

PANDORA'S BOX? OR THE NEIGHBOURHOODS OF TOMORROW

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ABSTRACT

Our cities, towns and communities are moving into a complex era defined by a mixture of certainties and uncertainties around climate change, and community expectations for urban form and environment. Has Pandora's box been opened, or in our urban environments can stormwater be the fashionable 'new black'?

Stormwater management has always played a major part in the design of our towns. Yet in many cases 'stormwater' has been seen as a nuisance or even a hazard to be controlled and expelled as quickly as possible. But this has already begun to change and the change is gaining pace.

Our communities are demanding appropriate responses to cultural, recreational, movement and residential needs. Increasingly there is a blurring of the lines between engineers, planners and designers. Could this mean a corresponding comprehensive rethink for stormwater management?

Smart and Resilient towns are looking to new ways to address the twin challenges of managing more frequent extreme rainfall events while minimizing impacts on downstream water quality and urban amenity. As one of our greatest future assets stormwater and its management infrastructure, through a collaborative and integrated response will be a key part of the design of our high and low density urban subdivisions, parks, and movement opportunities. Not to forget the integration of these things with one another.

This paper presents a challenge to stormwater asset managers as critical future guardians of both a water resource and our urban environments. Using examples from Tauranga, and a 'live' project from the iconic coastal settlement of Raglan, Nick, and Surya will show how an integrated outcome based approach will help protect what may in coming years be our most valuable resource – water, while at the same time delivering high amenity urban environments and delivering a typically 'kiwi' way of life into the decades to come.

KEYWORDS

Stormwater; Urban Design; Amenity; Recreation; Neighbourhoods; Resilience; Cultural; Kiwi

PRESENTER PROFILE

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1 INTRODUCTION

1.1 A TRULY KIWI CHALLENGE – PANDORA'S BOX? OR THE NEIGHBOURHOODS OF TOMORROW

This paper sets out to explore what is fast appearing to be a fundamental opportunity in the way we plan our towns. In particular, the way in which we plan for, build, and manage stormwater infrastructure.

These days we hear a lot about why we need urban environments that are 'integrated', 'holistic', 'resilient', future-proofed', 'people-centric', 'place-based' and so on. Stormwater infrastructure has and is perhaps becoming a key part of the way in which we quietly secure these attributes for our towns and cities.

We all know live in a country that is wet. We get a good amount of rain. I spent a lot of my childhood living in places like the West Coast, and Taranaki, so I know we have places that get a lot of rain. We also live in a country where people like to live in the *kiwi-dream*, low density residential developments. Where people, for the most part, value and have ready access to the outdoors.

We can argue about whether climate change is real, but the consensus appears to be that in the future our cities need to be better able to deal with more frequent and more extreme rain events, and more extreme droughts. Government Guidance on climate change science has been telling us this for some years now.¹

So, what does all of this mean for us as we plan, design, develop and manage stormwater infrastructure in our urban environments? Environments where we have started to open up, daylight, our pipes and drains and return them to more natural landscapes, is there any evidence of a reaction from our urban communities?

In this paper, I will look at some examples of how the built form of the rapidly growing city of Tauranga has responded. Also in this paper, Surya Pandey of Waikato District Council looks at the potential for stormwater infrastructure enhancement in the community of Raglan. I don't delve into the detail of rain gardens, swales and similar features, undoubtedly these are important those are things best designed for the specific location in which they will be placed. Rather I will look at the bigger picture of how combinations of these features can transform our urban environments.

2 THE NEIGHBOURHOODS OF TOMORROW

2.1 SOME CONTEXT - HOW DID WE END UP HERE?

To look forward, first I want to take a step back. For some context, we should remember that certainly since the 1990's the Resource Management act has not philosophically promoted proactive town planning or urban design, but rather a reactive response to development.

In 2003-2004 I led the development of the 'environment' components of the *Tauranga Tomorrow* – vision to 2050 strategy. I took a very clear message away from that project. The people of Tauranga valued quality in their urban environments. Securing higher amenity through urban form and opportunities for things like walking and cycling were key aspirations.

I followed that up with taking the Team Leader role for the Council's consents team. It was a time of high growth, and as one would expect in a time of high growth, we had a lot of subdivisions. We had a lot of quite large subdivisions, 200-300+ allotments in each one and many of these were close to or immediately adjacent to one another. This presented an opportunity.

In 2006, having moved on to Opus I presented at the 2006 Thinking Recreation Conference, a conference run by the New Zealand Recreation Association. At that conference, I spoke about my experience at Tauranga City Council and the need for recreation planners, land use planners, and infrastructure engineers to work together to secure the best location and design for integrated and connected new reserves.

Today we have a population that is around 85% urbanⁱⁱ, and that enduring desire for the kiwi ¼ acre dream, even if we no longer understand what an acre is and its shrunk back to closer to 500m². In a new subdivision this is typically part-covered by a 200m²+ dwelling. Last but certainly not least we increasingly have urban communities that are demanding higher quality towns and cities. Upgraded town centres and main streets, safe and convenient walking and cycling trails, waterfront promenades and entertainment precincts, places to 'play', opportunities for informal and/or passive recreation, responses to needs associated with culture, art, and what is rather arcanelly known in urban planning circles as 'place'.

Sure, not everything is spot-on just yet, we also have virtually no bike racks in schools and garage doors have emerged from the shadows to become our front porches. We have a housing shortage, in some places, and traffic jams, in some places. But lets face it. A new urbanist approach to securing enhanced urban amenity has arrived.

Urban amenity has become one of those important things we all want. So has resilient infrastructure. And this is where we start, with the combined objective of resilient urban amenity.

2.2 IS STORMWATER THE NEW BLACK?

In the past the approach has often been to pipe stormwater. Stormwater has been viewed as a nuisance to be disposed of. We've hidden it, contained it, piped it and then generally thrown it into the sea as fast as we can.

But over the past decade, for various reasons, a new trend has begun to emerge. This has resulted in our cities turning towards stormwater, taking away the pipes, or at least

some of them, enjoying our stormwater, and perhaps a little more respectfully allowing our stormwater to make its own way to the sea.

The introduction of features such as walking-cycling tracks, native and landscape planting and moderate maintenance has resulted in a diverse range of what are almost informal parklands in our residential environments. Connecting these together creates green corridors, connected networks not just for the movement of stormwater but also for the movement of people, and wildlife. Better yet, these spaces have often improved or even become high in amenity.



Photographs 1, 2 and 3: Photograph 1 shows an early photograph of Carmichael Reserve in the suburb of Bethlehem North. Houses are positioned to maximize their views

over the reserve to the north and east. Photographs 2 and 3 show the stormwater reserve as it was prior to development, and as it is in 2017.

Turning to Tauranga just over a decade ago, I asked a question, what would happen if we 'placed restrictions' on high fences onto these drainage reserves. What if we said low or no fences. What if we said 'road frontage' for parks, not hidden behind houses and fences? Seemed like a good idea at the time. Ten years on I went back to have a look.

Generalizing, what ten years ago was a semi-hidden, arguably undesirable drainage reserve, has become a valued local open space, connected to other like open spaces. Houses have low, and sometime no front fences, and face onto the amenity of the reserve. Houses are I'm told these days even marketed referencing the amenity afforded by the ponds, channels and open spaces.

'The Lakes' subdivision has gone further still and made a feature of stormwater (see photographs 4 to 7) Large stormwater detention ponds surrounds by pathways and walkways, rings of overlooking houses, open space and playgrounds and a small commercial hub.



Photographs 4 to 7: The Lake subdivision during construction in the mid 2000's, and in March 2017

Houses in other subdivisions are also clearly orienting towards and marketing a prized overlooking of stormwater reserves as evidenced by the below photographs 8 and 9 from the eastern suburb of Papamoa.



Photographs 8 and 9: Residential properties in Papamoa orientate towards the amenity afforded by stormwater detention ponds and basins.



Photograph 10: Connected walkway-cycle networks along the Wairakei Stream, formerly known as the Papamoa Main Drain

These spaces are heavily utilized by a range of recreational activities. Some of the main users are cyclists, walkers/joggers, and dog walkers. But there is also evidence and advice of activities such as orienteering, and remote controlled boatsⁱⁱⁱ. They have also become safe routes to school used by local 'walking school busses.

Contrast this with a reasonably large reserve just 200m down the road. In that case there are no stormwater ponds or channels. The reserve is large and fairly flat and also surrounded by a large number of residential dwellings. Maintenance appears to be at least similar, yet the space lacks character. It doesn't have that sense of uniqueness or 'place' or visual interest that the stormwater reserve ponds, waterways and undulating landscapes add. Most telling is the manner in which residential properties around this

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space have turned away. This space isn't faced onto by adjacent residential dwellings, rather these properties have typically erected 2m high solid fences. The same is true for a matching space opposite containing a playground. See photographs 11 and 12. This indicates that the difference between the spaces is not just a lack of function or activity but a lack of outlook and amenity. Stormwater can be attractive.



Photographs 11 and 12: Open space reserve in Papamoa surrounded by high fencing, a striking contrast with the low and visually permeable fencing and gateways adjacent to nearby stormwater ponds and waterways.

Anyone that has visited towns and cities with well designed neighbourhood squares and reserves will know that open doesn't space doesn't need to water to be attractive. But often such spaces are highly and more formally landscaped or have other specific features of attraction. Perhaps what the example of Tauranga is suggesting is that where we have large interconnected areas of open space, the presence of water in ponds or streams and the associated informal landform, landscaping and vegetation of a stormwater reserve is able to achieve similar benefits for a much reduced level of landscaping intervention and maintenance.

A further point worth noting is that these types of landscapes are often unique in some way, for example in the placement and shape of the streams and ponds. This uniqueness is able to be reinforced through simple design techniques such as signage, referencing heritage, cultural or ecological sites. Combined with a 'place-based' approach these techniques can form important focal or reference points for local communities and provide or reinforce the local identity and valid distinction from 'anywhere' suburbs that many communities consciously or sub-consciously desire.



Photograph 13: Another stormwater reserve in Papamoa, the stormwater channel just below the photograph. Here even simple grass combined with the undulating stormwater landscape and presence of water is enough to remove the fences and add in the access gates.

So taking these things into account it is fairly evident that no longer is this stormwater just a nuisance to put in a pipe or hide away in a weedy unkempt back-area. It, and the access to recreation and visual amenity afforded by it in the form of ponds and expansive green detention areas has become a significant opportunity for positive urban amenity for surrounding residents.

Considering the environment shown in photograph 13, it also appears that even where not all of this amenity has not been fully realized, there is a notable expectation that this will occur in the future. The dwellings have already oriented towards it. There are no walking tracks or areas or planting yet in this open space, just expansive grass.

Community orienteered information boards are now located throughout the Tauranga stormwater reserves. These cover a range of topics such as 'preventing pollution', 'how does the stormwater system limit flooding', 'how do stormwater ponds reduce pollution', and 'how does rain get dirty'. explaining the importance of clean stormwater and the role the stormwater reserves play in this.



Photographs 14 and 15: Stormwater information boards in Bethlehem, these are present in stormwater reserves around the city. They provide information to the community on the importance of the stormwater system and reserves for the management of flood risk, ecology and treatment of stormwater.

If we take Tauranga as an example of New Zealand low density urban development it appears increasingly irrefutable that stormwater and its management infrastructure, through a collaborative and integrated response will, and arguably already has, be a key part of the design of our high and low density urban subdivisions, parks, and movement opportunities. In examples such as these, community expectations for urban form and environment have already changed, and stormwater is no longer the nuisance to pipe and hide away, or the problem weedy area over the 2m high back fence, it is already well on the way to being a fashionable item for your backyard. Or perhaps, even your front yard.

2.3 BLURRING THE LINES, MULTI-FUNCTIONAL AND MULTI-DISCIPLINARY (CULTURAL, RECREATIONAL, CONNECTIVITY, AND LETS NOT FORGET RESIDENTIAL)

It seems clear that the demands of our communities for appropriate responses to cultural, recreational, movement and residential needs are increasing in respect of stormwater infrastructure and its management.

Taking full advantage of the amenities that the Tauranga examples indicate can be achieved means taking a more integrated, holistic, and multi-disciplinary approach. Beyond their primary functions of stormwater management and treatment these are valuable spaces for amenity, movement and community activity. At least equally important is the preservation or natural waterways, achievement of daylighting and better treatment of stormwater quality are just some of the changes sought by tangata whenua.

Such a response extends beyond just the design of the stormwater reserves themselves, to the arrangement of activities that surround them. Placement and orientation of buildings and convenient visual and physical access to the spaces is incredibly important. Understanding connectivity, movement and desire lines is also important. Developing open spaces and pathway networks for people also raises questions of safety. Safety around water, safety from being attacked in a remote location. Should these spaces be lit and so on.

Maintaining natural landscapes, enhancing biodiversity and protecting spaces and places or cultural significance also raises new questions of infrastructure placement and design.

Increasingly there is a blurring of the lines between engineers, planners and designers. A combination of these skill sets is needed to create the higher quality urban environments that are increasingly being demanded by our communities.



Photographs 15 and 16: Open space adjacent to stormwater ponds and wetlands can satisfy a range of community needs for open space such as for this Lions Market in Papamoa and semi-waterfont café and neighbourhood commercial area in The Lakes.



Photographs 17 and 18: Every house can have a gate onto these green corridors. The opportunity to develop high amenity off-road movement infrastructure and help manage transportation demand shouldn't be underestimated.

Enabling walking and cycling connections through adjoining stormwater reserves assists urban resilience by providing alternative means of travel. These relatively direct routes provide connections to schools, shops and other facilities. At times they can be more direct than the cul-de-sac nightmare often put in place in the subdivisions of the 1990's and 2000's. This contributes to more resilient urban mobility.



Photograph 19: Even where formal pathways aren't provided connected greenspaces form attractive off-road pedestrian and cyclist connections. This was just one of three people I observed in this small corridor in the space of 5 minutes. There were no obvious origins or destinations at either end of this reserve.



Photographs 20 and 21: An overland flow path in the suburb of Pyes Pa sought to be preserved by .tangata whenua. The photographs show the area shortly after establishment in the mid 2000's and as it is in 2017. This area is actually surrounded by housing development and as well as its cultural importance provides a significant area of green space in this neighbourhood.

2.4 URBAN RESILIENCE AND CLIMATE CHANGE

Smart and resilient towns are looking to new ways to address the twin challenges of managing more frequent extreme rainfall events.

It goes without saying that stormwater reserves and detention areas have a major more traditional and functional stormwater purpose, and are important to the resilience of the city against high rainfall events, and Tsunamis. They also aid the city in improving the quality of stormwater prior to it reaching the sea. Large interconnected detention areas in various residential suburbs in Tauranga and other towns provide the ability to channel and store large amounts of stormwater during high rainfall events. These we are told will increase in frequency with climate change.

Adding another dimension, as a series of semi-direct and connected pathways Tauranga's 'stormwater reserves' have become 'escape routes' for Tsunami. Signs have been erected along pathways directing the community to the nearest safe points and noting the distances to get there. Examples are shown in photographs 18, 19 and 20.



Photographs 22, 23 and 24: A stormwater channel and detention area marked as a Tsunami evacuation route. Signs like these are located at the bridge in photograph 22 and nearby pathways accesses directing people to designated high areas. Photograph 24

shows areas of higher Tsunami risk and the network of evacuation routes through and out of stormwater reserves.

The opening up of these areas, using expansive detention ponds and waterways as opposed to pipes has increased capacity to deal with stormwater, and thus increased the resilience of our urban areas to stormwater events. Towns and cities such as Tauranga are now protecting and even re-creating traditional stormwater overland flow paths and their potential contribution to the city's wider stormwater management network.^{iv}

Given that much of this paper is devoted to considering amenity and movement benefits it is important to note that the ability for overland and other open/daylit stormwater infrastructure to contribute to connected walkway and recreation type opportunity needs to take into account hazard potential such as that associated with depth and velocity.



Photograph 25: An information board explains the importance and role of stormwater system in limiting flooding

3 RAGLAN – A CASE STUDY

3.1 STREAM DAYLIGHTING



Photograph 26: Piping and daylighting as options for stormwater management

Stream daylighting has become an accepted design approach for dealing with water surface treatment by liberating streams from underground pipes and culverts to the surface. The integrated design approach of stream daylighting enhances our environment and communities that would typically be developed through hard engineered solutions hidden underground.

Waikato District identified low impact design (LID) as a key tool for achieving quality sustainable developments and open spaces. With the timing of the District plan review Waikato District Council had the desire to promote Low impact design to enhance developments and open space amenity, recreation and environmental benefits and through this wanted to do something positive for the Raglan community, with a project whereby the local community and their children could be involved to provide a sense of richness and ownership to the final design outcome.

With this in mind Waikato District Council engaged Opus International Consultants Ltd (Opus) to work with them on a joint venture scoping exercise to identify Stream daylighting opportunities in Raglan. This project is still a work in progress but the focus of this discussion is on the drivers and initial process to identify sites. There is still further works ongoing, and we will discuss these aspects in future papers.



Figure 1: Aerial image of the community of Raglan

3.2 AIM

The Objectives of this exercise included;

- The opportunity for the development of Educational opportunities through the engagement with local schools through the process, and with a final design to include an open air classroom for education of stream daylighting and the ecological and environmental positives it provides;
- Improved flow capacity and water quality (through the use of planting) in Raglan harbour;
- Opportunities for flood mitigation in Raglan;
- Natural habitat restoration;
- Reduced liabilities for underground pipe replacement;
- Greater understanding within the Council and community on the benefits of stream daylighting;
- Developing a process and a precedent for future projects and new developments;
- Supporting the social, cultural, economic and environmental well-being of residents and future generations through wise management of water resources;

3.3 PROCESS

The first task was to develop selection criteria to aid in the most appropriate site selection. These criteria were to cover things such as proximity to schools, strong community linkages, land availability, existing piped stormwater infrastructure and topography, and constructability.

With these in mind pre-workshop selection criteria included:

1. Site to be in the vicinity of either a community centre or public space.
2. Site selection to be on vacant or open land.
3. Site to be preferably on land owned by Waikato District Council.
4. Storm water pipe to be 300 mm dia or larger. This is to ensure that we have enough base flows.
5. Site to be in 1km radius of school to provide an educational opportunity for our younger generation on the wise management of water resources.
6. Site may have existing historical flood complaint areas- this would allow a current problem to be addressed.
7. Site should provide opportunity for linkages or connections between community sites.
8. Site should provide opportunity at proposed storm water pipe locations-instead of putting concrete pipe use the open stream daylight approach- save on the cost of piping and provides a more desirable way to treat storm water.
9. Site to have easy access for construction

Using these criteria through a desktop survey, various information and maps were cross referenced. These included such as 10yr and 100yr raglan catchment floodplain mapping, school locations, GIS maps-overlaying stormwater pipes and other utilities and services, available land, and sites that fell into the mentioned selection criteria.

Other key tasks were to identify if there were any archaeological aspects on the selected sites there was little surprise when 3 out of 4 sites came back with potential archaeology features identified as present. However it was considered that although most archaeological sites within Raglan would fall into a requirement for Authority, this would not be likely prevent the project from happening.

From this investigation 4 sites were identified as possible daylighting opportunities that were to be discussed in a workshop with community groups, council and iwi and analysed as to the suitability for stream daylighting.

3.4 ENGAGEMENT

Waikato District Council and Opus engaged with local community groups and Iwi to form a partnership in the application for funding for an open air class room through the Water New Zealand's 2017 Stormwater Conference

Momentum Waikato 2016 Grant, unfortunately this was not successful, however it was in so far as that the community bought into the idea of the project.

As part of Waikato District Council's commitment to making this project a reality for Raglan residents, the Council are committed to funding this in the Long term plan.

3.5 FUTURE WORKS

It is the intention that following the agreement of the sites by the community groups, iwi and the Council, the next phases will be to work through the design process in order to achieve the following desired outcomes;

1. Greater understanding within the Council and community on the benefits of daylight streaming;
2. Educational opportunity with outdoor classroom;
3. Creating a precedent for future projects and new developments;
4. Supporting the social, cultural, economic and environmental well-being of residents and future generations through wise management of water resources;
5. Help identify approaches for future daylighting projects; and
6. How future protection, enhancement and management of our waterways and surface water can be achieved.

Waikato District Council see Daylighting has the potential to act as a catalyst for other stormwater management in the catchment through partnerships with residential estates, commercial properties and schools, promoting low impact (LID) solutions as opposed to the traditional hard engineering solutions using concrete pipes.

4 CONCLUSIONS – LOOKING TO THE FUTURE

The findings of this paper suggest that there is an ongoing challenge to stormwater asset managers as critical future guardians of not just stormwater management but also potentially large and important parts of our urban environments.

The Tauranga experience has proven with little doubt that stormwater reserves not only play a cities part in securing urban resilience against climate change and flooding, but also how even with relatively low levels of management these areas can make very significant positive impacts on urban amenity and the quality of life in our towns and cities. For many town and cities this finding may not be new. It seems clear that in some towns and cities there is already an expectation on the part of our communities that stormwater reserves have multiple points of value, and these extend far beyond traditional stormwater management.

In the Reglan project the Waikato District Council have identified the opportunity to daylight stormwater infrastructure and achieve improved stormwater flow capacity, flood

mitigation and water quality. At the same time cultural, social, educational and other environmental benefits are able to be secured.

Stormwater managers have a unique ability to look at the wider development and integration of daylight stormwater infrastructure, in new subdivisions and in retrofitting older suburbs, at a small, neighbourhood or even city-wide scale to achieve multiple benefits. These benefits are associated with:

1. more resilient stormwater and flood management systems able to cope with more extreme rainfall events;
2. the treatment of stormwater and addressing ongoing challenges associated with contamination and discharges;
3. Tsunami and potentially other natural hazard risk;
4. movement options and the resilience of the transport network;
5. a wide range of recreation options;
6. the establishment of ecologically positive green corridors; and
7. addressing cultural concerns.

An integrated outcomes based approach to stormwater management may help to protect and use what may in coming years be a most valuable resource – water, while at the same time delivering more resilient infrastructure and higher amenity to our communities, and helping to preserve a typically 'kiwi' way of life into the decades to come.

Has Pandora's box been opened. Perhaps it has, but if so, consistent with the legend, it is *Hope* that has now emerged.

ACKNOWLEDGEMENTS

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^{iv} Pers Comm Wally Potts, Tauranga City Council Stormwater Manager, March 2017.