SCIRT Rebuilding Infrastructure

LEARNING LEGACY

Lessons learned from one of New Zealand's most challenging civil engineering projects: rebuilding the earthquake damaged pipes, roads, bridges and retaining walls in the city of Christchurch 2011 - 2016.

Central City Transport Optimisation Management Plan

Story: Central City Infrastructure Rebuild

Theme: Programme Management

A copy of the plan developed to facilitate a collaborative approach between all stakeholders and minimise the impact on the traffic network because of the extensive repair works necessary to repair vertical and horizontal infrastructure.

This document has been provided as an example of a tool that might be useful for other organisations undertaking complex disaster recovery or infrastructure rebuild programmes.

For more information about this document, visit www.scirtlearninglegacy.org.nz

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Christchurch Rebuild Programme Transport Optimisation Management Plan

Review:

Rev.	Status	Prepared by	Checked by	Date
A	Final	Sara Gulick, CERA Ryan Cooney – CTOC Richard Topham - SCIRT	Alistair Pearson	

Authorisation:

Name	Position	Date	Signature
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Contents

Background

Christchurch Transport Operations Centre (CTOC) is a joint venture between the Christchurch City Council (CCC), Environment Canterbury (ECAN) and New Zealand Transport Agency (NZTA) and responsible for the operation of the transport network. Traffic will be heavily impacted due to the extensive repair works necessary to repair vertical and horizontal infrastructure, therefore CTOC has a vital role to play in facilitating the rebuild programme whilst working to minimising the impact to the transport network.

As such, this Plan has been produced in conjunction with the Christchurch City Council, the Christchurch Central Development Unit (CCDU) and the Stronger Christchurch Infrastructure Rebuild Team (SCIRT) to ensure a collaborative approach is implemented between the public and privately funded programme holders and the CTOC team.

The Program Owners are defined as CCDU, SCIRT, Utility Providers, CCC, NZTA and Private Developers with the CCDU taking a wider coordination role with all programme owners through the CCDU Construction Management Office (CMO).

The Transport Optimisation Management Plan has therefore been produced to facilitate a collaborative approach between all stakeholders.

Purpose

The purpose of this Management Plan is to:

- Outline how the various programmes will be recorded, the impacts on the transport network assessed and how CTOC will work with the programme holders to minimise the impact to the network.
- Define the Governance process that may be necessary where the programmes reduce the network capacity below the minimum levels of service.

Key Management Task's

Programme Scheduling

A key challenge for the CTOC team is to effectively review forward works to allow sufficient transport impact assessments to be carried out to facilitate the work. Through the rebuild process, the Forward Works Spatial Collaboration (FWSC) tool, a part of the Spatial Data Infrastructure programme being led by Land Information NZ (LINZ) and is a web based portal for the visual display of forward works information at a street by street level. The tool is designed to identify spatial and network clashes at least three months prior to the start of construction activity.

LINZ operates and updates the FWSC when schedule data is submitted by the programme holders. Programme holders are expected to:

- Provide schedule updates to keep the information live
- Submit the schedules on a 'best foot forward' basis. Therefore the schedule should always reflect the programme holder's construction method and associated impact on the transport network, sequence and timing, irrespective of whether Traffic Management Plans (TMP's) are approved or programmes fixed.

This is to allow an integrated planning approach to be taken to identify conflicts or interactions between the various work programmes and allow CTOC to review the overall impact on the transport network. An example of the FWSC can be seen below in Figure 1.

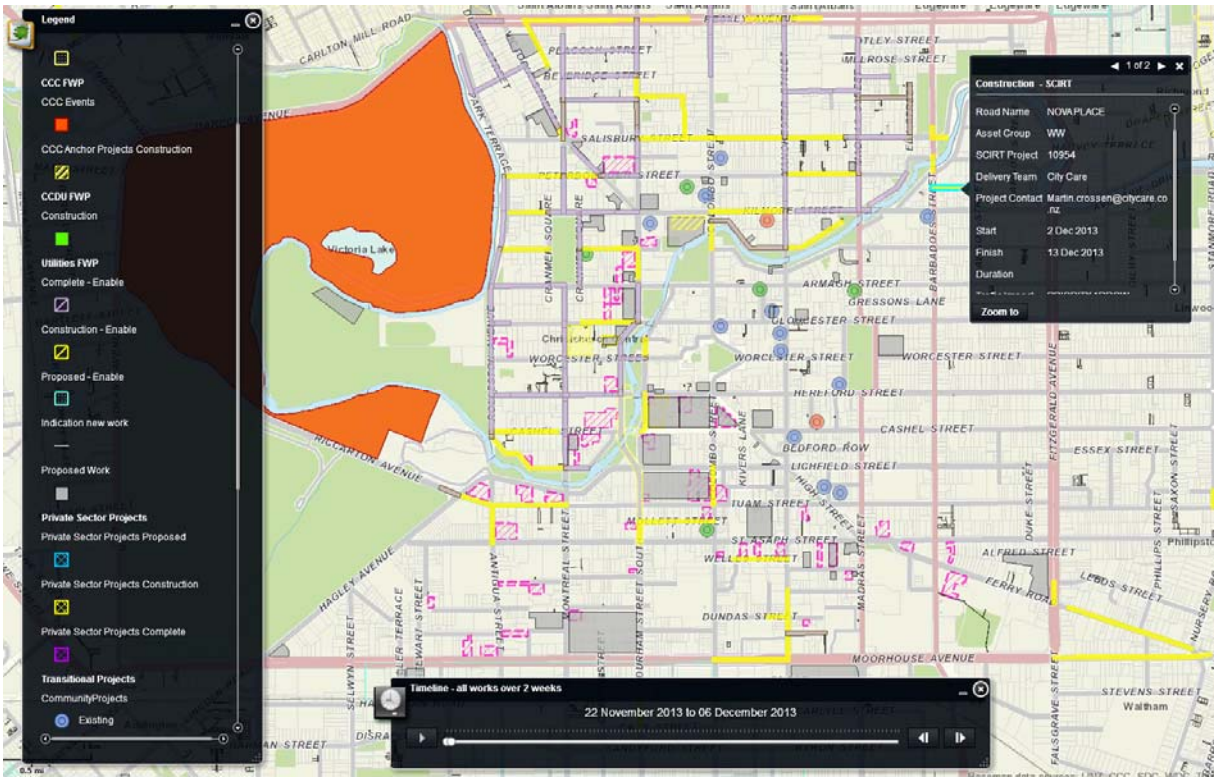


Figure 1 – FWSC screenshot for the period 22nd Nov – 6th Dec 2013

Across the city, and particularly in the central city area (bounded by the 5 Avenues), there are multiple publically funded and privately funded programme holders. The relationship of these programme holders and connectivity with the FWSC and CTOC is shown in Appendix A.

Transport Impact Minimisation Group (TIM)

Due to the number of programme holders, it was important that CTOC had direct coordination and support when reviewing the forward works and the effect of individual work sites on the transport network. As such, the Transport Impact Minimisation Group was formed as an advisory group to CTOC. The role of the TIM group and operating framework can be found in Appendix B.

The group includes representatives from CTOC, ECan, CCC (events coordinator) in addition to construction programme representatives from CCDU and SCIRT.

The group reviews the FWSC and identifies potential locations and times that the traffic network will be overly constrained. Identification of poor network performance will be undertaken by TIM with reference to the defined impact assessment process and the minimum network levels of service.

Traffic Impact Assessment & Traffic Modeling

A traffic-network minimum level of service assessment has been developed to determine the effect of the forward works programmes on the traffic network. This focuses primarily on the central city and effectively analyses the forward works programme on a week by week basis to determine the incremental loss or gain in network capacity compared to the previous week in addition to capturing the absolute cumulative effect of all rebuild work on the traffic network. Outside the central city, a more traditional approach is taken.

There are three levels in the network minimum level of service assessment:

1. Key route and screen-line capacity assessment
   This analysis considers the typical capacity of a route through the central city and then assesses the resultant loss in capacity as a result of planned forward works. This analysis considers the capacity of key routes block by block in a northbound, southbound, eastbound and westbound direction. This portion of the assessment identifies any planned sites which could potentially result in efficiency issues.

   The analysis also considers the minimum number of lanes across the CBD which are required to support northbound, southbound, eastbound and westbound movement across the central city. This is known as a screen-line assessment. This screen-line assessment will determine at which points in the rebuild programme the combination of planned sites will result in less than the minimum number of lanes required to support efficient movement across the city.

2. Traffic reassignment capacity
   This analysis is similar to the key route and screen-line capacity assessments but differs in that a simplified traffic model is used to estimate the likely reassignment (rerouting) from an over-capacity route to an alternate route. This assessment is particularly useful in understanding which alternate routes on a traffic network will

experience increased delay and congestion as a result of rebuild activity on a competing route.

3. Network accessibility assessment
   The most detailed level of traffic network assessment is that of network accessibility. This analysis presents a heat map of the entire transport network showing areas of relative high and low accessibility. This analysis is undertaken by measuring the impedance to a sample set of addresses across the network based on a number of pre-selected origins and destinations. As a general rule this analysis will show areas which are difficult (or impossible) to access as a cumulative effect of all rebuild activity on the network.

These assessments will be undertaken and presented to the TIM group for consideration on a fortnightly basis.

Traffic Minimum Levels of Service

A minimum level of service (LOS) for the traffic network is considered on the basis of providing sufficient number of traffic lanes to accommodate north-south and east-west traffic volumes with a specific focus on the peak AM and PM periods. This method recognises that there is some redundancy in the current transport system and works to identify when this redundancy is consumed, and congestion is likely to increase rapidly. All planned work will be assessed against the minimum LOS.

As the rebuild progresses, this assessment will be further developed as new traffic count/volume data is collected to provide a better understanding of the level of redundancy within the network.

Programme Optimisation

Prior to CTOC, the Road Controlling Authorities (CCC and NZTA) have required a minimum period for the submission of TMP's of 5 days prior to the work commencing.

Where a constraint was identified through review of a TMP, the Road Controlling Authority would reject the timing of the TMP or request changes to maintain network efficiency and safety service levels. This is still the case and CTOC are responsible for this process.

However, in the current earthquake rebuild environment, the aim will be to minimise rejection of TMPs to support the rebuild programme. Generally, any delay of a TMP's timing may have impact on cost and programme delivery for the programme holder, and due to the volume of work to be delivered, this could have significant cost or programme delivery impacts (and particularly to interdependent programmes). A balanced approach will therefore be needed to support both the rebuild process and provide minimum LOS on the transport network.

The primary method to minimise this is the submission of schedules into the FWSC to allow early consideration, impact assessment and programme optimisation during the planning phases of the projects, prior to submission of a TMP.

Therefore to allow early programme optimisation, the TIM group will review the outputs from the impact assessments against the minimum levels of service. Where minimum LOS cannot be maintained, the TIM group will work with the programme owner to investigate the possibility for re-optimisation of their schedule.

If re-optimisation or re-sequencing of work is not possible (i.e it is not possible to mitigate network constraints or programme clashes without incurring additional cost or have an adverse effect on the baseline programme) a governance decision will be requested.

The detailed process is shown in Appendix C.

Governance & Conflict Resolution

A Governance decision will be requested under the following circumstances:

- Where the publically funded programmes are directly affected by the constraint (either through other publically funded or privately funded programmes).
- Where minimum levels of service have been exceeded and the forecast effect on the transport network is considered unacceptable to the CTOC Manager
- The constraint cannot be resolved through programme optimisation
- There are cost and/or baseline programme implications to the rebuild

A business case will be produced in these circumstances by CTOC with input from the effected programme holders summarising:

- The impact on the transport system
- Proposals for additional messaging/traffic management requirements to mitigate the transport system impacts
- The associated costs or impact on construction programme for the various programme holders by delaying or altering the construction programme i.e. not accepting the additional requirements.

CTOC will then provide the business case to the Governance team for a decision to be reached to either:

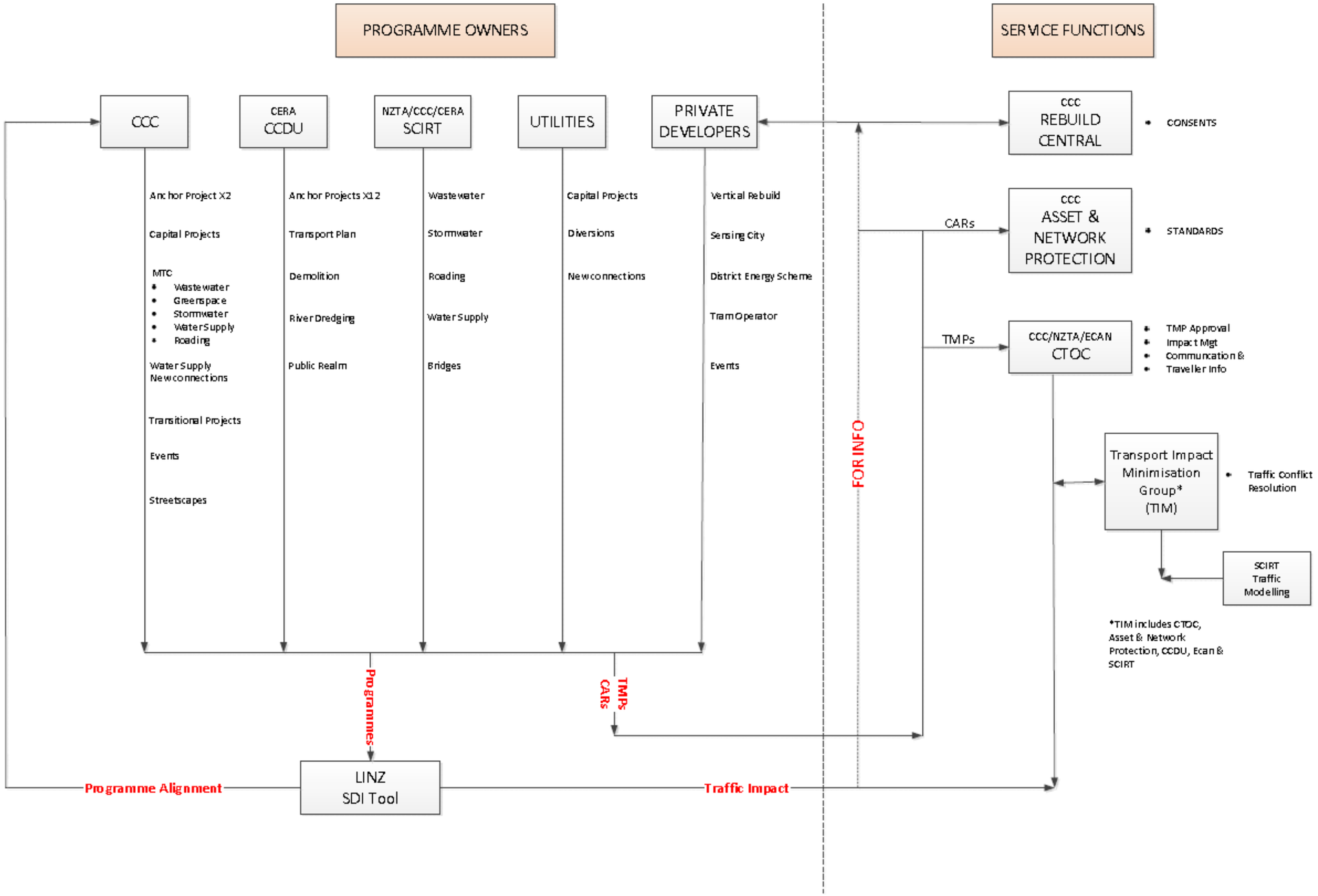
- Accept the traffic system impacts due to the work activity in which case CTOC will seek to mitigate the effects to the extent possible via current activities including public messaging and advanced traffic management (changing the phasing of traffic signals).

- To reject the traffic system impacts due to the work activity and the programme owners accept any associated additional costs and changes to the baseline programme.

Where no publically funded programmes are affected, and the constraint affects the provision of the minimum LOS, then CTOC will act under their current framework for the Road Controlling Authority but through coordination with the CCDU CMO to liaise with the Privately funded programme holder affected. As this situation has potential for negative feedback via the public domain, in this situation CTOC will seek to engage with the CTOC governance teams as soon as possible in the spirit of no surprises

Appendix A: Programme Holders

REBUILD PROGRAMME COMMUNICATIONS STRUCTURE



Appendix B: TIM Terms of Reference

Transport Impact Minimisation Group

Transport Optimisation of Forward Works Programmes

Terms of Reference

Date last updated – 2 December 2013

Group Purpose

1. Optimise forward activities programme to minimise the impacts of activities on the transport system. For context this is the first step in the diagram below:

Group Scope

2. Assess the transport impacts of all activities, for example road works and events, that affect the transport system.
3. Provide recommendations for activities including – nil impact (accept activity), investigate mitigation required, or programme change required.
4. Identify opportunity to optimise the transport system through management of planned events.

Group Participants

5. Group Convener:
    5.1.1. Ryan Cooney –Manager Christchurch Transport Operations Centre.
6. Group Chair:
    6.1. Simon Harty – CTOC Team Leader Temporary Traffic Management.
7. Group Secretary
    7.1. Mike Smith – CTOC Senior Traffic Management Coordinator (Acting).
8. Technical Advisors:
    8.1. Michael Blyleven – CERA Technical Specialist – Transport.
    8.2. Angus Bargh – SCIRT Transportation Planning Manager.
    8.3. Sam Wilkes – Ecan Team Leader Contract Management.
    8.4. Richard Attwood – CCC Events Development Manager.
    8.5. Sara Gulick - CCDU Infrastructure Coordinator Christchurch Central
9. Invitees as required.

Meeting Frequency

10. Weekly till inputs, both technical processes and data inputs, are established. Monthly thereafter.
11. To be arranged by the secretary.

Inputs

12. There will be a phased approach to data input requirements for this group.
    12.1. In the short term the group is to use appropriate data from any source that it can obtain. The most established source of data at current is the LINZ SDI Forward Works Coordination Tool.
    12.2. Long term the LINZ SDI Forward Works Coordination Tool, though it's various versions is to be the official source of data.
    12.3. Events planning schedules
13. Technical reports, models, traffic data as appropriate including inter alia:

13.1. CTOC Temporary Traffic Management Efficiency Toolkit Version 3.
13.2. Christchurch Transport Model (CTM), Christchurch Assignment and Simulation Traffic Model (CAST), Sidra.
13.3. NZTA Traffic Monitoring System, CCC Traffic Count database.
13.4. CTOC traffic signal data
13.5. Real time monitoring information.

Outputs

14. The output from the group is to be officially recorded minutes. These shall record inter alia:
    14.1. Participants.
    14.2. date of review.
    14.3. the programmes reviewed and their level of maturity.
    14.4. recommendations.
15. These minutes shall be circulated to the CTOC Manager (who will circulate to CTOC Steering Committee), CTOC Team Leaders and the affected programme owner's representative.
16. Where formal reporting is required a transport impact section of an impact report shall be prepared.

Process for Programme Review

17. To be developed by the group and approved by the Group Convener.
18. The programme owners will be proactively be consulted with regarding the review process.
19. Process is to consider two perspectives as appropriate:
    19.1. Traffic Engineering – shorter run effects that account for effects of a highly dynamic transport system. Short run is typically shorter than one week and includes network changes and where appropriate temporary travel demand changes,
    19.2. Transport Planning – long run effects that account for a semi stable transport system. Long run is typically longer than one week and assumes the travel demands as well as the network capacity are stable.

Escalation Process

20. Escalation will be required in two situations:
    20.1. The group have not been able to reach a common position regarding a matter.
    20.2. The group collectively identifying a matter that is likely to be contentious due to cost, programme or transport implications. This matter may be between inter alia:
        20.2.1. The transport system operators (CTOC) and the programme owner.
        20.2.2. Programme owners.
21. The escalation process is as follows:
    21.1. Group Chair reports to Group Convener and engages with the programme owners appropriate representative.
    21.2. Group Convener in conjunction with programme owners appropriate representative reports to the CTOC Partners Senior Managers (as a collective) and Programme Owners Managers or CTOC Board and Programme Owners Governance Body as appropriate. Where this is required, papers covering a number of facets including transport, cost, programme, political implications will be collectively developed.

Outside Groups Scope

22. Further matters as established by the Group and approved by the Group Convener.
23. The following specific matters unless changes are approved by the Group Convener:
    - 23.1. Programme resourcing/sequencing optimisation.
    - 23.2. Avoidance of physical rework optimisation.
    - 23.3. Project optimisation.
    - 23.4. Project approval.
    - 23.5. Project implementation optimisation.
    - 23.6. Escalation process change.

Appendix C: Optimisation Process

CTOC Version 1.0 - 5/12/2013

Author: Ryan Cooney
Contributors / Reviewers:

- Process Owner: CTOC
- Frequency: As required
- Purpose: Transport Optimisation Process