

## **A TALE OF TWO TOWNS: a Review of Two Taranaki Rain Events 2015**

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**Theme: Building Flood Resilient Communities: Flood Risk Assessment, Damage Cost Analysis and Management**

### **Abstract**

The purpose of this paper is to compare two separate significant rain events experienced in South Taranaki in the winter of 2015; each resulting in devastating but quite different impacts; and so demonstrating the resilience of the communities most affected through the different responses. In both events, and since, South Taranaki District Council continues to play a central role in assisting with the response and recovery for those communities.

In June 2015 a high intensity rainfall event struck the Taranaki region, depositing huge amounts of rainfall in three days over the eastern hills and predominantly pastoral farming country, and resulting in significant runoff via the deeply incised stream valleys draining this area. A civil defence emergency was declared and the small township of Waitotara evacuated, shortly before it was consequently inundated; 8 houses were flooded; the State Highway bridge closed, as well as numerous local roads impacted by hundreds of slips and dropouts. The estimated cost to repair and reinstate the local roads alone is put at \$10.25 Million.

In August 2015 the region again experienced a significant rainfall event; this time in the catchment above the Opunake Township on the coastal ring plain; however this event was quite different in nature and duration. The storm occurred overnight; with the main intensity over two hours in the early hours of the morning; highly localised and resulting in significant runoff through previously poorly defined channels and secondary flow paths within the township of Opunake, population 1,335. 18 houses were inundated with a further 71 having sheds and outbuildings and surrounds flooded.

By any measure these were damaging events; the paper will explore the different impacts on our urban and rural communities, against established service levels; and review the Council's response and damage assessment including cost; and consider subsequent planning for future similar events.

### **Keywords**

**Stormwater, Annual Exceedance Probability (AEP), Average Recurrence Interval (ARI), flood, South Taranaki District Council, Taranaki Regional Council (TRC), inundation.**

## Introduction

The South Taranaki District is situated on the West Coast of the North Island, covering 361,834 hectares. The total population is 26,577 spread over 16,716 properties (half residential & commercial the other half rural). The main centre is Hawera, with outlying service towns of Eltham, Opunake, Patea and Waverley. Waitotara is a small village south of Waverley on the southern boundary (population 63) see Appendix A. Opunake is the largest service town (population 1,335) see Appendix B.

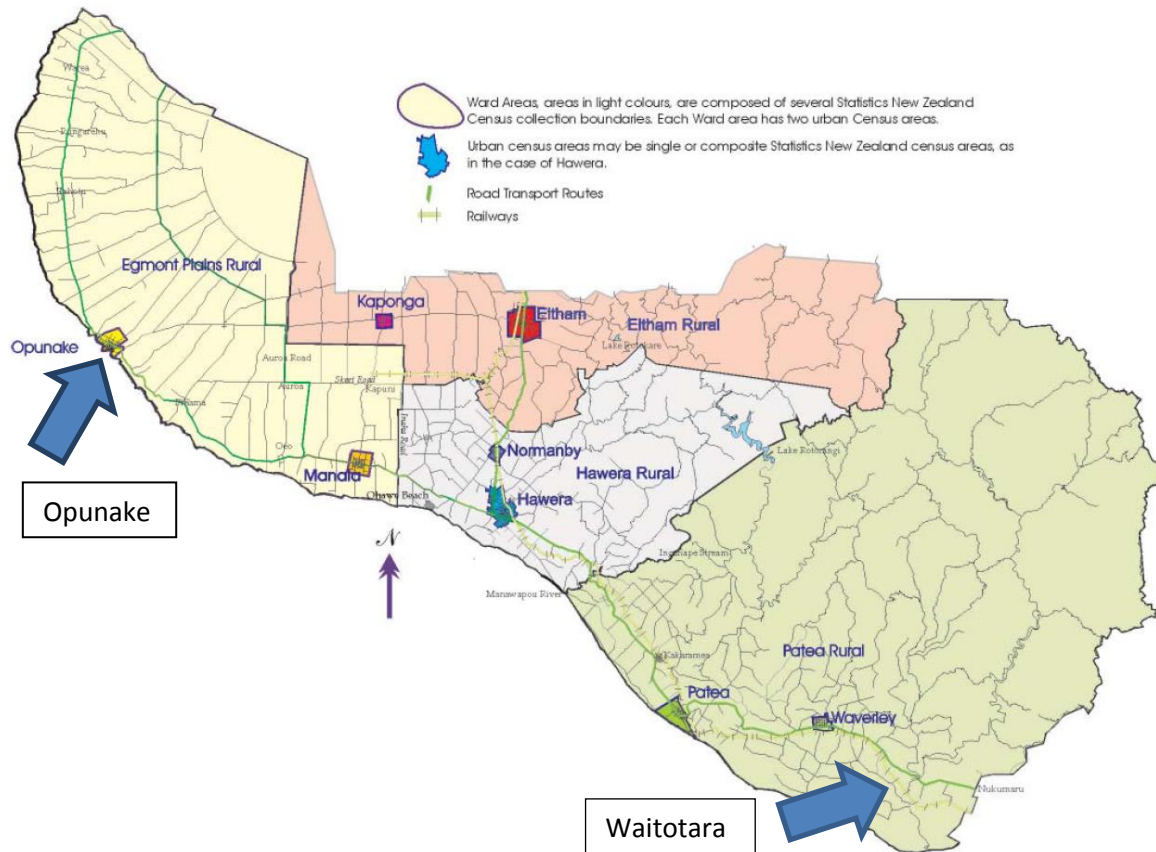


Figure 1 – South Taranaki District

A large storm event occurred over the lower west coast of the North Island on 19-20 June 2015; within the Taranaki area it struck some areas of north Taranaki and the back country of Stratford District. Within South Taranaki District it was concentrated in the eastern hill country; including the lower and mid reaches of the Whenuakura and Waitotara river catchments (see Figure 2). This event not only impacted greatly on Taranaki; Whanganui, Rangitikei, and Manawatu were severally impacted leaving state highways closed and power and communication down. The flood effects for South Taranaki were damaged roads, bridges and farms of the eastern hill country. The village of Waitotara was evacuated as the river levels rose and flooded the township with water laden with sediment. Seven habitable houses were inundated as were other vacant houses, land and sheds; the school was closed and the village streets unpassable.

On 6 August 2015 severe intensity rainfall occurred, centred on the outskirts of the coastal township of Opunake, taking place over a few hours during the early hours of the morning, and led to a flash flood which overloaded the channels through the town, flooding 71 urban properties and causing many evacuations (only 5 formally recorded of the 18 houses inundated). No emergency was declared and almost all affected home owners were back in their properties within a day. Nonetheless numerous properties suffered damage and lodged insurance claims, and Council's urban stormwater infrastructure was damaged.

South Taranaki District Council as the local body for both events above was responsible for the primary response, and led recovery for both the community assistance and its own infrastructure repairs. The work of repairing damaged infrastructure is still on-going as are repairs to residents homes. More detail is discussed below on each event in turn, followed by a comparison of the impacts.

### **Waitotara Event**

The rainfall fell between 19 and 21 June 2015 and was concentrated in the eastern hill country of Taranaki/Whanganui and including the lower and mid reaches of the Whenuakura and Waitotara river catchments. Across the affected area, recorded rainfalls were much higher than previous 'recent' flood events in 2004 and 2006, however in 2015 the worst effects were more localised. The flood effects of the June 2015 event were exacerbated by already low feed levels going into winter and severe road slipping which prevented access for some farmers to undertake normal seasonal work such as shearing and mustering of stock. As a consequence the government declared a medium scale adverse weather event and provided additional funding to assist farmers to recover from the event. Some of this government funded assistance continued into early 2016.

By local measures this wasn't the biggest storm to have hit the region in the past fifty years; there have been significant flood events in the Waitotara going back to 2011, 2006, 2004 and 1990 in recent memory. However the June 2015 event caused significant loss of pastoral farming land through slipping of hillsides, erosion of river flats, and inundation of land within the river valley flood plain.

Preceding the event, the District had received over 100% of its usual June rainfall – even by the end of May rainfall was at 121% of normal for the year. Additionally mean river flows were already well up, with several new high values recorded during the June event.

Rainfall was concentrated through the lower and middle reaches of the Whenuakura and Waitotara catchments, and in the eastern headwaters of the Patea catchment. Intense rainfall (see figure 2) fell consistently from 8 am on Friday 19 June until about 9 pm on Saturday 20 June.

Of interest was the fact that the flood peak in Waitotara Township in the lower river reaches was approximately 1.5 metres less than the event of 2004. This time around seven residential house floor levels were inundated of which none were declared uninhabitable; three of the seven however still require significant repair work. These numbers do not include the abandoned houses in Waitotara or some of the rural houses that were not reported.

The middle and upper Waitotara valley were inaccessible by road for some weeks afterwards, due to siltation, slipping and erosion of the only road access up the valley (Waitotara Valley Road) The impacted areas are represented on the map below (figure 2); this also shows the other affected hill country areas of Mangaehu and Whenuakura.

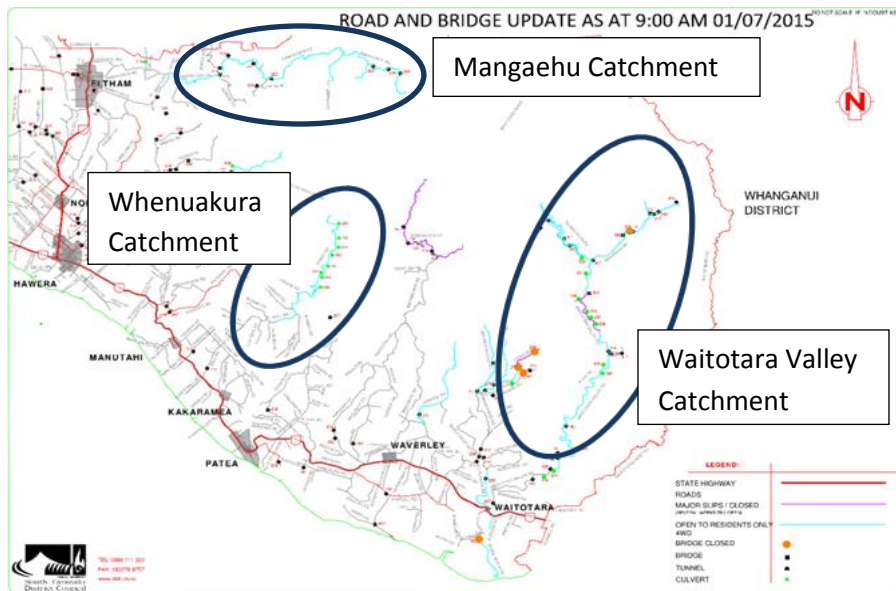


Figure 2 - Areas impacted in the Eastern Hill Country

The river catchment and its tributaries are accessed via the Waitotara Valley Road and Ngutuwera Road, and associated side-roads. The village of Waitotara is the predominant settlement of the catchment, located at the junction of the Waitotara Valley Road and State Highway 3. The viability of the Waitotara settlement has in the past decade been challenged by a number of devastating flood events, while the Waitotara School has undergone complete refurbishment.

In the upper Waitotara River valley lie the rural localities of Rangitatau, Puau, Orangimea, Tawhiwhi, Makakaho Junction, Ngamatapouri and Taumatatahi. Located in the upper reaches of the Makakaho Stream is the locality of Makakaho. The upper valley localities and marae are particularly isolated, Ngamatapouri Primary School being 47 km from Waitotara Village. Marae are situated in the river valley at Waitotara (Kaipo) and 20km up the Waitotara Valley (Takirau). Both were severally inundated; Takirau's Wharenui and out buildings were all inundated by 0.5m or more depth of flood water depositing large silt loads. The marae was isolated for four to five days after the event, accessible only by helicopter in that time.

The purpose of this discussion will be to compare the relatively limited impacts experienced in the township to the very devastating and long-lasting impacts on the farming and rural community up and down the Waitotara River valley and tributaries.



Figure 3 - Typical farm situation post flooding

## Rainfall

Calculated rainfall return periods ranged from 56 – 108 years for the various catchments as below. The total rainfall for the event is estimated<sup>1</sup> at between 100-200 mm for the hill country of South Taranaki.

The calculated Average Recurrence Intervals (ARIs) for the respective catchments, based on HIRDS rainfall data are as follows;

Waitotara Catchment	1 in 56 years
Whenuakura Catchment	1 in 74 years
Mangaehu Catchment	1 in 108 years



Figure 4 - Waitotara Village 21 June 2015

Significant damage was caused to infrastructure including bridges and under-slipping and over slips to roads, the flooding preventing road access, and power disruptions. Massive slips and landslides, as well as surface flooding, blocked local roads and the State Highway 3 bridge at Waitotara was closed to all traffic. A state of emergency was declared on 20 June and the Waitotara Township was evacuated prior to the flood peak at the township late on Saturday evening.



Figure 5 - Waitotara School

## Roading Impacts

The other residential area of Waitotara affected by the flood is the coastal settlement of Wai-inu Beach; although not flooded or impacted by the storm, apart from a brief power outage, the only road into this village had become inaccessible. Wai-inu Beach Road leaves State Highway 3 and passes through the Waitotara Village; there is a two-span bridge (known as the “Limeworks Bridge”) that crosses the Waitotara river, this was severely damaged during the flood with the abutment undermined and the bridge deck became unsafe (see Figures 6 and 7). The only access was overland through a farmer’s track for four wheel drive vehicles for approximately three weeks after the event.



Figure 6 - Limeworks Bridge Waiinui Beach Road

Figure 7 - Damage to Limeworks Bridge

As well as Waiinui Beach settlement, also cut off so was the local meat works plant; once the flood waters receded (days later), the long term viability of ensuring the meat works could operate became important as its closure would mean a loss of many jobs in the District. This was not the first time the Limeworks bridge had been damaged in a large storm event; wholesale replacement would still leave this area vulnerable in another flood, so a decision was made to repair the bridge and keep in its current position as a medium term measure, this has since been completed. A project has been initiated to construct a new road to Wai-inui Beach and the meat works that access the State Highway south of the Waitotara River; this will provide a resilient long term solution. The farmer most affected by the temporary diversion of traffic across his land offered the land for the new road (6.5 km).

Roads in rural areas form the critical lifeline for residents of those communities. Below is a table showing the estimated costs of repairs and reinstatement of roads in the affected catchments; this includes bridge repairs and replacement (in one case) with the new 6.5 km road route (above) to be constructed, still under consideration by the Council and the New Zealand Transport Agency (NZTA).

<b>As at October 2015</b>	<b>Cost Breakdown</b>
Road work	\$7,550,000
Bridge Repair Work	\$700,000
Professional Services Fee	\$400,000
Limeworks Bridge/Alternative Route Project	\$1,600,000
<b>Total</b>	<b>\$10,250,000</b>

Table 1

### **Economic Impacts**

Relief packages to farmers have been provided by Government and the Taranaki Regional Councils e.g. over \$500,000 fund is available through TRC to affected farmers for slope stability plantings and soil slip debris re-vegetation, and replacement of riparian planting. The Ministry of Primary Industries (MPI) estimates the total on-farm cost in the Taranaki-Whanganui regions to be approximately \$70 million.

The government is pledging to spend a further \$8.8 million over four years in rural assistance packages. This is shared across the three districts of Taranaki, Whanganui and Manawatu.

District councils fronted the emergency response to the event and have provided on-going resources and some funding for specific activities, plus repairs to damaged local authority infrastructure, predominantly roads, at a cost of \$2.6 million. There is a further \$10.25 million for Taranaki Roads that NZTA have agreed to fund; they estimated \$20 million for the three affected district Roding Controlling Authorities, however this has already been exceeded as the full extent of damage was realised.

### **Environmental Impacts**

The natural outlets of two historic landslide-dammed lakes in the Waitotara catchment in South Taranaki eroded during the storm; one of these was drained completely while the other (Lake Mangawhio, 10 hectares in area) dropped an estimated 5 metres in level with an associated substantial permanent loss in volume of approximately 500,000 m<sup>3</sup>. The effect of this additional and sudden rush of water on the Waitotara River must have also contributed to the severe downstream flood effects.

A subsequent report by GNS Science commissioned by the TRC noted that although the scale of the June 2015 event was not as extensive as in 2004, some farmers reported that landslides from the 2015 storm were worse. GNS commented that this damage pattern can result when intense rains storms are nested within a broader rainfall system. The rainfall chart below for Taranaki (courtesy of Taranaki Regional Council) shows significantly higher rainfall for particularly the eastern hill country compared to the June average;

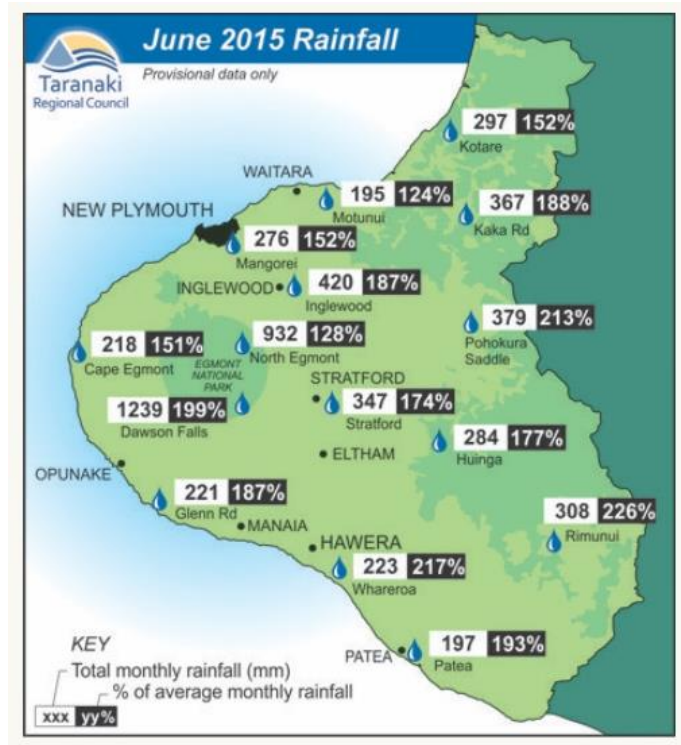


Figure 8 - June 2015 Rainfall

The majority of the June figures presented above are attributable to the event of 19-21 June.

The greatest impact of the June storm was on sheep and beef farms, predominant in the hill country terrain where dairy farming is less viable, and due to the quantum of landslides and damage to on-farm infrastructure such as bridges, culverts and fences.

There is an estimated 6,000 hectares of forestry in the catchment of which those plantations less than five years old were worst hit, affecting an estimated 800-900 hectares. The financial impacts are quantified at \$2,000 per hectare, at a resultant cost of \$1.6 million, not including reinstatement of road access.

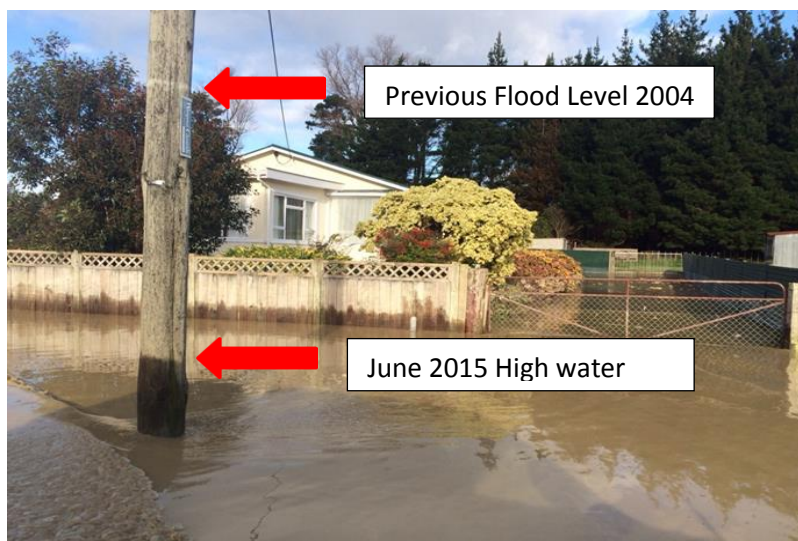


Figure 9 - Comparison of flood levels



## **Impacts on Community**

Most of the rural homes were inaccessible for up to 2 weeks (some in the remotest areas three weeks) as roading contractors started at the bottom of the valley and cleared slips progressively up the road. In some areas the local farmers who had diggers were employed as subcontractors and cleared their sections of the road. The slips and under slips were cleared to one lane 4wd vehicle access only. Power supplies were cut for several weeks and telecommunications lost at times; essential supplies were helicoptered in as well as evacuations carried out when needed. Once communication was established and regular updates on progress were given to the residents they worked together to look after their communities and start the long task of cleaning up.

Flooding events in the Waitotara township have happened on a regular basis over the last two decades and many of the previously flooded residential houses have either been removed or raised. Some houses have been paid out by insurance companies and gifted to the tenants as they are uninsurable. Although these floods are still inundating houses and causing massive disruption to the residents of this community it could be said that everyone has become better at dealing with the results, including Council, contractors and emergency services. This time the township had early warnings thanks to the monitoring stations up river and the police were able to evacuate the township. Once the waters receded, clean-up started with a systematic approach to clearing the mud, as pipes and open channels needed clearing to first allow for the streets and then private properties (above the road) to be cleared.

Of the seven houses inundated four were on bore water and could not live in the houses until testing of the water for sanitary condition could be established. Also portaloos were brought in as septic tanks had failed. As a consequence temporary accommodation was found for those affected through the welfare centre.

### **Opunake event:**

In August South Taranaki District again experienced a significant rainfall event; this time over the Opunake Township on the coastal ring plain; however this event was quite different in nature and duration to the Waitotara flood in June. The storm occurred overnight; with the main intensity over two hours in the early hours of the morning; highly localised and resulting in significant runoff through previously poorly defined channels and secondary flow paths within the township of Opunake, population 1,335. Eighteen houses were inundated with a further 71 having sheds and outbuildings and surrounds flooded. A road and water main were undermined too as an urban culvert overtopped spectacularly at Dieffenbach Street (see Figures 9 & 10)

On the day of the flooding a local welfare centre was set up by the Council in Opunake with 5 properties initially evacuated to the centre; by the end of day they were able to go back to their houses, only one could not return and temporary accommodation was found.

Comparing the total number of residential floor levels inundated (18) with Waitotara (7) shows a very different event to the Waitotara flood. The flooding occurred over a short period and the waters fell back to manageable levels

relatively quickly; allowing people to get access to their homes and get on with the clean up the same day. Having reticulated water and wastewater networks helped in this regard.

This event also differed in how it was handled as an emergency; the Opunake community had written their own Emergency Plan with the help of the TRC, and this had only been completed several months beforehand. The Deputy Mayor who lives locally headed up this proactive approach; when the storm event struck the and the other community members lead the response from the ground. As a result of this the outcome was better co-ordinated, communication was better and gathering information became more systematic. It had also only been 6-7 weeks since the Waitotara flood for a lot of the key staff from Council and TRC so staff and contractors were generally well seasoned.



Figures 10 and 11 - Dieffenbach Culvert Failure

Speaking to residents that have lived in Opunake for over 50 years they cannot remember any events larger or flooding of this magnitude; as a consequence there is now a large portion of the town that no longer feel that the stormwater systems work effectively and they are now concerned that this could potentially happen again.



Figure 12 - Flooded property Opunake

What we have found in our investigations since this event is that the insufficient capacity occurred mainly in the streams that run through private property, with debris and overgrown stream banks impeding the flow. Council's approach up until this point was to leave the maintenance of these streams to the individual landowners; in some cases this worked well and the streams remained clear, in many places the stream areas were used as dumping areas and poorly maintained. In some cases residents took great pride in their backyards and built structures or channelled the stream through a smaller area; this had the same affect, restricting flow and adding debris to the streams.

The rainfall event was quite different in intensity and duration to that of the Waitotara area experienced one and a half months earlier. Ground saturation (soil moisture) levels were also a contributing factor to the run-off effects experienced. Rainfall was recorded on 4 August of 177mm rain with a peak intensity of 33mm/hr, however the actual flooding event on the 6 August resulted from 186mm rain with a peak intensity of 20mm/hr. The first storm saturated the ground and filled depressions before the event that caused flooding.

Importantly Opunake is on the edge of the Mount Taranaki volcanic ring-plain bordered to the north east and up-gradient by intensively farmed dairy pastureland and farms. Significantly two small creeks which carry run-off from those farms bisect the town forming the back boundary to many residences within the town. In some cases residential properties have been modified to include the open waterway as a landscaped feature, and in others the watercourse has been piped or bridged, or realigned by the respective landowners.



Figure 13 - Debris blocking open drains in private property

A compounding effect on 6 August 2015 was the failure of a modest detention pond, built within the township by the Council in 2011, primarily to provide attenuation of storm flows and protect downstream properties. In the event the inflows exceeded the capacity and hydraulic detention time offered by the structure, and the earthen side bunds were over-topped, flooding through the back of three adjoining residential properties. Subsequent investigation has shown that the secondary flow path does not spill as intended by the design.



Figure 14 – Stormwater Detention Area

**Infrastructure Affected:**

Waitotara township has a minimal amount of stormwater infrastructure (pipes and drains mainly) at \$0.55M replacement value, compared with Opunake township at \$4.06M per table below. The relative permanent populations for the two towns however are 63 and 1,335<sup>2</sup>.

Waitotara	\$551,475
Opunake	\$4,061,613

As noted earlier, Waitotara valley and village has previously experienced damaging floods through the village – as a result, from 2004 the South Taranaki District Council came under local pressure to improve drainage and flood protection measures were investigated. The primary risk of flooding arises from the Waitotara River which flows to the immediate south of the village. Protection measures would need to include significant river training and modification works, which the Taranaki Regional Council and District Council considered were too expensive to construct. Significantly a number of houses within the village had a Section 36 order placed on them under the Resource Management Act (RMA) and we understand the owners of those properties are unable to secure insurance against flooding. The South Taranaki District Council did make funding

<sup>2</sup> 2013 census figures for normally resident population

available to villagers to relocate their houses or to raise them above the flood level – this level was in places 2 metres above the road. The TRC and STDC jointly contributed to a maintenance scheme removing willow trees and vegetation from the river banks to remove obstruction to the flood flows within the river channel. On the face of the evidence this vegetation clearance appears to have been a highly successful tactic in reducing inundation levels in the village i.e. the peak river flow was higher than the peak in 2004, yet flood levels in the town were in the order of 1.5 metres lower.

## **Social Impacts - Resilience**

Farming communities on river valleys know that there will be floods and develop their infrastructure with this in mind (e.g. siting and selection of bridges over streams and rivers). While their farming operation is susceptible to flood losses, and the effect on their balance sheet adds stress, these farmers generally expect to experience severe flooding at some point. That is not necessarily the case in towns – flood effected residents from the 6<sup>th</sup> August 2015 event within Opunake in many (if not all) cases, had no knowledge of the potential risk opposed by the ephemeral creek or watercourse in their back yard – similarly Gisborne Terrace (in Opunake) residents expected that the small flood detention pond built on one watercourse within the town was going to withstand all events. So what lead to this complacency?

## **Discussion on Contributing Factors**

We consider that the following factors contributed:

1. Lack of clarity around the status of drains and watercourses
2. Lack of maintenance carried out as a result of this not being clear
3. Lack of understanding of the differing statutory roles of regional and district council
4. Increased run-off effects through intensified pastoral land development
5. Poor choices made in regards to developing land and sighting houses in vulnerable locations.

South Taranaki District Council's stormwater budget is modest and amounts to the equivalent of \$855.30 per urban serviced household, or \$66 per rateable property per year. This is shown compared with spend across the water and wastewater networks, see table below. By comparison the national average is \$148 per property (WaterNZ National Performance Review 2014-15).

<b>Service</b>	<b>Total pipe length (km)</b>	<b>Operational Budget</b>	<b>Operating cost per serviced property</b>	<b>Operating cost per lineal meter</b>
Water	618	\$4,070,000	\$410	\$6.59
Wastewater	188	\$2,436,000	\$327	\$12.96
Stormwater	87	\$713,000	\$855	\$8.20

The total number of serviced properties is 2,720; total number of rateable properties in the District is 16,716, with the difference reflecting the mostly rural setting.

A consequence of the lack of budget available for storm water combined with an infrequent demand led (in our view) to an expectation that urban householders bordering the open waterways were expected to maintain their stream banks. This was only conveyed to the property owners when they came to Council for what they saw as Council responsibility, so the effect was a reduction in waterway peak capacity, as neither was willing to maintain the stream and vegetation. Culverts were inspected by roading contractors and kept clear but nobody took responsibility for inspecting the waterways in private property. In fact subsequent research has shown that the Council reviewed the matter of drains maintenance in 2005 and again in 2007 (post Waitotara floods of 2004, 2006) with no change at the time.

The lack of maintenance on some properties has meant that rubbish and garden waste was dumped along the stream banks causing problems for other residents and blockages in the culverts. No spraying or tree trimming of low hanging trees took place either. More vocal residents have expressed frustration with what they saw as Council not taking responsibility and Council saw as beyond their level of service.



Figure 15 - Debris pulled from Diffenbach Culvert

In the last twenty years farmers requiring more pastoral land to make their farmers more viable has meant draining wetlands, straightening streams, and flattening rough paddocks. This has all contributed to an added velocity to the streams and water ways above Opunake. Works on waterways in rural areas are not always carried out with TRC approval, just as many urban residents have seen the need to improve their properties and pipe natural water courses with whatever they can use cheaply (44 gallon drums being a typical example).

When development of our provincial towns was carried out in the 1970's and 80's there was a lack of awareness of the effect of draining swamps and diverting flows, and at the time impact was low as full urbanisation had not occurred nor had the change in weather patterns; it's not until years later when the upper catchments are being piped and large impervious areas created that the impact of increased velocities with open streams that have been diverted have been realised, example being Ponderosa Place where the properties at the top of the cul de sac had a metre of water through their houses.

## **Conclusions**

So what were the commonalties and differences between the two events and their relative effects?

## **Vegetation Effects**

The rainfall for both events rose in the catchment headwaters, mid and upper reaches, beyond the two towns impacted. Progressive land clearance of natural vegetation for pastoral development over decades has contributed to faster runoff and higher peaks.

Although the flood peak flows were the highest recently recorded for the Waitotara River (at Riminui, TRC gauging station) the flood peak in the township of Waitotara was at least 1.5 metres below that of 2004 (see photo), the 2004 peak marked by a white painted line on the power poles.

The lower inundation has primarily been attributed to the vegetation (mainly willow trees) and channel clearance the Taranaki Regional Council has undertaken in the mid and lower reaches of the river channel in the past ten years; costing about \$30,000 per time, and shared equally by TRC and STDC.

It is somewhat of an irony that a major contributing factor to the flood impacts on residential properties in Opunake in the August event was due to the vegetation in the open channels, there as a result of a lack of any clearance by any party. This hands-off approach was deliberate on the part of the District Council – who had previously adopted a policy that urban property owners were responsible for the maintenance of urban stormwater drains located on their own properties, including those drains which receive run-off from land upstream of their own property. This policy was presumably based on the Council not wanting to incur the extra maintenance cost. A consequence of this practice is that property owners, unless reminded regularly, and followed up with inspection by Council, relinquish their maintenance obligations over time, with the resultant reduction in capacity of the waterway, and commensurate increase in flooding risk for them. An additional contributing factor is where property owners make modification to the local drains on their property without engineering advice, or council knowledge and effectively impede or block the flow of water. Sections 511-512 of the Local Government Act (LGA) 1974 allow for the Council to require the land owner to remove obstructions, however this is less likely to be picked up in these types of streams, and especially so if the Council is not proactively inspecting drainage systems.

## **Level of warning**

The Waitotara event was a result of a slow moving low pressure system, with two days of persistent and heavy rain, high in the catchment, and on the back of higher than average rainfall for the preceding two months. Residents of Waitotara in the lower valley had adequate warning, as did Civil Defence staff who had seen the effects before (2004, 2006). Hydrologists based in the regional civil defence headquarters were able to use the time-stage relationship to predict approximate flow peak and timing which allowed for a timely declaration of emergency and evacuation order for Waitotara township (issued 9pm on Saturday 20 June). Consequently residents received adequate warning, nonetheless occupiers of some at risk properties refused to leave by night and were forcibly removed by Police.

In Opunake's case the rainfall occurred over a few hours, centred outside the township, overnight and primarily in the early hours of the morning, creating a 'flash flood'. Add to this the fact that some occupiers were not aware of the presence of the (normally placid or dry) open channel through their property, and had not experienced such flooding on their property previously. Effectively in Opunake we had a vulnerable community ignorant of the flooding risk posed.

## **Council's Solution**

During the 2015 winter Waitotara and Opunake were not the only places dealing with stormwater issues in the District; Eltham and Hawera towns had ongoing historical issues that Council had not solved as budget and resources had meant doing the best that could be done with what we had. An example being; privately piped waterways creating obstructions and causing flooding to the upper catchment; to alleviate the problem Council would initially clear the blockage to allow flooding to recede. The next step of addressing the issue of the ownership and responsibility for undersized and unsuitable piping had never been adequately addressed. Historically when the engineer did try to resolve these types of issues there was no consistency applied or no appetite for either Council or the private owner to fix.

The Opunake event highlighted many of the stormwater problems of the District and gave an opportunity for the community to take greater interest in stormwater and its impacts if not managed. In February of 2016 the Council adopted a Stormwater Policy 'taking back' responsibility for maintenance of public drains in private property, and agreed on extra spend in the maintenance budgets to reflect this change. The next step is to now identify all of those affected drains, determine their status (whether public or private) and set up maintenance inspections with Council's contractor, or otherwise agree on maintenance arrangements with the property owner.

An important role for Council's engineering staff will be as public educator, as the Council deploys resources to set up regular inspections and requires owners of private drains to clear up waterways or otherwise have council carry out the work and invoice them. Unfortunately it seems house and contents insurance premiums typically don't take into account mitigating factors in reducing flood risk on a case by case basis.



The TRC too have both a regulatory and public education role. TRC rivers engineers have worked along with District Council staff to identify solutions and inform public of progress. This common interface is an opportunity for both public bodies to get common messaging to our customers (who are all part of the same community both Council's serve). This could for example include an explanation of how Annual Exceedance Probabilities (AEP) apply and demonstrating the effects for different AEP.

Storm water hydraulic and dynamic models provide a great means to show flood mapping and demonstrate the predicted effects to a sometimes ill-informed public. Combined with clear explanation in 'lay-mans' terms there is great opportunity to raise public awareness on the risks of flooding. Eventually the flood hazard mapping will be added to the District Plan to assist in raising awareness for future property owners and to promote better development outcomes.

The winter of 2015 was a turning point for STDC in our approach to stormwater and the resilience of our towns, as we move to a point in urbanisation that requires a more sustainable approach.

Although there is a large amount of work ahead of STDC providing the best protection we can with the resources we have (within agreed levels of service); there are ways to engineer solutions and work with the public that don't have to cost greatly. Out of these two floods have been good outcomes; the public now understanding the risks and a willingness in most cases to work with us, a new policy that sets a clear way to move forward, a better working relationship with the regional council and most importantly funding to create sustainable development and infrastructure that perhaps would not have happened without the events of 2015.

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Taranaki Regional Council (TRC)

GNS Science

Taranaki Emergency Management Office (TEMO) and Taranaki CDEM Group

## APPENDICES

Appendix A – Waitotara Village (2012) with Waitotara River central (flows right to left)



Appendix B– Opunake Township



APPENDICES, Continued

Appendix C – Limeworks Bridge Area before and after June 2015 Flood

