**Edinburgh Tram Network (ETN) project – an explanatory note**

## 1. The parties and their roles

**tie** – (tie Limited) Owned by City of Edinburgh Council (CEC) as its executant for transport projects. The project managers and client for the ETN.

**CEC** – consents for the design as it affected the Public Realm.

**TSS** – Technical Support Services (Scott Wilson) – support to tie for detailed technical evaluation

**SDS** – System Design Services (Parsons Brinkerhoff, PB) – designers of the ETN and producers of the design management programme.

**MUDFA (**Multi-Utilities Diversion Framework Agreement) operated by Alfred McAlpine Infrastructure Services (AMIS) – the utilities diversion programme – separate from the ETN programme but supporting it. Construction of the diversions was to SDS designs. AMIS was purchased by Carillion during the course of the works.

**Infraco** – the constructor. Bilfinger Berger Siemens (BBS). Originally envisaged as the constructor of assured designs by SDS taking no design risk. In practice, as design continued concurrent with construction, BBS also took design risk.

**The board of tie –** part of the project governance process. This was not the statutory board of tie Limited (formerly Transport Initiatives Edinburgh Limited) but was an internal governance meeting at the highest level. Members at various times included elected CEC councillors, managers / directors of Lothian Buses, independents, representatives of Dundas and Wilson, and tie employees.

## 2. Project delivery overview

There is nothing conceptually or technically different about the ETN from any other tram system; any difficulties which have been experienced all derive from organisation and governance arrangements.

The design and delivery concept for the ETN was simple. The design was based on street track built on concrete slabs and ballasted track in segregated off-street track, sometimes located adjacent to NR tracks. Bridges and viaducts were provided as required, as were tram stops. Line of sight driving with conventional tram signalling and interlocking of road traffic lights was provided with points and crossings for routing. Power was provided via overhead lines with conventional power switching and earthing arrangements. All switching control is provided via a control room and

radio is provided for operational control. A single depot provides maintenance and stabling facilities and is used for service launch each day.

Delivery of the design and construction was planned as follows:

1. Locate all the utilities beneath street level and move them away from the alignment (track route) – MUDFA. This ensured that utilities would not be inaccessible beneath a concrete slab.
2. Survey the ground conditions to confirm the suitability for the track slab and adjust the design according to what was found. – tie through SDS (mostly).
3. Produce the preliminary design to prove the principles of the specification (Employers Requirements) and consistent with 1 and 2 – SDS
4. Develop 3 into a detailed design (SDS) with consents for Public Realm works from CEC and other statutory authorities to provide an Issued For Construction (IFC) design suitable for construction. The ETN was split into sections and the design issued section by section.
5. Appoint a constructor (Infraco) and build the IFC status design. Modify the design according to emergent issues hitherto undiscovered as required.
6. Test and Commission against the Employers Requirements and, after any adjustment or modification to ensure compliance, handover to CEC and the operator for service.

These points are certainly a simplification of the actual detail but not grossly so. The approach is typical of any tram system.

The roles of the parties in section 1 above can be clarified further.

- The design authority was SDS, appointed by tie and confirmed as competent for the task. Parsons Brinkerhoff (PB), the SDS contractor, has undertaken many such tasks and is self-evidently competent to design the ETN, but notwithstanding this was specifically confirmed as such by tie.

- tie acted as an integrator of the parties' activities to ensure that they were coordinated and aligned. In this sense it was project manager, but it was the parties who produced their own programmes. The SDS-produced programme was the key programme which depended upon all other items being available and consistent with it. In acting as integrator tie monitored SDS's progress against their own programme.

- tie had the duty to respond to SDS when it requested information or clarification necessary for the design unless SDS had specifically been appointed to provide it itself.

- tie had the authority as client to stop or redirect work, although not without consequence. SDS was entitled to claim for delays beyond its control where it incurred costs. If tie specified any design detail, the risk stayed with tie.

- tie was entitled to assurance (evidence that the right things had been done) on designs before they were finally issued. This is entirely different from checking a design. This is dealt with further below. tie's 'entitlement' was not a whim; if a design was accepted and was later shown to be defective, whereas the commercial risk may sit to a great degree with the designer or constructor, there may still be no tram system available for service, and, in that sense, the ultimate risk sits with tie and CEC. It was good practice to ask for assurance, which if a competent job had been done by the designer would be naturally available at almost no extra effort; it is the by-product of competent design work.

- TSS supported tie in any technical review of the design (note that this is different from assurance which can only be provided by the design authority - SDS). tie did not (need to) carry detailed technical resource itself in consequence of this; its role was to integrate and to receive assurance and had resource competent for that task.

Many of these issues are dealt with directly in two documents produced by me for Matthew Crosse in August 2007 ("to support a 'forensic analysis' of project history") and November 2007 dealing with entry into the construction phase, at his request. They are informal in nature although serious in intent and are attached as Appendix 1 and Appendix 2. I have no knowledge of any use to which they may then have been put.

Appendix 1 deals with experiences from Jan 2007 to Aug 2007 in working with SDS. Attachment 2 in Appendix 1 is the Design Assurance Statement in which it is clear what evidence SDS had to supply to demonstrate the adequacy of their designs. SDS agreed (Martin Conroy) to supply this but never did in practice at that time. The reasons are elaborated further in the main body of Appendix 1.

Appendix 2 deals with entry into the construction phase after appointment of the Infraco and the responsibilities of the parties to act to deliver a design and construction.

These documents did not deal with the commercial or governance arrangements in tie, but only with the engineering and programme issues.

They must all be seen in the context of the roles defined above in sections 1 and 2. Whereas tie might be 'accountable' for something it was rarely 'responsible' in the sense defined and detailed in Appendix 2, page 7, viz

A – Accountable to the overall Project Director – the person who specifies the 'right thing' to do
R – Responsible for doing the 'right thing' to the Accountable person

It was usually SDS/Infraco which was 'responsible' and the RACI chart in Appendix 2 (page 8) makes that clear.

The issues in Appendix 1 and Appendix 2 can be summarised:

SDS could have completed the design to a much earlier programme if:

- CEC had dealt with consents more flexibly; demanding a completed design when SDS depended further on decisions by CEC could not work. The process had to be iterative but it was treated as serial. SDS is not entirely blameless and could probably have offered more, but they were aiming a moving target because CEC was never clear on the absolute requirements taking a "we'll know it when we see it" approach.

- More focus had been placed on the Design Assurance Statement Approach – Appendix 1, Attachment 2, page 34 as distinct from checking designs. That approach required reporting of what SDS had to do anyway to deliver a competent design. It did not require detailed checking of a design which SDS were competent to deliver by themselves. It was called by some "self-assurance". That is nearly correct. If a competently completed design is accompanied by assurance information SDS had first to assure themselves that it was competent and complete before offering it elsewhere.

- TSS, tie and CEC had treated SDS as a partner in common endeavour where SDS were offered constructive support rather than being held at arms' length and treated by some with distrust. That may be an exaggeration of some small degree, but it was certain that SDS was forced to take a protective stance on their commercial interests, and expended energy on that to the detriment of making progress.

Trudi Craggs had it right when she observed in January 2007 that design was not recognised as being an iterative process. Actually it was 'recognised' as requiring that approach but the interests of the parties conspired (passively – there was no actual conspiracy) against that and treated it as a quasi-serial process. That single issue is probably the most important issue leading to delay. Other issues are:

- The MUDFA programme was held back by lack of knowledge of location of utilities. This applied particularly to water and gas. On excavation, unexpected assets so discovered had then to be the subject of unscheduled design and construction work. Publically available records from CEC indicate that 190 underground chambers were expected and 295 discovered, and that 27.188 km

of pipes and ducts were expected and 46.575 km were discovered. That may not have been foreseen, but it was certainly foreseeable; location of utilities has always been notoriously difficult in well-established cities. It is not clear that there was a real understanding of the potential impact such discoveries could have on the design work, or that there was a plan to accommodate them.

- The Employers Requirements, which went through several iterations, were a compendium of requirements, some very detailed, some not, and they were elaborated over 700 pages of text. The very nature of their complexity is such that it is likely that there will be some conflict between the details which must be resolved on discovery. That adds to delays. Elsewhere (London Underground, Network Rail) there are usually standards which sit apart from the project specification and there are outcome based specifications leaving the designer to deliver something which performs as required in the context of the standards. The standards are the subject of agreement on their detailed applicability before work starts The Employers Requirements were a mixture of these things. Their development seems to have been done as a separate activity leading to divergence in the requirements and the emergent design.

- The advent of the construction phase with the appointment of the Infraco caused additional delays. From the outset of the Infraco contract award, much of the SDS design was questioned and in many cases reworked – usually to make things more (unnecessarily) robust, possibly to protect Infraco's view of risk exposure. The Infraco at this stage was expected to take design risk as the design had not been completed. This significantly protracted the project design timescales and costs. It was a self-evident failure of the bespoke contract that this could happen.

- When the Infraco contract began, a Construction Project Management Team was set up (Bob Bell). However, the effect of this was to question design even further. Despite the existence of TSS and tie's own Engineering team, there followed much further so-called 'analysis' and cost examination. This simply caused further confusion and protraction. It is noteworthy that the only element of the project that fulfilled its cost and timescale objectives most closely was that of tram vehicle construction. That element was the only one not subjected to any great influence by the project as it was provided by CAF as a variant of a production run already underway for another client. The imminent arrival of the tram vehicles was a real problem with nowhere to put them; at one point they were offered to the Croydon tram system in south London on a temporary basis until the infrastructure to accommodate them had been built. That was not done as their length was too great.

- For completeness, mention must be made of the tie board arrangements. The membership noted in section1 above must have made for great discomfort; there are obvious conflicts of interest. Companies Act directors must only act in the

interests of the company, and although that did not directly apply to this internal meeting, the principle still holds good. How easy was that for an elected councillor to achieve if the company's interests did not coincide with their constituents' interests? How easy was that for Lothian Buses, a competitor of the tram system to achieve, if the interests of the bus system were incompatible with those of the tram system? I have no hard evidence either way, but there is no obvious explanation about why such an arrangement would ever be attempted. It would have been cleaner to have had an independent board with no conflicts of interests. It would then be for CEC to adjudicate between the competing interests rather than leaving the board to struggle with it. The board had direct influence over every aspect of the project so this is a significant issue.

In conclusion and summary, if SDS had been given greater freedom to exercise their competencies, and if tie, TSS and CEC had lined up with them to remove obstacles rather than treat them as a contractor who had to be tightly controlled and effectively distrusted, it is likely that far faster progress would have been made. Acceptance at an early stage the MUDFA could reasonably be subject to delays and agreement with SDS on contingencies for that would have turned a reactive situation into a planned one. All that in turn would have removed most of the detailed design from the construction phase and so removed at source many of the delays which eventually led to the collapse of the project. The Infraco would have been able to build an assured design, rather than be expected to take risk on a part-extant design of which they knew nothing.

That is the reason that the Design Assurance Statement regime was introduced; it would have had that effect. In the event, progress was not made because of all the reasons elaborated above, and the Design Assurance Statement regime was never fully implemented in consequence.

If a little control is good and necessary, it does not follow that more is better.

David Crawley

**Appendix 1**

# Working Experiences with Parsons Brinkerhoff (SDS Contract) January 2007 – August 2007

David Crawley

This is a personal account to support a 'forensic analysis' of project history.

**Contents**



## Jan 2007 to August 2007

On 9/10 January 2007 I undertook a review of the project (Attachment 1). The review covered people from most parts of the project. The most striking part of that review is that nobody interviewed believed that the project could be delivered to programme. Some believed that the only solution was to stop and begin again. The review stands as a snapshot in time undertaken by someone who at the time had no preconceptions or particular understanding of the project. Of all those interviewed only Gavin Murray is still in post from that time.

From February 2007 I undertook the role of Engineering Director of the project reporting to Matthew Crosse who was Project Director, having recently replaced Andie Harper.

It was immediately apparent, as indicated by the January 2007 review, that there was a significant problem with design progress (at that time the project was at the Preliminary Design stage prior to moving to Detailed Design).

In February 2007 there were about 80 items which were the subject of lack of agreement between SDS and **tie** and which had the effect of halting design progress. It was the SDS view that **tie** should instruct them to proceed on these items because they required decisions which were outside the scope of supply for which they took design risk. It was the **tie** view that SDS should take the relevant decisions, and hence the risk, as they were within the relevant scope of supply. The impasse that had developed was growing and the number of 'stuck' items was increasing.

By way of illustration of the syndrome one significant cause of dispute was design features which were to be located outside the Limits of Deviation (LOD) – the limits inside which **tie** has parliamentary and/or Council agreement to design and build a tram system. It was the SDS view that if they were asked to design outside the LOD then **tie** were outwith their authority and could not hold SDS to account and so should instruct SDS if they wished to proceed (thereby taking risk from SDS). It was the **tie** view that if the physics of design constraints required that features were to be

located outside the LOD they would gain the necessary authority and that SDS should design the tram system for Edinburgh which they had been contracted to produce. An example is:

**"SDS ARE PROPOSING TO PLACE A TRAM SUBSTATION WITHIN AN EXISTING CEC FACILITY LOCATED OUTSIDE OF THE LOD. DISCUSSIONS WITH CEC TO DATE HAVE INDICATED ACCEPTANCE TO THIS PROPOSAL. SDS ISSUED RFI 30/11/06 REQUESTING THE FORMAL AGREEMENT WITH CEC FOR USE OF SITE."** This was cleared on 17 May 2007

Other reasons for lack of progress relate to the SDS views of failure by **tie** to respond in a timely way in the design review process and failure by CEC to give planning permission in time for the review process. **tie** have said of these issues that there was some truth in the first issue, but in respect of the second that SDS did not provide sufficient information for CEC to approve. Examples are:

**"CEC 'RED' PER LACK OF DETAIL ON WEST SIDE OF SQUARE. SDS COORDINATING WITH CEC CAPITAL STREETS PROJECT."** This was cleared on 3 May 2007

**"CEC PROVIDED 'RED' STATUS TO PRINCES STREET DESIGN AT 6/12/06 DAP. CEC REQUEST CHANGE IN ALIGNMENT THAT CONFLICTS WITH TRAM DESIGN MANUAL & PREVIOUS GUIDANCE. CHANGE NOTICE REQUIRED. LETTER PROVIDED TO TIE 22/12/06."** This was cleared on 3 May 2007

**"CEC COMMENTS INDICATE THAT PLANNING SUMMIT MEETING MINUTES HAVE NOT BEEN CASCADED TO REVIEWERS. REQUESTS REPORT FROM SDS TO JUSTIFY SHANDWICK PLACE CHARRETTE DISMISSAL. LETTER ISSUED TO TIE 22/12/06."** This was cleared on 3 May 2007

**"HAYMARKET CAR PARK - WILL THIS SCOPE BE HANDED OVER TO NWR, LETTER SENT TO TIE ON 12/02/07. CLARIFICATION REQUIRED"** This was cleared on 10 May 2007

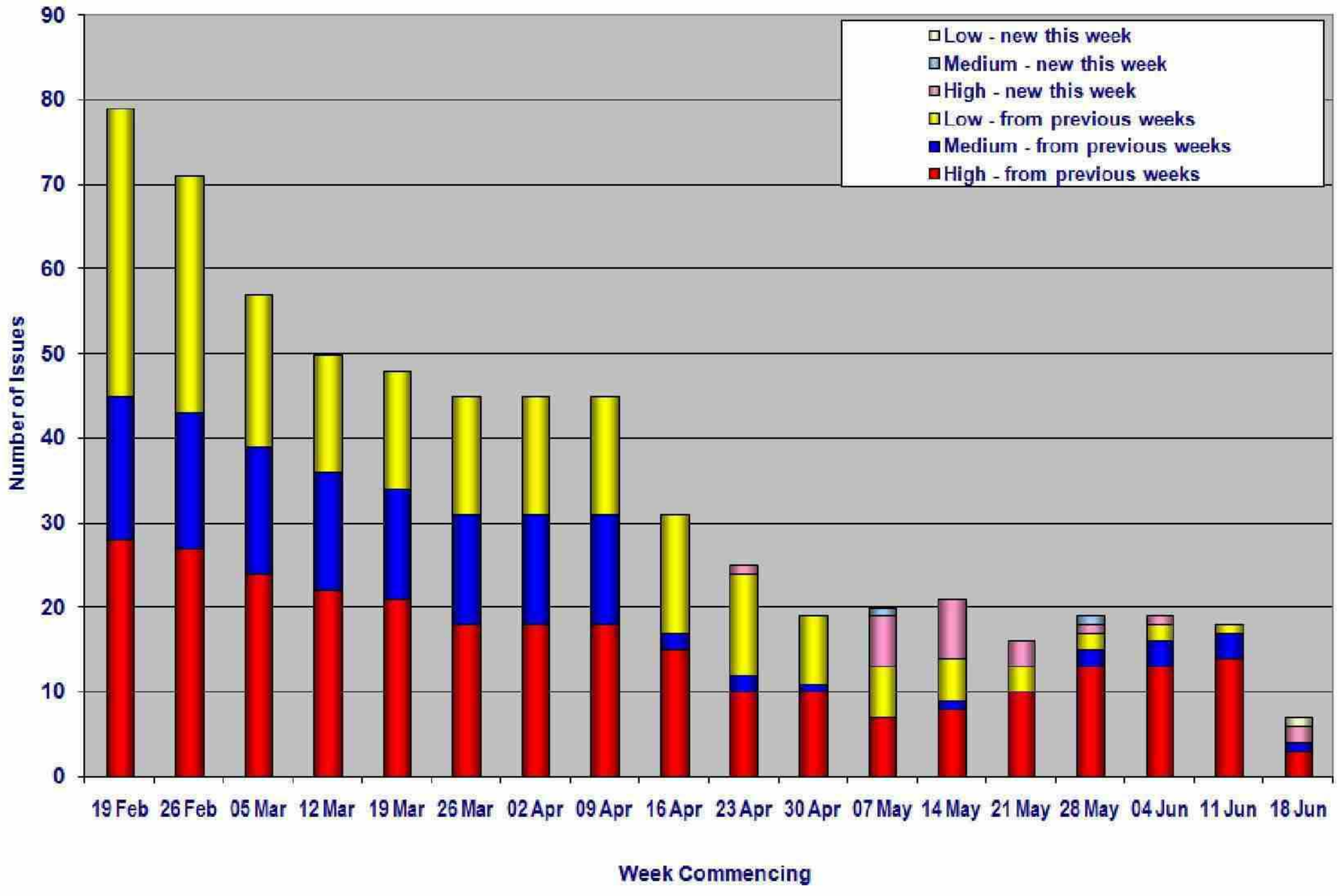
The various issues were classified as High Medium and Low which referred to the potential design time delay consequent upon them (< 10 days, 10 to 20 days, >20days respectively) or the Capex impact (<£50k, £50k to £250k, >£250k, respectively).

These issues were referred to as 'Critical Issues' and in February 2007 I established a process designed to clear them based upon the principle that the party best suited to taking the risk should do so. This process was made much easier by the cooperation of Steve Reynolds who was the most senior Parsons Brinkerhoff manager on site. He had been assigned to the project by Parsons Brinkerhoff specifically to deal with the growing problems leaving Jason Chandler to handle the steady-state workload. It was inevitable that as **tie** was the 'party of substance' that tie would be taking (back) most of the risk as it was best suited to carry it – but in practical terms that risk would not materialise, e.g. if building outside the LOD was required, CEC, as the owner of **tie**, could provide the necessary authority. This is a mechanism which would not be available to SDS. The chart below (page 3) indicates the position and history in June 2007. This indicates that significant progress was made in removing these issues. It also shows how new issues were being added in April and May following a restart of design work in April but that the issues were being quickly cleared as they arose. Accompanying this process were reports being produced personally by Steve Reynolds indicating the net effect on the project programme of each programme version referred to as Project Dashboards – most of which effects were due to clearing the Critical Issues. The diagram below indicates this process. Three programme versions are referenced (V14, V15, V16) with the

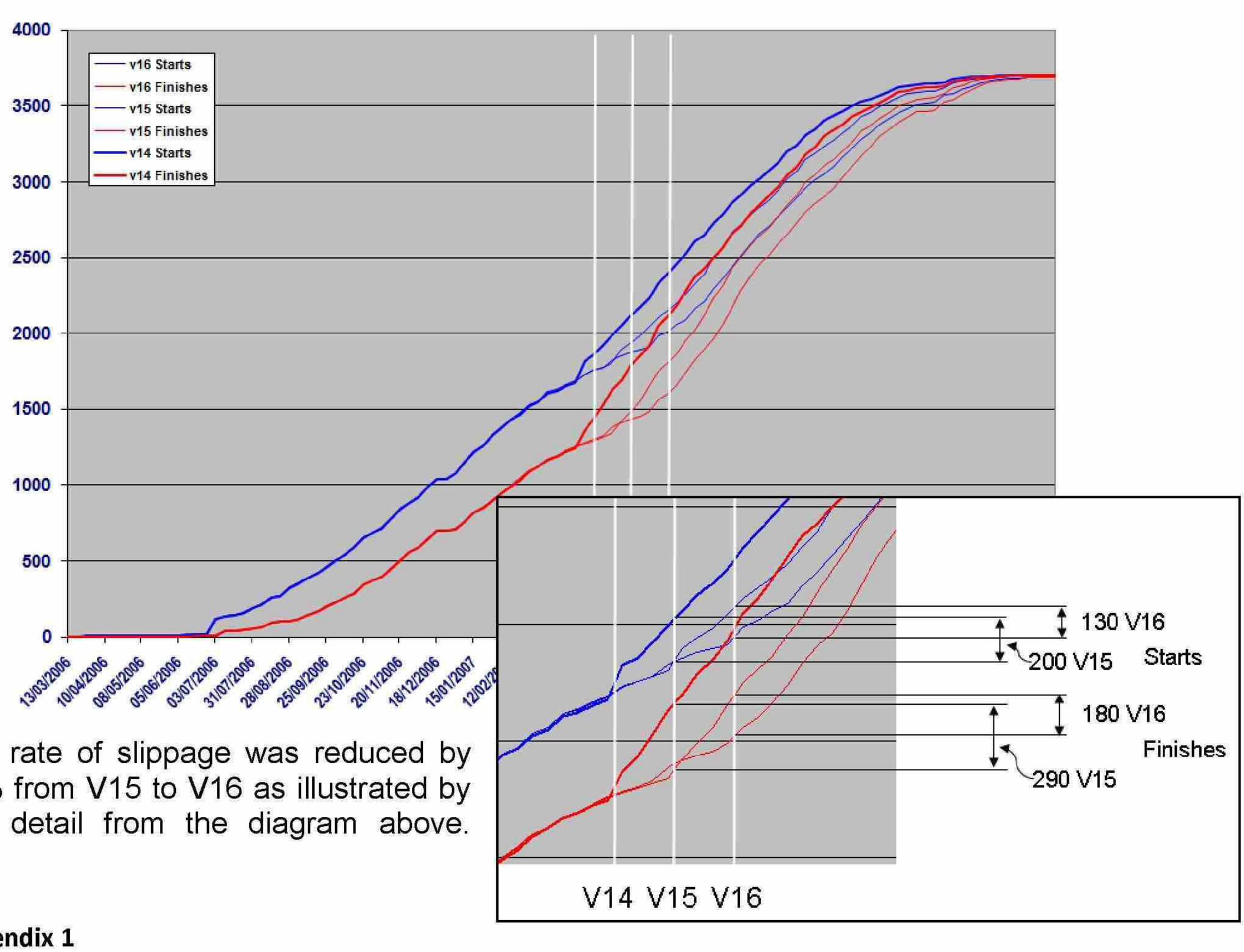


**Appendix 1**

vertical axis indicating the number of master programme items being either started or




finished in each 4-week period and the net effect on overall programme that this produces. The three white vertical lines show the start of each of the three programme versions (one per 4-week period).




The rate of slippage was reduced by 35% from V15 to V16 as illustrated by this detail from the diagram above.

**Appendix 1**

Most of this improvement was due to removal of the critical issues.

The easiest way to read these charts is to note that the more vertical the lines the less delay they indicate.

By July 2007 the weekly review process was subsumed into other 'business as usual' processes. It should be noted that the success of this process certainly depended upon the cooperation and leadership of Steve Reynolds, but that this did not read across into the wider SDS organisation in terms of behavioural change, typified mostly by the approach of Alan Dolan who, it appeared, would operate contract process as distinct from seeking opportunities to remove blocking problems.

By May 2007 the attention had switched to the receipt of design assurance from SDS. It was apparent from that engagement that cooperation from Parsons Brinkerhoff was less forthcoming. This may have been mostly to do with their lack of understanding of the concept which seemed to be limited to demonstrating that they had met the contracted specification in terms of standards and industry norms. The need to demonstrate why a design is a 'good' design and that each design element forms part of an integrated whole which can act as an operating tram system was not apparent.

Nevertheless, a pro-forma report was agreed with SDS in May 2007 against which they would provide assurance of the necessary type as each tram sub-section was completed. This is shown in Attachment 2. It is understood that this has never been applied successfully based on the fact that formal design completion of any tram sub-section has not been achieved and so assurance has not become 'due'. The reason for this relates to the last few design details of each tram sub-section being unavailable – in the SDS view this relates usually to CEC not approving the relevant details, but in the **tie**/CEC view due to SDS not providing enough detail to approve. The design review process is shown in Attachment 3 and had contractual commitments for tie and SDS. The process shown is for detailed design review but that for preliminary design is similar.

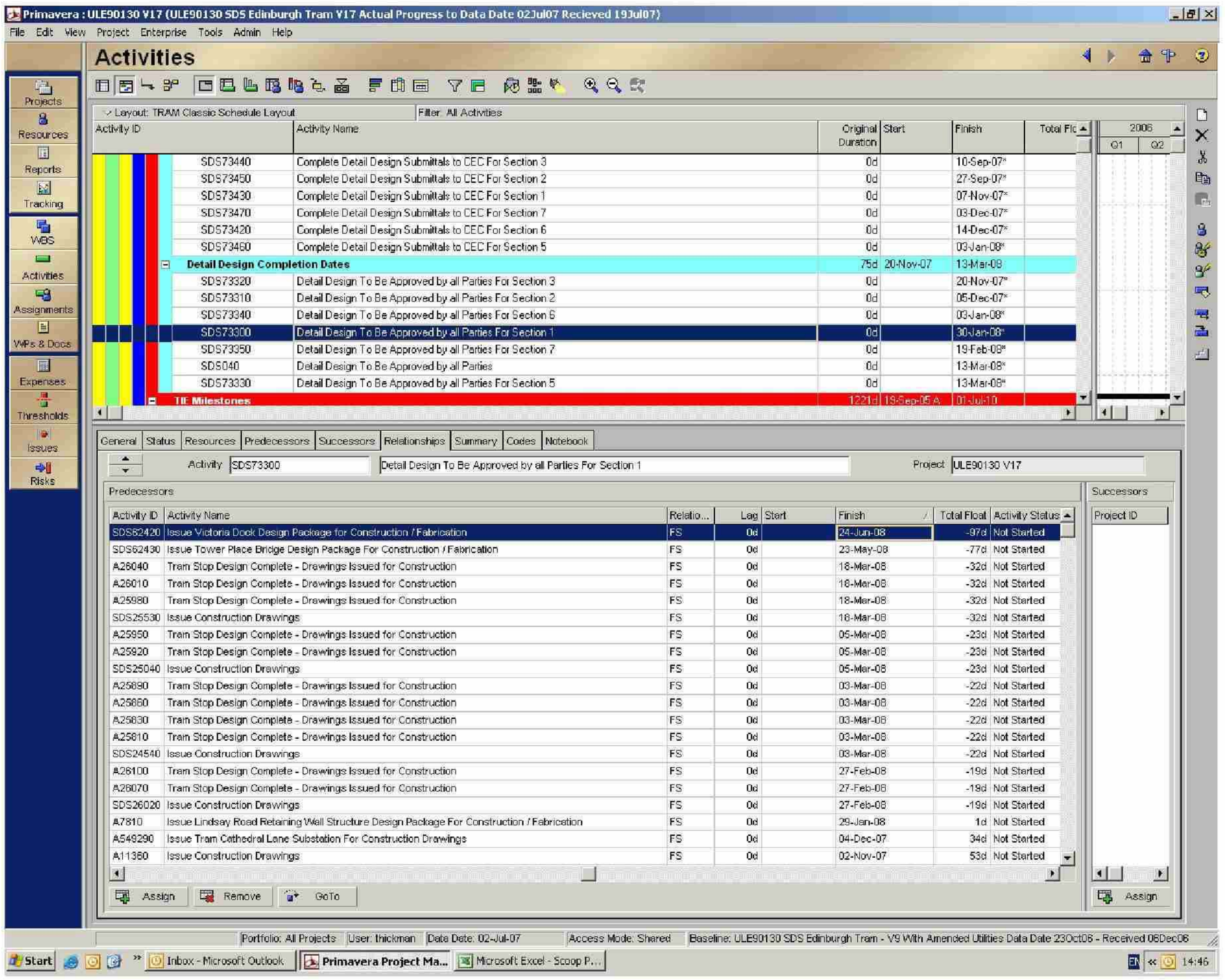
The first receipt of commitment by SDS to completed design dates which would support this process is shown below (page 5) in a screen dump (upper half) from their master project programme.

This quickly became superseded by ever later dates. The design review process in Attachment 3 needs to be seen in the context of the overall tie Design Management Plan (Document: Com-Project Controls-58 September 2007) a key extract of which is shown in Attachment 4. This shows how CEC and tie responsibilities are aligned and how the design review process relates to these. There was an attempt to receive from SDS provisional design assurance based on the achieved design position reached being sensibly complete. This did not meet with success and the leadership previously exhibited by SDS focused on their own team for clearing the critical issues did not materialise for this item.

In attachment 4 there is a green coloured box labelled 'Design Review'. This refers to a semi-formal event established by me in mid 2007 where SDS designs were presented by SDS to **tie**/TSS/CEC to demonstrate the principal details of the design and to indicate how the design had been integrated into the overall tram system



**Appendix 1**




design. The purpose of the reviews was to pre-position stakeholders prior to formal receipt of design submissions. These reviews met with mixed success and did indicate that SDS were presenting designs which had been a substantial way through the design process but which still contained significant omissions or lack of integration. These were usually explained as items yet to be dealt with by internal SDS processes (Inter-Disciplinary Design Check (IDC)) and which would be completed in time for tram sub-section completion. This was sometimes the case but it was also the case that IDC status designs which were incomplete were presented. There is memory of the infamous case of water being required to flow uphill to effect good drainage – John Dolan (ICP) was present for this review and pointed out the problem.

In August 2007 Damian Sharp was appointed to the role of Engineering Assurance and Approvals Manager with the remit of managing some of the above processes. His role description and definition of processes he was to manage are included in Attachment 5. The overall process diagram represents the total role of the engineering team with process A4 being operated by Damian Sharp. The format of this chart is classical IDEFØ[1] where inputs (from the left) are transformed into outputs (to the right) under the influence of controls (from the top, marked in red). Damian's role quickly matured to incorporate elements of the other processes.

[1] Integration Definition for Function modeling http://www.idef.com/IDEF0.htm



**Appendix 1**

In August 2007 it was apparent that although one major blocking issue had been removed (the Critical Issues) the mode of operation of the SDS contract was not easily going to deliver a completed design which was accompanied by the necessary assurance because the ability to reach full design completion, tram sub-section by tram sub-section, was reduced by the complex process of gaining CEC agreement to all relevant details (in part, Prior Approvals, Attachment 4), something which itself depended upon SDS providing sufficient detail. To achieve this would require more iteration than there was time for in the programme.



**Appendix 1**

# Attachment 1 – Project Review by David Crawley, January 2007



**Appendix 1**

# tie

## Tram Project

## A review

David Crawley

January 2007

# Scope

- A review of the Design Review Process based on interviews with key personnel
- Identification of key themes
- Proposal for solution methodologies.

# Interviewees

- Graeme Walker
- Douglas Leeming
- Trudi Craggs
- Daniel Persson
- Gavin Murray
- Jim Harries
- Alex Joannides
- Ray Millar
- Jim Hunter
- Martin Donohue
- Mark Bourke
- Ailsa McGregor





**Appendix 1**

# Process

- Open questions
  - How is it going?
  - What problems in doing your job?
  - Where are the big risks?
  - Will you meet the project programme?
  - What are your solutions?

- Reporting – summarised – close to verbatim
- Free-form interviews
- Conclusions drawn from comments made
- Solutions proposed.

# Interview notes

- Summarised, but as close to verbatim as possible
- Scope not forced to be consistent with defined scope of review – freeform discussion to elicit as much information as possible.
- Most participants had wider ranging issues than just design review.
- Good consistency for common themes

## The interview notes ….



**Appendix 1**

# Graeme Walker

- Discussion on utilities diversion as a hot issue.
- MUDFA arrangement leaves SDS and Utilities with design iterations (with visibility by AMIS) prior to final design being given to AMIS. AMIS deliver diversions but leave old utilities intact but disconnected – Infraco install track on top and treat all utilities as live – i.e. installation on 'unsterilised' land.
- Ground Penetrating Radar at hot-spots, but too many non-intrusive surveys elsewhere. Now putting slit trenches in other locations – inevitable that unpleasant surprises await.
- **Risk** – Practical detailed design far exceeds planned scope and leads to programme slippage, e.g. telecoms standards requirements on minimising number of connections or splices.
- **Risk** – Implementation and continuity plans lead to further delay once scope understood.
- **Risk** – third part interfaces add to scope and delay.
- 'Charettes' process is adding to scope also
- Will the programme be met? On a spectrum of Good Chance – Tight – Probably Not, view tends towards 'Probably Not'.
- **Solutions** – none – but felt that he has available to him processes that work for him.

# Daniel Persson

- Biggest issue - problems with RFI (Requests for Information) from SDS.
- **tie** have 7 day response time – not meeting this. Even though SDS should re-issue requests not responded to, **tie** position is commercially weak.
- Some RFIs not for **tie** but Daniel P is seen as default source of all information – he is overloaded.
- Difficult to get queries answered – everybody is very busy.
- Many queries are, or should be linked. There is no effective process to do this.
- **Risk** – SDS commercial position is strengthening towards a claim
- Other comments
  - Internal communications poor
  - Organisation has unclear responsibilities
  - Under-resourced, everybody too busy.
  - Perceived lack of meaningful programmes available, and those from SDS and **tie** are at different levels of detail. Not practically useable on a real-time basis and little clarity for people on how to plan their own work. Constantly responding rather than being pro-active.
- **Solutions**
  - Inter-departmental meetings
  - Simplify organisation
  - Better scheduling (weekly) to support individual work programmes

# Trudi Craggs

- Biggest issue – consents and approvals e.g. Traffic Regulations, prior approvals for power sub-stations, tram stops, poles etc
- Successful improved traffic light (RAG) process – but what to do with the red issues?
- Procurement processes not obviously supportive of phasing in design, approvals and contract letting.
- Many personnel changes leading to lack of continuity – few now understand the contracts and context of different issues as they arise. The information may exist in records, but it is not accessible.
- Little apparent acceptance in the team as a whole that design is an iterative process.
- CEC difficult to engage effectively
- Real concerns over governance of **tie.** Manageable as long as all parties have the same political will, but a real risk to delivery and cost if not, and possibly a personal risk for **tie** (Companies Act) directors
- **tie** believes risk had been laid-off through contracts, and, at first, everyone sat back and let things run – except there were too many gaps and oversights.
- **Risk** – "Programme not sustainable"
- **Solutions**
  - CEC should have desks in **tie**
  - Use the hiatus of the political process in May to re-think the project and 're-start' (without overt announcement)

# Douglas Leeming

- Biggest issue – **tie** don't know how to use TSS to greatest effect, and ignore their strengths and/or bring them in too late on any given issue
- TSS feel ignored (little response to their various proposals) and threatened, and believe their run-rate of spend exceeds what is necessary if the whole project were effectively integrated.
- TSS believe that **tie** lean on them for support when the going gets tough but would prefer not to use them at all – but also believe that they have people who are vital to the success of the project which they care about greatly. This affects morale adversely.
- A serious lack of effective management processes, particularly at an earlier stage of the project. Most people reacting rather than following a plan leading to poor and ineffective resource utilisation.
- What is the culture of the Tram Project?
  - Answered in terms of **tie**, TSS, SDS
  - Not seen as integrated at all
  - Not seen as a team, even within **tie**
- **Risk –** programme slippage
- **Solutions**
  - Fewer, but 'better' people at the right levels. 'Better' = more experienced. Do more for less spend run-rate by concentrating on the right things first time.

# Gavin Murray

- Biggest issues –
  - Generally poor understanding by many of others' responsibilities. Not sure everybody is doing what they should.
  - Big concerns over the CEC interface and its effectiveness.
- Feeling of being understaffed and too busy to be sufficiently effective.
- Good view of RAG traffic light review process and frequency, but not happy with the resource demand to support it.
- Project arrangement is not sustainable – too much stress and too little progress.
- **Risk** – programme slippage
- **Solutions**
  - Additional resource
  - Need to be more 'clever' with the interface with CEC
  - SDS must recognise that the programme is not just a deliverable document from them, but something to be followed by them too. There is no evidence that they understand this.

# Jim Harries

- Biggest issues - **tie** have a long way to go to become an informed client.
- Too much reaction and 'shooting from the hip' and not enough planning.
- **tie** quick to blame others for failures – and then quick to take on the risk and fix it themselves.
- SDS not performing well
- CEC interface is problematic – they are ambivalent and can't decide if they want the tram system or not. Too much not-joined-up thinking.
- System interfaces – feel uncomfortable
- Failure to control scope because no effective change control in place.
- Not enough of the right level of competence in the right places,
- Chance of meeting the programme overall ? "Zero"
- Tram Project culture? "not unified, even within **tie** where silos exist".
- **Risk** – programme will not be met.
- **Solutions**
  - Align tie across the middle managers – anyone external to the project should not see the join between people from **tie**, TSS, SDS, Transdev .
  - Enforce the discipline of change control.

# Alex Joannides

- Biggest issue – management of the SDS contact. To date neither **tie** nor SDS have managed the contract as written or originally planned. Seen as 'complex' and demanding. Whereas this may have been adequate for early work and preliminary design it will not cope with the rigorous attention required for the detailed design phase which the project is now entering. **tie** appear not to be contractually minded and need to become so.
- The DAP and 'traffic-light' process seen as effective, but notes that the number of issues emerging will be large and so programme-threatening.
- Culture – "as good as you are going to get". Pragmatic assessment of what is likely to happen on the basis of a core team and others deployed through service contracts. Not seen as ideal but seen as adequate.
- Communications are "OK"
- Assumptions on design and procurement should be common but may not be – however this is a necessary feature to enable progress to be made and they are "good enough".
- **Risks** – without re-making the design review process and dealing with SDS management the detailed design process will be threatened.

# Ray Millar

- Biggest issue – reactive nature of the workload and apparent lack of planning
- Unclear on how the parties roles align
- Challenge to get design review done "remotely"
- Little notice from tie on work requirements. Few written instructions and frequent change of verbal instructions.
- The current processes will not work for the detailed design phase.
- Not enough interaction with **tie** people who seem too busy to stop long enough to engage.
- Thinks **tie** believe that TSS is expendable.
- **Risks** - Programme – "quite a challenge" to meet.
- **Solutions** – cross-discipline meetings which are facilitated and must reach agreement and conclusions.

# Jim Hunter

- SDS not very responsive to client requirements and driven by programme
- **tie** could make better use of TSS.
- Low level of interaction between the various parties
- The Tram Project seems “very organic” and “haphazard” compared with other project experiences which seemed “organised”.
- Felt like “working in a bubble”
- High turnover of senior staff has not aided stability
- **Risks** – programme – “doesn’t bode well”
- **Solutions** – Learn from similar projects and copy their management processes.

# Martin Donohue

- Biggest concern – information management - seen by him as a basic hygiene factor – failure to provide this will threaten the programme overall. Not content that **tie** have understood that their information management plans may not be deliverable, or have understood that their system will need to be configured – a process which can take months. Not content that their proposed system can cope with the volume and integrity requirements for the detailed design phase.
- Tram Project team – clear that it should feel inclusive, but clear that it is not.
- Project management is not proactive and mostly reactive
- Everyone is busy fire-fighting
- Agrees that the SDS contract management as currently implemented is not adequate for the detailed design process.
- **Risks** – programme – there is "no complete programme"
- **Solutions** – Information management to cope with the volume and integrity requirements is key and any system should be intuitively useable. Proactive programme management is vital. Decisions should be made and communicated with clarity. "Procrastination" should be avoided.

# Mark Bourke

- Some contract issue “festering with SDS”
- Despite this some good progress made in recent times in having moved the project through significant change successfully.
- Positive transfer of risk as planned has not yet happened – but still can.
- Culture is now more inclusive than it was, but the leadership team still has more to do. A project charter had now been produced but not yet communicated which would aid progress.
- Recognised the potential conflict between the creation of an inclusive culture and the existence of parties contracted through “aggressive” contracts.
- Need for more work on processes and planning
- Belief that the overall programme can be met building on recent and planned changes in order to achieve this.

# Ailsa McGregor

- How is it going? – "Was going very badly, got better, but now seems to have reached a plateau". There appears to be a project "malaise" where the programme is not sacrosanct as it should be. Backlog of issues with SDS – not being managed properly. Failures by **tie** and SDS.
- Lots of resources on the project but not necessarily the right ones. Real concern at the poor value being gained from some staff and contracted staff.
- Project feels reactive rather than proactive.
- TSS are "ineffective"
- Real concern about the design review process – difficult to drive without line management responsibilities. Real need to inject energy to make it effective.
- **Risks** - Programme – "a need to transform" to meet it.
- **Solutions** – Change the people that need changing + leadership from the top.

# Specific Design Review issues

- The effective engagement of CEC remains an issue
- The Charettes process may lead to significant programme and cost risk as the enforced outcomes may not be consistent with the design and procurement assumptions. Believed to be close to an end – could more issues arise?
- The latest design review process seems to work, but resourcing may need to be reviewed.
- The alignment of the design review process and the procurement process needs further understanding – are the assumptions made for the procurement process in order to make progress the same as the design assumptions? And how are they kept aligned? If they are not aligned how is the risk mitigated?
- SDS interaction and management is not effective.

# Themes from the interviews

**Issues**

- The Tram Project is reactive and feels unplanned.
- Few believe the programme can be met – (with current arrangements)
- Not enough of the right experience in the right place to aid achievement of good solutions first time
- CEC seen as (necessarily) having many factional and incompatible views which need joining up.
- The Tram Project is not one team
- Design should be seen as an iterative process, but is not accommodated as such.
- TSS feel isolated and not part of the team

**Interviewees' 'solutions'**

- More experienced staff in the right places – less overall
- Create or use a natural hiatus to re-think the plan
- Enforce the discipline of change control and manage the SDS contract as contracted.
- Engage with CEC more effectively
- Have a project work plan aligned to the delivery plan which is practical to use.
- Change some of the people

# Analysis

- The issues and solutions from the interviewees have a good degree of common ground.
- There is no disagreement on programme risk – the programme will most likely not be met with current arrangements.
- Change control appears to need improvement and the need to understand how procurement and design assumptions are managed and aligned remains.
- The need to create overt common purpose and direction (and reduce energy spent on making internal processes work) is great.
- The need to move from the perception of reaction to planned action is great.
- Fixing these two issues will most likely lead to a reduction in spend run-rate – planning enables achievement of the right thing first time, whereas reaction rarely does.
- To move from reaction to planned action while still delivering the work will prove difficult – but must be attempted.

# Specific Strategic Problems

- The intention for **tie** to concentrate on strategic direction rather than detailed management has not been met.
- The management arrangements for the SDS contract are not appropriate for the detailed design phase – the provisions of the contract are not being utilised fully and the information turnover rate probably underestimated.
- The use of the TSS contract has not yet delivered the intended benefits. This is partly due to the fact that the form of management of the SDS contract has not allowed focused action by TSS, and so efficient use of TSS resources. It is also partly due to the fact that **tie** have not adopted their intended strategic role and so have managed TSS personnel on body-shopping arrangements rather than the TSS contract.
- The creation of one team from **tie** staff and contracted parties is not incompatible with effective management of the TSS and SDS contracts as a normal part of the management process – An effective team ethos should transcend its supporting contractual arrangements. This needs to be overtly addressed in the solution set.

# Solution Sets

A successful solution set is likely to contain the features of:

- Strong leadership fostering common goals and direction – **outward facing** delivering political and public support (also important to prevent a governance 'crisis' – see Trudi Craggs' notes) – **inward facing** creating the environment which makes everybody want to cooperate. **tie** occupies a strategic role, delivering through its TSS and SDS contracts but with one team ethos.
- Local work delivery plans for project staff linked to the project deliverables plans.
- A small number of more effective high-impacting project management processes such as design review and change control – which are rigorously enforced.
- Excellent, intuitively useable information management tools which can cope with high volume and assured integrity.
- Management of the TSS and SDS contracts as originally designed.
- Ensuring that if there is any organisation change it is done to support process change as the prime mover, ensuring best skills-fit for the role.
- Acceptance that the project delivery plans may need to change to assure delivery from this point.

# Action to deliver a solution

- A strategic level decision needs to be made on the need for action.
- There appears to be no shortage of ideas from the project team – so they should grow their own solution(s).
- Leadership from the top is the most important feature to mould and encourage these solutions and, in the first instance, overcome barriers (perceived or real) between **tie**, TSS and SDS. **The creation of a vision for the end-game is vital as part of this**. Leadership is also the right tool to use to prevent the formation of a vacuum of ideas – this encourages more reactive activity.
- Before specific solutions can be generated there needs to be a general sharing of issues to avoid everyone concentrating on their own solutions which act to the detriment of others.
- The project is resourced and structured to deliver a project, not to re-invent itself. **Support in creating a solution to acknowledged problems is important to enable change while still delivering**.

Attachment 2 – Design Assurance Template agreed with SDS May 2007

# APPENDIX 1 - EDINBURGH TRAM NETWORK
# DESIGN ASSURANCE STATEMENT

a) SUBMISSION DETAILS / TITLE:
**Section / Sub-Section to which this Certificate Relates:** (7)
Date of Issue: (8)

b) Summary of Section / Sub-Section Submission: **(9)**

c) Submission Specific Design Documents: **(10)**

**Have all Submission Specific Design Documents been reviewed, approved and under version control (in Hummingbird)?**
Yes ☐ No ☐
Comments

d) Submission Specific Drawings: **(11)**

**Have all Submission Specific Design Documents been reviewed, approved and under version control (in Hummingbird)?**
Yes ☐ No ☐
Comments

e) Applicable System-Wide Drawings and Documents: **(12)**

**Have all applicable System-Wide Drawings and Documents been reviewed, approved and under version control (in Hummingbird)?**
Yes ☐ No ☐
Comments

f) Principal Standards: **(13)**
Detail Applicable Standards;

**Have all referenced Principal Standards been adhered to, with any deviations approved and logged?**
Yes ☐ No ☐
Comments

g) Requirements Test Specification: Compliance of technical specification with Client needs/defined requirements (**14)**

**Compliance of technical specification with Client needs/defined requirements**. **Are the relevant Requirements Test Specification entries populated with the required compliance entries?**

Yes ☐ No ☐

Comments

h) Deviations and Non-Conformances including SDS requirements documentation: **(15)**
Detail relevant deviations' and non conformances

**Have all Deviations and Non-Conformances been approved and logged?**

Yes ☐ No ☐

Comments

i) Applicable IDC Forms: **(16)**

**Do all IDC Forms contain no issues and have been correctly signed off?**

Yes ☐ No ☐

Comments

j) Tram Design Manual and Design Briefs: **(17)**
**Have the Tram Design Manual and the Design Briefs been checked and issues addressed?**

Yes ☐ No ☐

Comments

k) Hazard Log: **(18)**
Detail Applicable References;

**Have all relevant entries in the Hazard Log been addressed and closed?**

Yes ☐ No ☐

Comments



**Appendix 1**

l) Risk Register: **(19)**
**Have all relevant entries in the Risk Register been addressed and closed?**
Detail Applicable References;

Yes ☐ No ☐
Comments

m) Design Issues Tracker: **(20)**
Detail Applicable References;

**Have all relevant entries in the Design Issues Tracker been addressed and closed?**
Yes ☐ No ☐
Comments

n) DDA Tracker: **(21)**
Detail Applicable References;

**Have all relevant entries in the DDA Tracker been addressed and closed?**
Yes ☐ No ☐
Comments

o) Approvals and Consents: **(22)**
Detail Applicable References;

**Have all Approvals and Consents been granted for this submission?**
Yes ☐ No ☐
Comments

**Have all relevant entries in the Approvals and Consents Tracker been addressed and closed?**



**Appendix 1**

Detail Applicable References;

Yes ☐ No ☐
Comments

p) Relevant Agreements and Undertakings: **(23)**
Detail Applicable References;

**Have all Agreements and Undertakings relevant to this submission been addressed and closed?**
Yes ☐ No ☐
Comments

q) CDM **(24)**

**"So Far as Reasonably Practicable(SFARP) has the design considered the avoidance of foreseeable risks to those involved in its construction, use, maintenance and decommissioning through the elimination/mitigation of hazards?**
Yes ☐ No ☐
Comments

**Have significant residual risks been recorded and provided in a clear manner with this design submission?**
Yes ☐ No ☐

Provide reference as to where information is contained (e.g. drawing no/ register reference)

Comments

r) Other Relevant Information: **(25)**

| | | | |
|---|---|---|---|
| | | | |
| Signatures: | | | |
| Section Design Manager | | Date: | |
| Design Manager | | Date: | |
| Project Director | | Date: | |

**GUIDANCE NOTES**

| | |
|---|---|
| (1) | Detail the Section or Sub-Section that this Certificate of Compliance covers, the Certificate Number and the Date issued. |
| (2) | Detail the section of the Edinburgh Tram Network that this submission covers. |
| (3) | Describe the works, plant or equipment that this submission consists of, e.g. **Trackwork**, including switches, crossings, buffer stops, points control mechanisms and assemblies etc. |
| (4) | Verify that Sections c), d) and e) of the Design Verification Statement have been fully populated. |
| (5) | Verify that Section f) of the Design Verification Statement have been fully populated. |
| (6) | Verify that Section h) of the Design Verification Statement have been fully populated. |
| (7) | Detail the Section or Sub-Section that this DVS covers |
| (8) | Date Issued |
| (9) | Brief summary of the Section / Sub-Section, the design and features. For example, the Section / Sub-section characteristics, Tramstops, Substations, Structures, Landscaping, Environmental etc. |
| (10) | List the documents that are specific for this submission in this section. |
| (11) | List the drawings that are specific for this submission in this section. |
| (12) | List the applicable system-wide drawings and documents for this submission in this section. |
| (13) | List the applicable Principal Standards in this section (e.g. Engineering Standards) in this section |
| (14) | Check of the Requirements Test Specification (ULE90130-SW-SW-SPN-00048) to ensure that all relevant entries have been populated and supplied to the Systems Engineer responsible for controlling the Requirements Database. |
| (15) | Provide detail of any Deviations and Non-conformances from standards and/or specification, including SDS requirements documentation. in this section |
| (16) | List the applicable IDC Forms. Check that all IDC Forms have 'no-issues' versions and are correctly signed off. |
| (17) | Confirm that the design has addressed the relevant issues from the Tram Design Manual and Design Briefs. |
| (18) | Confirm that all relevant entries in the Hazard Log have been addressed and closed Reference shall be made to the relevant hazards in this section also identify hazards relating to the submission that are still open. |
| (19) | Confirm that all relevant entries in the Risk Register have been addressed |



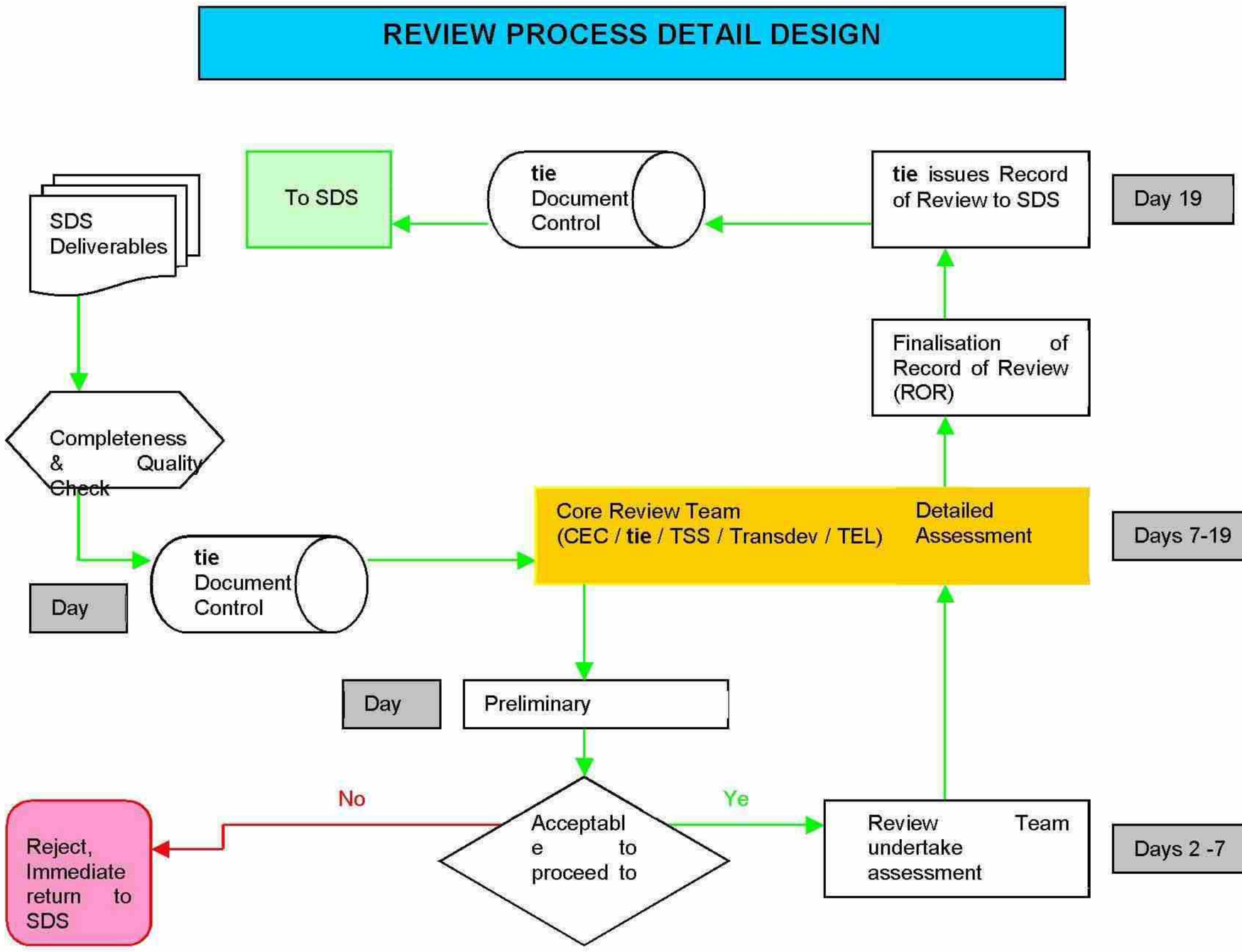
**Appendix 1**

| | |
|---|---|
| | and closed. Reference shall be made to the relevant risks in this section. |
| (20) | Confirm that all relevant entries in the Design Issues Tracker have been addressed and closed. Reference shall be made to the relevant issues in this section. |
| (21) | Confirm that all relevant entries in the DDA Tracker have been addressed and closed. Reference shall be made to the relevant issues in this section. |
| (22) | Confirm that all relevant entries in the Approvals and Consents Tracker have been addressed and closed. Reference shall be made to the relevant issues in this section. |
| (23) | List the relevant Agreements and Undertakings for this submission.<br>Confirm that all Agreements and Undertakings relevant to this submission been addressed and closed. Reference shall be made to the relevant issues in this section. |
| (24) | Confirm that the designer has complied with his duties under the CDM regulations 2007. Ensure that residual risk information is provided with a source reference. If there are no residual risks please make the statement "No significant residual risk" in this section. |
| (25) | List any other relevant information for this submission. |



**Appendix 1**

## Attachment 3 – Design Review Process




**Review Process - Detailed Design technical submission packages**

**1. Delivery of documentation by SDS** **Day 1**

**2. Completeness and quality check**

**3. tie document control (registration of submission)**

**4. Initial assessment** **Day 2**

a. Assessment of package fitness for review
b. Identification of key issues for review scrutiny

**5. Documentation placed on deposit for scrutiny by reviewers.**

Electronic copy of documentation issued to lead reviewer from each stakeholder **(tie/CEC/TEL/Transdev/TSS).**
Hard copy placed on Review table within design office for consideration and Markup

**6. Review by relevant stakeholder staff.** **Days 2 - 7**

Review team to consider documents submitted in preparation for a round table review session to be attended by representatives of all stakeholders.
Where hard copy documents are being reviewed they should be marked up in a colour relevant to that stakeholder, signed and dated such that all comments can be taken forward for consideration and potential inclusion on a Record of review at the formal Review session with SDS.

**7. Core Review Team Detailed Assessment** **Days 7 - 19**

Following at least one week of review all stakeholders **(tie/CEC/TEL/Transdev/TSS)** will gather for a formal review session to generate a Record of Review for issue to SDS.
This meeting will be attended by representatives of SDS (relevant to the discipline / element to be reviewed) who will present their design and subsequently respond do any queries raised to avoid unnecessary queries being included within the ROR responses.

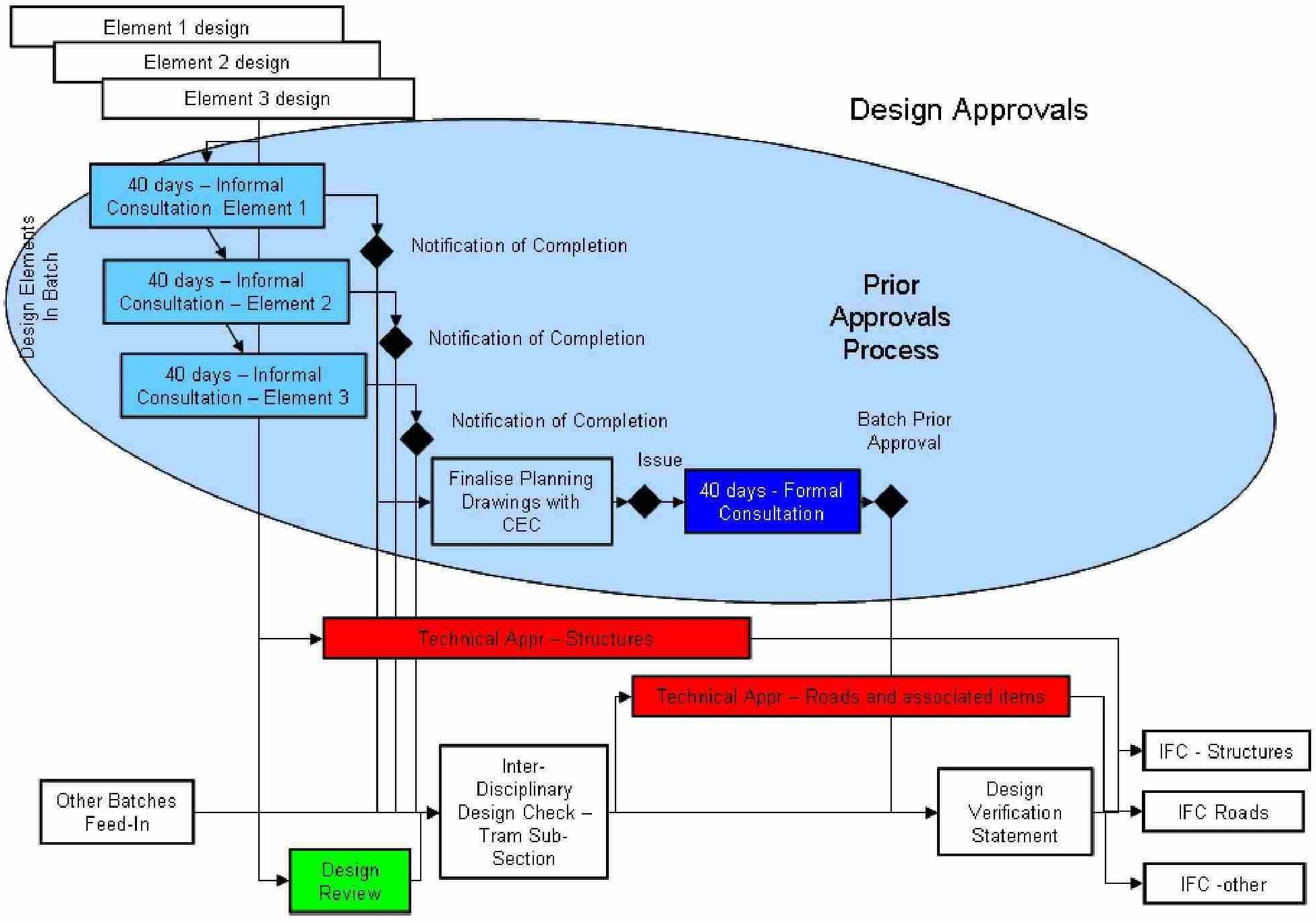
***Note: the core review team membership will consist of at least one member from each of the stakeholders (tie/CEC/TEL/Transdev/TSS )***

**8. tie Issues Response to SDS** **On or before Day 20**



**Appendix 1**

## Attachment 4 – Extract from tie Design Management Plan.






**Appendix 1**

## Attachment 5 – Engineering Team Functions

Engineering Team role summary:

To provide leadership and resolution for the engineering issues emerging from the Tram Project.
To report on and manage the SDS contract deliverables against programme.
To support the required project approvals to programme
To support delivery of Value Engineering savings by the Commercial functions.

**Strategy for success: Ensure designs are accompanied by adequate Assurance[2] and focus on the review of critical items**.
Practical functions and tasks:
Exercise of project delivery controls and reporting
Assurance management
Audit and review
Technical appraisal
Value Engineering
Key skills and resources:
Professional engineers experienced in trams systems engineering
Approvals law and process experience
Commercial experience
Design management experience
Strategic objectives and targets:
Delivery of affordable design to programme
Fit for purpose engineering giving optimum whole life cost performance
Key interfaces and dependencies:
SDS – in support of their contracted delivery of designs and approvals
Procurement / Commercial / Risk– in support of bidder liaison and negotiation.
Delivery / Programme – in support of an integrated and achievable Tram Project programme.
Finance and Business case – in support of financial reporting
Operations and Maintenance – ensuring fit for purpose design for operations and maintenance

---

**[2] Assurance – definition and specification of why the design options used have been chosen over others, why the design is fit for purpose, how the design is compliant with its various requirements, and how the design has been integrated with other system elements.**

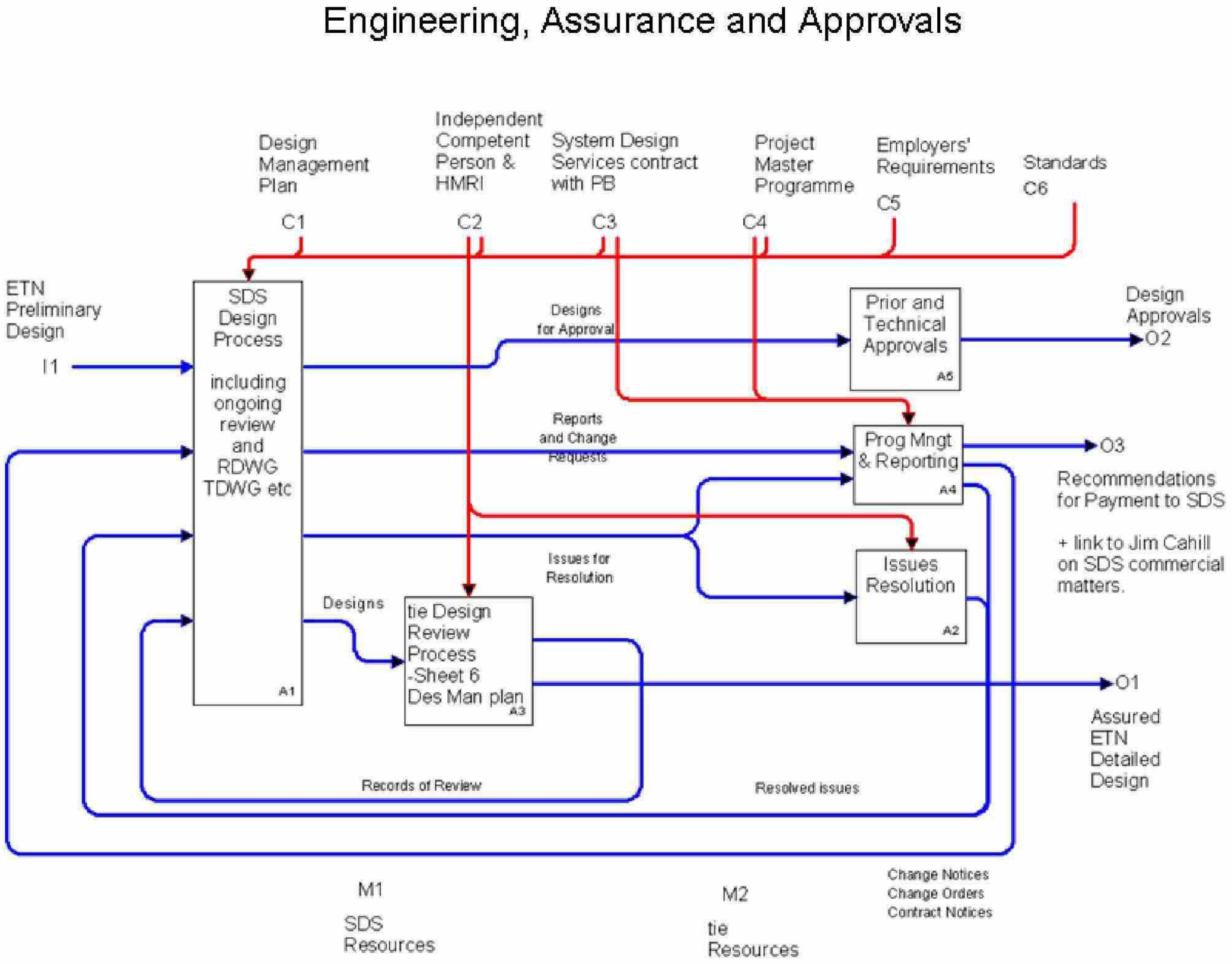
## Damian Sharp – role definition

The highlighted parts of the team description above summarise the main elements of the role. The process diagram attached shows the role in context with the overall Engineering Assurance and Approvals functions (the syntax is: inputs-from the left, outputs-to the right, constraints and controls–from above). Process element A4 refers – Programme Management and Reporting

The main responsibilities of the role are to:

- Receive reports from SDS on progress, reconcile with evidence of delivery and report into tie processes
- On the basis of available evidence, and as defined by contract requirements, recommend payments to SDS
- Manage and report on contractual issues arising between **tie** and SDS ensuring that the Commercial function is appraised of the facts. Issue contract notices as required.
- Receive, assess and process Change Requests, and in compliance with the SDS contract, issue Change Notices and Change Orders.
- Resolve issues arising in a manner which recognises the interdependencies of this role with others and respects the contractual arrangements we have with SDS.

A first priority is the gain clarity over SDS deliverables associated with Prior Approvals and Technical Approvals which are on the project critical path leading to designs being Issued for Construction.




**Appendix 1**

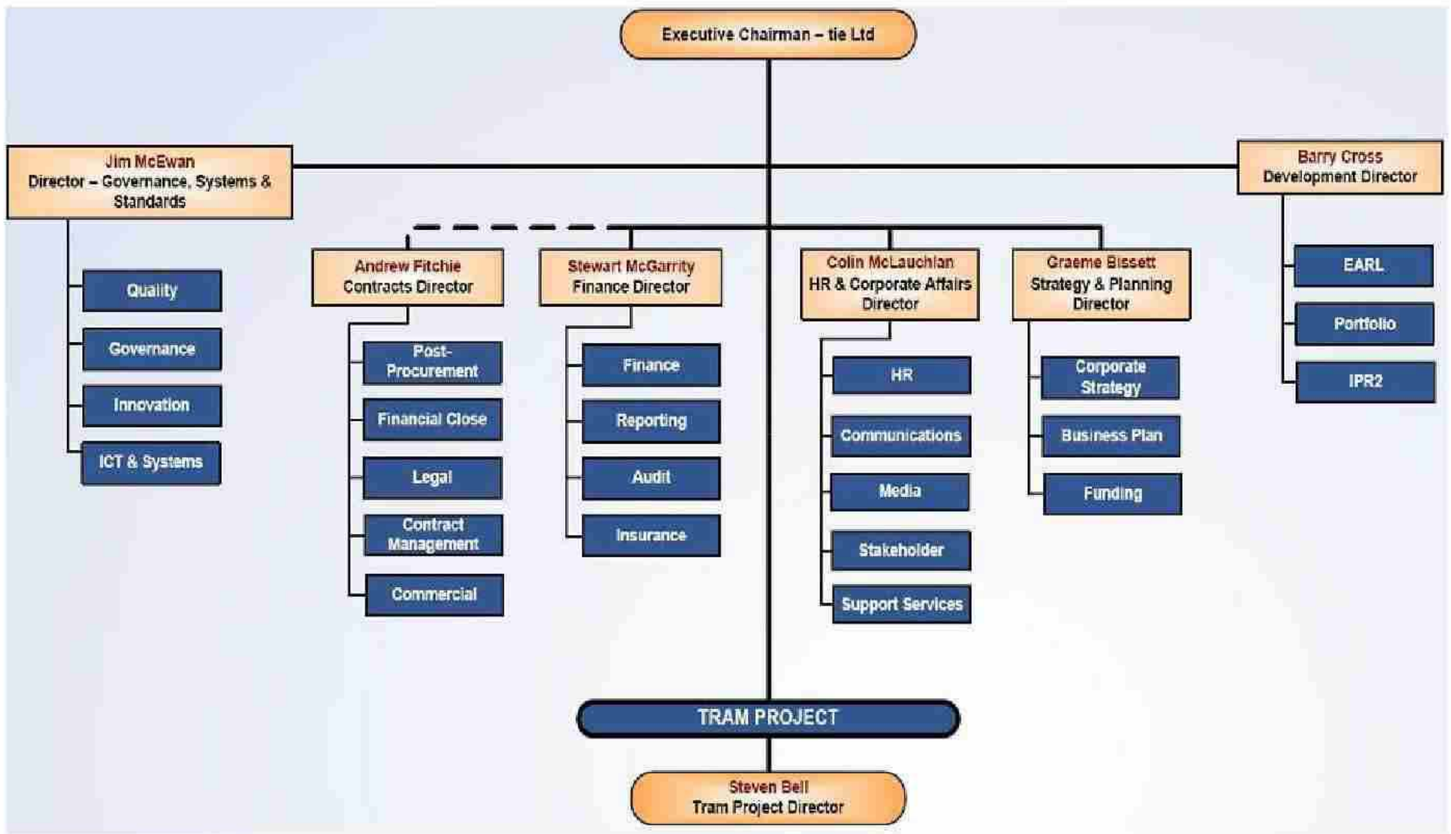
# Tram Project Organisation – Construction Phase

## 1.0 Introduction

The Tram Project is expected to move into its construction phase on 28 Jan 2008 on completion of the commercial deal with the preferred bidder (BBS).

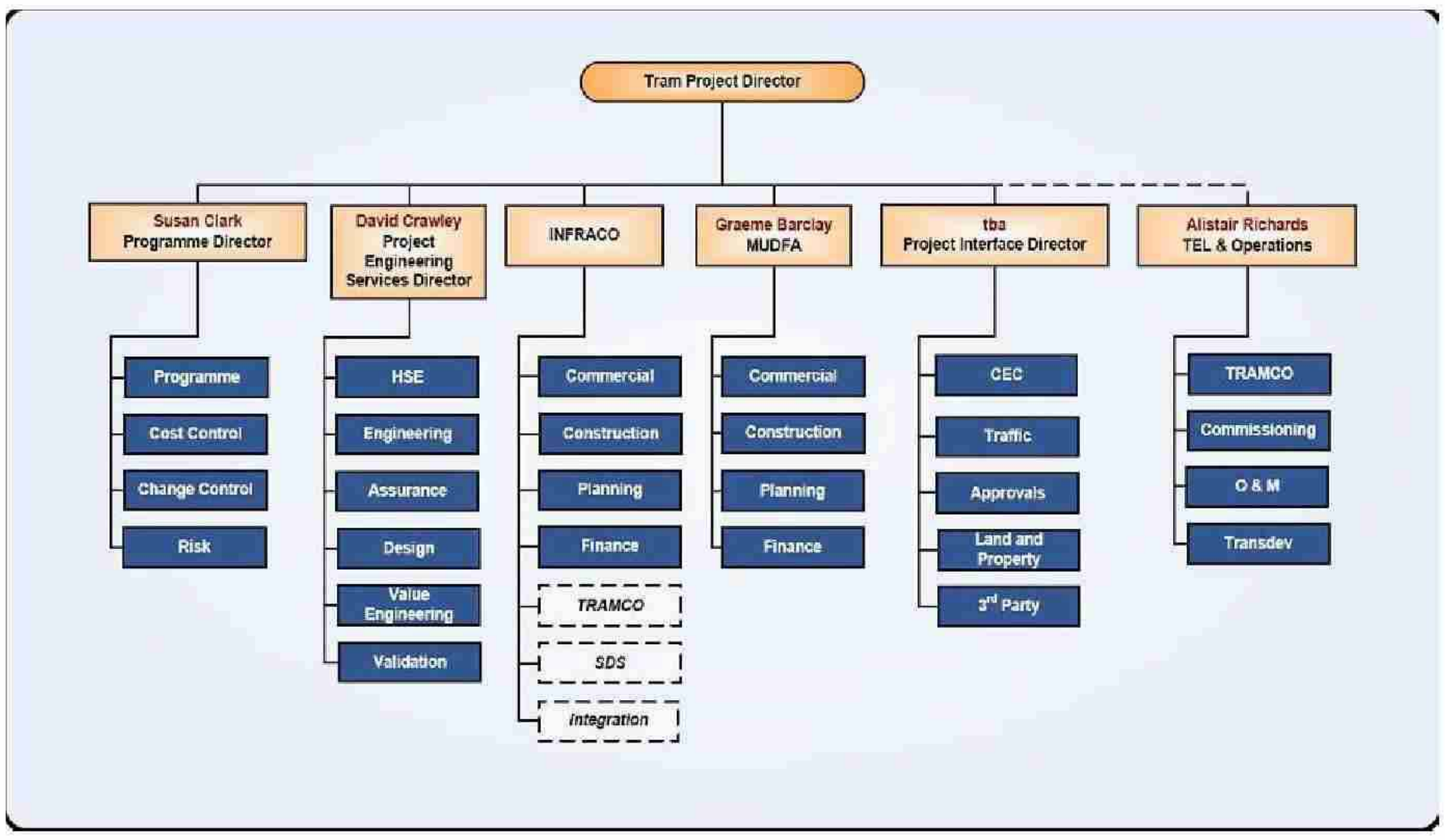
The move to this phase has been defined in an employee communication on 30/10/2007 and describes arrangements for the whole of **tie** Ltd. This document refers specifically to the Tram Project in the diagram below.

Fig 1




The details behind arrangements for the Tram Project have also been defined in the same communication as shown below:

Fig 2




The purpose of these notes is to inform the detail associated with the Project Engineering Services function. In dealing with these issues reference is

necessarily made to the whole of the Tram Project organisation arrangement, and to **tie** Ltd corporate functions.

## 2.0 Organisation Evaluation Process

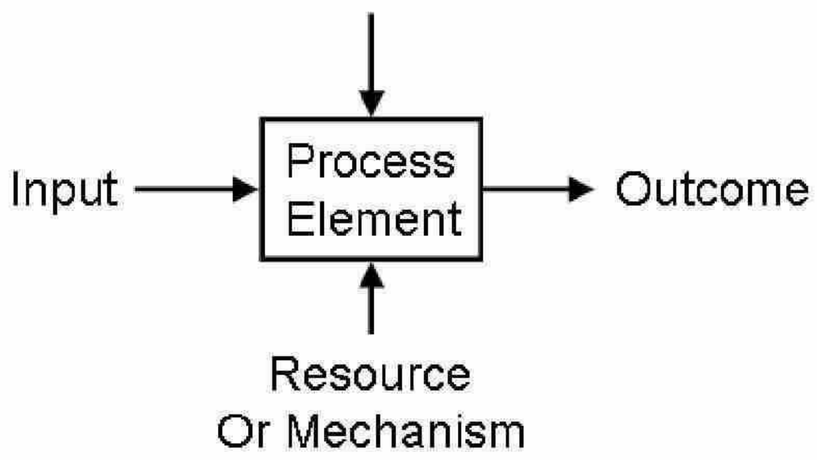
These notes follow a structured process in creating conclusions and recommendations for action as follows:

| **Process element** | **Definition** |
|---|---|
| 1. Definition of <u>what</u> the Tram Project delivers. | Outcomes the Tram project must achieve. |
| 2. Definition of <u>how</u> the Tram Project effects delivery. | The processes which the Tram project must operate in order to effect delivery of the outcomes. |
| 3. Definition of what skills in what quantity are required to effect delivery. | Self explanatory |
| 4. Definition of organisation arrangements to enable the skills to be applied to effect delivery. | Self explanatory |

Throughout these process elements recognition is made of constraints, controls and resources used in the construction phase.

In following this process use is made of IDEF methodology (IDEF = Integrated DEFinition). IDEF is a structured process design and mapping methodology which is rigorous in its application requiring all identified influences to be accommodated in a final design, or if not, positive decisions to be made about their exclusion. IDEF techniques exist is several forms, that employed here being IDEFØ[3] which is described more fully in the reference below. IDEFØ techniques are employed in process element 2 above.

The IDEFØ charts utilised in this document have the format shown below




[3] http://www.idef.com/idef0.html

## 3.0 Tram Project Outcomes

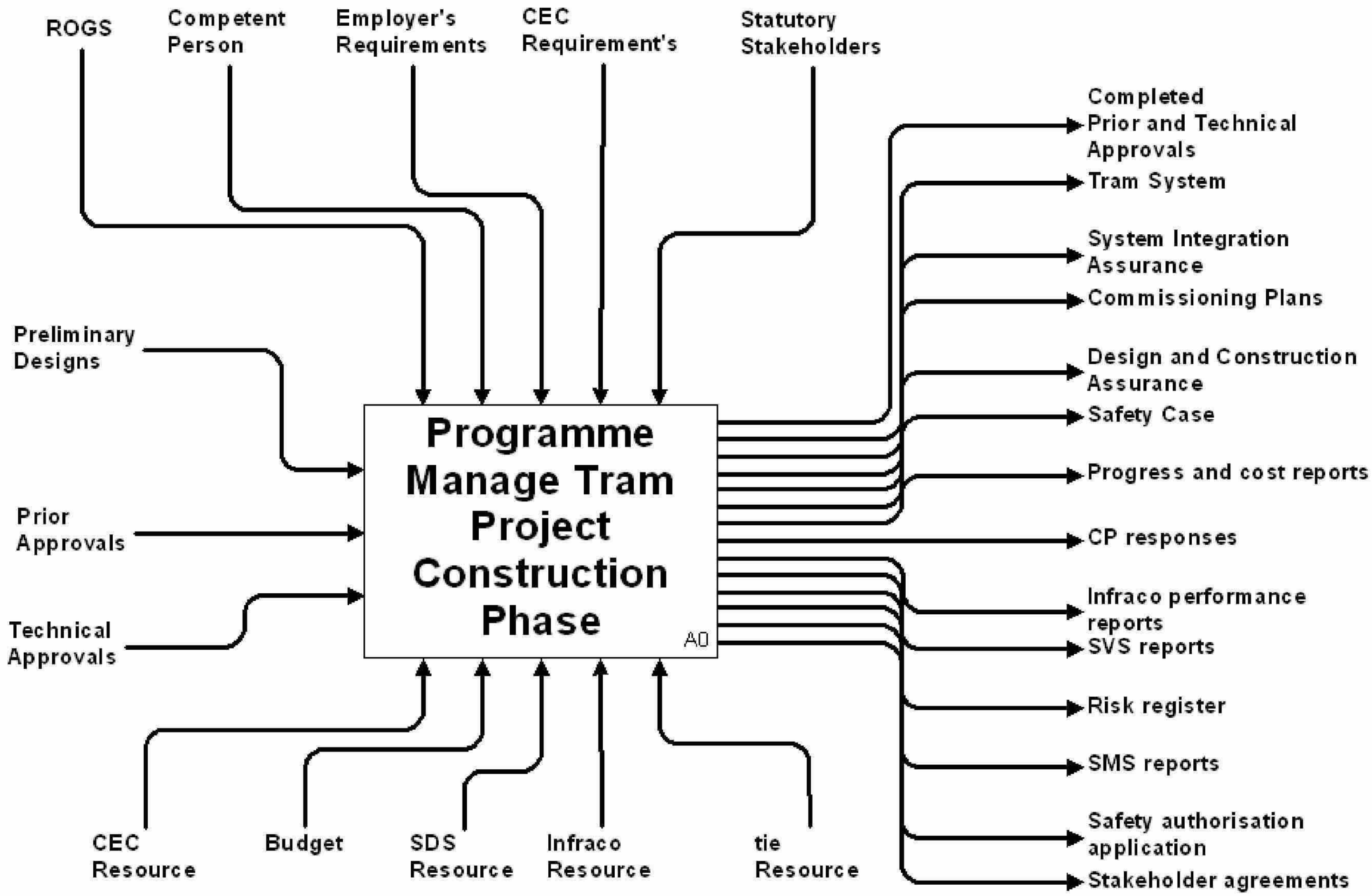
The term 'outcomes' refers to more than the substantive outcome of a tram system built to budget and programme. The term 'outcomes' also refers to reporting, consultation, statutory responses, regulatory responses, any third party intervention requirement and the creation of any arrangement which will outlive the formal end of the construction phase of the project.

It is recognised that design and construction will run concurrently (one ramping down as the other ramps up) at the beginning of the construction phase, and construction and commissioning will similarly run concurrently at the end of the construction phase.

A notional list of outcomes to be achieved by the construction phase (as defined above) of the tram project is:

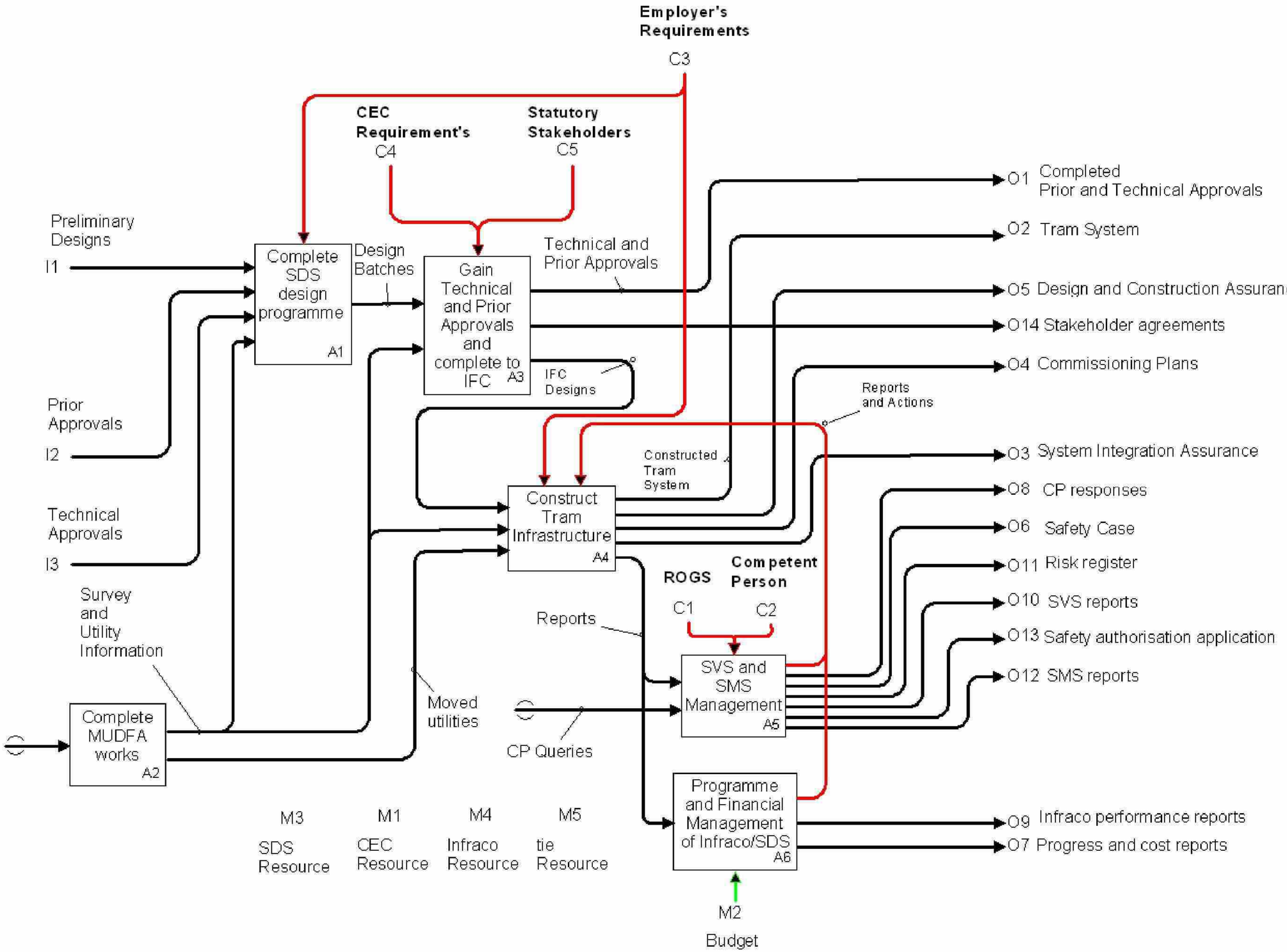
| **Outcome** | **Abbreviation on IDEF diagram** |
|---|---|
| A built Tram System | Tram System |
| System integration assurance and testing sufficient to begin commissioning work | SI Assurance |
| Commissioning plans | Commissioning plans |
| Design and construction assurance information to be used in conjunction with the Competent Person (CP) under ROGS | Design and construction Assurance |
| A safety case to allow commissioning to begin | Safety case |
| Reporting of physical progress and spend | Progress and cost reports |
| Reporting of Infraco contractual performance | Infraco performance reports |
| Reports and query responses to/from the CP | CP responses |
| Operation of a safety verification scheme as defined by ROGS -reports | SVS reports |
| A risk register defining mitigations and reporting of operation of the mitigations. | Risk register |
| Operation of a Safety Management System – audit reports, demonstration of ALARP outcomes | SMS reports |
| Application for 'first safety authorisation' to ORR (ref ROGS requirement) | Safety authorisation application |
| Agreements through consultation with affected parties and stakeholders | Stakeholder agreements |
| Assurance that Employer's Requirements have been met | ER Assurance. |

Not all of these activities are 'continuous' in nature – some outputs are singular in nature, and others repetitive. It is also the case that these outputs differ in importance through the construction phase. These effects are accommodated in the organisation arrangements which follow and do not influence the process definitions.


ROGS
Competent Person
Employer's Requirements
CEC Requirement's
Statutory Stakeholders
Preliminary Designs
Prior Approvals
Technical Approvals
Programme Manage Tram Project Construction Phase
A0
CEC Resource
Budget
SDS Resource
Infraco Resource
tie Resource
Completed Prior and Technical Approvals
Tram System
System Integration Assurance
Commissioning Plans
Design and Construction Assurance
Safety Case
Progress and cost reports
CP responses
Infraco performance reports
SVS reports
Risk register
SMS reports
Safety authorisation application
Stakeholder agreements

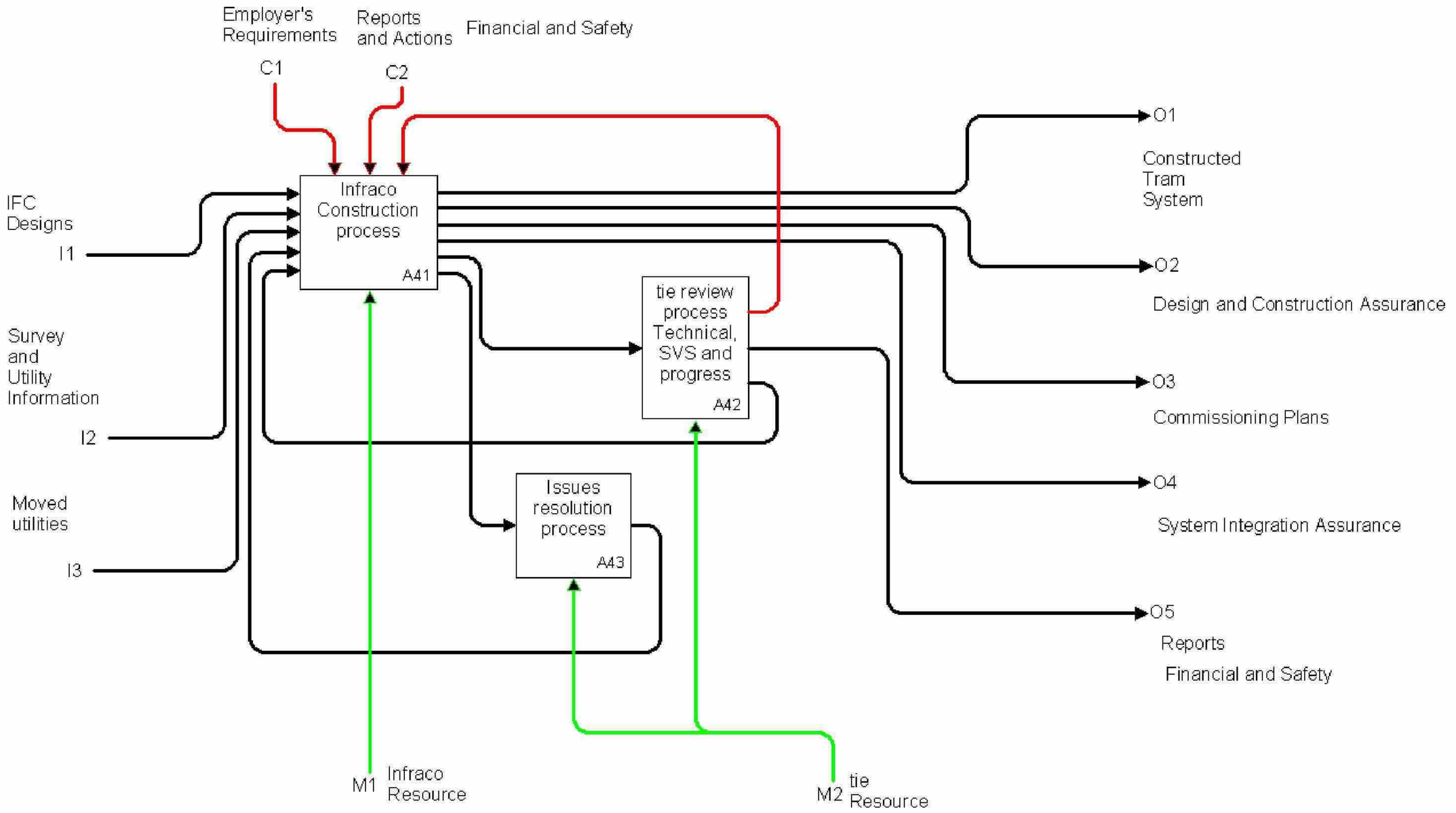


Appendix 2


Employer's Requirements
C3
CEC Requirement's
C4
Statutory Stakeholders
C5
Preliminary Designs
I1
Prior Approvals
I2
Technical Approvals
I3
Survey and Utility Information
Complete SDS design programme
A1
Design Batches
Gain Technical and Prior Approvals and complete to IFC
A3
Technical and Prior Approvals
IFC Designs
Reports and Actions
Constructed Tram System
Construct Tram Infrastructure
A4
Complete MUDFA works
A2
Moved utilities
Reports
ROGS
Competent Person
C1
C2
SVS and SMS Management
A5
CP Queries
Programme and Financial Management of Infraco/SDS
A6
M2
Budget
M3
SDS Resource
M1
CEC Resource
M4
Infraco Resource
M5
tie Resource
O1 Completed Prior and Technical Approvals
O2 Tram System
O5 Design and Construction Assurance
O14 Stakeholder agreements
O4 Commissioning Plans
O3 System Integration Assurance
O8 CP responses
O6 Safety Case
O11 Risk register
O10 SVS reports
O13 Safety authorisation application
O12 SMS reports
O9 Infraco performance reports
O7 Progress and cost reports



Appendix 2


Employer's Requirements
Reports and Actions
Financial and Safety
C1
C2
IFC Designs
I1
Survey and Utility Information
I2
Moved utilities
I3
Infraco Construction process
A41
tie review process Technical, SVS and progress
A42
Issues resolution process
A43
O1
Constructed Tram System
O2
Design and Construction Assurance
O3
Commissioning Plans
O4
System Integration Assurance
O5
Reports
Financial and Safety
M1
Infraco Resource
M2
tie Resource



Appendix 2

RACI Analysis

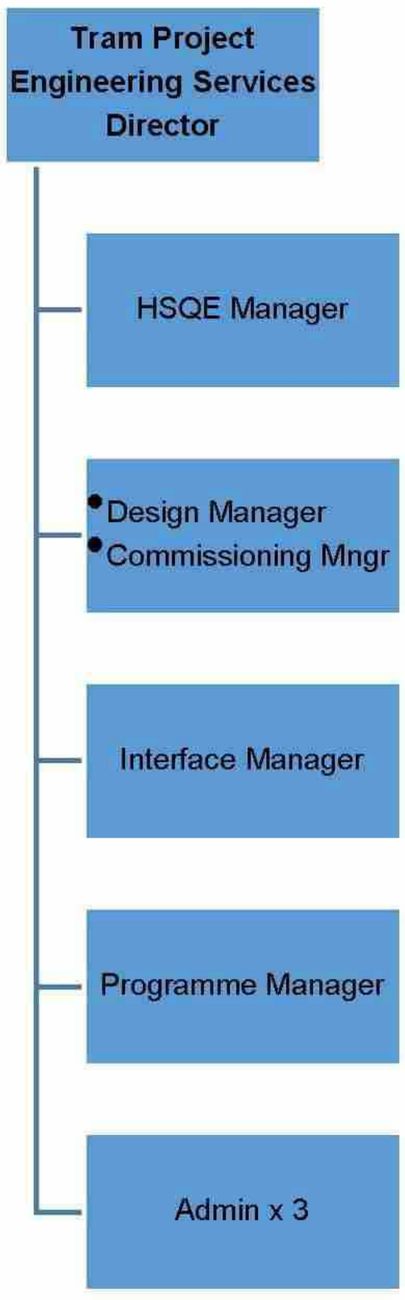
A – Accountable to the overall Project Director – the person who specifies the 'right thing' to do
R – Responsible for doing the 'right thing' to the Accountable person
C – Consulted – because they may have value to add by being consulted
I – Informed – because they need to do something with the information

RACI chart shown below for the Tram Project



Appendix 2

| Process ID | Process Description | Programme Director | Project Engineering Services Director | Infraco / SDS / Tramco | AMIS | MUDFA | Project Interface Director | TEL and Operations |
|---|---|---|---|---|---|---|---|---|
| A1 | Complete SDS Design programme | I | A | R | | C | C | C |
| A2 | Complete MUDFA works | I | I | | R | A | C | |
| A3 | Gain Technical and Prior Approvals and complete to IFC | I | A | R | | | C | |
| A4 | Construct Tram Infrastructure | I | A | R | R | C | C | |
| -A41 | Infraco Construction Process | I | A | R | R | C | C | |
| -A42 | **tie** review process – Technical, SVS and progress | I | A | R | R | C | C | |
| -A43 | Issues resolution process | I | A, R | C | C | C | C | C |
| A5 | SVS and SMS Management | I | A | C | C | C | C | C |
| A6 | Programme and Financial Management of Infraco/SDS | A | R | C | C | C | C | |
| (A7) | Commissioning | I | A | R | | | C | C |




The Project Engineering Services Director role, as defined in the above RACI analysis, implies a number of sub roles, The sizing of which draws on current Tram project experience.



Appendix 2

Design Manager until close of design works, then Commissioning Manager from start of commissioning.

As now – constant stakeholder issues arising – link to new Interface Director role

Local interface with Infraco/Tramco/SDS works. Links to Programme Director who is accountable.

Support to all the above roles.

| **Role** | **Processes** |
|---|---|
| HSQE Manager | A5 |
| Design Manager | A1, A2, A3, A41, A42, A43 |
| Commissioning Manager | A7 |
| Programme Manager | A6 |
| Admin | All |