



For The Attention of Martin Foerder
Project Director
Bilfinger Berger Siemens CAF Consortium
9 Lochside Avenue
Edinburgh Park
Edinburgh EH12 9DJ

Our Ref: INF CORR 4510/RB

Date: 25th March 2010

Dear Martin,

**Edinburgh Tram Network – Infraco
Audit on Design Assurance, System Integration & Best Value**

We refer to the above audit carried out under Clause 104 of the Infraco Contract.
Please find attached the Final Report, dated 1st March 2010 issued by the Nichols
Group.

Please confirm your intended course of action with respect to the findings of the report.
We would also welcome BSC's view with respect to the recommendation section of the
report.

Should you wish to discuss the matter further, please contact Bob Bell at your
convenience.

Yours sincerely

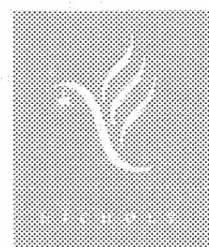
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Project Director – Edinburgh Tram

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web: www.tie.ltd.uk

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Edinburgh Tram Network

ETN Infraco Contract

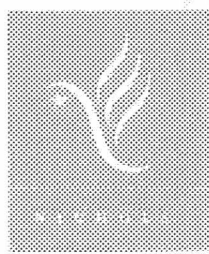
Audit on Design Assurance

System Integration

Final Report

1 March 2010

CEC00142686_0002



Executive summary

Introduction

In January 2010, Nichols, in conjunction with tie Ltd, undertook an audit of the ETN Infraco Contract in relation to design assurance, system integration and best value.

The critical success factors and objectives of the audit were to obtain confidence from the consortium that the design programme is being developed, monitored and effectively managed with respect to integration of the system components and with respect to best value. It was also to obtain confidence that the consortium has achieved and assured integrated design against the relevant acceptance criteria required to commence construction of the Leith Walk section of works and the Gogar Landfill Surcharge Area.

The audit was undertaken in accordance with the provisions of clause 104 'Information and Audit Access' of the Infraco Contract.

Audit findings

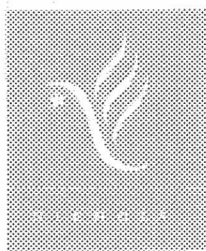
The findings of the audit in the three particular areas just described are outlined below.

Item 1 – Programme

- ✦ An integrated design programme is not being maintained and utilised by the consortium to manage the works. The consortium did provide details of the controls presently in place.
- ✦ There is a process in place to manage design integration issues and evidence was provided to confirm the ongoing management.
- ✦ The control programmes utilised to manage SDS, CAF and Siemens design elements do not appear to link to the monthly look ahead programme or the contract programme.

Item 2 – Best value

- ✦ The audit determined that the consortium does not follow a formal value management or value engineering process.
- ✦ There is no evidence of an integrated approach to risk or presence of an integrated risk register between BSC and tie.



Item 3 – Integrated design and acceptance criteria

- Whilst a formal systems integration plan has not yet been concluded, the consortium did articulate their intentions in respect to management of integration to date, and how it will be controlled during the remainder of the contract.
- The consortium has implemented an organisational structure which seeks to match competence with roles and accounts for succession planning of key resources.
- Design interfaces are being managed.
- Design Assurance Statements (DAS) are envisaged by the consortium to be issued at the end of the design, construction, testing and commissioning phase. It was noted by tie Ltd representatives during the audit that they are anticipating a progressive submission of DAS.
- The process utilised by the consortium to determine a section of works ready for construction is not well defined. It was evident from the description of the process given that the consortium has not progressed the design to a state ready for construction for Gogar Landfill and Leith Walk.

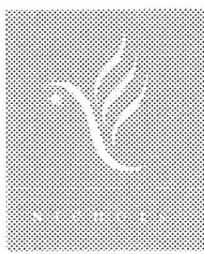
Audit recommendations

The recommendations of the audit are summarised in the following three items.

Item 1 - Programme

- As an integrated design programme is not being maintained by the consortium at present, at the very least the consortium should agree priority milestones and include them using the same coding within the logic of the design programmes for SDS, CAF and Siemens. In addition, they should reflect the same milestones within the look ahead and contract programmes.
- Consideration should be given to amending the monthly consortium progress reports to draw out design status of the project by inclusion of items such as the following:

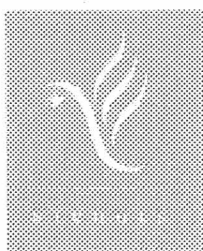
Approvals Tracker	Filtered to reflect approvals in period/remaining.
AFC Tracker	Filtered to reflect AFCs with respect to agreed prioritised milestones. Activity in period/remaining.
IDR / IDC Tracker	Filtered to reflect IDR/IDC activity in relation to agreed prioritised milestones Activity in period/remaining.
Design Milestones	Variance Tracker.

**Item 2 – Best value**

- The consortium should implement a value engineering process to ensure that opportunities are identified, assessed and implemented effectively.
- The consortium and tie Ltd should agree a collaborative approach to risk and opportunity management to ensure opportunities to attain best value are realised.

Item 3 – Integrated design and acceptance criteria

- To provide ongoing transparency in the design process, the consortium should develop an ICF tracker and provide ongoing evidence of active ICFs for each area as part of the monthly progress reports.
- At present, there is no plan for the consortium to put forward assured designs or assured construction for Safety Verification by tie and subsequent "no objection" by the ICP. It would be advantageous to each party to agree Safety Verification for completed designs and construction activities as the project progresses. This would allow progressive assurance and verification so that it is not left until the last minute. BSC and tie are to explore this further.
- It is suggested that consideration be given to the provision of a design construction pack for tie Ltd in advance of commencement of the works. This will ensure that all necessary design components are in place prior to construction, thereby reducing possible conflict during the works.



Contents

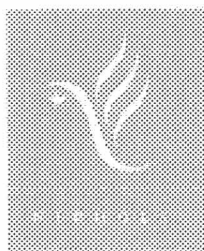
Executive summary

1. Scope of audit	1
2. Audit findings	2
3. Recommendations	10
4. Acknowledgements	11
5. Definitions and abbreviations	12
6. Appendices	13

Appendix 1 Scope of Audit

Appendix 2 Audit Attendance

Appendix 3 Evidence Provided by BSC Consortium



1. Scope of audit

In January 2010, Nichols, in conjunction with tie Ltd, undertook an audit of the ETN Infraco Contract in relation to design assurance, system integration and best value.

The critical success factors and objectives of the audit are described below.

Item 1 – Programme

- Obtain confidence from the consortium that the design programme is being developed, monitored and effectively managed with respect to integration of the system components.

Item 2 – Best value

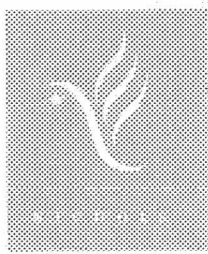
- Obtain confidence from the consortium that the design programme is being developed, monitored and effectively managed with respect to best value.

Item 3 – Integrated design and acceptance criteria

- Obtain confidence that the consortium has achieved and assured integrated design against the relevant acceptance criteria required to commence construction of the Leith Walk section of works and the Gogar landfill Surcharge Area.

The audit was undertaken in accordance with the provisions of clause 104 'Information and Audit Access' of the Infraco Contract.

The main findings and recommendations of the audit are set out in this report.



2. Audit findings

2.1 Item 1 – Programme

The audit sought to obtain confidence from the consortium that the design programme is developed, monitored and effectively managed with respect to integration of the system components.

The audit team requested that the consortium provide details and evidence of the procedures utilised to collate, control and update the design programme with respect to integration of the system components.

It was anticipated that the consortium would outline and demonstrate through evidence the existence and adherence to robust project controls procedures in relation to design schedule development and management.

Findings

An integrated design programme is not being maintained and utilised by the consortium to manage the works.

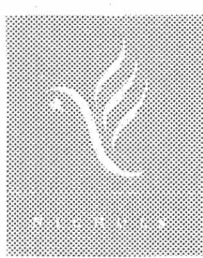
The consortium noted that the contract programme was issued in May 2008, revision 1 being issued in November 2008 and revision 2 issued in March 2009 as part of change process. Revision 2 has to date not been agreed with the client. The background of change requests has, in the opinion of the consortium, made it impractical to maintain an integrated design programme.

In the absence of the acceptance of revision 2 of the contract programme, the consortium has implemented a Focus and Prioritisation Process, which is outlined in their process flow chart within Appendix 3 (entitled 'Focus and Prioritisation').

The process as described includes setting anticipated commencement of construction dates for works elements. It was indicated that these priorities are reviewed on a weekly basis and that a steering committee resolves conflicts and reviews priorities.

The control programmes and variance statements are given on a monthly basis in the project report with the design progress being subjected to weekly monitoring meetings.

The process as detailed is not considered to be best practice and the provision of a fully integrated design programme is considered to be the most suitable approach to managing and monitoring interfaces between the various design teams. The lack of an agreed construction



programme is noted, however we recommend driving logic between the programmes should be established in a format acceptable to all parties.

There is a process in place to manage design integration issues and evidence was provided to confirm the ongoing management.

Design interfaces are identified via the Interface Management Process at the start of the project and are subjected to an ongoing review process to resolve them and close them out.

Interface Control Forms (ICF) are generated at the commencement of the design elements, and resolution of issues noted are checked during the development of the design. (ICF forms were provided as evidence items 14 to 18 for cable ducts). The evidence confirms that the consortium is following an iterative process of review and close out prior to entering formal Interdisciplinary Design Reviews (IDR), which are aimed at minimising residual design conflict whilst the design is under development. As a final step in the process, the consortium undertakes an IDR of the Issued For Construction (IFC) drawings to ensure that all residual interface issues have been resolved prior to commencement of construction. IDR minutes and checklist were provided as evidence (items 27/28 and 9). The evidence provided is further referenced within Item 3 (in Section 2.3). The Interdisciplinary Design Certificate (IDC) is the final assurance that a fully integrated and compliant design has been achieved. Once in place, the BSC Engineering Manager gives permission to construct.

The consortium is operating a schedule to get drawings to IDC. The schedule, however, does not reference any milestone coding from programmes to allow its impact to be taken in context of the wider programme.

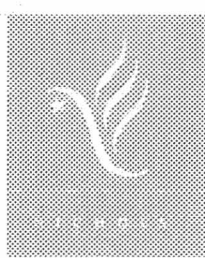
IDR for Leith Walk is ongoing. The consortium priority was that the design should be finished by the start of January 2010. The current plan is for all IDCs to be completed by early March. During the audit, it was confirmed by the consortium that at present there are no known impediments to concluding IDC for Leith Walk and Gogar Landfill Sites.

The control programmes utilised to manage SDS, CAF and Siemens design elements do not appear to link to the monthly look ahead programme or the contract programme.

The sample review of the SDS programme, monthly look ahead programme and contract programme could not identify common milestones which could be effectively used to monitor progress and impact upon the design and construction programmes respectively.

2.2 Item 2 - Best value

The audit requires confidence from the consortium that the design is developed, monitored and effectively managed with respect to best value in relation to the Leith Walk and Gogar Landfill areas. The aim is to determine that a process for value management exists and whole life costs have been assessed.



The audit is also seeking evidence of the process being used to identify opportunities and alternative design solutions to achieve the optimum and best value design solution, particularly regarding the integration of the SDS and BSC designs. Key evidence anticipated is the process for value engineering and opportunity management supported by examples.

Findings

The audit determined that BSC does not have any documented value management or value engineering processes.

Prior to contract award, £11m of value engineering options were deducted from the final contract sum; identified value engineering £9.965m; further value engineering £2.670m. The identified and further value engineering items are subject to key qualifications.

In addition to deducting identified value engineering options from the contract sum, the contract provides for an incentive mechanism via cl 81.3, whereby Infracore may retain 50% of any savings identified during the contract duration.

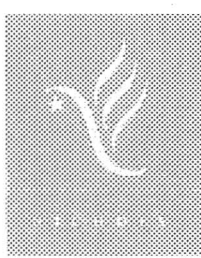
It was therefore anticipated that there would be evidence of proactive value engineering processes to achieve best value in the following manner:

- identification and implementation of further value engineering opportunities to maximise the efficiency of the adopted design solution
- consideration and implementation of value engineering options to minimise the impact of unforeseen events or encountered conditions.

BSC consider that any significant value management and whole life cost assessment should have been taken in the previous project phases, prior to contract award. BSC stated that realisation of the identified value engineering initiatives is challenging.

During the audit, the consortium did not make available details of its process for managing value engineering. Therefore, the audit concluded that at present the consortium does not have any documented value management or value engineering processes through which best value is being assured.

However, despite a lack of obvious value engineering processes or a proactive approach by the consortium, reference was made by BSC to some recent value engineering carried out for the Gogar Landfill site. This proposal comprises an alternative type of track form to the SDS design of rigid track form. BSC proposes a ballasted track option as it provides a cheaper solution in terms of capital cost and will help maintain the current budget. Maintenance costs have not yet been assessed but are thought to have minimum impact. Evidence presented by BSC comprised aerial photos of the Gogar Landfill, plus elevations and sections dated February 08 (See Appendix 2). Evidence of the proposed new design was not provided.



The following recommendations are proposed:

- * the consortium should implement a value engineering process to ensure that opportunities are identified, assessed and implemented effectively
- * the consortium and tie Ltd should agree a collaborative approach to risk and opportunity management to ensure opportunities for best value are realised.

2.3 Item 3 - Integrated design and acceptance criteria

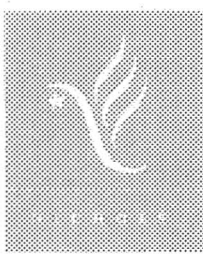
The audit sought to obtain confidence that the consortium has achieved and assured integrated design against the relevant acceptance criteria required to commence construction of the Leith Walk section of works and the Gogar Landfill Surcharge Area.

Findings

Whilst a formal Systems Integration Plan has not yet been concluded, the consortium did articulate their intentions in respect to management of integration to date, and how it will be controlled during the remainder of the contract:

The consortium noted they have aligned their processes with Schedule 30 of the Employers Requirements. The audit and subsequent overview of the consortium's processes observed that the intention is for systems integration to be achieved by adherence to:

- * Requirements Management
- * Requirements Management Plan [ETN(BSC\$MC&ADB#050401 Revision A)]
- * Interface Management
- * Interface Management Plan [ETN(SPM\$Q&ADB#050151 Revision B)]
- * Design Assurance Statement and Interdisciplinary Design Check [BSC/25.1.201/PSP/003]
- * Verification and Validation
- * Inspection and Test Plan
- * Testing and Commissioning Plan [to be drafted and concluded] (Verification & Validation)
- * Configuration Management
- * Configuration Management Plan [not viewed by audit team]
- * Reliability, Availability, Maintainability, and Safety [EN50126]



The consortium provided copies of the following evidence in support of adherence to processes noted above (listed within Appendix 3):

- 10 Response to Technical Approval Section 1B (CEC) SS/1/RG
- 11 Response to Roads Technical Approval Section 1B SS/1/HIB
- 14 – 18 Interface Control Form – Cable Ducts/duct works IF-5-SYS-CIV Rev – to E
- 27, 28 IDR/IDC Meeting 017/018 Minutes of 19 and 26.01.09 respectively

The consortium has implemented an organisational structure which seeks to match competence with roles and accounts for succession planning of key resources.

Role matching and appointment to key posts within the consortium has been subject to internal competence assessment, with opportunity to note objection given to the Ltd.

ETN Design is led by Stefan Rothaus, Engineering Manager of Bilfinger Berger (Civils), and Michael Wilken, Systems Engineering Manager of Siemens (Systems). Systems Integration Lead is taken by Michael Wilken. However, Michael and Stefan are each responsible for integration being achieved. In the event of consensus not being reached, any issues are in the first instance escalated to Colin Brady, Technical Director of Bilfinger Berger. Input to integration from CAF is via David Steele, Assistant on-site Project Manager, CAF.

Formal confirmation of the roles and responsibilities will be clarified by submission of the Systems Integration Plan.

The consortium noted that Simon Nisbett, Design Manager of Bilfinger Berger, has full authorisation to represent Stefan Rothaus and would be his successor in the event that this is necessary. In the event that Michael Wilken requires a successor, Miguel Berrozpe, Project Director of Siemens, would fulfil the role on an interim basis.

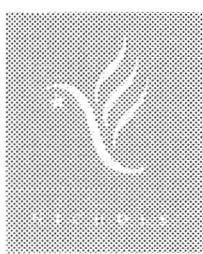
Job descriptions are available for key skills and competences.

Design interfaces are managed by complying with:

- Interface Management Plan [ETN(SPM\$Q&ADB#050151 Revision B)]
- Design Assurance Statement and Interdisciplinary Design Check [BSC/25.1.201/PSP/003]

The consortium demonstrated compliance with the process through provision of:

- 14 – 18 Interface Control Form – Cable Ducts/duct works IF-5-SYS-CIV Rev – to E
- 27, 28 IDR/IDC Meeting 017/018 Minutes of 19 and 26.01.09 respectively
- IDC/IDR Schedule Cover of Letter Ref ETN(BSC)TIE&ABC # 053877



The Interface Management Plan provides for the identification and recording of perceived interfaces via the Interface Control Form (ICF). The ICF forms provided by the consortium reflect cable ducting development from October 2008 to June 2009. Whilst the forms demonstrate compliance with the process, they are not specific to the Leith Walk and Gogar sections. The consortium should provide ongoing evidence of active ICFs for each area as part of the monthly progress reports.

In addition, the consortium provided nine IDR checklists, which set out actions following IDR meetings. The IDR checklist notes that interface elements have been identified for action in relation to OLE pole locations within the Leith walk section. Interfaces identified within the Gogar Landfill area include ambiguities and omissions identified between discipline drawings, OLE and foundation interfaces and so on.

IDR minutes presented as evidence provide further details of the interfaces noted above.

Design Assurance Statements (DAS) are envisaged by the consortium to be issued at the end of the design, construction, testing and commissioning phase. It was noted by tie Ltd representatives during the audit that they are anticipating a more progressive submission of DAS. Discussion and agreement is required between tie Ltd and the consortium to ensure that opportunity for progressive submission of DAS is maximised.

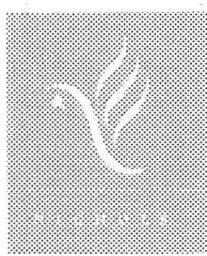
The DAS was noted to contain IDC of the section, completed ICFs, confirmation that the design complies with the requirements, verification, validation and testing requirements.

The consortium noted that DASs submitted in draft to date will not be submitted as final until all activities in a particular section are complete. There is an opportunity for provision of partial DAS submissions to be capitalised upon by the ETN project as a whole.

The process utilised by the consortium to determine a section of works ready for construction is not well defined.

The consortium noted that they determine design is ready for construction when:

- * approved for construction (AFC) drawings are complete with residual CDM risks noted on the drawings
- * safety deliverables are covered by the Traffic Management Plan
- * IDC is in place
- * tie Ltd grants permission to take access of the site
- * BSC Engineering Manager gives permission to the construction team to start on site.

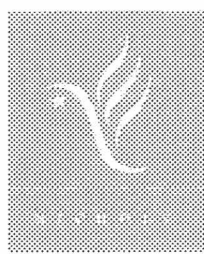


According to the processes demonstrated to tie Ltd to produce a fully integrated design, the consortium was not ready to start construction. This was due to the lack of Inter Disciplinary Design Certification and permission from the BSC Engineering Manager to the construction team.

We suggest that the consortium considers the provision of a construction pack to tie Ltd in advance of commencement of the works, which references the following:

- * area of works
- * details of the works proposed
- * approvals and consents attained
- * drawings and specifications associated with the works
- * confirmation of compliance with requirements
- * IDC forms
- * status of hazard close out
- * CDM residual risks
- * compliance and closure of any necessary third party agreements
- * signatories of relevant designers and checkers within the package confirm that they are satisfied that the works are suitable for construction.

It is understood that some of the above may be covered within the Work Package Plans and the adoption of any such refinement of process is subject to review of this.



3. Recommendations

3.1 Programmes

- As an integrated design programme is not being maintained by the consortium at present, at the very least the consortium should agree priority milestones and include them using the same coding within the logic of the design programmes for SDS, CAF and Siemens. In addition, they should reflect the same milestones within the look ahead and contract programmes.
- Consideration to be given to amending the monthly progress reports to draw out design status of the project by inclusion of for example:

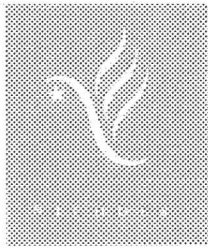
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3.2 Best value

- The consortium should implement a value engineering process to ensure that opportunities are identified, assessed and implemented effectively.
- The consortium and tie Ltd should agree a collaborative approach to risk and opportunity management to ensure opportunities to attain best value are realised.

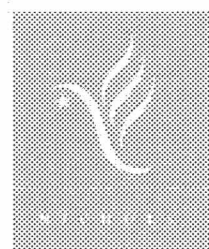
3.3 Integrated design and acceptance criteria

- To provide ongoing transparency in the design process, the consortium should develop an ICF tracker and provide ongoing evidence of active ICFs for each area as part of the monthly progress reports.
- At present, there are no plans for the consortium to put forward assured designs or assured construction for Safety Verification by tie and subsequent "no objection" by the ICP. It would be advantageous to each party to agree Safety Verification for completed designs and construction activities as the project progresses. This would allow progressive assurance and verification so that it is not left until the last minute. BSC and tie are to explore this further.
- It is suggested that consideration be given to the provision of a design construction pack for tie Ltd in advance of commencement of the works. This will ensure that all necessary design components are in place prior to construction, thereby reducing possible conflict during the works.



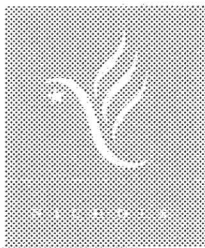
4. Acknowledgements

We wish to thank the staff of BSC for their co-operation, openness and support during this audit.



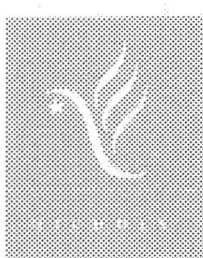
5. Definitions and abbreviations

tie Ltd	Transport Initiatives Edinburgh
ETN	Edinburgh Tram Network
CEC	City of Edinburgh Council
BSC	Bilfinger Berger, Siemens and CAF
ROGs	Rail and Other Transport Guided Systems
Design programme	Time schedule (Gant Chart) which sets out the timings and interdependencies of design activities across the various engineering disciplines and is used to develop and monitor design production.
DAS	Design Assurance Statement
ICF	Interface Control Form
IDR	Interdisciplinary Review
IDC	Interdisciplinary Design Check
CDM	Construction (Design and Management) Regulations 2007
BAFO	Best and Final Offer
OLE	Overhead Line Equipment
ICP	Independent Competent Person
IFC	Issue For Construction
AFC	Approved for Construction



6. Appendices

- Appendix 1 Scope of Audit
- Appendix 2 Audit Attendance
- Appendix 3 Evidence Provided by BSC Consortium



Appendix 1

Scope of Audit

Edinburgh Tram Network

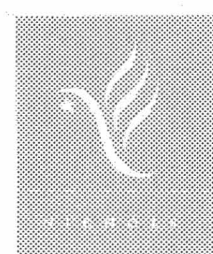
Design Integration and Assurance Audit of BSC Consortium

Scope of Audit

Item 1 – Programme

Obtain confidence from the consortium that the design programme is developed, monitored and effectively managed with respect to integration of the system components

- Provide details and evidence of the internal process utilised by the consortium to collate, control and update the design schedule, with respect to providing integrated design for Leith Walk and Gogar Landfill works.
- Demonstrate for Leith Walk and Gogar Landfill works by provision of evidence how the consortium:
 - allocates design schedule responsibility across its design team and supply chain
 - identified, allocated responsibility for and managed integration issues within the design schedule
 - identified, and managed constraints within the design schedule
 - identified, modeled and managed risk items that may directly affect the production of design outputs within the design schedule
 - undertaken review and update of design schedule to account for its time impact upon the master schedule
 - identified, modeled and communicated the time impact of change items with tie Ltd which seeks to minimise the impact upon the design schedule?



Definition of design programme – time schedule (Gant Chart) which sets out the timings and interdependencies of design activities across the various engineering disciplines and is used to develop and monitor design production.

Item 2 – Best value

Obtain confidence from the consortium that the design is being developed, monitored and effectively managed with respect to best value in relation to Leith Walk and Gogar Landfill areas.

The consortium raised concerns during the kick-off meeting on the 18 January 10 and within their letter of the 11 January 10 as to the definition and intent of the term “. . . best value. . .”. In their letter of 11 January 10 the consortium proposed the following interpretation:

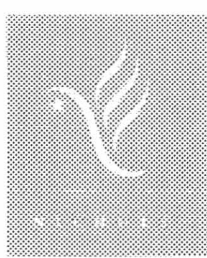
“. . . confirmation that the design process is producing construction design that is not uneconomic, having regard to specified performance and the requirements of the contract . . .”

- in principle, it is suggested that the above is an agreed starting point for the audit, with a test for “uneconomic” and seeking evidence of:
 - process and evidence that the consortium have in developing Leith Walk and Gogar Landfill designs sought to achieve an efficient design , and considered alternative solutions where possible that ensure this
 - process and evidence that the consortium have adopted a value engineering approach to identify possible opportunities to achieve an efficient design solution for Leith Walk and Gogar Landfill designs.

Item 3 – Integrated design and acceptance criteria

Obtain confidence that the consortium has achieved and assured integrated design against the relevant acceptance criteria required to commence construction of Leith Walk section of works and Gogar Landfill surcharge area.

- Consortium to demonstrate integration process adopted in lieu of the presence of a systems integration plan



- * Whilst the consortium have referenced Design Management Plan and its component controls Interface Management, Design Assurance Statement, Design Check in the letter of 11 January 10, evidence is required to demonstrate compliance with the process in relation to Leith Walk and Gogar Landfill areas. Therefore the consortium is requested in accordance with clause 104.3 to outline how it has developed an integrated design for Leith Walk and Gogar Landfill in compliance with their processes and including details of:
 - Organisational Structure/Competence matching of resources/succession planning
 - Communication – within design team / identification of interfaces / allocation of responsibility to manage identified interfaces,
 - Management of interfaces – how have they been assessed and accounted for within the design,
 - Provision of outputs from Design Development Workshops for the areas noted
 - Identification and management of design integration risks which may affect schedule for construction, cost or quality of the design solution and the management of the same
 - Interdisciplinary Design Checks and Interdisciplinary Design Reviews
 - Design Assurance Statement
 - Provision of details of process and evidence of process compliance adopted to assure readiness for construction

Our ref: 25.1.201/CBr/4364
Your ref: INF CORR 2836.RB

Bilfinger Berger-Siemens- CAF Consortium

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United Kingdom

11th January 2010

tie limited
CityPoint
65 Haymarket Terrace
Edinburgh
EH12 5HD

Bilfinger Berger Civil-EDI	
Date Sent	12 JAN 2010
File Number	
Action	
Distribution	

Phone: +44 (0) 131 452 2800

For the attention of Steven Bell – Tram Project Director

Dear Sirs,

**Edinburgh Tram Network Infraco
Audit on Design Assurance, System Integration and Best Value**

We refer to your letter no INF CORR 2836.RB dated 16th December 2009 and respond to your three bullet points as follows:

- 1 Obtain confidence from the Consortium that the design programme is being developed, monitored and effectively managed with respect to integration of the system components.

A response on this issue is being finalised by the relevant Consortium staff and will follow as soon as possible.

- 2 Obtain confidence from the Consortium that the design programme is being developed, monitored and effectively managed with respect to Best Value.

In the absence of the requested confirmation from Tie (email, Brady-Bell, 6/1/10, copy attached, refers) of the meaning of "design programme" and "Best Value", we respond on the basis that you are seeking confirmation that the design process is producing construction design that is not uneconomic, having regard to specified performance and the requirements of the Contract. Since you have accepted supplier specifications and pricing for systems and vehicle elements of the Consortium scope, we assume your concerns are with economy of the building and civil design, and respond on that basis.

Verification that civil and building design is not uneconomic, through the development from concept to construction design, is integral with the design process, which is defined in Contract Schedule 22 (Design Agreement) and can be summarised as follows:

- 1) Requirements Definition
- 2) Preliminary Design
- 3) Detailed Design

Contract Schedule 23 (Novation Agreement) introduces additional phases:

- 4A) Construction Support
- 4B) Extended Construction Support and Design Support

Specific Processes utilised to ensure design economy, within the design process described above, are:

Phase 1, Requirements Definition

- Active involvement by the designer to challenge and distil user and stakeholder requirements, express those requirements accurately and comprehensively, produce baseline documentation and preclude ongoing scope creep or deferment of selection of options.

Phase 2, Preliminary Design

- Confirm design concept economy by internal review, eg:
- Structures : AIP Process (equivalent to Network Rail process)
- Earthworks : designer/peer assessment
- Highways : definition of realistic base assumptions (eg CBR value of existing road subgrade) for future comparison/reference
- Basic Project Assumptions : internal VE review of key topics in 2006, conducted by PB (R Blackadder) with costings produced by SDS (eg Depot location – Gogar or Leith)

Phase 3, Detailed Design

- External review (by Tie) of emerging detailed design to confirm economy, conducted by TSS in Q1-Q2 of 2007
- External review (by Tie) of likely out-turn construction costs of BDDI design, by TSS, in late 2007
- Structure review (by Tie) of bidder VE proposals and instructed design amendment where accepted (eg relocation of depot northwards to reduce A8 retaining wall structure)

Phase 4A, Construction Support – not applicable to design economy

Phase 4B, Extended Construction Support and Design Support

- Development Workshop process to modify BDDI design in a controlled manner as necessary to incorporate Infracore Proposals; development of design estimates for Tie acceptance before design proceeds
- Interface Control process to ensure necessary integration of civil and systems design at detail level
- In both above cases, construction out-turn cost identified by contractual change process and submitted to Tie for acceptance before costs are incurred

Phases 1 and 2, including the detailed gate-review and phase completion processes defined in Schedule 22, were completed under Tie's management prior to Novation. A large proportion of Phase 3, including the Tie reviews noted above, was also completed prior to Novation. As detailed in our email (Brady-Bell, 6/1/10), we wish these reviews to be considered during the audit and have requested that you make the output available.

BSC are directly responsible for management of the residual part of Phase 3, including completion of IFC design from BDDI design, and for Phase 4B, particularly the amendment of civil/building

designs to incorporate Infracore Proposals. We are satisfied that changes to design principle, shape form and/or specification arising from this process were necessary and have not resulted in avoidably uneconomic design having regard to existing constraints such as approvals, programme etc.

In view of the huge scope of design now at or approaching IFC, it is not possible to provide specific evidence, as requested in your letter no 2836, to substantiate our belief that such design is not uneconomic. We suggest therefore that you identify specific areas where you believe design may be uneconomic so we can prepare detailed responses for review by audit.

3 Obtain confidence that the Consortium has achieved and assured integrated design against the relevant acceptance criteria required to commence construction of Leith Walk section of works and the Gogar landfill surcharge area.

To assure integrated design, BSC follow the Design Management Plan and the specific procedures "Interface Management" and "Design Assurance Statement (DAS) & Interdisciplinary Design Check". Appendix 3 of the Design Assurance Statement (DAS) & Interdisciplinary Design Check procedure lists the relevant criteria which refer back to Section 2.8 of Schedule 14 part C. Leith Walk

The designs for Leith Walk – Section 1B are largely complete but have not yet been subjected to the formal IDR/IDC process. A number of technical impediments to finalisation remain, including:

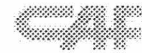
- Ongoing changes to highway layouts, arising from the TRO process and producing conflicts with existing IFC drawings
- Lack of acceptance by Tie of the existing Track Improvement layer solution to the void span criteria instructed by Tie
- Lack of accurate as-built utility details

Generic design for OLE foundations, track-improvement layer and ducting requirements will be transferred from IDC achieved for Princes Street (notwithstanding the improvement layer issue) and a study of potentially physical impacts will be carried out as MUDFA as-built information is being received. On this basis, our current intention is to complete the IDR/IDC reviews of this Section by the end of February 2010, and in advance of the construction work commencement. Gogar Landfill Surcharge Area.

As you are aware, consideration of a piled viaduct structure alternative to allow construction of Rheda Green track in this area identified a very large capital cost impact. The existing design for the Earthworks in the vicinity of the Gogar Landfill has now been confirmed by the results of further Geotechnical Investigation (GI) completed in late December 2009. This is on the basis that a change to ballasted track will be acceptable and finalisation of measures to restrain lateral movement of ballasted track in tight radius bends. The increased maintenance cost burden has been evaluated and is considered more economic than the capital cost of the piled structure. Arrangements will be put in place for the proposed workshop with Tie to discuss these issues, to be held at the end of January 2010. In the meantime, the Consortium will progress the IDR of this package to confirm technical validity and highlight any unresolved issues.

We note your timescale for the audit, and have confirmed (by email Brady-Bell, 6/1/10) that our lead for the audit will be jointly performed by Colin Brady and Michael Wilken, to ensure efficient participation by BSC.

We also note the reference in your final paragraph to "non conformances" and would request your confirmation that this means non-conformances with respect to the relevant procedures and processes in accordance with the appropriate requirements of the Contract and with formal audit procedures. This issue



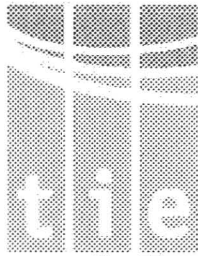
was raised as a concern in our responses to previous audits you have instructed in accordance with clause 104 of the Contract, and has not, in our view, been satisfactorily resolved.

Yours faithfully,

A handwritten signature in black ink, appearing to read "M. Foerder".

M Foerder
Project Director
Bilfinger Berger Siemens CAF Consortium

cc: CBr, SRo, KRu, MBe, MWI, D Steele



For The Attention of Martin Foerder
Project Director
Billfinger Berger Siemens CAF Consortium
9 Lochside Avenue
Edinburgh Park
Edinburgh EH12 9DJ

Our Ref: INF CORR 2836/RB

Date: 16th December 2009

Dear Martin,

**ETN Infraco Contract
Audit on Design Assurance, System Integration and Best Value**

tie wishes to undertake an audit of the BSC Consortium in accordance with the provisions of the contract under clause 104 'Information and Audit Access'.

The critical success factors / objectives of the audit are to:

- Obtain confidence from the Consortium that the design programme is being developed, monitored and effectively managed with respect to integration of the system components.
- Obtain confidence from the Consortium that the design programme is being developed, monitored and effectively managed with respect to Best Value.
- Obtain confidence that the Consortium has achieved and assured integrated design against the relevant acceptance criteria required to commence construction of Leith Walk section of works and the Gogar landfill surcharge Area.

tie wishes to assure that the Infraco is effectively managing the project, and in particular is effectively managing risks associated with cost, delivery delay, integration and acceptance. Please provide the evidence to tie within 7 working days of receipt of this notice. All evidence should be provided in electronic format and be readable within MS Word, Excel and Adobe pdf format.

The audit will be divided into two main phases:

Phase 1 – Establish Audit Arrangements/Contractor provides Evidence

A 'kick-off' meeting will be arranged with the contractor and representatives of tie. The meeting will set out the timescales of the audit and details of activities required to conclude the audit.

On receipt of the evidence from the Infraco, we will review the evidence, propose the detailed arrangements for the audit inclusive of meetings with your representatives, and undertake analysis of our findings. Additional supporting documentation shall be provided by the Infraco as required.

Phase 2 – Audit & Reporting

The audit is proposed to be conducted over two consecutive days with the initial findings presented verbally on completion of the second day. Following completion of the audit tie will complete their analysis. The analysis will be lead by Marc Hamilton under my delegated authority as tie's Representative with supporting resources being provided by tie for programme, HSQE, and Engineering.

Please confirm your lead person for this audit by 06th January 2010.

Thereafter tie's representative will provide a draft audit report to tie and BSC, including findings and recommendations, as the basis for agreement of actions to close out any residual non conformance. The final report will then be issued to both parties [tie and BSC].

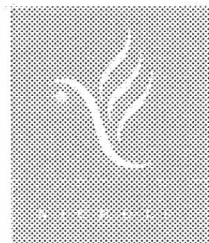
The key phases and outline timeline of the audit are provided below:

Establish Audit Arrangements	
Contractor notified of audit	17 th December 2009
Terms of reference issued to Contractor	17 th December 2009
Evidence Received and Analysed	
Kick off meeting	18 th January 2010
Contractor provides evidence	11 th January 2010
Audit Reporting	
Undertake Audit	28/29 th January 2010
Develop/Issue Draft Report	5 th February 2010
Receive comments, conclude report	12 th February 2010

Yours sincerely,



Steven Bell
Project Director – Edinburgh Tram



Appendix 2

Audit attendance

Marc Hamilton, the Nichols Group

Kate Gray, the Nichols Group

Colin Matlock, tie Ltd

Bob Cummins, tie Ltd

Sheena Smith, tie Ltd

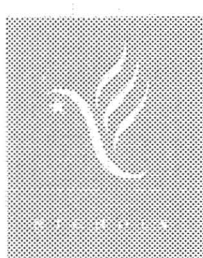
Colin Kerr, tie Ltd

Colin Brady, BSC Consortium

Michael Wilken, BSC (Siemens)

Stefan Rothaus, BSC (Bilfinger Berger)

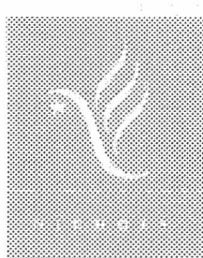
Alan Dolan, BSC (SDS)



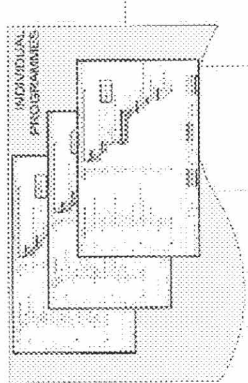
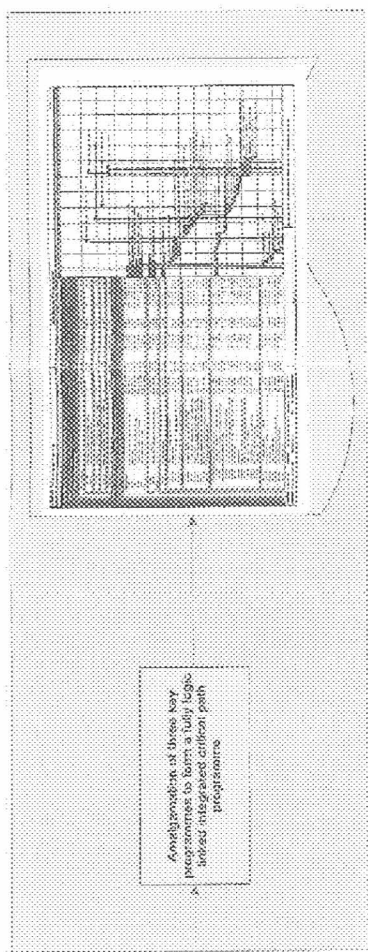
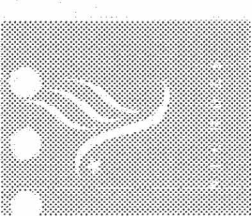
Appendix 3

Evidence provided by BSC Consortium

Serial	Document	Reference
1	Health & Safety Risk Register	ULE90130-01-RRR-00023 R1
2	Nehaven Road to Haymarket Road Scheme Layout Plan Section 1B Sheet 13 of 24	ULE90130-01-HRL-00013 R7
3	Newhaven to Haymarket Drainage Plan Section 1B Sheet 11 of 24	ULE90130-01-DNG-00011 R5
4	Gogar Landfill Surcharge Details Sub Section 7A	ULE90130-07-GEO-00010 R5
5	Gogar Landfill Cross Sections (Sheet 1 of 2) Subsection 7A	ULE90130-07-GEO-00011 R4
6	Gogar Landfill Cross Sections (Sheet 2 of 2) Subsection 7A	ULE90130-07-GEO-00012 R4
7	Gogar Landfill Reinforcement & Soil Nail Elevations Sub Section 7A	ULE90130-07-GEO-00014 R4
8	BSC Risk Register	Period 8
9	IDR Checklist	
10	Response to Technical Approval Section 1B (CEC)	SS/1/RG
11	Response to Roads Technical Approval Section 1B Road	SS/1/HIB
12	Current Drawing List for Leith Walk	Pgs 1to 8
13	Technical Approval Section 1b Road Safety Audit (ULE90130-01-REP-00094,R4), Roads Technical Design Statement (ULE90130-01-REP-00058,Rev 4) and Lighting Departures (ULE90130-01-REP)	SS/1/AR
14	Interface Control Form – Cable Ducts / duct works	IF-5-SYS-CIV Rev E
15	Interface Control Form – Cable Ducts / duct works	IF-5-SYS-CIV Rev D
16	Interface Control Form – Cable Ducts / duct works	IF-5-SYS-CIV Rev C
17	Interface Control Form – Cable Ducts / duct works	IF-5-SYS-CIV Rev B
18	Interface Control Form – Cable Ducts / duct works	IF-5-SYS-CIV Rev -
19	Request for Information 114	-
20	ETN Cable Duct Requirements Generic Arrangements	Email 21.09.08



21	Request for cable duct design support schedule BB/SDS from Siemens	Email 09.12.08
22	Proposal for Duct Design Section 1A	Email 05.05.09
23	Siemens markup on Proposal for Duct Design Section 1A	Email 30.07.09
24	Updated SDS cable duct/route drawings for section 1B – to be reviewed	Email 15.01.09
25	ETN SDS Design Programme	ULE90130-SW-PRO-0010 02.12.09 V51
26	Prioritisation Order – Drainage Approval and Roads Close out Report	Email 27.01.2010
27	IDR/IDC Meeting 017	Minutes 19.01.09
28	IDR/IDC Meeting 018	Minutes 26.01.09
29	Gogar Landfill Civil & Trackwork Design	Minutes 29.09.09
30	Gogar Landfill Civil & Trackwork Design	Minutes 13.01.10
31	Appendix C – Identified Value Engineering	-
32	Document Transmittal Form	ULE90130-SW-DTF-03848
33	Contaminated Landfill, Gogar – Option Appraisal	ULE90130-07-LET-00302
34	Gogar Landfill Treatment	Letter DES-ADM791
35	Value Engineering Report ULE90130-SW-REP-00260 V1	Letter ULE90130-SW-LET-00297
36	Programme & Schedule Prioritisation Process Diagram	-
37	Section 7A Estimate	INTC 28.11.08
38	BB Organisation Chart	-
39	Siemens Organisation Chart	-
40	Consortium Organisation Chart	-
41	Approvals Tracker	-



Prioritization and Focus in changing project environment

