

# THE QUEEN STREET INFRASTRUCTURE UPGRADE

Don Young, Principal Engineer, MWH, now part of Stantec, Nelson.

Russell McGuigan, Programme Delivery Manager, Tasman District Council, Richmond.

## Abstract

Due to recent severe flood events within the Richmond Central Business District (CBD), the Tasman District Council has committed to a series of stormwater upgrades.

Stage 1 of the works are in Queen Street, Richmond's main street and includes installing a large stormwater pipe, roadway reconstruction as an inverted crown with central slot drain, replacing aging water and sewer infrastructure, providing telecommunications and power ducting, and a safer shared traffic and pedestrian area.

The work results in an active construction site from shop front to shop front along the main street. To minimise disruption, the Council and MWH, now part of Stantec (MWH) developed an innovative contractual framework that requires the works are carried out in a travelling "box".

Each box has strict timeframes for each stage as it moves up the street. This ensures all work is completed in one pass, and the contractor has the full street width available with no conflicts from other users. The public are also safely separated from the construction. Additionally, the contract includes other innovative elements, such as requiring a full time "Stakeholder Liaison Officer", clear expectations around cartage effects, and a bonus linked to KPIs developed with the contractor.

A tender process that actively encouraged alternative methodologies, and included a negotiation workshop, ensured that the contractor was heavily involved in bringing their own expertise to the final outcome.

## Key Words

Stormwater, construction, contracts, town centre upgrades.

## Introduction

Richmond, the main town in Tasman district, has a population of about 14,000. The town centre is one of the largest commercial and retail hubs in the Nelson/Tasman Region and its role in the region is expected to grow as development around Tasman, and especially Richmond progresses.

Unfortunately in recent times, the town centre including Queen Street (the main street) has been subjected to several severe floods. The most severe was a 1 in 500 year short duration event in April 2013 that caused widespread flooding affecting many businesses.

Figure 1: Queen Street in Richmond



The issue is exacerbated due to the fact that there are reasonably large catchments on the foothills above Richmond, and the peak run-off from these foothills greatly exceeds the existing stormwater reticulation. Added to the fact that there are very few appropriate overland flow paths through the town, and that

the receiving drains downstream of the town are flat, and undersized, and we have a situation whereby there is an untenable risk of flooding.

**Figure 2: April 2013 flood event**



The Tasman District Council is working towards a major upgrade project to minimise future flooding, and since the main street will be significantly impacted by pipeline upgrades, they are also taking the opportunity to upgrade the Queen Street carriageway, footpath and streetscape environments.

This paper presents the Council's adopted solution, design elements, construction issues and contractual solutions of the first stage of the overall 10-year upgrade.

**Figure 3: April 2013 Flood Event**



### **Council's Adopted Solution**

Over the last two to three years, the Tasman District Council (in conjunction with MWH) has been considering the flooding issue in detail,

and assessing various options to mitigate the effects. This has included creating a hydrological and a hydraulic model of the catchments that affect the town centre, developing a range of options, assessing those against a range of criteria, and a series of workshops with the Councillors.

As background, the modelled effect of the 100 year current day scenario is shown in Appendix A.

The model results show a considerable portion of the CBD, and the Beach Road Industrial area is significantly affected.

As a result of the subsequent options assessment and workshops, the Council adopted an upgrade strategy worth approximately \$20million involving four stages:

- Stage 1 Queen Street upgrade.
- Stage 2 New pipeline from Washbourn Gardens to enlarged Poutama drain. Including the Upper Queen Street diversion. And the Gladstone Road diversion.
- Stage 3 Upgrade of Blair Terrace and the Washbourn Drive area.
- Stage 4 Multiple local surface re-shaping to manage overland flows.

The implementation of Stage 1, the Queen Street Infrastructure Upgrade is now well underway.

A contract for approximately \$11million was awarded to Hawkins Infrastructure in November 2016 for the upgrade of the infrastructure services in Queen Street.

The contractor has now started on site, in February 2017, with a planned completion date of April 2018.

### **Design Elements**

In order to achieve the objectives from the preliminary and detailed design phase, there were a number of Council imperatives that needed to be incorporated into the scope of works. Specifically these included a number of elements that required specific design and construction approach.

In particular, some of the more specific design aspects are as follows.

### ***Bypassing Flow Away from the Town Centre***

One of the primary objectives of the overall upgrade strategy is to intercept the current flow path that overtop from local streams and channels during high intensity rainfall events.

In particular, Jimmy Lee Creek, the main upstream creek, over-tops its banks during large rainfall events and floodwater flows into the town centre.

Diverting this overland flow away from the town centre by capturing it in a detention pond and diverting it through a 1650mm gravity/pressure pipeline is critical to lessening the flooding effects in the town.

This is Stage 2 of the overall upgrade strategy, and will commence once the Stage 1 Queen Street works are complete.

### ***Inverted Crown***

As noted above, there is a marked absence of appropriate overland flow paths through or around the town centre. The result of this is that once the runoff exceeds the capacity of the primary reticulation, flooding of neighbouring properties occurs.

This has resulted in flooding of the downtown shopping area, offices and commercial buildings, and included the Richmond Mall, the largest in the region with approximately 60 shops.

In order to provide some available volume for this overland flow to mitigate this flooding, the team has designed an inverted 'V'-shaped horizontal road profile along Queen Street. This relies on a central slot drain to take the road run-off, with regular take-off points to a large new longitudinal stormwater pipe.

The construction of this inverted crown has a number of other consequential impacts which then also need to be considered. This includes:

- Retro-fitting an appropriate cross-fall grade from the property boundaries into the slot drain.
- Ensuring adequate thought has been given to on-going operation and maintenance issues, and health and safety issues.

- Requiring a lowering of approximately 500mm depth on the centreline, resulting in significant undercutting to retain good sub-base.
- Requiring a re-think of the road profile (and therefore the road layout) in order to create an uninterrupted inward flowing cross-fall (ie. no kerb and channel).
- Careful consideration of the cross fall to ensure no contact conflicts with opposing high-sided vehicles eg. trucks or buses passing each other.

**Figure 4: Inverted Crown in pavement (Another town)**



### **Construction Issues**

#### ***Scale and Extent of Works***

The total length of the street to have major works is approximately 800m, running from Gladstone Road (SH6) to Salisbury Road (refer to Appendix B). This is effectively the full length of the retail area.

The new services to be installed include:

- a new stormwater gravity concrete pipe reducing from 1200mm to 900mm to 750mm up the street
- a 375mm water main
- a 200mm water main
- new ducting
- new laterals
- full excavation and reinstatement to 600mm of new carriageway
- two concrete "buffer strips" separating the road and the footpath, and
- new street furniture and landscaping.

From an early stage, the expected timeframe for this work was determined to be in the order of 18-24 months from start to finish. This is a significant period of time for any town centre to be so badly affected by a major construction project.

One option considered for the construction methodology assumed that each of the services would be replaced in a longitudinal fashion, which would result in multiple passes over the same area, and a huge amount of frustration to the community. By the time the various services were installed, or removed, and the road was reconstructed, then each shop owner may have had up to 12 work crews trundling past!

### ***Conflict between the Profitability of the Town Centre, and the Efficiency of the Contract***

As with any contract, there is a balance between allowing the contractor unrestricted use of a site in order to maximise efficiency (and therefore minimise price), and protecting the access rights of the general public and traffic. In this particular instance, this was a major consideration, as the two extremes are very extreme. Without doubt, giving the contractor full access to the main street would allow them to optimise their work streams and reduce timeframes. However, left in an uncontrolled state, the effect on the local businesses could be devastating.

### ***Conflict between Traffic and Pedestrians, and Construction***

Queen Street is not only a destination, but as with many rural towns, it is also an accepted through route for many locals. While the Council may not ideally wish this to be the case, nevertheless it is a very engrained pattern of behaviour. It is not possible nor politically acceptable to change this overnight by creating extensive disruption. Therefore, any construction methodology needs to recognise the need to manage the traffic accordingly.

Similarly, the pedestrian traffic in a town centre is the lifeblood of the commercial sector, and it is critical to ensure the disruption caused by the construction is understood and managed.

### ***Multiple Underground Services within a Crowded Carriageway***

The main street corridor in most towns is the corridor for many or most of the critical services in that area. That is certainly the case in Richmond. In addition, these underground services are aging and at times quite fragile, and their location is uncertain. Valves to shut down areas can be few and far between, and the so the effect of a planned (or worse, unplanned) interruption can be difficult to ascertain.

### **Contractual Solutions**

The trick with contracts in this sort of sensitive environment is to allow the contractors to bring their expertise and knowledge to resolving difficult programming, scheduling or technical problems, while ensure that the effect of their choices is within a previously established scope envelope.

As noted above, we were very aware that in a situation such as this, the contractor will (quite rightly) look at ways of maximising their productivity within the boundaries set by the contract. Therefore our challenge was to develop a contract that effectively put boundaries around the contractor's choices, while still allowing the market to identify innovative and efficient ways of delivering the desired outcomes. The following gives some guidance to the type of actions that were implemented to try to achieve the right balance.

### ***Development of a "Box" Methodology***

Given the extensive excavation and re-construction that would take place at any one location in the street, the design team developed the concept of a "box". This is effectively a method to allow the contractor full and unrestrained access to the main street over a length of approximately 100-150m, between the kerbs. The contractor is expected to achieve all of the necessary pipe laying, pipe removal, road reconstruction, and laterals within that box within a set contractual timeframe (a maximum of ten weeks). The road is closed to all traffic during this time, although the footpaths on either side must remain open. Traffic must be allowed in other parts of the street. The box is surrounded by a hoarding, which is available for decorating by local schools.

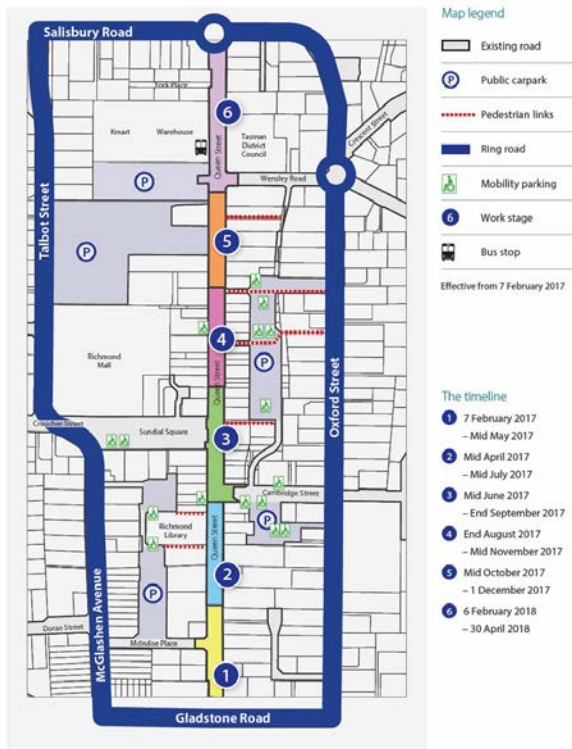
Once the box has moved on, the contractor has a maximum further five weeks to complete

the laterals, the concrete buffers, the work in the footpaths, the street furniture and landscaping, and the road resurfacing.

The length of each box was determined by each tenderer, although the key constraints to be met were finishing each box within the ten weeks, and finishing the main length of the street between start of February 2017 and start of December 2017. This has resulted in six construction boxes.

One of the major benefits of this approach is the complete separation of the general public from the most extensive construction activity. While the projects retains a large number of very real and active health and safety challenges, these have been significantly reduced by adopting this approach.

**Figure 5: The Six Construction Boxes**



**Inclusion of a Series of “Minimum Requirements”**

The contractual basis includes approximately 20 statements that the contractor must abide by. These include:

- the timeframes around the box (as noted above)
- work that must take place in the box
- restricting activity to one box at a time

- maintaining vehicular access on the remainder of the road
- maintaining pedestrian access, maximum road closures (outside of the box)
- continuity of services, and
- a number of other requirements.

These requirements are the key cornerstones to the contract, and guide any discussions with the contractor about their proposed work methodology.

**Good Consultation with the Community before the Works**

After developing the contractual methodology, and the expected timeframes, the Council undertook extensive consultation with all of the affected businesses, property owners and interest groups. This has meant that all parties have generally bought into the contractual concepts, and have accepted the significant disruption. This communication has extended to painting the proposed locations of the boxes on the kerbs, and advising the public when they can expect each length to be closed off.

**Figure 6: Construction Establishment in the ‘Blue’ Box**



**Good Communication with the Community during the Works**

A key part of the contract was hiring a full time Community Relations person, and basing them on the main street close to the works. This position is specifically tasked with meeting the local business people regularly, keeping them informed about activities coming up, and listening to and responding to any concerns or complaints they may have.

**Restrictions of Work on Site**

In order to minimise disruption to the businesses during the very busy Tasman

summer, the contract prevented any construction works on site prior to early February 2017, and between December 2017 and January 2018. In setting up this restriction, the Council clearly understood that it would pay a premium, as the contractor must effectively disestablish and re-establish during this time.

However it was prepared to pay that premium in order to be able to assure the community that the disruption would not extend through the peak trading season.

### ***Targeting the Critical Length of Queen Street***

The contract has been separated into two separable portions, with the works through the main part of the town being completed before December 2017, and the works in the upper section of town being completed between February 2018 and April 2018.

By separating out this portion, the Council has taken some of the time pressure off the works, which are already on a very tight timeframe. This did not meet the original expectations of the Council and community who sought a one year timeframe, but was a realistic compromise.

### ***Bonuses***

As is the case with most contracts, there is a Liquidated Damages regime in place for Separable Portion 1 and Completion Date.

However the Council recognised that the success or otherwise of this project would rest on far more than whether we met those dates alone. Therefore the Council has established a bonus pay-out system, which is payable upon assessment of a number of KPIs and KRAs. These relate to a range of attributes including stakeholder communication, minimising disruption, and meeting the interim deadlines for each 'construction box'.

### ***Summary***

At time of writing, the contractor has been on site for approximately six weeks. After some technical difficulties slowed the initial progress of the works, the contract is now largely back on track.

It is too early to fully endorse the success or otherwise of the various contractual approaches that have been included.

However, there are some observations that can be made.

The use of the 'Minimum Requirement's has been critical in defining an agreed set of parameters for the Contractor to operate in.

It became clear through the tendering process that all tenderers were going to struggle to meet the challenging timeframes, and so all of them were looking for different ways to approach the works. Having clearly defined restrictions assisted the Council in maintaining control over the methods and approaches that were considered acceptable.

The 'construction box' approach has so far fulfilled the expected role, although as yet the works have not progressed to a full scale "box". Nevertheless, the concept of a dedicated area for the contractor to have unrestricted use of the roadway appears to date to be a good concept for the contractor, the businesses and the public.

During the tendering process, a number of concerns were raised about the inclusion of the replacement of the 300mm AC pipe inside the box, due to the potential fragility of the AC pipe. This led to a change allowing the contractor to replace the AC pipe in advance, which has partially outside the box philosophy. However the current works on site has clearly shown this to be a sound and well-founded change.

The dedicated Community Relations person has been a real success, putting a friendly and responsive face in front of all stakeholders, and (so far) dealing with all issues before they escalate.

### **Conclusions**

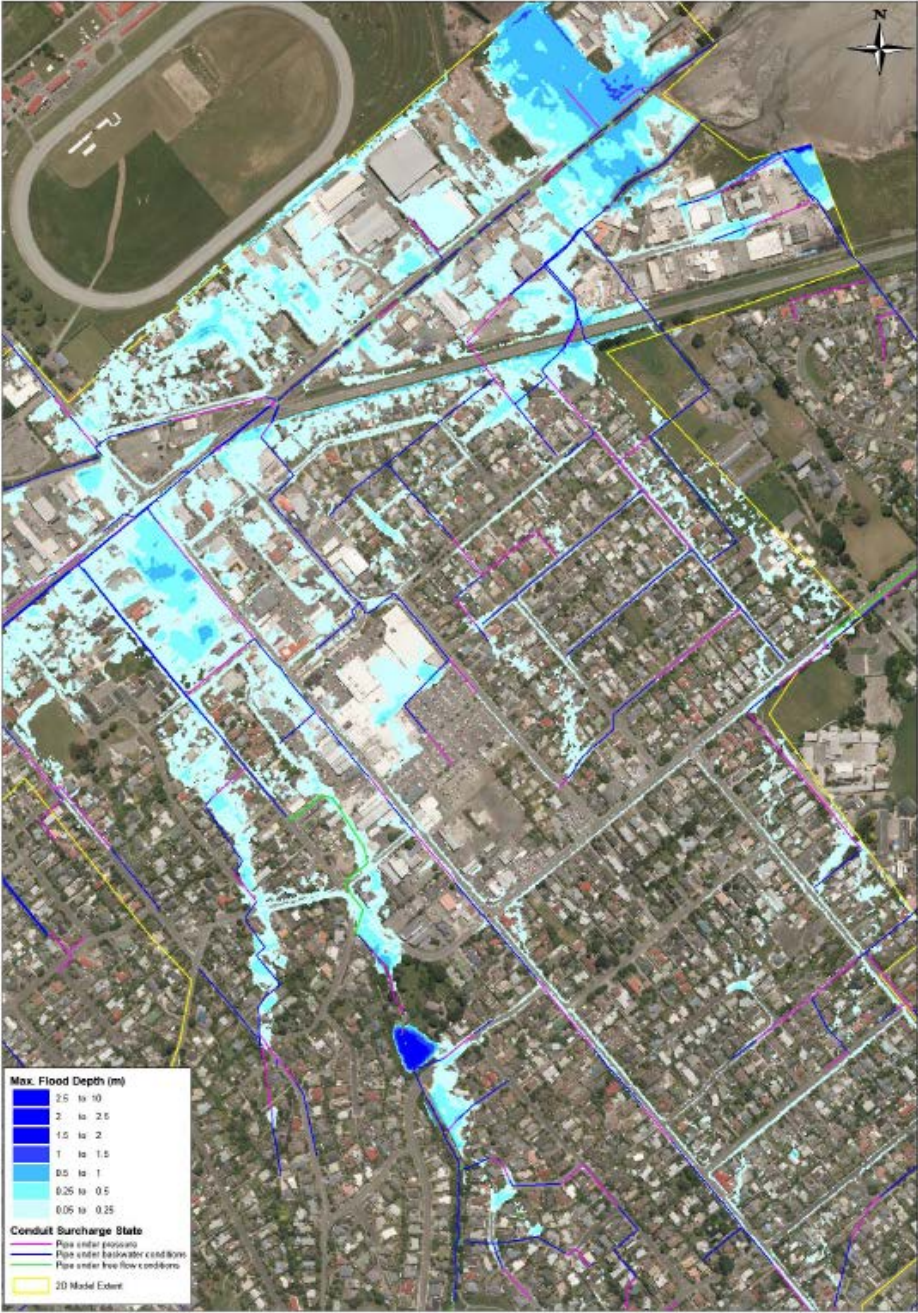
In conclusion, this exciting and challenging project is still in its early stages of construction, but a series of innovative and targeted design and contractual approaches have given the Council and the community a great chance of successfully delivering a year-long major and disruptive infrastructural project right through the full length of Richmond's main street.

### **References**

MWH NZ Ltd (2015) Richmond Central Flood Options Assessment Report. Prepared for Tasman District Council

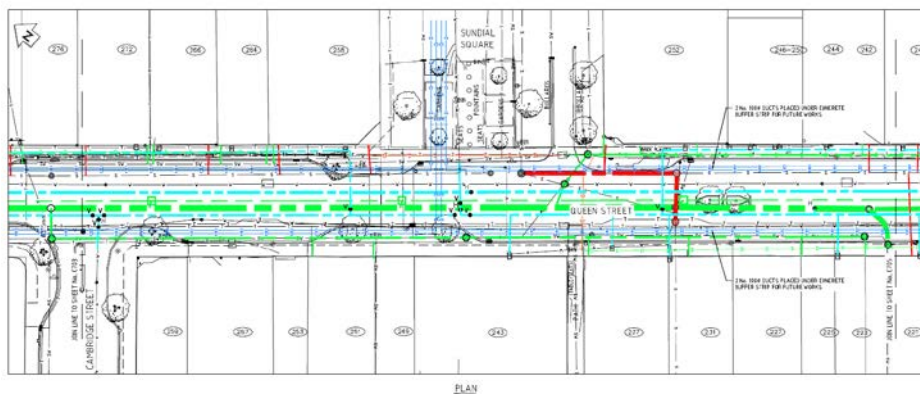
MWH NZ Ltd (2015) Richmond Central  
Infrastructure Renewals Queen Street Utilities  
Design Development Decision Report. Prepared  
for Tasman District Council

# Appendix A – Modelled 100 year ARI Maximum Flood





## Appendix B – Queen Street Aerial and Construction Drawing



### Author Biographies

Don Young is a Principal Engineer with MWH, now part of Stantec, based out of the Nelson office. Don has many years of experience, mainly at senior management level in District Councils (including Mackenzie and Waimakariri District Councils), and more latterly in consulting. Don has been involved in the design development phases and is now leading the local team through the construction phase.

Contact address: MWH NZ Ltd. 66 Oxford Street, Richmond, 7020

Contact e-mail: [don.b.young@mwhglobal.com](mailto:don.b.young@mwhglobal.com)

Russell McGuigan is the Programme Delivery Manager for the Tasman District Council.

Contact address: Tasman District Council, 189 Queen Street, Richmond 7020

Contact e-mail: [Russell.McGuigan@tasman.govt.nz](mailto:Russell.McGuigan@tasman.govt.nz)