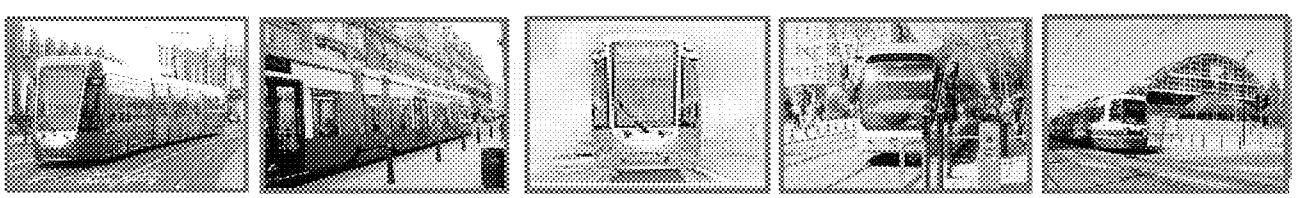
**tie Limited**
**Edinburgh Tram**

# Preliminary Design Review Report



*06 December 2006*



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"We operate a truly multi-disciplinary company with specialist project management staff trained to deliver fully integrated projects".

**Edinburgh Tram**

Preliminary Review Validation Report

*06 December 2006*

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## EXECUTIVE SUMMARY

**tie** is a delivery organisation that is charged with the delivery of the Edinburgh Tram network (ETN). It is supported by two consultancy contracts: System Design Services (SDS) and Technical Support Services (TSS).

The Preliminary Design Validation report has been developed to collate the comments made by TSS reviewers, CEC and Transdev on the documentation and associated drawings submitted by SDS during the preliminary design stage through the completion of record of review (RoRs), Design Approval Panel (DAP) proforma and Red Amber spreadsheets.

This report will comprise the current status of the preliminary design in regard to the review process, **tie/**TSS comments on drawings and documents, comments and responses resolved by SDS and issues on comments and responses not resolved and further actions required.

From the summaries presented earlier in this section of the report it is clear that there has been a lot of good work done both within the preliminary design submission and subsequent in the dialogue that has taken place between tie, SDS and TSS. Running through the disciplines the general position is:

- Track: General acceptance of the submission
- Structures: A split outcome with majority of the structures being acceptable or requiring some confirmation of coverage in the detailed design phase. There are some however that are less clear-cut and these particularly involve the charettes or outstanding decisions from CEC regarding the design requirements.
- Roads: General acceptance of current development
- Traction Power: General acceptance of current development
- Overhead Line: General acceptance of current position
- SC&S: Acceptance of the submission
- Systems: Generally accepted or accepted with conditions with the exception of Verification and Validation Plan, Hazard Log, and the Reliability Availability and Maintainability Management Plan
- Environment: General acceptance of the current position

The engineering aspects of the project seem generally to be on course with the structures a notable exception. These elements have been subject to recent interest and decisions are outstanding on certain design aspects. This is not something that SDS can be held wholly responsible for. Away from the hard engineering a number of the softer issues would appear to be outstanding. It is clear that these will require to be addressed in early course given their impact throughout the project.

Our overall conclusion is that the bulk of the Preliminary Design submission is now either acceptable or acceptable given the responses from SDS.

# PART 1 –REVIEW PROCESS

## 1 BACKGROUND

### 1.1 Introduction

**tie**, the organisation charged with the delivery of the Edinburgh Tram network (ETN) is supported by two consultancy contracts. The System Design Services (SDS) consultant is charged with producing the design of the tram infrastructure and obtaining the necessary approvals for the project. The Technical Support Service (TSS) contract provides **tie** with client-side support over a wide range of disciplines. As part of the TSS the consultant is responsible for undertaking a review of the designs that are produced by SDS.

This report provides an account of the review that has been undertaken by TSS of the preliminary design submitted by SDS at the end of June 2006.

### 1.2 Structure

Following the short account of the background to the exercise the report is structured such that it provides a summary of the process that was deployed to undertake the review and then outlines the findings of the exercise. This overview is supported by copies of the review documentation in the appendices to the report. A fourth section highlights the further actions that are required to close out the preliminary design.

The final section contains a high level overview of the findings of the review.

# 2 DESIGN PROCESS

## 2.1 Introduction

This Section of the report provides a description of how the validation of the ETN preliminary design was undertaken. It covers the process involved, and lists the documents that were reviewed.

## 2.2 Process

The original SDS preliminary design submission took place at the end of June 2006. At that time documents and drawings were delivered to **tie** via its Document Control system. This documentation was then distributed by the **tie** Design Management team to respective reviewers. The review team included the TSS provider and as such a significant amount of work was undertaken in considering the SDS submission. Packages of the documents were distributed to a number of reviewers at once in order to speed the processing time. Further drawings were made available in the Tram offices for consideration and comment.

Despite the means put in place to control the process it appears that there was some confusion regarding the co-ordination of the feedback to SDS on their submission. The problem was typified by the loss of review sheets and a lack of ownership of some of the comments made, particularly on drawings.

A part of the Preliminary Design approval process a series of Design Approval Panels met to sign-off batches of the submission. These DAPs comprised of members of the various stakeholder groups, notably Transdev, CEC and TEL. Each of these parties then marked the individual submissions relative to their quality. The outputs from these meetings showed the scoring of the documentation across the range of representation.

By mid-October it became clear that the overall review process was in somewhat disarray and required to be closed out with SDS. As a result TSS were provided with a list of the Preliminary Design Record of Review (RoR) documentation with a brief to close out the outstanding issues as far as possible and to produce a report on the overall conclusions of the preliminary design (this report).

Close Out

As described above, TSS was requested to close-out, as far as possible, the outstanding issues associated with the preliminary design. TSS was supplied with a list of the RoR forms, the DAP meeting minutes and "score" charts for the drawings which had previously been compiled by TSS as part of another exercise.

The RoR forms had been issued to SDS and had come back into **tie** with comments on the original review concerns. The DAP minutes contained only the comments from the Panel. The score charts contained the original TSS remarks on the drawings.

The process for the TSS review in this exercise is presented in the following design:

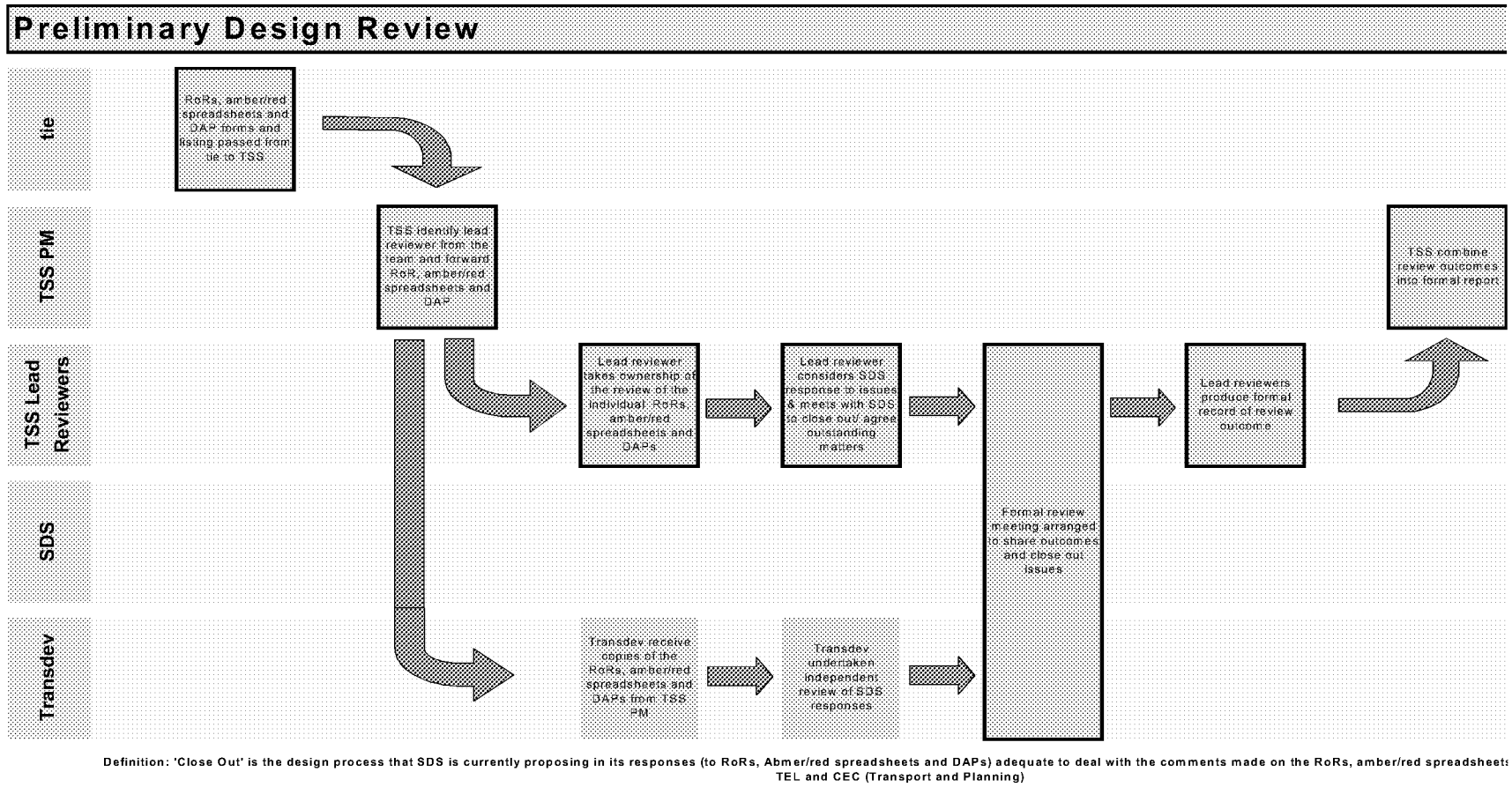


**Figure 2-1: Preliminary Design Review Process**

## 2.3 Scope

The close-out review was initiated with the delivery to TSS of a package of documentation. The scope of the review that was undertaken by TSS was based on this package alone. Appendix A contains a listing of the documentation involved.

## 2.4 Definitions

By its very nature the review that was undertaken by TSS involved a number of disciplines and because of the varied level of involvement in the project it is not always necessary for certain engineering functions to be represented on site thus a proportion of the work was carried out off-site. This made the need for a co-ordinated approach to the review an important element in the work.

Throughout the exercise the progress of the review was monitored centrally by the TSS management team and reviewers were encouraged to meet with the counterparts in SDS and the stakeholders who may have input to tie review.

# PART 2 –DESIGN REVIEW

Part 2 of the report provides a summary of the findings of the review from the respective disciplines

## 3 TRACK

### 3.1 Introduction

This section of the report provides a summary of the review undertaken for the track designs.

### 3.2 Review & Evaluation

Overall Subsystem

The Trackform is still a significant area of concern. It is apparent that this is not currently feeding into the trackform design and that the current trackform is being designed on first principles rather than on the basis of a robust and thoroughly thought out proposal, which offers the best all-round solution. Although it was acknowledged that the contractor may later suggest an alternative proposal it is deemed as being the responsibility of the designer to examine the various solutions to propose the best all-round solution. The contractor would then have to provide a sound argument as to why another solution was being adopted.

ETN Section/Location Specific Items

Section 1

- All of the ROR comments have been addressed and have or will be closed out by SDS.
- The DAP was not fully carried out at Preliminary Design Stage due to the number of Charette Changes proposed for this section. However, for those drawings that were reviewed all the comments raised in relation to the track design have subsequently been addressed and have or will be closed out by SDS. Unfortunately it has not been possible to address all of the comments made by City of Edinburgh Council Planning and Transportation Departments, TEL Ltd, Transdev PLC nor those of **tie** Ltd. (other than those for Track).
- All the Drawings annotations raised in relation to the track design have been addressed and have or will be closed out by SDS. Unfortunately it has not been possible to fully address all of the annotations made other than for those for Track.

Section 2

- All of the ROR comments have been addressed and have or will be closed out by SDS.

- All of the DAP comments have been addressed and have or will be closed out by SDS. Unfortunately it has not been possible to address all of the comments made by City of Edinburgh Council Planning and Transportation Departments, TEL Ltd, Transdev PLC nor those of the **tie** Ltd. (other than those for Track).
- All of the Drawings annotations have been addressed and have or will be closed out by SDS.

Section 3

- All of the ROR comments have been addressed and have or will be closed out by SDS.
- All of the DAP comments close out narrative have been addressed and have or will be closed out by SDS. Unfortunately it has not been possible to address all of the comments made by City of Edinburgh Council Planning and Transportation Departments, TEL Ltd, Transdev PLC nor those of the **tie** Ltd. (other than those for Track).
- All of the Drawings annotations have been addressed and have or will be closed out by SDS. Unfortunately it has not been possible to fully address all of the annotations made other than for those for Track.

Section 5

- All of the ROR comments have been addressed and have or will be closed out by SDS.
- All of the DAP comments have been addressed and have or will be closed out by SDS. Unfortunately it has not been possible to address all of the comments made by City of Edinburgh Council Planning and Transportation Departments, TEL Ltd, Transdev PLC nor those of the **tie** Ltd. (other than those for Track).
- All of the Drawings annotations have been addressed and have or will be closed out by SDS with the exception of those dependent on third party agreement with Network Rail. Unfortunately it has not been possible to fully address all of the annotations made other than for those for Track.

Section 7

- All of the ROR comments have been addressed and have or will be closed out by SDS.
- All of the DAP comments have been addressed and have or will be closed out by SDS. Unfortunately it has not been possible to address all of the comments made by City of Edinburgh Council Planning and Transportation Departments, TEL Ltd, Transdev PLC nor those of the **tie** Ltd. (other than those for Track).
- All of the Drawings annotations have been addressed and have or will be closed out by SDS.

### 3.3 Summary of Remaining Issues

- The Trackform is still a significant area of concern. It was suggested that a workshop be held in order to gain a consensus decision to the approach adopted.
- For the acceptance of track design there is a requirement for the relationship between the track geometry and the normal maximum operating speed to be understood in order to assess compatibility with accepted design criteria from both a safety, maintenance and passenger comfort perspective. This is not currently discernable. In addition, Transdev have a requirement for a drawing showing all speed restrictions and reason e.g. Geometry, Road Speed, sighting etc. It is suggested that further discussion is required between all parties to determine requirements.
- It is unclear as to the extent of the design activities carried out by the designer and those of the Infraco's track installation contractor in relation to Detailed S&C Design. It is suggested that further discussion is undertaken between all parties, to determine the extent of design/construction scope and CDM responsibilities.
- Another area of concern relates to gauging information. In some cases this is being addressed by other SDS disciplines such as Structures. However, in other instance such as lineside signs, SC&C or urban infrastructure this is not clear. For the acceptance of the track design clearance drawings to all infrastructure where appropriate should be provided by the track discipline. It is suggested that further discussion between all parties takes place.
- A large area of concern has been the IDC process. From information recently received from SDS it is apparent that the IDC was only carried out following the issue of the Preliminary Design. However, with a sufficiently robust IDC process it is acknowledged that aspects of the scheme such as drainage that would normally be expected to be included as part of the track design could be undertaken by another team and does not have to be shown on the track drawings. SDS proposes to implement an on-going IDC process at which high-level representation would be welcomed from **tie** and Transdev at these sessions.

### 3.4 Conclusions

It is the considered option that:

- On balance the remaining issues are such that it is considered that subject to obtaining confirmation from SDS that such issues will be picked up early in detailed design then PD can be closed out.

# 4 STRUCTURES

## 4.1 Introduction

The purpose of this document is to collate the comments made by TSS-Structures, CEC and Transdev on the structures AIP's and associated drawings submitted by SDS during the preliminary design stage and record the current status in regard to the overall preliminary design.

## 4.2 Review & Evaluation

Overall Subsystem

The review and evaluation of the AIP's and associated drawing(s) took several forms. These were:

- Record of Reviews (ROR) by TSS-Structures submitted to SDS for response, which were then accepted or further comments made.
- A similar ROR process for structures which City of Edinburgh Council (CEC) were an interested party. These comments being transferred onto the relevant DAP Proformas by others.
- Annotations on the preliminary drawings produced for each structure for which initially no formal record of review was prepared. The comments were subsequently transferred to a spreadsheet entitled "Preliminary Design – Client Feedback SDS Response Form" for SDS's response following their review of the annotations on the drawings. It should be noted that many of the drawings have been revised since the annotations were appended and many of the comments have been addressed.

The current status of this process for each of these sets of comments for each structure on the ETN is given below.

ETN Section / Location Specific Items

The Edinburgh Tram Network is divided into several sections containing the various structures as given below. It should be noted that these sections are taken from the DAP Proformas and that these included 2 Section 7's which have been denoted 7A and 7B below and that there is no Section 4:

Section 1A

- S16 - Victoria Dock Entrance Bridge
- S17 - Tower Place Bridge
- W01 – Lindsay Road Retaining Wall

Section 1B

- S18 - Leith Walk Railway Bridge

Section 2A

- S19 – Haymarket Station Viaduct
- S20 – Russell Road Bridge

Section 3A

- S01- Roseburn Terrace Bridge
- S02 – Coltbridge Viaduct
- S03 – St George's School Access Bridge
- S04 – St George's School Footbridge
- S05 – Ravelston Dykes Bridge
- S06 – Craigleith Drive Bridge
- S07 – Holiday Inn Access Bridge
- S08 – Queensferry Road Bridge
- S09 – Groathill Road South Bridge
- S10 – Telford Road Bridge
- S11 – Drylaw Drive Bridge
- W02 – Ferry Road Retaining Wall
- W100 – Roseburn Retaining Walls

Section 3B

- S12 – Crewe Road Gardens Bridge

Section 5

- W03 & W04 – Russell Road Retaining Walls 1 & 2
- S23 – Carrick Knowe Underbridge
- S27 – Edinburgh Park Station Bridge

Section 5A

- S21A - Roseburn Street Viaduct
- S21B – Murrayfield Stadium Retaining Wall
- S21C – Murrayfield Stadium Underpass
- S21D – Murrayfield Training Pitches Retaining Wall
- S21E – Water of Leith Bridge
- W08 – Baird Drive Retaining Wall
- S22 – Balgreen Road Bridge
- W09 – Balgreen Road Retaining Wall 1

Section 5B

- S26 – South Gyle Access Bridge
- W11 – Bankhead Drive Retaining Wall

Section 5C

- S28 – A8 Underpass

Section 6

- S32 – Depot Access Bridge
- W16 – A8 Retaining Wall

Section 7A

- S30, S31 & S34 – Gogar Culverts
- W14 – Gogar Burn Retaining Walls

Section 7B

- S29 – Gogar Burn Bridge
- S33 - EARL Underbridge

Miscellaneous

Please note that the following structures were not included on any of the DAP Proformas given to TSS-Structures:

- S24 – Saughton Road Bridge
- S25 – Broomhouse Road Bridge
- W17 – Depot Internal Retaining Walls
- W18 – Murrayfield Tramstop Retaining Wall
- W19 – Gyle Stop Retaining Wall

Section 1A

S16 - Victoria Dock Entrance Bridge

- In regard to the ROR process no further significant comments are expected regarding this structure, which would prevent detail design work commencing.
- In regard to the DAP Proforma CEC have accepted the responses made by SDS to their comments, but note that a minimum 2m footway is to be provided as per Tower Place. Provided this is agreed then detail design should be able to proceed. There is an outstanding comment regarding the provision of costs for the non-preferred options, but this should not prevent detail design commencing.

- Transdev have commented on the need for consistency on the project in regard to the lateral clearances. The SDS responses go someway to answering this comment, but this should be reviewed at an early stage of the detail design to ensure it has been adequately addressed.

S17 - Tower Place Bridge:

- In regard to the ROR process no further significant comments are expected regarding this structure, which would prevent detail design work commencing.
- In regard to the DAP Proforma SDS have satisfactorily responded to the comments on V1 of the AIP, but TSS Structures has no details of the SDS response for CEC comments on V2 of the AIP issued on 12 October 2006 for this structure. It should be noted that this structure is subject to a charette to agree the final form of the structure. If necessary, this will require the AIP and associated drawing(s) to be revised and go through the preliminary design review process and therefore detail design will be unable to commence until this has been satisfactorily completed.
- Option Two for this structure is now being further developed and therefore comments on Option One and Three no longer need to be considered. In regard to Option Two Transdev have commented on the need for consistency on the project in regard to the lateral clearances.

W01 – Lindsay Road Retaining Wall:

- In regard to the ROR process the SDS response to TSS Structures comments on V1 of the AIP made on 20 July 2066 is awaited, although there are no comments, which would prevent detail design commencing.
- In regard to the DAP Proforma SDS have responded to the comments on V1 of the AIP issued on 28 July 2006, but TSS Structures has no details of the CEC reply to these responses.
- SDS has responded satisfactorily to the annotations/comments on the drawing(s) for this structure.

Section 1B

S18 - Leith Walk Railway Bridge:

- In regard to the ROR process the SDS response to TSS Structures comments on V1 of the AIP made on 12 May 2066 is awaited, although there are no comments, which would prevent the structural assessment commencing.
- In regard to the DAP Proforma, SDS has intimated that the comments are addressed in the resubmitted and accepted AIP for the assessment.
- The SDS responses have adequately answered the annotations/comments on the drawing(s) for this structure.

Section 2A

S19 – Haymarket Station Viaduct:

- In regard to the ROR process the revised AIP is awaited to confirm the responses to TSS Structures comments on V1 issued on 22 May 2006 have been implemented, although no further significant comments are expected regarding this structure, which would prevent detail design work commencing.
- In regard to the DAP Proforma, SDS has intimated that the comments are addressed in the resubmitted and accepted AIP.
- The SDS responses have adequately answered the annotations/comments on the drawing(s) for this structure.

S20 – Russell Road Bridge:

- In regard to the ROR process revised AIP received confirming responses to TSS Structures comments have been implemented apart from some minor issues to be dealt with during detail design. No further significant comments are expected regarding this structure, which would prevent detail design work commencing.
- In regard to the DAP Proforma, SDS has intimated that the comments are addressed in the resubmitted and accepted AIP.
- There appeared to be no drawing(s) for this structure included in the package of preliminary drawings provided for annotation.

Section 3A

S01- Roseburn Terrace Bridge:

- In regard to the ROR process no further significant comments are expected regarding this structure, which would prevent detail design work commencing.
- In regard to the DAP Proforma, SDS has intimated that the comments are addressed in the resubmitted and accepted AIP.
- The drawing(s) annotations indicate that Transdev are concerned about the lateral dimensions shown on the drawing(s). The DKE of the tram varies from structure to structure as do the lateral clearances and walkway dimensions shown. They are anxious that this matter is resolved early in the detail design stage to ensure consistency and economy throughout the project. Other issues annotated are minor in nature and should not prevent the detail design progressing. It should be noted that the drawing(s) annotations have not been transferred to the "Preliminary Design – Client Feedback SDS Response Form" therefore SDS have no mechanism to respond on this structure.

S02 – Coltbridge Viaduct:

- In regard to the ROR process no further significant comments are expected regarding the current structure, which would prevent detail design work commencing, although planning issues are still pending which when addressed will need to be reviewed.
- In regard to the DAP Proforma, this structure is subject to a charette to agree the final form of the cantilever walkway. If necessary, this will require the AIP and associated drawing(s) to be revised and go through the preliminary design review process and therefore detail design will be unable to commence until this has been satisfactorily completed. SDS has responded that three options for this structure have been produced. The structure is now subject to a 'red' light from the DAP and they await further instruction.
- There are no annotations/comments on the drawing(s) for this structure.

S03 – St George's School Access Bridge:

- In regard to the ROR process no further significant comments are expected regarding this structure, which would prevent detail design work commencing.
- In regard to the DAP Proforma, SDS has intimated that the comments are addressed in the resubmitted and accepted AIP.
- The annotations on the drawing(s) indicate that the location of the "Detail Retaining Wall" shown is not clear in the Plan and that it will be necessary to show the lateral clearances in the Plan as they vary on the approaches to the structure and at the structure. These should be addressed at detail design stage. It should be noted that the annotations on the drawing(s) have not been transferred to the "Preliminary Design – Client Feedback SDS Response Form" therefore SDS have no mechanism to respond on this structure.

S04 – St George's School Footbridge:

- In regard to the ROR process no further significant comments are expected regarding this structure, which would prevent detail design work commencing.
- In regard to the DAP Proforma, SDS has intimated that the comments are addressed in the resubmitted and accepted AIP.
- There are no annotations/comments on the drawing(s) for this structure.

S05 – Ravelston Dykes Bridge:

- In regard to the ROR process no further significant comments are expected regarding this structure, which would prevent detail design work commencing.
- In regard to the DAP Proforma, SDS has intimated that the comments are addressed in the resubmitted and accepted AIP.

- The annotations on the drawing(s) note that a barrier is required on each side of the carriageway over the bridge, but the form, currently detailed as an "Edinburgh Pattern Pedestrian Handrail", will require to be discussed. SDS response notes this has been provided at CEC's request and **tie** will require to indicate if an alternative is to be provided. In addition, the annotations on the drawing(s) ask if the crossfall shown on the footpath under the bridge should be in the opposite direction similar to that provided on platforms. SDS response intimates that it falls towards the carriageway for drainage purposes. A decision by **tie** is required to clarify this matter.

S06 – Craigleith Drive Bridge:

- In regard to the ROR process no further significant comments are expected regarding this structure, which would prevent detail design work commencing.
- In regard to the DAP Proforma, SDS has intimated that two options have been produced for this structure, which is subject to a 'red' light and are awaiting further instructions.
- The annotations on the drawing(s) indicate that Transdev are concerned about the lateral dimensions shown on the drawing(s). The DKE of the tram varies from structure to structure as do the lateral clearances and walkway dimensions shown. They are anxious that this matter is resolved early in the detail design stage to ensure consistency and economy throughout the project. It should be noted that the annotations on the drawing(s) have not been transferred to the "Preliminary Design – Client Feedback SDS Response Form" therefore SDS have no mechanism to respond on this structure.

S07 – Holiday Inn Access Bridge:

- In regard to the ROR process no further significant comments are expected regarding this structure, which would prevent detail design work commencing.
- In regard to the DAP Proforma, SDS has intimated that the comments are addressed in the resubmitted and accepted AIP.
- The annotations on the drawing(s) indicate that Transdev are concerned about the lateral dimensions shown on the drawing(s) and the need for consistency. SDS response intimates that these will be in keeping with the standard cross section for the Roseburn Corridor. SDS has responded to the other annotations satisfactorily.

S08 – Queensferry Road Bridge:

- In regard to the ROR process no further significant comments are expected regarding this structure, which would prevent detail design work commencing.
- In regard to the DAP Proforma, SDS has intimated that all comments pertaining to this structure have now been agreed with CEC Structures and the AIP has been accepted in principle. However, prior to formally accepting the AIP, a structural assessment is ongoing that may affect the carriageway works detailed within the AIP document.

Following completion of the assessment, the AIP can either be amended or formally accepted.

- The annotations on the drawing(s) and responses are as for S05 Ravelston Dykes Bridge.

S09 – Groathill Road South Bridge:

- In regard to the ROR process no further significant comments are expected regarding this structure, which would prevent detail design work commencing.
- In regard to the DAP Proforma, SDS has intimated that the comments are addressed in the resubmitted and accepted AIP.
- The annotations on the drawing(s) indicate that Transdev are concerned about the lateral dimensions shown on the drawing(s) and the need for consistency. The 300mm proposed between the trams and similar clearances at other structures both between the trams and to structures may encourage someone to stand at these locations thinking they are safe from being struck bearing in mind this impression may be enhanced given that the actual tram dimensions is less than the DKE. Transdev are of the opinion that the minimum clearance at such locations may be preferable. Consideration should be given to amending this at detail design stage. A comment regarding the footpath crossfall similar to S05 Ravelston Dykes Bridge needs to be resolved at an early stage of the detail design stage. The SDS response intimates the clearances and direction of crossfall they are providing at this structure with which Transdev are in disagreement are as indicated above for S05 Ravelston Dykes.

S10 – Telford Road Bridge:

- In regard to the ROR process no further significant comments are expected regarding this structure, which would prevent detail design work commencing.
- In regard to the DAP Proforma, SDS has intimated that the comments are addressed in the resubmitted and accepted AIP.
- The annotations on the drawing(s) are in regard to lateral clearances and footpath crossfall as noted under S09 Groathill Road South. In addition, the annotations on the drawing(s) make the same comment in regard to the provision of the "Edinburgh Pattern Pedestrian Handrail" as under S05 Ravelston Dykes Bridge.

S11 – Drylaw Drive Bridge:

- As this structure is now to be demolished, the comments on the AIP and associated drawing(s) are no longer relevant.

W02 – Ferry Road Retaining Wall:

- In regard to the ROR process no further significant comments are expected regarding this structure, which would prevent detail design work commencing. Minor issues to be dealt with during detail design.
- In regard to the DAP Proforma, SDS has intimated that discussion is ongoing with CEC Structures as the revised LOD local to the structure has provided the opportunity to greatly reduce the scope of the retaining structures at this location. This work is ongoing.
- The annotations on the drawing(s) indicate that Transdev are concerned about the lateral dimensions shown on the drawing(s). The DKE of the tram varies from structure to structure as do the lateral clearances and walkway dimensions shown. They are anxious that this matter is resolved early in the detail design stage to ensure consistency and economy throughout the project. It should be noted that the annotations on the drawing(s) have not been transferred to the "Preliminary Design – Client Feedback SDS Response Form" therefore SDS have no mechanism to respond on this structure.

W100 – Roseburn Retaining Walls:

- In regard to the ROR process, SDS response is awaited on TSS Structures comments on V1 of the AIP issued on 21 July 2006, although no further significant comments are expected regarding this structure, which would prevent detail design work commencing. Minor issues to be dealt with during detail design.
- In regard to the DAP Proforma this structure was missing from the comments/responses in the Design (Quality) section and SDS response is awaited on CEC comments on V1 of the AIP issued on 2 October 2006.
- The annotations on the drawing(s) indicate that Transdev are concerned about the lack of lateral dimensions and cross-sections shown on the drawing(s). SDS has responded intimating that this will be developed during detail design.

Section 3B

S12 – Crewe Road Gardens Bridge:

- In regard to the ROR process TSS Structures has accepted the SDS responses to comments made on V1 of the AIP, no further significant comments are expected regarding this structure, which would prevent detail design work commencing.
- In regard to the DAP Proforma, SDS has intimated that the comments are addressed in the resubmitted and accepted AIP.
- The annotations on the drawing(s) indicate that Transdev are concerned about the lateral dimensions shown on the drawing(s), the 680mm clearance to the structure is not consistent with other structures although this is determined by the existing structure and the 460mm passing clearance may not be adequate for centre OLE poles understood to

be proposed at this location. The SDS response indicates the latter will be determined by the permanent way design.

Section 5

W03 & W04 – Russell Road Retaining Walls 1 & 2

- In regard to the ROR process a revised AIP is awaited to confirm that the outstanding comments on the original AIP have been addressed, together with confirmation from SDS that clause 3.76 of the Requirements Specification ULE90130-SW-SW-SPN-00049 V2 which states that the parapet is to be designed for 1.2 kN/m horizontal loading and height to be 1.25m has been superseded as they state, although other than these issues no further significant comments are expected regarding this structure, which would prevent detail design work commencing.
- In regard to the DAP Proforma, CEC have accepted the SDS responses on their comments on the original AIP although the issue regarding the design loading on the proposed parapet as noted above which was also raised by CEC is still outstanding.
- The annotations on the drawing(s) indicate that Transdev are concerned about the lateral dimensions shown on the drawing(s). The DKE of the tram varies from structure to structure as do the lateral clearances and walkway dimensions shown. They are anxious that this matter is resolved early in the detail design stage to ensure consistency and economy throughout the project. Other issues annotated are minor in nature and should not prevent the detail design progressing.

S23 – Carrick Knowe Underbridge:

- In regard to the ROR process TSS Structures has accepted the SDS responses to comments made on the AIP and no further significant comments are expected regarding this structure, which would prevent detail design work commencing, although planning issues are still pending which when addressed will need to be reviewed. It should be noted that SDS has agreed that the Category III check for this structure will be carried out by a third party organisation.
- In regard to the DAP Proforma, CEC have accepted the SDS responses to their comments on the AIP. It should be noted that this structure is subject to a charette to agree the final form of the structure. If necessary, this will require the AIP and associated drawing(s) to be revised and go through the preliminary design review process and therefore detail design will be unable to commence until this has been satisfactorily completed.
- The annotations on the drawing(s) indicate that Transdev are concerned regarding lateral clearances and the requirement for consistency on the project. The note regarding tram envelope to be confirmed by others should be removed as the DKE to be assumed in the design has now been agreed. There is no indication of the OLE on the structure and the curvature on the approach may make positioning the OLE difficult with the current layout. This should be addressed early in the detail design stage. The requirement for a P6

parapet at this location is questioned as the tram will have it's own containment slab, but SDS advise this has been discussed with Network Rail and they are awaiting formal acceptance of the proposal. The provision of a P6 parapet may affect sighting and speed at this location. The painted yellow line to demarcate the safe walking route is not consistent with other structures and gives rise to a maintenance problem. The walkway of 1200mm is not consistent with those provided at other structures. The headroom at this structure is significantly greater than at S33 EARL Underbridge. Consideration to be given to reducing this during detail design if possible to save on construction costs.

S27 – Edinburgh Park Station Bridge:

- In regard to the ROR process a response is awaited on the TSS Structures comments on the original AIP although no further significant comments are expected regarding this structure, which would prevent detail design work commencing, although planning issues are still pending which when addressed will need to be reviewed.
- In regard to the DAP Proforma, CEC have accepted the SDS responses to their comments on the AIP. It should be noted that this structure is subject to a charette to agree the final form of the structure. If necessary, this will require the AIP and associated drawing(s) to be revised and go through the preliminary design review process and therefore detail design will be unable to commence until this has been satisfactorily completed.
- The annotations on the drawing(s) indicate that Transdev note that the drawing(s) show a P5 parapet at this structure whereas a P6 parapet is proposed at S23 Carrick Knowe and a 3C containment parapet at S33 EARL Underbridge. There appears therefore to be some inconsistency regarding the level of containment at the structures crossing the railway. This point has not been addressed in the SDS response and should be clarified prior to detail design commencing. The headroom at this structure (5800mm) and S23 Carrick Knowe (6000mm) is significantly greater than at S33 EARL Underbridge (4780mm). Although the SDS response intimates that electrification clearance for Network Rail is 5800mm and will be used at S23 & S27 if consideration was given to reducing this to 4780mm which it is understood permits future electrification then there would savings on construction costs for these two structures. Although SDS intimate that the clearances are in accordance with RSPG, Transdev feel there is inconsistency as the clearances differ at Carrick Knowe from this structure. This should be clarified early in the detail design stage to ensure consistency.

Section 5A

S21A - Roseburn Street Viaduct:

- In regard to the ROR process the revised AIP was received 15 November 2006 and reply to SDS responses to comments on original AIP issued 28 August 2006. Revised AIP to be checked to ensure responses have been incorporated, although no further significant comments are anticipated which would prevent detail design commencing.

- In regard to the DAP Proforma SDS have agreed that a Category III check is appropriate for this structure. As this requires the appointment of an independent consultant to carry out the check this should be put in hand a soon as possible.
- The annotations on the drawing(s) indicate that Transdev are concerned regarding lateral clearances and the requirement for consistency on the project although the annotation merely states, "Lateral dimensions". SDS has recently responded intimating that the lateral dimensions are shown.

S21B – Murrayfield Stadium Retaining Wall:

- In regard to the ROR process the revised AIP is awaited, although no further significant comments are anticipated which would prevent detail design commencing. Reply to SDS responses to comments on original AIP issued 9 October 2006.
- In regard to the DAP Proforma SDS advise that the derailment containment will be addressed as part of the track form design. This should be checked at detail design stage to confirm the adequacy of the proposals.
- There appeared to be no drawing(s) for this structure included in the package of preliminary drawings provided for annotation.

S21C – Murrayfield Stadium Underpass:

- In regard to the ROR process the revised AIP was received on 5 October 2006 and reply to SDS responses to comments on original AIP issued 13 October 2006. No further significant comments are anticipated which would prevent the detail design commencing. Note that the current AIP deals with the construction of the new underpass and not the infill option.
- In regard to the DAP Proforma, SDS advise that differential settlement will be considered at detail design stage upon receipt of the results of the geotechnical investigation and that in relation to the protection of the waterproofing, appropriate protective material used in the heavy rail industry will be determined during detail design stage. Provided the material chosen to protect the waterproofing is one approved by Network Rail this should not prevent approval being given. These issues should be checked at detail design stage.
- There appeared to be no drawing(s) for this structure included in the package of preliminary drawings provided for annotation.

S21D – Murrayfield Training Pitches Retaining Wall:

- In regard to the ROR process the revised AIP is awaited, although no further significant comments are anticipated which would prevent detail design commencing. Reply to SDS responses to comments on original AIP issued 9 October 2006.

- In regard to the DAP Proforma SDS advise that the derailment containment will be addressed as part of the track form design. This should be checked at detail design stage to confirm the adequacy of the proposals. The proposed flood scheme at this location requires to be taken into account during the detail design of this structure.
- There appeared to be no drawing(s) for this structure included in the package of preliminary drawings provided for annotation.

S21E – Water of Leith Bridge:

- In regard to the ROR process the revised AIP awaited. The reply to SDS responses to TSS-Structures comments on original AIP was issued on 18 August 2006. The form of the structure was agreed at the recent structures charette. This is based on the preferred option, but with constant depth main girders. This does not affect the ROR of this structure and should not prevent detail design commencing.
- In regard to the DAP Proforma SDS advise that the derailment containment will be addressed as part of the track form design. This should be checked at detail design stage to confirm the adequacy of the proposals. It is understood that the form of the structure was agreed at the recent structures charette. This is based on the preferred option, but with constant depth main girders. This should not affect progressing with the detail design of this structure.
- The annotations on the drawing(s) indicate that Transdev are concerned about the lateral dimensions shown on the drawing(s). The DKE of the tram varies from structure to structure as do the lateral clearances and walkway dimensions shown. They are anxious that this matter is resolved early in the detail design stage to ensure consistency and economy throughout the project. It should be noted that the annotations on the drawing(s) have not been transferred to the "Preliminary Design – Client Feedback SDS Response Form" therefore SDS have no mechanism to respond on this structure.

W08 – Baird Drive Retaining Wall:

- In regard to the ROR process the revised AIP is awaited, although no further significant comments are anticipated which would prevent detail design commencing. The reply to SDS responses to TSS-Structures comments on original AIP was issued on 18 August 2006.
- In regard to the DAP Proforma SDS advise that the derailment containment will be addressed as part of the track form design. This should be checked at detail design stage to confirm the adequacy of the proposals
- There are no annotations/comments on the drawing(s) for this structure.

S22 – Balgreen Road Bridge:

- In regard to the ROR process the revised AIP awaited and response awaited to TSS-Structures comments on original AIP issued on 11 July 2006, although no further significant comments are anticipated which would prevent detail design commencing. It should be noted that the AIP reviewed was for the re-use of the existing Network Rail structure. This structure is subject to on-going discussions with Network Rail and it is likely that the form and location of the bridge may change leading to the submission of a revised AIP submission.
- In regard to the DAP Proforma SDS advise that the derailment containment will be addressed as part of the track form design. This should be checked at detail design stage to confirm the adequacy of the proposals
- There are no annotations/comments on the drawing(s) for this structure.

W09 – Balgreen Road Retaining Wall 1:

- In regard to the ROR process the revised AIP is awaited, although no further significant comments are anticipated which would prevent detail design commencing. The reply to SDS responses to TSS-Structures comments on original AIP was issued on 16 August 2006.
- In regard to the DAP Proforma SDS advise that the derailment containment will be addressed as part of the track form design. This should be checked at detail design stage to confirm the adequacy of the proposals. It is understood that there are Network Rail issues regarding access at this structure that will require to be resolved by tie.
- There are no annotations/comments on the drawing(s) for this structure.

Section 5B

S26 – South Gyle Access Bridge

- In regard to the ROR process the revised AIP received 2 November 2006 and review outstanding, although no further significant comments are anticipated which would prevent detail design commencing. Reply to SDS responses to TSS-Structures comments on original AIP issued 18 August 2006.
- In regard to the DAP Proforma SDS advise that they do not believe a Category III check as suggested by CEC is required at this structure. This and all other responses have been accepted by CEC.
- The drawing(s) annotation on drawing 00403 Section B-B indicates that Transdev are concerned about the lateral dimensions being consistent for the whole project. It should be noted that the drawing(s) annotation has not been transferred to the "Preliminary Design – Client Feedback SDS Response Form" therefore SDS have no mechanism to

respond on this. There are no annotations/comments on the other drawing(s) for this structure.

W11 – Bankhead Drive Retaining Wall:

- In regard to the ROR process the revised AIP was received on 2 November 2006 and review outstanding, although no further significant comments are anticipated which would prevent detail design commencing. The reply to SDS responses to TSS-Structures comments on original AIP was issued on 18 August 2006.
- In regard to the DAP Proforma no comments have been included under the heading Design (Quality) on the DAP Proforma for this structure although in response to CEC query on the ROR form regarding the combined services pipe SDS have responded that nature and depth of services/sewer pipe is to be confirmed and that text in AIP will be amended to reflect this.
- The annotations on the drawing(s) indicate that no lateral dimensions are given. SDS has intimated that these will be confirmed during detail design and are not critical to the design solution. This issue should not prevent the detail design progressing although they require to be addressed at an early stage to define the location of the wall.

Section 5C

S28 – A8 Underpass:

- In regard to the ROR process comments on the revised AIP were issued on 8 November 2006 and closed out in regard to the structure. Comments received from Roads Section regarding traffic management for the construction of the structure are to be appended to the ROR form. These are as follows:

Para 1.2 the actual speed limits from the A720 should be checked to confirm where the 50mph limit changes on the city bypass approach
Para 3.7.1 The TTM lane widths will need to be checked for compliance with Chapter 8 -TSM. Also the setback and working widths for the TVCB need to be accounted for.

- In general the plans are schematic and some of the indicated layouts and direction changes need to be enhanced and smoothed out - see particularly the W/B diverge shown on drawing BRG-00527. On this drawing the detail of the start of the TVCB is probably not acceptable - no "flare" away from oncoming traffic.
  *The effects on delays to all traffic using Gogar roundabout and the impacts of the loss of vehicle stacking area between it and Mayberry junctions will need to be accepted by the Roads Authorities before adopting the proposed construction phasing.*
- In regard to the DAP Proforma SDS advise that abnormal loading is catered for by 45 units of HB loading. CEC should confirm that this is satisfactory and that no other abnormal loading need be catered for. Comments received from Roads Section to be appended to the ROR form.

- The annotations on the drawing(s) indicate that Transdev have asked if the headroom could be reduced from the present 5m to reduce construction costs of the structure and the approach works and if the centre rail is required. SDS has recently responded intimating that the 5m headroom shown at preliminary design stage is to allow some 'contingency' should the services in the A8 carriageway be at a lower level and that the containment requirements will be taken into account within the design of the track slab. The walkway at this location is 850mm compared to 700mm at other locations therefore consistency is required. The DKE is not symmetrical on the vehicles shown in Section A-A. SDS has responded that the Generic cross section was used in preliminary design and that the difference is probably due to the allowance for cant on some of the structures. Is there a requirement for a handrail? Is the wall facing required? SDS has responded intimating that the facing is required and exact details will be confirmed at detail design stage. The query regarding the handrail was not transferred onto the Response Form. The drawing annotations also indicated that there was no indication of lighting in the 65m+ tunnel. SDS has responded that this will be confirmed through detail design. In addition to the foregoing, the carrier drain shown should be taken into account in the main drainage scheme. These issues should not prevent the detail design progressing although they require to be addressed at an early stage.

Section 6

S32 – Depot Access Bridge:

- In regard to the ROR process the revised AIP is awaited, the original AIP was reviewed on 20 July 2006. SDS responses to TSS Structures comments are awaited.
- In regard to the DAP Proforma SDS has advised the reasons why the structure is not fully integral as suggested should be the case by CEC. It is understood that CEC are still keen that this structure should be fully integral for maintenance and access reasons and this matter requires to be resolved prior to detail design commencing.

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W16 – A8 Retaining Wall:

- In regard to the ROR process the revised AIP is awaited the original AIP was reviewed on 4 July 2006. SDS responses to TSS Structures comments are awaited.
- In regard to the DAP Proforma it should be noted that no comments have been included under the heading Design (Quality) on the DAP Proforma for this structure. The traffic impact of the proposed depot entrance is as yet undetermined and may affect the location and design of the structure when known. Please note that any impact on the retaining wall may have a knock on effect on the adjacent Depot Access Bridge. These issues will require to be resolved prior to detail design commencing.
- The annotation on drawing RTW-00521 asks, "Where is the stone facing?" although this has been transferred onto the Response Form as "store". SDS has responded that they do not understand the comment. The query arises, because Transdev understand that CEC requires a stone facing to this structure although this is shown in Sections A-A, B-B

& C-C of the drawing and is more clearly detailed as "facing brickwork" on drawing RTW-00522 in "Detail 1".

Section 7A

S30, S31 & S34 – Gogar Culverts:

- In regard to the ROR process no further significant comments are expected for these structures in respect to the original AIP which was reviewed, which would prevent detail design work commencing although it is noted that SDS have intimated that a revised AIP will be submitted which will require review.
- In regard to the DAP Proforma SDS advise that a revised AIP will be submitted to address the comments.
- SDS responses address the annotations made on the drawing(s).

W14 – Gogar Burn Retaining Walls:

- In regard to the ROR process no further significant comments are expected for these structures in respect to the original AIP which was reviewed, which would prevent detail design work commencing although it is noted that SDS have intimated that a revised AIP will be submitted which will require review.
- In regard to the DAP Proforma this structure was missing from the comments/responses. A response is awaited from SDS on CEC comments.
- The annotations on the drawing(s) indicate that Transdev are concerned about the lateral dimensions shown on the drawing(s). The DKE of the tram varies from structure to structure as do the lateral clearances and walkway dimensions shown. They are anxious that this matter is resolved early in the detail design stage to ensure consistency and economy throughout the project. Other issues annotated are minor in nature and should not prevent the detail design progressing.

Section 7B

S29 – Gogar Burn Bridge:

- In regard to the ROR process the revised AIP is awaited, although no further significant comments are anticipated which would prevent detail design work commencing. The original AIP was reviewed on 23 June 2006. Reply to SDS responses to TSS-Structures comments on the original AIP was issued 18 August 2006.
- DAP close out narrative SDS advise that details of the flooding criteria upon which the proposed design has been based has been forwarded by means of two No. 'Technical Notes' TMSDS/11/001 and TMSDS/11/003 issued to Bob McCafferty of CEC. CEC will

require to respond on this matter prior to detail design progressing if they have not already done so.

- The annotations on the drawing(s) indicate that Transdev are concerned about the apparent excessive width of the structure and thus its cost in comparison to the generic cross-sections. SDS has recently responded intimating that the cross section is based on the track alignment provided to the Structures team and as track cant etc is unknown at preliminary design stage an allowance in the overall deck width was made to cater for this. SDS intimated that the alignment would be rationalised during the detail design stage to give the optimum solution. Other issues annotated such assuming the voids between the prestressed beams are filled with foam concrete and the size of the OLE support plinth are minor in nature and should not prevent the detail design progressing although Transdev perceive a maintenance problem with the void between the beams although this area should require no maintenance, but perhaps require measures to prevent pigeons from nesting etc. SDS has confirmed that OLE support plinth is indicative only and that there is no fill between the beams.

S33 - EARL Underbridge:

- In regard to the ROR process the revised AIP awaited, although no further significant comments are anticipated which would prevent detail design work commencing. The original AIP was reviewed on 13 July 2006. Reply to SDS responses to TSS-Structures comments on the original AIP was issued 28 August 2006.
- In regard to the DAP Proforma SDS have responded to the comments on V1 of the AIP issued on 6 July 2006, but TSS Structures has no details of the CEC reply to these responses.
- The annotations on the drawing(s) indicate that Transdev are concerned about the vertical and lateral clearance dimensions shown on the drawing(s) together with the proposals being acceptable to Network Rail. The DKE of the tram varies from structure to structure as do the lateral clearances and walkway dimensions shown. They are anxious that this matter is resolved early in the detail design stage to ensure consistency and economy throughout the project. SDS has recently responded that the assumed DKE has been used throughout the design and that Network Rail has given feedback regarding their requirements at this structure. Other issues annotated such as the track slab being drawn thinner than the bridge slab although stated as being thicker, the services to outwith the DKE and the size of the OLE support plinth are minor in nature and SDS has responded that these are either a misinterpretation of the drawing or will be addressed during the detail design stage.

Miscellaneous

S24 – Saughton Road Bridge:

- In regard to the ROR process, as this structure currently carries two guided bus lanes which will be converted to carry trams it has been subject to a structural assessment

which concludes it is capable of carrying the proposed trams, but that this will be reviewed when the tram design is finalised. Therefore at present no AIP has been prepared for review.

- This structure has not been included on the DAP Proformas.
- The annotations on the drawing(s) indicate that Transdev are concerned that no OLE has been shown on the structure. SDS has responded that no OLE will be positioned on the structure.

S25 – Broomhouse Road Bridge:

- In regard to the ROR process, as this structure currently carries two guided bus lanes which will be converted to carry trams it has been subject to a structural assessment which concludes it is capable of carrying the proposed trams, but that this will be reviewed when the tram alignment is finalised. Therefore at present no AIP has been prepared for review.
- This structure has not been included on the DAP Proformas.
- The annotations on the drawing(s) indicate that Transdev are concerned that no OLE has been shown on the structure. SDS has responded that no OLE will be positioned on the structure.

W17 – Depot Internal Retaining Walls:

- In regard to the ROR process as these structures are dependent on the depot layout no AIP has been issued for review at present.
- This structure has not been included on the DAP Proformas.
- No drawings have been issued in regard to these structures at present.

W18 – Murrayfield Tramstop Retaining Wall:

- In regard to the ROR process TSS-Structures has reviewed the AIP and issued their comments on 10 November 2006 to which a response is awaited from SDS.
- This structure has not been included on the DAP Proformas. CEC has reviewed the AIP and issued their comments on 23 November 2006 to which a response is awaited from SDS.
- Annotations on the drawing(s) close out narrative

W19 – Gyle Stop Retaining Wall:

- In regard to the ROR process TSS-Structures has reviewed the AIP and issued their comments on 10 October 2006 to which a response is awaited from SDS.
- This structure has not been included on the DAP Proformas. CEC has reviewed the AIP and issued their comments on 1 November 2006 to which a response is awaited from SDS.
- No drawings were available for this structure to annotate at the time the review was carried out.

### 4.3 Summary of Remaining Issues

There are a number of issues on the project relating to structures which are not yet resolved. As stated for many of the structures above Transdev have concerns regarding the clearances and wish to see consistency throughout the project. SDS have intimated in one of their responses that the assumed DKE has now been used on all of the structures which should resolve most of the concern regarding structures clearances etc. although these should be checked early in the detail design process to ensure that Transdev are satisfied that this is the case. Before detail design can commence it will be necessary to confirm the actual tram loading against that currently assumed to avoid abortive design work being carried out should this prove to be more onerous. Many points have been addressed with the revisions to the AIP's and drawing(s) since the comments on the AIP's were made and the annotations made on the preliminary drawing(s) however, the outstanding issues are given for the relevant structure in conclusion below.

### 4.4 Conclusions

- It is therefore our considered opinion that provided a copy of the accepted AIP is provided to **tie** and the clearances and DKE issues raised by Transdev are addressed at an early stage the PD can be closed out for S18 Leith Walk Railway Bridge, S19 Haymarket Station Viaduct, S20 Russell Road, S01 Roseburn Terrace Bridge, S03 St George's School Access Bridge, S04 St George's School Footbridge, S05 Ravelston Dykes Bridge, S09 Groathill Road South Bridge, S10 Telford Road Bridge and S12 Crewe Road Gardens Bridge. Provided SDS adopts CEC's comment regarding the provision of a 2m wide footway the PD can also be closed out for S16 Victoria Dock Entrance Bridge.
- However, on balance the remaining issues are such that it is considered that subject to obtaining confirmation from SDS that such issues will be picked up early in detailed design then the PD can be closed out for the following structures. W01 Lindsay Road Retaining Wall and W100 Roseburn Retaining Walls if SDS responses to TSS comments are acceptable and CEC accepts SDS responses. For S08 Queensferry Road Bridge detail design can commence when outcome of structural assessment is known. Upon SDS clarifying the handrailing loading detail design can commence on W03 & W04 Russell Road Retaining Walls 1 & 2. Provided revised AIP's for S21A Roseburn Street

Viaduct, S21B Murrayfield Stadium Retaining Wall, S21C Murrayfield Stadium Underpass, S21D Murrayfield Training Pitches Retaining Wall, W08 Baird Drive Retaining Wall, S26 South Gyle Access Bridge, W11 Bankhead Drive Retaining Wall have incorporated the changes agreed by SDS to the comments made by TSS and CEC, detail design can commence on these structures. For S28 A8 Underpass confirmation is required from CEC that 45 units of abnormal loading is satisfactory and traffic management issues to be resolved at an early stage before detail design can commence. Provided the revised AIP satisfactorily deals with the comments made by CEC the detail design can commence for S30, S31 & S34 Gogar Burn Culverts. Provided the revised AIP for W14 Gogar Burn Retaining Walls satisfactorily deals with the comments made by TSS and CEC then detail design can commence. Provided CEC accept the SDS responses to their comments on S33 EARL Underbridge detail design can commence. Provided the responses awaited on the TSS and CEC comments on the AIP's for W18 Murrayfield Tramstop Retaining Wall and W19 Gyle Stop Retaining Wall are accepted then detail design can commence on these structures.

- There are still significant issues that remain to be resolved in regard to the following structures and therefore the PD for these cannot be presently be closed out. For S17 Tower Place Bridge a reply to CEC comments on V2 of AIP from SDS is awaited and this structure is subject to charette, S02 Coltbridge Viaduct is subject to a charette, S23 Carrick Knowe is subject to a charette and SDS require to take cognisance of Transdev's comments on this structure and S27 Edinburgh Park Station Bridge subject to charette. The AIP for S21E Water of Leith Bridge has recently been revised to take cognisance of the charette noted above and detail design may commence when this has been through the preliminary design review process. For S06 Craigleith Drive Bridge SDS are awaiting further instructions on which of two options they have prepared is to be adopted. The revised LOD local to W02 Ferry Road Retaining Wall has resulted in the reduced scope of the retaining wall requirement and preliminary design work in connection with this is ongoing. For S32 Depot Access Bridge the issue regarding whether the bridge should be fully integral or not requires to be resolved with CEC prior to detail design commencing. In addition to the revised AIP for W16 A8 Retaining Wall being outstanding, the traffic impact of the new depot entrance may have an affect on the location and extent of this retaining wall and in conjunction with this the location of the Depot Access Bridge. Detail design should not commence until this issue is resolved. In addition, no AIP has been received for W17 Internal Depot Retaining Walls and a revised AIP is required for S22 Balgreen Road Bridge as a new structure is required at this location rather than the re-use of existing a currently shown on the AIP. As the location of S22 Balgreen Road Bridge is liable to alter it is likely that the location and extent of W09 Balgreen Road Retaining Wall will alter and therefore a new AIP will be required for review. The flooding issue at S29 Gogar Burn Bridge will require to be resolved with CEC before detail design can commence. AIP's for S24 Saughton Road Bridge and S25 Broomhouse Road Bridge have not yet been issued as they depend on the final tram alignment.

# 5 ROADS

## 5.1 Introduction

The section covers the review of the roads preliminary design scheme.

## 5.2 Review & Evaluation

Overall Subsystem

The following sections of this report outline clearly all significant issues that remain to be resolved. However, it should be noted that the remaining issues are such that it is considered that subject to ongoing consultations (between all the relevant parties in the lead up to the design submissions) and consequently obtaining substantiation from SDS, these will be picked up and cleared out early in detailed design process.
It is also fundamental that the SDS must prove that the PD2 model, or the subsequent revisions there of, demonstrates that all the junction layout designs are suitable and within capacity.

ETN Section/Location Specific Items

ROR close out

- In the Scope of the Roads Technical Design Statement, additional topographical survey information is listed as one of the items of data required to progress the design. Confirmation is required of when this will become available. SDS need to confirm that the survey information is now being made available for the Detailed Design Stage.
- General Design Assumptions - The junction capacity testing stated in the Roads Technical Design Statement as being undertaken in the detailed design phase, need to tie in with the relevant TM programmes for MUDFA implementation and for the TRO process.
- Drainage Concerns – SDS need to cover how they intend to establish existing drainage details. They have stated that CEC have no existing drainage plans. In the past SDS have referred to consultations at detailed design stage. We would have expected that preliminary discussions would have started by now.
- (See also Drawings close out narrative below)

DAP close out

- Pedestrian island widths – all pedestrian island widths have been designed to DMRB Departmental Standard TD50/04 (1.5m min), and not CEC guidance (1.85m min). Consideration will need to be given in detailed design to making these islands compliant with CEC standards, where possible.
- Lane width reduction, acute crossing angles of the tramway and footway width reductions will all need to be addressed at detailed design.
- Road Safety Audit comments will need to be addressed at detailed design.

- Side roads may require signalisation from a safety view point - need to be considered during detailed design.
- Details to be to Standards for Streets requirements
- Use of guard rails and introduction of signage need to be addressed
- Toucan signals should be shown where appropriate
- Excessive lengths of tactile paving have been used
- Details of cycle integration at junctions required
- Hatching areas will need to be reviewed
- Improvements required to pedestrian movements to access tram stops. (Some awkward paved areas and sections where tram interface with footway.)

Charettes sessions were held prior to, during and after the submission of the Preliminary Design to discuss a number of locations in particular on Section 1 which had been identified as having outstanding issues in terms of junction layout, tram stop location, use of road space for parking/loading etc. The purpose of these sessions was to propose possible solutions, which would aid SDS in the preparation of design that would satisfy all parties including CEC Planning.

The following are the effects of the Charettes/planning summits at the given locations (DAP panel yet to review):

- Haymarket Junction - SDS are currently investigating a crossroads option but are retaining the kidney shaped roundabout as a contingency. However the full effects of this junction were not known until the modelling result of PD2. (See also Preliminary Design 2 below)

Shandwick Place - the proposed changes were not feasible and the PD1 solution of the central tramstop is retained.

- Princes Street - the central tramstop will be positioned more centrally longitudinally in Princes Street and there is a potential change of the turning movements at the Mound.
- St Andrew Square - SDS are currently developing a solution where the tramway will run on St Andrew Street only but the choice of central island against side platform tramstops has not yet been made. Harvey Nichol's access/loading requirements have been identified as a key-influencing factor. CEC Transport would prefer the central platform whereas CEC Planning prefer the side platform option. This design has to be integrated with the Capital Streets public realm project.
- Picardy Place - SDS are currently developing a large triangular circulatory with contraflow bus lane across west side to assist with bus interchange. This enables the reinstatement of the historic alignment of a street in front of the cathedral.
- Leith Walk - SDS currently developing improved parking/loading provision by using variations in tramway alignment along with alternative to central OLE poles i.e. side

poles or building fixings. The issue of how to enforce the banned right turns on Leith Walk is still outstanding if there is to be no central reservation.

- Constitution Street - tramstop to be moved into Constituiton Street from Foot of the Walk.

Preliminary Design 2 (PD2)

It was originally planned that there would be one Preliminary Design submission from SDS and this was made at the end of June 2006. However, CEC were unwilling to sign off on untested junction layouts where the junctions were deemed to have potential traffic capacity issues and therefore required a further review when the modelling results had been assimilated. This affects all of Sections 1B, 1C and 1D and Ferry Road Junction. This has resulted in the Preliminary Design being split into PD1 and PD2.

The relevant modelling results have been provided to SDS by the JRC (based on opening year flows) and the supplementary PD2 submission is not entirely convincing. PD2 should include modelling information to back up the junctions which have been demonstrated to operate satisfactorily and reworked layouts for those which do not work. As the model has in some instances been based on superseded drawings it will in these cases need to be revisited.

Drawings close out

In general the drawings have been well presented however the following will need to be addressed prior to Detailed Design submissions:

- The drawings are based on an old topographical survey, which does not reflect what is on the ground (e.g. CETM measures are excluded). Confirmation is required that 'local grid' refers to survey grid. (Other section drgs state they are based on 'local OS grid', which doesn't appear to make sense). Updated survey should be undertaken as a matter of urgency. SDS need to confirm and make sure that the survey information will be available for the Detailed Design Stage.
- Notes state that drawings are based on OS Local Grid although it appears to be a survey at most locations. This is confusing and the base background is not extensive enough for most drawings.
- Matchlines and street names are required to be added throughout.
- The legends on the junction detail drawings are incomplete for traffic signal symbology.
- The presentation of the drawings varies between teams for different sections. Generally there are enough markings to indicate how roads/junctions operate. Some are more detailed with respect to signs and markings.
- No structural works have been shown on the drawings. Basic structure locations should be shown on the Roads Design Drawings. Further co-ordination with the Structures team so that structures are indicated more clearly on drawings will provide a better understanding.
- At all roundabouts the issue needs to be addressed in the detailed design of clearing circulating traffic prior to the green tram signal.

- Taxi provisions are not shown but they should generally be included in bus lanes and consideration should be given to the specific needs of taxi operators.
- Wherever the tram crosses a side road close to the mainroad serious consideration should be given to the provision of signal controls to mitigate the risk of drivers (as they look over their shoulder) failing to sight oncoming trams.
- Generally the approach to the provision of controlled/uncontrolled pedestrian crossings should be reviewed, ie it is not necessarily appropriate to have controlled tramway crossings in the vicinity of controlled traffic junctions.
- Diagram numbers for traffic and tram signs are missing from many drawings
- Sections are required at specific locations where there are issues tying track and road levels together, e.g. St Andrew Square junctions.
- There are some inconsistencies with presentation of road markings (e.g. all proposed markings should be shown in red).
- Drawings could show further details such as dimensions and a clearer background to get a better understanding of the surrounding area.

### 5.3 Summary of Remaining Issues

- Signalised junctions and uncontrolled crossings

  SDS have made the statement that pedestrian and cyclist crossings of the tramway in the vicinity of signalised road junctions will also be signalised, which is not necessarily appropriate. Signalised crossings of the tramway are not commonplace in existing tramway systems in the UK and the RSPG recognises passive signing as the normal provision with the need for signals being dictated by ped/vehicle flows and visibility. SDS stated that for Section 1 all pedestrian crossings are close to signalised junctions and therefore will be controlled as one junction and that splitting signalised junctions and uncontrolled crossings will lead to confusion as well as reduced operational efficiency of the road network. They have also said that there will be a few exceptions in Sections 2, 3, 5 and 7 where pedestrian crossings will be uncontrolled.

  Transdev do not recommend controlled crossings of the tramway. This aspect of the design does not appear acceptable as it currently stands. SDS will need to adopt a solution, which will be accepted by all parties. This has been commented upon in the Preliminary Design reviews and in the Roads Design Working Group meetings and is being addressed in ongoing consultations. (tie's involvement/intervention may be required as this will inevitable need to be bottomed out.)

- PD2 Preliminary Design 2 (PD2)

  With the submission of PD2, there were no projections of traffic flows into the future. This would determine the likely impact on future junction capacity, and would assist in identifying the future patterns of traffic displacement and the wider impact this will have. There was no assessment made on the impacts on adjacent junctions and road network due to increased traffic delays.

Also the inaccuracies and omissions of data made it difficult to properly evaluate the submission and as stated previously; the relevant modelling results which have been provided to SDS by the JRC (based on opening year flows) and the supplementary PD2 submission is not entirely credible. PD2 should include modelling information to back up the junctions, which have been demonstrated to operate satisfactorily and reworked layouts for those which do not work. (As the model has in some instances been based on superseded drawings it will in these cases need to be revisited in detail for the next phase.)

- Drawings

  Clearly, there are many issues still outstanding that will need to be addressed in order to smooth the way for the next phase of the works. Some comments refer to information we would more often than not, but not always see at PD. However this does not exempt SDS from their obligations to close out all of these issues. We will most definitely expect to see that, that is the case for the Detailed Design to progress.

## 5.4 Conclusion

With respect to the roads design working group meetings and the general design development, in several instances we are looking at a snap picture in time of what are ongoing live documents and drawings. (Some of the drawing and documents in the PD are covering areas that are under constant design change or alterations.) As stated and outlined in the previous sections of this report, there are still significant issues that remain to be resolved. However on balance the remaining issues are such that it is considered that subject to ongoing consultations (between all the relevant parties in the lead up to the design submissions) and obtaining confirmation from SDS that these issues will be picked up early in detailed design, then PD can be closed out.

# 6 OVERHEAD LINE EQUIPMENT

## 6.1 Introduction

This PD validation report covers the preliminary design deliverables as provided by SDS for the overhead line equipment (OLE) elements of the Edinburgh Tram Network. This includes selection of equipment type, and layout design including pole positions, method of support and parallel feeder cables. It should be noted that in the street-running sections there is a very close interface with the roads layout. Power supplies, traction substations and the feeding and sectioning arrangements form a separate design package and hence are covered in a separate PD validation report.

## 6.2 Review & Evaluation

The documents provided to support the preliminary design are as follows:

- Overhead line equipment proposal plans showing support method (centre pole, side pole, headspan etc.) by geographical area
- Example cross sections of the various support types
- Equipment option report
- Outline OLE layout plans
- OLE technical specification.

### Overall Overhead Line System

The proposed overhead line system for the ETN consists a single contact wire per track, reinforced by buried parallel feeder cables. A simple catenary system was covered in the OLE Option Report but was not taken forward into the design as the additional complexity outweighs the benefits. The contact wire will be supported by centre poles, side poles or headspans to suit the location concerned.

A notable fault of the OLE layout plans as initially submitted was that the OLE shown was based on out of date track layouts while showing the current ones. Therefore in places there was a significant mismatch between the track alignment and OLE. As a result the Section 1 were marked as 'not accepted'. These mismatches have been rectified in a revised suite of drawings provided for InfraCo tender purposes, although it should be noted that the Section 1B – 1D drawings which cover the areas subject to charettes have been revised again and are still subject to further change. In general the method of OLE support originally proposed remained valid despite the mismatch and the choice of centre or side poles etc. was carried forward to the revised drawings.

Another point made on a number of the drawings was the locations where the track interval and curvature appeared appeared unsuitable for centre poles unsuitable. However the initial comments were made based on significantly pessimistic assumptions regarding tram DKE, and on applying those for the assumed tram vehicle these areas appear to be suitable for centre poles as proposed. SDS nevertheless responded that these areas would checked.

OLE layouts showed the pole identification prefixes to be by nearest tramstop, rather than by electrical section identifier as described in the Electrical Nomenclature Report. This has been addressed in the revised drawings, although some identifiers will change due to the revised substation names agreed with Scottish Power. It should be noted that the nearest tramstop nomenclature used was as per the original requirements specification.

ETN Section/Location Specific Items

Section 1

It was commented that with the removal of the 'dog-leg' in the track across the road outside North Leith Sands substation that the change to reduced tension equipment could be moved further towards Ocean Terminal. This has been incorporated in the revised layouts.
There was also no provision for the centre reversing / holding road at Ocean terminal – this has also been rectified.

The emergency crossovers in York Place and Shandwick Place were also not adequately covered. In the case of York Place, the crossover was shown, but the OLE wiring was not – this has since been rectified although the crossover has been moved to a less favourable position relative to the junction with Easter St East and the feeds and section insulators for Cathedral (now Cathedral Lane) substation. Shandwick Place crossover, which forms the west end turnback when Princes St is closed for events, is not shown on the base track layout and hence there is correspondingly no OLE wiring for it. This has not been addressed in either the InfraCo tender or charette plans and remains outstanding, although this is really a track and operational issue rather than being driven by OLE.

Section 2

Other than comments concerning passing clearances to poles as covered in section 2.1 above, comments on this section were very minor and there are no outstanding issues. The OLE arrangement as designed includes wiring the West to North chord at Roseburn Junction, but this uses independent wire runs so there will be no effect on the Roseburn corridor and airport routes if the chord is not built.

Section 3

One observation in the RoR was that the position of the OLE poles on the same side of the track as the cycleway could be a useful part of the demarcation between the cycleway and tramway. No action was required against this, but at the Design Approval Panel concerns were raised that the poles could obscure a tram driver's view of those on the footpath / cycleway. The layout has therefore been revised to use twin-track cantilevers on the side away from the cycleway, except where this is impractical, for example anchor poles for the Outer Track wire runs.

The RoR expressed concern about the attachment of twin-track cantilevers, with their inherently higher overturning moment, on Coltbridge viaduct. At the DAP it was agreed that the design would remain as proposed and that suitable fixing arrangements would be developed by the SDS's structural engineers.

At Granton Square the RoR highlighted that the preliminary plans did not have the scissors crossover at the West end of the tramstop wired, or any provision for the holding bay(s) to the East of it. Both these issues have been resolved in the revised plans although it should be noted that only the outer track has the holding facility.

Section 5

A number of comments in this section were regarding passing clearances to centre poles, particularly on small radius curves. SDS's response was that these would be investigated the suggested changes

incorporated where possible. This has been closed out as, for example, the approaches to Carrick Knowe underbridge have been changed to TTC's on the outside of the curves.

No wire run was shown for Edinburgh Park Station crossover – this is incorporated in the revised plans, however a further minor revision will be required as it has been requested that the crossover be trailing rather than facing as currently shown.

In the vicinity of the depot West entrance, where line runs alongside the retaining wall for the A8 Gogar roundabout sliproad, some of the poles were, and still are, shown very close to the retaining wall. Confirmation that fixings to the retaining wall will be possible is required. Two of these are poles are balance weight anchors which will complicate any wall fixings.

The suggestion in the RoR that the overlap just South of Edinburgh Park TS be made into an insulated overlap for isolator DS3 BG has been taken up in the revised plan.

Section 6 – Gogar Depot.

In certain areas the arrangement of wire runs shown, particularly those going out to anchor, is such that very high radial loads on the registration arms and supporting poles would be generated. This needs to be addressed during the detailed design phase.
The RoR also stated that section insulators are required in the centre of the workshop on roads 4 & 5 to permit half road isolations, and that the western half of road 5 be wired. Exact sectioning and isolation arrangements are still the subject of discussions between SDS, Transdev and **tie**, and these need to be agreed before the resulting arrangement is applied to the OLE layout. This can, but must, be resolved as soon as possible in the detailed design phase.

As shown the OLE poles in the depot are prefixed 'DEP' which is rather unwise given the standard meaning of this abbreviation (designated earthing point). The comment suggested that the pole identifiers be prefixed with the electrical section identifier, as per the main line. This needs to be incorporated in the next revision of the drawing. It is accepted that including the chainage in the pole identifier is impractical in the depot and it is therefore suggested that the simple sequential numbering used is retained.

Section 7

Other than those concerning passing clearances to poles, the only RoR comment was that the OLE layout for the scissors crossover at the airport needed to be revised to account for the altered crossover position. This has been closed out in the revised (InfraCo tender) drawings.

### 6.3 Summary of Remaining Issues

Sections 1B to 1D are still subject to further refinement of the track and roads layout, and the corresponding OLE will need to be reviewed and modified as appropriate when the layouts are finally agreed. It is accepted that the changes are likely to be minor, and can be closed out in the detailed design phase.

Isolation and sectioning arrangements in the depot workshop need to be agreed and the outcome cascaded to the OLE layout as described in section 2.2.5 above and in the Traction Power PD Closeout report.
Pole positions and their mounting arrangements at the western entrance to Gogar Depot need to be given detailed consideration due to the A8 sliproad retaining wall. This may necessitate some reorganisation of tension lengths if the balance weight anchors cannot be accommodated.

## 6.4 Conclusion

Whilst there are certain issues outstanding, the tensioning methods, support arrangements, and pole positions proposed form a workable design which should meet **tie**'s requirements. The preliminary design can therefore be closed out with the qualification that the remaining issues are addressed as soon as possible in the detailed design phase.

# 7 TRACTION POWER

## 7.1 Introduction

This PD validation report covers the preliminary design deliverables as provided by SDS for the traction power elements of the Edinburgh Tram Network. This includes power supplies, traction substations and the feeding and sectioning arrangements for the overhead line equipment (OLE). The OLE layout and supporting arrangements form a separate design package and hence are covered in a separate PD validation report.

## 7.2 Review & Evaluation

The documents provided to support the preliminary design are as follows:

- Feeding & sectioning plans for the city loop; airport line; and the depot
- Single line protection & tripping schematic for exemplar substation
- Exemplar substation layouts for containerised substations
- Geographical location plans for each substation
- Substation equipment specification covering all InfraCo supplied equipment
- System earthing policy and stray current management reports.

Overall Traction Power System

The proposed traction power supply system for the ETN consists of eleven traction substations and one track paralleling (TP) hut, generally located at approximately 2-2.5km intervals and (except for the TP hut) supplied from Scottish Power's 11kV network. Discussions with Scottish Power concerning the HV configuration, naming of substations and the source of supply in SP's network are well advanced.

Between adjacent substations, the overhead lines for the inbound and outbound or inner & outer lines will be cross connected and fed as a single electrical section. The major item of contention in the overall power supply arrangement was that SDS's original proposal was to have the ETN transformer rectifier fed directly from SP's 11kV ring main unit circuit breaker, as has been done on Sheffield Supertram. TSS supported this arrangement as a minimum capital cost and substation size option, however it became apparent that Scottish Power had serious reservations about this arrangement where their equipment would be responsible for protecting the customer's. The feeding & sectioning arrangements have therefore been revised to include an additional ETN-owned HV circuit breaker protecting the rectifier.

It should also be noted that positions for the traction substations have been fixed, and that names for them, which need to be common to Scottish Power, have since been agreed.
Comments on the substation single line protection & tripping diagram included the following:
The requirement to interlock the rectifier negative isolator and DC circuit breaker – this has been included on the when it was revised to include the additional HV circuit breaker.
That the control room hard-wired mass trip should also go to the rectifier DC circuit breaker. SDS stated that the intention of this was to isolate all OLE sections, rather than the DC busbar, and that this would involved an additional action in restoring supplies. This is accepted.

A further comment questioned whether the earth leakage trip would immediately trip the DC circuit breakers at the far ends of the OLE sections as well as the local ones. SDS's response that this would be that case, to minimise possible equipment damage, is accepted.

ETN Section/Location Specific Items

Sections 1, 2 & 3

Feeding & Sectioning Diagrams

ROR comments on the feeding & sectioning plans for section 1 relate to the requirement to be able to individually isolate & earth down the platform roads at Newhaven Road, the ability to isolate and earth the outer track at Ocean Terminal to allow cleaning of the front of the Ocean Terminal building, and the positioning of section isolators relative to Shandwick Place and Picardy Place tramstops and emergency crossovers. These have now been revised to be operationally appropriate, although it should be noted that the base track layout still does not show Shandwick Place crossover. Clearly this is not a traction power issue but it is important to the operation of the network as the Operational & Performance Requirements Specification states that Shandwick Place will be the West End turnback location when Princes St is closed (and the OLE isolated correspondingly).

The other comments, both in the ROR and annotated concerned the arrangements at Russell Road TP Hut, and the necessity to avoid having three circuit breakers feeding into a section. It has been agreed that interlocking will be considered.

Comments annotated on the feeding & sectioning drawings mainly concerned the provision of earth positions on the section isolators. These are required to allow earthing of the OLE for personnel safety during maintenance work, without the use of temporary or 'portable' earths. SDS's view is that earth positions will only be provided where there is a specific requirement, as to cover all possible isolations two isolators back-to-back would be required at each location. This item is yet to be closed out and as it is an operational safety matter requires a concensus between SDS, **tie** and Transdev.

Substation Layouts

Leith Sands, Craigleith, and Granton Mains were accepted without any ROR comments. For Leith Walk, Granton Road (now to be named Granton View) and Cathedral, it was requested that locations for the trackside isolators be identified. In the case of Cathedral the trackside isolators are shown, but in the substation compound which is a considerable distance from the connections to the OLE (which will be by the York place / Easter Street East junction). The first two will be addressed by the inclusion of a trackside isolator compartment in the exemplar substation container.

Cathedral substation, being a bespoke installation in an existing building, requires a detailed layout plan of the same scale and level of detail as provided for the exemplar containerised substations. The submission was initially marked as 'not accepted – resubmit for this reason, but as it has no interdisciplinary impact it was accepted on the basis that the aforementioned plans are provided at the detailed design stage.

Sections 5 & 7

Sectioning & Feeding Diagram

The main ROR comment on the sectioning diagram for sections 5 & 7 was to move the section insulators for Gogar Depot (main line) substation so that they lie between the east and west entrances to the depot. This has been addressed in the revised sectioning diagram. Minor comments relating to ensuring that the sectioning diagram reflects the current track layout, such as removing the loop between Saughton Road and South Gyle Access, have also been addressed in the revised sectioning diagram.

Substation Layouts

ROR comments on the substation location plans for this section concerned awkward road access into Jenners Depository substation – also highlighted at the DAP. This will be resolved at detailed design stage by the roads design. Comments on Ingliston Park & Ride substation included the requirement for provision (or at least passive provision) of a fourth DC circuit breaker for the Newbridge Branch and the trackside isolator cubicle position limiting vehicle space in the compound. Both of these will be closed out by the revised exemplar substation layout design.

Depot

Depot sectioning ROR comments concerned the requirement to provide a second emergency feed from the main line towards Ingliston, and to ensure that all depot sub-sections have an alternative feed – these has now been incorporated in the revised sectioning diagram. Those comments marked up on the drawing were to have all workshop roads electrified, with a definite requirement that each workshop road be split into two sub-sections to permit half road isolations. This creates safety issues with working around the boundary between the two sections. There are several possible solutions with varying degrees of complexity and operational flexibility, but this is yet to be resolved.

Substation Layout

The layout of the depot substation was considered as part of the depot buildings review rather than traction power so is not covered in this review.

## 7.3 Summary of Remaining Issues

There are two main issues which are still to be resolved. The first is whether all section isolators are to be specified with earth positions to allow the isolators to be used as the earthing points for personnel safety, or if the system is to use designated earthing points (DEPs) along with portable earths. It is accepted that the Princes Street section will have such earth positions on the isolators at both ends.

The second concerns the isolation and sectioning arrangements in the depot workshop as described in section 2.2.3 above.

Both these issues require a concensus between SDS, **tie** and Transdev and although they do not prevent progress into the detailed design phase, they must be resolved then, particularly as these two areas will be subject to HMRI scrutiny.

## 7.4 Conclusion

Whilst there are certain minor but significant issues outstanding, the concept and intended implementation of the traction power system as proposed is sound and will form a robust system well able to achieve **tie**'s requirements. The preliminary design can therefore be closed out with the qualification that the remaining issues are addressed as soon as possible in the detailed design phase.

# 8 SUPERVISORY CONTROL & COMMUNICATIONS

## 8.1 Introduction

SDS has produced a preliminary design for the Supervisory Control & Communication (SCC) subsystem of the Edinburgh Tram Network. The original submitted preliminary design has been reviewed by **tie**, Transdev and CEC through the preliminary design review process.
This document take cognisance of the "Records of Review", "Design Approval Panel forms" and submitted drawings in attempting to draw conclusion as to whether the Preliminary Phase of the project can be closed out

## 8.2 Review & Evaluation

The original preliminary design submission did not match **tie's** expectation as it largely comprised a series of logical design parameters depicting the concept of how certain remote infrastructure elements were to be supervisions and controlled.

The whole submission was on a 'system-wide' perspective and had no application to the geography of the Edinburgh Tram Network.

These two issues and a stream of associated items made the original submission wholly unacceptable and it was therefore rejected by **tie** and SDS were instructed to take the prescribed remedial actions and resubmit a compliant preliminary design. This scenario applied collectively to the design specification and drawings submitted, comments to all of which were captured Record of Review and Design Approval Panel Pro-forma.

The SDS SCC Design Team have since worked with **tie** and have produced a revised specification (ULE90130-SW-Rep-00167 V4 is the one upon which this report is based) and a revised set of drawings.

## 8.3 Summary of Remaining Issues

The collaborative work between **tie** and the SDS SCC design team have proved most fruitful. The resubmitted design specification and attached drawings have lead to a mutually acceptable conclusion.
The revised submission has been reviewed by tie and a further Record of Review has been created, which concludes that the resubmitted design is acceptable with comments. However, the points raised in the RoR have not yet been shared with Transdev.

## 8.4 Conclusion

It is the opinion of TSS that the SCC design as submitted in ULE90130-SW-Rep-00167 V4 and its associated drawings is an acceptable preliminary design submission. Therefore, on balance the remaining issues are such that it is considered that subject to obtaining confirmation from SDS that such issues will be picked up early in detailed design then PD can be closed out.

# 9 VERIFICATION & VALIDATION PLAN

## 9.1 Introduction

The purpose of this document is to describe the current stations of the SDS Verification & Validation plan (doc no. ULE90130-SW-SW-PPN-00005, version V5) submitted as part of the SDS preliminary design deliverables.

## 9.2 Review & Evaluation

As the document being reviewed is a 'Management Plan' it has system-wide jurisdiction.

## 9.3 Record of Review

The submitted Verification & Validation Plan was originally reviewed by **tie** and Transdev before 14th August 2006. The result being a rejection of the document which required SDS to make numerous alterations before resubmitting the amended document to **tie** for further review.

SDS have responded to **tie**'s comments and these are shown on the ROR; 40-81-ROR-001481 attached as an Appendix to this report. This Appendix represents the current status post the review with Interfleet on 22nd November 2006.

The original review of August 2006 raised questions and called for evidence that the contents of the V&V Plan were being carried out and importantly that the preliminary design submitted by SDS had been appropriately verified and validated. At that point in time and indeed remaining so to date, there has been no verification and validation report submitted by SDS nor does the Preliminary Design Case for safety provide any further substantiation.

There are a number of amendments to the text, which from SDS response they have amended although there is no clarity as to **tie** receiving an up-issue of the plan against which cheeks can be made.

## 9.4 Summary of Remaining Issues

There are still a lot of remaining issues with the V&V Plan; some of which are fundamental to both the close out of the plan and indeed the submitted preliminary design in its entirety.

The remaining issues can be categorised as:

Textual Amendments

These are proposed by SDS and once **tie** provide TSS with a copy of the revised V&V plan such changes can be substantiated.

Evidence of Conformity

As a management plan there is no need to demonstrate that the actions stated in the plan are being undertaken. However, TSS has received no other documentation from which we can clearly state that the plan is being actioned. It must therefore:

- Seek clarification from **tie** that no verification & Validation report(s) have been received from SDS.
- Hold this plan as unacceptable until such time as (a) is fulfilled and that TSS is satisfied that the Preliminary Design Case for safety clearly demonstrates an appropriate level of verification and validation has been accomplished.

Demonstration of PRAMS

SDS state that PRAM demonstrations can be left until detailed design phase. Whilst the detailed design phase should indeed demonstrate that the detailed design delivers the PRAM targets, the preliminary design should equally demonstrate that it delivers the PRAM targets or at worst provides confidence that if the preliminary design is progress these targets will be met. As with comments relating to the second bullet above there is no evidence of this. Furthermore, SDS's response to clause 3.2 clearly flags a commercial and contractual issue relating to the PRAM target of delivering the required percentage of trams to timetable. This is a matter for **tie** to resolve and instruct TSS against which Target to benchmark.

## 9.5 Conclusion

It is the opinion of TSS that the V&V Plan as submitted and the outstanding issues to resolve mean that it cannot be accepted for preliminary design purposes.

# 10 HAZARD LOG

## 10.1 Introduction

The purpose of this document is to describe the current stations of the SDS Hazard Log (doc no. ULE90130-SW-SW-MAT-00006, version V3) submitted as part of the SDS preliminary design deliverables.

## 10.2 Review & Evaluation

As the document is being reviewed as a 'Management Plan' it has system-wide jurisdiction.

## 10.3 Record of Review

The submitted SDS Hazard Log was originally reviewed by **tie**. The result being a rejection of the document which required SDS to make numerous alterations before resubmitting the amended document to tie for further review.

SDS have responded to **tie's** comments and these are shown on the ROR; 40-81-ROR-001477 attached as an Appendix to this report. This Appendix represents the current status post the review with Interfleet on 22nd November 2006.

The original review of August 2006 raised questions and called for evidence that the contents of the Hazard Log were being carried out and importantly that the hazard mitigations stated therein have been incorporated by SDS in their subsystem and overall system preliminary design submitted and that such designs have been appropriately verified and validated. At that point in time and indeed remaining so to date, there has been no verification and validation report submitted by SDS nor does the Preliminary Design Case for safety provide any further substantiation.

There are a number of amendments to the text which from SDS response they have amended although there is no clarity as to tie receiving an up-issue of the plan against which cheeks can be made.

## 10.4 Summary of Remaining Issues

There are still a lot of remaining issues with the Hazard Log; some of which are fundamental to both the close out of the hazard log and indeed the submitted preliminary design in its entirety.

The remaining issues can be categorised as:

Textual Amendments

These are proposed by SDS and once tie provide TSS with a copy of the revised V&V plan we can substantiate such changes.

Evidence of Conformity

The Hazard Log should and must be the vehicle for demonstrating that hazards have been mitigated and dealt with in accordance with the System Safety Management Plan. The document as submitted contains no details as which of the identified hazards have been dealt with in the design or how they have bean dealt with.

TSS will arrange a discussion with SDS to take these issues forward.

## 10.5 Conclusion

It is the opinion of TSS that the SDS Hazard Log as submitted and the outstanding issues to resolve mean that it cannot be accepted for preliminary design purposes until the ISA is satisfied that the Preliminary Design Case for safety clearly demonstrates an appropriate level of hazard management has been effected as well as suitable verification and validation has been accomplished to prove that the design is acceptable safe.

# 11 RELIABILITY AVAILABILITY & MAINTAINABILITY MANAGEMENT PLAN

## 11.1 Introduction

SDS has produced a preliminary RAMS Plan for the Preliminary Design Phase, document numbered "ULE90130-SW-PPN-00027". The original submitted preliminary design has been reviewed by **tie**, Transdev and CEC through the preliminary design review process.

This Preliminary Design Report document take cognisance of the "Records of Review", "Design Approval Panel forms" and submitted drawings, where relevant, in attempting to draw conclusion as to whether this revision of the document titled "ULE90130-SW-PPN-00027" can be closed.

## 11.2 Review & Evaluation

The original preliminary design submission did not match **tie's** expectation as it largely fails to clarify many fundamental principles relating to project maintenance, performance and safety.

Furthermore following from the SDS validation and close-out meeting held between TSS and SDS on the 29th November 2006, it is clear that SDS appreciate that this is the case and in an effort to offer **tie** further clarification and detail regarding the RAMS methodology and processes, SDS shall be replacing this single RAMS document with three separate documents namely:

1) A dedicated RAM plan
2) A dedicated System Safety Management Plan
3) A dedicated project Safety Management Plan

It remains to be seen whether these forthcoming base documents shall satisfy **tie's** concerns, but what is clear is that the review and close-out of this document can not occur until these new base documents have been produced.

## 11.3 Summary of Remaining Issues

This document is to be parked until TSS, TransDev and SDS can meet and discuss the direction of the new documentation and how they will satisfy the fundamental principles that concern **tie.**

## 11.4 Conclusion

It is the opinion of TSS that the RAMS Plan as submitted in ULE90130-SW-PPN-00027 V1 remains classified as "Not Accepted".

# 12 CONFIGURATION MANAGEMENT PLAN

## 12.1 Introduction

SDS has produced a preliminary Configuration Management Plan for the Preliminary Design Phase, document numbered "ULE90130-SW-SW-PPN-00004". The original submitted preliminary design has been reviewed by **tie**, Transdev and CEC through the preliminary design review process.

This Preliminary Design Report document take cognisance of the "Records of Review", "Design Approval Panel forms" and submitted drawings, where relevant, in attempting to draw conclusion as to whether this revision of the document "ULE90130-SW-SW-PPN-00004" can be closed.

## 12.2 Review & Evaluation

ETN Section/Location Specific Items/ General Comments

ROR Comment No. 1

This document is marked for information yet it is a preliminary design deliverable and should have been submitted for acceptance.

Agreed action to close-out item #1:

- The document Authorisation Page, Revision History clearly shows that v5 issued in 30 June 06 was 'Updated for Preliminary Design Phase Submission".

Status of Comment #1:

- Acceptable response
- Comment can be closed out.

ROR Comment No. 2

Good words but it is far too general. There are no details as to what is being done and when or what has been done to date and evidence of it. It does not give **tie** confidence that the whole system design is being integrated.

Agreed action to close-out item #2:

- SDS shall provide evidence that can be substantiated by the preliminary design case for safety.

Status of Comment #2:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 3 – Reference Section 4.3

- Bullets should identify TramCo and InfraCo as supplier/constructor and as maintainer separately.
- There is no identification of who is the ETN "Chief Engineer". Document to be amended such that Chief Eng is identified as Engineering Manager.
- The columns in Fig.5 need to correctly reflect the currently proposed breakdown of operations and maintenance responsibilities and that of the ETN Engineer. This is not the case at present.

Agreed action to close-out item #3:

- The CMP does not specify the project responsibilities of any of the four parties included in the bullet point list. It merely states they have CM responsibilities. The nature of all four organisations project responsibilities will appear in the parent PMP document so does not have to be repeated here.
- SDS shall amend the forthcoming revision of the base document such that the SDS Chief Engineer is termed the "Engineering Manager".
- This table not included here for project management responsibilities. Refer to the parent Project Management Plan document for this definition. However, the SDS shall add a cross reference to the appropriate project management plan base document within the forthcoming revision of the base document.

Status of Comment #3:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 4 – Reference to Appendix A

These are billed as Example Responsibilities. At this stage of the project, we believe these must be applied to each of the various parties involved (as seen in comments above).

Agreed action to close-out item #4:

- The word 'Example' shall be removed when document next revised.

Status of Comment #4:

- Acceptable response.
- Comment can be closed out.

ROR Additional Comments

Additional Comments No. 2

As a general comment, the document presently does not adequately reflect the presently-planned split of operations and maintenance between Transdev, TramCo, and InfraCo. We would also comment that the document is somewhat complex to understand. It fails to set out

the actual practical application of the proposed process, or to signpost the relevant procedures. Re. 2.2 first paragraph we believe the clarity promised is not delivered.

Agreed action to close-out Additional Comment item #2:

- The CMP does not specify the project responsibilities of any of the four parties it merely states they have CM responsibilities. The nature of all four organisations project responsibilities will appear in the parent PMP document so it does not have to be repeated here. This document remains substantially the same as previously approved by tie with no previous record of comment on complexity. By its very nature CM can be a complex process to understand and we believe this plan sets down the principles at a high level in a clear way. The practical application explanation is contained in more detailed process and procedure documents being used by all those at the working level. The CMP makes this clear in 2.2 para 3.

Status of Additional Comment item #2:

This comment will be considered closed only on the conditions that:

- The forthcoming revisions of the PMP and SSMP base documents will include an interface organigram that clarifies who has CM responsibilities.
- The forthcoming revision of the CFM base document shall include a cross reference to the above PMP and SSMP base documents and the relevant sections in question.

### 12.3 Summary of Remaining Issues

Other than the remaining agreed actions to be undertaken by SDS above, no other unresolved issues remain.

It should be noted however that the points raised in the ROR (and hence the agreed actions above) have not yet been shared with Transdev.

### 12.4 Conclusion

The PD can be closed out and the document status considered "Accepted", subject to the following condition:

- Verification by either tie and/or TSS that a forthcoming revision of the SDS base document "ULE90130-SW-SW-SPN-00048" shall be amended according to the agreed actions contained within this report.
- Verification by either **tie** and/or TSS that a forthcoming revision of the SDS PMP and SSMP base documents shall be amended according to the agreed actions contained within this report.

# 13 SYSTEM ARCHITECTURE SPECIFICATION

## 13.1 Introduction

SDS has produced a preliminary System Architecture Specification for the Preliminary Design Phase, document "ULE90130-SW-SPN-00058". The original submitted preliminary design has been reviewed by **tie**, Transdev and CEC through the preliminary design review process.

This Preliminary Design Report document take cognisance of the "Records of Review", "Design Approval Panel forms" and submitted drawings, where relevant, in attempting to draw conclusion as to whether this revision of the document "ULE90130-SW-SPN-00058" can be closed.

## 13.2 Review & Evaluation

ETN Section/Location Specific Items/ General Comments

ROR Comment No. 1

This document is marked for information yet it is a preliminary design deliverable and should have been submitted for acceptance.

Agreed action to close-out item #1:

- Not correct. Transmittal notice ULE90130-SW-DTF-00419 has the System Architecture Specification submitted for Approval.

Status of Comment #1:

- Acceptable response.
- Comment can be closed out.

ROR Comment No. 2

It does not fulfil **tie's** expectations as to what the preliminary design deliverable for a system architecture specification should contain. It should:

- Give an overview of the system being designed
- Give a detailed description of the System and subsystems
- Describe and illustrate the system and subsystem architecture of how it all fits together both logically and physically
- Form the basis from which all other designs and associated documentation flows
- State design assumptions, constraints, approaches considered and rejected in favour of the stated design approach taken

Agreed action to close-out item #2:

- The System Overview is contained in the Operations and Performance Requirements Specification which is referred to.
- The detailed descriptions are contained within the SDS Requirement Specifications.

- Level 2 context diagrams depict the logical interactions between systems. Physical interactions are not defined.
- The SDS System Architecture Specification is used to maintain and control definitions of tram network systems, and their constituent subsystems, and interfaces. This adds value and manages design risk by ensuring completeness of the system design.
- The scope of the System Architecture Specification does not include design assumptions, or rationale for selected solutions.

Status of Comment #2:

- Acceptable response.
- Comment can be closed out.

ROR Comment No. 3

There is no cross reference as to where to find the specified system level design or lower level subsystem designs.

Agreed action to close-out item #3:

- The System level design is contained in the Non Functional Requirements Specification, and the Operations and Performance Specification. The level 2 designs are contained within the referenced documentation set.

Status of Comment #3:

- Acceptable response.
- Comment can be closed out.

ROR Comment No. 4

There is no statement or evidence as to how the system architecture meets the PRAMS to deliver 98% timetable tram services no more than 2 mins late.

Agreed action to close-out item #4:

- This evidence will be provided and the relevant sections referenced to within the forthcoming RAM Plan base SDS document – (note: This new document is a split from the historical RAMS Plan – Prelim Design Phase document ULE90130-SW-PPN-00027).

Status of Comment #4:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 5

There is statement of evidence as to how the system and subsystem architecture deliver an acceptably safe system and form input to the preliminary design Case for Safety.

Agreed action to close-out item #5:

- This evidence will be provided and the relevant sections referenced to within the design case for safety (aka the forthcoming system safety management plan base SDS document – note: This new document is a split from the historical RAMS Plan – Prelim Design Phase document ULE90130-SW-PPN-00027).

Status of Comment #5:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 6 – Reference Section 3.2.3

States "there will be an interface specification produced" when will this happen?

Agreed action to close-out item #6:

- The scope of the comment does not necessarily fall within the SAS base document. A resolution can be found by offering the transparency of the current process and project programmed actions within another base document, perhaps i.e. SI Plan or Project Management Plan.
- SDS to consider and identify which document this "process/project omission" is best placed.

Note:

- Currently the SDS holds regular Interface review meetings, possess a Technical Interface Register and a stakeholder Interface register.
- Interface between the sub-system design process and meetings are programmed within the detailed design phase but have not been submitted to tie as part of their project programme during the prelim design phase.

Status of Comment #6:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 7 – Reference Section 3.3

Ought to have some reference to TEL.

Agreed action to close-out item #7:

- The forthcoming revision of this base document shall be updated with an amended figure.

Status of Comment #7:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 8 – Reference Figure 4

- Access: Where is location of the interface with Roads & Utilities? This is shown as an external interface to the depot "system" in 3.2.2.
- Service Facilities: Does this refer to the maintenance equipment. Might be helpful to separate the fixed/installed equipment and the mobile equipment (spanners to road-rail vehicle).
- Utilities: Is this site clearance or supplies to depot building? Or building services?
- Overhead Line Equipment: This is a bit confusing. See 3.4.1. Would not have expected as part of depot "system" scope unless the interlocking with maintenance equipment and access gantries etc?? Traction equipment is not included, being identified as an external interface to the "system". Similar for SCC.
- Electrical (LV supplies): See Utilities above. Others e.g. gas, water, sewerage?
- Where are the following covered?:

  Security, passive and active (The latter not part of SCC)

  Civil engineering and site preparation

  Finishes and landscaping (with structures? -not part of Depot "system" scope).

Agreed action to close-out item #8:

Note all the information listed below shall be cross-referenced accordingly within the relevant SAS base document.

- Access – this covers more than road access to the depot, also security, paths etc.
- Service Facilities – Yes. Will assess impact of splitting into fixed and mobile.
- Utilities – this covers both clearance/diversion and provision of to Depot Site.
- OLE – covers the interlocking with maintenance equipment etc
- Traction Equipment is covered in updated SBS under Plant & Equipment subsystem.
- Electrical LV Supplies – covers supplies for CCTV, Mechanical Plant, UPS, Lighting etc.
- Security – covered in Access.
- Civils & Site Prep – covered in Depot, Buildings and Associated External Works.
- Finishes & Landscaping – covered in Structures & Civils.

Status of Comment #8:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 9 – Reference Figure 5

We assume the staff halt is part of the tramstops "system" scope, being on the main line. Or is this a reference to the interface data base.

Agreed action to close-out item #9:

- Correct, however the context diagram is being updated to reflect this during the detail design phase.

Status of Comment #9:

- Acceptable response.
- Comment can be closed out.

ROR Comment No. 10 – Reference Figure 7

Not clear on context link to Tram.

Agreed action to close-out item #10:

- They are for on-board ticket validators. This shall be updated and clarified during the detail design phase.

Status of Comment #10:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 11 – Reference Figure 8

- Bonding: Not clear which bits relevant here, when comparing with Fig.10.
- Where are the following covered?

  Pole foundations

  Building fixings

  Pantographs

  Street lighting integration

Agreed action to close-out item #11:

- Bonding – Will remove as covered by interface to Power Distribution.
- Pole foundations, Building fixings & Street lighting integration covered in the Equipment Support & Registration subsystem. Cross reference to be added to base document.
- Will update base document and add information on Pantograph.

Status of Comment #11:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 12 – Reference Figure 10

- Connection to trams: Not clear what this represents. Is it data for simulation work?

- Traction substations: does this include buildings?
- Earthing (5 boxes): easier to just reference E&B Spec?
- Track and OLE: Not clear what is in the OLE part

Agreed action to close-out item #12:

- The connection to Trams covers Track, Sectioning, Bonding, Block joints, Voltage Limiting Devices, Trackside positive power cabling, Traction return cables, Trunk OLE support power & Positive circuit breaker terminals.
- Traction substations subsystem will be updated to include substation buildings.
- SBS diagram updated to remove all E&B and replace with the System Earthing Policy.

Status of Comment #12:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 13 – Reference Figure 11

- Context link to Roads and Utilities: Is this the LV supplies to traffic signs?
- Not clear on context link to IFC.

Agreed action to close-out item #13:

- Link to Roads & utilities is for the LV supplies to traffic signs.
- Link to IFC is for the LV supplies to TVMs.

Status of Comment #13:

- Acceptable response.
- Comment can be closed out.

ROR Comment No. 14 – Reference Figure 12

Where are the following covered?

- Traffic signals and UTC
- Road lighting

Agreed action to close-out item #14:

- Traffic Signals to be added to SBS.
- Road lighting is covered within the Roads subsystem, to be made clearer in update to SBS.

Status of Comment #14:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 15 – Reference Figure 13

- Context link to Power Distribution presumably ducting?
- Context link to SCC: UTC?
- Context link to OLE & Pantograph presumably foundations? (If so, what happens away from roads?)

Agreed action to close-out item #15:

- Link to Power Distribution is for ducting.
- Link to SCC is for the TPDS system and the UTC.
- Link to OLE & Pan is for foundations. Away from Roads it is covered by Track System. This shall be made clearer within a forthcoming revision.

Status of Comment #15:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 16 – Reference Figure 14

- Line 1/2 split inappropriate
- Where are the following covered?

  Substation site preparation

  Earthworks
- Where depot site split with depot "system"?

Agreed action to close-out item #16:

- The current Structures & Civils requirement specification refers to line1 / line 2. The System Architecture Specification is will be updated when the requirement specifications are updated.
- Substation site preparation to be added.
- Depot Earthworks to be added.

Status of Comment #16:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 17 – Reference Figure 15

- Context link to Power Distribution presumably ducting?
- No context link to SCC: why not ducting?
- Context link to Depot: where is split in "system" (see above)

Agreed action to close-out item #17:

- The System Architecture Specification is being used to ensure complete coverage of ducting across the whole Edinburgh Tram Network system and the document will be updated during the detail design phase.

Status of Comment #17:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 18 – Reference Figure 16

UTC interface? The inclusion of a range of systems suggests it would be useful to extend down to the next level.

Agreed action to close-out item #18:

- The UTC interface is an interface between the Edinburgh Tram Network and external works. This is not detailed in the Level 2 to Level 2 Internal interfaces.

Status of Comment #18:

- Acceptable response.
- Comment can be closed out.

ROR Comment No. 19 – Reference Figure 17

No context link to Structures & Civils: drainage pump fails alarms? e.g. A8, Depot.

Agreed action to close-out item #19:

- The context diagram will be updated in the forthcoming revision.

Status of Comment #19:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 20 – Reference Figure 18

- Switch Machines: add control, heating.
- Cable routes presumably ductwork.
- Where are the following covered?

  Alignment

  Operational signage
- Perhaps worth clarifying the different track forms covered.

Agreed action to close-out item #20:

- SBS updated and expanded to include switch control and heating. Forthcoming revision to reflect updates.
- Yes, Cable route is ductwork.
- SBS expanded to include Alignment. Forthcoming revision to reflect updates.
- Clarification needed for "operational signage". Forthcoming revision to reflect updates.

Status of Comment #20:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 21 – Reference Figure 19

What is context link to OLE & Pantograph?

Agreed action to close-out item #21:

- OLE Foundations.

Status of Comment #21:

- Acceptable response.
- Comment can be closed out.

ROR Comment No. 22 – Reference Figure 20

Not sure that the breakdown is very useful (with the exception of Wheel/Rail interface) given the tram is a separate contract and a single manufactured item.

Agreed action to close-out item #22:

Taken that the initial comment is interpreted that the figure is out of context with no baseline as to what the associated importance of the figure represents.

- SDS to provide additional explanation within this sub-section describing the context and addition of this figure within its own sub-section in the base document.

Status of Comment #22:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 23 – Reference Figure 21

What is context link to IFC?

Agreed action to close-out item #23:

- This figure relates to on-board ticket validators – the base document shall be updated in the forthcoming revision to clarify this position.

Status of Comment #23:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 24 – Reference Figure 22

- The 3 boxes for Tramstop Shelter, Tramstop Equipment and Tramstop and Street Furniture would benefit from better definition/distinction.
- We note Tramstop Access is covered here; boundary to Roads & Utilities to be clarified.

Agreed action to close-out item #24:

- The base document shall be updated in the forthcoming revision to clarify this position.

Status of Comment #24:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Additional Comments

Additional Comments No. 1

Without both logical and physical links the design cannot be reviewed for being successfully integrated.

Agreed action to close-out Additional Comments item #1:

- This comment can be considered interrelated with once ROR Comment No. 6 Above (i.e. Comment related to Section 3.2.3).
- SDS is currently completing an additional base document titled the "Edinburgh Tram Network Interface Plan (ETNIP)", which shall document the detailed approach and activities undertaken to ensure an integrated system.

Status of Additional Comment item #1:

- Accepted with comments.
- Comment can be closed out upon;
  a) Verification that the forthcoming proposed ETNIP document satisfies **tie's** expectations.
  b) Closing out of ROR Comment No. 6 above.

Additional Comments No. 3

Cannot tell what the architecture of this subsystem is as there is no subsystem architecture specification for it. There is no adequate System architecture specification anyway so it is impossible to conclude that all subsystems integrate properly into the holistic system design.

Agreed action to close-out Additional Comments item #3:

- This comment can be considered interrelated with once ROR Comment No. 6 Above (i.e. Comment related to Section 3.2.3).
- SDS is currently completing an additional base document titled the "Edinburgh Tram Network Interface Plan (ETNIP)", which shall document the detailed approach and activities undertaken to ensure an integrated system.

Status of Additional Comment item #3:

- Accepted with comments.
- Comment can be closed out upon;
  a) Verification that the forthcoming proposed ETNIP document satisfies **tie's** expectations.
  b) Closing out of ROR Comment No. 6 above.

### 13.3 Summary of Remaining Issues

There is a clear apprehension by **tie** that the SDS system architecture is being developed in sub-system isolation and that there is no clear methodology to ensure and promote a complete unified and integrated system.

While the SDS do feel they have approached the complete system design in a holistic manner, they appreciate that this is not transparent to tie and such understand that their methodologies and programme need to be made more visible during this preliminary design phase.

In response, the SDS is ready to provide more documentation to resolve this issue. Two key elements to this being resolved (and therefore this document being formally closed-out) are;

- The completion and verification of the additional base document deliverable titled the "Edinburgh Tram Network Interface Plan (ETNIP)"
- Providing further transparency of the current process / project actions within another base document, perhaps i.e. SI Plan or Project Management Plan. The SDS need to update **tie** as to their proposals.

Note: Both of these documents are new deliverables and thus need to progress through the rigorous review phases. As such formal close-out of this document may need to be parked until these new base documents and proposals are signed off by **tie.**

## 13.4 Conclusion

The PD can be closed out and this document status considered accepted, subject to the following conditions:

- Obtaining confirmation from SDS that such issues noted above will be updated in the forthcoming document revisions, and;
- The issues noted in Section 3 above are actioned by SDS and approved by **tie.**

# 14 REQUIREMENT TEST SPECIFICATION- PRELIMINARY DESIGN PHASE

## 14.1 Introduction

SDS has produced a preliminary Requirement Test Specification for the Preliminary Design Phase, document titled "ULE90130-SW-SW-SPN-00048". The original submitted preliminary design has been reviewed by **tie**, Transdev and CEC through the preliminary design review process.

This Preliminary Design Report document take cognisance of the "Records of Review", "Design Approval Panel forms" and submitted drawings, where relevant, in attempting to draw conclusion as to whether this revision of the document "ULE90130-SW-SW-SPN-00048" can be closed.

## 14.2 Review & Evaluation

ETN Section/Location Specific Items/ General Comments

ROR Comment No. 1

Not all of the tests cover all of the project life cycle. Some do cover design and implementations phases (like Fare Collection) but the majority relate to either design or implementation. Such tests should cover all phases, please amend.

Agreed action to close-out item #1:

- This will be included as part of the update of the Requirements Tests.

Status of Comment #1:

- Accepted with comments
- Comment can be closed out upon verification of SDS' proposed agreed action.

ROR Comment No. 2

It would be appropriate as:

- a measure of control,
- evidence for the Cases for Safety, and
- planning and procurement tenders

to specify the description of the tests and at which phase(s) in the life cycle they should be carried out.

Agreed action to close-out item #2:

- The addition of the phases in the lifecycle for each test statement will be added. Will assess and update the Requirements Tests accordingly.

Status of Comment #2:

- Accepted with comments.

- Comment can be closed out upon verification of SDS' proposed agreed action.

ROR Comment No. 3

There is no cross references in this document to the relevant sections of the Requirements Test Specifications, Preliminary Design Test Specifications, or the V&V Specification/Testing & Commissioning Specification at either the System level or Subsystem Level.

Agreed action to close-out item #3:

- Relevant cross references will be added where appropriate.

Status of Comment #3:

- Accepted with comments.
- Comment can be closed out upon verification of SDS' proposed agreed action.

ROR Comment No. 4

There are numerous requirements and associated test statements dotted around the document that say "....system shall be fully tested and commissioned...". Please make it clear within the text of that requirement/test as to which subsystem etc these statements apply to.

Agreed action to close-out item #4:

- This will be included as part of the update of the Requirements Tests.

Status of Comment #4:

- Accepted with comments.
- Comment can be closed out upon verification of SDS' proposed agreed action.

ROR Comment No. 5

There is no evidence that the defined tests have been approved by the relevant designer, engineering manager etc.

Agreed action to close-out item #5:

- Correct. This will be included as part of the revision 4 update.

Status of Comment #5:

- Accepted with comments.
- Comment can be closed out upon verification of SDS' proposed agreed action.

ROR Comment No. 6

There is no evidence that the defined tests for the preliminary design phase have been fulfilled. Where are the test reports for them?

Agreed action to close-out item #6:

- This will be assessed for the Revision 4 update.

Status of Comment #6:

- Accepted with comments.
- Comment can be closed out upon verification of SDS' proposed agreed action.

ROR Comment No. 7

At this stage of the project **tie,** anticipated that this document and the design test specs and V&V spec would be **sufficiently detailed** in terms of tests to be carried out during each phase the test specification could have been included with the design information supplied as part of the TramCo and Infraco procurements, yet such specification have not as yet been received and this document does not make reference to them.

Agreed action to close-out item #6:

- **tie** to clarify what is meant by "sufficiently detailed".
- Once clarification is received, TSS will action the item for close-out with SDS.

Status of Comment #6:

- Status of comment shall remain open until clarification is received from **tie.**

ROR Comment No. 8 – Reference 1.1, 3rd Paragraph

Surely the purpose of the Plan is to demonstrate how all the elements and processes that deliver these elements of the design are integrated into a coherent whole.

Agreed action to close-out item #8:

- It was agreed that the scope of this document is limited purely to providing the lists of test specifications and the development of the information related to the above comment should be found in the V&V plan.

Status of Comment #8:

- Accepted with comments.
- Comment can be closed out upon acceptance and formal close-out of the V&V plan.

## 14.3 Summary of Remaining Issues

There is an open item that involves ROR comment No. 7 (detailed above). Both TSS and SDS agree that the action to close-out this comment currently rests with **tie.**

Once clarification is received by tie (please see Section 2.1.1.7), TSS and SDS can come to an agreed resolution on how to close this comment out.

Other than the above item, no other unresolved issues remain.

It should be noted however that the points raised in the ROR (and hence the agreed actions above) have not yet been shared with Transdev.

### 14.4 Conclusion

The PD can be closed out and the document status considered "Accepted", subject to the following condition:

- **tie** provides clarification to Section 2.1.1.7.

- Verification by either **tie** and/or TSS that a forthcoming revision of the SDS base document "ULE90130-SW-SW-SPN-00048" shall be amended according to the agreed actions contained within this report.

# 15 SYSTEM INTERFACE DATABASE BASELINE NO 1 REPORT

## 15.1 Introduction

SDS has produced a preliminary System Interface Database Baseline No. 1 Report for the Preliminary Design Phase, document numbered "ULE90130-SW-REP-00208". The original submitted preliminary design has been reviewed by **tie**, Transdev and CEC through the preliminary design review process.

This Preliminary Design Report document take cognisance of the "Records of Review", "Design Approval Panel forms" and submitted drawings, where relevant, in attempting to draw conclusion as to whether this revision of the document "ULE90130-SW-REP-00208" can be closed.

## 15.2 Review & Evaluation

General Comments

ROR Comment No. 1

The submission of this document in .pdf format makes it almost impossible to search the database at the back of the document. Please resubmit in a format that can be either easily transferred into Excel, or preferably in Excel. We are unable to comment in detail on the database until we are able to interrogate the database electronically.

Agreed action to close-out item #1:

- SDS are pleased to provide and submit an MS Excel version.

  It should be noted that following previously agreed protocol, SDS had submitted an offer to **tie** to provide several options and were just awaiting **tie's** formal request as to the desired option. This protocol is mandatory and therefore **tie** shall request formally to the SDS to be provided with an MS Excel format.

Status of Comment #1:

- Acceptable response
- Comment can be closed out.

ROR Comment No. 2

The database should include all of the relevant interfaces issues raised in the Topics Register that tie issued to SDS. We are not convinced that this is the case. Please provide an analysis of how the interface issues raised in the Topics register have been addressed in SDS's design process. Most of the issues in the Topics Register are interface issues.

Agreed action to close-out item #2:

- Add cross-reference to Topics Register within base document.
- Management methodology of the Interface issues within the Topics register shall be explained in more detail within the following base documents;

a) System Integration Plan

b) The new base document titled "Edinburgh Tram Network Integration Plan".

Status of Comment #2:

- Acceptable response.
- Comment can be closed out.

ROR Comment No. 3

The "True/false" flags in the database may be better as "date done" fields to permit more transparent traceability. This would also enable items that have not been progressed for a while and may have got "stuck" in the system to be identified.

Agreed action to close-out item #3:

Both elements are contained within the database.

Upon request from **tie**, SDS can generate reports from the database that provide the "date complete" fields.

Status of Comment #3:

- Acceptable response.
- Comment can be closed out.

ROR Comment No. 4

There appears to be no way of establishing how these interfaces relate to the programme requirements. Clearly they impact on the programme, but in very different ways. SDS should demonstrate how the interface with the project programme is managed.

Agreed action to close-out item #4:

The detailed design phase programme includes a series of intermediate design review meetings. System interfaces are a formal part of the meeting agenda. These intermediate design review (IDR) meetings are a milestone event within the Project Programme.

Upon request from **tie**, SDS would be pleased to provide **tie** with IDR meeting minutes to offer transparency concerning the management of interface issues.

Status of Comment #4:

- Acceptable response.
- Comment can be closed out.

## 15.3 Summary of Remaining Issues

Other than the remaining agreed actions to be undertaken by SDS above, no other unresolved issues remain.

It should be noted however that the points raised in the ROR (and hence the agreed actions above) have not yet been shared with Transdev.

## 15.4 Conclusion

It is the opinion of TSS that the base document as submitted in ULE90130-SW-REP-00208 V1 is an acceptable preliminary design submission. Therefore, on balance the remaining issues are such that it is considered that subject to obtaining confirmation from SDS that such issues and corresponding agreed action noted above will be picked up early in detailed design then PD can be closed out.

# 16 SYSTEM INTEGRATION PLAN

## 16.1 Introduction

SDS has produced a preliminary System Integration Plan for the Preliminary Design Phase, document numbered "ULE90130-SW-PPN-00029". The original submitted preliminary design has been reviewed by **tie**, Transdev and CEC through the preliminary design review process.

This Preliminary Design Report document take cognisance of the "Records of Review", "Design Approval Panel forms" and submitted drawings, where relevant, in attempting to draw conclusion as to whether this revision of the document "ULE90130-SW-PPN-00029" can be closed.

## 16.2 Review & Evaluation

General Comments

ROR Comment No. 1

This document is marked for information yet it is a preliminary design deliverable and should have been submitted for acceptance.

Agreed action to close-out item #1:

- Not correct. Transmittal notice ULE90130-SW-DTF-00419 has the System Architecture Specification submitted for Approval.

Status of Comment #1:

- Acceptable response.
- Comment can be closed out.

ROR Comment No. 2 & No. 3

ROR comment no. 2:

It is far too general. There is no substance to it. It does not give **tie** confidence that the wholes system design is being integrated

ROR comment no. 3:

It is another document that talks about the logical structure where at this stage of the life cycle it ought cover the physical structure of the system including:

- Who is in charge of integration and how are they ensuring that it is integrated in physical terms;
- The process and actionees responsible for making the physical artefacts/subsystems come together in design and implementation terms.

Agreed action to close-out item #2 & 3:

Note: During the close-out meeting with SDS that took place on 29th Nov. 2006, TSS explained that the SDS system integration plan does not reflect that it is being developed

and/or integrated clearly enough within the wider project management plan, i.e. with dedicated interface resources, system wide testing specifications, activities, programmes and milestones, etc. There exists a clear lack of visibility by **tie** to SDS integration activities and the associated plans / methodologies behind them that SDS have put in place to ensure a successful system wide compatibility and integration. In response, the SDS is ready to provide **tie** with evidence to bolster project transparency and resolve this key issue.

The agreed actions and evidence to close-out these comments will come in the form of:

- The completion and verification of the additional base document deliverable titled the "Edinburgh Tram Network Interface Plan (ETNIP)".

Note: This document is a management document that shall provide a holistic and integrated project view of the SDS base documents; V&V, RAM, SI, Testing and Commissioning, System Safety Management Plan, etc. It is envisaged that this document should establish that complete system integration is being considered and planned for by SDS.

- The activities that are listed within the forthcoming ETNIP base document can be audited by **tie** via the provision:
    a) The SDS Engineering Plan
    b) The SDS Project Deliverables
    c) SDS records of review and checks for design phases.
- A future revision of the System Integration Plan base document (ULE90130-SW-PPN-00029) shall be updated and amended to reference the relevant sections within the ETNIP and Project Management Plan, where appropriate.

Status of Comment #2 & 3:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 4

Diagrams in section 2 show the System Architecture Specification going nowhere (i.e. a standalone document). This clearly should not be the case and serves to demonstrate that SDS has a lack of understanding as what is required of a proper system design approach and they cannot therefore be assembling an integrated and acceptable design.

Agreed action to close-out item #4:

- The diagram is intended to show the general structure of specifications for SDS. It is not intended to show all the relationships of the System Architecture Specification. SDS will review the System Architecture Specification to ensure its context is clearly defined in relation to the requirements, interface and design documents. SDS will amend the document to clarify.

Status of Comment #4:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 5

There is no clear evidence or reference as to how the system and subsystem PRAMS and safety analysis is incorporated to deliver an acceptably safe and reliable system and form input to the preliminary design Case for Safety.

Agreed action to close-out item #5:

- The comment is outside the scope of this document, however a future revision of this SIP document shall be amended such that any related SDS base documents that are relevant shall be included in a front section of the document as reference.

Status of Comment #5:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 6 – Reference Section 1.1 3rd Paragraph

Surely the purpose of the Plan is to demonstrate how all the elements and processes that deliver these elements of the design are integrated into a coherent whole.

Agreed action to close-out item #6:

- This appears to be a comment directed at the V&V Plan, however a future revision of this SIP document shall be amended such that any related SDS base documents that are relevant shall be included in a front section of the document as reference.
- This comment will also be closed out by the completion of the agreed actions to in Section 2.1.1.2.

Status of Comment #6:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 7 – Reference Section 1.1

There is no demonstration of, or reference to, a subsystem architecture being derived and apportioned from the system architecture.

Agreed action to close-out item #7:

- The SDS System Architecture Specification is used to maintain and control definitions of tram network systems, and their constituent subsystems, and interfaces. As agreed with tie this document will be amended to clarify status of the diagram, and refer to the System Architecture Spec.

Status of Comment #7:

- Accepted with comments.

- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 8 – General Comment about Section 2

There is no demonstration of, or reference to, a subsystem architecture being derived and apportioned from the system architecture.

Agreed action to close-out item #8:

- The SDS System Architecture Specification is used to maintain and control definitions of tram network systems, and their constituent subsystems, and interfaces. As agreed with tie this document will be amended to clarify status of the diagram, and refer to the System Architecture Specifications.

Status of Comment #8:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 9 – General Comment about Section 2

There is no demonstration of or reference to a system design spec being derived and apportioned from the system architecture, nor how subsystem design specs (which is assumed are the preliminary design specifications referred to in the diagram) are derived and appointed from the subsystem architecture and system design.

Agreed action to close-out item #9:

- The system design is specified within the submitted Preliminary Design Specifications, Non Functional Requirements Specification, and the Operations and Performance Specification. The structure and format of System design documentation is outside the scope of this document, however a future revision of this SIP document shall be amended such that any related SDS base documents that are relevant shall be included in a front section of the document as reference.

Status of Comment #9:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 10 – Reference Diagram in Section 2

The diagram does not demonstrate a coherent whole system approach therefore SDS cannot have delivered a design that meets such.

Agreed action to close-out item #10:

- The document tree shown in Section 2 is appropriate for the preliminary design stage. It will be further developed in this document during the detail design phase.

Status of Comment #10:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Comment No. 11 – General Comment about Section 5

Where is clear prioritisation process set out?

Agreed action to close-out item #11:

- SDS shall amend a forthcoming revision of the SIP base document to reference the "Criticality Factor" established within the Interface Register (which is what drives the prioritisation of issues internally within SDS)
- Furthermore the SIP base document shall be amended to define this "Criticality Factor" and how each factor is established and quantified.

Status of Comment #11:

- Accepted with comments.
- Comment can be closed out upon verification of proposed agreed action above.

ROR Additional Comments

Additional Comments No. 1

Without both logical and physical links the design cannot be reviewed for being successfully integrated.

Agreed action to close-out Additional Comments item #1:

- This comment can be considered interrelated with ROR Comment No. 2 and 3 above (i.e. Comment related to Section 2.1.1.2).

Status of Additional Comment item #1:

- Accepted with comments.
- Comment can be closed out upon;
  - c) Verification that the forthcoming proposed ETNIP document satisfies ties expectations.
  - d) Closing out of ROR Comment No. 2 and 3 above.

Additional Comments No. 3

Cannot tell what the architecture of this subsystem is as there is no subsystem architecture specification for it. There is no adequate System architecture specification anyway so it is impossible to conclude that all subsystems integrate properly into the holistic system design.

Agreed action to close-out Additional Comments item #3:

- This comment can be considered interrelated with ROR Comment No. 2 and 3 above (i.e. Comment related to Section 2.1.1.2).

Status of Additional Comment item #3:

- Accepted with comments.
- Comment can be closed out upon;
  - e) Verification that the forthcoming proposed ETNIP document satisfies **tie's** expectations.
  - f) Closing out of ROR Comment No. 2 and 3 above.

### 16.3 Summary of Remaining Issues

The SDS system integration plan as submitted within ULE90130-SW-PPN-00029 V1 does not reflect that the preliminary design phase is being developed and/or integrated clearly enough within the wider project scope. There is a clear apprehension by **tie** that the SDS system is being developed in sub-system isolation and there exists a clear lack of visibility by **tie** to SDS integration activities and the associated plans / methodologies behind them that SDS have put in place to ensure a successful system wide compatibility and integration.

While the SDS do feel they have approached the complete system design in a holistic manner, they appreciate that this is not transparent to tie and such understand that their methodologies and programme need to be made more visible during this preliminary design phase.
In response, the SDS is ready to provide more documentation to resolve this issue.

The agreed evidence to close-out these comments will come in the form of:

- The completion and verification of the additional base document deliverable titled the "Edinburgh Tram Network Interface Plan (ETNIP)".

Note: This document is a management document that shall provide a holistic and integrated project view of the SDS base documents; V&V, RAM, SI, Testing and Commissioning, System Safety Management Plan, etc. It is envisaged that this document should establish that complete system integration is being considered and planned for by SDS.

- The activities that are listed within the forthcoming ETNIP base document can be audited by **tie** via the provision of:
  - a) The SDS Engineering Plan
  - b) The SDS Project Deliverables
  - c) SDS records of review and checks for design phases.

Note: Both of these documents are new deliverables and thus need to progress through the rigorous review phases. As such formal close-out of this document may need to be parked until these new base documents and proposals are signed off by tie.

### 16.4 Conclusion

The PD can be closed out and this document status considered accepted, subject to the following conditions:

- Obtaining confirmation from SDS that such issues noted above will be updated in the forthcoming document revisions, and;
- The issues noted in Section 3 above are actioned by SDS and approved by **tie.**

# 17 INTERDISCIPLINARY CHECK PROCEDURE

## 17.1 Introduction

This document formalises the reviews that have been undertaken on SDS deliverables at the Preliminary Design phase.

## 17.2 Review & Evaluation

The deliverables that have been reviewed and evaluated comprise:

- ULE90130-SW-PRE-00005 V4 – Interdisciplinary Check (IDC) Procedure.
- IDC forms.

Overall Subsystem

The activities that have been validated comprise the Interdisciplinary Check that has been undertaken.

Interdisciplinary Check

The actions arising from the Record of Review form have been acknowledged by SDS. An undertaking has been given by SDS that these will be actioned either by the 18/12/06 or within the detailed design stage. The key issues are however listed below.

## 17.3 Summary of Remaining Issues

The key issues re are a number of remaining issues that have to be actioned by the 18/12/06 or within the detailed design stage. These comprise:

- There will be a cross referencing of IDC forms that form the backup onto the signed IDC forms.
- The items identified with comments will be categorised. The classification will differentiate the significant issues from the more minor ones. The significant issues will be addressed as a priority within the detail design stage.

In addition the IDC procedure is being reviewed in light of its application on the Preliminary Design phase.

## 17.4 Conclusion

On balance the remaining issues are such that it is considered that subject to obtaining confirmation from SDS that such issues will be picked up early in detailed design then PD can be closed out. In addition measures such as a regular meeting with **tie** to discuss the IDC process have been formulated.

# 18 HEALTH & SAFETY AND QUALITY

## 18.1 Introduction

This document formalises the reviews that have been undertaken on SDS deliverables at the Preliminary Design phase.

## 18.2 Review & Evaluation

The deliverables that have been reviewed and evaluated comprise:

- ULE90130-SW-SW-PPN-00002 V5 – Safety Management Plan Preliminary Design.
- ULE90130-SW-SW-PPN-00003 V5 – Quality management Plan Preliminary Design.

## 18.3 Overall Subsystem

The workstreams that have been validated comprise:

- Health and safety management; and
- Quality management.

Health and Safety Management

The actions arising from the Record of Review form have been addressed by SDS. Transdev have agreed with the comments made by SDS.

Quality Management

The actions arising from the Record of Review form have been addressed by SDS. Transdev have agreed with the comments made by SDS.

## 18.4 Summary of Remaining Issues

There are no remaining issues that have not been resolved.

## 18.5 Conclusion

The Preliminary Design phase can be closed out as there are no outstanding actions. A number of the actions relate to the development of the Safety Management Plan and Quality Management Plan within the Detailed Design phase.
It is important that a programme for the development of these plans within the Detailed Design phase is agreed with SDS.

# 19 ENVIRONMENTAL COMPLIANCE

## 19.1 Introduction

The environmental management plan currently focuses on the design stage of the project and will be updated during detailed design to consider construction. As the majority of environmental impacts are likely to occur during construction, the purpose of this plan is to identify potential impacts and incorporate appropriate mitigation into the design. The objective is to reduce the likelihood of any negative environmental impacts occurring during construction and operation. This EMP is now in its fourth iteration and has been reviewed in detail on three occasions since the SDS team first presented it in December 2005. Further updates will be delivered throughout the programme the purpose being to ensure that the EMP remains wholly relevant to the circumstances of the ETN, its site specific requirements and any new or reviewed environmental commitments which where appropriate require to be include as part of the detailed design information and construction requirements as the project progresses. In addition the EMP is designed to provide "high level" and strategic context of **tie**'s own emerging EMS procedures.

## 19.2 Review & Evaluation

The purpose of this review is on the one hand to provide an ongoing assessment of the competence and coverage of the EMP as well as identification for close out of any potential impact on the programme (particularly in terms of Preliminary Design) of the ETN.
A number of changes have been identified in this version of the EMP. These are:

- Updates on awareness training undertaken to June 2006
- Updating the position of the EMP as it relates to the emerging tie EMS and the responsibilities for environmental management within the SDS team
- The relevance of the Code of Construction Practice in terms of Environmental Management
- The requirement of Site Specific EMP's as it relates to the contractor's (MUDFA & Infraco) and how they intend to be developed ; and
- Ongoing audit and review of Environmental Management Plan as it will relate to the Design, Construction and Operational Phases of the programme.

In all of these instances and following discussions with SDS over the period and during regular fortnightly meetings with the TSS, SDS and tie representatives, each of these issues have been reviewed and or closed off. Consequently the EMP has reflected the general view of the team as it relates to that which can practically and competently be achieved as the scheme design progresses. To that end the EMP is actively guiding and being guided by the Environmental team as a working document.

In formal terms therefore, given that this is a heavily used working document subject to almost constant review we are content that it is addressing all the issues relevant to environmental impacts of the ETN and are on this occasion not providing any commentary on issues that require to be closed off.

## 19.3 Summary of Remaining Issues

No issues as it relates to Environmental Management were identified and there none require to be closed off at this review.

## 19.4 Conclusions

The TSS team are broadly content with this fourth draft of the EMP and consequently will not be providing any commentary on actions either outstanding or failing to have been addressed in this version of the EMP. Consequently we are of the view that there are no significant and therefore PD can be closed out

# PART 3 –CONCLUSIONS

## 20 DISCIPLINE CONCLUSIONS

Following are a summary of the conclusions of the Preliminary Design Review Report by discipline. At the end of the section a summary is provided of the overall view on the Preliminary Design submission.

### 20.1 Track

It is the considered option that on balance the remaining issues are such that it is considered that subject to obtaining confirmation from SDS that such issues will be picked up early in detailed design then PD can be closed out.

### 20.2 Structures

- It is therefore our considered opinion that provided a copy of the accepted AIP is provided to tie and the clearances and DKE issues raised by Transdev are addressed at an early stage the PD can be closed out for S18 Leith Walk Railway Bridge, S19 Haymarket Station Viaduct, S20 Russell Road, S01 Roseburn Terrace Bridge, S03 St George's School Access Bridge, S04 St George's School Footbridge, S05 Ravelston Dykes Bridge, S09 Groathill Road South Bridge, S10 Telford Road Bridge and S12 Crewe Road Gardens Bridge. Provided SDS adopts CEC's comment regarding the provision of a 2m wide footway the PD can also be closed out for S16 Victoria Dock Entrance Bridge.

- However, on balance the remaining issues are such that it is considered that subject to obtaining confirmation from SDS that such issues will be picked up early in detailed design then the PD can be closed out for the following structures. W01 Lindsay Road Retaining Wall and W100 Roseburn Retaining Walls if SDS responses to TSS comments are acceptable and CEC accepts SDS responses. For S08 Queensferry Road Bridge detail design can commence when outcome of structural assessment is known. Upon SDS clarifying the handrailing loading detail design can commence on W03 & W04 Russell Road Retaining Walls 1 & 2. Provided revised AIP's for S21A Roseburn Street Viaduct, S21B Murrayfield Stadium Retaining Wall, S21C Murrayfield Stadium Underpass, S21D Murrayfield Training Pitches Retaining Wall, W08 Baird Drive Retaining Wall, S26 South Gyle Access Bridge, W11 Bankhead Drive Retaining Wall have incorporated the changes agreed by SDS to the comments made by TSS and CEC, detail design can commence on these structures. For S28 A8 Underpass confirmation is required from CEC that 45 units of abnormal loading is satisfactory and traffic management issues to be resolved at an early stage before detail design can commence. Provided the revised AIP satisfactorily deals with the comments made by CEC the detail design can commence for S30, S31 & S34 Gogar Burn Culverts. Provided the revised AIP for W14 Gogar Burn Retaining Walls satisfactorily deals with the comments made by TSS and CEC then detail design can commence. Provided CEC accept the SDS responses to their comments on S33 EARL Underbridge detail design can commence. Provided the responses awaited on the TSS and CEC comments on the AIP's for W18 Murrayfield Tramstop Retaining Wall and W19 Gyle Stop Retaining Wall are accepted then detail design can commence on these structures.

- There are still significant issues that remain to be resolved in regard to the following structures and therefore the PD for these cannot be presently be closed out. For S17 Tower Place Bridge a reply to CEC comments on V2 of AIP from SDS is awaited and this structure is subject to charette, S02 Coltbridge Viaduct is subject to a charette, S23 Carrick Knowe is subject to a charette and SDS require to take cognisance of Transdev's comments on this structure and S27 Edinburgh Park Station Bridge subject to charette. The AIP for S21E Water of Leith Bridge has recently been revised to take cognisance of the charette noted above and detail design may commence when this has been through the preliminary design review process. For S06 Craigleith Drive Bridge SDS are awaiting further instructions on which of two options they have prepared is to be adopted. The revised LOD local to W02 Ferry Road Retaining Wall has resulted in the reduced scope of the retaining wall requirement and preliminary design work in connection with this is ongoing. For S32 Depot Access Bridge the issue regarding whether the bridge should be fully integral or not requires to be resolved with CEC prior to detail design commencing. In addition to the revised AIP for W16 A8 Retaining Wall being outstanding, the traffic impact of the new depot entrance may have an affect on the location and extent of this retaining wall and in conjunction with this the location of the Depot Access Bridge. Detail design should not commence until this issue is resolved. In addition, no AIP has been received for W17 Internal Depot Retaining Walls and a revised AIP is required for S22 Balgreen Road Bridge as a new structure is required at this location rather than the re-use of existing a currently shown on the AIP. As the location of S22 Balgreen Road Bridge is liable to alter it is likely that the location and extent of W09 Balgreen Road Retaining Wall will alter and therefore a new AIP will be required for review. The flooding issue at S29 Gogar Burn Bridge will require to be resolved with CEC before detail design can commence. AIP's for S24 Saughton Road Bridge and S25 Broomhouse Road Bridge have not yet been issued as they depend on the final tram alignment.

## 20.3 Roads

With respect to the roads design working group meetings and the general design development, in several instances we are looking at a snap picture in time of what are ongoing live documents and drawings. (Some of the drawing and documents in the PD are covering areas that are under constant design change or alterations.) As stated and outlined in the previous sections of this report, there are still significant issues that remain to be resolved. However on balance the remaining issues are such that it is considered that subject to ongoing consultations (between all the relevant parties in the lead up to the design submissions) and obtaining confirmation from SDS that these issues will be picked up early in detailed design, then PD can be closed out.

## 20.4 Traction Power

Whilst there are certain minor but significant issues outstanding, the concept and intended implementation of the traction power system as proposed is sound and will form a robust system well able to achieve **tie**'s requirements. The preliminary design can therefore be closed out with the qualification that the remaining issues are addressed as soon as possible in the detailed design phase.

## 20.5 Supervisory Control & Communications

It is the opinion of TSS that the SCC design as submitted in ULE90130-SW-Rep-00167 V4 and its associated drawings is an acceptable preliminary design submission. Therefore, on balance the remaining issues are such that it is considered that subject to obtaining confirmation from SDS that such issues will be picked up early in detailed design then PD can be closed out.

## 20.6 Verification and Validation Plan

It is the opinion of TSS that the V&V Plan as submitted and the outstanding issues to resolve mean that it cannot be accepted for preliminary design purposes and therefore we are unable to advise **tie** to close out the PDP phase.

## 20.7 Hazard Log

It is the opinion of TSS that the SDS Hazard Log as submitted and the outstanding issues to resolve mean that it cannot be accepted for preliminary design purposes until the ISA is satisfied that the Preliminary Design Case for safety clearly demonstrates an appropriate level of hazard management has been effected as well as suitable verification and validation has been accomplished to prove that the design is acceptable safe.

## 20.8 Reliability Availability and Maintainability Management Plan

It is the opinion of TSS that the RAMS Plan as submitted in ULE90130-SW-PPN-00027 V1 is classified as "Not Accepted".

## 20.9 Configuration Management Plan

The PD can be closed out and the document status considered "Accepted", subject to the following condition:

- Verification by either tie and/or TSS that a forthcoming revision of the SDS base document "ULE90130-SW-SW-SPN-00048" shall be amended according to the agreed actions contained within this report.
- Verification by either tie and/or TSS that a forthcoming revision of the SDS PMP and SSMP base documents shall be amended according to the agreed actions contained within this report.

## 20.10 System Architecture Specification

The PD can be closed out and this document status considered accepted, subject to the following conditions:

- Obtaining confirmation from SDS that such issues noted above will be updated in the forthcoming document revisions, and;
- The issues noted in Section 3 above are actioned by SDS and approved by tie.

## 20.11 Requirement Test Specification – Preliminary Design Phase

The PD can be closed out and the document status considered "Accepted", subject to the following condition:

- **tie** provides clarification to Section 2.1.1.7.

- Verification by either tie and/or TSS that a forthcoming revision of the SDS base document "ULE90130-SW-SW-SPN-00048" shall be amended according to the agreed actions contained within this report.

### 20.12 System Interface Database Baseline No 1 Report

It is the opinion of TSS that the base document as submitted in ULE90130-SW-REP-00208 V1 is an acceptable preliminary design submission. Therefore, on balance the remaining issues are such that it is considered that subject to obtaining confirmation from SDS that such issues and corresponding agreed action noted above will be picked up early in detailed design then PD can be closed out.

### 20.13 System Integration Plan

The PD can be closed out and this document status considered accepted, subject to the following conditions:

- Obtaining confirmation from SDS that such issues noted above will be updated in the forthcoming document revisions, and;
- The issues noted in Section 3 above are actioned by SDS and approved by tie.

### 20.14 Interdisciplinary Check Procedure

On balance the remaining issues are such that it is considered that subject to obtaining confirmation from SDS that such issues will be picked up early in detailed design then PD can be closed out. In addition measures such as a regular meeting with **tie** to discuss the IDC process have been formulated.

### 20.15 Health & Safety and Quality

The Preliminary Design phase can be closed out as there are no outstanding actions. A number of the actions relate to the development of the Safety Management Plan and Quality Management Plan within the Detailed Design phase.

It is important that a programme for the development of these plans within the Detailed Design phase is agreed with SDS.

### 20.16 Environmental Compliance

The TSS team are broadly content with this fourth draft of the EMP and consequently will not be providing any commentary on actions either outstanding or failing to have been addressed in this version of the EMP. Consequently we are of the view that there are no significant and therefore PD can be closed out

# 21 SUMMARY CONCLUSIONS

From the summaries presented earlier in this section of the report it is clear that there has been a lot of good work done both within the preliminary design submission and subsequent in the dialogue that has taken place between tie, SDS and TSS. Running through the disciplines the general position is:

- Track: General acceptance of the submission
- Structures: A split outcome with majority of the structures being acceptable or requiring some confirmation of coverage in the detailed design phase. There are some however that are less clear-cut and these particularly involve the charettes or outstanding decisions from CEC regarding the design requirements.
- Roads: General acceptance of current development
- Traction Power: General acceptance of current development
- Overhead Line: General acceptance of current position
- SC&S: Acceptance of the submission
- Systems: Generally accepted or accepted with conditions with the exception of Verification and Validation Plan, Hazard Log, and the Reliability Availability and Maintainability Management Plan
- Environment: General acceptance of the current position

The engineering aspects of the project seem generally to be on course with the structures a notable exception. These elements have been subject to recent interest and decisions are outstanding on certain design aspects. This is not something that SDS can be held wholly responsible for. Away from the hard engineering a number of the softer issues would appear to be outstanding. It is clear that these will require to be addressed in early course given their impact throughout the project.

Our overall conclusion is that the bulk of the Preliminary Design submission is now either acceptable or acceptable given the responses from SDS.

Appendix A is contained in a separate volume

# Appendix A
# **Reviewed Documentation**