



Report & Action Plan

from the
2nd VE Workshop
with Infraco Bidder BBS

held on 07.06.07

Team Co-ordinator

Geoff Gilbert, TRAM Project Commercial Director,

tie Ltd, Verity House, 19 Haymarket Yards
Edinburgh EH12 5BH

Tel: 0131 [REDACTED]

E-mail: geoff.gilbert@tie.ltd.uk

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By



DEARLE & HENDERSON

Mike Jefferyes, CVS PVM TVM

& INSPIRE Dearle & Henderson
Part of the Erinaceous Group

Telephone: 07 [REDACTED]

E-mail: - Mike@Jefferyes.com

EXECUTIVE SUMMARY

An initial VE workshop was held on 01.06.07 in the search for potential capital cost saving opportunities, with members of the **tie** team (including TEL and Transdev, plus TSS and **tie**'s designers, SDS) and with BBS, one of two Infraco Bidders.

The purpose was to work together to help identify means of reducing capital cost and so close the gap between estimated costs and available funding. This effort supplements the internal VE programme initiated by **tie** in December 2006.

This report records the progress of investigations and actions resulting from that initial workshop, as reviewed in the second workshop held on 07.06.07.

This report supersedes the initial report and can be read as a stand-alone document without the need to refer back to the first report. All items and actions are shown as either 1.6.n or 7.6.n (coming from either the 1.6.07 or the 7.6.07 workshop), with "n" being a numerical progression from 1 to 33 through the report.

SAVINGS: A promising total saving of over £1.8 million is indicated from the reviews with BBS to date, with further savings yet to be quantified.

These opportunities are summarised overleaf.

BBS noted that their quoted savings were in general net of an allowance for some scheme redesign time and cost (but not assuming a repeat of detail design).

ACTIONS: Some initial actions are complete. For these, conclusions are shown and the actions are deleted. Other actions are ongoing and some new ones arose on 7.6.07. All actions shown in the report therefore remain alive.

Note that the final action, 7.6.33, requests BBS urgently to provide data and costs to enable evaluation of a fully compliant bid – not yet submitted.

TIMING: There is an urgent need to demonstrate Tram Project affordability, comparing indicated costs with available funds. **tie** have yet to define precise timing, but until shown otherwise – please work to complete all actions and return results to bob.dawson@tie.ltd.uk, andy.steel@tie.ltd.uk & Mike@Jefferyes.com by the end of Tuesday 19th June – except for those actions shown either as longer-term or those shown as dependent on the outcome of an earlier action yet to be completed.

Any change to this timing will be communicated by e-mail via Bob Dawson.

Summary of Potential Saving Opportunities

The table below summarises the ideas and their potential savings, already over £1.8 million total, with further savings yet to be quantified. However, the last item shows that BBS have yet to provide a compliant bid and are requested to do so urgently. This may add cost, but against this the alternative proposals in the present bid generally offer benefits and savings not accounted as savings below. i.e. these adds & deletes will probably balance out, but compliance must be shown.

No.	Proposal	Easy?	Saving £k	Action
1.6.1	Raise Depot Level (already under study by tie/SDS)	Med	Large	SDS/BBS
1.6.2	Move through-roads 1.5-2m north saves Retaining wall	M	150	tie/SDS/ Transdev
1.6.2	Reduce Wall's Water Table protection (see 1.6.12)	M	225	tie/SDS
1.6.3	Extend Depot East by steeper gradient from underpass. ← <i>only if longer trams don't fit – SDS??</i>	Hard	Adds cost	SDS
1.6.4	Raise track in Underpass using solid conductor rail	Easy	see 1.6.12	SDS
1.6.5	Reduce Structure size of A8 underpass (see 1.6.12)	M	see 1.6.12	
1.6.6	Reduce/delete Sidings at East end – ACCEPTED	E	TBE	tie/SDS
1.6.7	Dump spoil north of site – Landscape	M	Assumed	-
1.6.8	Roseburn Street viaduct structure savings	M	TBE	BBS
1.6.9	Water of Leith Bridge structure	M	100	tie/SDS
1.6.11	Steel structure saves cost & temp works. Planners??	H	250 +	BBS/SDS
1.6.12	A8 Underpass piling (Reduce water table protection)	M	175	tie/SDS
1.6.12	A8 Underpass width/height reductions (inc 1.6.4)	E	TBE	BBS
1.6.13	Simpler Wing walls to A8 Underpass	M	TBE	BBS
1.6.14	Russell Rd savings give buildability & less disruption	E	100	tie/SDS
1.6.15	Lime Stabilisation	E	250 +	tie
1.6.16	Site won CBGM aggregates	M	TBE	BBS
1.6.18	Lindsay Rd Wall. £250k saving held for other changes	-	-	-
1.6.20	Signalling rationalisation – Siemens to define & cost	M	TBE	Siemens
1.6.21	CCTV Rationalisation – tie/SDS/Transdev re-examine	M	TBE	Siemens
1.6.22	UPS reductions	M	85	tie/SDS/ Transdev
1.6.23	Traffic Signals. Reuse existing kit, get CEC to agree	M	500	tie
1.6.24	Any BBS savings if tie make changes to reduce risk?	?	TBE	BBS
1.6.25	Any savings if changes made to reduce programme?	?	TBE	BBS
1.6.26	Any savings if Employer's Requirements relaxed?	?	TBE	BBS
1.6.27	Can tie/SDS accept thinner slab & help MUDFA	M	TBE	tie/SDS
1.6.31	Review Stray Current policy (convince Utilities)	M	Nil, assumed	BBS → tie/SDS
7.6.33	Compliant Bid – BBS to show a Compliant bid asap		Adds cost	BBS

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1 Introduction

A Value Engineering programme was initiated on the Edinburgh Tram Project in December 2006 generating many cost saving ideas during the first quarter of 2007. Some of these have been accepted as revised project assumptions, others are still under consideration.

After an initial tendering process, the bidders for the supply of trams (Tramco) have been reduced to two, similarly there are two Infraco bidders for the Infrastructure works. The two Infraco bidders had, alongside their bids, identified a number of opportunities for cost savings and improvements.

By May 2007 it was evident that forecast capital costs still exceeded available funding and further savings were required. A series of VE workshops have therefore been arranged with each of the Infraco bidders in the search for these savings to close the funding gap.

This report records the findings and the resulting actions agreed at the second of the workshops to be help with Infraco bidder team, BBS (Bilfinger Berger + Siemens Consortium). The workshop, on 7th June, reviewed progress on actions agreed at the first workshop on 1st June.

2 The 7th June Workshop

2.1 Time and Place:

The workshop was held from 12.30 until 17.00 on Thursday 7th June 2007, eventually in the Macadam Room, Citypoint – with many apologies for the late changes of room/ building.

2.2 Team Members who attended the workshop

Andy Dixon	SDS Design team (PB)
Roger Jones	Transdev
Scott McFadzen	BBS Team, Civils
Tom Murray	BBS Team, Civils
John Pantony	TSS, Cost Manager
Alastair Richards <i>a/</i>	TEL
Andy Steel	tie Project Delivery
Stephen Wright	BBS Team, Siemens
Mike Jefferyes	VE Facilitator

a/ Attended for part of the workshop

2.3 Workshop Objective

The purpose of the workshop was to review progress on the actions agreed at the first workshop held on 1st June, to assess the scale of savings available and to agree next steps.

Note that since many of the recommendations from the first workshop remain valid and many of the actions are ongoing – they are all repeated in this report, so that this becomes a complete and up to date record.

3 BBS identified opportunities

1.6.1 Raise level of Depot (BBS Idea 7.03)

BBS were fully in support of this idea, reducing the dig, reducing spoil disposal and simplifying construction. It was explained that considerable effort had already been expended by the in-house team, as summarised below.

Background

Co-operation from BAA had been anticipated in the early stages, but more recently was shown to come at a significant price, outweighing the benefits to the Tram project. This idea had therefore been put on hold, if not rejected outright.

An accurate profile of the flight path had been obtained and effort made to reconfigure the Depot to minimise it's height in the critical areas. However, the flight path profile was so flat that very limited advantage could be gained by moving the higher elements (the main building) away from the runway.

Greatest opportunity was shown to come from any reductions to the height of the Depot Building and attention focussed here. Potential height savings identified by the project's VE team included the following – all explored by the SDS designers.

- Reduce the crane from 12 to 6.3 tonnes (*max anticipated lift = 5 t bogey*)
This proposal, also assumed by the 2 Infraco bidders, is adopted and enables a shallower structure height above the trams in the depot building.
- Reduce the roof pitch. SDS is making useful height savings here.
- Reduce the OLE height within the shed.
Removal of OLE over the critical roads in the shed was not thought acceptable to Depot Operations, despite availability of a shunter.
- Delete (or reduce) the clearance allowed between building roof and flightpath. SDS were reluctant to reduce construction tolerances or to leave little room for roof penetrations (vents/lights/lighting conductors, etc) - or for future roof maintenance (*although such occasional infringement of the flight path may not be as firmly banned as permanent structures*).
- Raise all other areas of the depot (e.g. sidings), just leaving the building at the required deeper level to clear the flight path. (*not popular for fear of trams rolling down slopes in the Depot*)

Interim Conclusions.

Subject to design confirmation of the height build-up, SDS have indicated that height savings would allow the depot to rise by around 1.4 (now about 1.3?) metres.

SDS have quoted a maximum allowable rise of 1.5 metres, limited by the slope of the approaching roads into the depot, climbing from the A8 underpass.

It should also be noted that raising the depot may present a Planning issue, but this was accepted as a hurdle to jump.

Action 7.6.1a SDS to complete building / depot height investigations. **Action: SDS**

Action 1.6.1b SDS agreed to BBS's request for the drawings which show the flight path profile and the building height build-up. These two sets of information determine the Depot level. **Action: SDS asap please - Andy Dixon to expedite**

Action 1.6.1c BBS to consider any means to reduce building height and raise the depot level. **Action: BBS (Bilfinger Structures, Siemens Depot Ops)**

1.6.2 Move the pair of through-tracks at the southern edge of the site 1 metre north, (now 1.5-2m) away from the site boundary. (new idea from 1.6.07 workshop)

This, assuming that the Depot can be raised by around 1.4 metres, will avoid the need for the high cost, bored piled retaining wall along this boundary, enabling the cheaper solution of Soil Nailing.

Feasibility? First sight indications suggest that sufficient reconfiguration of the Depot Layout may be possible to enable this saving, but may need to take advantage of one or more of the following:

1. Removal of one of the planned sidings. Note that this was already planned anyway, since it is thought that 40 tram stabling will not be required. However, it remains to be shown that the sidings will accommodate four of the longer trams end to end.
2. Pushing close to the Depot Approach road at the north-west end of the site may necessitate a new retaining wall. However, this will be smaller and much less cost than the one saved along the southern boundary.
3. Reconfiguration of the site will move the depot building north, but must still accommodate the tram delivery road/track.
4. Some eastwards expansion of the site may be needed. See the ideas below.

UPDATE 7.6.07

- A. BBS indicate that if the recommendations of idea 1.6.12 (below) are validated and adopted (i.e. that there is no water-table problem in this area), then this southern boundary retaining wall can be built as a simpler anchored, piled wall, giving a saving of **around £225k** with no change in depot layout.
- B. If the main through-running lines can be moved **1.5 to 2.0 metres** north, away from this southern boundary wall, then (still assuming the depot is raised around 1.3/1.4 metres, as planned) this boundary can be constructed by soil nailing, offering a further saving of **about £150k** (to be confirmed and subject to the track movement distance).
- C. It was then noted by Transdev that not only had the deletion of the eastern sidings already been agreed (see 1.6.3 below), but as part of that change in layout, the two NE/SW roads which link the depot into the through lines halfway along this southern boundary were now reduced to one.
Given the removal of one road – it appears that space exists to achieve the 1.5 to 2 m realignment of the through roads for about half the length of the southern boundary with minimal impact on the rest of the depot layout.
Exploration of points 1 to 4 above may still permit depot reconfiguration to enable the rough roads to move 1.5 to 2m north to permit use of soil nailing over the full length of this wall.

Action 1.6.2b tie & SDS and BBS to conduct a layout review to assess the ability to achieve this 1.5-2 metre northwards movement of the through-tracks for the full length of the southern boundary to secure the full savings. (Ensure DDA compliant driver/crew access to Staff Halt is protected). **Action: tie, SDS, Transdev**

Action 7.6.2a once given the achievable depot reconfiguration (1.6.2b above), BBS to confirm the saving vs their compliant bid – both with and without the relaxation in water table assumptions (1.6.12 below). **Action: BBS (after 1.6.2a)**

1.6.3 Increase the available Depot footprint towards the east, by increasing the track gradient up from the A8 underpass to the maximum acceptable, based on experience elsewhere (maybe increase from 6%? to 7.5% ?).

David Powell, Roger Jones and Andy Steel agreed that 7.5% is the correct, safe maximum gradient.

Note that clearance below the Depot Approach road as it leaves the roundabout above these tracks must be confirmed acceptable. If not, then possible means to overcome this problem include:-

- Solid Conductor rail below the Depot Approach Road bridge.
- Shallower bridge deck on the Approach Road
- Reduce structure depth by using columns between tracks
- Raised approach road for extra clearance, particularly if the tracks are slewed further north (idea 1.6.2).
- Lowered Street Lighting to clear the Runway Flight Path if the road is raised.

See related ideas 1.6.4 & 1.6.5 below, which could help extend the depot eastwards, if this is required, depending on the outcome of action 7.6.3a below.

First Action:- The principal reason for this proposal is to enable either of the remaining trams (up to 43m+) to be stabled with four end-to-end in sidings. This will be unnecessary if the longer trams already fit this area. The original layout had 10 sidings, but long-term fleet size now indicates a maximum of 8 sidings with perhaps only 6 or 7 built initially (see Appendix 1 item 9)

Action 7.6.3a SDS to confirm that longer trams will fit the existing area, or whether any eastwards extension of the site is necessary. Action: SDS – Urgent Please

Note that Idea 1.6.3 will only be progressed if long trams won't fit the current site. See also later idea 1.6.6, action 7.6.6b

1.6.4 Raise the track level in the A8 underpass by use of a solid conductor rail (not a wire) above the trams at the minimum height above the trams (i.e. minimum pantograph extension).

This, plus increased track gradient (idea 1.6.3), may permit the flat level of the Depot to extend towards the east, if this is required from idea 1.6.3 above.

Idea 1.6.4 will also be pursued for its own sake as a potential saving (and minor benefit of reduced track gradient up to the depot if idea 1.6.3 is not used).

On 7.6.07 it was stated that 4.4 metres from rail top to underside of roof structure could be achieved with a solid conductor rail (100mm, including insulation). This dimension will be used, together with other ideas 1.6.5 & 1.6.12 below, to reduce the A8 underpass structure costs. See action 7.6.12b.

1.6.5 Reduce the structure size of the A8 underpass. *Note that this duplicates VE team idea 24.1.32, but now identifies specific proposals, as follows:-*

- a. General reduction in structure size (wall thickness etc)
See also BBS cost reduction proposal 7.07 – item 1.6.12 below.
- b. More precise alignment, once locations of BT Fibre-optic ducts are known.
The long awaited survey data is now expected within 2 weeks (i.e. by 15.6.07)
- c. Reduce the internal section of the underpass by deleting one walkway (retain only one, adequately sized walkway).
- d. Reduce the internal section by re-examination of the correct kinematic envelopes, without excess clearance between and around the two tracks.
- e. Raise the base (track level) in the underpass by moving the tracks (or whole structure) east within the LOD, rising up the A8 gradient above it – if nothing else, by simply deleting the eastern walkway and moving the tracks across.
This rise and movement eastwards, although small effects, both improve the track gradient up into the depot or the possibility to extend the depot east.

Action 1.6.5a *SDS, in conjunction with ideas 1.6.3 & 1.6.4, to establish how much further east the tracks in the depot can reach the depot level (assume 1.4m above initial plan), based on:-*

1.6.3: steeper gradient,

1.6.4: higher starting point in the underpass,

1.6.5e: Starting point in the underpass higher and further east.

Action: HOLD in case needed after Action 7.6.3a above

Note that even if eastwards extension of the depot is not required, these ideas will be pursued as a separate cost savings opportunity. See item 1.6.12. action 1.6.12a

longer-term, once the BT duct location (b. above) is known, design optimisation can proceed, considering conclusions from actions 1.6.3, 4 & 5 above and 1.6.12 below.

Action: SDS, longer-term, subject to initial findings

1.6.6 Reduce or delete the sidings at the north east end of the site to reduce the extent of excavation, slope stabilisation and construction.

UPDATE 7.6.07. Transdev advised that this change had already been agreed.

Action 7.6.6a *tie to use existing data to assess the savings in excavation, slope creation and track laying in this area – also the saving from deleting the second NE/SW link road from the depot tracks to the through roads. (item 1.6.2 – C)* **Action: tie (JP)**

Action 7.6.6b *If eastwards extension of the depot is required after action 7.6.3a, removal of these sidings may help the layout.*

1.6.7 Use the north area of the site, beyond our dig, for spoil disposal. Landscaping may even help Planning.

Note: This will not represent a saving, because BBS bid allows only 90k m³ of off-site spoil disposal, as the Environmental Statement. BBS assume that any further spoil will be disposed on site or re-used elsewhere in the project construction (but may need temporary storage).

See also later ideas 1.6.15/ 16/ 17 for other soil utilisation ideas.

Area for spoil dump now greater (& less spoil), with eastern sidings deleted.

1.6.8 Roseburn Street Viaduct Structure (BBS Idea 7.03)

BBS consider the steel section larger than needed. They also propose a revised construction methodology, using pre-cast rather than in-situ concrete which, beside cost savings, will give appearance benefits.

There is a potential short-term disadvantage in the need to prop the structure during the curing of the concrete deck. It was felt, given other local road restrictions, that this will be manageable.

Action 1.6.8a *BBS to establish the likely saving if this proposal is adopted. (If this appears worthwhile, implications will then be explored)* **Action awaited: BBS**

1.6.9 Water of Leith Bridge Structure (BBS Idea 7.04)

BBS propose to design the deck with pre-cast cantilever edge beams and to revise the piling arrangements – making the bridge quicker and easier to build.

Savings identified 7.6.07 are around **£100k**

Action 7.6.9a *tie/ SDS decision required on acceptance of this proposal and the associated savings* **Action: tie / SDS**

1.6.10 Carrick Knowe Bridge (BBS Idea 7.05) ~~This idea abandoned. The Council now insist on addition of a cycleway to this bridge. Redesign is therefore in progress.~~

1.6.11 Edinburgh Park Station Viaduct (BBS Idea 7.06)

VE team idea 24.1.31 considered savings to this viaduct. However, this is politically very sensitive and a major Planning risk. SDS has held several discussions with the Planners, but has not been confident to propose savings here by changing to a steel structure.

BBS consider that a steel viaduct could be made to appeal to the Planners and to generate savings and construction benefits.

Alastair Richards urged that any capital savings should take increased operational costs (maintenance) into account. This was however judged to be a minor issue with the durability of modern paint finishes – and this must be demonstrated.

SDS expressed willingness to approach the Planners again if BBS could present a good case for the benefits of a steel viaduct.

Action 1.6.11a *BBS to develop proposals for a revised structure, showing the cost and construction benefits, maintenance effects and impact on appearance (demonstrate by examples). First sight indicated savings are around **£250k**, including saved Possession costs (there will be corresponding soft benefits from saved possessions) and saved Temporary works (required but not yet costed for Concrete), which must be strong enough to withstand train impact. (A steel bridge needs no temp works).*

i.e. this offers not only a £250k saving, but additional cost avoidance.

BBS confirm that the supplier can create a double-curve plate steel bridge, attractive and economical. No deeper than current concrete proposal. Details under prep for review with tie/SDS before decision and preparation of approach to the Planners.

Action: 1. BBS presentation to tie/ SDS

Action 7.6.11a *If OK, then tie/SDS to approach the Planners.* **Action 2: then tie / SDS**

1.6.12 A8 Underpass Structure (BBS Idea 7.07) See also item 1.6.5

Proposals call for a costly substructure of secant, re-enforced male & female piles – specified to cater for a high water table. BBS advise that:

- 1) two independent reports suggest there is no significant water table problem here,
- 2) BBS learnt from the contractor who built the A8 roadway cutting which crosses the tram route that that structure is contiguous piles and concrete walls and has shown no evidence of water ingress.
- 3) A local pump installed to cater for the 100 year storm has not been triggered by any excesses of groundwater.

BBS recommend a simpler structure for the tram underpass structure – either delete re-enforcement in at least the female piles or use contiguous piles and concrete wall.

UPDATE 7.6.07. BBS indicate around **£175k** saving, net of scheme redesign costs.

7.6.12a tie & tie advisers must accept the revised water table assumptions (BBS can supply supporting evidence) in order to gain this saving. **Action: tie & tie advisers**

Action 7.6.12b BBS to identify the further savings on this structure if the following additional reductions are incorporated with the simplified piling above.

→ Reduced height structure (solid conductor, 4.4m rail to inside top slab. Idea 1.6.4)

→ Reduced width, Deleting one walkway (Idea 1.6.5c)

(→ Further reduced width, by review of DKE (1.6.5d) – may need to hold for SDS detail design, once scheme agreed)

→ Other possible benefits from items 1.6.5a & e

Action: BBS

7.6.12c Critical to the precise alignment of this structure is the location/route of a bank of BT Fibre-optic ducts (ref 1.6.5b). The long awaited survey data is now expected in 1 week (i.e. by 15.06.07) and must be considered within any redesign.. **Action: SDS**

1.6.13 Wing walls on A8 Underpass (New BBS Idea)

BBS advise that the wing-walls at the ends of the underpass would be easier to construct (more simple temporary works) and cheaper if they were straight, not set at 90^o.

Action 1.6.13a BBS to indicate savings with straight wing walls **Action: BBS awaited**

1.6.14 Russell Road structure (BBS Idea 7.08)

Current proposals use very deep excavations beside the railway embankment and require major cost for temporary works. Some difficulties with Network Rail are likely.

BBS propose to combine temporary and permanent works and to use contiguous piles, with a 3 metre high piling platform built up on the road, which will be closed for the duration of the works. This will reduce Network Rail impact and help Buildability.

UPDATE 7.6.07. BBS confirm savings are around **£100k** – and this proposal ensures Buildability alongside Network Rail. BBS presented tie/SDS with drawings showing their proposals at the meeting on 7.6.07. First sight response was favourable.

Action 1.6.14b tie/SDS must review and accept this alternative design and construction method, confirming their initial response of 07.06.07. **Action: tie/ SDS**

1.6.15 Lime Stabilisation (BBS Idea 7.09)

BBS indicated around £250k to £300k saving achievable if a safe means can be demonstrated to treat the excavated soil for re-use as a sub form – rather than disposing of this material and bringing new material to site. This also scores very useful “green points.”

Not all excavated material can be so treated and used.

Note that BBS presented papers by Con-Form on soil treatment for use in construction, including dustless systems (essential in the use of lime).

UPDATE 7.6.07. BBS indicated that if the “Plastic Limit” is OK (it appears so, but must be confirmed with more GI later) then savings of **£250k to £300k** can be made. This is a Best Guess, not a Best Case, i.e. it assumes that not all sites will be perfect.

Action 7.6.15a tie to assume the saving and plan how to account it in the estimates. (maybe take the saving but add some risk?) **Action: tie (JP)**

1.6.16 Site won CBGM Aggregates (Cement Bound Granular Materials) (BBS # 7.10)

This also avoids bringing in all new aggregate to lay under the tracks, instead re-use road planings etc, gaining further “green points.”

This material has not been popular with the Highways Authorities, but in our case, laid under the tracks, it may prove acceptable. It can certainly be used off highway.

Action 1.6.16a BBS to quantify the likely savings (all & off-highway). **Action: BBS**

If worthwhile, then an approach to the Highways for approval must be planned.

1.6.17 Lime Stabilised Refill – for re-enforced earth. (BBS Idea 7.11)

This may be an important “green” contribution to achieving the Environmental Statement’s commitment of limited spoil disposal, by converting depot excavated class 7 spoil into class 9 material for re-use. One logistical problem is that the best material for this conversion is the top soil first excavated, which may incur the costs of storage and preservation before re-use. The costs of material conversion roughly balance purchase of new equivalent fill – savings come from reduced spoil disposal. Recognising that the BBS bid assumed only 90k m³ disposal, without defining how any excess spoil is re-used, this is a detail for implementation planning, not a saving to bank now.

1.6.18 Lindsay Road Wall (BBS Idea 7.12)

BBS consider that the proposed structure is unnecessarily costly with its contiguous bored pile wall. Simplified slope geometry and soil nailing, or a modified version of a king post wall, should be achievable, offering around £200k-300k saving.

Update 7.6.07. Useful potential, but may become irrelevant.

To be held for possible future use, pending other decisions by CEC & Forth Ports for this area.

1.6.19 Development of Detailed Designs (BBS Idea 7.13)

BBS initial list of opportunities included this item (7.13) saying:

”The current timescale for the finalisation of detailed design, has extended the tendering schedule and will compress the delivery programme. Design information also lacks input from the systems and track designers and this may result in abortive design works. Early involvement of the suppliers’ designers would advance the detailed design and give surety of programme.”

On 1.6.07, BBS added that timescales now allow better design refinement and optimisation, better pricing. However, in some cases (e.g. structures) BBS have too much information, in other cases insufficient (e.g. Highways works).

Advantage could be gained by agreeing priorities with SDS for the supply of required information – e.g. Street lighting design, noise barriers. Street dig data is needed in order to give a lump sum for this work.

Action 7.6.19a – BBS to define preferred priorities, then

Action BBS

Action 1.6.19a tie to review these potential benefits with BBS and then consider what changes may be required in SDS priorities.

Action: tie & SDS

4 Further BBS opportunities Reviewed on 7.6.07

BBS had identified four further cost saving opportunities with their tender submission. These were held for review on 7.6.07 when a Siemens representative attended.

These four items are:-

1.6.20 Tram detection & control system rationalisation (BBS Idea 7.14)

Siemens consider the design unnecessarily complex, with savings available through a design review and rationalisation – e.g. local signal communication, not back via the central system (UTC).

Some system complexity comes from uncompleted roads layout detail. This is part of the system refinement as surveys are completed and detail designs progress.

Action 7.6.20a Siemens to identify any significant saving proposals, showing the cost effects and implications (any compromises to be accepted).

Action: Siemens

1.6.21 CCTV rationalisation (BBS Idea 7.15)

Siemens suggest that a design review of the 139 CCTV cameras and their purpose may lead to rationalisation and savings. (The 139 include 1a & 1b, but do not include the extra 2 per tram stop).

All agree, this number appears excessive.

Action 7.6.21a Siemens to identify the source of the 139 units (plus any extras) i.e. What were each of these specified for?

Action: Siemens

Action 7.6.21b tie/TEL/Transdev to review real needs.

Action: tie/TEL/Transdev

1.6.22 UPS provision (BBS Idea 7.16)

Siemens believe savings can be made by challenging the UPS strategy, including the AC systems to support the UPS. Saving **£2-£3k per tram stop**.

The Control Centre uses a Diesel Generator plus two UPS systems – excessive?
(remember Substations & radio base stations)

Around **£80k-90k** capex saving expected (& reduced ongoing maintenance).

Action 7.6.22a *tie/SDS/Transdev to review & rationalise the required UPS strategy and systems.* **Action: tie/ SDS/ Transdev**

1.6.23 Traffic Signals (BBS Idea 7.17)

BBS pricing is based on limited data. Siemens believe savings can be made, given firmer data – and recommend adding their expertise to the design process.

Siemens are already responsible for some of Edinburgh's traffic control hardware and consider that savings of **around £500k** can be made if CEC will accept system adaptation and re-use of existing equipment (in situ or elsewhere) – rather than demanding all new equipment as currently specified.

Action 7.6.23a *tie to seek such flexibility from CEC.*

Action: tie

7.6.32 Russell Road TP Hut savings – New idea raised 7.6.07

BBS raised the point, and tie acknowledged that it was already under consideration, to omit the traction power supply and switchgear from the Russell Road TP Hut.

This equipment should only be installed at a future stage when plans were made to convert this TP Hut into a Substation. As this is not planned in the foreseeable future, this equipment is presently redundant and should be deleted.

Action 7.6.32a *tie to are already calculating the savings from this.*

Action: tie

5 tie VE team identified opportunities

The list of “live” ideas from the tie VE team's work were now reviewed with BBS – after deletion from that list of items not directly related to the Infraco works.

This list is reproduced in Appendix 1. It was explained that a number of these ideas have already been accepted by the project, although not communicated to the bidders, other ideas remain under investigation or are held pending client/political debate.

Specific ideas from that list which generated actions from this 01.06.07 workshop are:

1.6.24 Risk (tie VE idea list item 51)

It was explained that tie had undertaken an extensive review of project risks, as a result of which a number of project changes and actions had been undertaken. The remaining defined risks and levels of provision were accepted as correct.

The primary reason for raising this item with BBS were to initiate the following action

Action 1.6.24a *BBS to identify any items within their tender submission which have been increased significantly in cost as the result of perceived risk.*

Identification of such issues will open the possibility of the tie team working with BBS to remove or reduce the factors causing these risks – and thereby reduce costs.

Action: BBS awaited

1.6.25 Shorten Project Delivery period (tie VE idea list item 84)

This remains an open idea, system-wide, aimed at streamlining project delivery to reduce overheads. A number of individual ideas also target this goal.

Action 1.6.25a BBS to identify any elements of their anticipated project delivery programme where, if constraints were lifted, useful programme savings and resulting cost reductions could be made. Please identify both the approximate saving (in time and cost) and also the changes to enable it. **Action: BBS awaited**

1.6.26 Challenge the Employer's Requirements (tie VE idea list item 89)

This is another open idea, searching for any Employer's Requirement which might be placing unnecessary burden on the project implementation budget.

Action 1.6.26a BBS to identify any elements of their design or delivery where, if Employer's Requirements could be revised, useful savings could be made. Please identify both the approximate saving (time &/or cost) and also what changes in Employer's Requirements would be needed. **Action: BBS awaited**

Starting point – awaiting BBS compliance matrix of proposals to meet full ERs (15.6.07) (e.g. testing/shadow running periods) **Action: BBS** for 15.6.07

Then – what savings/benefits for any non-compliance. **Action: BBS**

1.6.27 Thinner track Slab (tie VE idea list item 97)

BBS have already priced for what they judge to offer best value, being a shallower depth than the initial design assumptions.

The key opportunity here is for **tie** to decide and commit to such a depth sufficiently early, that these assumptions can be built into the MUDFA instructions, reducing the depth to which they must undertake service diversions. The resulting MUDFA savings will not be realised without an early **tie** commitment to thinner track slab.

There remains a risk of surprises found in the ground by the Infraco, regardless of depth of MUDFA activity and track slab. **tie** will retain this risk and handle as found.

Action 1.6.27a A MUDFA saving opportunity available if **tie** can make an early commitment. **tie** need to understand if MUDFA diversion depths are significantly greater than needed by BBS trackform. Can a commitment be made for a reduced track form depth? **Action: tie**

1.6.28 11Kv Traction Power feeds to sub stations (12 nr). (tie VE ideas 103 & 104)

This is an open issue, yet to be negotiated with the DNO. Key issues and risks which raise the potential cost here are:

- 1) negotiation effectively with a monopoly,
- 2) the risk of paying not just for our base requirements, but for additional capacity of supply, required as general power network re-enforcement.

Who is best placed to handle this negotiation – **tie**? CEC? Or the Infraco?

SDS recommend that **tie**/SDS handle negotiation. Most are not long-distance routes, except near the airport.

Action 7.6.28a. **tie** to plan negotiation of power supply infrastructure. **Action: tie**

1.6.29 Reduce size pre-packaged Traction Power Units. (tie VE idea list item 106)

Another open issue. Redundancy and ability to continue operations with one substation out of use is a key consideration.

On 7.6.07, BBS stated that their bid pricing includes for pre-fabricated building and they have assumed there will be no metre cabinets.

1.6.30 Combine TPDS and SCADA (tie VE idea list item 128)

This may offer savings and will be investigated during development of the full signalling and control system.

Action 1.6.30a BBS (Siemens) are invited to consider what savings could be offered here in relation to their bid, and what changes in the systems specified in the ITT documents would be required to achieve this – what impact on operations.

Update 7.6.07. BBS envisage that development costs outweigh savings – and that this proposal offers no great potential.

1.6.31 Review the Stray Current policy (new idea from 1.6.07, redefined 7.6.07)

Stray current problems represent what is thought a small risk – unlikely to occur, but of potentially major consequence if it did. Consequently, SDS is very reluctant to take the risk of deleting the stray current mat.

Anecdotal evidence of continental experience without such stray current protection and of TfL investigations for the West London tram suggests that this item of capital expense can be eliminated.

Update 7.6.07. BBS identified that their bid already assumes that this proposal is adopted – therefore no saving is available versus their bid.

Action 7.6.31a BBS to identify what added cost is incurred if this idea is not accepted and stray current reverts to the original specification. **Action: BBS**

Action 1.6.31b Once the “Savings” from this proposal are quantified, if they prove worthwhile, then tie & SDS must satisfy themselves regarding the residual risk of stray current problems in operation and must satisfy the Utilities, before the policy can be changed and any savings accepted. **Action: tie / SDS, after 7.3.31a**

(7.6.32 This idea, raised 7.6.32, is shown earlier in this report, after idea 1.6.23)

7.6.33 Compliant Bid / Non-Compliant Bid

It became clear that the BBS bid is not fully compliant.

Whereas some of their recommended alternative submissions offer potentially attractive benefits and savings, it is important that the baseline of a fully compliant bid can be established.

Action 7.6.33a BBS are requested urgently to provide the cost changes from their current submission in order to achieve a compliant bid. **Action: BBS Urgent**

APPENDIX 1

**The list of Infraco-related ideas remaining in the tie VE team’s list,
 as reviewed with BBS on 01.06.07**

EDINBURGH TRAM PROJECT - PHASE 1A			
			REVISION 13+
VE INFRACO OPPORTUNITIES REVIEWED WITH BBS 01.06.07			
Item	Opportunity	Proposal Origin	Comments
	BUILDINGS		
	DEPOT		
5	Depot construction levels. May impact on ability to obtain prior approvals from planning authority Impacts Advance Works ACCEPTED	Project 9.1.1 - see also ideas 26-32 below	
8	Delete depot pumping station/storm tanks by utilising existing gravity system which has been confirmed to be at a suitable level where diversion is not required. ACCEPTED		Further impact on operating costs to be investigated
9	Depot - Build part now with provision to expand in the future/reduce size of car park facilities ACCEPTED	Project - 9.1.3 (see also item 10)	Revisit estimate for full dig for 35 tram fleet (8 sidings) but infrastructure installed for 27 tram fleet (6 sidings) or 31 tram fleet (7 sidings) AR - AGREED
10	Depot - Reduce numbers accommodated in Depot, Buildings & Car Park - to enable reduced floor area ACCEPTED	Project - 24.1.21 (see also item 9)	Staff numbers to be accommodated in the depot and commensurate with fleet size to be finalised and confirmed ASAP to SDS. AR issued sheet with max 400 staff souls to be accommodated
11	Depot Building - reduce cost of depot building. Perception that current estimate too high	Project - 24.1.33	Reduce size of the accommodation. Need to be clear what the occupancy figures are based on – accepted by tie?
12	Depot equipment - lease rather than purchase POSTPONE	Project - 24.1.22	Pending scope development Excluding shunter

Note that ideas highlight pink all relate to Depot Height.

Item	Opportunity	Origin	Comments
19	Depot - downgrade 12 tonne gantry crane to 6.3 tonne (max lift 5 tonne bogies)	Project - 7.2.1	Change agreed and SDS instructed to accommodate within the design. BOTH BIDS ALLOW FOR A 7T CAPACITY CRANE. NOTE - SIGNIFICANT SAVING AVAILABLE IN THE REDUCED STEEL SECTION SIZE REQUIRED TO SUPPORT THE CRANE
20	Depot – deletion of one pavement (inner). <i>Does this allow longer sidings?</i> <i>ACCEPT, subject to CEC</i>	Project - 7.2.2	May not be realised as a saving due to requirement to feed water main under footway
24	Depot - delete requirement for concrete apron to security fence	SDS	
26	Depot - Lower the roof sufficiently to allow the depot to rise 1.5 metres from the current level. <i>ACCEPT as part of Depot Height</i>	Project - 7.2.8	Saving of 200mm indicated
27	Depot - if general OLE height lowered from 7m to 6 or 6.5m - what savings can be made to depot height? <i>ACCEPT as part of Depot Height</i>	Project - 21.2.2	Initial indications for Items 19 & 27 indicate a total of 500mm can be saved
28	Depot - remove OLE from critical roads in the tram shed (i.e. under crane) - move trams in/out by alternative power (shunter, Shore power, on board battery power) <i>Not Popular</i>	Project - 21.2.3	Designers NOT IN FAVOUR
31	Depot - if height is determined at the boundary closest to the runway, and the runway approach path must be a sloping plane, and the depot building is some distance back from the boundary - how much extra height is the depot roof allowed to rise? ACTUAL PROFILES CONFIRMED & USED But need to retain some margin	Project - 21.2.6	Bringing the roof right up to the flight path clearance plane, with no extra clearance needed, indicates possible 300mm lift 295mm lift.
32	Depot - ensure that the highest point of the roof is away from the airport end of the building <i>NOT CRITICAL</i>	Project - 21.2.7	Re examination of the flight path suggests we can lift Depot 500mm with no runway change. Commitment from BAA sought by WG for the maximum available depot space on the sloping flight path, recognising that the highest point, the depot building roof, is some way back from the depot boundary and off-set sideways from the runway centre line - NOTE

			allowance required for roof penetrations (lightning protection and ventilation) BAA NO LONGER CRITICAL TO THIS OPPORTUNITY
129	Depot - delete compressed air system, utilise 1 or 2 local compressors ACCEPTED	Project - 16.3.2	
	HIGHWAYS		
36	Material recovery and reprocessing FP have a reprocessing facility - you may want to discuss with SC		Who owns the granite blocks within the road construction? What is CEC position and has INFRACO bids taken disposal of high value items such as this within their respective bids?
37	Reduction in extent of road reinstatement. Max 25%, Min 10%. Need also to consider type of reinstatement - don't know what has been priced?	Project	AR -Very difficult to support!! Maybe after MUDFA but then fully reinstate by INFRACO
	LAND & PROPERTY		
	NETWORK RAIL		
42	NR Immunisation - ETN only to pay for Direct Current immunisation	Project - 7.2.4	
	OLE		
45	OLE - reduce height of Overhead Power Line reduces cost of pantograph	Project - 31.1.7	
46	OLE - reduce height of Overhead Power Line reduced cost of support poles etc? Depends if poles are also to be street lights. Needs more consideration	Project - 31.1.7	Reduction in height under investigation. Need to consider views of the TDWG as pre application stage of re prior approvals. May lead to more poles albeit shorter

Item	Opportunity	Origin	Comments
47	OLE - reduce height of Overhead Power Line may allow depot to be raised further out of the ground?	Project - 21.2.2	Initial indication for 7.2.1 and 21.2.2 is total 500mm excavation can be saved
50	OLE - advance purchase of cabling to avoid future cost escalation	Project - 14.2.1	
	RISK		
51	System Wide - review risk allocation and mitigations Reviewed, reduced, incorporated, and closed.	Project - AH11	Nina reports that Risk Reviews & Risk Expiry has reduced the Risk Allowance and no further reduction is advisable.
	STRUCTURES		
54	Value Engineering developed for the final designs for all structures, <u>particularly substructures and foundations</u>	Both Bidders & Project - 14.2.9	Initial bids based on Prelim Design. Both bidders have stated that they anticipate savings will be generated through co-operative detailed design. There has already been co-operative design
55	Edinburgh Park Viaduct - utilise steel beams in lieu of concrete Appearance considered critical to neighbours/Planners. Steel Beams no longer being considered. - Closed ???	Project & both bidders	Higher initial construction cost but through use of weathering steel can achieve lifetime savings in not maintaining paint system. Cost estimated as part of item 15 above. But may not retain looks! STEEL NO LONGER BEING CONSIDERED???
56	Structures – Carrick Knowe Bridge Parapet - down grade from P6 / P5 to N2 (reduced cost of parapet plus knock on effect on deck design/cost)	Project - 7.2.3	Requirement for N2 protection - bids to be checked to establish if P6/P5 costed
57	Structures - A8 Underpass - over sized? Key issue is precise location and depth of a bank of ducts containing fibre optic cables	Project - 24.1.32	Key issue is precise location and depth of a bank of ducts containing fibre optic cables
58	Structures - Eastburn Ave Works - flood defence works - ensure no over scoping, betterment or over funding	Project - AH13	
59	Structures - reduce structure thickness by 25mm	Project - AH115	Redesign costs will impact on any potential savings
60	Structures - EARL Structure S33 - remove from estimate	Project - 14.2.6	tie to confirm which budget is to carry cost of S33

Item	Opportunity	Origin	Comments
NEW! 131 1b	Structures - minimise alteration work to Holiday Inn Access Bridge to bare minimum proposed in HMRI Design Substantiation Report "Roseburn Corridor: Holiday Inn Access Bridge" Doc Number ULE90130-03-REP-00206 i.e. provide compressible board and joint sealant to joint gaps in existing parapet		
NEW! 132 see 58	Structures - delete requirement for compensatory floodwater storage at Gogarburn in line with proposal contained in report "Compensatory Floodwater Storage Assessment" Doc ` ` Number ULE90130-07-REP-00029 V1		
SUPERVISORY & COMMS			
SYSTEM WIDE			
77	Optimise the work site lengths wherever practical to ensure efficient construction outputs	Project - 5.1.1 ??	
80	Accept more disruption over shorter period to maximise efficiency of construction operations	Project - 5.1.1	
81	Aligning SDS and the Employer's Requirements - make best use of the design already completed. Accept that there are scope miss-matches between SDS & Infraco	Project - 5.1.7	Has already increased project costs - not VE!
83	System Wide - reprogrammed to reduce impact from inflation	Project - AH4	
84	System Wide - review delivery programme - complete earlier reducing OH's	Project - AH12	
85	System Wide - Review KPIs - relax requirements	Project - AH101	
86	System Wide - reduce cost of approvals - reduce OH's and tie organisation costs	Project - AH107	
89	System Wide - challenge Employer's Requirements	Project - 5.1.7	
THIRD PARTY			
TRACK FORM			
96	Omit OCT to Newhaven section, create turn back facilities at OCT Politically a non-starter - see CEC report January 2006?? Impact on MUDFA	Project	Potentially add back as part of future phase to link Granton to OCT. Need to understand impact on business case
97	Thinner track slab impact on MUDFA (linked to 4 above)	Project - 24.1.26	Allow 10% to 15% reduction in required diversions. Depends on when a decision is made

Item	Opportunity	Origin	Comments
TRAM STOPS			
110	Delete 2 tram stops (Ocean Drive & South Gyle) leaving provision for adding stops back in the future. This is unlikely to be acceptable politically. Plus 2 x Phase 1b stops On Hold	Project - 31.1.13	Await tie /TEL decision. Allocate between 1a & 1b
112	Prefab drop-in tram stops and other items. It has been agreed that substations will be package substations On Hold	Project - 24.1.30	Perceived wrong image
113	Tram stops - finishes to be minimum standard throughout On Hold	Project - 5.1.24	Perceived wrong image
TRAMS			
128	Combine TPDS & SCADA	Project - SDS11	