the evaluation process, **tie** may contact the client references given as part of the pre-qualification process.

At each stage of the tendering process a report will be produced which shows the relative ranking of the Candidates' proposals. For the avoidance of doubt, it is anticipated that Candidates may have submitted a number of variant proposals, which will form part of **tie**'s evaluation. Accordingly, there may be multiple rankings for each candidate.

As part of the evaluation, **tie**'s team may conduct a number of visits to:

- reference project(s) where trams manufactured by the Candidate are currently in operation;
- reference project(s) where they are currently carrying out Tram maintenance;
- the factory(ies) where they are currently manufacturing trams, similar to those offered by them for the Edinburgh Tram Network.

Each Candidate's performance at such visit will be evaluated and the evaluation of this performance will be included as part of the Final Evaluation Report prepared in relation to each Candidate and information gathered from such visits will be incorporated into the Final Evaluation Report.

Legal and Commercial aspects - Qualifications to terms and conditions will be negotiated with bidders as a 'mark up' of the contract is to be submitted with the tender. Any qualifications which adversely change the fundamental principles of the Project Procurement Strategy and which are not withdrawn will at the discretion of the Project and its stakeholders disqualify the bidder from further consideration.

Insurances - Are proposed insurances the correct level with acceptable terms as specified in the ITN? If not bidders will be required to adjust their bids to include the specified requirements.

4.3 Evaluation Model

The evaluation will be conducted using the Evaluation Model. This sets out the basis for assessing the relative strengths of the Candidates' proposals for each evaluation criterion. The model also sets out the framework for determining the incremental benefit of the assessed non-financial proposals and for comparing this relative incremental benefit with the differences in the financial proposals of each bidder.

5.0 VARIANT PROPOSALS

In section 6.7 of the ITN, Candidates were allowed to submit Variant Proposals which they consider may produce better value for money, improved delivery times or System performance or improve the prospects of achieving an affordable scheme for the Edinburgh Tram Network.

The Variant Proposals will not be considered by **tie** unless a compliant Base Bid has also been submitted. **tie** reserved the right not to evaluate Variant Proposals where it considered that such proposals were contrary to the objectives for the Edinburgh Tram Network.

The assessment of any Variant Proposals will carried out on the same basis as the assessment of Base Bids as is described in this Methodology.

6.0 RECOMMENDATION

6.1 It is recommended that this evaluation process is accepted.

Proposed	Geoff Gilbert Project Commercial Director	Date: 11/10/06
Recommended	Andie Harper Project Director	Date: 11/10/06
Approved	…… …… David Mackay on behalf of the Tram Project Board	Date: ……

7.0 APPENDICES

APPENDIX 1

ITN TENDER SUBMISSION CHECKLIST

Has the Candidate submitted a complete Standard Tender Submission? YES/NO

Section Number	Content	Comment
1.	Executive Summary	
2.	Signed Formal Offers for Tram Supply and Tram Maintenance Agreement	
3.	Tram Technical and Performance Specification	
4.	Associated Equipment Technical and Performance Specification	
5.	Tram Maintenance Services Specification	
6.	Quality Plan 6A - Management, Organisation and Key Personnel 6B - Mobilisation Plan 6C - Delivery Plan and Programme 6D - Approvals, Testing and Commissioning Plan	
7.	Variant Proposals	
8.	8A - Completed Tram Supply Agreement Pricing Proformas 8B - Completed Tram Maintenance Agreement Pricing Proformas	
9.	Legal authority of signatory(ies)	
10.	Anti-Collusion Certificate	
11.	Tram Supply Agreement Compliance Matrix	
12.	Tram Maintenance Agreement Compliance Matrix	
13.	Tram Supply Agreement Risk Allocation Matrix	
14.	Tram Maintenance Risk Allocation Matrix	
15.	Mark-up of Tram Supply Agreement and Detailed Commentary on Mark-up	
16.	Mark-up of Tram Maintenance Agreement and Detailed Commentary on Mark-up	
17.	Tram Design Drawings and Illustration of Internal Layout	
18.	Completed Insurance Questionnaire	
19.	Commitments of material third parties and	

	shareholders (including parent companies/bond providers)	
20.	Completed Tram Technical Information Proformas	
21.	Pre-Works Development Services and Tram Mock-up Proposals and Mobilisation Services	
22.	Completed Spare Parts Proformas	
23.	Completed Tool and Test Equipment Proformas	
24.	Operator Training Plan	
25.	Maintenance Training Plan	
26.	Commentary on Depot Information	
27.	Commentary on Tram Interface Specification	
28.	Tram Requirements Specification Compliance Matrix	
29.	Tram Maintenance Specification Compliance Matrix	
30.	Return Condition	
31.	Completed Tram Major Components - Life Cycle Costs Proforma	
32.	Completed Tram Major systems - Reliability, Availability and Maintainability Proforma	
33.	Completed Tram Interface Specification "Tram Supplier Action" Information	
34.	Completed Track Alignment Criteria "Tram Supplier Comment" Information	

Checked by	…….. **David Powell, tie**
Checked by	…… **Valerie Clementson, tie**
Witnessed by	…… **Geoff Gilbert, tie** …….. **Date**

APPENDIX 2

Tender Evaluation Criteria (As included in the Tramco ITN)

4.3 Tender Compliance

The Tenders will be first checked for compliance with this ITN and for completeness. Clarification may be sought from Candidates in order for **tie** to determine if a Tender is complete and compliant.

Candidates should make no unauthorised alteration or addition to the Formal Offers, the Anti-Collusion Certificate, or to any other component of the Tender other than as expressly permitted in this ITN.

Tenders must not be qualified and must be submitted strictly in accordance with this ITN.

If a Tender is not substantially complete, or is qualified or is not submitted strictly in accordance with this ITN, **tie** may exclude such a Tender from further consideration. **tie's** decision to exclude a Tender shall be final. Nevertheless, **tie** expressly reserves the right, in its absolute discretion, to treat any Tender as valid and to proceed with the inclusion of a Candidate notwithstanding any procedural defect in relation to a submission in respect of this ITN.

All information requested in this ITN must be provided in English. Where any element is not submitted or is submitted incomplete or damaged, **tie** reserves the right to disregard the Tender as non-compliant or to accord such weight as **tie** considers appropriate in its absolute discretion to the incomplete element. Where a Candidate considers that any information requested is not relevant for its Tender, this should be clearly stated, giving reasons. **tie** shall determine the validity or otherwise of these reasons in its sole discretion.

7.2 Tender Evaluation Criteria

The Tram Supply Agreement and Tram Maintenance Agreement shall be awarded by **tie** to the Candidate which, at the conclusion of the process, offers the most economically advantageous Tender.

In order to evaluate which Tender submission is the most economically advantageous Tender, **tie** has determined that the submissions will be evaluated in the following key areas:

- Programme and Project Execution Proposals
- Project Team
- Technical
- Financial
- Legal and Commercial
- Insurance

As guidance:

The most economically advantageous Tender is the Tender that offers the maximum value for money proposal, based upon a comparison of Candidates' overall Financial proposals which will include in each case the combined incremental differential effect of the accompanying proposals for Programme and Project Execution, Project Team, Technical, Legal and Commercial and Insurance issues.

tie will assess the Financial component to determine an initial ranking of Candidates, subject to section 7.6, and then proceed to evaluate Tenders against the non financial criteria on a comparative basis. The assessments will then be combined to produce a composite ranking.

The Programme and Project Execution, Project Team and Technical proposals must meet minimum evaluation criteria in order to be considered. The minimum evaluation criteria are generally that the Candidate demonstrates in their proposals that they are able in the opinion of **tie** to deliver into operation tram vehicles that can be successfully integrated into the Edinburgh Tram Network and which comply with the requirements of this ITN, and in particular the requirements of the Tram Specification, Tram Maintenance Specification Tram Testing and Commissioning Specification and Tram Interface Specification contained in Volume 3 of this ITN.

Equal consideration will be given to the Programme and Project Execution, Project Team, Technical, Legal and Commercial and Insurance proposals within the evaluation and the Legal and Commercial and Insurance proposals will be evaluated for acceptability or non-acceptability against the Compliance Matrices for the Tram Supply and Tram Maintenance Agreements and Candidates' completion of the Insurance Questionnaires.

Please note that, as part of the evaluation process, tie may contact the client references given as part of the pre-qualification process.

Variant Proposals proposed by Candidates will be evaluated against the same criteria as those used to evaluate Candidates' Base Bids. The basis of evaluation of any submissions made during dialogue and negotiations will be consistent with the criteria set out in this Section 7 for evaluation of Tenders.

7.3 Programme and Project Execution

Each Candidate's proposals for Programme and Project execution will be evaluated in accordance with the following criteria:

- robustness and comprehensiveness of the Candidate's proposals
- ability to provide the Pre-Works Development Services and Mobilisation Services within the overall Project programme
- ability to supply and deliver the required Trams within the overall Project programme
- approach to risk management
- comprehensiveness and robustness of the Candidate's quality plan, and
- overall understanding of the Candidate's responsibilities.

7.4 Project Team

Each Candidate's project team will be evaluated in accordance with the following criteria:

- experience, suitability and competence of the project team and the proposed key personnel including any sub-contractors
- availability of relevant, current and competent skill sets
- ability to manage resources
- applicable team and key personnel delivery track record
- resource availability
- ability to work with **tie** and **tie's** existing Project team
- suitability of management structure, and
- logistical organisation to support ongoing maintenance.

7.5 Technical

Each Candidate's technical proposals will be evaluated in accordance with the following criteria:

- compatibility with the Tram Requirements Specification
- compatibility with the Tram Maintenance Specification
- compatibility with Tram Interface Specification
- compatibility with the Non-Functional Requirements Specification
- reliability
- passenger carrying capacity of Tram
- floor height, configuration and ease of access to seating
- door configuration
- Tram vehicle performance:
- run time, including speed limitation (in particular, around curves and through switches and crossings)
- energy consumption
- aesthetics
- weight
- quality of Operator facilities
- quality of passenger facilities

- noise characteristics, and
- maintainability.

7.6 Financial

Each Candidate's financial submission will be evaluated to determine the acceptability of the value for money offered by the pricing proposed for Tram supply and the payments sought for provision of Tram maintenance services, including adjustment for **tie**'s assessment of the value of the Candidate's qualifications and assumptions, if any, in respect of risk allocation between **tie** and the Candidate.

7.7 Legal and Commercial

The response to the contract documentation included by Candidates as part of the Tender submission will be evaluated in accordance with the following criteria:

- the Candidate's approach to overall risk allocation; and
- the extent to which the Candidate has supported any proposed revisions in the Tram Supply Agreement Compliance Matrix and Tram Maintenance Agreement Compliance Matrix with reasons acceptable to **tie**.

7.8 Insurance

Each Candidate's insurance proposals will be evaluated to determine the acceptability of the Candidate's insurance proposals.

7.9 Formal Interviews and Visits

A combined visit and formal interview with each Candidate will be held at each Candidate's offices/factory during the Tender development process. The purpose of the formal visit and interview will be to allow **tie** to engage with each member of the Candidate's core project team and to allow **tie** to assess the suitability of each Candidate's manufacturing facilities. It is expected by **tie** that the key members of the Candidate's proposed team will be in attendance at the formal visit and interview. **tie** will issue further instructions to Candidates regarding the format and timing of these formal visits and interviews in due course.

tie's assessment of each Candidate's performance at the formal interview will be included as part of the Tender evaluation process.

7.10 Clarification/Negotiation Meetings

tie will organise and timetable a series of technical, commercial, legal and/or insurance clarification/negotiation meetings with each Candidate during the Tender evaluation, clarification and negotiation periods. Discussions at these meetings will form part of the tender evaluation process.

7.11 Evaluation and Negotiation Programme

The stages in the tender evaluation and award process are:-

- Analysis and evaluation of Tenders;
- Initial negotiations to select preferred bidder to engage in Tramco/Infraco negotiations facilitated by **tie**;

- Infraco/Tramco facilitated negotiations;
- Final BAFO clarifications/negotiations, concluding with a binding BAFO; and
- Contract Award.

7.12 Tramco/Infraco Facilitated Negotiations

The objective of these negotiations is to resolve to **tie's** satisfaction all remaining commercial, technical, legal and programme issues, and to remove any qualifications of both parties to enable them to proceed to Final BAFO clarifications/negotiations and submission of BAFOs. **tie** may elect to observe and, where appropriate, manage timetable during the facilitated negotiations to safeguard principles of transparency, equality of treatment and proportionality.

Any submissions made during these sessions or arising from this phase shall be evaluated as outlined in 7.2 above.

tie Limited

TRAM Project

Paper to : **Tram Project Board**

Subject **Funding (grant) Requirements to end of Financial Year 2006/2007**

Date : **3rd November 2006**

1.0 Introduction

1.1 The purpose of this paper is to obtain from the Tram Project Board

- Confirmation of the approved current budget figure of £40.7 million.
- Approval for the completion of additional deliverables to be funded from this current budget.
- Approval to increase the budget to £44.041 million to include for land Purchase on phase 1a only and,
- Approval for all deliverables to be completed by 31st March 2007.

2.0 Background

2.1 A grant offer from Transport Scotland was made to City of Edinburgh Council on the 20th of July 2006 in which the Scottish Ministers offered to provide a capital grant up to a maximum of £32.7 million to be used by the Project to implement the continued development of the Tram Project to completion and approval of the draft Final Business Case by end January 2006.

2.2 The current forecast 2006/2007 budget at for the Edinburgh Tram Project currently stands at £40.7 million and comprises the £32.7 million indicated above plus an £8 million under-spend from financial year 2005/2006.

2.3 The funding offer of £32.7 million (to be spent by December 2006) was made in respect of specific deliverables as detailed in the grant offer, section 17. These (original) deliverables are:

- *"Agreement by the Scottish Ministers, tie & City of Edinburgh Council on structure/content of the draft Final Business Case by end July 2006*
- *Agreement by Scottish Ministers, tie, Transport Edinburgh Ltd and City of Edinburgh Council of the strengthened governance arrangements by end September 2006*
- *Endorsement of the proposed TEL business plan by the TEL Board in November 2006*
- *Agreement on baseline programme and costs based on Phase 1a, Phase 1b resulting from proposed phasing of tram network by end July 2006 – the programme and costs shall separately identify the elements relating to Phase 1a, Phase 1b and any common elements*
- *Positive outputs from the Joint Revenue Committee work by mid October 2006 on:*
  a. *Bus/Tram, Integration*
  b. *Modal shift & new travel*
  c. *Social inclusion*
  d. *Travel accessibility*

- *Implementation of recommendations of project reviews as set out in paragraph 15;*
- *Completion of the draft Final Business Case by December 2006"*

3.0 Funding (grant) Requirements to end of Financial Year 2006/2007

3.1 Subsequent to the grant letter the Project has identified opportunities to increase it's "spend" to include the additional deliverables as confirmed in Transport Scotland's (Damien Sharp) e-mail dated 21 September 2006,

- *"MUDFA contractor's accommodation set up prior to end March 2007 – fixed costs only (£370,000)*
- *Trial holes – to ascertain service depths etc (on route 1a) (£25,000)*
- *SGN preliminary costs of HP diversion at Gogar Depot site – advance payment towards purchase of longlead items (£500,000)*
- *MUDFA preliminaries arising from 2.1 and 2.3 (£369,000)*
- *Design work for HV power requirements at Gogar/Airport (Scottish Power) (£200,000)*

The total estimated value of these works is £1,464,000."

3.2 These additional deliverables can be met within the current Total Budget of £40.7 million.

3.3 In line with Transport Scotland's recent verbal agreement to purchase all land associated with Phase 1a, funding in relation to Land and Property requires an increase in the approved current forecast budget of £40.7 million. Funding for certain District Valuers services was included in the original £32.7 million funding but not the total cost of land and property as the phasing of this has changed in this financial year as part of the updates to the Draft Final Business case.

The total land and property costs (VOWD and commitment) are currently being valued at £15.830 million in this financial year. It should be noted that section 75 and CEC owned land (termed as "gifted" land) has been valued at £5,159 million. Therefore, this amount is required to be deducted (see table below) to determine the incremental amount required in relation to the approved current forecast budget figure of £40.7 million.

Table 1	**£k's**
Total valued Amount of Land and Property (06/07)	15,830
Deduct Section 75/CEC Owned (Gifted) Land	(5,159)
Total Forecasted Land Budget to Mar 08	**10,671**
Deduct Land value included in Tram Monthly Report (October)	(6,850)
Incremental amount now required in relation to Land & Property	**3,821**

3.4 The forecast spend to the end of this financial year including the additional deliverables is summarised as follows. This is more than the current budget of £40.7m.

Table 2	**£k's**
Funding Offer	32,700
Items from 3.1 above	1,464
Adjustment to reflect current forecast since last funding approval	(794)
Land purchase	10,671
Total funding in financial year 06/07(VOWD)	**44,041**

3.5 Appendix 1 below details the original forecast spend at the time of the grant offer (highlighted in yellow) versus the revised forecast spend to deliver all the additional deliverables, adjusted items and purchase of land and property referred to above (highlighted in orange).

3.6 All forecast budget figures relate to phase 1a only in this financial year.

4.0 Consultation

4.1 The following have been consulted in the preparation of this paper:-

- Transport Scotland

5.0 Recommendation

5.1 It is recommended that the Board:

- Confirm the current budget of £40.7 million within the current Financial Year 2006/2007.
- Approve the additional deliverables to be funded from the current forecast and.
- Approve the increase of the budget to £44.041 million.
- Approve the completion of all deliverables (original and additional) by 31st March 2007.

Proposed Andie Harper, Project Director — Date:- 13/11/06

Recommended Geoff Gilbert, Project Commercial Director — Date:- 13/11/06

Approved …… ……. — Date:- ……

David Mackay On behalf of the Tram Project Board

tie Limited
ETN PROJECT - PROJECT SPEND TO MAR 2007
PHASING OF VALUE OF WORK DONE
Date:- 13.11.06

Cummulative Approved Budget
Cummulative Current Forecast Value to expend Budget

Figures in '£000s	Approved Budget	Cumulative Approved Budget vs Forecast						
	Apr - Dec 06	Spend/Bud to date (Oct)	Nov-06	Dec-06	Jan-07	Feb-07	Mar-07	07/08
IMPLEMENTATION								
1 tie RESOURCES	2,612	2,026	2,319	2,612				
		3,282	3,763	4,241	4,698	5,155	5,706	
2 DPOF	540	420	480	540				
		238	268	298	328	358	389	
3 LEGALS	2,072	1,655	1,864	2,072				
		1,397	1,637	1,884	2,160	2,416	2,634	
4 SDS	11,478	9,266	10,495	11,478				
		7,748	8,702	9,552	10,402	11,702	13,002	
5 JRC	638	612	624	638				
		596	604	634	672	702	902	
6 TSS	3,585	2,894	3,234	3,585				
		2,286	2,666	3,066	3,476	3,886	4,296	
7 UTILITIES								
8 DESIGN SUPPORT								
9 3RD PARTY NEGOT								
		98	158	209	232	255	280	
10 LAND & PROP	72	56	64	72				
		12	17	22	27	32	10,713	
11 TROs								
12 COMMS / MKTG	461	346	412	461				
		332	485	523	566	609	638	
13 TEL	585	455	520	585				
		370	420	470	520	570	620	
14 SERV INTEG PLANNING	250	210	230	250				
		58	58	58	58	58	58	
15 PUK	54	42	48	54				
		50	56	62	68	74	80	
16 FINANCIAL ADVISORS	60	40	60	60				
		38	38	38	38	38	38	
17 INSURANCE	994	990	992	994				
		29	32	35	1,018	1,021	1,024	
18 CONSTRUCTION Utilities incl MUDFA	6,260	6,000	6,130	6,260				
		265	1,065	1,260	1,550	1,850	3,235	
19 Infraco								
				21	41	262	282	
20 Tramco								
99 OTHER	45	35	40	45				
		95	105	115	125	135	145	
SPECIFIED CONTINGENCY	2,971	2,505	2,751	2,971				
BUDGET TOTAL	32,678	27,552	30,264	32,678				
CURRENT FORECAST		16,893	20,072	22,487	25,977	29,120	44,041	

Paper to : **Tram Project Board**

Subject : **Risk Management Development Plan**

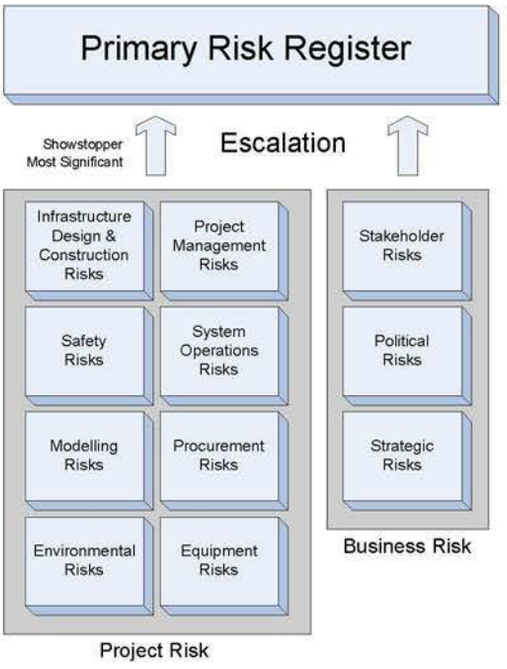
Date : **9th November 2006**

1.0 Introduction

1.1 The purpose of this document is to:-

- Ensure a consistent and demonstrable approach to risk management, risk allowances management and reporting;
- Ensure accurate identification and assessment of risk;
- Ensure delivery of mitigations;
- Assure **tie** Board, the Project Board and stakeholders that risks are being managed appropriately; and
- Support the ongoing decision making process of the **tie** project management team.

1.2 The scope of risks considered by this process shall comprise those potential events that have an impact on project cost, programme and quality (tram system performance) performance. Reporting of safety and environmental related risks shall also be included in a manner that allows escalation of issues to decision makers, as shown below.



1.3 **tie** requires that a consistent, demonstrable approach to Risk Management is adopted across its projects thus providing an informed view of the risk position across all projects. In order to achieve this, the risk management process shall be mandatory.

1.4 The Tram Project maintains a risk register that has been used to undertake

QRA analysis on capital cost estimates. The Tram Project is supported by service providers, including, SDS (Parsons Brinckerhoff) who maintain an Infrastructure Design Risk Register and JRC (Steer Davies Gleave) Transport Modelling Risk Register. It is proposed that a single platform for management of the risks is developed.

1.5 The Risk Manager (Mark Bourke) shall be responsible for implementing this Plan in consultation with the Commercial Director (Geoff Gilbert) with ultimate accountability for the management of risk exposures to the scheme residing with the Project Director (Andie Harper). It is intended that Risk Owners will be the Project Managers, Functional Manager or Team Principal Manager e.g. Procurement Manager.

2.0 Management Activities

2.1 The management activities associated with the co-ordination of service provider inputs will require to be documented within a Project Risk Management Plan.

2.2 A RACI chart has been appended to this report to summarise overall responsibilities.

2.3 The Plan will be developed to accommodate the inputs (e.g. reports on risk) from our contractors including MUDFA, TramCo and InfraCo. The format of inputs from current service providers including SDS, TSS, JRC and Operator shall be reviewed to ensure that the necessary information is obtained to manage the Project's risk position

2.4 The Risk Manager will be responsible for the development and maintenance of the Project Risk Management Plan.

2.5 Risks will be allocated to the relevant Risk Owners who will be responsible for managing them (essentially identifying and delivering the mitigations)

2.6 The indicators for measuring the success of mitigation shall be the delivery of planned mitigations and consequential reduction in project risk allowances, 'current' severity rating and ability to 'close' the risk. The Risk Manager shall hold one-to-one meetings with the agreed Risk Owners to assess the progress of planned mitigation measures for each risk and seek updates on progress on the above indicators. The 'due dates' for concluding planned mitigations will be defined by the Risk Owners consistent with the Project Design and Construction Phase implementation programme. The Risk Manager shall validate these due dates in consultation with the Project Managers.

2.7 Roles and Responsibilities in relation to planning and managing risk, risk allowances management and contractual risk allocation management are detailed below.

- The Estimating Manager (John Pantony) and Risk Co-ordination Manager in consultation with the Commercial Director shall be responsible for allocating the estimated risk allowances to the appropriate Contract, Budget Workstream and Project Manager
- The Procurement Manager (Bob Dawson) shall be responsible for reviewing the risk register in consultation with Risk Manager and

Risk Co-ordination Manager in order to ensure that the Contracts under preparation or negotiation adequately address the perceived risk exposures and that the desired allocation is set out in the Project Procurement Strategy and Contract Documents

3.0 Process

3.1 The risk management process can be broken down into the two stages.

- Identification and Assessment of Risk
- Monitoring, Review, Reporting and Action

3.1.1 The Identification and Assessment of Risk stage requires the following to occur:-

- All Project Managers, Functional Managers and Directors to be responsible for the identification of risk to the Tram Project activities and bring this to the attention of the Risk Co-ordination Manager.

3.1.1.1 The Risk Co-ordination Manager shall:-

- be responsible for maintaining a 'live' risk register. The identification and assessment process shall be additionally supported through workshops.
- liaise with the Risk Owners regarding the likelihood and severity of each risk and mitigation plans. This activity shall be recorded in a Risk Mitigation Plan Template.
- ensure that the risk register is updated each month via discussion with Risk Owners. Updates of QRA shall in turn be undertaken at each month for significant changes.
- be responsible for the preparation and maintenance of a Quantitative Risk Analysis and Optimism Bias Analysis for reporting the range of potential necessary risk allowances on the capital cost and estimate and programme. These analyses will inform the Project Estimate, Baseline Programme and in turn the Business Case.

3.1.2 Throughout the Monitoring, Review, Reporting and Action stage, the following actions shall need to be carried out:-

- The Risk Co-ordination Manager shall be responsible for monitoring the progress being made in completing mitigation actions with the Risk Owners and shall report where mitigation actions have not been completed by 'due dates' to the Risk Manager who will meet the relevant Risk Owners. The Risk Owners will be responsible for ensuring that the planned actions are completed.
- They shall also develop the format and content of Progress Reports with support from the Risk Manager and Commercial Director.
- The Risk Manager will supplement the monitoring with formal quarterly reviews (and at each significant milestone) of Risk Register to ensure that the risk management processes are meeting the objectives.
- The Risk Manager shall be responsible for presenting the risk report elements to the Commercial Director prior to them being reported to the DPD and Tram Project Board monthly meetings.
- The Project Director and Commercial Director shall be responsible for decision making regarding the release of risk allowances. The

Commercial Director shall be responsible for reporting on this drawdown.

- Drawdown of risk allowances shall be authorised via the Project Change Control Process
- The following criteria will be used to extract the 'critical' external (stakeholder) and internal (project) risk exposures to readily inform the **tie** Board, Project Board and Project Team and incorporate within a monthly Progress Report.

Risk Type	Short-listing Criteria
Stakeholder	Severity of risk to **tie**'s reputation; project viability and immediacy to mitigate risks e.g. project affordability, availability of funding, approval of business case.
Project	Magnitude of impact to cost and programme e.g. Network Rail interface costs, late submission of TRO information, unforeseen ground.

4.0 Risk Register Structure

4.1 The existing Tram Project risk register records both 'stakeholder' and 'project' risks and has been used to determine the levels of potential cost and time risk allowances required on the scheme by Monte Carlo analysis.

The following headers will be considered in the development of the single Risk Register by the Risk Co-ordination Manager in consultation with the Risk Manager.

- Identification of 'stakeholder' and 'project' risks
- Cost, time and system performance impacts
- Risk owners (named individuals) with dates for completing treatment and indication of 'status' (e.g. active or closed)
- Scoping of 'complete actions' and 'planned mitigation' to allow current residual risk assessment
- Contract where risk will be allocated (e.g. TramCo) and 'desired' risk allocation e.g. retained, transferred or shared with private sector
- Mitigation factor to allow Optimism Bias estimation

4.2 The intended software to be used for recording risk register will be Active Risk Manager (web based software for enterprise risk management). The Risk Manager and Co-ordinator will be responsible for developing and implementing a plan to compile a 'single' scheme risk register under **tie**'s control. The Risk Co-ordination Manager will agree the necessary licence requirements and access rights of Directors and principal Project Managers within the project team.

5.0 Principal Outputs

5.1 The main outputs from this development plan are summarised as follows.

1. Project Risk Management Plan including:-
    1. Risk Mitigation Plan Forms for each risk
    2. Project Risk Register

3. Quantitative Risk Analysis (QRA) on estimated Cost and programme risk impacts
4. Contract Risk Allocation Matrices

2. Risk Management Progress Report
3. Optimism Bias Estimate on Cost Estimates

6.0 Recommendation

6.1 It is recommended that the Board approves the proposals set out above.

Proposed	Mark Bourke Risk Manager	Date:- 09/11/06
Recommended	Geoff Gilbert Project Commercial Director	Date:- 09/11/06
Approved	…….. …… David Mackay on behalf of the Tram Project Board	Date:- ……

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

tie Limited

Paper to : Tram Project Board

Subject : Update on the Functional Specification

Date : 20 November 2006

1.0 Background

1.1 At the Tram Project Board in September, the draft Functional Specification was tabled. The key stakeholders, the City of Edinburgh Council (CEC), Transport Scotland (TS) and Transport Edinburgh Limited (TEL) agreed to review the draft and revert to **tie** with comments.

1.2 Since the September Board meeting further work has been undertaken on the draft Functional Specification. This paper provides an update.

2.0 Progress to date

2.1 Following the Tram Project Board, TS reviewed the draft and provided Susan Clark with comments. On receipt of the comments a meeting was set up with Trudi Craggs of **tie** and Lorna Davis and Martin McKinley of TS. This meeting took place on 6 October.

2.2 Since then the Functional Specification has been reworked, Transport Scotland has had sight of sections 1 – 4 which have been reworked to take account of their comments. In addition, in the Draft Final Business Case which was circulated on 9 November, section 5 contained the Functional Specification as reworked at that time. This included further amendments to the previous draft forwarded to TS.

2.3 There have been no other comments on the draft Functional Specification circulated to the key stakeholders at the September Tram Project Board. It is therefore assumed that both CEC and TEL were happy with the previous draft.

2.4 Since the Draft Final Business Case was circulated further amendments have been made to the Functional Specification. The final version is attached to this paper. As all amendments to date have been improvements to the document it is anticipated that neither CEC nor TEL will have any comments or issues with this final draft.

3.0 Consultation

3.1 This paper was not presented to the DPD and therefore the DPD has not had an opportunity to comment on this paper or the final draft of the Functional Specification.

4.0 Recommendation

4.1 The Board is asked to approve the final draft of the Functional Specification.

Prepared by: Trudi Craggs, Development and Approvals Director

Recommended by: Andie Harper, Project Director

Date: 13 November 2006

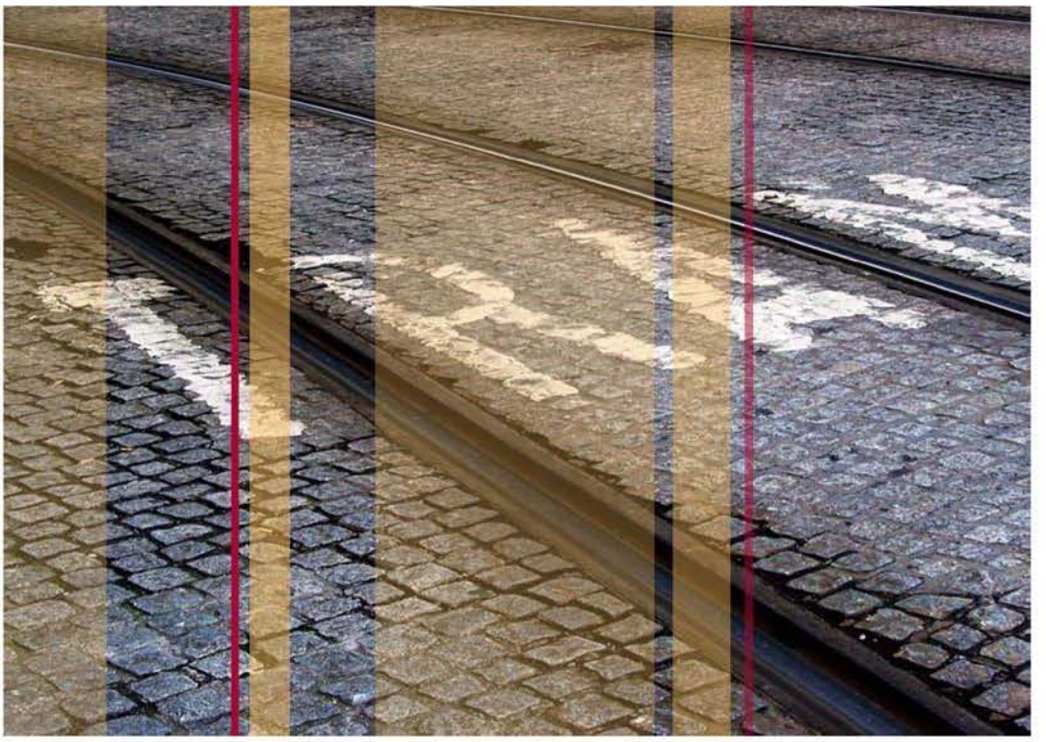
Approved …… Date:- ……
David Mackay on behalf of the Tram Project Board

Edinburgh Tram Network

Functional Specification

Trams for Edinburgh

..connecting our Capital



Glossary

AQAP – Air Quality Action Plan
CDA – Core Development Areas
CEC – The City of Edinburgh Council
DPOFA – Development Partnering Operator Franchise Agreement
EARL – Edinburgh Airport Rail Link
HMRI – Her Majesty's Railway Inspectorate
Infraco – Infrastructure Contract
ITI – Integrated Transport Initiative
ITN – Invitation to Negotiate
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
MUDFA – Multi Utilities Diversion Framework Agreement
OLE – Overhead Line Equipment
SDS – System Design Services
tie – **tie** limited
TEL – Transport Edinburgh Limited
Tramco – Tram Vehicle Supply and Maintenance Contract
TS - Transport Scotland

1 Project Objectives and targets

Purpose of Document

1.1 This Functional Specification has been prepared as a standalone document which refers to other scheme documents and deliverables. It is intended that this offers the reader a succinct reference document within which the strategic functionality of the project is captured.

1.2 This document also defines the baseline of the project for all the parties involved including the promoter, The City of Edinburgh Council (CEC); the funder, Transport Scotland (TS); tie Limited (tie) and Transport Edinburgh Limited (TEL). It will be from this baseline that changes will be identified, considered and measured.

1.3 This document supersedes the Project Definition Statement approved by the TEL Board on 15 May 2006.

Background and Scheme Development

Need

1.4 Substantial road traffic growth across the Edinburgh area combined with forecast population and employment increases will lead to significant growth in road congestion. To support the local economy, CEC identified trams as the preferred way to provide a comprehensive, higher quality public transport network to support the local economy and to help to create sustainable development.

Scheme Development

1.5 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 delivery of the tram network in its Local Transport Strategy (LTS) Inception Report which was published in 1998. This was followed in 1999 by CEC's New Transport Initiative (now known as the Integrated Transport Initiative) (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.

1.6 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 (a joint venture between CEC and Scottish Enterprise Edinburgh and Lothians) 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. In October 2001, CEC made their application to the Scottish Ministers for 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.

1.7 On 30 April 2002 Transport Initiatives Edinburgh Limited (now tie limited) was incorporated. The recommendations in the Feasibility Study for a North Edinburgh Rapid Transit Solution, the Arup Report, CEC's LTS and the Application culminated on funding supporting in June 2002 from the Scottish Executive to develop the northern loop (line 1) and the western route (line 2) for Parliamentary submission. 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 for the northern loop and the Edinburgh Tram (Line Two) Bill for the western route (the Bills) to the Scottish Parliament.

1.8 The case for the tram was further considered in the Edinburgh LRT Masterplan Feasibility Study commissioned by CEC in December 2001and 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.

1.9 On 28 February 2003 the Transport Minister announced that there was £375 million 'available in principle' for the Edinburgh Tram.

1.10 In respect of the 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.

1.11 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.

1.12 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.

1.13 On 23 December 2003 the Bills 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.

1.14 The Bills, as drafted, proposed two lines which could be operated as part of a network.

1.15 Line 1 is 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.

1.16 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.

1.17 The section of tramway between St Andrew Square and Roseburn is common to both Line 1 and Line 2.

1.18 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.

1.19 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 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 to the Scottish Parliament with the proposed amendments to the Bills.

1.20 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.

1.21 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.

1.22 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.

1.23 In parallel to the Parliamentary process, taking a prudent view on capital cost estimates and funding sources, an examination was undertaken by a number of parties – tie, CEC, TEL and Transdev – to assess the optimum construction phasing of a complete network of Lines 1 and 2. This work was validated by TS.

1.24 The parties determined through reasoned argument and professional judgement which phases within the totality of lines 1 and 2 would be best to proceed with. Consideration was given to a range of options for the first phase of the network construction and to the pattern of construction of the subsequent phases.

1.25 Accordingly it was agreed that the project should be phased as follows:-

Phase 1a –Newhaven to Edinburgh Airport
Phase 1b –Granton Square to Roseburn Junction
Phase 2 – the section along the Waterfront from Newbridge, along Starbank Road to Granton Square
Phase 3 – the section from Ingliston Park and Ride to Newbridge

1.26 The target date for the start of construction of Phase 1a is October 2007 at the Depot. The target date for the start of operation of Phase 1a is December 2010. The maximum available funding for Phase 1a is £545M.

1.27 The target date for the start of the construction for Phase 1b is July 2009. The target date for the start of the operation of Phase 1b is December 2011. The estimated cost of Phase 1b is £80 Million.

1.28 It is still the intention to construct and complete Phases 2 and 3, using the powers in the Acts. The intention is that the construction of Phase 2 would commence in line with previous timescales i.e. 2010. The construction of Phase 3 would commence by 2015. Accordingly, while these sections are not being designed as part of the current design work, the scope and the design of the project takes cognisance of future expansion.

Summary of Act powers

1.29 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 ie 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) – eg 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.

1.30 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

Objectives

General

1.31 The broad policy objective of the Acts is to help to create the transport infrastructure necessary to promote and support a growing local economy and create a healthy, safe and sustainable environment. Sustainable economic growth can only take place with a step change in public transport. Road space must be created by modal shift away from cars to enable economic growth to take place without increasing congestion. A tram system will enable new development and continued growth of existing development in a sustainable way. Without it, growing traffic congestion and lack of access to development sites will curb future growth and threaten the economic prosperity of the city.

1.32 The Tram Project supports the national, regional and local planning and transport policies. The aim of the project is to meet the following objectives:

To support the local economy by improving accessibility

1.33 An integrated, efficient, accessible and high quality public transport system promotes economic growth to the local community which leads to social inclusion and further economic development. There will be better and easier access to employment opportunities in Granton, Leith, Muirhouse, Pilton and Newhaven which will be created as a result of the redevelopment of this area. In addition those people who reside in Granton, Leith, Muirhouse, Pilton and

Newhaven will have easy access to employment opportunities in West Edinburgh and beyond.

To promote sustainability and reduce environmental damage caused by traffic

1.34 The tram will help to increase the share of travel on public transport and by non-motorised modes is sustainable. Encouraging modal shift from car will reduce emissions and will help the City of Edinburgh comply with the targets set by the Air Quality Amendment (Scotland) Regulations 2002. Modal shift is fundamental to achieving the environmental, sustainability, health and traffic aspirations.

To reduce traffic congestion

1.35 Fundamental to the achievement of economic development and environmental aims of the vision are:

- Reduce the number of trips made by car; and
- Reduce road traffic volume on key urban routes.
- Reducing congestion and delays on key routes will enable cars to be used efficiently.

To make the transport system safer and more secure

1.36 By reducing vehicle volumes, speeds and making roads safer for both users and non-users, there will be less road traffic accidents and casualties.

To promote social benefits

1.37 The new system will provide an opportunity to promote social inclusion and community benefits, which are fundamental to the respective elements of the vision by:

- Improving the liveability of streets; and
- Improving access to transport system by people with low incomes, no access to car, the elderly or mobility impairments.

Benefits of the Scheme

General

1.38 Although Edinburgh's economic success brings many benefits to both the City and the wider region, it also creates problems, such as traffic congestion. The tram will help to address these problems, as detailed below:

Economic regeneration and integration of land use and transport planning

1.39 In the parts of Edinburgh serviced by the tram such as Leith Docks, Granton Waterfront and Sighthill, regeneration is a key priority. Tram supports the development of brownfield sites by providing sustainable transport connections to areas either currently poorly served by public transport or experiencing congestion, particularly at peak times.

1.40 By providing a tram system to serve and connect Core Development Areas (CDA) across the City, the need for car dependence to access employment, residential and retail areas will be minimised. A tram system will ensure that there is effective, high quality public transport linking the City's strategic development and regeneration sites. Without a tram system, it is likely that major developments will be less likely to succeed and where they do, will contribute significantly more to City wide congestion as a direct result of the failure to integrate land use and transport policies. Such developments will also be likely to be diverted to less sustainable locations with less potential for effective transport integration

Traffic congestion

1.41 Tram, rather than directly reducing existing congestion, will operate primarily to permit further development without creating additional congestion. As other tram schemes in the UK have shown, there is greater potential for modal shift from car to tram than to buses, or guided buses, particularly if the tram is in operation before the development comes online and travel patterns have already been established. Modal shift from car is a key objective of the Local and Regional Transport Strategies because it will help to relieve the problems of traffic congestion that are experienced in the City and the wider region.

Integration with other Transport Modes

1.42 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. With the establishment of TEL in 2005, full integration is envisaged between tram and Lothian Buses, the major local public transport provider in Edinburgh. The interchange at Haymarket and close proximity to Waverley Station and Edinburgh Park Station mean integration with heavy rail will be good. These interlinking services, along with the proposed frequency of the service, means tram will afford easier access to employment and service areas.

Environment

1.43 CEC has a statutory responsibility under the Environment Act 1995 to work to comply with the national air quality objectives. CEC declared an Air Quality Management Area in December 2000 covering parts of the City centre area on the basis that the levels of nitrogen dioxides are likely to exceed government targets on air quality levels in 2010 and beyond. Vehicles within the City have been shown to account for up to 88% of emissions of nitrogen oxides. CEC is currently implementing its Air Quality Action Plan (AQAP) in relation to nitrogen dioxide pollution. Trams will contribute to the objectives of the AQAP by providing an alternative to the car for 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.

Accessibility and Social inclusion

1.44 Social inclusion can be facilitated by providing better public transport, which allows improved access to jobs and services for those without access to a

car. Although neither line will serve anywhere not currently served by bus, and will have greater spacing between tramstops than bus, this will be off-set by the level of frequency offered by the tram. The tram links major residential developments in the North of Edinburgh and employment centres in the West of Edinburgh (South Gyle, Edinburgh Park, Gogarburn, the Airport and Newbridge) and provides enhanced reliability.

1.45 There is a requirement for the design of tram vehicles and tramstops to 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, the advantage of tram over buses in terms of design specifications and ride-quality makes public transport more accessible for a significant section of Edinburgh's population

Streetscape

1.46 Linked to economic regeneration is the image of a City conveyed by its streetscape. In spite of its historical importance, parts of Edinburgh's urban environment are of much poorer quality than is desirable. Experience in France has shown that investment in trams has been 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 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 project are being considered.

Reliability

1.47 There are three key factors which will contribute to the reliability of Tram in Edinburgh when compared to other forms of local public transport:

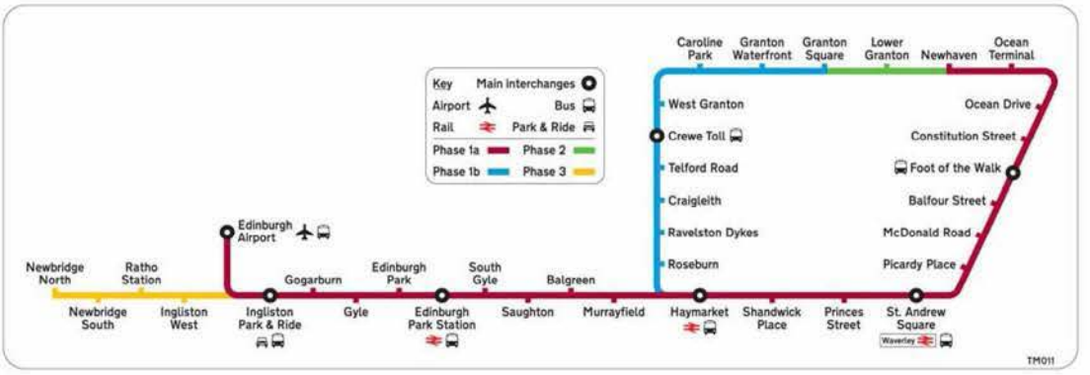
Tram will benefit from greater segregation from general traffic and is thus protected from the vagaries of traffic congestion;

Tram will use off-vehicle ticket machines and have multi-door boarding which reduce dwell time and dwell time variability at tramstops; and

Junction priority for the tram.

2 Geographical Boundaries and Interfaces

EDINBURGH TRAM NETWORK PHASING



2.1 The currently proposed phasing of implementation is:

Phase 1a Newhaven to Edinburgh Airport

Phase 1b Haymarket to Granton Square

Phase 2 Waterfront section

Phase 3 Ingliston to Newbridge

2.2 The LOD and theLLAU, 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 - Phase 1a

Newhaven to Constitution Street

2.3 From the centre island tramstop 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 a side platform, where a turnback facility is provided.

2.4 From Ocean Terminal, the tram 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. 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.

2.5 From Tower Street, along Constitution Street, to Foot of the Walk, the tram 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

2.6 The tram will run on-street (centre running) for the length of Leith Walk from Foot of The Walk to Picardy Place.

2.7 Platform stops, located centrally between tram lanes, are proposed at Foot of The Walk, Balfour Street, and McDonald Road.

2.8 The London Road and Picardy Place junctions will be modified as necessary. There will be a giratory at Picardy Place together with two side platforms.

2.9 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

2.10 The layout of the tramline through St Andrew Square will consist of double 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.

2.11 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 provsion is to be made for a centre platform tramstop at Waverley Bridge. In addition, there will be a single 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. Continuing towards Haymarket along West Maitland Street the tram will be centre running reaching Haymarket Junction, where there will be a revised junction/cross roads configuration. The roads around the junction, such as Morrison Street, Dalry Road and Grosvenor Street will also require to 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.

2.12 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

2.13 The alignment continues parallel to the railway line and crosses over Russell Road. From here the tram skirts around the northern boundary of the ScotRail depot. The tramline alignment will be supported by a retaining wall

to the rear of the business properties fronting onto Roseburn Street. An elevated stop consisting of two side platforms is proposed immediately opposite the Murrayfield turnstiles, which will service the stadium and the surrounding area.

2.14 The tram will cross Roseburn Street on a viaduct and will then continue to the south of the rugby stadium on an 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 consisting of two side platforms 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

2.15 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).

2.16 The tram will cross South Gyle Access on a new bridge and then run in the verge beside Bankhead Drive and the railway. A tram stop comprising two side platforms will be provided at Edinburgh Park Station to allow for interchange for passengers between light and heavy rail.

2.17 The tram alignment will then rise onto a viaduct and turn north to recross the railway and enter Edinburgh Park. The tram will run on a grass track, 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

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

Depot

2.19 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 7 metres.

2.20 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 tramstop, consisting of two side platforms, for staff only.

Gogarburn

2.21 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

2.22 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 tramstop consisting of two side platforms will be provided. 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 an island platform, will be on the site of Burnside Road and will allow for future inclusion within a transport interchange hub for heavy rail link, the tram, buses and taxis.

Route Alignment - Phase 1b

Granton Square to Ferry Road

2.23 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 the 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. Stops are planned at Granton Square (centre platform), Granton Waterfront (two side platforms), Caroline Park (two side platforms), West Granton, midway along West Granton access (two side platform), and Crewe Toll (two side platforms). The Crewe Toll stop, which will 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.

2.24 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.

2.25 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.

2.26 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

2.27 The tram will follow the former railway corridor on a full segregated alignment from Ferry Road to the point where it meets the existing heavy rail corridor just west of Haymarket. Tramstops are planned at Telford Road (two sided platform), Craigleith (two sided platform), Ravelston Dykes (two sided platform) and Roseburn (two sided platform).

2.28 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.

2.29 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.

2.30 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.

2.31 The cycleway and footpath will be surfaced in a fine grade blacktop as existing, while the tram track, with the exception of crossings, will incorporate a grass finish.

Interchanges

General

2.34 The integration with buses, achieved through Service Integration Plans (see section 6 - Operational Integration with Bus) is dependent on successful physical integration of bus and tramstops at key locations.

2.35 Several key locations have been identified as being critical for an effective interchange infrastructure and these now form part of the scope of the project.

2.36 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

2.37 For Phase 1a there are two designated bus/tram interchanges:

Foot of the Walk

2.37.1 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.

2.37.2 At this stage the interchange solution for the Foot of Leith Walk is being developed. 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

2.37.3 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.

2.37.4 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.

2.38 In respect of Phase 1b, and in addition to the interchanges required for Phase 1a, there is also a requirement for an interchange at Crewe Toll.

2.39 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.

2.40 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.

Other interchange opportunities

Haymarket

2.41 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. 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.

2.42 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.

2.43 Further interchange opportunities have been identified at the following locations:

2.43.1 **Ingliston Park & Ride** - 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, as well as potential future integration opportunities with regional bus services, necessitate high quality interchange facilities.

2.43.2 **Edinburgh Park Station** - 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.

2.43.3 **Granton Square & Newhaven** - Following on from the decision for phased construction, 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.

3 Interfaces with Other Projects and Functional Boundary

Edinburgh Airport Rail Link (EARL)

3.1 The proposed alignment runs close to the section of Phase 1a between the Depot 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.

Edinburgh Waverley Infrastructure Enhancement

3.2 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

3.3 Commitments have been made with 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 depot. 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

3.4 Phase 2 of Ingliston Park and ride lies adjacent to the Ingliston Park and Ride tramstop, Phase 3 of the Tram Project, 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 the projects benefit from the 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, to allow patronage to increase in advance of the tram coming in to service. By instructing **tie** to carry out the design, 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

3.5 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 project attends all of the Haymarket Interchange Masterplan Steering group meetings.

Granton Masterplan

3.6 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

3.7 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 ned to be close interaction between the CEC Planning Authority and the tram project.

Leith Docks Development Framework

3.8 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

3.9 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

3.10 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

3.11 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

3.12 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 developments, which are either committed or in the process of being consented to, to try to ensure all of the necessary works are carried out as efficiently as possible in terms of time and money.

4 System Capability

Vehicle Capability

4.1 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/ m^2
- At least 80 seats, of which a minimum of 16 seats must be accessible to passengers without using steps
- Up to 10 m^2 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

4.2 The performance criteria of the route include the following:

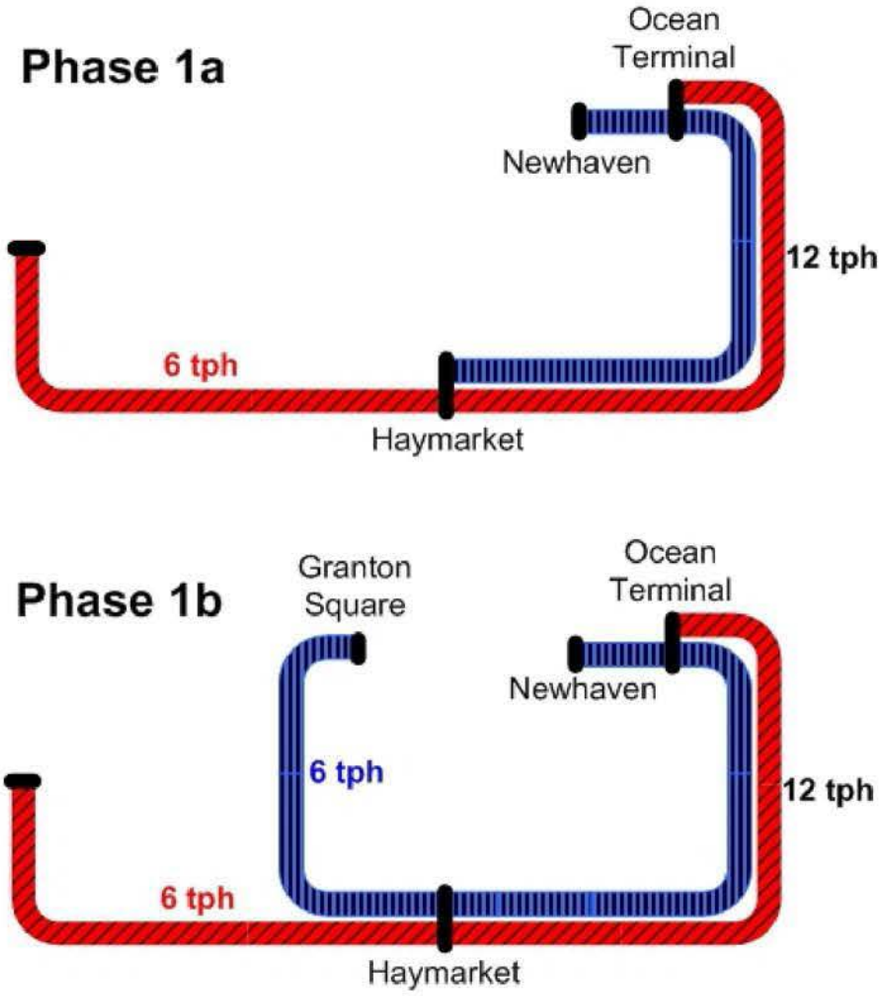
- Phase 1a has a target journey time (including layover and dwell times of 25 seconds at each stop) of 44 minutes and thirty seconds in each direction.
- Phase 1b has a journey time of 16 minutes and thirty seconds (including layover and dwell times of 25 seconds at each stop)
- The design of the network will enable 99% of all tram journeys to be no earlier than 1 minute and no greater than 2 minutes late. This reliability will be measured at:-

  a Edinburgh Airport (arrival and departure)
  b Edinburgh Park Station (arrival)
  c Haymarket (arrival)
  d Foot of the Walk (arrival)
  e Leith (arrival)
  f Picardy Place (arrival)
  g Crewe Toll (departure)
  h Granton Square (departure)

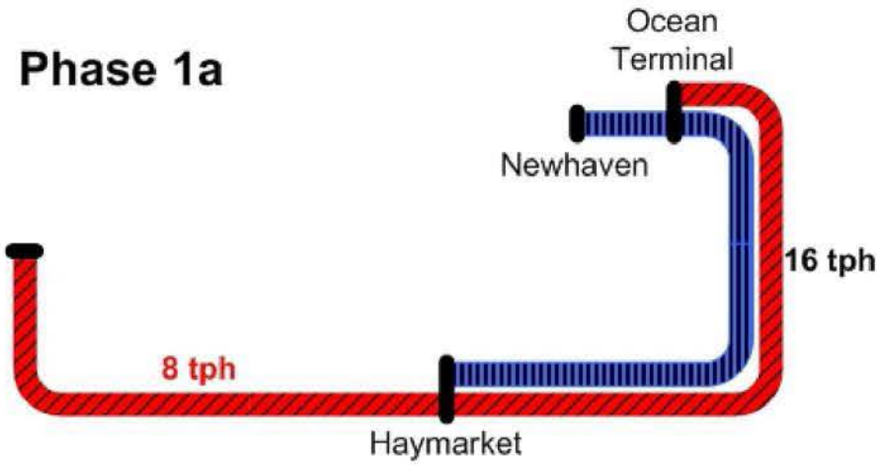
- The scheme has been designed to allow a service frequency of up to eight trams per hour in each direction for each of the two services, giving a frequency of up to 16 trams per hour on the common section. The following diagrams show the proposed tram service patterns. These are based on the following assumptions and conditions:-

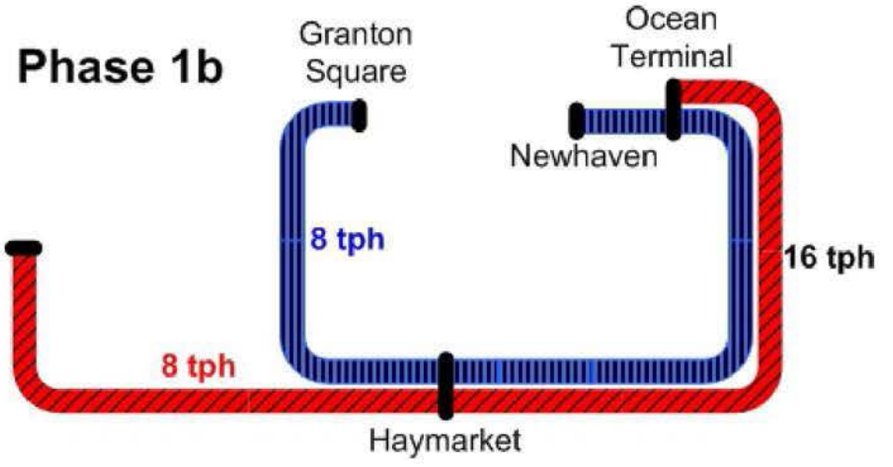
  - a basic frequency of 6 or 8 trams per hour service (combined to give a total of 12 or 16 trams per hour) is required during the daytime to replace withdrawn bus services (and therefore demand and capacity) on Leith Walk
  - Short workings between Edinburgh Airport/Granton Square and St Andrew Square are based on the ability to turn trams at St Andrew Square.
  - 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 the Depot and Ocean Terminal/Newhaven will run "in service" from the Gyle
  - Haymarket or Granton Square service trams going out of service running between Newhaven and the Depot will run "in service" as far as the Gyle
  - St Andrew Square curtailed trams going out of service running between St Andrew Square and the 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 the depot
  - the period of time between the last tram returing to the depot at night and the first tram leaving the depot in the morning is about 4 hours 30 minutes. Consequently the maintenance window will allow works on the system infrastructure for about 3 hours and 45

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



Peak Service Patterns for 6 & 6 tram per hour scenario





Peak Service Patterns for 8 & 8 tram per hour scenario

- 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:-

  a Edinburgh Park Station
  b Balgreen Road
  c Haymarket
  d Shandwick Place
  e York Place
  f Foot of the Walk
  g Ocean Terminal
  h Crewe Toll

- A tram must always be present at the Airport tramstop

- 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 amd Granton Square
- The depot halt at Gogar will be the location where drivers changeover
- 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]:-
    - Maximium speed of 80kph
    - Assumed deductions in speed to reflect horizontal and vertical alignment
    - Assumed deductions in speed to reflect line of sight conditions
- Provision will be made in the design for a delta junction at Roseburn.

5 Operations and Control Functionality

Control Room

5.1 The Control Room will be the focal point for the control and operation of the Edinburgh Tram Network. Its purpose is to provide a working place for the operational employees to manage and coordinate day-to-day activities associated with system operations.

5.2 The control room will be located on the first floor of the depot building and will comprise 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 will be designed to carry out control functions in an ergonomically efficient manner.

5.3 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
- communiciations network management
- video/closed circuit television image printing; and
- fire alarm system

Tram signals/Urban Traffic Control

5.4 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.

6 Operational Integration with Bus

6.1 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.

6.2 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.

6.3 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

6.4 The business plan will also consider likely competitors' responses and opportunities for integration with other bus operators and other modes of transport

7 Project Constraints

General

7.1 The system 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.

7.2 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.

Specific Policies and constraints

7.3 In addition, various documents were prepared during the Parliamentary process, which impose constraints on the construction and operation of the tram. These include:-

7.4 **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.

7.5 **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.

7.6 **LHMP**– 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.

7.7 **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.

7.8 **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.

7.9 **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.

Programme Constraints

7.10 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 rum 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

8 Project Workscope

Track

8.1 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 paviors, 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

8.2 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 precoated 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.

8.3 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

8.4 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; and
- 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, guidance and aspirations.

8.5 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

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

8.7 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.

8.8 The track will be double track.

Depot

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

8.10 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.

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

8.12 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.

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

8.14 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.

8.15 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.

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

8.17 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.

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

8.19 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
- Whel 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

8.20 Tramstops will be either platform stops, side platform stops or combined side and island platform stops (see section 2 for details of the type of stop at each stop location). The tramstops must be long enough to cater for a 40m tram.

8.21 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.

8.22 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).

8.23 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.

8.24 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.

8.25 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

8.26 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

8.26 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
- Rsoeburn 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
- Craigleith 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

8.27 Due cognisance will be taken of the historical status of any of the structures affected by the works.

8.28 The structures are to be designed and constructed to comply with the Noise and Vibration Policy.

8.29 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.

8.30 The structures are to be designed to comply with the loadings imposed by construction and maintenance vehicles.

8.31 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.

8.32 Finishes to all concrete components of the works shall comply with the following:-

- All buried and permanently submerged surfaces F1, U1
- Pier tops, bearing shelves and hidden surfaces F2, U2
- Parapet coping, exposed surfaces F3, U3
- Main Bridge deck U4

8.33 The structures are to be designed for minimal maintenance requirements.

Roads and Utilities

8.34 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).

8.35 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, Infraco or otherwise; and
- Removal of all redundant services and apparatus affecting the works.

8.36 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.

8.37 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.

8.38 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.

8.39 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"

8.40 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".

8.41 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.

8.42 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.

8.43 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.

8.44 Road User Safety Audits shall be carried out as required by The City of Edinburgh Council and sufficient to demonstrate the integrity of the design process to HMRI.

Substations

8.45 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

8.46 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.

8.47 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.

8.48 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.

8.49 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.

8.50 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.

8.51 The whole of the depot yard shall be earthed on the negative side including the workshop traction supplies.

8.52 The enclosure of the yard and workshop circuit breaker shall be solidly earthed, and also connected to the rectifier negative pole.

8.53 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.

8.54 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.

8.55 At all substations, control and indication multi-pair cabling shall be provided and connected to a SCADA remote terminal unit (RTU).

8.56 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

8.57 The OLE will be energised at a nominal 750v in accordance with BS EN 50163:2004:Railway Applications – Supply voltage of traction systems.

8.58 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 Drvie and Caroline Park to Granton Square transtops 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.

8.59 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 busses (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.

8.60 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

8.61 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.

8.62 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.

8.63 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.

8.64 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

8.65 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 (see section 5).

9 Maintenance Effects and Requirements Post – Completion

9.1 This section relates to life cycle maintenance and renewals post-project completion, i.e. the operational period following completion, commissioning and acceptance by the operator.

9.2 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. For the purpose of the Draft Final Business Case and the TEL business plan, a life expectancy of 60 years has been assumed for the whole system.

9.3 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.

9.4 Life expectancy for key system components are summarised 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.

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

The details of the maintenance to be performed by InfraCo/TramCo is set out in the Infraco/Tramco ITN and contract documents.

10 Performance Effects and Requirements Post- Completion

10.1 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.

11 Safety and Environmental Effects and Requirements Post-Completion

Safety

11.1 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.

11.2 These safety risks are referred to as Hazards. Reference should be made tothe Hazards Log.

11.3 Areas of known or potential vandalism and route crime should be identified, particularly at overbridges.

Environment

11.4 Post completion environmental impacts and mitigation measures are identified in the project Environmental Management Plan. In particular noise, vibration and visual impact as 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.