

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.

## Estimating Management Plan

**Story:** SCIRT Management Plans

**Theme:** The SCIRT Model

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A plan which outlines how projects will be estimated to generate project Target Out-turn Costs (TOCs), and how these link into the programme TOC.

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](http://www.scirtlearninglegacy.org.nz)



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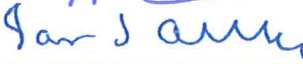


## Estimating Management Plan

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## ESTIMATING MANAGEMENT PLAN

### ACRONYMS, ABBREVIATIONS AND DEFINITIONS

| Term   | Definition   |
|--------|--|
| AA     | Alliance Agreement   |
| AOC    | Actual Outturn Cost  |
| ADN    | Alliance Defect Notice   |
| BOARD  | SCIRT Board of Directors   |
| CCC    | Christchurch City Council  |
| CERA   | Canterbury Earthquake Recovery Authority                             |
| CHIRP  | Christchurch Horizontal Infrastructure Rebuild Programme (The Works) |
| DMP    | Design Management Plan   |
| DTL    | Delivery Team Leader   |
| EGM    | Executive General Manager  |
| EMP    | Environmental Management Plan  |
| EOC    | Estimated Out-turn Cost  |
| FAT    | Factory Acceptance Test  |
| FMP    | Financial Management Plan  |
| FOC    | Forecast Out-turn Cost   |
| FFC    | Forecast Final Cost  |
| GST    | Goods and Services Tax   |
| HIRAC  | Hazard Identification, Risk Analysis and Control                     |
| HIRS   | Horizontal Infrastructure Recovery Strategy                          |
| HRMP   | Human Resources Management Plan                                      |
| IDV    | Independent Design Verifier  |
| IE     | Independent Estimator  |
| IFA    | Independent Financial Auditor  |
| IRMO   | Infrastructure Rebuild Management Office                             |
| IST    | Integrated Services Team   |
| ITP    | Inspection and Test Plan   |
| IWMS   | Integrated Work Method Statements                                    |
| JDE    | JD Edwards Accounting System   |
| KPI    | Key Performance Indicator  |
| KRA    | Key Result Area  |
| MT     | Management Team  |
| NZTA   | New Zealand Transport Agency   |
| NOP    | Non Owner Participant  |
| OPS    | Overall Performance Score  |
| PMP    | Programme Management Plan  |
| PMS    | Programme Master Schedule  |
| QMP    | Quality Management Plan  |
| RFQ    | Request for Quote  |
| SA     | Supply Agreement   |
| SAT    | Site Acceptance Test   |
| SCIRT  | Stronger Christchurch Infrastructure Rebuild Team                    |
| SCHIRP | Stronger Christchurch Horizontal Infrastructure Rebuild Plan         |
| SWG    | Specialised Working Group  |
| TLG    | Tactical Leadership Group  |
| TMTG   | Tactical Management Traffic Group                                    |
| TOC    | Target Out-turn Cost   |
| USC    | Utility Service Coordinator  |

## 1. INTRODUCTION

### 1.1 PURPOSE

The Estimating Management Plan (EMP) outlines how projects will be estimated to generate project TOCs, and how other TOCs link into the programme TOC.

### 1.2 OBJECTIVES

The Estimating Management Plan is critical in enabling the following Alliance Agreement (Alliance Agreement) objectives:

- b) Demonstrate best long run value for money;
- g) Do the right thing right, at the right time to the right standard every time. Complete the rebuild effort to prescribed standards with minimal rework;
- h) Return the built assets to the Christchurch City Council with proof they will be more resilient than they were before;
- i) Incorporate ideas currently not known;
- k) Rebuild Christchurch ensuring the infrastructure sector maintains a sustainable market condition;
- l) Purposely lift the capability of the sector wide workforce.

### 1.3 RELATIONSHIP TO OTHER MANAGEMENT PLANS

The functional interfaces with other plans include the:

- Financial Management Plan which outlines how timely and accurate information relating to actual project costs, future commitments, and total forecast cost will be managed and reported within the Programme;
- KRA Measurement Plan which details how timely and accurate information relating to KPIs and their related Performance Scores will be obtained and reported at the programme-level and, at the project-level;
- Procurement Plan which outlines how services and suppliers will be engaged, and how projects will be allocated to Design and Delivery Teams.

## 2. THE ESTIMATING FRAMEWORK

Within the estimating framework there are the following processes:

- Establishing projects;
- Developing Non Construction Project TOCs;
- Concept Design Estimation;

- Detailed Design phase Estimation to generate a Project TOC;
- Verification of project cost assumptions during construction;
- Reviewing aggregated project cost trends at a programme level during construction;
- Distribution of Actual Outturn Cost against assets, and Limb 3 payments post construction.

### **2.1 PROGRAMME TOC**

The Programme TOC is made up of a number of TOCs (Figure 1) which is measured at an aggregated level. The Programme TOC is the sum of all of the following:

- Integrated Services Team (IST) P&G costs,
- Delivery Teams (City Care, Downer, Fulton Hogan, McConnell Dowell and Fletcher Construction) P&G TOC,
- Project TOCs (including Design and Construction).

The Programme TOC is measured against the Actual Outturn Costs (AOC) and is used in the calculation of Limb 3 (see Section 2.3).

#### *IST P&G Costs*

The IST P&G costs will be budgeted each year for the period of July 1<sup>st</sup> to June 30<sup>th</sup> and then reviewed and agreed by the Board. The agreed IST P&G budget will be monitored by the Commercial Team, and variance between AOC and budget reported on a regular basis.

#### *Delivery Team P&G TOC*

The Delivery Team P&G TOC shall be set annually based on project turnover for the following year. It will be submitted by the delivery teams by March and agreed by SCIRT by June for the given turnover for the period of July 1<sup>st</sup> to June 30<sup>th</sup>.

The Delivery Team P&G TOC relates to the overhead required to run the delivery teams business, i.e. Project Directors, Commercial, SQE, Stakeholder and Communication and Administration support. This TOC excludes Site Direct Project Staff (e.g. Project Managers and below) and specific communications resource required for a particular project which are applied to each Project TOC.

#### *Project TOCs*

All Projects within the SCIRT Programme will be issued with a unique Project Number that will be generated from Project Centre (Document Control System).

A Design TOC will be established (for Concept and Detailed Design) within each Project TOC by the Professional Services Manager with input from the Design Team. The agreed Design TOC will then be loaded against the Project Number on the financial sub form in Project Centre JDE.

## ESTIMATING MANAGEMENT PLAN

At the end of Detailed Design, a Construction TOC will be prepared by SCIRT incorporating Early Contractor Involvement (ECI) inputs. Once the project enters construction it will then report monthly on life to date costs incurred (Actual Cost), forecast Cost to Complete (providing Forecast Outturn Cost) and Earned Value analysis to track productivity.





**Total Outturn Cost**  
29/01/2014

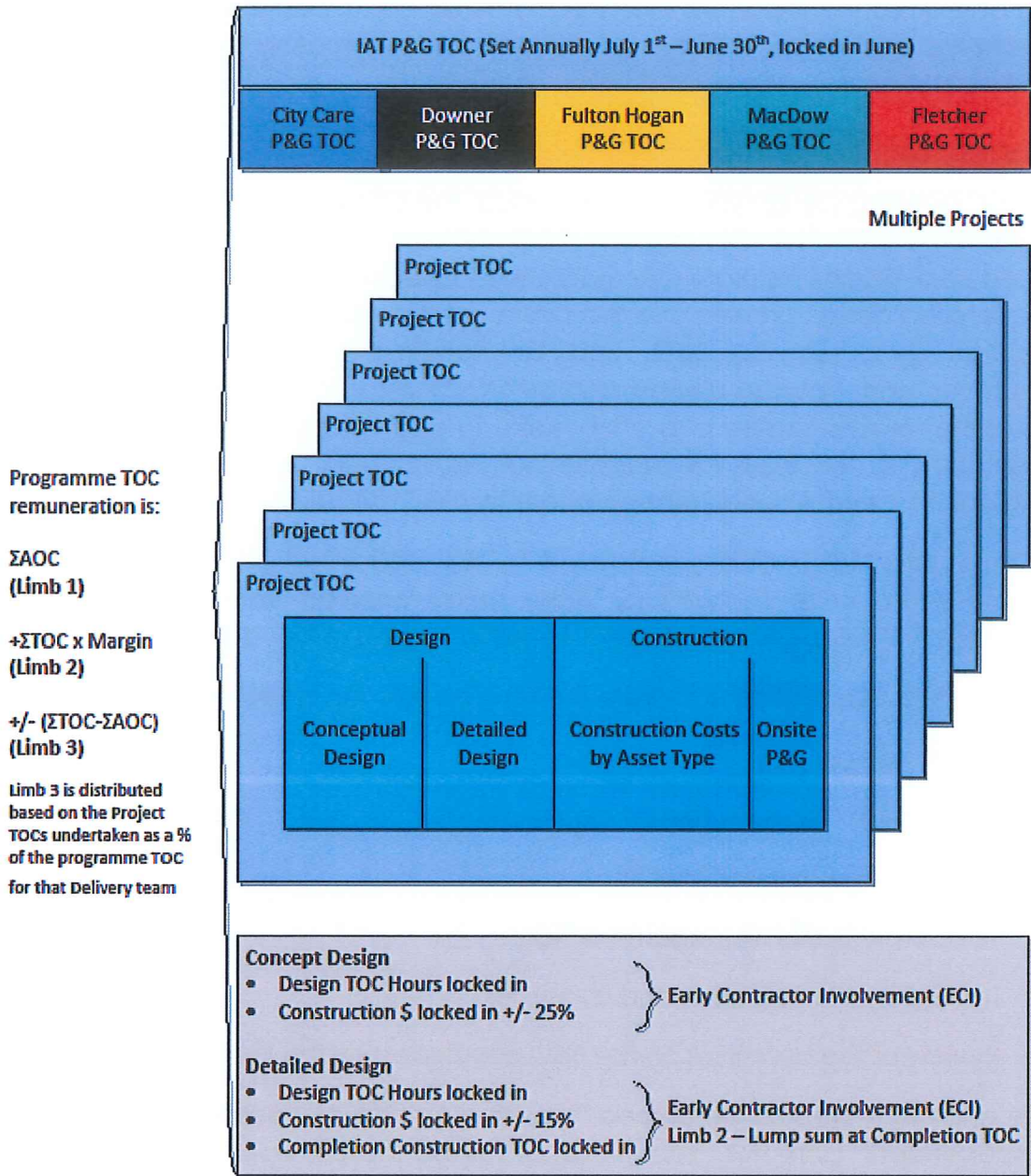


Figure 1. Overview diagram illustrating the relationship of all TOCs in the programme.

## 2.2 PROGRESSIVE ELABORATION OF PROJECT TOCS

Each project will have a cost estimate that is updated and refined as it moves through the project lifecycle (i.e. scoping, concept design, and detailed design).

### *Concept Design Estimate*

An initial estimate at the Concept Design Phase (see Programme Management Plan) will be based around the assets identified to be rebuilt. This estimate will assume typical productivities and utilise average pricing from the estimating system to generate a Project cost estimate within +/- 25% of the final AOC.

### *Detail Design Estimation to Construction TOC*

Once the Detailed Design phase is completed, the Construction TOC will be prepared from first principles. The Construction TOC will also be prepared using an agreed standard Bill of Quantities (BoQ). The BoQ will be populated by the design teams as part of the detailed design process and the Delivery Team Quantity surveyors provided with the opportunity to verify the BoQ. Each line item in the BoQ will be assigned a CCC WBS number, and reported against agreed CCC's Asset Classifications ("Asset Types"). The % of the total estimated cost attributable to each of these Asset Classifications will later be used as the basis for allocation of Project AOC to "Asset values" and the starting point for depreciation management by CCC following handover.

The Construction TOC will be completed by the appointed Estimator from the SCIRT Estimating Team once Deliverables have been received from the Delivery Team, agreed with the Independent Estimator to within 2% and reviewed by IST Management.

ECI Deliverables required to complete the TOC include the following:

- Methodology,
- Schedule in bar chart format clearly detailing the critical path,
- Risk Schedule in excel format,
- Temporary Traffic Management Plan,
- Temporary Works Design and quantities,
- Review of the quantities on the BoQ developed by the Designers.

Labour and plant rates will be agreed through a process of independent verification by the Independent Estimator. Labour rates will be based upon a blended rate of remuneration being paid by the delivery teams.

Material price inputs will be sourced by the SCIRT Estimating team and they will work with major suppliers to get panel prices for key items (e.g. aggregates and pipes). Prices used in the development of Construction TOCs will be advised to the Delivery Teams at the time of project handover. However the delivery teams have discretion to determine the supplier that they wish to use and take advantage of superior purchasing arrangements.

Prices and productivities will be captured and monitored throughout the programme of works. Formal review of prices used in the TOC estimating process by the estimating team will take place with the Independent Estimator at least every six months in May and November.

Delivery Team involvement on the project through the concept and detailed design phases will continue into the TOC development process. The ECI Process will require the delivery teams to provide input into, amongst other things, the methodology for the physical works. This methodology along with the agreed plant and labour rates will define the TOC. Two meetings per project will be scheduled between the Estimator, the Independent Estimator and the Delivery Team. The purpose of these meetings is to understand the methodology and to make sure that the Estimator fully understands the constraints impacting on the project as well as understand all construction risks associated with the project. The first meeting will be scheduled at the start of TOC development; and should be attended by the Delivery Team, Estimator, Independent Estimator and Designers. This meeting should be in the form of a workshop to challenge and agree on any amendments to the methodology and schedule.

The second meeting should include a site visit with the objective that any remaining misalignment on methodology between the Estimator, Independent Estimator and Delivery Team should be resolved and agreed. Once the differences have been resolved, the TOC will be reviewed and signed off. The minutes taken at each of these meetings will be uploaded to the Project Register in Project Centre.

The first principles estimates developed for the Construction TOCs will be benchmarked against completed Project TOCs developed by SCIRT and constructed by Delivery Teams.

The productivity rates used in the TOC will be reviewed against the Earned Value analysis reported by the Delivery Teams. Further comparison against similar completed projects in conjunction with the Independent Estimator will inform the decision on the appropriate productivity targets to set. The Independent Estimator will also be updated during the development of the design and Construction TOC preparation on all non-price information such as methodology, constraints, design status etc.

A formal risk assessment (refer Risk and Opportunity Management Plan) will also be undertaken and the resultant risk provision will be incorporated into the Construction TOC. The ECI process will enable the delivery teams to contribute to the risk register.

All productivity rates, including their changes, will be managed in the proprietary estimating system Candy. The estimating system will allow SCIRT to demonstrate:

- Consistent approach to pricing across the projects and construction TOCs,
- Provide the transparency to satisfy all audit requirements,
- Easy and timely adjustment of pricing inputs to reflect actuals achieved in the field.

The updating of first principle inputs in the Master BoQ within the estimating system will also be undertaken on a regular basis following feedback from the delivery teams (see

During Construction sections). Six monthly, as a result of the reviews held in November and May, a hard copy of the Master Resource list will be printed and counter signed by the Estimating Manager and Independent Estimator. Any changes made in between will be recorded and signed on the hard copy. The Master BoQ will also be provided to the clients at the end of the programme, detailing all productivities and rates.

Each Construction TOC will be a full parallel estimate between the SCIRT Estimator and the Independent Estimator. Once the price is reconciled a final review meeting will take place with the Executive General Manager, Delivery Managers, Risk Manager, Commercial Manager, Estimating Manager and Independent Estimator. Once the Construction TOC is agreed the following documents will be uploaded into the Project Centre project specific registry by the Estimating team:

- Priced BoQ
- Budget Breakdown by sub code (CCC Asset Type)
- Worksheet report detailing rate build up
- CCS Candy file
- Priced Risk Register
- TOC Pricing Review Sheet signed by the SCIRT Estimator, Estimating Manager, IE and CM or EGM.
- SCIRT TOC Top sheet
- TOC review meeting minutes
- End of project review form with the TOC assumptions i.e. productivities, crew sizes etc. (see post construction distribution)

The agreed Construction TOC will then be input into JDE by the Commercial Team as the Original Construction TOC. The Original Construction TOC will be sub-divided into Asset Type for project cost management and reporting purposes.

The agreed Construction TOC will be used to calculate the Limb 2 component, as a percentage of the Limb 1 TOC as defined by the AA. Limb 2 is a lump sum and fixed, and will not be recalculated on AOC.

Limb 1 TOC and Limb 2 Lump sums will only be recalculated for work scope changes that occur in any project. Changes to Project Construction TOC and Limb 2 Lump Sum can only be approved by the EGM.

### *During Construction (verification of project assumptions during construction)*

Part of the monthly reporting process, during construction, will include feedback on the assumptions used in the Construction TOC development. This will include feedback on the following:

- Productivity trends through the Earned Value reporting;
- Plant; and
- Specific feedback will also be requested on a project by project basis to review specific construction risks, including ground conditions, and contingency spend.

### *During Construction - Reviewing aggregated project trends, including forecasting*

Construction productivity data will be collected based on Earned Value reporting on a project by project basis and will be aggregated for comparison on a like for like basis, across construction projects and across Delivery Teams. This data will be analysed and appropriate changes made to the Master BoQ for future TOCs.

A forecast cost to complete shall also be provided by the delivery team on a monthly basis for each Project TOC.

### *Post Construction - Distribution of Actual Outturn Cost against assets*

The final Actual Outturn Cost will be distributed against the CCC Asset Classifications in the same percentage ratio as the original Construction Project BoQ. A percentage for overall P&G costs, assessment costs and CCC sunk costs will also be attributed across all projects to enable CCC costs of assets to be capitalised and depreciated by CCC. This information will be transferred to the CCC for use in their asset management and accounting systems.

Final productivity and other feedback data will also be analysed for review and used to update the master BOQ where necessary.

## **2.3 WORK SCOPE CHANGES**

The original TOC value will be adjusted through an approved Work Scope Change process. Consideration for TOC adjustments will be given to Design Changes, Client Instructions and Project Definition Changes with a value of more than \$10,000 per event. Once the basis for a Work Scope Change has been established by the Delivery Manager and Schedule impact determined by the Scheduling team, the Estimating Team will evaluate the value of the TOC adjustment that may be required.

The assessment of the Work Scope Change will be from first principles taking into consideration allowances made in the TOC and items on the Risk Register. If the value of the Work Scope Change is less than \$50,000 the Work Scope Change will be signed off by the Estimating Manager and forwarded to the EGM for final approval. Any Work Scope Change with an assessed value of more than \$50,000 will be agreed with the Independent Estimator and forwarded to the EGM for final approval. Work Scope Changes with a value of greater than \$2m require Board approval.

Once the TOC is adjusted, the following information will be uploaded as a new revision into the Project Register in Project Centre:

- Priced BoQ with each Work Scope Change added at the bottom of the TOC
- BoQ with the Work Scope Change Number in Project Centre as the heading with the items listed below.
- Budget breakdown by Asset Type for the Work Scope Change only
- Worksheet report detailing rate build-up
- CCS Candy file
- Work Scope Change Pricing Review sheet signed by the Estimator, Independent Estimator and Estimating Manager.

Work Scope Change Process is appended as Appendix One.

## **2.4 EARLY PROJECTS (IRMO)**

For those projects in transition from the IRMO to SCIRT delivery model there is an agreed arrangement that the AOC becomes the TOC therefore there was no need for the SCIRT estimators to prepare TOC's for these projects.

# **3. MANAGEMENT PLAN CONTROL**

## **3.1 AUTHORISATION**

Initial authorisation is in accordance with the Alliance Agreement, Section 6.1.1. All plans are also authorised by the Executive General Manager and will be submitted to the Board for approval in the first Board meeting following the execution of the Alliance Agreement.

Subsequent revisions to plans will be authorised by the Executive General Manager unless the EGM deems the revision requires endorsement by the Board.

## **3.2 DISTRIBUTION**

The Plan is a controlled document and shall be distributed and revised in accordance with the SCIRT Quality Management Plan. Hardcopies are Un-Controlled copies. The Controlled copies are maintained in "Project Centre" which is a secure website which supports various project management functions for the Programme including "configuration management" i.e. version control of documents.

## **3.3 AUDITING**

An Alliance Auditor shall conduct regular reviews, as outlined in the Alliance Agreement.

### 3.4 MANAGEMENT PLAN REVIEW AND REVISION

This management plan is a dynamic document that is current at the time of issue. The process for monitoring and review of the Plan or its implementation and operation are detailed within the SCIRT Quality Plan.

The quality of the information produced under this plan will be measured to assess the effectiveness of the management plan and may initiate a review and revision of the management plan.

Site management will conduct a reassessment of the plan for the purpose of continuous Improvement. The review will consider the results of management monitoring, audit results, analysis of data, corrective and preventive actions as well as feedback from the Board, MT, IST, Design Team, Delivery Teams and site personnel. The frequency of the review will typically be as detailed in the Review and Audit section of the Quality Plan

Implementation of resolutions from the review will contribute to continuous Improvement.

Revisions to any management plan will always involve the Quality Manager who will take responsibility for ensuring the management plan set remains co-ordinated when revisions occur.

The document may be revised and updated in response to areas identified for improvement, such as;

- Changes in the Requirements and Minimum Standards defined in the Alliance Agreement
- Substantial changes in design or scope, construction sequence, staging, methodology, process or resource
- Requests by any Statutory Authority
- Internal and external audits
- Suggestions and comments from personnel
- Preventative action following a non-conformance
- Necessity for corrective action
- Senior management review
- Recommendations of the External Alliance Auditor or Independent Estimator

#### 4. ROLES AND RESPONSIBILITIES

Each Estimator in the estimating team will be responsible for pricing assigned projects, made up of multiple infrastructure activities, working alongside the relevant Delivery Team. Responsibilities for each section of the TOC process will be as follows:

|   | <b>Activity</b>  | <b>Organisation Responsible</b> | <b>Person Responsible</b>  |
|---|--|---------------------------------|--|
| 1 | Preparation of design TOC                                    | SCIRT                           | Design Manager/<br>Estimating Manager  |
| 2 | Development of Methodology                                   | SCIRT /Delivery Teams           | Estimator/Delivery<br>Team Project<br>Manager  |
| 3 | Development of Project Estimate (Pricing Bill of Quantities) | SCIRT                           | Estimator/Delivery<br>Team QS  |
| 4 | Preparation of Construction Programme                        | Delivery Team                   | Delivery Team Project<br>Manager   |
| 5 | Internal Review of Estimate                                  | SCIRT                           | Executive General<br>Manager/ Delivery<br>Managers, Risk<br>Manager, Estimating<br>Manager |
| 6 | Approval of TOC  | SCIRT                           | Commercial<br>Manager/ Executive<br>General Manager  |
| 7 | Assignment of TOC to Project                                 | SCIRT                           | Commercial Manager   |
| 8 | Assignment of Limb 2   | SCIRT                           | Commercial Manager   |
| 9 | Breakdown of TOC by GL Codes                                 | Delivery Teams                  | Delivery Team<br>Commercial Manager  |



Appendix 1 Work Scope Change Process

**SCIRT Work Scope Change Process**

Process Owner: Richard Wesley  
 Author: Alex Ferizis  
 Contributor: Paul Botha

Version: 3.0  
 Last Updated: 16 Oct 2014

Outputs:  
 Closed WSC2 Form



Purpose: To capture changes in a project's scope resulting from design change, client direction or project definition; and adjusting the project's Target Out-turn Cost and Schedule Baseline accordingly.  
 Frequency: As Required

