

# PAINTING THE TOWN ORANGE – TEMPORARY TRAFFIC MANAGEMENT AFTER CHRISTCHURCH'S EARTHQUAKES

**(Co-Author & presenter) Robyn Gardener** GDip RS, PGDip T&T  
Transport Safety Manager, Christchurch City Council  
[robyn.gardener@ccc.govt.nz](mailto:robyn.gardener@ccc.govt.nz)

**(Co-Author) Angus Bargh** MSc, MIPENZ, CPEng, IntPE  
Transportation Planning Manager, Stronger Christchurch Infrastructure Rebuild Team (Downer)  
[Angus.Bargh@scirt.co.nz](mailto:Angus.Bargh@scirt.co.nz)

## ABSTRACT:

Post earthquake, as work shifts from major demolition to replacement and rebuilds of vertical and horizontal infrastructure, traffic flows on the already stretched Christchurch City network are in danger of grinding to a halt without careful planning and assessment by the team co-ordinating Temporary Traffic Management Plans being submitted for proposed works.

This paper presents a purpose-built electronic Traffic Management Plan (TMP) submission tool, TMPforChch, and a cutting-edge traffic flow modelling tool for cumulative worksites, allowing for proactive management of traffic before congestion occurs.

TMP submitters can view all worksites in a proposed TMP area and time-frame, allowing collaboration among contractors before TMPs are submitted, better work programming and less time wasted submitting plans in isolation.

TMPforChch is simple and easy to use, with no licence costs to impose barriers to use for TMP submitters. It allows information on road closures and major work to be shared with third party users and currently informs the TransportforChristchurch (TfC) website, a joint agency project disseminating traveller information.

These tools have equipped Christchurch City Council's Traffic Management Co-ordinators and Stronger Christchurch Infrastructure Rebuild Team (SCIRT) Traffic Managers to collaboratively manage the huge increase in TMP submissions, with ease and at a cost way below that of other options available.

## **INTRODUCTION:**

Christchurch City Council (CCC) is the second largest Council in New Zealand and the largest city in the South Island. The city has a population of 363,200 (Statistics NZ, 2012). The Council's network consists of 2275 km of local roading of which 1529 km is urban and 746 km is rural. There are 328 bridges on this network.

A series of major earthquakes have rocked Christchurch, leaving the city and its suburbs with major horizontal infrastructure problems requiring extensive unplanned construction works to repair and replace. Vertical infrastructure has also been significantly affected and there has been a consistent degradation in the safety of buildings throughout the city as they are subjected to ongoing quakes and aftershocks.

The entire central business district has been cordoned off from public access as buildings are assessed, repaired and demolished. The shut down of the central city has closed routes through the city requiring traffic to shift to alternative routes designed for lesser capacities to maintain links between the suburbs. There are also cordons throughout the suburbs, but due to the smaller scale and lower heights of suburban structures, traffic flow is generally still maintained.

As work shifts from major demolitions in the closed off central city and worst-affected red-zoned suburbs to rebuilds of vertical infrastructure and extensive replacement of horizontal services (sewage, potable and storm water, and power), the flows on the already stretched network are in danger of grinding to a halt without careful planning and assessment by the team of Traffic Management Co-ordinators (TMC) approving the Temporary Traffic Management Plans (TMP) being submitted for proposed works.

Critical to the development of these tools was the ongoing collaboration between the road controlling agencies [CCC, New Zealand Transport Agency (NZTA)] and SCIRT, an alliance representing the stakeholder agencies [CCC, NZTA and Christchurch Earthquake Recovery Agency (CERA)] and the 5 major contracting companies delivering the work programme. Without strong collaborative links between the agencies and a commitment to ensure a quality process outcome from the industry, the City's transport network had the potential to be crippled by multiple road closures and gridlocked routes.

This technical paper discusses the development of an electronic TMP submission process to ensure that the small team of TMCs is able to process, co-ordinate and manage the large increase in plans expected to be submitted over the next few years. It also documents the planning and development of a cutting-edge traffic flow modelling tool for cumulative worksites to replace the standard worksite traffic impact assessment, allowing for proactive management of traffic before congestion occurs.

## **DISCUSSION:**

### **The TMPforChch Tool ([www.tmpforchch.co.nz](http://www.tmpforchch.co.nz)):**

#### **Overview:**

After the quake of February 2011, it was identified that CCC's ability to process and co-ordinate TMPs in the wake of the devastation was not at a capacity likely to maintain the required level of service for TMP turnaround times for approvals. The team was working on an Access data-base and was processing around 125 plans a month and predictions were for a significant increase once the SCIRT rebuild works ramped up to the predicted \$40 million per month.

Various electronic options designed for Corridor Access Request (CAR) processing were evaluated but none was able to deliver an immediately satisfactory option for TMP processing and, more importantly, co-ordinating across the network. Moreover, the high costs of maintaining

licencing had not been identified in any previous Council budgeting programme so funding of the licencing was going to remain an ongoing issue.

The goal for the project was to deliver a simple and efficient web-based tool, allowing TMPs to be submitted, approved and co-ordinated spatially on a map-based, time-bound system that enabled filtering and delivery to an external web-site without any compromise to data security.

An additional criteria was identified – that of providing a tool with a “no-barriers” access policy (eg no-costs, simple to understand and fast to use). Anecdotal comment from the industry suggested that if a submission programme was required along with ongoing licencing costs, there would be some who would avoid those costs and risk undertaking work without submitting a TMP.

An identified risk, with the introduction of an electronic submission system, was less computer-savvy submitters who may still expect to deliver paper TMPs. In-house electronic submission of those plans was organised with the expectation that perhaps 20% of plans would remain paper based. This resource was unnecessary with all plans being submitted electronically within the first month.

Assumptions made:

- The web-based tool would operate on >95% of current standard computer operating interfaces.
- There would be no cost to access or use the TMPforChch web tool.
- No design allowance would be made to accommodate outdated operating systems.
- Commercial users with web upload and download constraints work with their own Information Technology (IT) specialists to allow permissions.
- Users will require a basic operational knowledge and understanding of their computer. Full training will be provided to use the tool.

## The Project

TMPforChch was staged in two parts – Stage 1 being a “minimum viable product” to go live in time to inform a new CCC public website, TransportforChristchurch, being launched to inform travellers of traffic delays in the city. This project involved CCC, NZTA, Environment Canterbury, Selwyn District Council, Waimakariri District Council, and the Greater Christchurch Urban Development Strategy team.

The functionality of Stage 1 included:

- Registration feature for users and a logon process for use of the tool.
- Process for submission of TMPs for approval and co-ordination on a map-based co-ordination layer.
- Mechanism for viewing pending, current or archived TMPs.
- Mechanism for editing and amending TMPs already in the system.
- Email notifications that remain with the submitted TMP to provide a “one-stop-shop” for all information relating to the specific TMP.
- Administration area for approving and monitoring users and their submissions.
- A city-wide “viewing map” showing all submitted and active TMPs within a time bound “snapshot”, with variable dates ranges that can be user defined.
- Data security taking into account commercial sensitivity of TMPs.
- Data integrity and robust filtering and links to the TransportforChristchurch website.
- A training programme to ensure freely available access to all potential users of the submission tool.
- Management of the hosting for the site and cloud data storage facilities for large amounts of data to be maintained to a three-year rolling schedule.
- Three-year rolling scheduled off-load.
- Robust testing of TMPforChristchurch tool before “go-live”.
- Robust filtering and links to the TfC website and set up clear permissions for 3rd party users of the filtered data link.

Feedback from the industry was very positive and the programme was embraced and used almost exclusively from the day it was launched. SCIRT partners said after their first submissions “if you can use Trademe, you can submit a TMP via TMPforChch”. Enthusiasm for the programme snowballed and additional functionality ideas and ways to improve processes were so exciting that Stage 2 commenced immediately.

Stage 2 allowed for development of the TMP tool to meet the needs of the users and was collaboratively worked on by those submitting the majority of the TMPs. This stage provided functionality for the users when submitting TMPs and an initial set of analysis tools to meet the reporting requirements of the traffic management co-ordination business within CCC.

The functionality improvements and upgrading of Stage 2 included:

- Reporting outputs, to ensure agreed level of service is provided, by:
  - input date range,
  - contractor,
  - processing point or processing timeframe,
  - plan type.
- Revision process to update, amend and extend existing approved TMPs.
- An almost immediate change to Google Maps API, replacing GeoSmart maps, to improve user functionality, requiring work to ensure the 3<sup>rd</sup> party TfC site remained unaffected.
- Switchable layer of updated “post quake” road levels.
- Switchable layer of traffic volume information.
- Switchable strategic routes throughout the network layer.
- Varying methodologies for provision of road closures to suit SCIRT work programme methodologies (eg rolling, staged, rolling within staged).
- Various types of plans (eg generics for maintenance contractors, service agreements for repetitive works, universal plans, site specific, and area plans), all designed to make the TMP submission process easier and requiring less plan submissions.
- Online forms (eg TMP submission, short form TMP submission, road closure).
- Online information (eg bulletins, Council specifications and standards, links to information).
- Third party links for emergency services.
- Search features.
- Automatic removal of plans once closed.
- Detour routes.
- Web searchable submission of TMPs – [www.tmpforchch.co.nz](http://www.tmpforchch.co.nz), updating the Stage 1 non-searchable extension from TfC website – [www.transportforchristchurch.govt.nz/tmp](http://www.transportforchristchurch.govt.nz/tmp)

### **The Traffic Modelling Tool:**

#### **Overview:**

Following the February 2011 earthquake, Christchurch experienced a mass displacement of employment, generally in a westward direction, following the closure of the CBD. This posed two distinct challenges when attempting to assess the effects of a proposed TMP. The first challenge related to the mass change in traffic volumes on the network and the need to review and update the road level classification. The second challenge was to design a framework by which the cumulative effect of many TMPs and work-fronts across the network could be assessed. There was a recognition by all stakeholders that, whilst the impact of individual TMPs could be managed on a site-by-site basis, there would be a quantum of city-wide work activity which the network would struggle to support.

In response to these challenges SCIRT, in close liaison with CCC, established an iterative assessment framework to maintain an up-to-date predictive picture of network conditions which incorporates the effect of proposed/submitted TMPs. To deliver this, SCIRT utilised the post-earthquake update traffic assignment model, CAST. One of the initial challenges with the adoption of the model was its coarse geometric representation of the network and the lack of road names

which reduced the ability to quickly identify roads of interest in the assessment process. To overcome this a spatial-mapping process was established to link CAST to a thematic based geometric road network (LINZ). In addition, a process was also developed to approximate the details from a submitted TMP to a change in the road network within the CAST model.

## **The Project**

The following is a brief summary of how the tool operates. The post-earthquake calibrated CAST traffic assignment model is updated to take account of current road closures and CBD cordons (this is referred to as a T0, or time-zero, network). When a TMP is submitted the road(s) affected are digitally/spatially captured together with the type of traffic impact (full closure, one-way closure, stop-go, speed/capacity reduction etc). For all TMPs with a significant traffic impact a corresponding change is automated within the CAST model network. The assignment model is then run and outputs gathered to assess the differential impact of new work fronts and TMPs. If the cumulative effect of submitted TMPs is unacceptable then attempts are made to re-sequence work fronts to minimise the network wide impact in the travelling public. This re-sequencing is then assessed.

One of the key benefits of the tool is that outputs have been reformatted so that information can be readily digested by a non-professional audience. This assists with short lead times for media releases and stakeholder communication. This process has also allowed for a full update of road level classification. The tool continues to be refined and future developments include full integration with TMPforChch.

## **RESULTS:**

TMPforChch has enabled CCC to quickly respond to the increase from 125 TMPs per month pre-earthquake to the current 650-700 TMPs per month. With tight budgetary constraints, only one additional staff member was approved to enable the unit to manage the additional post-quake workload. The team estimates that the TMPforChch has taken the place of between 1.5 and 2 FTEs. Without TMPforChch, the Access data-base system would have been unlikely to manage the industry's requirements and there would be no big-picture co-ordination of the TMPs being submitted.

The TMPforChch programme has been developed to a small extent of its potential and a further programme of additional functionalities has been listed ready for implementation as funding becomes available.

The costs involved were minimal totalling in the region of \$150k:

- Stage 1 was estimated at \$30k but ran over budget by more than 200% costing in the region of \$60-65k (costs split between CCC and NZTA based on TMP numbers – roughly 1 plan in 10 being NZTA).
- Stage 2 has had input of approximately \$80-90k (CCC), and has implemented most of the functionality requirements required by the industry and the TMC approval teams. There is more development planned to allow some of the “nice-to-have” functions to be addressed.

The Traffic Modelling Tool has been crucial in the planning and co-ordinating of the cumulative effects of TMPs within areas of the city. The traditional assessment of a worksite and its site-specific Traffic Impact Assessment was not a viable option when many worksites across an area of the city were causing multiple cumulative impacts.

Prior to Christmas 2012, the TTM teams can confidently say that, despite the huge number of worksites operating, there has been minimal serious congestion resulting from planned worksites operating on the road.

## **CONCLUSION:**

The successful development and implementation of these two tools has been totally reliant on a collaborative approach that allowed all partners to identify and have their needs met as part of the process.

Implementation of any new process does not happen without large amounts of robust discussion and the occasional teething problem. Pulling a project as complex as this together and getting a high level of satisfaction for all partners is a measure of the commitment of everyone, from the managers through to the teams on the ground, to make the process work to gain a better long term outcome for all – a collaborative approach was the key.

## **REFERENCES:**

[http://www.stats.govt.nz/browse\\_for\\_stats/population/estimates\\_and\\_projections/SubnationalPopulationEstimates\\_MRYe30Jun12.aspx](http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/SubnationalPopulationEstimates_MRYe30Jun12.aspx)

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