

- 5.72 In addition, various documents were prepared during the Parliamentary process, which impose constraints on the construction and operation of the tram. These include:
- **Code of Construction Practice (CoCP)** – 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 CoCP. 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.;
 - **Code of Maintenance Practice** – This has been developed from the CoCP specifically to cover maintenance activities after the tram becomes operational;
 - **Noise and Vibration Policy** – Again this was document was developed during the parliamentary process and the Bills were amended to provide that the authorised undertaker must use all reasonably practicable means to ensure that the Noise and Vibration Policy is applied to the operation of the tram. This imposes operational requirements during testing and commissioning on the tram supply 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 barriers following the operation of the tram. Noise and vibration are important considerations that have been taken into account in the tram supply evaluation and the tram to be provided by the preferred tram supplier has been demonstrated to have low noise and vibration characteristics. The policy also sets out monitoring requirements and the basis of an insulation scheme in the event that this is found to be necessary.
 - **Landscape and Habitat Management Plan** – This was also developed during the parliamentary process in response to the objectors along the Roseburn Corridor. It sets out the likely impacts on the corridor as well as the mitigation and the ongoing management of the corridor once the tram is constructed and is operational. This requires the approval of the planning authority prior to the works along the Roseburn Corridor commencing;
 - **Environmental Statement** – The Bills were amended so as to provide that the residual impacts of the scheme must be no worse than as assessed in the Environmental Statements;
 - **Tram Design Manual** – This has been developed and approved by the Planning Authority as supplementary planning guidance which will be a material consideration in the assessment of all the prior approval application; and
 - **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 Gyle Shopping Centre, the LoD has been changed to minimise the absolute land take and reduce land assembly costs. Further, the alignment was changed to suit potential future development.

Project workscope

Track

- 5.73 The nature of tramline surfacing (track, swept path, affected roads and footpaths) is dependent upon its environment. The various track finishes will include the following:
- Tar macadam or other similar road surfacing;
 - Block paviers, stone setts or the like;
 - Ballast, eg depot area, and some off street sections outside the built-up area;
 - Concrete or similar hard surface e.g. on a bridge or other structure, an apron or special surface in the depot, sidings and tramstops; and
 - Grass track through the sensitive area of Edinburgh Business Park.
- 5.74 On street, trackslab construction (reinforced concrete) must provide strength to support the traffic / tram loads (including risk of voids beneath) together with appropriate stray current protection. Steel rails 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 in certain sections outside the built-up area.

- 5.75 The different track forms comprise the following:
- Street running track (integrated and segregated);
 - Grass track;
 - Direct fixation track;
 - Ballasted track; and
 - Special trackforms in the depot and at tramstops.
- 5.76 The trackform that has been designed 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 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 and guidance.
- 5.77 The following track elements have been designed 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; and
 - Rail lubrication.
- 5.78 Track will be a standard tramway track with steel rails set to standard gauge (1.435m).
- 5.79 Trackwork components to be provided include but are not limited to the following:
- Rails;
 - Sleepers and points and crossing bearers;
 - Turnouts;
 - Points and points motors;
 - Points baseplates and slippers;
 - Points rollers;
 - Crossings;
 - Check rails and check rail fastening systems;
 - Guard rails and guard rail fastening systems;
 - Transition rails;

- Rail joints (fishplated and welded);
- Insulated rail joints;
- Isolatable rail joints and provisions for access to associated rail / cable connections;
- Rail movement joints;
- Rail fastening systems;
- Rail pads;
- Baseplates;
- Resilient baseplate systems;
- Rail embedment for street running track;
- Paved trackbed and concrete trackbed systems;
- Grooved rail drainage systems (including boxes);
- Buffer stops and vehicle arrestor systems;
- Ballast;
- Granular filtering;
- Granular blanketing;
- Geotextile membranes;
- Plastics membranes;
- Geosynthetic reinforcement;
- Provision and installation of signs and markers; and
- Grasstrack.

5.80 The track will be double track.

Depot

- 5.81 The depot is to be located at Gogar and complies with the Civil Aviation Authority regulations in relation to bird strike and height restrictions given the proximity to the crosswind runway at Edinburgh Airport.
- 5.82 There will be road access from the A8 Gogar Roundabout. All existing utilities and services will be relocated. The depot will be secured by a continuous 2.4m high security fence and will have a CCTV system.
- 5.83 The depot accommodates a minimum of 32 berths that are 43 metres long in the stabling area free of fouling points and walkways. The design provides for expansion up to 37 berths. Staff and visitor parking is to be provided with a minimum of 100 spaces.
- 5.84 The main tram workshop, other workshops, stores, management, administration, operations and maintenance offices and staff welfare facilities (support accommodation) and the control room for the complete ETN, shall be contained within a steel framed building clad in an insulated panel cladding system. The roof of the building shall be insulated to a suitable standard with the minimum number of penetrations.
- 5.85 The building workshop shall accommodate a minimum of two tram maintenance roads each accommodating two trams, plus a wheel lathe road that includes a further single tram service road.
- 5.86 The support accommodation shall be arranged on two floors set to one side of the main tram maintenance workshop. The depot control room shall be located at first floor level with the equipment room set below. A view of the depot external stabling area and tram entry / exit point shall be provided to control room staff from within the control room.
- 5.87 The depot shall be provided with the appropriate electricity supplies including 400V / 415V for individual items of workshop equipment both inside and outside the building, 230V for internal domestic use and 110V for small tools.
- 5.88 Natural light in offices shall be maximised and all rooms shall be placed within the building in locations appropriate to their function.

- 5.89 Additional service space shall be provided for the accommodation of gas, compressed air and battery charging equipment as well as for the accommodation and systems directly linked to the tram operations.
- 5.90 Full heating and ventilation will be provided throughout the building with air conditioning to the control room, equipment room, training and meeting rooms.
- 5.91 The plant and equipment to be provided and installed will include the following:
- Remote controlled vehicle shunter;
 - Underfloor vehicle lifting jacks / stands;
 - Tram wash and cleaning equipment capable of high quality operation all year round;
 - Cab air-conditioning repair;
 - High-level access platforms;
 - Wheel hub removal / press;
 - Tyre splitter;
 - Depot furnishings;
 - Cleaning (shot blast / wet spray);
 - Workshop cranes;
 - Craneage (general);
 - Underfloor wheel lathe;
 - Bogie maintenance area;
 - 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;
 - Mobile generators;
 - Rail groove cleaning equipment;
 - Mobile platforms (road / rail based);
 - Track measurement equipment;
 - Sand plant; and
 - Mobile paint shop booth.

Tramstops

- 5.92 Tramstops will be platform stops, side platform stops or combined side and island platform stops. The tramstops must be long enough to cater for a 43m tram.
- 5.93 Side platforms are to a minimum of 3m wide. Island platforms will be a minimum of 4m wide. The platform height must match the requirements of the tram to ensure level access in accordance with the Rail Vehicle Accessibility Regulations.
- 5.94 Tramstops have been designed to be compliant with:
- The requirements of the Tram Design Manual;
 - Her Majesty's Railway Safety Principles and Guidance;
 - DDA requirements;
 - Rail Vehicle Accessibility Regulations;
 - Taking into account the Mobility and Access Committee for Scotland (MACS);
 - The Department for Transport Inclusive Mobility Guide to Best Practice on Access on Pedestrian and Transport Infrastructure; and
 - The Building Regulations (Part M).
- 5.95 In addition, the tramstop must comply with the following:

- Mobility-impaired access and egress to and from each platform. The minimum width of ramps provided on the ETN 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; and
 - Landings shall be no shorter than the width of the ramp.
- 5.96 Tramstop finishes are to be in accordance with the Tram Design Manual. Provision is to be made for 400mm wide tactile strips. The platform edge is to have a 65mm wide white inset line to the leading edge of the line-side coping. Boarding areas will be indicated.
- 5.97 Each tramstop will be equipped as is appropriate for the location of the stop. Such equipment may include any of the following:
- Shelters providing 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; and
 - Ticket vending machines.
- 5.98 Each stop will be provided with an equipment cabinet, which will house the majority of the control equipment such as communication and signalling equipment. Where practicable, this would be co-located with a sub-station. Such cabinets are generally metal units with a 1-2m frontage, up to 1m depth and 1.5m high.

Structures

- 5.99 The project requires the construction or modification to a number of structures along the route of Phase 1a:
- Lindsay Road retaining wall;
 - Victoria Dock entrance bridge;
 - Tower Place bridge;
 - Leith Walk railway bridge;
 - Haymarket Station viaduct;
 - Russell Road bridge;
 - Russell Road retaining wall one and two;
 - Water of Leith bridge;
 - Baird Drive retaining wall;
 - Balgreen Road bridge;
 - Balgreen Road retaining wall one;
 - Carrick Knowe underbridge;
 - Saughton Road bridge;
 - Broomhouse Road bridge;
 - South Gyle access bridge;
 - Edinburgh Park Station bridge;
 - A8 underpass;
 - Gogar Burn bridge;
 - Gogar Burn culverts;
 - Gogar Burn retaining walls;
 - Murrayfield Tramstop retaining wall;
 - Roseburn Street viaduct;
 - Murrayfield Stadium retaining wall;

- Murrayfield Stadium underpass;
 - Bankhead Drive retaining wall;
 - Gyle tramstop retaining wall;
 - A8 retaining wall (under redesign to minimise this structure);
 - Depot Internal retaining walls (under redesign to minimise these structures); and
 - Depot Access bridge.
- 5.100 Due cognisance will be taken of the historical status of any of the structures affected by the works.
- 5.101 The structures are designed and are to be constructed to comply with the Noise and Vibration Policy.
- 5.102 The design is to minimise the need for bearings and movement joints within the structures. Where bearings are used either elastomeric or pot type bearings will be used to accommodate longitudinal and transverse translations and rotations while minimising lateral loads on sub-structures. All bearings must be replaceable under full live loading.
- 5.103 The structures are designed to comply with the loadings imposed by construction and maintenance vehicles.
- 5.104 All elements are designed and provided to cater for tensile breakage of one rail at any location at ultimate limit state only. Clearances will be to HMRI requirements.
- 5.105 Finishes to all concrete components of the works 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.
- 5.106 The structures are to be designed for minimal maintenance requirements.

Roads and utilities

- 5.107 The majority of the works required to divert or protect utilities are being carried out by the contractor appointed under the Multi Utilities Diversionary Framework Agreement (MUDFA).
- 5.108 In addition the roads and utilities works include the following:
- Road and junctions (including all necessary off-alignment works);
 - Site clearance;
 - Safety barriers and fencing;
 - Drainage works including track drainage;
 - Earthworks;
 - Surfacing;
 - Road lighting;
 - Traffic signage and road markings;
 - Traffic signals and tram signals;
 - Landscaping;
 - Temporary and permanent traffic measures;
 - All associated cable ducting required for the works;
 - Depot access and utilities, including within the depot;
 - Utility diversion works whether carried out by MUDFA, Infracore or otherwise; and
 - Removal of all redundant services and apparatus affecting the works.

The tram network will be segregated from the road, wherever feasible, providing efficient use of available space, 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 will optimise their effectiveness, without significantly compromising safety and operational factors, including the

shared use by buses as appropriate, operation of junctions and emergency and maintenance access.

- 5.109 Wide-area modelling of traffic impacts consequent to the design is being provided as a pre-requisite to approval, and prior agreement with CEC on the TROs and TTROs necessary to implement the design and complete the works. Details are provided in section 8.

The roads design meets the standards set out in the Design Manual for Roads and Bridges (DMRB), City Development Transport – Development Quality Handbook – Movement and Development and the Tram Design Manual.

- 5.110 Where cycleways are provided, for example along the Roseburn Corridor, these are designed and constructed in accordance with the relevant guidelines including:
- Design Manual for Roads and Bridges;
 - CEC “Roads Development Guidelines”;
 - Scottish Executive’s “Cycle by Design”; and
 - Sustrans “Cycle Friendly Infrastructure Guidelines for Planning and Design”.
- 5.111 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 will be consistent with “Edinburgh Standards for Streets”.
- 5.112 The traffic and tram signalling systems will support the run-time of the tramway whilst minimising the impact on other road users. It shall be fully integrated with CEC’s urban traffic control system. A protocol is developed with CEC regarding the installation and integration of the traffic and tram signals. The signalling system will incorporate recent / current technological developments, as appropriate, to optimise the combined efficiency of the tram and traffic signals.
- 5.113 The traffic management system will accommodate the direct and consequential impacts of the Tram system and will be subject to approval by tie and CEC (section 8).
- 5.114 Road lighting will conform with CEC policy and the Tram Design Manual. The lighting columns and OLE poles will be rationalised to minimise road clutter.
- 5.115 Road User Safety Audits shall be carried out when they are required by the Roads Authority and sufficient to demonstrate the integrity of the design process to the ICP (and HMRI).

Substations

- 5.116 Eight new 11kV substations will be built along the Phase 1a route to accommodate the traction power supply:
- Cathedral 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; and
 - Jenner’s Depository substation.
- 5.117 There will also be a substation at the depot. The substations will be spaced along the route at approximately 2km intervals, as dictated by the needs to supply power to the system. The substation buildings will be approximately 15m by 4m plan area, including a provision for Distribution Network Operator supply.

- 5.118 Each Edinburgh Tram traction power substation will 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;
 - Supervisory control and data acquisition (SCADA) interface marshalling panels;
 - Associated internal power and control cabling;
 - Provision for a 11 kV supply to the depot services transformer; and
 - Miscellaneous items to complete.
- 5.119 The Russell Road track paralleling hut will be provided with similar equipment as all other substations. However, a high voltage supply from Scottish Power will not be provided and the substation will be used as a track paralleling hut in the first instance.
- 5.120 The equipment at the depot traction and services substation will comprise three HV supply cables from three Scottish Power circuit breakers, or ring main units feeding two indoor transformer-rectifier units for depot stabling traction and main line traction, and the other to the services transformer in the depot building.
- 5.121 One four-panel 750 V dc switchboard, with direct acting overcurrent protection, relay overcurrent protection, thermal image, earth fault protection on three (two for the yard and one for the workshop) track feeder circuit breakers and direct acting reverse current protection on the rectifier circuit breaker will be fed from one rectifier transformer; a three panel 750V dc switchboard feeds the main line in the usual way described above.
- 5.122 The whole of the depot yard will be earthed on the negative side including the workshop traction supplies.
- 5.123 The enclosure of the yard and workshop circuit breaker will be solidly earthed, and also connected to the rectifier negative pole.
- 5.124 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 will be provided.
- 5.125 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 will be provided.
- 5.126 At all substations, control and indication multi-pair cabling will be provided and connected to a SCADA remote terminal unit (RTU).
- 5.127 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 ETN rectifier of the traction substation. In the event Scottish Power is unable to agree to this electrical arrangement then additional HV switchgear shall be provided in series with the Scottish Power switchgear.

Overhead line equipment

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

Communications and signalling

- 5.133 The Tram Position and Detection System will monitor the efficient and effective movement and overall regulation of trams running on the ETN. The tram position and detection system will include both tram-borne and trackside equipments.
- 5.134 The Tram Position and Detection System shall collect, in real time, the following from each tram for transmission to the control centre:
- Tram number;
 - Tram run number;
 - Tram destination;
 - Driver staff identity number;
 - Driver duty number; and
 - Tram in service / out of service.
- 5.135 The Tram Position and Detection System will provide a number of functions which will 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; and
 - Provide controlled entry to and exit from the depot berthing and maintenance facilities.
- 5.136 The systems to be provided include 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;
- SCADA; and
- Operational data network.

5.137 There will be a control room which will be the focal point for the control and operation of the ETN. Its purpose will be to provide a working place for the operational employees to manage and coordinate day-to-day activities associated with system operations.

Maintenance effects and requirements post-completion

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

5.139 High level requirements for maintenance and renewals for the whole network are contained in the Maintenance ER, the Roads Demarcation Agreement matrix of responsibilities and have been costed in the Life Cycle Costs report prepared as part of the DFBC and TEL Business Plan development. Tramco and Infraco bidders have included detailed maintenance specifications within their Contractors Proposals and have provided the associated firm costs for undertaking this maintenance. The systems performance and operations requirements are based on the Operations and Performance ER document which is part of the suite of ER documents which, along with the Contractors Proposals, will form part of the Infraco, Tram Supply and Tram Maintenance Agreements.

5.140 Life expectancy for key system components are summarised in Table 5.3 and these were used in the Lifecycle Cost Report prepared for the DFBC and incorporated into the costs. Achievement of these is an obligation passed through the Infraco Agreement onto the equipment suppliers and the maintainers to deliver 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. upholstery, motors, pantographs) and planned renewals as dictated by the specified performance criteria of the individual system.

Table 5.3. Anticipated system element life expectancy.

System element	System life expectancy (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
OLE	40 years
Traction power equipment	35 years
Track – off street locations	30 years
Track – on street locations	50 years
Buildings	50 years
Structures	120 years

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

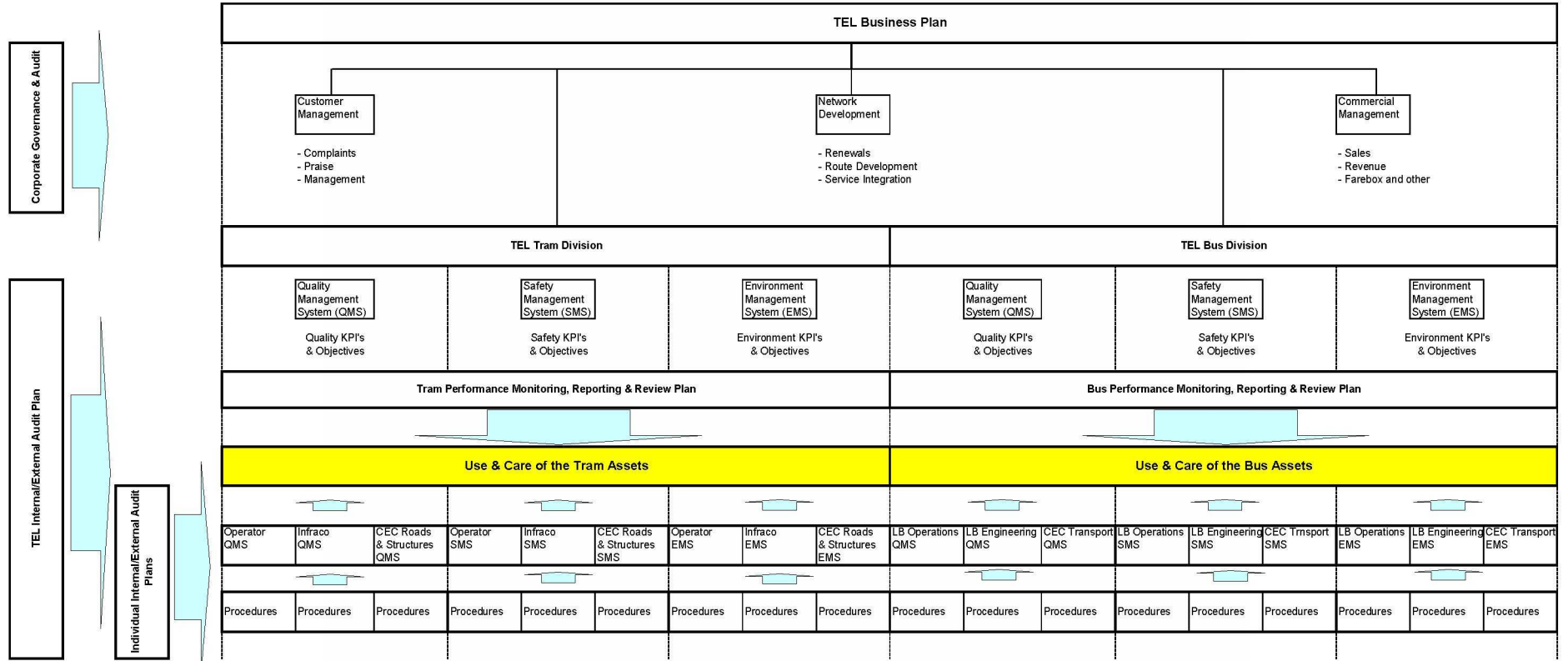
Performance effects and requirements post-completion

- 5.142 Post completion performance effects and requirements form part of the sensitivities considered in the TEL business plan. An operational performance regime framework has been established in the contracts between TEL and the operator and maintainer. Key performance indicators include tram punctuality, systems availability, systems reliability, target repair times as well as qualitative measures for cleanliness, appropriateness of passenger information provision, helpfulness of staff.
- 5.143 In addition, the impact the tram has on the wider area road network has been modelled, and the emerging effects will have to be monitored as the construction and testing is undertaken. This will ensure that any adverse impacts can be addressed as they arise through the use of various traffic management measures provided for within the TROs that are in the process of being obtained. Items such as signage and changes to traffic light sequencing and timings will be optimised in the light of experience gained with the changing traffic patterns that will emerge.

Safety and environmental effects and requirements post-completion

- 5.144 Project design considers safety risks to those who use, maintain and operate the tram system as well as other road users and parties such as NR and BAA. These are detailed in the project hazard log and are mitigated through design, procedures and maintenance. These identified mitigations will be verified during each phase of the project leading up to the final testing.
- 5.145 The case for safety will include evidence that the hazards have been mitigated to reduce the risks to as low as reasonably practicable before the system is approved to commence passenger operation. The project safety certification committee is responsible for closing the hazards and providing the assurance to the ICP under ROGs. Maintaining the ongoing safety assurance will be achieved through the TEL safety management system (Tables 5.4 and 5.5) which will encompass all elements of the tram operation and maintenance, relying on the operator safety management system for tram operation, the Infraco safety management system for tram and infrastructure maintenance and the CEC roads safety management processes for traffic signal maintenance.
- 5.146 This assurance regime will provide an integrated and comprehensive management process and will retain the services of the ICP on an ongoing basis after opening to provide independent audit and approvals for any changes to safety procedures or modifications required to the tram system.

Table 5.4. Proposed TEL integrated management system.



Summary of the Safety Management System (SMS):

- i. All safety responsibilities flow through the contractual routes to TEL as the ultimate client for Tramco, Infraco and Transdev Edinburgh Tram;
- ii. TEL's role is the overall strategic safety of the ETN and for ensuring that there are appropriate internal and external audit and management processes in place with all relevant parties;
- iii. Transdev Edinburgh Tram Limited has day to day responsibility for the operation of the ETN;
- iv. Infraco has the responsibility for the safety of the infrastructure;
- v. Tramco has responsibility for the safety of the trams;
- vi. TEL are to arbitrate in safety issues where alternative solutions impact differently on the parties concerned and consequently TEL must accept the consequences of so doing;
- vii. TEL has overall strategic policy liaison with third parties;
- viii. Contracting partners (those listed in the four right hand columns in table 5.5) co-operate with each other in the implementation of their SMSs; and
- ix. TEL manages the contract to maintain the ticket machines at tramstops directly.

Table 5.5. Summary of responsibilities under the Safety Management System.

	Transdev	Infraco	TEL	Tramco
Transdev				
Infraco	Obligations to provide safe tram and infrastructure for safety of all tram staff and passengers. Obligation on both parties to act on identified deficiencies. Obligation on Transdev to operate equipment properly.			
TEL	Overall responsibility for passenger safety, conditions of carriage and contracting party for the transportation. TEL ensure Operator performs obligations.	Infraco to provide safe tram and infrastructure. TEL to ensure Infraco performs obligations.		

	Transdev	Infraco	TEL	Tramco
Tramco	Obligation on Transdev to use equipment properly. Tramco to provide safe trams for crew and passenger safety.	Infraco to ensure Tramco performs obligations. Infraco to ensure infrastructure does not damage tram. Tramco to ensure tram does not damage infrastructure.	Tramco provides safe tram for passengers (H&S)	
Network Rail	Incident management at interface, joint responsibility, control room liaison.	Safe working at the interface – joint responsibility. Infraco ensures Tramco does not import risk to NR.	Semi-annual review meetings to discuss liaison.	Ensures Tramco does not import risk to NR.
ORR	Transdev to comply with own SMS. RIDDOR reporting.	Infraco to comply with own SMS. RIDDOR reporting.	TEL to comply with own SMS. Through Monthly Safety Management Review Meeting make sure RIDDOR reports are reviewed across the system.	Tramco to comply with own SMS. RIDDOR reporting.
HSE	None.	Construction works that are off the operational system.	Engagement through ICP for liaison.	Possible RIDDOR reporting.
CEC as Roads Authority	CEC obligations to Transdev, same as for any other road user. Remote calling of junctions. Transdev to report any unauthorised and / or unsafe work on the road.	Maintenance interfaces	Lead TRO and coordinate traffic measure refinements process. CEC obligations to TEL in connection with shared maintenance.	Tram to signalling interface.
CEC Planning	Provide input on safety implications of third party planning implications.	Provide input on safety implications of third party planning implications.	Lead in any planning applications for the system.	None.
CEC Events Management	Support TEL.	Support TEL.	Lead planning for special events, Festival etc.	Support Infraco.

	Transdev	Infraco	TEL	Tramco
Buses (LB only)	Day to day operational communication as appropriate to achieve integration.	Input to planning process for Infraco works that may impact on LB.	TEL overview.	None.
Non-bus road users	Transdev and users have mutual duty of care. Transdev to operate trams accordingly.	Infraco and users have mutual duty of care. Infraco to maintain tram infrastructure so as to assure safety of other users.	None.	Tramco to maintain tram so as to assure safety of other users.
Scotrail as Haymarket depot operator	None.	Maintenance interfaces.	None.	None.
Scotrail as station operator	Communication and action in connection with station evacuation.	Maintenance of remote PIDS.	Policy.	None.
Local residents	Transdev cooperates with Infraco in respect of noise issues.	Maintenance of noise levels. Some maintenance issues at boundaries.	None.	None.
Police, traffic enforcement	Transdev to report incidents to Police. Police to instruct tram movements under emergency and some degraded modes.	None.	Policy.	Some interfaces in connection with tram recovery.
Police, emergency	Communication. Transdev to cooperate in incident investigation	Infraco to cooperate in incident investigation.	Policy.	Tramco to cooperate in incident investigation.
Fire Brigade	Communication. Provision of communication in respect of emergency isolations.	Implementation of emergency isolations and issue permit to works to Fire Brigade.	Policy.	None.

	Transdev	Infraco	TEL	Tramco
BAA and Murrayfield	Joint incident management arrangements. Joint crowd control arrangements. Event management.	Maintenance at interfaces.	Policy.	Tramco maintains trams to Electromagnetic Compatibility standards.
Frontagers	Transdev reacts to any unauthorised works. Transdev liaises with Infraco.	Main point of contact for frontagers that wish to undertake work that may impact on the tram system. Implementation of mitigation measures for such works. Infraco liaises with Transdev.	Support Infraco and Transdev.	None.
Static advertising hoarding contractors	Transdev reacts if contractor fails to work safely.	Infraco reacts if contractor fails to work safely.	TEL manages contractors to control safety in respect of the tram system.	None.
Tram carried advertising	Transdev reacts if contractor fails to work safely or if advertising impairs safety of operation.	None.	TEL manages contractors to control safety in respect of the tram system.	Tramco reacts if contractor fails to work safely or if advertising impairs safety of trams.
Suppliers	Transdev to manage its own suppliers' safety.	Infraco to manage its own suppliers' safety.	Tel to manage its own suppliers' safety.	Tramco to manage its own suppliers' safety.
Utilities	Transdev reports any unauthorised and / or unsafe work on the road to Utility	Stray current management. EMC with Communications Utilities; Working arrangements for Utilities when on or near tramway.	Oversee stray current management.	Tramco maintains tram to EMC standards.
Third party agreement safety obligations	TBD.	Limitations on working heights at the depot and airport stop in respect of BAA.	TBD.	TBD.

5.147 Environmental management has been an integrated part of the project development, with environmental impacts and mitigation measures identified in the project Environmental Management Plan. In particular, noise, vibration and visual impact are considered. There is an obligation in the Acts to use reasonably practicable endeavours to ensure that the residual impacts are no worse than as predicted in the Environmental Statements. This has been applied during the design and will be monitored through construction and testing to ensure that they are achieved. Post completion, environmental management is a fundamental element of the Operators contract and the infrastructure contract with each being required to operate environmental management systems that comply with ISO 14001 and to discharge the obligations of the Acts and the Environmental Management Plan and Environmental Statements.

6. Governance

Background

- 6.1 The delivery of Edinburgh's integrated transport system has the following key players:
- CEC as the Authorised Undertaker under the Tram Acts, will be the user of the output from the project and is part-funder of the project;
 - TEL is a wholly-owned subsidiary of CEC which is working on the delivery of an integrated bus and tram system;
 - LB is the main bus operator in the Edinburgh City Region and is owned 91% by CEC;
 - **tie** is the delivery agent for the tram as specified by its client CEC acting through TEL; and
 - TS is the principal funder.
- 6.2 This section describes the:
- i) Project governance structure through to mid-2007;
 - ii) Period from mid-2007 to Financial Close; and
 - iii) Anticipated project governance structure for the construction period.
- 6.3 The objective of this section is to demonstrate that the project governance structure competently controlled the project while accommodating differing governance requirements applicable to different periods in the development of the project and that robust arrangements are in place for subsequent stages.

Governance structure – Period to mid-2007

- 6.4 The structure deployed in the period to mid-2007 is described in the following sections and highlights the following four key bodies, the roles of which are represented in Figures 6.1 and 6.2:
- TEL Board;
 - Tram Project Board (TPB); and
 - TPB sub-committees: Business Planning, Integration and Commercials (BPIC) and Design, Procurement and Delivery (DPD).
- 6.5 From mid-2007, following an announcement in the Scottish Parliament by the Cabinet Secretary for Finance and Sustainable Growth, changes in the governance structure were executed to reflect significant changes to the project funding arrangements. These changes are described in Sections 6.23 to 6.68 below.
- 6.6 It should be noted that sections 6.4 to 6.19 are written in the past tense as they describe a historical period. However, as is explained in Section 6.15, the structure deployed from mid-2007 retained a number of the key features of the previous structure.

Figure 6.1. Governance to mid-2007.

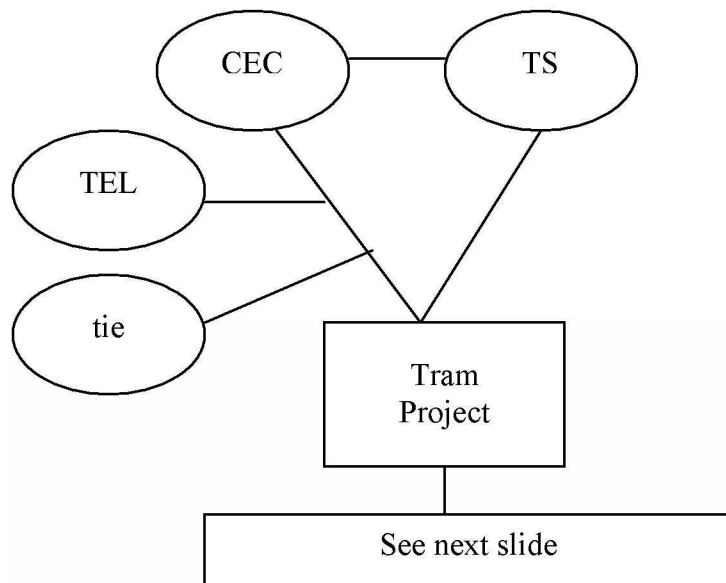
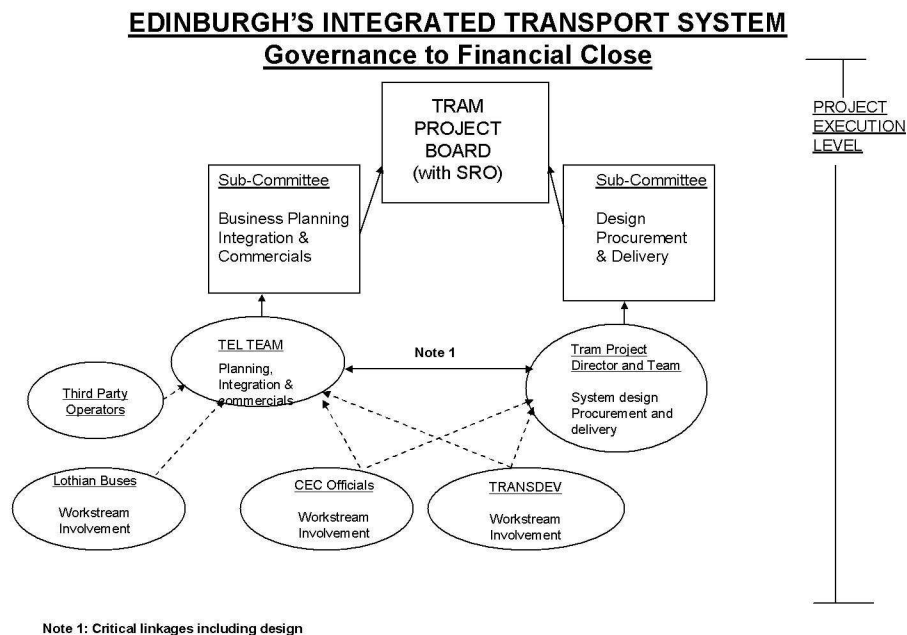


Figure 6.2. Governance to mid-2007 – Project Execution Level



6.7 The role of each body in the period to mid-2007 was as follows:

TEL Board

6.8 The role of the TEL Board was focussed on its statutory stewardship role and on its overall responsibility to deliver an integrated tram and bus network for Edinburgh, on behalf of CEC. It made the formal recommendations to CEC on key aspects of the project including Business Plan and Business Case approval, contractual commitment and matters which have a political dimension. Attendance was restricted to Directors, other than additional attendees at the

discretion of the Chairman. The TEL Board also addressed any matters outwith the direct arena of integrated bus and tram systems and any statutory TEL considerations.

TPB

- 6.9 The TPB was established as an independent body to monitor the execution of the project. In doing so, the TPB followed normal best practise in project management.
- 6.10 The membership of the TPB was 6 people (Office of Government Commerce constituency definitions “highlighted”):
- Chair;
 - Senior TS Representative;
 - Senior CEC Representative - “Senior User Representative”;
 - TEL CEO and Project “Senior Responsible Owner”; and
 - “Senior Supplier” representatives (**tie** Executive Chairman and TEL Operations Director).
- 6.11 The Chair was the TEL Non-executive Chairman, rather than the Project SRO. Other parties, principally senior project management and advisers, were called to attend as required, though a common group, including the Tram Project Director, attended most meetings.
- 6.12 The empowerment of Senior Representatives of TS and CEC enabled the TPB to act with appropriate efficiency.
- 6.13 The Senior TS Representative was empowered by TS to support all decisions made by the TPB except those matters reserved by Scottish Ministers and set out below. In particular, the milestone approval requirements set out in the grant award letter are within the approval powers of the Senior TS Representative. The Senior CEC Representative was empowered by CEC to support all decisions made by the TPB, except those matters reserved by CEC.
- 6.14 Exceptionally, the TS or CEC Senior Representatives could withhold approval of matters within their powers for further reference in their respective organisations.

TPB Sub-committees

- 6.15 Execution workstreams were categorised as either BPIC or DPD. The BPIC programme was under the direction of TEL management and was focussed on the period leading up to the submission and approval of the DFBC in late 2006. The DPD programme was under the direction of the Tram Project Director. Critical linkages and dependencies required to be managed effectively. At operational level, CEC, TS and Transdev had key involvement in many of the workstreams. The structure encompassed all workstreams and approvals needed to deliver the integrated system. In particular, the two programme leaders were required to ensure that all other project-related activities (“influencing groups”) were fully aligned with the governance structure.
- 6.16 The role of the sub-committees was to challenge and filter workstream outputs and provide recommendations to the TPB. Membership of sub-committees were partly sub-set of the TPB and partly additional advisers and stakeholder representatives. Membership varied according to the subject-matter on the table. The sub-committees had no delegated decision-making authority (except as specifically delegated by the TPB), but made recommendations to the TPB.

The tie Board

- 6.17 In addition to the four primary bodies, the **tie** Board retained a specific role, in line with its previous responsibilities, as follows:
- i) To apply quality assurance to the execution by the Tram Project Director and their team
 - ii) To make formal funding requests to TS and be accountable for expenditure; and
 - iii) To enter into contractual arrangements necessary to execute project delivery.

The **tie** Board placed reliance on the governance processes executed by the TPB in assessing the work required to execute its own responsibilities under ii and iii.

Scottish Ministers' Reserved Matters

- 6.18 The following matters were reserved by Scottish Ministers and could not be determined by the TS Senior Representative without further consultation within TS and the SE:
- Those of CECs reserved matters set out below which may be referred to the Scottish Ministers for determination;
 - Approval of the Business Case;
 - Commencement of physical works under MUDFA;
 - Entering into contracts for the delivery of tram vehicles (Tramco) or system infrastructure (Infraco);
 - Increases in Scottish Ministers' funding beyond the total of grant already offered to CEC; and
 - Decisions in relation to the application of concessionary fares to the Edinburgh Trams scheme.

CEC Reserved Matters

- 6.19 The following matters were reserved to CEC and could not be determined by the CEC Senior Representative without further consultation within CEC:
- Those TS reserved matters set out above which may be referred to the Council for additional determination;
 - Approval of the Business Case;
 - Commencement of physical works under MUDFA;
 - Commencement of physical works for Infraco;
 - Entering into contracts for the delivery of tram vehicles (Tramco) or system infrastructure (Infraco);
 - Changes to contractual costs or budgets from that previously agreed by the TPB. The formal mechanism for informing the Council to be through the TPB on which the CEC Director of Finance (or his delegate) sat. Depending upon the scope and scale of financial change, it may have been necessary to seek approval from the Council Executive or full Council;
 - Matters of substantive public interest which require political involvement, as are determined by the CEC Senior Representative;
 - Decisions in relation to the application of concessionary fares to the Edinburgh Trams scheme; and
 - Statutory processes:
 - *Prior Approvals* – All Prior Approvals are to be approved by CEC, through the planning process;
 - *Land Acquisition* – The land acquisition process where it depends upon Council agreement or use of powers must be authorised by the Council either under delegated or direct Council approval procedures (i.e. GVD, CAAD etc);
 - *Traffic Management* – Traffic Management will be facilitated by the production of both TROs and TTROs that will emerge from the approved roads design. Both TROs and TTROs will need to be approved and made by the Council;
 - *Roads and Structures design* – Facilitated through the design approval process; and
 - *Roads Demarcation Agreement* – The Roads Demarcation Agreement will detail the ownership and maintenance liabilities for future operation of the tram and its associated infrastructure. It will also detail the agreed associated financial arrangements between the operator, the maintenance contractor, **tie** and CEC, and may include a transfer of obligations / risks.

Governance structure – mid-2007 to Financial Close

- 6.20 The structure described in Sections 6.4 to 6.19 above were applicable through the period to mid-2007, including the following key milestones:
- Award of the MUDFA contract in October 2006 and subsequent mobilisation;
 - Submission to and approval by the Council of the DFBC in December 2006;
 - Development and issue of principal documents in support of the Infraco and Tramco procurements, assessment and negotiation of bidder responses throughout the period; and
 - Award of additional project funding of £60m from TS in March 2007.
- 6.21 On 27 June 2007, the Cabinet Secretary for Finance and Sustainable Growth announced that funding would be conditionally provided to continue the delivery of the Edinburgh Tram system, up to a maximum of £500m, with no further indexation for inflation. Additional funding required for the project would require to be provided by CEC or by other parties under the direction of CEC. The detail of these arrangements is explained in section 10.
- 6.22 Discussions subsequent to 27 June 2007 among the principal stakeholders determined that the changes to the governance structure set out in Sections 6.23 to 6.68 below would be implemented to reflect the revised funding arrangements.

Transport Scotland

- 6.23 The primary interests of TS, acting on behalf of the Cabinet Secretary, were summarised as follows :
- Satisfaction that the airport / Leith tramline would be delivered and in priority to all other lines;
 - Confirmation that the BCR as presented in the FBC is greater than 1.0 reflecting the absence of EARL;
 - Confirmation in the FBC that there will be no Government subsidy requirement for the integrated bus and tram operations; and
 - Adherence to proper practices designed to protect the public pound.
- 6.24 TS withdrew from the formal governance processes (TPB and sub-committees) in favour of a monitoring regime based on regular reporting and meetings with CEC, supported by audit processes and issue of regular compliance certificates in relation to grant award letter terms.

City of Edinburgh Council

- 6.25 In the light of the revised funding arrangements and, in particular, the increased risk resting on CEC's resources, CEC re-assessed its internal arrangements including the relationship between the Council, TEL and **tie**, together with the role of the TPB, and the necessity for the appropriate involvement of elected members in decisions associated with the project.
- 6.26 The principal revisions to the internal Council processes included updating of the Operating Agreements which govern the relationship between the Council and its arms length companies ; and the creation of a consultative group of senior officers within the Council (the Tram Internal Planning Group), to ensure adequate internal coordination with respect to the project, chaired by the Council's Chief Executive and involving the Directors of City Development, Corporate Services, Finance and Services for Communities, with support from the Council Solicitor, Communications and the Tram Project team.
- 6.27 In addition, the role of elected members in project decision-making was addressed and a sub-Committee of the Council's Transport, Infrastructure and Environment Committee, dedicated to the Tram Project, was established. This codified the powers reserved to elected members and those delegated to officials and facilitated communication with elected members on the key aspects of the project. The sub-Committee will be chaired by the Executive Member for Transport and will meet on a 6-8 weekly cycle. The purpose of the sub-Committee is to review