EDINBURGH TRAM NETWORK

VALUE ENGINEERING REGISTER

WORK IN PROGRESS

28/06/2016

VERSION 30

Item	Opportunity	Filter	Proposal Origin	Opportunity Champion	Cost of Project Element	Opportunity Value: Min	Opportunity Value: Most Likely	Opportunity Value: Max	SDS Design Programme	Construction Programme	Impact on: System Performance	Impact on: Project Constraints	Impact on: Stakeholders	Impact on: Maintenance Costs	Impact on: Business Case	Work Stream affected	Current Status	Probability of Success (Phase 1a only): Easy (80%) 0.80	Medium (50%) 0.50	Difficult (20%) 0.20	Comments
1	Depot reorientation (External works)	Depot	Scoop	SDS	£5,443,555	£2,000,000		£3,500,000								Infraco - advance works	OPEN		£1,375,000		SDS Depot Feasibility Study. Note: estimate 25% reduction in excavation programme duration
2	Depot construction levels	Depot	Project, Scoop	SDS												Infraco - advance works	OPEN		£0		Connected to "Depot reorientation". See 1 above
3	Depot location (whole depot) - relocate to alternative location	Depot	Project	SDS	£19,640,560	£0		£1,000,000								Infraco - advance works	HOLD				This has been considered before and PARKED. Affected by LCC. Therefore no saving taken
4	Track bed construction details - reduce track slab thickness with structurally efficient members	Trackform	Scoop	SDS	£63,783,325	£3,100,000		£6,000,000								Infraco	OPEN	£3,640,000			Reduced excavation and concrete within track bed
5	Track form - specific application of types - adopt ballasted track wherever possible	Trackform	Scoop	SDS		£750,000		£1,500,000								Infraco	OPEN				Exchange precast rail beam with ballast track in Roseburn corridor (NOT GLUED). Not priced as is an alternative to item 8
6	Track geometry at the Ocean Terminal - rationalise layout to reduce complexity/amount of trackwork whilst maintaining operational flexibility	Trackform	Scoop	SDS												Infraco	OPEN		£0		
7	Track geometry at the Depot - rationalise layout	Depot	Scoop	SDS												Infraco	OPEN			£0	
8	XI Track for stabilized ballast as an alternative to directly fixed track - glued ballast (Roseburn Corridor)	Trackform	Scoop	SDS	See 4 above	£1,140,000		£2,640,000								Infraco	HOLD				Exchange precast rail beam with ballast track in Roseburn corridor (GLUED) - Phase 1b issue - not priced - NOW DEEMED UNLIKELY TO BE REALISED
9	Vertical alignment optimization - minimise highway reconstruction	Highways	Scoop	SDS												Infraco	OPEN			£0	
10	Single line sections between Roseburn Junction and Granton Square (Track form for Roseburn Corridor only)	Trackform	Scoop	SDS	£16,825,591	£2,000,000		£3,000,000								Infraco	OPEN				Reduction in track only - no savings taken at this point for reduced embankment works or structures savings (Reduced loadings). Run times will be adversely affected - relates to Phase 1b so not priced
11	Gogar Roundabout - redesign - implementation of traffic light controlled at-grade tramway crossing	Highways	Scoop	SDS												Infraco	OPEN				
12	Soil stabilisation - sub grade - stabilise with lime and cement	Structures	Scoop	SDS												Infraco	OPEN				
13	Soil stabilisation - retaining slopes - use of gunite, block and crib walling, soil nailing, gabions etc in lieu of retaining walls	Structures	Scoop	SDS												Infraco	OPEN				
14	Material recovery and reprocessing	Highways		SDS												Infraco	OPEN				Limited range of materials to recycle coupled to track form largely replacing the volume of material originally excavated
15	Value Engineering developed for the final designs for all structures, particularly substructures and foundations	Structures	Scoop, Roley, Project	SDS	£52,740,000	£5,000,000		£15,000,000								Infraco	OPEN	£8,000,000			Initial bids based on Prelim Design. Both bidders have stated that they anticipate savings will be generated through co-operative detailed design
16	Optimise the work site lengths wherever practical to ensure efficient construction outputs	System Wide														Infraco	OPEN				
17	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?	Depot		FD	£350,000	£350,000		£400,000								Infraco	OPEN	£300,000			Further impact on operating costs to be investigated
18	Omit OCT to Newhaven section, create turn back facilities at OCT	Trackform	Project	GG	£6,060,160	£4,000,000		£5,396,682								Infraco	OPEN			£939,668	Potentially add back as part of future phase to link Granton to OCT
19	Thinner track slab impact on MUDFA (linked to 4 above)	Trackform	Project		£39,400,000	£3,940,000		£5,910,000								MUDFA	OPEN		£7,462,500		Allow 10% to 15% reduction in required diversions
20	Edinburgh Park Bridge - utilise steel beams in lieu of concrete	Structures	Project, Scoop, Roley													Infraco	OPEN				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
21	Murrayfield Pitch Relocation - mods only to Waranders Club House TBC	Third Party	Project		£3,355,000	£2,684,000		£3,355,000								Infraco	OPEN	£2,415,600			Comments made by various individuals suggests that a compromise has been reached with SRU. Await final confirmation from?
22	Second hand Tram vehicles	Trams	Project	DP	£65,000,000	£10,000,000		£20,000,000								Infraco	OPEN			£2,000,000	Generated from high level discussions
23	Reduction in extent of road reinstatement. Max 25%. Min 10%	Highways	Project		£5,210,041	£521,004		£1,302,510								Infraco	OPEN			£182,351	
24	Merseytram Rail stockpile (1,000 tonnes of rail - Information from SDS. ETN requirement approx 4,000 tonnes)	Trackform	Project	AD		£900,000		£1,400,000								Infraco	OPEN	£920,000			Allowance made for cleaning and transportation
25	11Kv Traction Power feeds to sub stations (12 nr at £302k each)	Traction Power	Project	TK	£3,635,934	£1,595,923		£2,075,928								Infraco	OPEN	£1,468,742			SDS allowance £302k per feed. Discussions suggest that £130k per feed more appropriate
26	Network Reinforcement - not to be paid for by ETN	Traction Power	Project	AL/DE	£2,647,958	£2,647,958		£2,647,958								Infraco	OPEN	£2,118,366			Argument that ETN alone should not be penalised for upgrading SP network when there are significant other developments ongoing in the City
27	Depot - Build part now with provision to expand in the future/reduce size of car park facilities	Depot	Project	SDS		£0		£2,000,000								Infraco	OPEN		£500,000		
28	Depot Building - reduce cost of depot building. Perception that current estimate too high	Depot	Project	SDS	£14,063,521	£2,812,704		£4,219,056								Infraco	OPEN	£2,812,704			£2,344/m2 .
29	Depot equipment - lease rather than purchase	Depot	Project	AR/DE												Infraco	HOLD			£0	Pending scope development
30	Tram mock-up - use an existing mock-up rather than purchasing new	Trams	Project	DP		£0		£250,000								Tramco	REJECTED	£0	£0	£0	Unlikely to procure a UK tram without major re-work. Not easy to find, would not meet all required objectives
31	Reduce fleet size - run 8+8 on 1a only (26 trams) or 6+6 on 1a and 1b (26 trams)(build in option to buy additional trams in the future)?	Trams	Project	AR		£0		£10,000,000								Tramco	OPEN				See 33 below
32	Buy 26 tram units, lease extra when needed	Trams	Project	AR		£750,000		£10,000,000								Tramco	OPEN			£1,075,000	
33	Reduce fleet size - delete 1 tram from spare capacity and accept risk to lower performance	Trams	Project	AR				£2,000,000								Tramco	OPEN		£500,000		
34	Trams - purchase without seats or luggage racks - fit out under own order	Trams	Project	DP		£0	£0	£0								Tramco	REJECTED	£0	£0	£0	No CAPEX saving to claim
35	Trams - place passenger counters on only 20% of fleet - not whole fleet. Counters deemed inaccurate	Trams	Project	AR		£0		£250,000								Tramco	OPEN	£100,000			
36	OLE - reduce height of Overhead Power Line reduces cost of pantograph	OLE	Project	SDS												Infraco	HOLD	£0			Pantograph scope removed from Tram Suppliers
37	OLE - reduce height of Overhead Power Line reduced cost of support poles etc)	OLE	Project	SDS/TSS												Infraco	HOLD	£0			Reducing height of OLE decreases pole spacing and therefore increases number of poles required
38	OLE - reduce height of Overhead Power Line may allow depot to be raised further out of the ground	OLE	Project	SDS												Infraco	HOLD				
39	Reduced noise mitigation measures - use "quieter trams"	Trams	Project	SDS/TSS/DP		£0		£1,000,000								Infraco	OPEN				Potential higher tram capital costs as a consequence to be considered. Phase 1b issue - not priced
40	Remove/reduce contractual bonds (rely on PCG)	System Wide	Project	GG		£0		£400,000								Infraco/Tramco	OPEN	£160,000			
41	Delete 4 tram stops (Ocean Drive, Roseburn, Ravelston & S Gyle) leaving provision for adding stops back in the future	Tram Stops	Project	tie/Tel		£0		£750,000								Infraco	HOLD			£0	Await tie/TEL decision
42	Delete fencing at sub stations and accept security risk	Buildings	Project	GG	£76,000	£0		£76,000								Infraco	REJECTED				
43	Delete one substation and accept risk of total system failure should another substation go down	Buildings	Project			£0		£500,000								Infraco	REJECTED				If 1b deleted, "10th" sub station will still be required to provide sufficient power on 1a
44	3rd Party Branding of tram stops (e.g. RBS at Gogarburn)	Tram Stops	Project	AR		£0	£0	£0								Infraco	CLOSED	£0	£0	£0	No future opportunity
45	Infraco bidders offering discounts for using specific tram suppliers	System Wide	Project, Scoop, Roley	GG												Infraco	OPEN	£0			Hold pending TRAMCO/Infraco negotiations
46	Install cable route along Section 4 linking 1a to 1b (eliminates need to duct route elsewhere)	Trackform	Project, Scoop	tie		£150,000		£150,000								Infraco	OPEN	£120,000			
47	Prefab drop-in tram stops and other items	Tram Stops	Project	GG												Infraco	HOLD		£0		[illegible]
48	Tramco - discount for earlier stage payments	Trams	Project	DP/GG												Tramco	OPEN		£0		
49	Tramco - to provide some of the depot equipment (might gain advantage from Tramco procurement knowledge &/or buying power)	Trams	Project	DP												Infraco/Tramco	OPEN		£0		
50	Tramco - Value Engineering with top 2 bidders	Trams	Project	DP/GG												Tramco	OPEN	£0			Not raised - currently known ideas captured above
51	Tramco - reduce power demand (environmental grants available?)	Traction Power	Project	DP												Tramco	OPEN				
52	Transdev - accept more disruption in short term to maximise efficiency of construction operations	System Wide	Project	SC/AH/KR												Infraco/Tramco	OPEN			£0	
53	Aligning SDS and the employers Requirements - make best use of the design already completed. Accept that there are scope miss-matches between SDS & Infraco	System Wide	Project	GG												Infraco	OPEN				
54	Omit all customising of cab exterior - ie have appearance DR?	Trams	Project	DP/AH												Tramco	OPEN				
55	OLE - minimise building fixings	OLE	Project	SDS/GD/JP												Infraco	REJECTED			£0	
56	Review size of pre-packaged Traction Power Units to make smaller	Traction Power	Project	SDS/Transdev												Infraco	OPEN				
57	Reconfirm the necessity for each of the subsystems comprising Supervisory, Control and Communications	Supervisory & Comms	Project	SB/Tel/Transdev												Infraco	REJECTED				
58	Tram stops - finishes to be minimum standard throughout	Tram stops	Project	SDS												Infraco	HOLD			£0	[illegible]
59	Depot - sale of top soil	Depot	Project	GG	£300,000	£44,549		£172,145								Infraco	OPEN	£86,598			Only top 250mm as quality top soil. See separate opportunity for disposal of bulk material below
60	Savings in management through integrated teams	System Wide	Project	GG		£100,000		£300,000								tie	OPEN	£160,000			Based on reduction in shadowing engineering staff Mar to Sep 07
61	Signalling & Comms -De-spec some requirements off EBIScreen eg the requirement for making Radio calls from it, selecting CCTV cameras etc	Supervisory & Comms	Scoop													Infraco	OPEN				
62	Signalling & Comms - fewer speech channels for the radio system	Supervisory & Comms	Scoop													Infraco	OPEN				
63	Signalling & Comms - fewer CCTV cameras	Supervisory & Comms	Scoop													Infraco	OPEN				

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64	Signalling & Comms - Delete Mimic Display Panel in the CTC	Supervisory & Comms	Scoop													Infraco	OPEN				
65	Signalling & Comms - fewer CCTV cameras	Supervisory & Comms	Scoop													Infraco	OPEN				
66	Signalling & Comms - Dual feed the Tramstop Equipment Panels from adjacent substations instead of having a separate UPS in each cabinet	Supervisory & Comms	Scoop													Infraco	OPEN				
67	Signalling & Comms - rationalise fibre optic rings - are 3 really necessary? More economic architecture that performs the same function could be employed	Supervisory & Comms	Scoop													Infraco	OPEN				
68	Signalling & Comms - Provide separate pieces of Control Equipment on each Operators desk instead of integrating them on a touch screen console	Supervisory & Comms	Scoop													Infraco	OPEN				
69	Signalling & Comms - fewer Operator positions (Also fewer operators - OPEX)	Supervisory & Comms	Scoop													Infraco	OPEN				
70	Signalling & Comms - No fallback position in case of CTC evacuation	Supervisory & Comms	Scoop													Infraco	OPEN				
71	Signalling & Comms - Current requirement for location and interface of the SCADA and Points controllers etc is unnecessarily complex. A solution based on Nottingham Tram would provide a less complex and cost effective option	Supervisory & Comms	Scoop													Infraco	OPEN				
72	Signalling & Comms - rationalise loop quantities by combining some loop functions	Supervisory & Comms	Scoop													Infraco	OPEN				
73	Signalling & Comms - Remove ambient noise sensing on the passenger announcement system	Supervisory & Comms	Scoop													Infraco	OPEN				
74	Signalling & Comms - Remove induction loops for PA system	Supervisory & Comms	Scoop													Infraco	OPEN				
75	Power supply - AC switchboards / DNO supply - If this board could be shared savings could be realised in both space in the substation and further optimisation of the AC switchboard equipment	Traction Power	Scoop													Infraco	OPEN				
76	Power supply - Rationalise layout of modular housings to reduce overall space requirements	Buildings	Scoop													Infraco	OPEN				
77	Power supply - Track / Bypass isolators - switches could be combined with the DC switchgear in the substation	Traction Power	Scoop													Infraco	OPEN				
78	Power supply - Russell Rd TPH - could equipment for future upgrade to substation be supplied when this is actually realised? i.e. don't supply transformer rectifier now	Traction Power	Scoop													Infraco	OPEN				
79	Overhead Contact system - Switchgear - rationalise specification - considered "quite onerous"	OLE	Scoop													Infraco	OPEN				
80	Depot - Delete under floor lift plant and utilise mobile jacks	Depot	Scoop													Infraco	OPEN				
81	Depot - delete Windscreen remover - not required at Nottingham Tram	Depot	Scoop													Infraco	OPEN				
82	Depot - split vehicle accommodation system - requirement dependent on tram vehicle selection	Depot	Scoop													Infraco	OPEN				
83	Depot - Track Maintenance Equipment - rationalise scope requirement	Depot	Scoop													Infraco	OPEN				
84	Depot Power - delete bidders allowance for equipment to be supplied by Scottish Power	Depot	Scoop	DL		£80,000		£90,000								Infraco	OPEN	£66,000			DL email 19-01-07 refers
85	Noise attenuation (outside of Roseburn Corridor) 3,650m of fencing	Trackform	Project			£0		£0								Infraco	CLOSED		£0		Noise barriers - opportunity already reflected in estimate
86	Depot - downgrade 12 tonne gantry crane to 6.3 tonne (max lift 5 tonne bogies)	Depot	Project													Infraco	OPEN	£0			Agreed - estimate to be updated
87	Depot - deletion of outer pavement	Depot	Project			[illegible]		[illegible]								Infraco	OPEN	[illegible]			
88	Structures - Carrickmowe Bridge Parapet - down grade from P6 / P5 to N2 (reduced cost of parapet plus knock on effect on deck design/cost)	Structures	Project	SDS (TK)												Infraco	OPEN				Requirement for N2 protection - bids to be checked to establish if P6/P5 costed
89	Structures - A8 Underpass - over sized?	Structures	Project	SDS												Infraco	OPEN				Key issue is precise location and depth of a bank of ducts containing fibre optic cables
90	NR Immunisation - ETN only to pay for Direct Current immunisation (£3.5m)	NR	Project			£0		£3,000,000								Infraco	OPEN			£300,000	
91	NR Immunisation - TS to pay for all upgrading associated with AC and DC immunisation (£6.5m - off set £3m in 91 above)	NR	Project			£0		£3,500,000								Infraco	OPEN			£350,000	
92	NR Immunisation - Condition survey existing NR assets, agree betterment with NR	NR	Project													Infraco	OPEN			£0	
93	Land & Property - NR Land - lease rather than purchase	Land & property	Project			£201,409		£436,170								Infraco	OPEN	£255,064			Impact on OPEX requires investigation. Anticipated that annual lease cost £1 consideration only
94	Highways - Review extent and quality of boundary treatments	Highways	Project			£0	£0	£0								Infraco	REJECTED	£0	£0	£0	Insignificant allowances for this - no great opportunities for Savings
95	Trackform - ongoing maintenance of Roseburn corridor vegetation by CEC	Trackform	Project			£0	£0	£0								Infraco	REJECTED	£0	£0	£0	OPEX impact on Line 1b - Not evaluated
96	Land & Property - Part 1 claims - understand assumptions made and allowance made - review against experience on other projects and reduce if necessary	Land & property				£0	£0	£0								Infraco	CLOSED	£0	£0	£0	Part 1 claims already "value engineered" by transferring to Risk and applying probabilities
97	System Wide - reprogramme to reduce impact from inflation	System Wide														Infraco	OPEN				
98	Land & Property - review "cautious" DV figures	Land & property														Infraco	OPEN				
99	System Wide - review risk allocation and mitigations	Risk														Infraco	OPEN				
100	System Wide - review delivery programme - complete earlier reducing OH's	System Wide														Infraco	OPEN				
101	Structures - Eastburn Ave Works - flood defence works - ensure no over scoping, betterment or over funding	Structures														Infraco	OPEN				
102	System Wide - Review KPI's - relax requirements	System Wide														Infraco	OPEN				
103	System Wide - reduce cost of approvals - reduce OH's and tie organisation costs	System Wide														Infraco	OPEN				
104	Depot - reduce size of tram stop	Depot														Infraco	OPEN				
105	System Wide - relax run time requirements	System Wide														Infraco	OPEN				
106	Trackform - Amend requirements at Roseburn Delta Junction	Trackform	Project			£0		£250,000								Infraco	OPEN		£87,500		
107	System Wide - remove Guided Busway Programme Constraints	System Wide	Project			£0	£0	£0								Infraco	REJECTED	£0	£0	£0	Current programme ignores constraint and represents most efficient programme. Introduction of constraint should be recognised as a potential risk
108	Tram Stops - delete cycle racks	Tram Stops	Project			£0	£0	£0								Infraco	REJECTED	£0	£0	£0	Negligible saving and reduced functionality
109	Structures - reduce slab(?) thickness by 25mm	Structures														Infraco	OPEN				Redesign costs will impact on any potential savings
110	OLE - advance purchase of cabling to avoid future cost escalation	OLE														Infraco	OPEN				
111	Depot - disposal of excavated material over adjacent farmland. Avoid transportation costs and landfill costs?	Depot														Infraco	OPEN				
112	Trams - Reduce service to 4 trams per hour on Phase 1b	Trams														Transco	OPEN				
113	Structures - FABI Structure S33 - remove from estimate	Structures	Project			£1,097,317		£1,186,799								Infraco	OPEN	£911,447			tie to confirm which budget is to carry cost of S33
114	Structures - Gyle Stop retaining wall - excessive structure - delete from design	Structures	Project													Infraco	REJECTED	£0	£0	£0	Retaining wall requirement can't be deleted or modified in such a way as to realise a significant saving
115	Depot - sale of general excavated material (See opportunity 63 above for topsoil sale)	Depot	Project			£868,884		£1,524,399								Infraco	OPEN		£598,321		
116	Depot - delete requirement for concrete apron to security fence	Depot	SDS													Infraco	OPEN				
117	Depot - gas main diversion - Excavation delayed due to 3rd Party - move required valve location to expedite excavation of depot area	Depot	Project													Infraco	OPEN				
118	Depot - if general OLE height lowered from 7m to 6 or 6.5m - what savings can be made to depot height?	Depot	Project													Infraco	OPEN				
119	Depot - remove OLE within building and sidings - move trams by alternative power (shunter. Shore power, on board battery power)	Depot	Project													Infraco	OPEN				
120	Depot - delete shunter from equipment list	Depot	Project													Infraco	OPEN				
121	Depot - if BAA want £2m to give 1.2m rise, what would it take/cost for say 0.5m (out of our 1m target)?	Depot	Project													Infraco	OPEN				
122	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?	Depot	Project													Infraco	OPEN				

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																		0.80	0.50	0.20	
123	Depot - ensure that the highest point of the roof is away from the airport end of the building	Depot	Project													Infraco	OPEN				
124	Depot - transfer sand store outside the building - what is the driver here?	Depot	Project													Infraco	OPEN				
125	System Wide - challenge employers requirements	System Wide	Project													Infraco	OPEN				
						£46,793,633	£0	£117,307,137										£23,397,316	£5,323,321	£0	
	NOTE: Financial Impact calculated on average Max/Min impact multiplied by the probability of success																		Total	£34,967,857	

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																		0.80	0.50	0.20	
	BUILDINGS																				
45	Delete fencing at sub stations and accept security risk	Buildings	Project	[illegible]	£26,000	£0		£26,000								Infraco	REJECTED				Insignificant value saved versus security risk
43	Delete one substation and accept risk of total system failure should another substation go down	Buildings	Project			£0		£500,000								Infraco	REJECTED				If 1b deleted, "13th" sub station will still be required to provide sufficient power on 1a
76	Power supply - Rationalise layout of modular housings to reduce overall space requirements	Buildings	Scoop													Infraco	OPEN				
						£0	£0	£526,000										£0	£0	£0	
	DEPOT																				
1	Depot reorientation (External works)	Depot	Scoop	SDS	£3,443,555	£2,000,000		£3,500,000								Infraco - advance works	OPEN		£1,375,000		SDS Depot Feasibility Study. Note: estimate 22% reduction in excavation programme duration
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59	Depot - sale of top soil	Depot	Project	AG	£300,000	£44,349		£172,145								Infraco	OPEN	£86,598			Only top 250mm as quality top soil. See separate opportunity for disposal of bulk material below
80	Depot - Delete under floor lift plant and utilise mobile jacks	Depot	Scoop													Infraco	OPEN				
81	Depot - delete Windscreen remover - not required at Nottingham Tram	Depot	Scoop													Infraco	OPEN				
82	Depot - split vehicle accommodation system - requirement dependent on tram vehicle selection	Depot	Scoop													Infraco	OPEN				
83	Depot - Track Maintenance Equipment - rationalise scope requirement	Depot	Scoop													Infraco	OPEN				
84	Depot Power - delete bidders allowance for equipment to be supplied by Scottish Power	Depot	Scoop	DL		£60,000		£90,000								Infraco	OPEN	£60,000			DL email 19-01-07 refers
86	Depot - downgrade 12 tonne gantry crane to 6.3 tonne (max MR 5 tonne bogies)	Depot	Project													Infraco	OPEN	£0			
87	Depot - deletion of cutter equipment	Depot	Project			£60,000		£75,000								Infraco	OPEN	£54,000			
104	Depot - reduce span of tram stop	Depot														Infraco	OPEN				
111	Depot - disposal of excavated material over adjacent farmland. Avoid transportation costs and landfill costs?	Depot														Infraco	OPEN				
115	Depot - sale of general excavated material (See opportunity 59 above for topsoil sale)	Depot	Project			£868,884		£1,524,399								Infraco	OPEN		£598,322		
116	Depot - delete requirement for concrete apron to security fence	Depot	SDS													Infraco	OPEN				
117	Depot - gas main diversion - Excavation delayed due to 3rd Party - move required valve location to expedite excavation of depot area	Depot	Project																		
118	Depot - If general OLE height lowered from 7m to 6 or 6.5m - what savings can be made to depot height?	Depot	Project																		
119	Depot - remove OLE within building and sidings - move trams by alternative power (shunter, Shore power, on board battery power)	Depot	Project													Infraco	OPEN				
120	Depot - delete shunter from equipment list	Depot	Project													Infraco	OPEN				
121	Depot - If BAA want £2m to give 1.2m rise, what would it take/cost for say 0.5m (out of our 1m target)?															Infraco	OPEN				
122	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?															Infraco	OPEN				
123	Depot - ensure that the highest point of the roof is away from the airport end of the building															Infraco	OPEN				
124	Depot - transfer sand store outside the building - what is the flood level?	Depot	Project													Infraco	OPEN				
						£6,215,937	£0	£12,930,600										£3,321,382	£2,473,321	£0	
	HIGHWAYS																				
9	Vertical alignment optimisation - minimise highway reconstruction	Highways	Scoop	SDS												Infraco	OPEN			£0	
11	Gogar Roundabout - redesign - implementation of traffic light controlled at-grade tramway crossing	Highways	Scoop	SDS												Infraco	OPEN				
14	Material recovery and reprocessing	Highways		SDS												Infraco	OPEN				Limited range of materials to recycle coupled to fast track form [illegible] volume of material minimally [illegible]
23	Reduction in extent of road reinstatement. May 20% Min [illegible]	Highways	Project		£9,310,041	£521,904		£1,302,565								Infraco	OPEN			£182,351	
64	Highways - Review extent and quality of boundary treatments	Highways	Project			£0	£0	£0								Infraco	REJECTED	£0	£0	£0	Insignificant allowances for this - no great opportunities for savings
						£521,904	£0	£1,302,510										£0	£0	£182,351	
	LAND & PROPERTY																				
93	Land & Property - NR Land - lease rather than purchase	Land & property	Project			£201,499		£436,170								Infraco	OPEN	£255,064			Impact on OPEX requires investigation. Anticipated that annual lease cost £1 consideration only
96	Land & Property - Part 1 claims - understand assumptions made and allowance made - review against experience on other projects and reform if necessary	Land & property				£0	£0	£0								Infraco	CLOSED	£0	£0	£0	Part 1 claims already "value engineered" by transferring to Risk and applying probabilities
98	Land & Property - review "cautious" DV figures	Land & property														Infraco	OPEN				
						£201,499	£0	£436,170										£255,064	£0	£0	
	NETWORK RAIL																				
90	NR Immunisation - ETN only to pay for Direct Current immunisation (£3.5m)	NR	Project			£0		£3,000,000								Infraco	OPEN			£300,000	
91	NR Immunisation - TS to pay for all upgrading associated with AC and DC immunisation (£6.5m) - offset £3m in 91	NR	Project			£0		£3,500,000								Infraco	OPEN			£250,000	
92	NR Immunisation - Condition survey existing NR assets. Agree betterment with NR	NR	Project													Infraco	OPEN			£0	
						£0	£0	£6,500,000										£0	£0	£650,000	
	OLE																				
36	OLE - reduce height of Overhead Power Line reduces cost of substructure	OLE	Project	SDS												Infraco	OPEN	£0			
37	OLE - reduce height of Overhead Power Line reduced cost of support poles etc?	OLE	Project	SDS/TSS												Infraco	OPEN	£0			
38	OLE - reduce height of Overhead Power Line may allow depot to be raised further out of the ground	OLE	Project	SDS												Infraco	OPEN				
55	OLE - minimise building fixings	OLE	Project	[illegible]												Infraco	REJECTED			£0	
79	Overhead Contact system - Switchgear - rationalise specification - considered [illegible]	OLE	Scoop													Infraco	OPEN				
110	OLE - advance purchase of cabling to avoid future cost escalation	OLE														Infraco	OPEN				
						£0	£0	£0										£0	£0	£0	
	RISK																				
66	System Wide - review risk allocation and mitigations	Risk														Infraco	OPEN				
						£0	£0	£0										£0	£0	£0	
	STRUCTURES																				
12	Soil stabilisation - soil nailing - stabilise with lime and cement	Structures	Scoop	SDS												Infraco	OPEN				
13	Soil stabilisation - retaining slopes - use of gunite, block and rock netting, soil nailing, gabions etc in lieu of retaining walls	Structures	Scoop	SDS												Infraco	OPEN				
15	Value Engineering developed for the final designs for all structures, particularly substructures and foundations	Structures	Scoop, Roley, Project	SDS	£53,740,000	£5,000,000		£15,000,000								Infraco	OPEN	£8,000,000			Initial bids based on Prelim Design. Both bidders have stated that they anticipate savings will be generated through co-operative detailed design
20	Edinburgh Park Bridge - utilise steel beams in lieu of concrete	Structures	Project, Scoop, Roley													Infraco	OPEN				Higher initial construction cost but through use of weathering steel can achieve lifetime savings in not maintaining paint system. [illegible]
88	Structures - Carrickknowe Bridge Parapet - down grade from P6 / P5 to N2 (reduced cost of parapet plus knock on effect on deck design/cost)	Structures	Project	SDS (TK)												Infraco	OPEN				Requirement for N2 protection - bids to be checked to establish if P6/P5 costed
89	Structures - A8 Underpass - over sized?	Structures	Project	SDS												Infraco	OPEN				Key issue is precise location and depth of a bank of ducts containing fibre optic cables
101	Structures - Eastburn Ave Works - flood defence works - [illegible]	Structures														Infraco	OPEN				
106	Structures - reduce slab thickness by 75mm	Structures														Infraco	OPEN				Reduction in [illegible] will impact on [illegible] potential savings
113	Structures - [illegible] - remove from estimate	Structures	Project			£1,097,313		£2,186,289								Infraco	OPEN	£917,447			Tie to confirm which budget it to come out of [illegible]
114	Structures - Gyle Stop retaining wall - excessive structure - delete from design	Structures	Project													Infraco	REJECTED	£0	£0	£0	Retaining wall requirement can't be deleted or modified in such a way as to realise a significant saving
						£6,097,313	£0	£16,186,289										£8,917,447	£0	£0	

CEC01793673_0004

EDINBURGH TRAM NETWORK

VALUE ENGINEERING REGISTER

WORK IN PROGRESS

[illegible] **VERSION 30**

Item	Opportunity	Filter	Proposal Origin	Opportunity Champion	Cost of Project Element	Opportunity Value: Min	Opportunity Value: Most Likely	Opportunity Value: Max	Impact on: SDS Design Programme	Impact on: Construction Programme	Impact on: System Performance	Impact on: Project Constraints	Impact on: Stakeholders	Impact on: Maintenance Costs	Impact on: Business Case	Work Stream affected	Current Status	Probability of Success (Phase 1a only): Easy (80%)	Probability of Success (Phase 1a only): Medium (50%)	Probability of Success (Phase 1a only): Difficult	Comments
	SUPERVISORY & COMMS																				
57	Reconfirm the necessity for each of the subsystems comprising Supervisory, Control and Communications	Supervisory & Comms	Project	08/Tel/Transdev												Infraco	REJECTED				
61	Signalling & Comms - De-spec some requirements off ERS/scope eg the requirement for making Radio calls from it, selecting CCTV cameras, etc	Supervisory & Comms	Scoop													Infraco	OPEN				
62	Signalling & Comms - fewer speech channels for the radio system	Supervisory & Comms	Scoop													Infraco	OPEN				
63	Signalling & Comms - fewer CCTV cameras	Supervisory & Comms	Scoop													Infraco	OPEN				
64	Signalling & Comms - Delete Mimic Display Panel in the CTC	Supervisory & Comms	Scoop													Infraco	OPEN				
65	Signalling & Comms - fewer CCTV cameras	Supervisory & Comms	Scoop													Infraco	OPEN				
66	Signalling & Comms - Dual feed the Tramstop Equipment Panels from adjacent substations instead of having a [illegible]	Supervisory & Comms	Scoop													Infraco	OPEN				
67	Signalling & Comms - rationalise fibre optic rings - are 3 really necessary? More economic architecture that performs the same function [illegible]	Supervisory & Comms	Scoop													Infraco	OPEN				
68	Signalling & Comms - Provide separate pieces of Control Equipment on each Operators desk instead of integrating [illegible]	Supervisory & Comms	Scoop													Infraco	OPEN				
69	Signalling & Comms - fewer Operator positions (Also fewer operators - OPEX)	Supervisory & Comms	Scoop													Infraco	OPEN				
70	Signalling & Comms - No fallback position in case of CTC evacuation	Supervisory & Comms	Scoop													Infraco	OPEN				
71	Signalling & Comms - Current requirement for location and interface of the SCADA and Points controllers etc is unnecessarily complex. A solution based on Nottingham [illegible]	Supervisory & Comms	Scoop													Infraco	OPEN				
72	Signalling & Comms - rationalise loop quantities by combining some loop functions	Supervisory & Comms	Scoop													Infraco	OPEN				
73	Signalling & Comms - Remove ambient noise sensing on the passenger announcement system	Supervisory & Comms	Scoop													Infraco	OPEN				
74	Signalling & Comms - Remove induction loops for PA system	Supervisory & Comms	Scoop													Infraco	OPEN				
						£0	**£0**	**£0**										**£0**	**£0**	**£0**	
	SYSTEM WIDE																				
16	Optimise the work site lengths wherever practical to ensure efficient construction outputs	System Wide														Infraco	OPEN				
40	Remove/reduce contractual bonds (rely on PCG)	System Wide	Project	GG		£0		£400,000								Infraco/Tramco	OPEN	£160,000			
45	Infraco bidders offering discounts for using specific tram suppliers	System Wide	Project, Scoop, Bidder	GG												Infraco	OPEN	£0			Hold pending TRAMCO/Infraco negotiations
52	Transdev - accept more disruption in short term to maximise efficiency of construction operations	System Wide	Project	SC/AH/KR												Infraco/Tramco	OPEN			£0	
53	Aligning SDS and the employers Requirements - make best use of the design already completed. Accept that there are [illegible]	System Wide	Project	GG												Infraco	OPEN				
60	Savings in management through integrated teams	System Wide	Project	GG		£100,000		£300,000								tie	OPEN	£160,000			Based on reduction in shadowing engineering staff Mar to Sep 07
97	System Wide - reprogramme to reduce impact from inflation	System Wide														Infraco	OPEN				
100	System Wide - review delivery programme - complete earlier reducing OH's	System Wide														Infraco	OPEN				
102	System Wide - Review KPI's - relax requirements	System Wide														Infraco	OPEN				
103	System Wide - reduce cost of approvals - reduce DVT's and fee organisation costs	System Wide														Infraco	OPEN				
105	System Wide - relax run time requirements	System Wide														Infraco	OPEN				
107	System Wide - remove Guided Busway Programme Constraints	System Wide	Project			£0	£0	£0								Infraco	REJECTED	£0	£0	£0	Current programme ignores constraint and represents most efficient programme. Introduction of constraint should be [illegible]
125	System Wide - challenge employers requirements	System Wide	Project													Infraco	OPEN				
						£100,000	**£0**	**£700,000**										**£320,000**	**£0**	**£0**	
	THIRD PARTY																				
21	Murrayfield Pitch Relocation - mods only to Waranders Club House TBC	Third Party	Project		£3,355,000	£2,684,000		£3,355,000								Infraco	OPEN	£2,415,600			Comments made by various individuals suggests that a compromise has been reached with SRU. Await final confirmation from?
						£2,684,000	**£0**	**£3,355,000**										**£2,415,600**	**£0**	**£0**	
	TRACK FORM																				
4	Track bed construction details - reduce track slab thickness with structurally efficient members	Trackform	Scoop	SDS	£63,793,325	£3,100,000		£6,000,000								Infraco	OPEN	£3,640,000			Reduced excavation and concrete within track bed
5	Track form - specific application of types - adopt ballasted track wherever possible	Trackform	Scoop	SDS		£750,000		£1,500,000								Infraco	OPEN				Exchange precast rail beam with ballast track in Roseburn corridor (NOT GLUED) [illegible]
6	Track geometry at the Ocean Terminal - rationalise layout to reduce complexity/amount of trackwork whilst maintaining operational flexibility	Trackform	Scoop	SDS												Infraco	OPEN		£0		
8	Track for stabilized ballast as an alternative to directly fixed track - glued ballast (Roseburn Corridor)	Trackform	Scoop	SDS	See 4 above	£1,140,000		£2,640,000								Infraco	HOLD				Exchange precast rail beam with ballast track in Roseburn corridor (GLUED) - Phase 1b issue - not priced - NOW DEEMED [illegible]
10	Single line sections between Roseburn Junction and Granton Square (Track form for Roseburn Corridor only)	Trackform	Scoop	SDS	£16,025,591	£2,000,000		£3,000,000								Infraco	OPEN				Reduction in track only - no savings taken at this point for reduced embankment works or structures savings (Reduced loadings). Run times will be adversely affected - relates to [illegible]
18	Omit OCT to Newhaven section, create turn back facilities at OCT	Trackform	Project	GG	£6,060,160	£4,000,000		£5,396,682								Infraco	OPEN			£939,668	Potentially add back as part of future phase to link Granton to OCT
19	[illegible]	Trackform	Project		[illegible]	[illegible]		[illegible]								[illegible]	OPEN		[illegible]		[illegible]
24	Merseytram Rail stockpile (2,000 tonnes of rail - Information from SDS, ETN requirement approx 4,000 tonnes)	Trackform	Project	AD		£900,000		£1,400,000								Infraco	OPEN	£920,000			Allowance made for cleaning and transportation
46	Install cable route along Section 4 linking 1a to 1b (eliminates need to dual route elsewhere)	Trackform	Project, Scoop	tie		£150,000		£150,000								Infraco	OPEN	£120,000			
85	Noise attenuation (outside of Roseburn Corridor) 3,650m of fencing	Trackform	Project			£0		£0								Infraco	CLOSED		£0		Noise barriers - opportunity already reflected in estimate
95	Trackform - ongoing maintenance of Roseburn corridor vegetation by CEC	Trackform	Project			£0	£0	£0								Infraco	REJECTED	£0	£0	£0	OPEX impact on Line 1b - Not evaluated
106	[illegible]	Trackform	Project			£0		[illegible]								Infraco	OPEN		[illegible]		
						£15,980,000	**£0**	**£26,346,682**										**£4,880,000**	**£2,550,000**	**£939,668**	
	TRACTION POWER																				
25	11Kv Traction Power feeds to sub stations (12 nr at £302k each)	Traction Power	Project	TK	£3,635,934	£1,595,928		£2,075,928								Infraco	OPEN	£1,468,742			SDS allowance £302k per feed. Discussions suggest that £130k per feed more appropriate
26	Network Reinforcement - not to be paid for by ETN	Traction Power	Project	AD/BE	£2,647,958	£2,647,958		£2,647,958								Infraco	OPEN	£2,518,364			Argument that ETN alone should not be penalised for upgrading SP network when there are significant other developments [illegible]
51	Tramco - reduce power demand (environmental grants available?)	Traction Power	Project	DP												Tramco	OPEN				
56	Review size of pre-packaged Traction Power Units to make smaller	Traction Power	Project	SDS/Transdev												Infraco	OPEN				
75	Power supply - AC switchboards / DNO supply - If this board could be shared savings could be realised in both space in the substation and further optimisation of the AC switchboard equipment	Traction Power	Scoop													Infraco	OPEN				
77	Power supply - Track / Bypass isolators - switches could be combined with the DC switchgear in the substation	Traction Power	Scoop													Infraco	OPEN				
78	Power supply - Russell Rd TPH - could equipment for future upgrade to substation be supplied when this is actually [illegible]	Traction Power	Scoop													Infraco	OPEN				
						£4,243,886	**£0**	**£4,723,886**										**£3,987,106**	**£0**	**£0**	
	TRAM STOPS																				
41	Delete 4 tram stops (Ocean Drive, Roseburn, Ravelston & S Gyle) leaving provision for adding stops back in the future	Tram Stops	Project	tie/Tel		£0		£750,000								Infraco	HOLD			£0	Awaits tie/TEL decision
44	[illegible]	Tram Stops	Project	[illegible]		£0	£0	£0								Infraco	[illegible]	£0	£0	£0	[illegible]
47	[illegible]	Tram Stops	Project	[illegible]												Infraco	HOLD		£0		[illegible]
58	[illegible]	Tram Stops	Project	[illegible]												Infraco	HOLD			£0	[illegible]
109	Tram Stops - delete ride cycle	Tram Stops	Project			£0	£0	£0								Infraco	REJECTED	£0	£0	£0	[illegible]
						£0	**£0**	**£750,000**										**£0**	**£0**	**£0**	
	TRAMS																				

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
2	TYNE&WEAR TRAM SAFETY																						
3						WORK IN PROGRESS																28/06/2016	VERSION 30
4	VALUE ENGINEERING REGISTER																						
5							Opportunity Value						Impact on							Probability of Success (Phase Ea only)			
6	Item	Opportunity	Filter	Proposal Origin	Opportunity Champion	Cost of Project Element	Min	Most likely	Max	TDS Design Documentation	Construction Documentation	System Performance	Project Constraints	Stakeholders	Maintenance Costs	Business Case	Work Stream affected	Current Status		Low (20%)	Medium (50%)	High (80%)	Comments
7																				x 0.2	x 0.5	x 0.8	
8	10	Second-hand Trams (whole ...	Trams	Project	AB	£48,000,000	£10,000,000		£20,000,000								Infraco	OPEN				£2,000,000	Refurbished trams both level/accessible ...
9	10	Tram mock-up - use an existing mock-up rather than construct new.	Trams	Project	DP		£0		£250,000								Tramco	REJECTED		£0	£0	£0	Unlikely to prepare a UK tram without major re-work. Not easy to find suitable not meet all required interfaces
10	11	Reduce fleet size - run 9#6 on 1a only (26 trams) or 8#6 on 1a and 1b (24 trams)(build in option to buy additional trams in the future)	Trams	Project	AR		£0		£10,000,000								Tramco	OPEN					See 33 below
11	33	Buy 36 trams (note: lease extra when needed)	Trams	Project	AR		£786,000		£10,000,000								Tramco	OPEN				£1,019,000	
12	22	Reduce fleet size - delete 1 tram from spare capacity and accept risk to train performance	Trams	Project	AR				£2,000,000								Tramco	OPEN			£500,000		
13	34	Trams - purchase without seats or luggage racks - fit out under ren. order	Trams	Project	DP		£0	£0	£0								Tramco	REJECTED		£0	£0	£0	No CAPEX saving to claim
14	35	Trams - place passenger counters on only 20% of fleet - not whole fleet. Counters learned/calibrate	Trams	Project	AR		£0		£250,000								Tramco	OPEN		£100,000			
15	38	Reduced noise mitigation measures - use "quieter trams"	Trams	Project	DDS/TSS/DP		£0		£1,000,000								Infraco	OPEN					Potential higher tram capital costs as a consequence to be considered. Phase 1b issue - not sound
16	48	Tramco - Replace fire audio alarm manually	Trams	Project	AB/AR												Tramco	OPEN			£0		
17	49	Tramco - to provide some of the depot equipment (night gen advantage from Tramco procurement knowledge b/w buildings)	Trams	Project	DP												Infraco/Tramco	OPEN			£0		
18	50	Tramco - Hatch Engineering with Ian T holdings	Trams	Project	AB/AR												Tramco	OPEN		£0			Not sound - unsafe know (door replaced twice)
19	51	Delete all instructions of job where - a base appearance	Trams	Project	AB/AR												Tramco	OPEN					
20	117	Trams - Radios require 3-4 trams per hour on Phase 1b	Trams														Tramco	OPEN					
21							£10,750,000	£0	£40,500,000											£100,000	£500,000	£4,075,000	
22																							
23																							
24																							
25																							
26							£46,793,833	£0	£117,387,137											£10,967,516	£5,572,374	£2,117,000	
27		NOTE: Financial Impact calculated on average Max/Min impact multiplied by the probability of success																			Total	£19,962,857	