

# LESSONS FROM CO-DEVELOPMENT OF STORMWATER MANAGEMENT PLANS – ENHANCING OUTCOMES.

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## ABSTRACT

In 2020, Ngāti Kearoa Ngāti Tuarā and Ngāti Whakaue ki Ōhinemutu expressed opposition to the residential development Plan Change at Pukehāngi Heights. Their concerns included the further extinguishment of the ability to return to ancestral lands at Pukehāngi, and increased flood risk and water quality degradation for downstream marae, hapū, iwi and papakāinga communities. Notwithstanding this opposition, the Plan Change was approved with clear direction for stormwater management planning to be developed alongside mana whenua, including Te Arawa Lakes Trust (TALT).

Mana Whenua approached the development of stormwater management planning through a values-based lens that drew on the belief in the power of ihirangaranga (vibrations) - we impact wai positively or negatively through our intentions, kupu (words), and actions. From this perspective, the working group agreed that the plan would not be entitled 'Stormwater Management Plan' as these connoted negative intentions towards wai – all water is taonga and is no less because of human impacts. As such, the plan is titled 'A Plan to Protect our Wai and Communities' (the Plan) - signaling clear and positive intentions towards our wai and communities.

As mana whenua, the responsibilities of Ngāti Kearoa Ngāti Tuarā, Ngāti Whakaue ki Ōhinemutu and Te Arawa Lakes Trust involve prioritising the ability of wai to sustain all with life-giving properties, a responsibility passed through whakapapa (ancestral lineage).

Grounded in the shared whakapapa between wai and mana whenua, the mana whenua entities have adopted a Te Mana o te Wai planning framework that through the supporting stormwater management approaches uphold Te Mana o te Wai, and in doing so, uphold the mana of the Ātua who provide wai its mana. This collaborative working group collectively sought to find, mitigate, and address all existing and potential impacts of building up to 1,000 new homes along the Pukehāngi rim of the Rotorua caldera by identifying interventions drawing on the current and emerging technologies and tools available.

This work guides the future subdivision and build out of the Development Area by identifying desired outcomes for Te Mana o te Wai and the measures that will be used to achieve those outcomes. The Plan recognises the inherent values wai carries within the Utuhina and Lake Rotorua catchments, and the impacts that historic rural land use and intensive urban development have had on those values. Specifically, measures that differ from previous development led SMPs and incorporated through this mahi are:

- Distributed mātauranga Maori led treatment and erosion control across the site,
- Maintaining connection of wai with the whenua, and

- Enabling mana motuhake through a co-governed stormwater management forum with landowners, council, and iwi.

The paper shares the unique structures and approaches taken for co-design, through the co-governed forum, that have guided the development of an appropriate overarching plan that can enhance and improve existing water management concerns across the rohe.

The lessons learnt through this process are fundamentally applicable across the motu and will help to transition the poor reputation that land use change currently has with the degradation of our waterways. Following this approach will either enable (where no other forums exist) or enhance ongoing opportunities for kōrero, agreement to, and co-delivery of schemes targeting improved wai / water management relating to the catchment/s. Doing so and delivering similar co-governed plans can further enable trust and governance of future activities to be delivered sensitively, equitably and enabling better outcomes for the water environments that we love and rely on.

The result for the specific application, being greater flood management benefits downstream, enabling the mauri of the wai to be maintained through the development and a sizeable opportunity to dent the current housing availability crisis across the city.

## **KEYWORDS**

**Te mana o te wai, mauri, co-design, mana motuhake, stormwater, management plans, flooding, waterways, low impact design, water sensitive urban design, sponge cities, city wide strategy.**

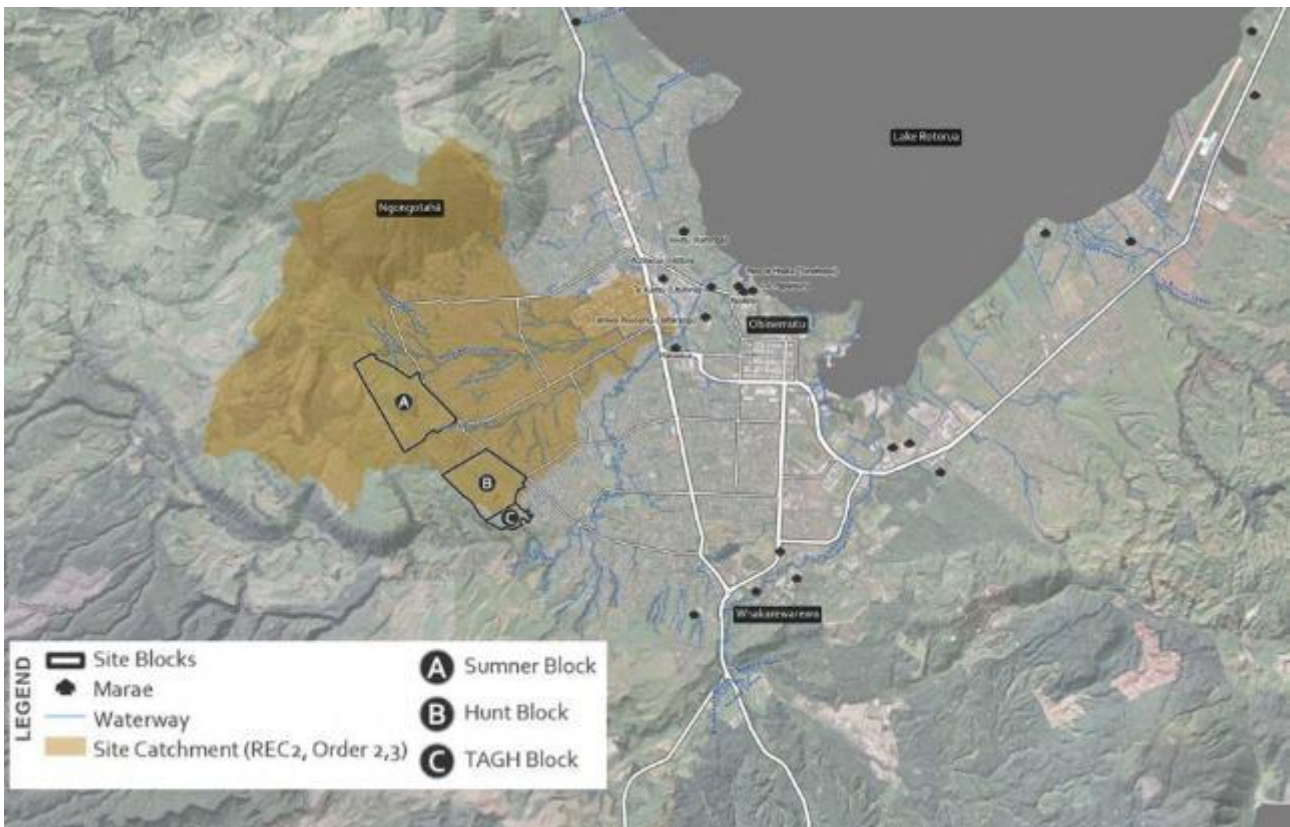
# 1 BACKGROUND

## 1.1 THE PROCESS

The Pukehāngi Heights Development Area is located to the southwest of Pukehāngi Road and Matipo Avenue is in two parts, separated by the Parklands Development Area.

During 2020, the council and landowners progressed with a Streamlined Planning Process, proposed to rezone approximately 160 hectares of Rural zoned land within the Pukehāngi Heights Development Area to enable residential development to occur on two distinct upper and lower terraces, and large lot rural residential development to occur on the north facing escarpment located between the two terraces.

Two small-scale local centres are also proposed to provide limited commercial services that are easily accessible by walking. Re-vegetation or partial revegetation is sought in and over parts of the development area, with the site yield expecting to achieve 750 – 900 units towards the critical housing shortage across the city.



**Figure 1 - Pukehāngi Heights Development Area Location (Collective name for sites A, B & C on figure)**

## 1.2 THE ROLE OF MANA WHENUA.

In 2020, mana whenua expressed opposition to the Plan Change for residential development at Pukehāngi Heights. Their concerns further extinguishment of the ability to return to ancestral lands at Pukehāngi, and increased flood risk and water quality degradation for downstream marae, hapū, iwi and papakāinga communities. Despite objections, development is now imminent, requiring a focus on mitigating impacts on te mana o te wai (the life-giving properties of water) and the safety of downstream communities. The provisions of the Plan Change require iwi groups to be included in the

process to deliver a discharge consent for the whole development area. This process is the result of this requirement and supports the approach to deliver a holistic plan with iwi and the Landowners, enabling multiple additional values to be won through its creation.

As mana whenua, the responsibilities of Ngāti Kearoa Ngāti Tuarā, Ngāti Whakaue ki Ōhinemutu and Te Arawa Lakes Trust involve prioritising the sustainability of water and acknowledging their connection to it through whakapapa (ancestral lineage). They believe in the power of ihirangaranga (vibrations) and the positive or negative impacts of intentions, words, and actions on wairua (spirit), waiata (song) and waiora (wellbeing).

### **1.3 CHANGING THE WAY WE DELIVER.**

To honour the importance of water, working collaboratively with the project team, we delivered a document titled 'A Plan to Protect our Wai and Communities' (the Plan) instead of simply a "Stormwater Management Plan" (Rotorua Lakes Council, 2022). The term "stormwater" negates the positive intentions they wish to convey toward water, emphasising that all water is taonga (treasure), regardless of human impacts.

Representatives of mana whenua entities, along with landowners, local and regional authorities, and technical experts, have collaborated to develop the plan. Although constrained by government legislation, policy, and systems, they have strived to protect the interests of their whānau and hapū. They acknowledge the need for more houses in Rotorua but stress the importance of enabling kaitiakitanga (guardianship) through appropriate spatial and infrastructure planning, restoration of the natural environment, and equitable decision-making for the wellbeing of all communities, including Te Arawa hapū mai Maketū ki Tongariro.

The Plan considers impacts on both the water flowing through the development area and downstream environments, including the Utuhina Catchment and Te Rotoruanui-a-Kahumatamomoe (Lake Rotorua). It incorporates mātauranga (indigenous knowledge) and Te Mana o te Wai (TMotW) principles, aiming to restore natural cycles that sustain communities.

While the work cannot control outcomes in the wider catchment, it manages the effects of urbanisation within the development area and addresses off-site impacts. The Plan provides a conceptual masterplan and a principles and outcomes approach for stormwater management with detailed design and applications for the Discharge and Subdivision consents to follow.

The Pukehāngi Heights Stormwater Report (WSP, 2022) indicates that the masterplan can have a neutral or beneficial impact on downstream flooding for more frequent flooding events. It identifies key strategic infrastructure, laying the foundation for the final design to mitigate impacts effectively. Further exploration of on-site and off-site solutions may occur in later design phases.

## **2 KO AU KO WAI, KO WAI KO AU AS THE BASIS FOR STORMWATER MANAGEMENT.**

Mana whenua shared with the project team that the foundation of The Plan would be centered on the whakapapa to the Atua, taiao (environment) and each other – ancestors and future generations. The text that follows for this section is taken from the collaboratively developed plan (the Plan) and is kindly shared here so that we can help elevate awareness and knowledge amongst the stormwater management community.

"Mana Whenua connection to taiao is reinforced spiritually through our shared whakapapa that traces to Ranginui and Papatūānuku. Our pepeha, our way of identifying who we are,

looks first to our Maunga, our waterways, our whenua, signifying that taiao is inseparable from our identity. Indeed, the mauri and mana of our wai is intimately linked with our own health and wellbeing - Ko au ko wai, ko wai ko au.

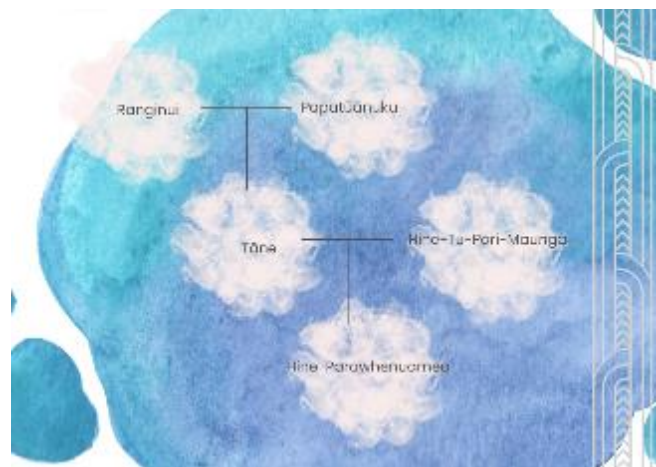
Our inseparable connections mean we have responsibilities as hungatiaki to restore and protect the mauri and mana of taiao. For Pukehāngi, we look to that connection and associated mātauranga to understand how to best design a stormwater plan that protects both taiao and those who live in the catchment.

### ***Ko Ranginui e tu iho nei, ko Papatūānuku e takoto nei***

Wai first manifests in our whakapapa as Wainuiātea (the great expanse of water), the first partner of Ranginui. Ranginui and Papatūānuku (our primordial parents) were separated by their son Tāne-mahuta (also known as Tāne te Waiora) following a great battle between their tamariki.

Following their separation, the tears Ranginui sheds for Papatūānuku (ngā roimata aroha o Ranginui) and the sighs (or mists) of Papatūānuku are integral in the cyclical journey our wai takes carried between Papatūānuku and Ranginui by their uri. The separation created the world we know today.

We inhabit the vast beauty of Papatūānuku, sustained physically and spiritually by Te Waiū (her life-giving waters). It is the union of Tāne Māhuta and Hine Tū- Pari Maunga (Atua Maunga) that begat Parawhenuamea our tupuna of the waters of earth – the springs, streams, and rivulets that run off the hills and mountains and that exist in relationship to rock.



***Figure 2: Nā ko Parawhenuamea koia te matua o te wai***

Aroha Yates-Smith (Te Arawa scholar) shares that Parawhenuamea emerges from her mother Hine Tū-Pari-Maunga as pure spring waters. She cascades down the slopes of her mother, falling as a waterfall, before gliding across the surface of the plains. Yates-Smith describe that her name Parawhenuamea denotes fine grains of silt deposits rising up out of the ground with the water's force and being carried along by the flow of the stream, merging with other streams to form large rivers, while depositing silt along the riverbanks.

It was when Parawhenuamea approached the coastline, she saw the form of Kiwa, the ocean entity in the distance. Kiwa moved forward to embrace Parawhenuamea. When their bodies merged, Hinemoana (the sea) was created<sup>1</sup>.

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<sup>1</sup> Yates-Smith A. (2019). E Hina e! E Hine e! Exploring Akua/Atua ancestral ties across Ka Moananuiākea/Te Moana-nui-a-Kiwa.

As with all our Atua, Parawhenuamea must be both protected, and feared. Our mātauranga tells us that we must ensure that te mana o te wai is protected as Parawhenuamea carries the tears of her grandfather on her journey, sustaining our earth mother Papatūānuku and all those who flourish in her waters (as pictured in Figure 3).

She flows to Te Rotoiti i kitea a Ihenga, feeding Te Kaituna, running all the way to her love Kiwa at Te Moana nui a Kiwa and to their daughter Hinemoana. As Parawhenuamea guides the flow of wai (and specifically wairere noa) through its journey, over land, through the rohe to the ocean, she carries with her the nutrients that sustain all life.



**Figure 3: Te Hangahangatanga o te Wai Māori (development site marked in red)**

The cycle of wai is developed by the input of each environmental realm belonging to Atua. Beginning from Papatūānuku, the realms in-between and up to Ranginui and back down and under-ground to Rūaumoko. It is in these realms and the roles played by each Atua that develop and create the resource, and the outcome we know as wai. Like a western engineering process, the development of a resource can only take place if each part of the engine works in combination with every other part.

As we (Te Arawa) are hungatiaki, descendants of Atua in our environment -this is their taonga, their aroha given to us of Te Arawa, to us as Māori. As such it is our responsibility to ensure our Atua and our natural resources are protected for future generations.

**"Nā mātou te Wai, nō ngā Atua i homai hei oranga mā mātou"**

We know that with climate change we will start to see increased water flows, which will result in Parawhenuamea carrying increased nutrients throughout the rohe and out to her daughter Hinemoana. We also know that development causes her to carry harmful pollutants (waikino) from our homes and our industries throughout the land.

With future development, we need to make sure that our mahere (plan) for Pukehāngi enhances the life-giving properties of our wai as it sustains all life in our awa, manga and roto on its journey to Hinemoana. While we acknowledge that for the purposes of this stormwater plan, we are focused only on the Pukehāngi development, the story of Parawhenuamea tells us to ensure we are enhancing te mauri me te mana o te wai. It implores us to mitigate the effects of pollutants and we look to Te Mana o te Wai framework to give us the tools to do this".

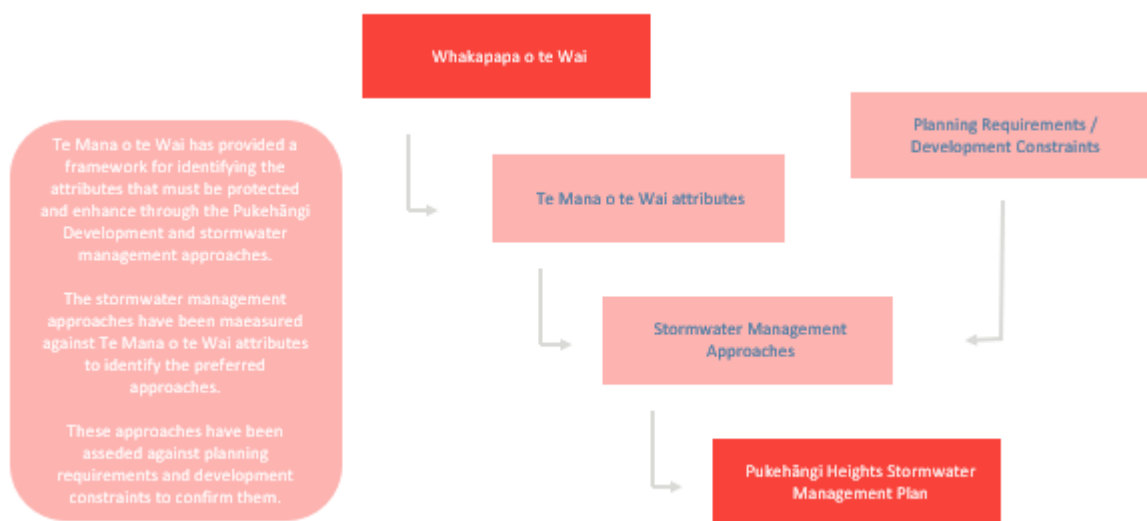
The shared kōrero and mātauranga formed an integral part of the responses that were developed throughout The Plan process from the derivation of the Te Mana o te Wai Framework through to the proposed development layout, the proposed mitigations and structures and the over-arching vision for The Plan.

### 3 TE MANA O TE WAI STORMWATER MANAGEMENT FRAMEWORK

Ko au ko wai, ko wai ko au – the Mana Whenua Entities’ expression of the whakapapa cycle of wai (Figure 2) provides the basis for adopting Te Mana o te Wai (TMotW) as a framework for identifying preferred stormwater management options. The TMotW Framework provides an opportunity for mana whenua to identify approaches to creating this, The Plan, that upholds the mana of mana whenua and the Wai Whakapapa Cycle.

Given the NPS-FM (2020) requires the regional freshwater planning to be undertaken at a freshwater management unit scale by 2024, mana whenua are keen for this work to inform wider catchment planning. Figure 4 shows how both the Wai Whakapapa Cycle and the TMotW framework interact to provide the stormwater management approach adopted by the Plan. Figure 4 shows that:

- The whakapapa of wai provides wai its mana.
- Mana whenua have identified attributes (TMotW Attributes) that give effect to Te Mana o te Wai. Those attributes have been identified following the planning framework set out in NPS-FM 2020.
- Stormwater Approaches that give effect to the TMotW Attributes have been chosen for The Plan. Planning requirements and development constraints have also fed into the Stormwater Approaches.
- Those Stormwater Approaches have been looped back around to the Wai Whakapapa Cycle to identify how each approach provides tools for the Atua within the Wai Whakapapa Cycle to thrive.



**Figure 4: Stormwater Management Framework to deliver The Plan**

The project has several key takeaways that are relevant for all future stormwater management plans across Aotearoa New Zealand:

- **Co-design with Mana Whenua Entities:** The plan was developed through a collaborative process between Rotorua Lakes Council and Te Arawa Lakes Trust, Ngāti Whakaue (represented by Te Komiro o te Utuhina), and Ngāti Kearoa Ngāti Tuarā Trust (collectively referred to as **Mana Whenua Entities**).
- **Mātauranga Maori as the foundation:** The Mana Whenua Entities' perspective is grounded in their whakapapa (genealogy) connecting them to the land and water. This includes their responsibility as kaitiaki (guardians) to protect the mauri (life force) and mana (prestige) of the environment.
- **Wai (Water) as a Living Entity:** The report describes the Maori perspective on water through the whakapapa of wai, tracing its journey from the tears of Ranginui (sky father) to the life-giving waters of Te Waiora (healthy water). Approaching the conceptual design of stormwater management features with this in mind shifts the conversation and approach to one of treating water with empathy as opposed to burying it away in pipes.
- **TMotW Framework:** This framework guides decision-making to prioritise the health and well-being of freshwater and waterbodies. It aligns with the National Policy Statement for Freshwater Management (NPS-FM 2020).

Central to the success of The Plan is that the works consider the impact on downstream environments and future generations. It emphasises the importance of maintaining and protecting natural water flow paths, enhancing mahinga kai (food gathering places), and using cultural practices like karakia (chants) and rāhui (restrictions) where appropriate.

## 4 FOLLOWING A COLLABORATIVE DELIVERY APPROACH

As described above, the collaborative team approach brought together the key technical expertise required to allow The Plan to not only deliver an effective stormwater management solution but also respect and uphold the cultural values of Te Ao Māori (the Māori worldview). It is worthy of acknowledgement, that the Landowners have been integral to the success of this approach, actively engaging in and supporting the process and contributing to the co-design of The Plan.

### 4.1 SHARED VISION AND GOALS

The overarching vision for The Plan is to create a sustainable stormwater management system for the Pukehāngi development that minimise its impact on the environment while protecting the mauri (life force) and mana (prestige) of the waterways. This vision is grounded in the principles of TMotW framework and aligns with the National Policy Statement for Freshwater Management (NPS-FM 2020).

Collaborative workshops were held with representatives from Rotorua Lakes Council, the Landowners, and the Mana Whenua Entities to establish common goals for The Plan. These goals align with the expectation of the Landowners that the development creates a positive legacy for the community and Rotorua. Further technical and cultural objectives were agreed, and the Plan Change provisions developed to:

- Reduce the risk of flooding downstream.



- Improve the quality of stormwater discharged from the development, by implementing water-sensitive design approaches across the site.
- Enhances the mauri of the waterways that are important for mana whenua (Mangakākahi, Otamatea, Utuhina, and Rotorua).
- Protects and restore mahinga kai (food gathering places) for future generations.
- Integrates mātauranga Maori (Māori knowledge) and cultural practices into the design and implementation of The Plan.

## 4.2 COLLABORATIVE GOVERNANCE STRUCTURE

A collaborative governance structure was established to oversee the development of The Plan and its future implementation, linked to the Plan Change provisions. This structure includes:

- **Joint Management Committee** comprising representatives from council, the Landowners and Mana Whenua Entities, providing high-level direction, key decisions and aligning the work meets with the vision and goals.
- **Technical Working Group** consisting of technical experts from across the development partners, landowners, and mana whenua in dedicated working groups to address specific aspects of the plan. This group focused on the delivery of a consistent and comprehensive masterplan.

## 4.3 COMMUNICATION AND INFORMATION SHARING

Open and transparent communication was crucial for the successful delivery of this project, delivered through ongoing technical meetings, regular written updates, and presentations at various hui as well as a collaborative site visit.

## 4.4 CAPACITY BUILDING AND KNOWLEDGE SHARING

Recognising the value of shared knowledge and understanding, the project team had regular opportunities to participate in workshops to gain a deeper understanding of Te Ao Māori and the cultural values associated with water management as well to share the technical aspects of the plan to support our alignment with TMotW framework and incorporating mātauranga Maori into the decision-making process.

# 5 APPLYING THE TE MANA O TE WAI PLANNING FRAMEWORK

The plan heavily leans on the TMotW planning framework and its hierarchy of obligations to ensure the health and well-being of the local waterways are prioritised.

## 5.1 OUR CORE VALUES

The core values for TMotW were applied:

**Mana Whakahaere:** The authority and responsibility of tangata whenua (Māori people) to make decisions that protect the health of freshwater. This translates to involving Mana Whenua at all stages of the planning process, resourcing them appropriately to contribute and, as such, respecting their leadership role, which was central to the application of this work as recognised in a recent awards submission for LGNZ by Te Paepae Tapu o Ngāti Whakaue:

*"We would like to emphasise that the process Rotorua Lakes Council employed is an exemplar and has enabled the creation of an innovative plan through co-design. A co-design process will not always guarantee mana whenua endorsement, particularly when we have opposed development of Pukehāngi from the outset. Despite this, we acknowledge Council's efforts and would like to see this process replicated across other kaupapa to continue to work together to enhance our natural environment for future generations and for the benefit of all our people – Tatau tatau".*

Moving forward, the Mana Whenua Entities, the Landowners and RLC intend to work together closely to address Pukehāngi Heights Development issues that sit outside The Plan process and are considering the adoption of an MoU to address these matters.

**Mātauranga:** Integrating traditional Māori knowledge and worldviews into the plan. This involved using Te Whakapapa o Te Wai (the genealogical relationship between water and all living things) to understand the importance of water and guide decision-making as well as to guide future adaptive management planning responses as development progresses.

**Manaakitanga:** Respectful care for freshwater and the wider community. This translates to considering the impact on downstream environments and future generations (including reducing the exposure to flooding for events up to and including the 1% AEP plus climate change event). The plan incorporates appropriate protocols for accidental discovery of archaeological sites and involvement of mana whenua in future operations to manage and monitor the performance of the developed stormwater approaches into the future, so that further lessons can be learnt, and any issues remedied as quickly as possible.

**Hungatiakitanga:** The obligation of tangata whenua to preserve, restore, and enhance freshwater for future generations. This translates to focusing on goals like improved water quality from the site enabling the development to enhanced mahinga kai (food gathering places), as well as maintaining contact between the water and the whenua to support healthy ecosystems throughout the catchment area.

## **5.2 TRANSLATING VALUES INTO ACTION:**

Working with mana whenua, the team applied the values throughout the development of The Plan, focusing on influencing the technical work, with specific attributes identified to represent the practical application of the core values. These attributes address aspects like healthy mahinga kai populations, restored natural water flow paths, and improved water quality. The Plan uses these to guide the selection of stormwater management options.

**Focus on Long-Term Wellbeing:** The TMotW approach goes beyond just addressing immediate stormwater management needs. It emphasises the interconnectedness of the environment and the importance of considering the long-term health of the waterways and the communities that depend on them. This ensures The Plan is a sustainable solution that benefits future generations.

**Limitations and Ongoing Processes:** The Plan has a specific scope, and not all the attributes could be fully addressed within this project. As such, the Collaborative Working Group acknowledge these limitations and through Council processes have identified necessary actions and next steps to support their implementation as the future stages of the development progress.

TMotW provided a valuable framework for The Plan. By prioritising cultural values alongside technical considerations, the project creates a sustainable solution that respects the environment and the well-being of the community.

## 6 DELIVERING TE MANA O TE WAI IN STORMWATER MANAGEMENT

The Pukehāngi development anticipates between 750 - 900 new homes, posing a significant challenge for stormwater management to support and enhance TMotW outcomes as well as deliver the main objectives as framed in the Shared Vision and Goals.

### 6.1 TMOTW INFORMING CORE DESIGN PRINCIPLES

The following TMotW outcomes influenced the selection and design of interventions:

- **Healthy Mahinga Kai:** Abundance of healthy native fish and plant species within the interconnected waterways (Mangakākahi, Otamatea, Utuhina, and Rotorua). This can be measured by monitoring fish populations and health of aquatic plants.
- **Enhanced Mauri:** Improved life force and overall health of the awa. This can be measured through water quality testing and monitoring of ecosystem health.
- **Ki Uta Ki Tai:** Maintaining the natural flow of water from the mountains to the lake, including associated wetlands and downstream areas. Achieved through mimicking natural patterns and minimising disruption to existing flow paths.
- **Equitable Allocation:** Ensuring downstream environments are not adversely affected by increased discharges from the development. This involves ensuring downstream areas are not subjected to increased flooding or erosion risks.

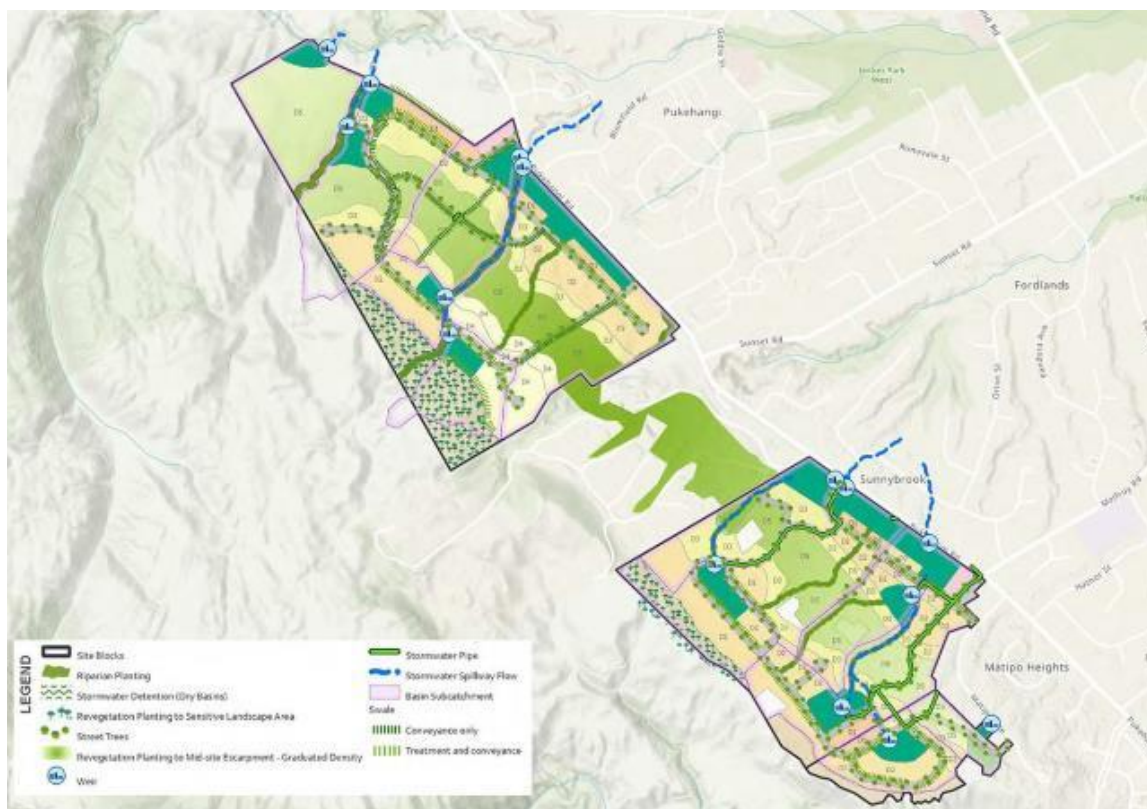
These attributes were balanced with the overall programme goals of creating a lasting positive legacy and delivering much needed additional housing for Rotorua to support and enhance the adjacent local community, providing additional services and connectivity.

### 6.2 THE PROPOSED INTERVENTIONS.

Through the process, the management of stormwater was a core overarching concern through the SPP, and a core requirement of the post Plan Change approval was to continue to develop an acceptable approach across the whole development area.

Brockbank and Afoa (2018) identifies that *'A water sensitive approach is one such mechanism aligning indigenous and non-indigenous thinking – development through a water sensitive lens aligns far more strongly with Te Ao Māori and Māori aspirations for development than the traditional western approach. Te Aranga Principles (Ngā Aho, 2019), arising from the Te Aranga (2008) Cultural Landscape Strategy aims to enable iwi to positively influence and shape the design of cultural landscapes, including water sensitive design, within their tribal boundaries.'*

Our approach has sought to imbed water sensitive design principles at the core of the proposed stormwater management approach, with a treatment train framework incorporated within the final masterplan designs, shown in Figure 5.



**Figure 5 – The masterplan for the Pukehāngi Heights proposed development.**

The approach being to use an integrated water-sensitive design and treatment train solution to both reduce the volume of water and have the potential to treat it onsite using planting media. Brockbank & Afoa (2019) note, this is "...in line with the ethic that Papatūānuku is responsible for the ultimate treatment of a pollutant. The integrity of the receiving waters and surrounding environment is retained, thus maintaining the mauri of the water and ecosystem as a whole".

As such, the project team concentrated on recognising the value of wai across our catchments and the historical impacts on communities, acknowledging the interconnectedness of the waterways within the catchment. Impacts on the Pukehāngi development can potentially affect the health of downstream environments like Lake Rotorua. This meant the collaborative team delivered:

- A catchment-wide approach, extending beyond the immediate development area. This will involve collaborating with landowners upstream and downstream to investigate and implement complementary stormwater management initiatives.
- An increased recognition of the cultural values associated with the entire catchment. This includes ongoing engagement with tangata whenua with mana whenua interests beyond the development footprint.
- A through acknowledgement of the legacy of past development on the health of the waterways. Past practices that have contributed to increased flooding, decreased water quality, and degraded mahinga kai.
- An approach to remediate these historic issues through enhancing downstream flood performance for smaller more regular flooding events that befall the catchment, and seeking to be deliberate in supporting initiatives that restore

cultural connections to the whenua, maintaining connected flow pathways for the tears of rangi to make their way unimpeded to the precious taonga awa and roto.

The Plan describes a sustainable solution, proposing a holistic bi-cultural approach to stormwater management. This was recognised by Mayor Tapsell, Rotorua Lakes Council in 2023, thus *"Preservation of lake water quality has been a priority for our Rotorua community for many years. The SMP developed through this project, with its water sensitive design and treatment train approach, provides an effective strategy to safeguard the quality of Rotorua lakes. By prioritising sustainable practices, the project is addressing the community's needs while also preserving this important natural resource."* -

The strategy includes measures such as water re-use, soakage disposal, water quality treatment, conveyance, and detention. The WSP (2022) Stormwater Report, contains the conceptual design information summarised in The Plan. Our Treatment Train proposal follows the journey of water through the site and to its receiving environment which aligns to the Wai Whakapapa Cycle and recognises the interconnection of the various parts of that cycle – impacts to one part of the cycle will affect other parts. The WSP (2022) Stormwater Report considers implementation across both private and public properties, with private properties using "on-lot" measures that connect to the central drainage system. Public infrastructure, including larger devices and networks, will be vested to RLC for operation and maintenance, with specific outcomes being:

- Culturally significant sites (including mahinga kai sites) within the Development Area and downstream are protected, integrated within the open space provisions on site, recognised with access provided.
- The Pukehāngi Heights Development Area can only release stormwater at a rate that decreases the downstream flood risk to the wider Rotorua community up to and including the 1% AEP plus climate change design event, including key kāinga at Riri Street, Sunset Road, Tārewa Pounamu and Ōhinemutu. This is achieved through a connected network of conveyance/storage channels/swales through to the reserves and detention basins that have a set of appropriately sized orifices at various levels.
- Water quality discharged from site, contributes to an improving quality within the Mangakākahi, Otamatea, Utuhina, and Rotorua such that whānau can eat from their awa, swim in their awa, and heal in their awa. The Plan includes a treatment train that retains and treats water where the rain falls, managing water on the surface for the most part. The treatment train incorporates:
  - On lot options such as rain gardens, green roofs, choice of roofing materials and rainwater harvesting tanks (amongst others),
  - At source 'public' swales (bioretention or conveyance) and raingardens (amongst others) to capture and convey public roading runoff.
  - Dry stormwater basins, incorporating first flush forebays and extended detention features.
- Ecological corridors along the Utuhina, Mangakākahi, Otamatea and Rotorua catchments are enhanced, including through enhanced habitat and fish passage and control of pest animal and plants. This is being integrated with the working group and council processes influencing the ongoing Comprehensive Stormwater

Discharge Consent applications to derive an appropriate response to enhance the quality of stormwater discharges.

- Natural pathways for water on site and within the Utuhina, Mangakākahi, Otamatea and Rotorua catchments are restored, and integrated stormwater and recreation reserves are used to treat stormwater. Maintaining the water contact with the whenua was a key consideration of the design. The Plan identifies for a network of open water pathways through to the integrated stormwater and recreation reserves distributed across the development. These discharge to either an open waterway (the Mangakakahi Stream) or through to the existing stormwater network of the Otamatea catchment.

Whilst this approach is becoming more common across Aotearoa, the alignment of the proposed strategy with the TMotW Attributes, the whakapapa wai values and mana whenua involvement results in stormwater management options that support sustainable design principles. The identified Treatment Train concept is an opportunity to mitigate the impacts of land use change on stormwater quality and quantity throughout the catchment.

This approach requires ongoing monitoring and adaptation, with the Mana Whenua Entities actively involved. Future reviews will assess the effectiveness of the chosen interventions and identify opportunities for improvement.

## **7 LESSONS LEARNED AND OPPORTUNITIES FOR AOTEAROA**

The Plan provides valuable lessons and opportunities that has the potential to reshape land-use change practices and foster ongoing conversations around water management and be applied across Aotearoa New Zealand.

- 1) **Collaborative strength:** The Pukehāngi project demonstrates the power of collaboration between mana whenua and local authorities and serves as a model for future application. ACTION – Actively pursue collaborative models for future land and water management that incorporates mātauranga Māori.
- 2) **Build Capacity and Capability:** The availability of appropriate funding of, and technical support for, mana whenua will influence the potential for similar projects to be equally successful. ACTION – Provide appropriate funding and connecting both cultural and technical expertise to support broader outcomes.
- 3) **TMotW as a Guiding Framework:** TMotW offers a valuable framework for prioritising the health and well-being of waterways. ACTION – Apply and adapt this grounded approach across Aotearoa.
- 4) **Benefits of Water Sensitive Urban Design approaches:** The project's success in utilising WSUD techniques and defining how to implement TMotW in practice across the catchment to maintain the mauri o te wai for waters crossing the site. ACTION – Future land development must prioritise the delivery of integrated water sensitive design and mātauranga Māori approaches.
- 5) **Reinforces the importance of catchment-wide thinking:** The project emphasises the interconnectedness of waterways. A narrow focus on the immediate development site would have overlooked potential downstream impacts. ACTION – Recognise the

position of your development within the catchment and seek the opportunities to maximise benefits across the whole catchment community.

- 6) **Addressing Historic Impacts:** Acknowledging and addressing the negative consequences of past development practices sets a positive precedent. ACTION – to unlock the wider benefits of future masterplans / structure plans, future projects should review and seek to enhance outcomes that achieve a more restorative future.
- 7) **Enhancing Water Management Conversations:** The Pukehāngi project provides a springboard for ongoing kōrero (conversations) within the Kaituna catchment on water management. ACTION – Seek opportunities to showcase successful integration of cultural values and technical expertise that advance better outcomes as the basis for inclusive water management delivery.

### 7.1 SHIFTING HOW WE DELIVER FUTURE LAND USE CHANGE.

Land-use change has often been associated with negative environmental impacts. The Plan showcases a different approach. By prioritising cultural values, environmental well-being, and utilising innovative stormwater management techniques, this project:

**Shifted Perception** proving that water sensitive development can be delivered across tricky catchments and occur alongside environmental protection and cultural respect, in a manner that still delivers within the expectations of the yield for this site. Acknowledging that this process was enabled through the Plan Change provisions, it is clear that Landowners are keen to leave a legacy that positively enhances the wider community.

**Inspired Sustainable Development:** By showcasing a successful balance between development and environmental responsibility, The Plan serve as an inspiration for future land-use projects, encouraging a more sustainable approach nationwide.

**Opportunities for ongoing Kōrero:** The Plan serves as a catalyst to spark broader conversations about incorporating mātauranga Maori and upholding Te Ao Māori (the Māori worldview) principles within water management and land-use planning processes through the Rotorua Lakes area – the approach taken is valid across Aotearoa.

The Plan serves as a testament to the transformative potential of collaborative partnerships and culturally informed decision-making. By embracing TMotW principles and fostering ongoing kōrero around water management, this project paves the way for a development that can deliver on necessary housing needs whilst enabling a suite of broader outcomes to be met, including the environmental protection and cultural reverence for our precious wai (water).

## 8 CONCLUSIONS

The Plan transcends the realm of technical solutions, offering a pathway towards a more sustainable and integrated future for Rotorua. Here's a look at the key achievements and their lasting value:

- **A Collaborative Triumph:** The project establishes a successful collaborative model, fostering enduring partnerships between Rotorua Lakes Council and Mana Whenua Entities. This ensures that cultural values and environmental considerations are interwoven throughout the decision-making process and will endure long after this development has been delivered, through ongoing and future land and water policy identification and application.

- **Availability of Dedicated Resources:** Co-designed plans require time, resources, and technical expertise. The availability of appropriate funding of, and technical support for, mana whenua will influence the potential for similar projects to be equally successful. The nature and type of resource made available is crucial for success. For this plan development mana whenua were supported with a resource they selected enabling high trust and confidence in the process and outcomes to follow and be the cornerstone of the team's approach.
- **Safeguarding Communities:** Through the collaborative and comprehensive stormwater management plan the wider communities' resilience is enhanced. The inclusion of Stormwater Management features reduces the current flooding exposure across the catchment up to the 1% AEP rainfall event and offsets future increases from this development. This supports community outcomes through incrementally enhancing the safety and well-being of residents throughout the catchment area.
- **Rejuvenating the Waterways:** The Plan prioritises the mauri (life force) of importance taonga waterways, the Mangakākahi, Otamatea, Utuhina, and Lake Rotorua itself by incorporating Te Mana o te Wai principles. Water sensitive urban design (a Plan Change provision), replanting the undeveloped segments of the development and future focused detention assets and their careful planning/design will contribute to improved water quality and healthier ecosystems. The future stages are required to deliver a discharge consent that meets with the outcomes expected and the plan change provisions including the utilisation of waters sensitive design across the development area. The revitalisation paves the way for a new story for these waterways, one of restoration and respect.
- **Addressing Housing Needs:** The development, guided by The Plan, contributes to addressing a critical housing shortage. With the sustainable practices followed, this development balances growth with protecting our natural environment.

The Plan signifies more than just a stormwater management plan. It embodies a new approach to development – one that prioritises collaboration, cultural values, and environmental well-being.

This project serves as a model for future endeavors, fostering a future where development, cultural and environmental responsibilities coexist. By ensuring increased flood protection for downstream communities, maintaining, and enhancing the mauri of the wai, and contributing to a new story for the waterways, The Plan paves the way for a brighter future for Rotorua, addressing critical housing needs while safeguarding our precious water resources for generations to come.

The project undertook a multifaceted approach, where a diverse technical team addressed a shortfall in housing, identified future infrastructure, environmental, cultural, and economic factors, and delivered it in a manner that was considered, inclusive and effective.

## 9 REFERENCES

Rotorua Lakes Council (2022) – A Plan to Protect our Wai and Communities: Pukehāngi Heights Stormwater Management Plan, Rotorua, Bay of Plenty, N.Z.

WSP (2022) – Pukehāngi Heights Stormwater Report, Christchurch, Canterbury, N.Z.  
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