# SECURING OUR REGION'S FUTURE

CONSTRUCTING THE WAIMEA COMMUNITY DAM

Waimea Water


Constructing New Zealand's largest dam in 25 years to secure Tasman's water supply.

# Contents

# A SIGNIFICANT REGIONAL PROJECT

## This is the story of one of the most significant regional projects in Nelson Tasman's history. This book is a record of why the Waimea Community Dam was needed, how it was built, the challenges the project faced from its very beginnings, and the solutions to these challenges.

Long-term security of water supply for Nelson Tasman is crucial for the region. The local economy, community and the environment are dependent on sufficient water all year-round.

In particular, during the 2001 drought when rivers dried up, the impact on the primary sector, the wider economy, the community and the environment was stark. This was seen again during the severe droughts of early 2024, which impacted the entire top of the South Island.

At these times of drought, less rain for longer periods dries out soils and the aquifers do not sufficiently recharge for urban and irrigation supply, unless they are augmented. Operational from the first half of 2024, the Waimea Community Dam (dam) became the main water augmentation solution for the Nelson Tasman region.

Its benefits were demonstrated early on, as Mike Scott, CEO of Waimea Water Ltd (WWL) explains. 'When we released 20 per cent of the reservoir during the drought in March and April 2024 we saw the benefits immediately. It meant the region avoided water restrictions that would have severely impacted residential water supply, shut down some industries, and impacted our food production and exports. Restrictions would have had a significant impact on both the economy and river health. The dam is doing its job.'

### The dam company and project structure

WWL is a Council-Controlled Organisation (CCO) established in November 2018 to manage the construction, ownership, financing, operation and maintenance of the dam on behalf of shareholders Tasman District Council (Council) and Waimea Irrigators Ltd (WIL). The dam was constructed for WWL through a joint venture between Fulton Hogan Ltd and Taylors Contracting Ltd (Contractor).

Despite New Zealand's strong history building dams, the dam is the country's first publicly funded large dam to be constructed for more than 25 years and the first to be publicly funded since the Clyde Dam finished in 1992 (noting that the Waimea Community Dam is funded by both public and private funders). And since the 1990s, the population has increased by more than 45 per cent and the climate has changed.

The disestablishment of the Ministry of Works and Development in 1988 disrupted the nation's capacity to deliver large scale infrastructure projects like dams, with significant expertise lost overseas and large infrastructure decision-making moved to local government.

Due to the limited dam construction knowledge locally, WWL hired its CEO from overseas in 2019. Returning expat Mike Scott, experienced in business and project development, strategy, planning, operations and engineering, in turn hired the necessary expertise from Australia and from around the country. Leading dam engineers Damwatch Engineering Ltd provided engineering, design and independently assured the construction, and GHD Engineering peer-reviewed design changes and designed the temporary works.

"Water security for our communities, the environment and the economy is important. The dam will provide regional prosperity for many generations. It has been a privilege to have been part of this legacy project."

**Mike Scott, CEO, Waimea Water Ltd**

# An essential vision is realised

The dam realises the vision of many groups and individuals, supported by Council personnel, to provide greater water security for the Waimea Plains and the wider community for 100+ years. Thousands of volunteer hours were poured into finding a solution for regional water supply, which came on stream in 2024 when the dam started operations.

### A growing need for water security

While the landscape and land use have changed significantly over the decades, the challenge of securing a reliable water supply has been a constant issue. From pastoral farming in the past to a more diverse horticultural base today, the reliance on water has only increased, making its sustainable management a critical priority.

In the late 20th century, water management in Tasman was largely reactive, responding to crises rather than planning for the future. The relationship between Council and water users was sometimes strained, with debates over funding and priorities. But, for all parties, there was a desire to move beyond political divisions and bring a commercial perspective to solutions, to ensure water efficiency and long-term sustainability.

Discussions about water around the Nelson Catchment and Regional Water Board table in 1979 resulted in a study that considered a dam for the Wairoa Gorge. This site was discounted, and active work on solutions was paused until the 1980s and early 1990s, when work such as the Tasman Regional Water Study provided more clarity about the district's water issues.

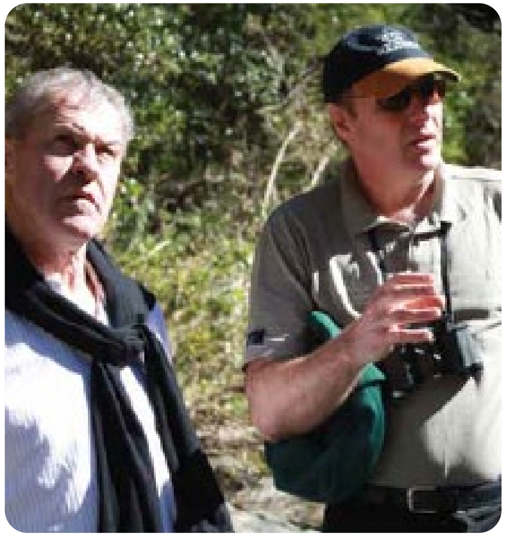
As Council began allocating water resources in the 1990s, concerns rose among producing landowners. Water restrictions fluctuated significantly, affecting the viability of primary production.

With limited land available for cultivation - only 5 per cent of the region is suitable for growing crops, and less than 3 per cent is highly cultivable - water security was an economic imperative. There was a strong desire to maintain the Waimea Plains primarily as a food-producing region rather than it becoming mostly used for housing, which would reduce its economic value and reduce the number of jobs for locals.

*Former Waimea Water Augmentation Committee (WWAC) members.*

*Back: L-R: Barney Thomas, Tim King, Dave Plant, Jeff Cuthbertson, Stephen Sutton, David Easton, Kit Maling, Richard Kempthorne, Martin Heine, Murray Staite, and Dennis Cassidy.*

*Front: L-R: Neil Deans, Julian Raine, Murray King, Joseph Thomas, and Valerie Gribble, Executive Assistant.*



*WWAC Fish & Game representative Neil Deans (right) explains the benefits of the project to former Agriculture Minister David Carter at the dam site in the upper Lee Valley.*

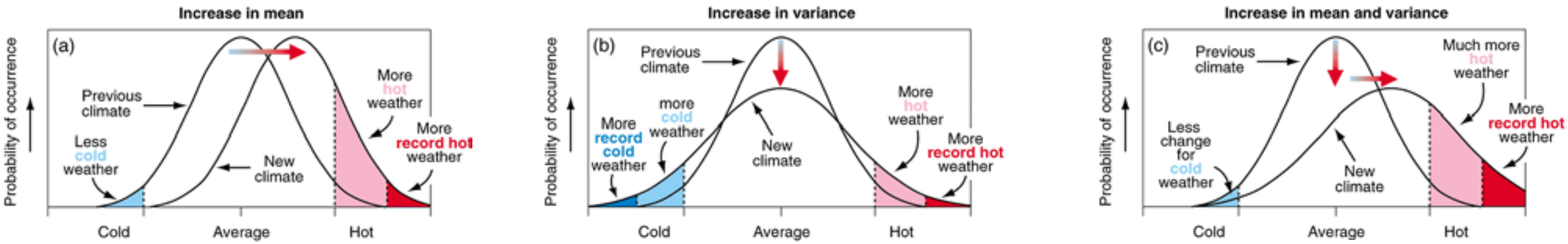
*Project Manager Joseph Thomas and Engineering Consultant Mark Foley lead committee members and visitors on the long climb out of the valley floor at the dam site.*

**Complex drivers to find a solution**

The Waimea Water Augmentation Committee (WWAC), led by Murray King and Julian Raine, was founded in 2001 following the region's significant drought, which caused both severe water restrictions and saltwater intrusion into groundwater along the coast. This drought, along with a number of other factors, underscored the need for a long-term water solution. These factors included the moratorium on water permits, resulting in a long waiting list for these permits, the extension of water metering and rationing to all Waimea Plains water holders, Council's minimum flow review and that water allocation limits would have to reduce to meet new standards.

Facilitated by Council's Joseph Thomas and Dennis Bush-King, a milestone meeting was held in 2003 for those with an interest in water. Water augmentation was high on the agenda, with the goal to create a system that could support water needs over a 50 year period.

*The 2001 drought known as 'The Big Dry'.*




*'Understanding the new "normal" climate' Folland and Karl et al. 2001. IPCC, 2001.*

WWAC was tasked with finding a 'win-win' solution that would meet all community needs. After thousands of volunteer hours, expert advice, and teamwork with the Council, the solution was found – a dam in the Lee Valley.

**Julian Raine, former Deputy Chair, WWAC. Founding board member, WWL**

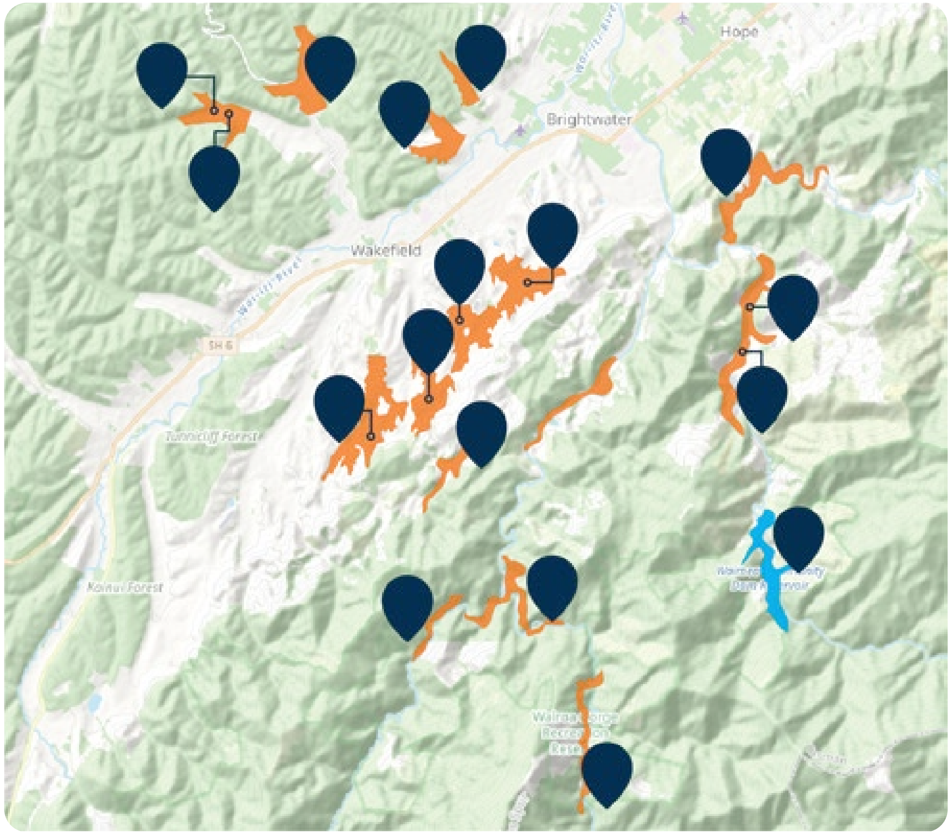
The first phase of WWAC's mandate was to assess a wide range of options for water solutions, considering everything from piping water in from outside the district to creating weirs in rivers. Out-of-catchment solutions were found to be unviable for a variety of reasons as were the adequacy of weirs without enhanced flows in the rivers.

In 2007, WWAC considered 18 potential water storage sites initially and then undertook a detailed assessment of five sites, looking at engineering, environmental and social factors. The group spent close to $6 million on investigations and discussions with the community before the Lee Valley site was ultimately chosen due to:

- The valley's ability to capture rain in its headlands, sitting beneath the Richmond Ranges.
- The Lee River being a feeder into a number of waterways that in turn recharge the aquifers of the Waimea Plains.
- Its lower impact on both the environment and recreational users than other sites.
- The minimal gravel movement from higher up in the reservoir catchment.

The initial area of benefit for the Lee Valley dam was assessed at around 7,700 hectares (water equivalent). This helped to determine the amount of stored water required to service the land and size of dam.

Meanwhile, Waimea Community Dam Ltd was established in 2011 with the purpose of being a vehicle of applying for the resource consent, which was granted in 2015.




The 18 sites in Tasman investigated for an augmented water solution.

Investigated sites

Actual dam site

## Founding WWAC members

Murray King (WWAC Chairman), Lower Confined Aquifer

Dennis Cassidy, Delta Zone

Kit Maling, Waimea East Irrigation Co

Stephen Sutton, Waimea West

David Easton, Upper Confined Aquifer

Julian Raine (WWAC Deputy Chair), Golden Hills/Hope Aquifer

Barney Thomas, Nelson iwi representative

Tim King, Council

Richard Kempthorne, Council

Joseph Thomas (WWAC Project Manager), Council

Peter Thomson, Council

Neil Deans, Fish & Game NZ

Dave Plant, NCC

Martin Heine, DOC

**A project for all**

WWAC's diverse membership included representatives from all irrigation zones on the Waimea Plains as well as the Department of Conservation (DOC), iwi, Fish & Game NZ, Tasman District Council and Nelson City Council (NCC).

WWAC was regarded as a true and successful collaboration. Each party came to the table with different views, but with a shared desire for a healthy river system and reliable water supply for the primary sector and urban areas, as summed up at the time by Neil Deans, Fish & Game NZ's Nelson Marlborough Manager - "The dam in the Lee Valley is a once in a generation opportunity, with substantial long-term economic and environmental benefits to both the regional and the wider New Zealand community."

Early in the process, iwi were engaged to ensure their voice in decision-making. Barney Thomas was appointed to represent iwi on WWAC, playing a key role in including iwi perspectives, which helped to shape a more balanced approach to water management.

Meanwhile, Neil Deans ensured that concerns about biodiversity and river health were addressed. Approximately 30 per cent of the dam's storage capacity was to increase the river's natural flow to enhance the river and its surrounds. Prior to building the dam, funding was secured to support environmental mitigation measures, including $1.5 million allocated for biodiversity projects.

*Biodiversity and river health were a shared desire for WWAC members.*

"The vision and perseverance of the group of people working on the Waimea Water Augmentation Committee post the serious 2001 drought is to be commended. There was a wide range of work led by this group, including the early investigations to support the resource management plan changes and also to obtain the various resource consents for the dam. I am proud to have been involved with WWAC over the years and pleased to see an operative dam that will serve the community well into the future."

**Joseph Thomas, Principal Scientist - Water & Special Projects, Council**

**Progress is never easy**

Despite broad agreement on the need for water security, political and financial obstacles delayed progress.

Maintaining support within Council elected members, especially after different election cycles leading up to the project, was a massive challenge. Former Tasman Mayor Richard Kempthorne, former Deputy Mayor Tim King, some other elected members and Council officers sought to keep a focus on the need for an augmented supply, the financial benefit to the region, and the cost of no augmentation. Work carried out by teams of Council officers under the leadership of Council CEOs, in particular Lindsay McKenzie and Janine Dowding, was significant.

However, dam proponents faced significant opposition to the project, before and throughout construction from a few Councillors and some members of the public, with opposers primarily concerned about the cost to ratepayers.

Legal and bureaucratic hurdles also slowed progress, particularly regarding land acquisition. Eventually, a local bill presented to Parliament by former Nelson MP Hon Dr Nick Smith, helped secure the public land needed for the dam and to allow this land to be inundated by the reservoir.

Funding challenges persisted, with shifting government policies affecting financial support. For example, the Crown Irrigation Fund, initially intended to assist projects towards construction, took a more commercial approach rather than providing grants, which complicated the financing for the dam.

Funding was sourced through a combination of self-imposed levies, ratepayer contributions from Council, central government funds such as the Sustainable Farming Fund and the Irrigation Acceleration Fund, and a grant from NCC. Most of these grants were match-funded by prospective shareholders. Understanding the importance of the dam as an augmentation solution, proponents found solutions to overcome these hurdles.


*Demonstrators for and against the dam outside Tasman District Council offices, 9 August 2018.*

> There was a large amount of work done by Council CEOs and their teams to assess all water supply options for our region to ensure the right decision was made. The dam was deemed the only option to solve all the water supply challenges facing the Council and the community in one piece of infrastructure. And, now that it is operating, all the benefits we hoped for have been realised. I feel this is the most important project I have been involved in during my six years as Councillor and 12 years as Mayor. I am incredibly proud.

**Richard Kempthorne, former Tasman Mayor**

"A dedicated group of enthusiastic, progressive people deserve immense thanks for their part over more than 20 years in securing water supply for our region's future. They had a clear vision to capture water when it is abundant and augment the river system in dry times and avoid the acute water shortages. This vision was finally realised in 2024."

**Murray King, former Chair, WWAC. Chair, WIL**

**Partnering with the water users**

While Council continued managing geology and engineering exploration on the Lee Valley site, with rating contributions from inside the zone-of-benefit, how the dam's construction would be overseen and paid for was still to be decided.

Local grower Nick Patterson's role grew during the consenting process before he became Project Director for dam funding. He was instrumental in getting people, especially water users, onside and involved in the project, acting as a crucial bridge between Council and the irrigators, until he passed away in January 2016.

Later in 2016, Waimea Irrigators Ltd (WIL) was incorporated, and WIL directors approached generational Tasman grower John Palmer to act as the strategic advisor for the project.

Maintaining an effective relationship with Council as a partner was a critical piece of work, and John worked to be the lynch pin, promoting the project to irrigators, councillors and central government.

At its incorporation, the company had no funds or personnel, so John was quick to employ experienced project manager Natasha Berkett to build and run WIL.

WIL's purpose was to guarantee water user rights to access dam water, and in 2017 a 50/50 shareholding framework for the dam between Council and WIL was agreed. A CCO, which would later become WWL, was required as an ownership structure due to the need to transfer Crown land to another public entity, that being Council. In 2018, WIL would eventually become a significant partner in the development of the dam, and later a shareholder of WWL with Council. On establishment in November 2018, WWL's shareholding changed to 51/49, with Council holding the majority interest.

First though, WIL's shareholder base needed to be built in order to fund the irrigator contribution of the dam. This would come from direct investor equity (i.e. water users purchasing Water Shares) and from loans from Crown Irrigation Investments Ltd (CIIL), which WIL shareholders had liability for.

Additional loans were provided from Council, with Council's funding also sourced from CIIL, and grants came from the Ministry for the Environment and NCC.

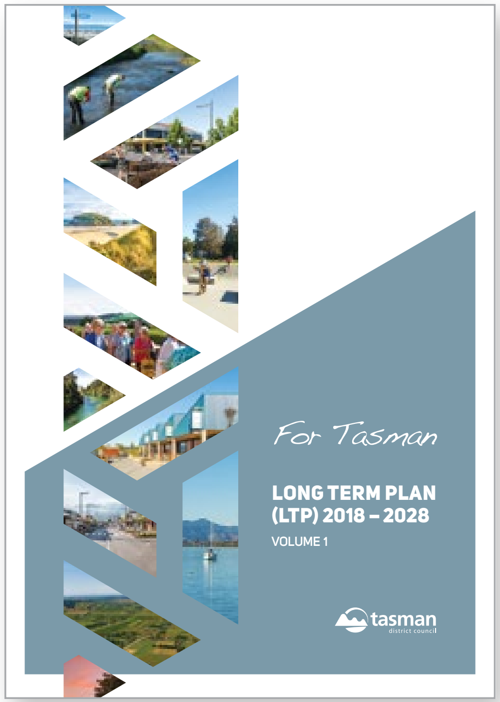
Three thousand shares sold to irrigators was a milestone to allow the project to commence.

*Irrigation in the Waimea Plains.*

John Palmer and Natasha Berkett led all of WIL's work programme and negotiations to:

- Raise pre-finance to run WIL.
- Raise equity from water users to help construct the dam.
- Raise loans from CIIL to help construct, maintain and operate the dam.
- Enter into a shareholder agreement with Council.
- Enter into a 'wholesale' water augmentation agreement with WWL to enable WIL to augment water to its shareholders through the release of dam water into the river and groundwater system.
- Enter into a water augmentation agreement with each WIL shareholder.

Meanwhile, as WIL worked to raise project funds through 2017 and 2018, the primary public discourse focused on the ratepayer burden of the dam's cost, and again questioned whether or not it was the best solution for water security. Dam proponents struggled to inform the public about the regional economic value of the dam (beyond irrigators), the urgent need for urban water supply for the burgeoning residential developments, and the requirement to meet newly introduced minimum river flow conditions.




Funding options that were mooted ranged from a dedicated levy on irrigators, due to the perception by some that they were the only beneficiaries, to a general rate, because of the widespread benefit, to a special rating. The 2016 local body elections saw the funding issue become a key debate that was carried into the Council Chamber by newly elected Councillors. How the dam would be funded was included in the subsequent Long Term Plan and as part of a separate consultation document.

With funding contributions for the dam still not confirmed by 2018, and construction cost estimates rising, WIL sought to raise an additional $16 million through shares. A group of water users who understood the risk of not having a dam led the way, building confidence amongst the rest of the water user community. This resulted in a successful funding raise across a mix of large and small rural businesses and lifestyle land owners.

But, in August 2018, a new construction cost estimate meant a further $11 million was needed. With the funding gap now being the size it was, Council voted to stop the project altogether. John Palmer led the campaign to find more funding, and at the 11th hour a group of the larger irrigators pledged to fund the balance estimated at that time. With the finances secured, the August Council no-vote was revoked the following month, with the final yes-vote occurring in November just ahead of financial close. The larger irrigators formed Century Water Ltd in December 2018 as their funding mechanism.

> For projects such as this one, having people who are passionate, experienced and willing to get things done, are critical to the right outcome. Through the highs of the Council yes-votes and the shocks of the no-votes, these people never stopped, understanding the bigger context of how critical the dam is to the future of the district and all our grandchildren and their grandchildren.

**John Palmer, Strategic Advisor, WIL**

### Expert advice along the way

In October 2017, the Community Water Solutions Advisory Group (CWSAG) was established to consult with Waimea Water, Council, NCC, WIL and the community, on impacts and opportunities that would come to light during Council consultation processes.

CWSAG brought together eight creditable, independent and knowledgeable individuals to provide robust evidence for the need for more water storage in the region, the science underlying the prime delivery method, (aquifer recharge) and the ecological benefits to the river systems and aquifer waters. The need for such an advisory arose because the global distrust in science and evidence-based decision-making was also increasing in this country.

CWSAG members included New Zealand's former Parliamentary Commissioner for the Environment Morgan Williams QSO (PhD, MSc), John Hutton (BA, MBA (Econ)), Jackie McNae (BReglPlng (Hons)), Kevin Thompson (BEng (Hons), PhD, IPENZ), Andrew Fenemor (BAgEng, MSc), Paul Dalzell (BA (Econ), MA (Econ - Hons)), Mike Johnston (BSc, PhD), and John Bealing (BAgrSc, MNZIPIM).

CWSAG's role was fulfilled when construction of the dam was agreed by Council in November 2018.

Meanwhile, the resource consent process for the dam was significant, requiring a team of WWAC members to undertake extensive engagement with stakeholder groups. The project had 22 permits containing 184 resource consent conditions. Neil Deans alongside Council's Environment and Planning Manager Dennis-Bush King led WWAC's consent development process, with it being approved almost without challenge.

Overall, Council's extensive expert assessments and consultation throughout the years is credited for the project processes not facing any legal challenges

## Pre-construction milestones

**2014**
Tasman Resource Management Plan changes to water rules come into effect, containing allocation limits, minimum flows and rationing triggers that apply when the dam is in place as well as transitional arrangements until the dam is operating.

The Government enacted the National Policy Statement for Freshwater Management, directing councils to manage water in an integrated and sustainable way while providing for economic growth within set water quantity and quality limits.

**2015**
Council consults the community on including up to $25M (33% of the estimated dam capital cost) in its Long Term Plan 2015–2025.

Resource Consent is granted.

**2017**
**27 July**: Council and WIL decide that a dam in the Lee Valley is the best solution for the community's water supply needs, after undertaking an options assessment.

**14 December:** Council and WIL appoint Fulton Hogan Taylors JV for an Early Contractor Involvement (ECI) process.

**2018**
**28 August**: Council voted 8-6 against proceeding due to rising costs, now estimated to be $102M, which was $26M more than previously projected.

**6 September:** Council revoked the August decision and voted 9-5 to push on after they were presented with a reworked funding model that lowered the expected costs to ratepayers.

**30 November:** Council voted 9-5 to proceed with the dam project and approved its total contribution, authorising necessary agreements.

# Complexities caused delays and cost increases

The five-year dam construction project began in March 2019, with site works commencing in August 2019 after the access to the site was cleared and built.

Challenging weather – droughts in the summers, multiple floods and icy temperatures in the winters – impacted the project's timeline from the beginning to the end.

*Flooding 5–8 November 2020.*

*Extensive remedial work required at the base of the spillway and plunge pool.*

Along with the disruptive weather, the build itself was not straightforward. Challenges that led to a 2.5 year delay in completion included, but were not limited to:

- The encountered geology (see pages 26–28).
- COVID-19-enforced shutdowns and closed borders.
- Inflation increasing material costs and delaying their delivery.
- Shortages of people able to work on the project.
- The structures taking longer to construct than the Contractor had anticipated.

The final and successful testing of the two large dispersing valves on 10 April 2024 marked the dam as being ready for full operations, with the Contractor completing their residual work and the documentation required for practical completion in June 2024. Ironically, while wetter than normal winters hindered construction in 2021 and 2022, in 2023 – the winter when rain was needed to fill the reservoir – the region recorded some of its driest weather in many years.

As well as a delayed programme of works, the aforementioned impacts led to an increase in the project's cost. Since the original budget of $104.4 million in December 2018, the final project cost was $211 million.

Read more about the project's milestones on pages 18–19.

## From reservoir to land

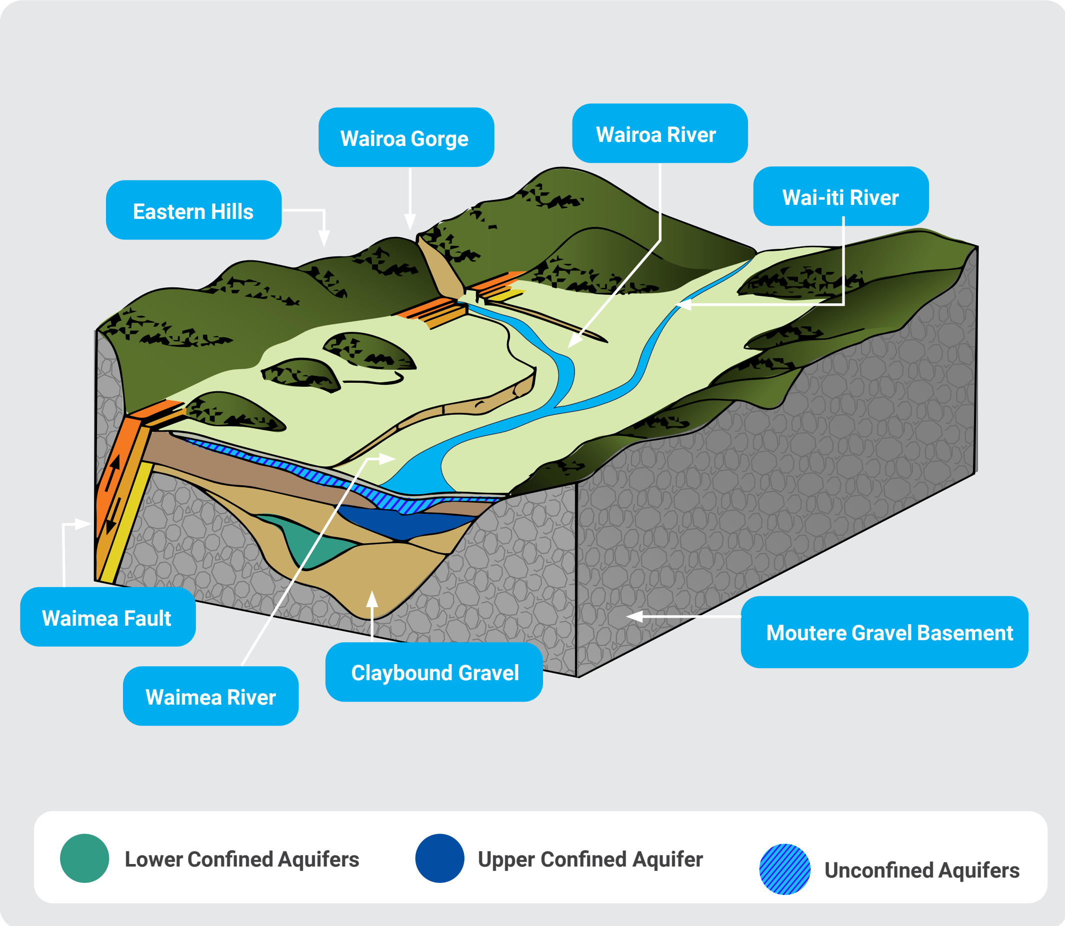
The dam uses nature's delivery system – rivers – to supply water from the upstream reservoir to the rivers downstream and then to the aquifers that supply Waimea's plains and bores.

Rainfall is caught and stored in the dam's reservoir, with water naturally flowing down the spillway into the river when the reservoir is full. Additional water is released in times of need to maintain sufficient flows in the Lee and Waimea rivers.

Maintaining higher river flows and aquifer levels during droughts also protects the overall health of the river, which is essential for river plants and fish and eel species and lowers the risk of coastal saltwater seeping into the aquifers and damaging potable water supply.

Behind the dam, the 13 million m³ reservoir – gifted the name Te Kurawai o Pūhanga by Ngāti Koata in 2023 – spreads over 68 hectares within the Richmond Ranges, below Mt Rintoul. From the dam, the reservoir extends southeast approximately 4.5 kilometres up the Lee River and branches into Waterfall Creek and Flat Creek. The reservoir is large enough to maintain sufficient river flow and aquifer recharge to mitigate the impact of a drought greater than a 1:50-year event across much of the Waimea Plains.

The flow from the dam supports both horticulture and the domestic water wells near Appleby that supply water to the combined Richmond-Nelson water network. Māpua, Ruby Bay, Brightwater and Wakefield also use bores in the Waimea Plains and benefit from the recharged aquifers.




*Three-dimensional hydrogeology of the Waimea Plains.*

## Providing economic, environmental and social outcomes

The dam provides three key benefits. Firstly, having a reliable water supply supports the urban population of the fast-growing Richmond and Waimea areas. Secondly, the irrigators of the Waimea Plains benefit from water security, driving our primary industry and supporting our wider region's economy. And thirdly, the environment – higher river levels improves river health. These benefits are explained in more detail on the following pages.

The stability of water supply has enabled more investment, leading to more permanent jobs. So it's not just about picking apples, it's everything else that goes with that.

**Matthew Hoddy, Vailima Orchards**

The water security from the Waimea Community Dam has enabled Connings to invest in food production and retail facilities.

**Ben Conning, Connings Food Market**

# ECONOMY

The dam provided positive economic outcomes to the regional economy directly during construction through the work and workforce, and indirectly through enabling investment and growth across the region. During the project, WWL also employed engineering interns and graduates to support the development of New Zealand's future engineers.

This enabling of residential, commercial and industrial investment and development brings jobs and associated economic activity to the region.

Water security supports Tasman's food-growing community and provides its primary sector with confidence to invest and produce food in the face of a changing climate, which in turn leads to the subsequent growth of associated secondary and tertiary industries. Because of the dam, the risk of water restrictions is dramatically reduced for all businesses that use and rely on water to operate; businesses which employ hundreds of local people.

Before the commencement of the project, the New Zealand Institute of Economic Research estimated in 2017 that the economic benefit of the dam would be $55 million in the first two years.

A great win-win-win all round for the region.

**Prime Minister, Rt Hon Christopher Luxon**

# ENVIRONMENT

Ongoing, adequate water supply from the dam improves the health in the Lee and Waimea rivers for aquatic life to thrive. It also supports swimming, fishing and other recreational activities.

During construction, WWL managed and mitigated impacts on the environment through intensive planning. Plans included initiatives such as building sediment retention ponds to capture construction runoff and removing or mulching cleared trees to prevent them going into the water. Water quality was also measured on a regular basis. Read more about the dam's robust testing and maintenance of water quality on page 61.

As part of its ongoing biodiversity and environmental initiatives, by 2024 WWL had planted 10 hectares of native trees and plants at Rough Island and relocated rare plant species and restored parts of the Waimea Bermlands, as explained further on pages 58 to 60.

"Higher minimum river flows achieved by the dam's water release mitigate the risk of long-term damage to the aquifer and potable supply by saltwater intrusion, and improve river health for plant and fish communities."

**Alasdair Mawdsley, Environment & Sustainability Manager, WWL**

# COMMUNITY

The community's importance to the project is reflected in the dam's middle name – the Waimea *Community* Dam.

With the public-at-large unable to visit the site due to its remote location, access via private land and the safety risk, WWL took the community on the construction journey in other ways.

Community meetings were held, interactive displays were installed at the Richmond Library and Richmond Mall, and a stall was set up at the A&P Show. WWL also hosted iwi, central and local government representatives, shareholders, and national and local media onsite, with the latter's stories helping to keep the wider community updated.

WWL's website, YouTube channel and Facebook page were regularly updated with aerial videos and photos. In particular, a 360-degree virtual 'tour' of the dam during construction was popular, receiving thousands of views.

*Young visitors to the Richmond Mall display, March 2023.*

*The 2024 Merrell Spring Challenge's new whitewater rafting stage was made possible due to water releases from the dam.*

*Tasman Mayor Tim King and WIL Chair Murray King tour the site with WWL CEO Mike Scott, April 2024.*

"This project was always intended to deliver positive outcomes to the economy, environment and wider community. Despite the many challenges during its planning and construction, it is already delivering the envisaged economic, social and environmental benefits and will continue to do so well into the future."

**Tim King, Tasman District Mayor**

**Pre-construction**

# TIMELINE

Several decades of work have been invested into this significant regional infrastructure.

**2003**
Following a severe drought in Tasman in summer 2001 - 2002, WWAC[1] is established to look at water supply options.

**2010**
WWAC completed detailed feasibility study.

**2013**
WWAC proposed a private co-operative company operates the dam, but it had legal constraints on funding for Council[2].

**March 2014**
Changes to water rules in the Tasman Resource Management Plan came into effect.

**September 2014**
WCD[3] lodged an application for resource consent.

**October 2014**
NZIER[4] report showed regional GDP would reduce significantly ($17.5 – $34.5 million p/a) without the dam.

**October 2014 – May 2015**
Community consultation on how the dam should be funded and managed.

**March 2015**
Resource consents are granted, subject to conditions.

**2015–2016**
Water permits introduced change water allocation policies and rules in the Waimea water management zones.

**2016**
WIL is incorporated.

**Early 2017**
EOI[5] process to establish the construction cost of the dam.

**June 2017**
NZIER updated its 2014 economic assessment, showing the benefits of the dam.

**November – December 2017**
Public consultation on funding Council's share of the dam.

[1] Waimea Water Augmentation Committee
[2] Tasman District Council
[3] Waimea Community Dam Ltd
[4] New Zealand Institute of Economic Research
[5] Expression of Intent
[6] Council Controlled Organisation
[7] Waimea Irrigators Ltd
[8] Nelson City Council
[9] Early Contractor Involvement
[10] Waimea Water Ltd

## Construction

**February 2018**
Council approved using a CCO[6] to oversee and manage the dam project.

**April 2018**
WIL[7] closed month-long water shares offer raising $16.5M.

**June 2018**
Council and NCC[8] 2018/28 Long Term Plans included dam funding.

**August 2018**
ECI[9] process estimated costs above the original budget. Council submitted a Local Bill, sponsored by Nelson MP Nick Smith, to allow access to land in Mount Richmond Forest Park for the dam.

**September–October 2018**
A revised budget was proposed and Select Committee hearings on the Local Bill were held.

**November 2018**
Council voted to proceed with construction.

**December 2018**
WWL[10] is incorporated.

**11 March 2019**
Dawn blessing of the site.

**March 2019**
Site work started.

**9 August 2019**
Ground-breaking ceremony.

**January–February 2020**
Geological issues were identified, requiring design changes and increased budget.

**28 April 2020**
Construction recommenced after the COVID-19 lockdown.

**14 August 2020**
Blessing and ceremony for completed culvert.

**February 2021**
Further geological issues and COVID-19 impacts resulted in a budget increase.

**June 2021**
Downstream reinforced rockfilled portion of dam is completed.

**August 2021**
COVID-19 Level 4 restrictions.

**September 2022**
Dam face and equipment, parapet wall and spillway are completed.

**October 2022**
Partial closure of culvert.

**January–March 2023**
Temporary pipework is installed and commissioned.

**May 2023**
River diversion. Reservoir is closed.

**June 2023**
Ngāti Koata reservoir blessing.

**August 2023**
Reservoir filling commenced.

**January 2024**
Te Kurawai o Pūhanga reservoir reacheed full capacity and water flowed down the spillway.

**February 2024**
Temporary pipework is removed and permanent pipework connected and completed. Plunge pool completed.

**March–April 2024**
Water is released through the permanent dispersing valves.

**June 2024**
Dam is commissioned and fully operational.

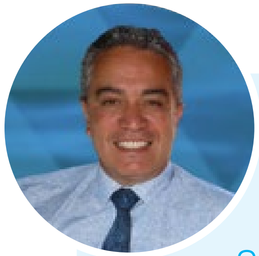
Dawn blessing of the dam site, March 2019.

Blessing of the diversion culvert, August 2020.

## Partnering with tangata whenua

There was engagement with tangata whenua and iwi throughout the project. A mauri stone was laid in 2019, a mark of respect to Papatūānuku, the earth mother, and a blessing was bestowed on the site and the dam structure. Ngāti Koata also blessed the culvert in August 2020 and the reservoir, spillway and bridges in June 2023, gifting them Māori names, as described on page 22.

A Partnering Deed ensures WWL continues to work closely with Ngāti Koata in perpetuity to protect and nurture taonga (objects and locations of value) in the area and to integrate Māori cultural values in caring for the environment in WWL's work.



Ngāti Koata is proud to be part of the Waimea Community Dam. The mauri of the awa and associated aquifers is of great importance to Ngāti Koata and recognises the value of water as a taonga for all New Zealanders. As tangata whenua, Ngāti Koata has an intrinsic interest in the water including a kaitiaki responsibility that must be consistent with the concept of Te Mana o te Wai.

**Hemi D Toia, Chief Executive, Koata Ltd**

## Ngāti Koata blessed the reservoir and bridges in June 2023 and named the reservoir Te Kurawai o Pūhanga, the upstream bridge Te Arawhiti o Mauriri and the downstream bridge Te Arawhiti o Renata.

*Blessing of the diversion culvert, August 2020.*


*Ngāti Koata bless and name the reservoir Te Kurawai o Pūhanga, June 2023.*

# NAMES OF KEY STRUCTURES

## Te Kurawai o Pūhanga | Reservoir

### PUHANGA HEMI TUPAEA

Just as a dam creates a reservoir of water that will be a life force for this area way into the future, Puhanga Hemi Tupaea of Ngāti Koata, Ngāti Kuia, and Ngāti Toa from Te Tauihu (Top of the South Island), holds a reservoir of knowledge in traditional Māori arts, crafts, music, and tikanga.

She has spent a lifetime feeding, sharing, instructing, and gifting to those she connects with. Those connections are strong, and they enrich and beauty to the lives of others. Her creative designs are woven into the panels and paintings around several marae in Aotearoa, but especially in the wharenui, Kākati, at Whakatū Marae, Nelson.

Her tukutuku design, Whakaaro Kotahi, seen in the wharenui is also on the New Zealand $100 note. The Ngāti Koata Trust logo is also her design, which she gifted to a fledgling entity that has grown in strength over the decades. Her songs of tūpuna, experiences, and connections, both past and present, uplift, educate, and inspire.

## Te Arawhiti o Mauriri | Upstream Bridge

### MAURIRI

Mauriri, a great-great-grandson of Koata, was born in Aotea in the 1770s during a time of extensive conflict. An accomplished warrior and an expert in forest lore, Mauriri was among the Ngāti Koata who left their ancestral homelands c. 1820, initially making their way to Taranaki.

Scouts, considered the 'eyes and ears', advanced before the main party to determine the best route forward. Mauriri is identified as the principal scout for Ngāti Koata in their main heke, Te Heke Whirinui, from Taranaki to the Kapiti Coast. He had two wives and at least four children. One of his sons, Matiu Te Mako, was a key figure in the initial taking of Kapiti Island and the establishment of the Ngāti Koata outpost at Waiorua. During the battle of Waiorua c 1824, Tawhi, a Ngāti Koata youth of high rank was seized by Kurahaupō warriors and taken to Te Tauihu. Mauriri commanded one of two waka that pursued them. Tawhi was returned and a tuku or offer of territory was given by Tūtepourangi to Ngāti Koata who became the first of the northern iwi to settle in Te Tauihu. Just as a bridge provides safe passage over obstacles, Mauriri helped facilitate the safe passage of his people to Te Tauihu.

Mauriri settled in Motueka with his second wife who was of Ngāti Rārua descent. He also made a tuku of territory to Ngāti Rārua from Motueka westwards. Mauriri was accidentally killed in Admiralty Bay in 1834 and is buried on Rangitoto ki te Tonga.

## Te Arawhiti o Renata | Downstream Bridge

### RENATA TE KAWHAKI

Renata Te Kawhaki (also known as Renata Te Kauwhata, Renata Te Morehu, Renata Te Kawharu, and Renata Te Pau) was successful in building bridges between two cultures.

Originally from Kāwhia; his father was involved in the main heke or migration south to Te Tauihu. Renata was known as a 'Lover of Peace.'

He was recognised for his service as a pilot for the NZ Company boats at the time of the settlers' migration, in 1840, by "navigating them through the potentially dangerous passageway into the safe Nelson harbour."

Renata was married several times, including to Erama Wauwau, Raiha Mokena and Ngatangi or Peita Renata. He was survived by several whāngai (adopted) children. He was a staunch supporter of establishing a Native School at Whangarae, where he lived for most of his later life. When he passed away in 1901, at the age of 87, he was recognised and honoured by his people with an inscription on his headstone "...the last great chief of the Ngāti Koata tribe." His tangihanga was attended by large numbers from both the Māori and Pākehā communities.

## Patterson Bridge | Spillway

### NICK PATTERSON

Nick (A.O.) moved to Nelson in the 1970s. He quickly established himself as a leader in the horticultural and wider Nelson community. He and his partners established Wai-West Horticulture in the 1980s growing a range of fruit crops on the Waimea Plains.

He recognised the certainty of water as a key factor in growing food crops to feed and support the local community, provide jobs, earn export revenue and support the wider economic, social, and environmental needs. Nick was instrumental in establishing, along with other leading primary producers, WIL.

He engaged with the wider irrigating community to find ways of funding its share of the Waimea Dam alongside the Council.

He was the symbolic bridge between the 225 irrigation shareholders (WIL) and Council to successfully establish this 100+ year community project.

# LOCATION


Richmond
6
Brightwater
River Terrace Rd
Wakefield
Lee Valley Rd
DAM
DAM TO
Brightwater 15 km
Wakefield 21 km
Richmond 23 km
Nelson 30 km


Before


After


Before


After

# Issues with the rock

A concrete-face rockfill dam design was selected as the most appropriate design for the geology, location and seismic loads of the Lee Valley site. This design utilised the indigenous sandstone onsite as the drainage material inside the embankment.

However, from early 2020, issues with the geology at the dam site started to emerge – issues that had not been found during the extensive pre-construction testing.

As excavation progressed, rather than a strong, clean, free-draining sandstone, the indigenous rock was found to be predominately a foliated silt or mudstone argillite that broke down on handling and processing.

This encountered 'dirty rockfill' posed risks with both drainage inside the dam embankment and erosion under and around the dam structures, although the undisturbed foundation rock on which the embankment sits was sufficient and as expected. The poor onsite rock meant the engineers needed to adapt the embankment design to use dedicated drainage layers, with 110,000 m³ of drainage rock imported from a neighbouring quarry.

The remaining 77 per cent of the embankment used lower-cost indigenious rock as planned.

This adjusted design enables any seepage that may occur to flow through the embankment drainage zone without saturating the indigenious rockfill. It also provides support to the concrete face if there is any movement or settlement of the fill.

"Despite the challenges with the encountered poor rockfill, we re-engineered the embankment to maintain the integrity of the rockfilled dam design."

**Iain Lonie, Engineering Manager, WWL**

*Encountered indigenous rockfill (top) and imported rockfill (bottom).*

# How the geology impacted specific dam structures

### More overburden than expected

There was more overburden (soil and soft rock) than expected, and it needed to be removed from both the abutments and the old riverbed. Once the additional overburden was removed it was found that:

- ~60,000 m³ more rockfill was required within the embankment, increasing its size to ~490,000 m³, 13 per cent larger than planned.
- The true left-hand side (LHS) was highly fractured and defective, needing 50 per cent more flow-limiting material than anticipated to treat defects and 25,000 tonnes of sand to be imported from around Te Tauihu.

Stabilisation of the batters was needed above and below the spillway to anchor the rock and protect the spillway.

*Shear zones on the LHS.*

### Solifluction deposit found

A 45,000 m³ solifluction deposit (highly weathered soil), was found beneath the proposed spillway access and reservoir roads, immediately upstream of the spillway. If left untreated and once saturated by reservoir filling, this could have eroded into the reservoir, causing water quality problems and a loss of access for operations. The material was removed and replaced, and a high-capacity subsoil drainage system installed.

### Substantial grouting required

To further strengthen the waterproofing and prevent seepage beneath the dam, greater quantities of drilling and grout were needed to close the subsurface. The original plan had been to drill ~300 bores and undertake ~5,000 metres of drilling, but more than 880 bores and 18,000 metres of drilling were needed to sufficiently reduce the permeability of the subsurface beneath the dam.

### Voids and foundation treatment

More than 1,000 m³ of concrete was poured to treat voids found beneath the culvert and LHS plinth. Additional voids and foundation defects beneath the embankment and spillway also required treatment.

*Stabilising structures under the RHS plinth.*

### Stabilising the right-hand side

Colluvial material encountered above the right-hand side (RHS) plinth required additional stabilisation.

Also, a lower section of the RHS plinth, ~12 metres above the embankment foundation, was found to have deficient rock to build the plinth on.
This deficiency was rectified by replacing the missing rock with a concrete beam, and constructing a concrete 'staircase' to mitigate differential settlement of the rockfill against the plinth. Additionally, voids beneath the plinth required remediation.

### The problematic left-hand side

The key structures of the ogee weir, spillway, flip bucket and plunge pool all sit on the true left-hand side of the dam, where the most significant geology issues were found.

Two shear zones of up to two metres wide and consisting of clay gouge and heavily shattered, very weak rock intersected the spillway near the ogee weir. These shear zones posed an erosion risk to the spillway.

To rectify this, a 5,000 m² impermeable geomembrane apron was constructed upstream of the ogee weir, drainage zones were added, piezometers were installed to monitor seepage, and enhanced grouting was placed.

The lack of topography on the true right and the fractured founding rock on the left of the spillway meant a concrete liner reliant on the founding rock was not possible.

Instead, the spillway's walls were redesigned to be free-standing cantilevered concrete walls, with additional drainage and foundation treatment.

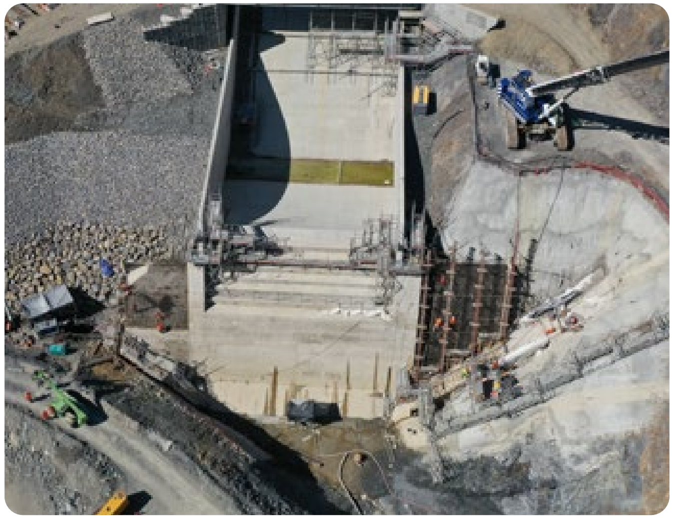
Working down the spillway, the founding rock beneath the flip bucket was also unsuitable, so was removed and replaced with more than 2,000 m³ of mass concrete.

Greater erosion of the plunge pool meant it was deepened to six metres below river level and the cut-off wall was extended a further three metres below the plunge pool. Shotcrete was used to treat the shear zones immediately in front of the cut-off wall.

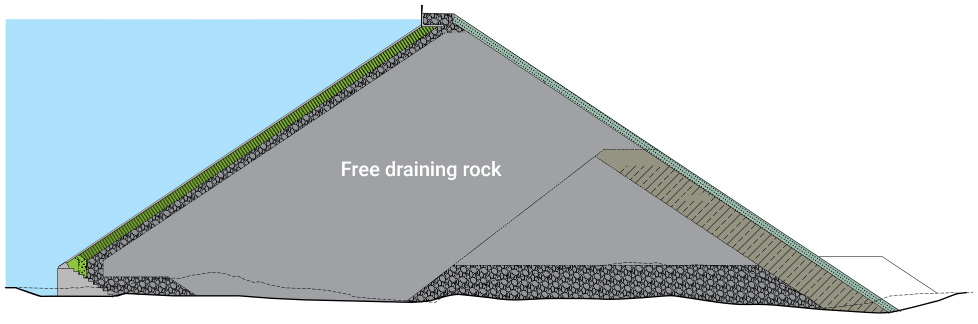
*A view of the fractured true LHS with shear zones above the spillway.*

*Drilling holes for the grout curtain in front of the ogee weir.*

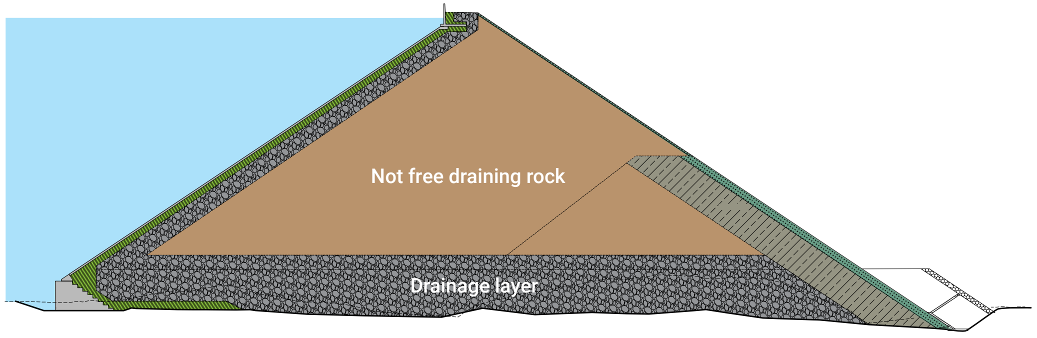
*Free-standing cantilevered spillway walls above the steep topography.*



*Spillway cut-off wall and shotcrete around the plunge pool to protect the spillway.*




*Original design based on free-draining rockfill found onsite.*




*Updated design with increased drainage layers.*

# DAM DESIGN

The concrete-face rockfill dam is designed in accordance with NZSOLD's New Zealand Dam Safety Guidelines, New Zealand Standards, New Zealand Building Regulations, international best practice and to the relevant highest design requirements and standards for floods and earthquakes.

A concrete-face rockfill dam design was selected as the most appropriate and efficient design for the geology, topography and seismic and flood loads. This remained as the dam design, with adjustments made due to the rock found onsite.

All critical dam safety elements of the design were assessed by Damwatch Engineering Ltd. Where warranted, these designs were reviewed by an independent panel of engineers from GHD Engineering.

**As a High Potential Impact Category (PIC) structure the dam is designed to the highest standards required by the NZSOLD guidelines. The key criteria of the design are:**

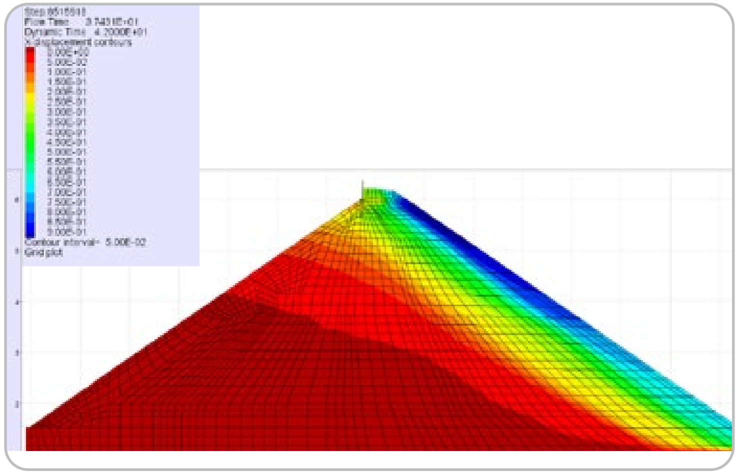
- ✓ **Inflow Design Flood (IDF):** 1:10,000 Annual Exceedance Probability (AEP) to Probable Maximum Flood (PMF) depending on potential loss of life from a dam failure.
- ✓ **Operating Basis Earthquake (OBE):** 1:150 AEP where the dam is required to continue operating as intended with only cosmetic damage allowed.
- ✓ **Safety Evaluation Earthquake (SEE):** 1:10,000 AEP.

The terms used above are explained in the glossary section.

# The dam includes the following features:

## 1. Seismic resistance

The dam and spillway have been designed to not fail under seismic loads, estimated by GNS Science, from the nearby Waimea-Flaxmore Fault System (approximately eight kilometres from the site) and the Wairau and Alpine faults (approximately 21-22 kilometres from the site) during 1:10,000-year events. In 2020, a detailed Fast Lagrangian Analysis of Continua (FLAC) of deformation under design seismic loads was completed. It found any resulting embankment deformation from seismic loads would not compromise the performance of the dam.

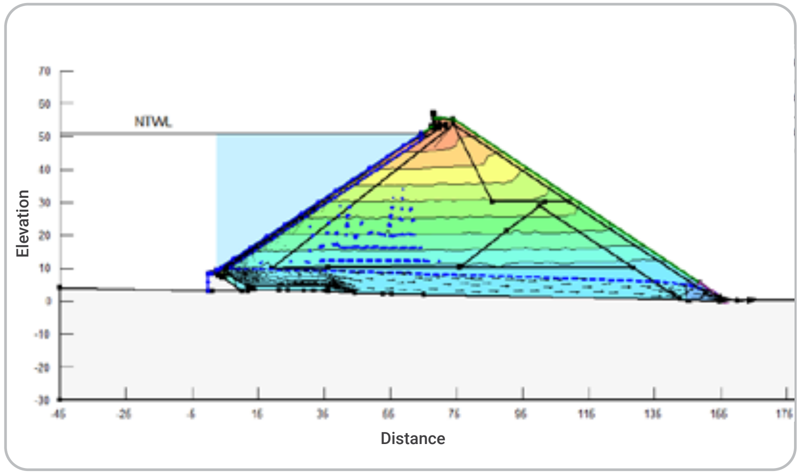

FLAC diagram (Credit: Damwatch Engineering Ltd.)


*The concrete-face rockfill dam, designed to the highest standards required by NZSOLD guidelines.*

## 2. Embankment

The rockfill embankment was designed to limit, and then drain seepage without saturating the indigenous rockfill, to mitigate the risk of internal erosion. Specifically, this included:

- A highly engineered flow-limiting barrier (zone 2B) to firstly reduce flow into the embankment.
- Size and transmissivity of chimney and blanket drains (zone 3P) to allow drainage, under full head and without any concrete face, without saturating the indigenously-mined dirty rockfill. The drainage chimney and blanket were constructed of imported drainage fill from a nearby quarry.
- A lined toe-berm captures any seepage and releases flow through weirs that measure and monitor any flow through the embankment.



*Seepage flow through maximum dam section. (Credit: Damwatch Engineering Ltd.)*


*Flow-limiting zone on left and chimney drain on right.*

## 3. Impermeable concrete face and parapet wall

The concrete face is designed to international best practice with flexible waterstop joints to the plinth. The concrete parapet wall on top of the crest was precast, installed in sections, and has an elastic geosynthetic membrane external waterstop to allow flexibility and movement if there is a seismic event.

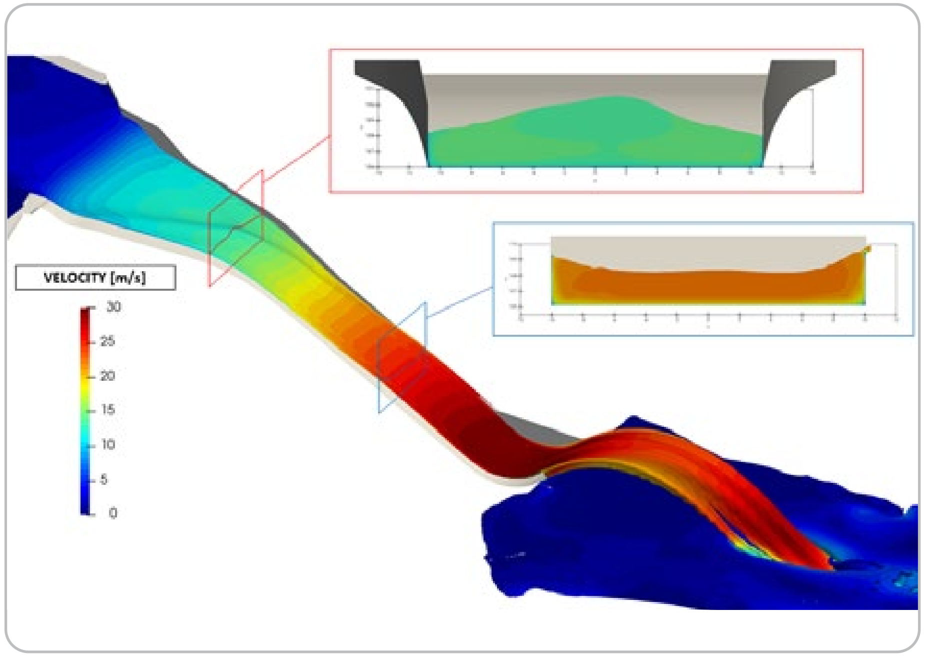
*Installation of the parapet wall on the dam's crest, June 2022.*

*Concrete face completed, September 2022.*

## 4. Spillway

The approach channel, flip bucket and plunge pool were revised and the lower spillway bridge abutments were modified to suit rock conditions. The conventionally designed spillway features:

- **Inflow Design Flood (IDF) Capacity:** The dam's adopted IDF is the PMF, which accounts for a peak outflow of 1,059 m³/s. 2020 modelling showed that the spillway is actually capable of passing 1,200 m³/s, 13 per cent more than PMF requirements, with its design also catering for predicted increases in flood intensity due to climate change.
- **Drainage:** Extensive longitudinal and lateral drains flow into open drainage and then into weirs to both release any subsurface flow and hydrostatic uplift, and to monitor any subsurface flow.
- **Anchoring:** Dam engineering standards changed following the failure of the Oroville Dam spillway in 2017. In line with this contemporary standard, circa 1,500 anchors were installed in the spillway at a typical depth of five metres into the rock at the dam.




*Velocities for the PMF scenario estimated using a 3D CFD model of the Stage 5 design. (Credit: Damwatch Engineering Ltd).*

*Spillway nears completion, August 2022.*

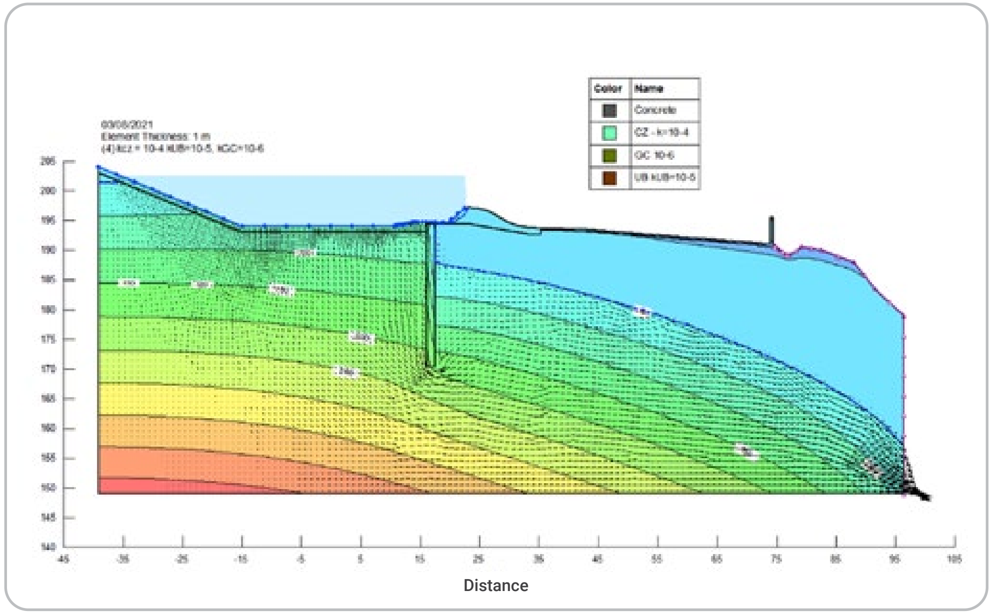
## 5. Spillway approach apron

During excavation, extensive shear and crush zones containing thick erodible clay seams were identified as bisecting the approach channel to the spillway and the spillway itself. If left untreated, these defects would be potential seepage flow paths beneath the spillway, and threatened the integrity of the overlying spillway.

Seepage analysis through the shear zones and beneath the spillway was completed to understand uplift pressures and hydraulic gradients beneath the structure.

Extensive optioneering was undertaken to develop a cost-effective solution. Three-dimensional imagery, survey and design allowed the design of drainage and an impermeable apron to be custom fitted to the encountered geology. The design features:

- Geomembrane lining of the approach channel to prevent ingress of seepage into the shear zones and to lengthen the seepage path. The geomembrane was sourced and delivered from Carpi Tech in Europe.
- Drainage zones to remove any seepage that bypasses the liner.
- Increased grouting across the spillway alignment including additional grouting through shear zones.
- An increased network of piezometers to monitor seepage within the approach channel and shear zones.




*Seepage analysis (Credit: Damwatch Engineering Ltd).*

*Carpi waterproof liner being placed on the spillway approach, April 2023.*

## 6. Plunge pool

Upon excavation of the plunge pool and cut-off wall at the downstream end of the spillway, poor rock conditions, including a network of shear zones, were encountered. This raised concerns about the depth of potential scour within the plunge pool and the stability of the cut-off wall.

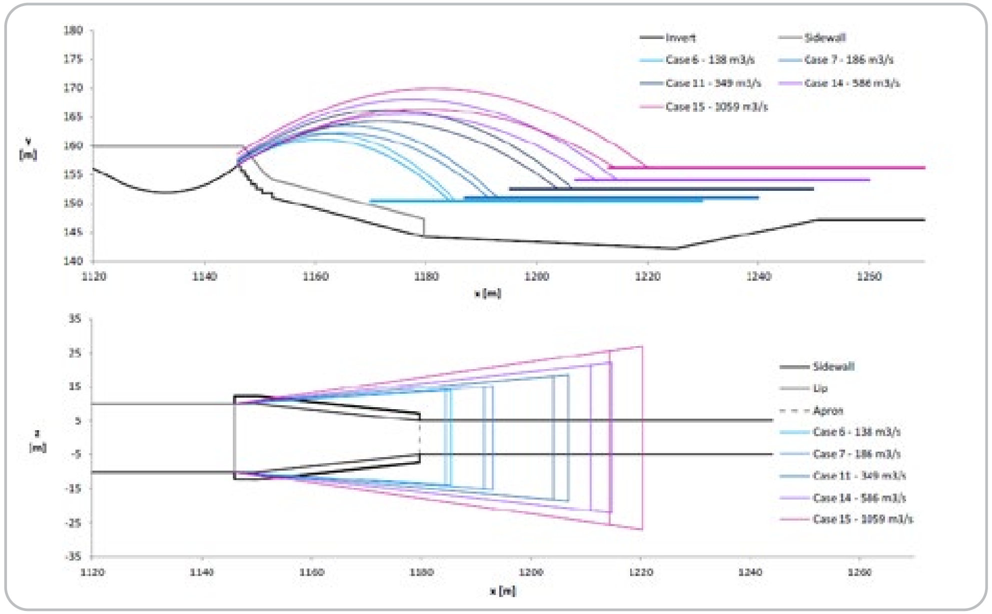
Undercutting of the flip bucket foundation could occur if the depth of scour in the plunge pool is greater than expected or deep scour of the shear zones occurs. If untreated, this could have led to major damage or loss of the cut-off wall and flip bucket.

Significant effort was put into assessing and understanding both the geological conditions at the cut-off wall and the hydraulic performance of the flip bucket and plunge pool.

An engineering solution was developed to mitigate the risks from the poor ground conditions at the cut-off wall:

- The plunge pool was deepened to be six metres below river level and the cut-off wall was deepened to a further three metres below the plunge pool.
- Treatment of the shear zones immediately in front of the cut-off wall included either shotcrete reinforcement or excavation and concrete backfill.

Constructability issues due to the depth of excavation and staging of shear zone treatments were identified and resolved with the Contractor.




*Profile and plan view of estimated jet trajectories for flow cases (Credit: Damwatch Engineering Ltd).*

*Constructing the cut-off wall at base of flip bucket and plunge pool shotcreting.*

## 7. Grout curtain

Extending up to 40 metres into the subsurface, the grout curtain provides a low-permeability barrier to limit seepage flows beneath the embankment. This required more than 18,000 metres of drilling and pumping grout into the subsurface.

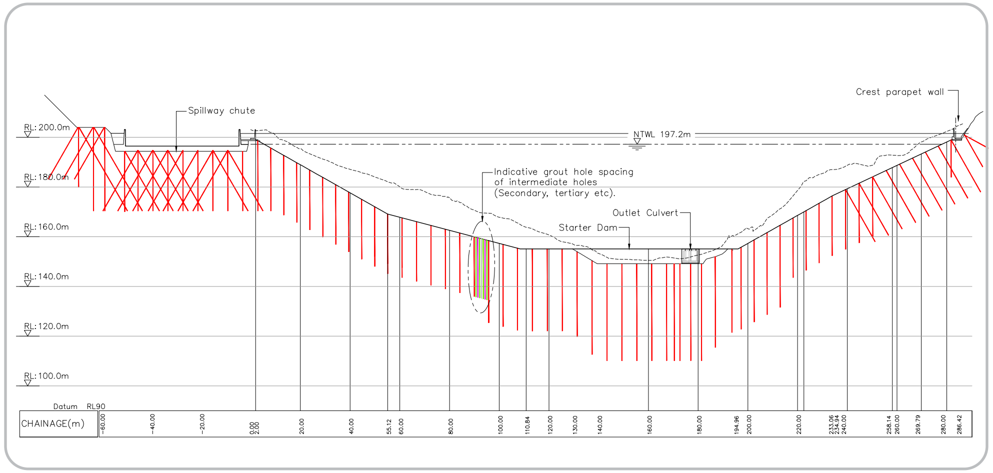


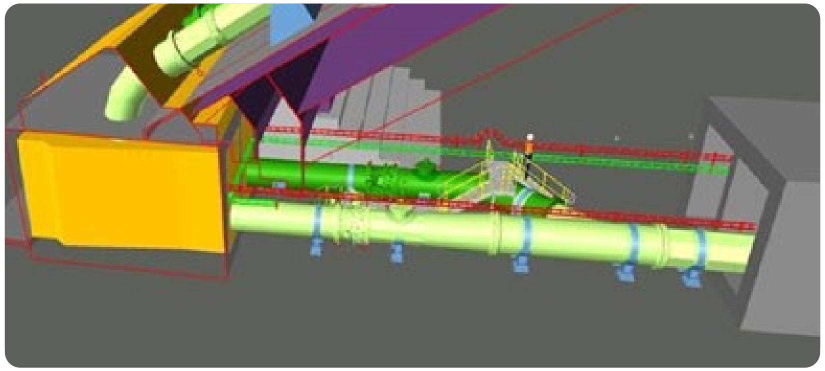

*Diagram of the grout curtain showing curtain alignment along the entire length of the dam and spillway. (Credit: Damwatch Engineering Ltd).*

*Grout curtain being drilled through true left plinth slabs.*

## 8. Discharge pipework

The two stainless steel intake screens allow selective offtake for water quality. The screens can be winched to the dam crest for cleaning and maintenance. These screens are connected to a stainless steel welded pipe in the culvert, with primary isolating valves (PIV) on each intake and energy dispersing cone valves at the discharge point downstream. The outlet works have been designed to remain operational following a 1:10,000 Annual Exceedance Probability (AEP) Safety Evaluation Earthquake (SEE), if one occurs.

The mechanical, electrical and control systems enable discharge to meet user and resource consent requirements of up to five $m^3/s$ through either pipe (collectively nine $m^3/s$), and the discharge of water at 27 $m^3/s$.



*The two intake pipes enter the upstream valve chamber, where water quality is achieved by mixing the flows from the two pipes using primary isolating valves (PIV).*

*Intake screens and pipes on the dam face.*

# MAINTAINING RESILIENCE

**Dam integrity is managed through the implementation of a Dam Safety Management System, meeting the requirements of the Dam Safety Regulations 2022 and international standards. Surveillance instrumentation and processes monitor and assure dam performance. This includes:**

1. Real-time monitoring of reservoir and spillway levels and outflows.
2. Real-time monitoring of seepage and flows through the drainage layer and from beneath the spillway into the monitoring weirs.
3. Real-time monitoring of water levels and flow through the dam and beneath the spillway using 26 telemetry-equipped piezometers.
4. Real-time leak detection at the plinth (the leading upstream edge) using thermistors.
5. Observation wells from the dam crest through the embankment to measure seepage levels and monitor rockfill performance.
6. Seismographs to measure earthquake loads.
7. Regular surveying of the dam for deformation, and surveying of the reservoir for slope stability.
8. Onsite cameras for remote monitoring.
9. Regular comprehensive inspections.

*One of the dam's prisms, which form part of the system for monitoring dam movement and settlement.*

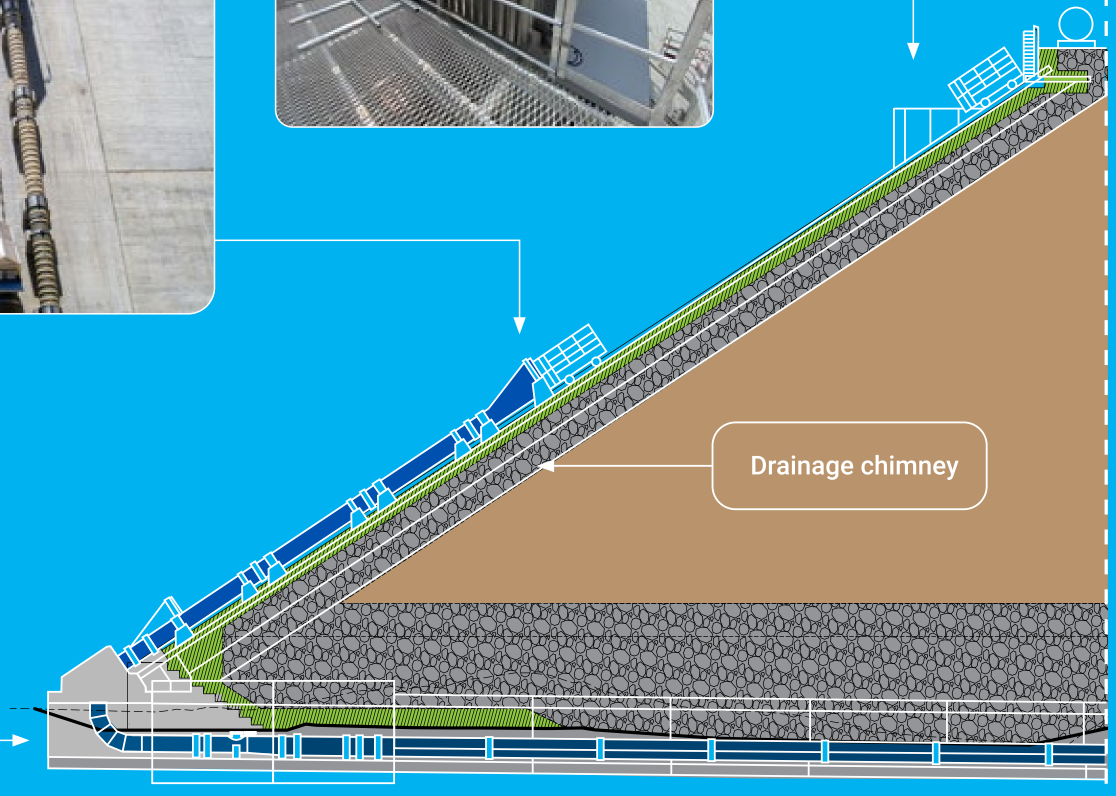
# How the dam's mechanics and electrics work

Water from the upstream reservoir flows into either or both of the lower and upper intake screens. The screens work as a filter to exclude fish, eels and debris from the outlet works. The water then flows through the screens into the upstream valve chamber where the water from the two intakes is mixed to maintain water quality targets. After flowing through approximately 160 metres of pipework, the length of the dam, the water reaches the downstream valve chamber where cone valves control the release of the water to the river.

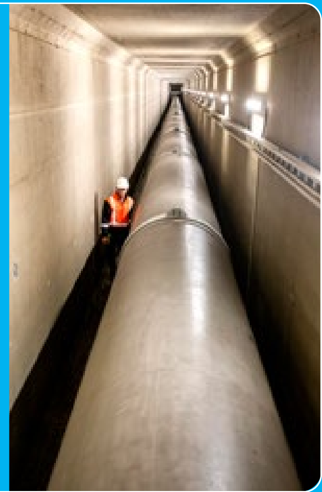
Reservoir water is filtered through the upper and lower INTAKE SCREENS to meet water quality objectives. The 20mm screen openings prevent harm to fish and eels and prevent debris from entering the pipes and valves.

The INTAKE SCREENS can be winched to the dam crest for cleaning and maintenance, with a platform to make it safe for personnel.

The two intake pipes enter the UPSTREAM VALVE CHAMBER where water quality is achieved by mixing the flows from the two pipes using butterfly valves (PIVs).

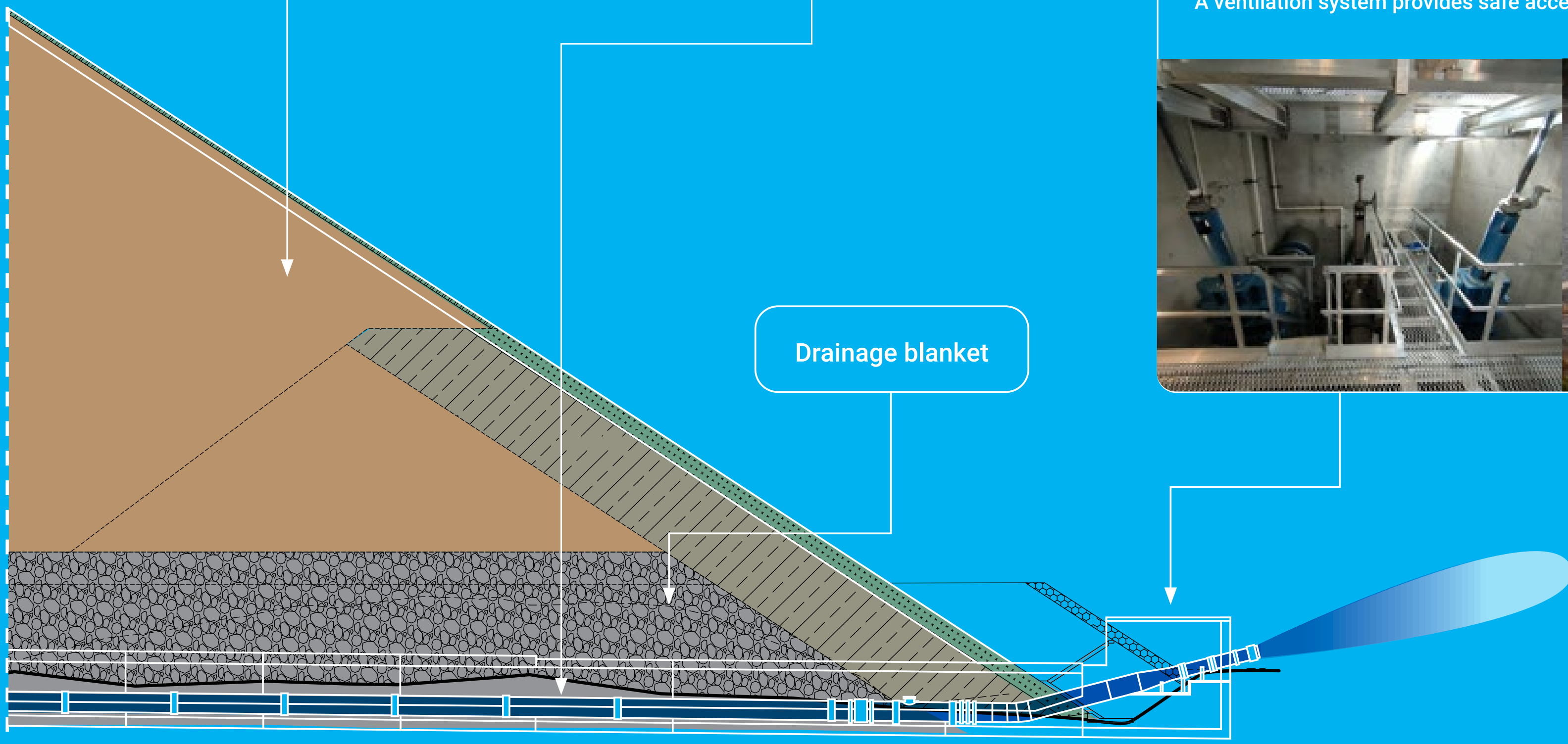


The RIGHT-HAND SIDE CULVERT houses the pipe for upstream reservoir water to flow downstream to the discharge valves.



During dry periods, the dam's stored water is released from the reservoir to maintain even flows in the Lee and lower Waimea rivers. The flowing rivers top up the Waimea aquifers to maintain water levels for extraction, reduce the risk of saltwater intrusion from the coast and maintain a healthy river habitat for plants and fish and eel species. The flow from the dam supports both horticulture and the domestic water wells near Appleby that supply water to the combined Richmond / Nelson water network. Māpua, Ruby Bay, Brightwater and Wakefield also use bores in the Waimea Plains, benefitting from the recharged aquifers. In an average year the dam is expected to be full 83% of the time. The size of the reservoir mitigates the impact of a drought greater than a 1:50-year event.

A DOWNSTREAM VALVE CHAMBER houses cone valves to disperse the pressurised flow into the river by dissipating energy. The micro-hydropower turbine inside the downstream valve chamber generates power for the dam. A ventilation system provides safe access for personnel to the culvert.



# BUILDING THE DAM

*The dam under construction, February 2021.*

**The dam is constructed from 490,000 $cm^3$ of rock, 32,000 $cm^3$ of concrete and more than 3,000 tonnes of reinforcing steel.**

# BREAKING GROUND

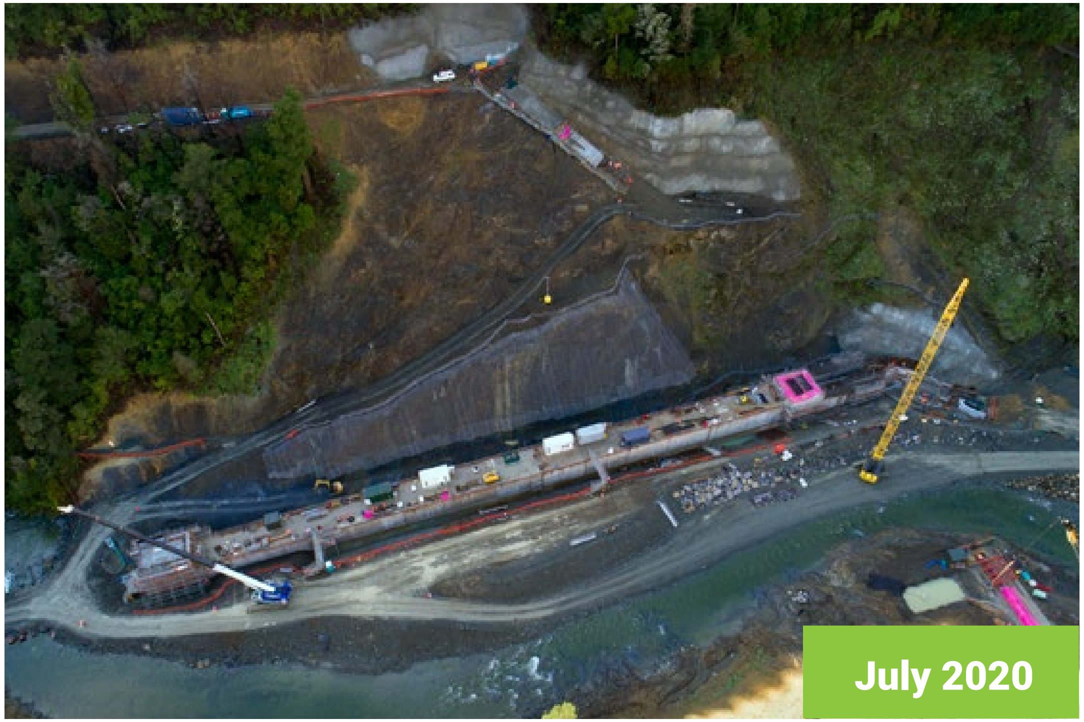
The groundbreaking ceremony took place on Friday 9 August 2019, signalling the start of site excavation ahead of construction. Board members, management, shareholders, Ngāti Koata representatives and then-Nelson MP Hon Dr Nick Smith attended this milestone.

At the ceremony, the efforts and foresight of the number of people over the previous decades who had helped the dam to proceed were recognised.

> It was a long journey from the severe drought in 2001 to securing community and government support, and Council and Parliament approvals, for the first sod to be turned in 2019. We are now better placed than any region in New Zealand for water security and river sustainability.

**Nick Smith, former Nelson MP. Nelson Mayor**

July 2019



July 2020

November 2020

February 2021

September 2021

August 2022

September 2023

August 2024

Site preparations by the Contractor began with upgrades to the 6.5-kilometre Lee Valley access road, construction of new haulage roads, and alternative access roads to land that would otherwise be landlocked when the reservoir was full. Sediment retention ponds and the 'Pig Flat' construction compound were also built, and vegetation was cleared from the dam site and reservoir, ready for the dam structures to be built.

The following pages explain the key structures of the dam, namely the culvert, starter dam, embankment, concrete face, spillway, plunge pool and mechanical and electrical systems.

In 2019, an onsite concrete batching plant was built to provide the concrete, turning what would have been a one-hour drive to the nearest concrete plant into just five minutes to site.

From 35 contract personnel working regularly on the site in early 2019, a further 130 people joined the construction team, building up to 140–180 personnel onsite at any time by mid-2020. 1622, mostly local, people worked on the project.

*Building the site access road, 2019.*

*Reservoir site tree clearance, 2019.*

*Onsite concrete batching plant built in 2019.*

## Everybody got home at the end of the day, safe and well

The large, 53 metre-high dam was built under time pressure in difficult, steep topography with weather challenges, and yet there were no lost-time injuries during construction. This is a remarkable safety record that WWL and the dam's Contractor are very proud of. It comes from a strong commitment to the welfare of all workers involved in building the dam.

"No task is too important or so urgent as to preclude health and safety."

**Richard Greatrex, Construction Manager, WWL**

*Health and safety briefings were held regularly.*

*Celebrating 500 days of zero injuries at an early morning awards presentation onsite, 2020.*

# Features of the dam

## 1 Apron

An impermeable apron added to the approach channel to stop water seeping through rock shear zones beneath the spillway.

## 2 Spillway

Surplus river flows down the spillway. Designed for a maximum of ~3 X 1:100-year flood (1,094 $m^3/s$), passing ~85% of river flow.

## 3 Flip Bucket

The flip bucket at the bottom of the spillway dissipates the water's energy created from dropping 50 metres, by ejecting and aerating it into the plunge pool.

## 4 Plunge Pool

The plunge pool further absorbs energy from the water flowing down the spillway and has been enhanced to mitigate erosion.

## 5 Valve Chamber

The downstream valve chamber houses fixed cone valves to allow safe water discharges into the river.

## 6 Electrical and Control Buildings

The electrical and control buildings house the controls for dam operations.

## 7 Abutment

The dam sits against the abutment – or side of the valley. Its foundations were cleaned, mapped and defects treated with concrete and flow-limiting material.

## 8 Plinths/Grout Curtain

Plinths found and seal the upstream edge of the dam and are tied to the concrete face.
A grout curtain through the plinth and up to 40 metres deep was made by pumping grout through more than 880 bores into the substrata.

## 9 Intake Screens

Intake screens filter the reservoir water before it passes through the pipework, to meet water quality objectives.

## 10 Culvert

The culvert runs through the dam at river level. Reservoir water travels through its internal pipework into the Lee River on the downstream side of the dam.

## 11 Flow-Limiting/ Drainage Zones

Flow-limiting and drainage zones using imported rock behind the upstream concrete face.

## 12 Concrete Face

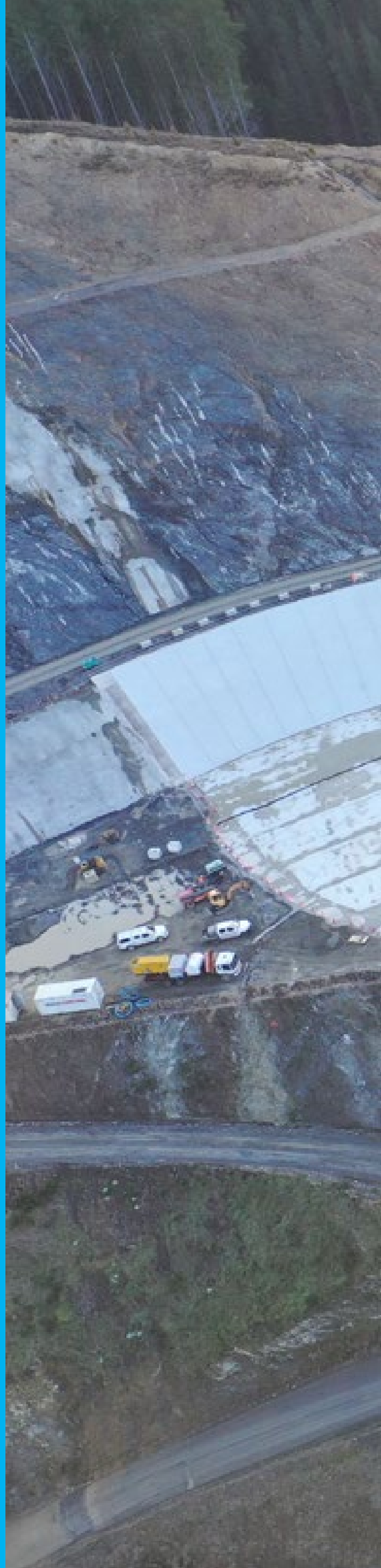
Upstream concrete face, which sits on top of stacked concrete kerbing.

## 13 Reinforced Rockfill Face

The downstream reinforced face provided temporary flood protection from a 1:1000-year flood during construction.

## 14 Embankment

The embankment is the dam itself, built from ~77% indigenously mined rock. Engineered for 1:10,000-year earthquake loads.

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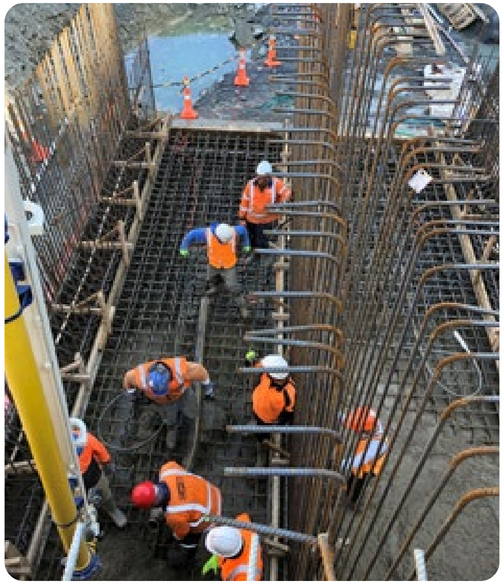
# THE CULVERT

The 165 metre-long, seven metre-wide culvert runs through the dam's embankment at river level.
The diversion culvert:

1. First diverted the river away from the riverbed where the embankment was being constructed; and then
2. Permanently houses the pipework that runs through the dam for operations.

The culvert was constructed between 7 November 2019 and 1 September 2020, interrupted because of a one-month shutdown during April 2020 – the first COVID-19 lockdown. After the foundation was cleaned, mapped, treated and sealed with concrete, the culvert was constructed of 4,500 $m^3$ of concrete and 815 tonnes of steel, and its upstream section includes 1.6 metre-thick walls, roof and floor.

The diversion culvert was officially blessed on 14 August 2020 at a ceremony led by the late Te Waari Carkeek (Ngāti Koata, Ngāti Toa) and attended by the WWL board and staff, Tasman Mayor Tim King, then-Nelson MP Hon Dr Nick Smith, Contractor staff and dam engineers from Damwatch. Following the blessing, the removal of the temporary diversion bund opened the culvert's entrance, allowing the river to be diverted into the culvert from 2 September 2020.



*The culvert was constructed of 4,500$m^3$ of concrete and 815 tonnes of steel.*

> The culvert was a key part of the dam. It allowed the river to be diverted to create a dry site for building the embankment and was carefully sized to minimise the flood risk during construction.

**Daniel Murtagh, Projects Manager, WWL**

Diverting the river into the culvert then allowed for work on the former riverbed to begin, under the protection of coffer dams at either end. This included constructing the starter dam, preparing the embankment foundation and constructing the downstream reinforced rockfill dam.

On 18 October 2022, once the dam and spillway were substantially completed, the LHS culvert was closed and a temporary pipe installed for the next stage of river diversion.

In its last significant milestone, the RHS of the culvert was then fully closed off on 26 May 2023 and the river diverted into the temporary pipework. This allowed the permanent pipework to be installed in the culvert while the reservoir filled.

*The culvert took 10 months to construct.*

# COFFER AND STARTER DAMS

Once the river was diverted into the culvert, two coffer dams were constructed at either end of the culvert in September 2020 to guide the river and protect the works on the riverbed. A gravity concrete starter dam was first constructed on the upstream edge of the embankment in late 2020.

*The starter dam concrete structure and one of the gravel coffer dams, 2020.*

# THE REINFORCED ROCKFILL DAM

Between November 2020 and June 2021 the reinforced rockfill dam was constructed in the downstream face of the embankment to protect the embankment works from flood events. The reinforcing was laid at one metre lifts to a height of 29 metres above river level and the reinforcing extended up to 23 metres back into the embankment. The reinforced rockfill dam is designed to withstand and protect the works in a flood event with a 1:1,000 AEP.

*Construction of the rockfill dam started in November 2020.*

*The completed rockfill face protects the embankment during construction.*

# THE PLINTH AND GROUTING

Ahead of the main embankment, a 4.6 metre-wide concrete plinth was constructed around the upstream perimeter of the embankment, down both abutments, to connect with the starter dam. The plinth was anchored to a depth of more than three metres in the bedrock at two metre centres, with its foundation on the RHS abutment modified to suit the topography and geology.

Then, through the plinth and across the spillway, more than 18,000 metres of drilling was completed to a depth of more than 40 metres to construct the grout curtain that seals the subsurface and reduces subsurface seepage beneath the dam.

The concrete face would later tie into the plinth. The plinth essentially anchors the upstream edge of the embankment to the founding rock, and then seals the subsurface with the dam face.

*The plinth being constructed, 2020.*

# THE MAIN EMBANKMENT

Once the embankment foundation, in both the old riverbed and then on both abutments, had been cleaned, mapped and treated, the embankment was constructed between January and December 2021.

A total of 108 concrete kerbs were progressively stacked atop each other on the upstream face. The kerbs facilitated construction of the flow limiter and drainage chimney, while providing erosion protection to the flow limiter. The first 10 metres of rockfill at the bottom of the embankment were imported rock, forming the drainage blanket. Subsequent layers were predominantly indigenously mined rock downstream of the flow-limiting layer and drainage chimney. In total, 110,000 m³ of rock were imported from nearby quarries and 25,000 tonnes of sand were imported from Tasman, Marlborough and the West Coast to construct the new embankment drainage and flow-limiting zones.

*Embankment during construction, September 2021.*

The bulk of the 490,000 m³ embankment is around 370,000 m³ of indigenously mined rock and river gravels.

With the precast parapet wall units installed along the top of its crest, the embankment stands at 53 metres high above river level, is 220 metres long and is six metres wide at the crest.

With the embankment completed, the culvert is able to safely pass water of a 1:100-year flood event without overtopping, while any events up to a 1:1,000-year flood would still see water safely overtop the dam.

# THE CONCRETE FACE

The concrete face on the upstream side of the embankment provides the impermeable membrane that contains the reservoir. Completed in May 2022, the 12,000 m² concrete face, consisting of reinforcing and more than 4,000 m³ of concrete, was continuously slip-formed in 15 metre-wide panels. Up to 90 metres in length, the longest panel took over 50 hours to slip-form.

Once the concrete face was finished, the GRP intake pipework, intake rails and screens, and the crest platform were installed, with all completed in September 2022.

The parapet wall panels were precast earlier offsite and then laid out in a row of bollards on top of the embankment once the face was completed. An elastic geosynthetic external wall-stop seals the joints while providing for movement between the parapet modules.

*Top: Early in the concrete face's construction.*
*Middle left: Preparing the concrete face in September 2021.*
*Middle right: Slip-forming of the concrete face.*
*Bottom: Concrete face finished.*

# THE SPILLWAY

When the reservoir is full, surplus river water flows down the spillway which, at 165 metres-long, can handle 1,094 $m^3/s$ (which is like pouring an Olympic-sized swimming pool into the spillway every two seconds).

Construction of the rectangular-walled spillway progressed through 2021 and 2022, with final completion in September 2022. The concrete slip-forming of the spillway's wall bases was unique for New Zealand and required specialist personnel and equipment from Brazil.

At the base of the spillway is the flip bucket, where the water's energy is dissipated before it lands in the plunge pool below. The flip bucket was constructed of more than 2000$m^3$ of concrete to accommodate the encountered geology. Its construction included a concrete pour of more than 430$m^3$ over a 14-hour period using both onsite and Nelson batching plants. The flip bucket includes eight metre-high walls on either side that each needed to be slip-formed continuously over three days.

*A nine metre cut-off wall below the flip bucket.*

At the bottom of the spillway, more shear zones hampered the construction of the plunge pool. Extensive concrete reinforcement was needed to handle the pressure of the water coming out of the flip bucket. A nine metre-high concrete cut-off wall between the spillway flip bucket, and extending to three metres below the plunge pool, was constructed to protect the spillway from erosion.

With the lower and upper spillway completed, the ogee weir at the top of the spillway was built.

Upstream and bisecting the top of the spillway, more shear zones were encountered in the rock foundation. To ensure water couldn't seep and erode through the shear zone, which would otherwise compromise the integrity of the spillway, a 4,500 $m^2$ flexible geosynthetic liner was installed by Carpi Tech in the approach to the spillway. Subsurfacing grouting and instrumentation were also both extended in the spillway approach apron to mitigate the impact of these shear zones.

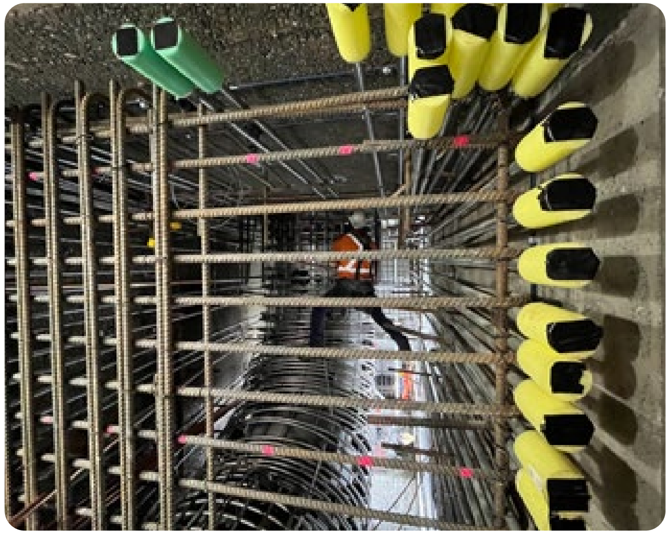
*Upper spillway and ogee weir.*

*The spillway during construction.*

# CLOSING THE CULVERT

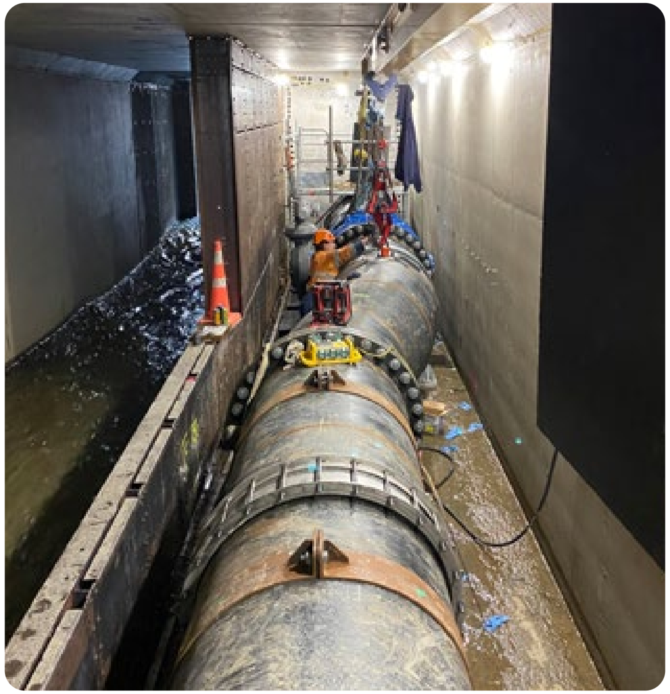
On 18 October 2022, with the embankment and spillway sufficiently complete, the LHS of the diversion culvert was closed with the first stoplog. With the river flowing down the RHS, the permanent intake lobster back bend pipe, entombing concrete plug and the PIV were all installed in the left side. A temporary 1.2 metre diameter HDPE pipe was then installed for the subsequent river diversion.

There were minor delays to the temporary works in April and May 2023 due to flood events. But then in late May, once engineering certification and subsequent regulatory approval was completed, the temporary river diversion pipe and facilities were commissioned. The second stoplog was installed on 26 May 2023 to the RHS of the culvert to close the reservoir so it could start filling with rainfall.



*Reinforced pipework, July 2023.*

*Installing lobster back bend pipe.*



*Installing temporary diversion pipe in left culvert.*

*Installing temporary river diversion HDPE pipe in left culvert.*

*The second stoplog installed to permanently close the river diversion, 26 May 2023.*

With the river flowing through the temporary pipe and facilities in the LHS culvert, the permanent 1.4 metre diameter stainless steel pipe, valves, electrical and control systems were installed between June and December 2023 in the RHS culvert.

Intake pipes and PIVs.

Fifteen-degree bend pipe being lifted into position at the culvert outlet chamber.

1.4 metre diameter stainless steel pipe in the right culvert.

# Three years turn into five years

**Delays throughout construction added more than two years to the project programme. These delays were caused by COVID-19, wet weather and floods during construction, a dry period during reservoir filling and other construction delays.**

### COVID-19

Like many other projects around the country in 2020 and 2021, COVID-19 had a large impact on the cost and schedule of constructing the dam, due to:

- Government mandated lockdowns in 2020 and 2021.
- Various periods of restrictions to work practices on site.
- Mandated absence for any staff who tested positive.
- Restrictions on workers and specialists moving to the site from around the country.
- Specialists from overseas requiring visas and Managed Isolation and Quarantine (MIQ).
- A disrupted international supply chain, which, for example, led to the airfreight rather than seafreight of six-tonne winches from Italy and a 12-tonne PIV from Germany.

Initiatives to reduce the impact of COVID-19 included achieving an exemption after a few days of the August 2021 lockdown from the Ministry of Business, Innovation and Employment so that construction could recommence, but with restrictions.

Another example of mitigating the impacts of COVID-19 and closed borders related to the geosynthetic waterstops on the dam face being constructed by Carpi Tech, an Italy-based infrastructure waterproofing specialist.

Visa and MIQ restrictions at the time meant a Carpi Tech technician could not fly to site from Italy to weld the waterstops. Instead, Carpi Tech mocked up part of the dam face in their workshop in Italy, and WWL airfreighted 250 kilograms of waterstops to Carpi Tech in December 2021 for welding. These waterstops were then returned back to site by January 2022. The waterstops on the dam face went around the world airfreight within a month before being installed.

Furthermore, given the criticality of the work, WWL had spare waterstops on standby in the Middle East. The plan worked well to avoid what could have been a lengthy delay associated with MIQ, albeit at a cost.

### Significant weather events

A 1:5-year storm in July 2021 saw the site experience its largest flood. River flows peaked in excess of 180 m³/s, and more than 12.5 million m³ of water passed through the site over three days, with water being impounded to 20 metres above river level upstream of the dam.
The site was well-prepared for this event and only minimal damage occurred, but the site clean-up added time to the programme.

Then, in 2022, two more floods resulted in delays. The first of these was a flood on 12 July, with 233 millimetres of rainfall recorded that month. And then, a second severe storm on 19 and 20 August caused region-wide damage and a six day delay. This 1:50-year event saw over 30 million m³ of water flow through the dam site, enough to fill the reservoir two and a half times in four days.

Over the entire month of August, 187 millimetres of rain fell – three to four times the historic average.

Despite these major storm events, the site suffered no significant damage and the flood controls and plans worked well, which is a testament to the Contractor's planning and management.

*Flooding at the site caused delays, July 2021.*

*The construction team working at night to make up time, 2021.*

### Slow reservoir filling

Ironically, after abnormally wet winters and floods during construction, the region then encountered an abnormally dry spring right at the time rain was needed to fill the reservoir.

The reservoir was first filled in stages with comprehensive testing as the first hydraulic loads came onto the embankment and subsurface grout curtain. During this first fill, a seepage defect was detected during the staged testing in September 2023 in a crush zone beneath the left plinth. With the reservoir already filling slower than expected and planned, the repair of this defect caused further delays, including a delay in completing the outlet pipework and the commissioning of the discharge valves.

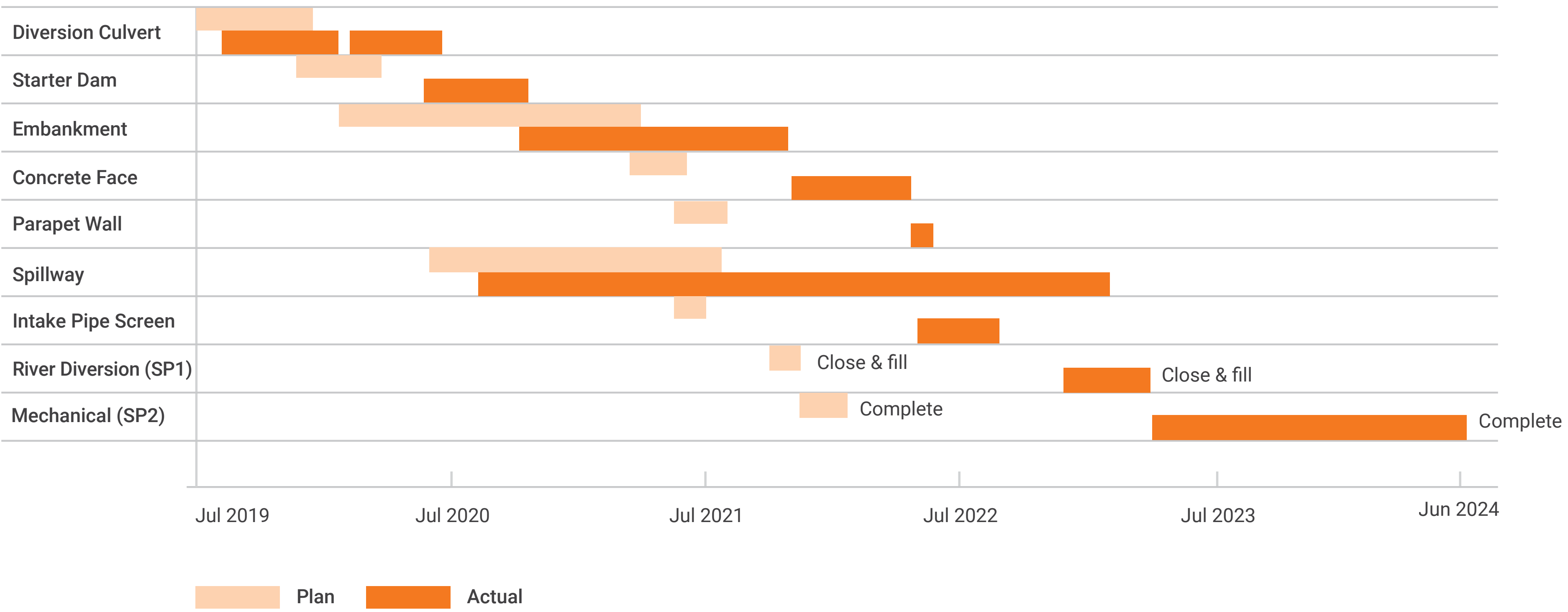
The dry spring also led to regional drought restrictions in the 2023/24 summer that necessitated an early release of water to mitigate the impact to water users and the regional economy.

### Other delays

The structures also took longer to construct than planned and there were delays to the mechanical and river diversion works.

Throughout the project, construction managers continually investigated possible time savings on the programme. Some savings were found, such as the move to a precast parapet wall, and increasing construction shifts, but the main delays could not be recovered.

## MILESTONE COMPARISON

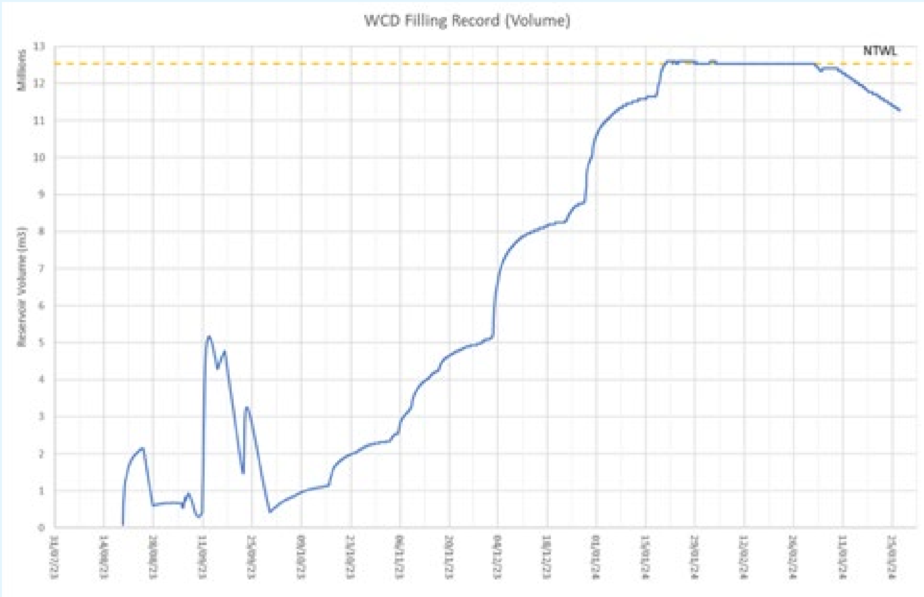



*Milestone comparisons from the start of construction.*

# AND THEN THERE WAS WATER

In August 2023 the dam was ready for the reservoir to be filled. It was filled in stages, with the dam's performance assessed at four hold points in accordance with the reservoir filling, surveillance and instrumentation plans.

Filling of the reservoir was paused in September 2023 to fix seepage at a shear zone on the left plinth. Filling then continued, but it was slow because the region experienced an abnormally dry spring.




*Left: The reservoir being filled in stages, October 2023.*

## Summer water flows down the spillway

The reservoir reached water capacity on 21 January 2024, with water flowing down the spillway naturally for the first time. Following surveillance and testing procedures, the temporary pipework in the culvert was removed in early February 2024. The permanent intake pipes were connected together and commissioned in late February.

*Water from the reservoir flowing down the spillway, January 2024.*

## Autumn's water release halts regional water restrictions

As the 2023/2024 drought gripped the region, the reservoir level dropped and water no longer flowed naturally over the spillway. Two submersible pumps were installed as a back-up, which enabled the dam to release water to ensure a minimum flow downstream, ahead of the cone valves being ready to release water.

The smaller of the three cone valves was commissioned on 1 March 2024 and water was released the next day. At the time, regional water restrictions were in place and were due to be increased to an extent that would have severely impacted water users. Restrictions were instead removed just two days after the small cone valve was opened, which had seen sufficient water released from the dam.

Twenty per cent of the reservoir water was released during March and early April 2024, increasing downstream river levels. Without this water release, water restrictions in the first quarter of 2024 would have been very harsh, had a significant impact on shareholders, the community, the local economy, and the river.

Successful testing of the two larger cone valves in early April 2024 marked the dam's completion and it being ready for operations.

*The two large fixed cone valves tested, commissioned and ready for operations, April 2024.*

# PROTECTING AND SUPPORTING THE ENVIRONMENT

WWL built and operates the dam to high environmental standards. As it did through construction, WWL remains committed to minimising the operating impact on the environment.

To protect and compensate for any impact of the dam, WWL complied with 178 resource consent conditions.

## Environmental and biodiversity programmes

A Construction Environmental Management Plan managed the impact of construction activities at the dam site on the environment and, in particular, to the river.

A range of silt fences, decanting earth bunds and sediment retention ponds were installed at the construction site to treat the runoff from earthworks. The Contractor's hydroseeding and straw mulching equipment revegetated cleared areas to reduce erosion and the need to treat water affected by sediment.

Meanwhile, a Biodiversity Management Plan (BMP) included 10 ecological restoration projects within the Waimea catchment, aiming to offset ecological losses at the dam site.

An independent Biodiversity Technical Advisory Group (BTAG) oversaw the progress of activities. It included nominees from Council and the Royal Forest and Bird Protection Society and the Director General of Conservation.

*Left: Rough Island wetland where native species were planted.*

**Environmental and sustainability initiatives include the following:**

### Rough Island wetland

45,000 native species were planted over more than 10 hectares on Rough Island.

The restoration project also included eradicating non-native pest plants from around the wetland, providing an opportunity for rare and threatened species to regenerate and thrive, and to enable augmentation of the existing jointed twig rush population.

*Left: One of 45,000 natives planted on Rough Island.*

### Waimea River Park Bermland

A replanting project at the 10 hectare Waimea Bermlands saw 10,000 trees planted for a future native forest. Two to three hectare subsections are prepared for each year's new plants.

*Above: Planting at Waimea Bermlands.*

### Restoration planting at the dam site

5.0 hectares of native beech forest, including mānuka and kānuka trees, will be planted at the dam site.

*Above: Native tree planting at the dam site.*

### Rare and threatened plants

New Zealand shovel mint, rock coprosma and scented broom were salvaged from the reservoir footprint and propagated into suitable habitats in the region. Some 600 plants were planted in the Wairoa and Lee River catchments.

*Above: A mature scented broom in seed as part of the rare plant salvage programme.*

**Alluvial and riparian forest downstream of the dam**

The invasive pest plant old man's beard was targeted for eradication in an effort to enable residual pockets of native plants to thrive.

**Downstream gorge turf plant communities**

Downstream gorge turf communities were monitored to assess potential effects of the dam on these plants at two locations in both the Lee and Wairoa rivers.

**Old man's beard in the Wairoa catchment**

Targeted eradication of old man's beard enables residual pockets of native plants to thrive in the Wairoa gorge area.

**Eel and fish trap and transfer**

An eel and fish trap and transfer plan, to ensure aquatic species could complete their natural life cycles, was successful during construction, with 252 kōaro and 239 elvers captured below the construction site and released upstream in Waterfall Creek over the 2022/2023 summer transfer season. Post construction, trap and transfers continue.

# Maintaining water quality

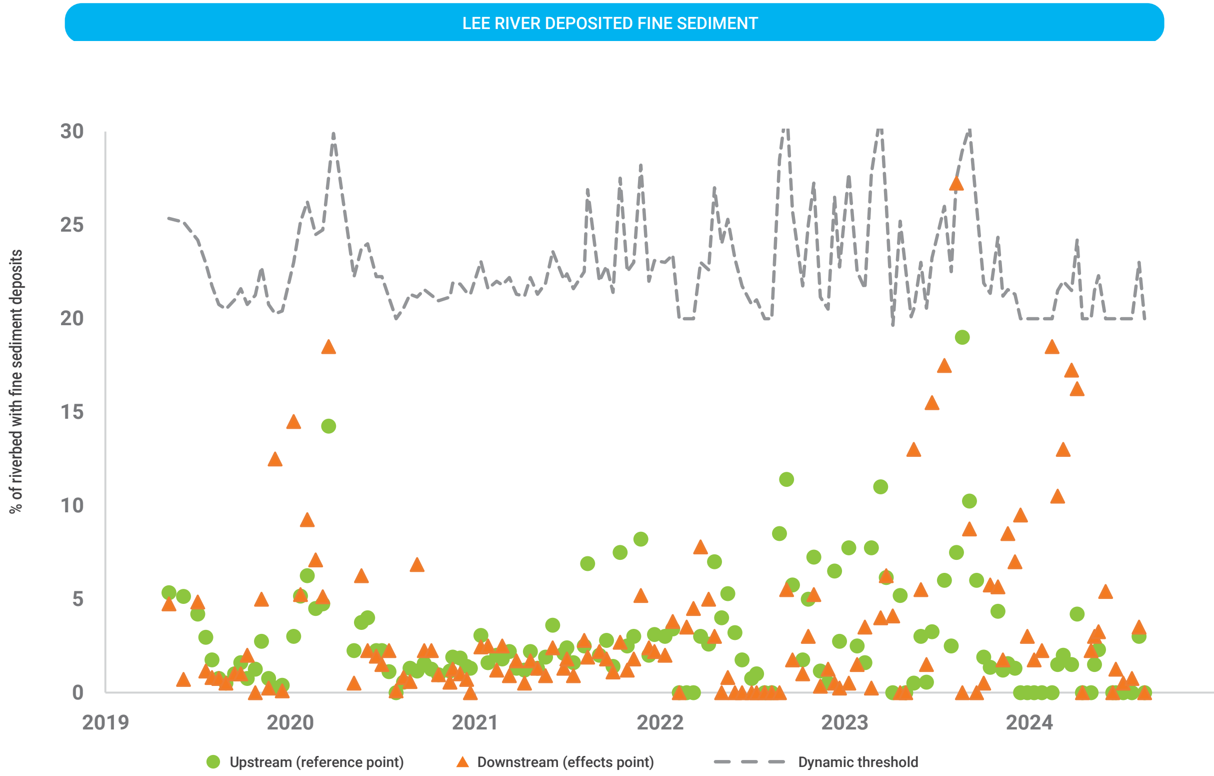
The Lee River is a sensitive environment and is highly valued by the community.

Throughout the construction of the dam, in accordance with its resource consent conditions, WWL was careful that the Waimea and Lee rivers and surrounding environment were not adversely affected by the build.

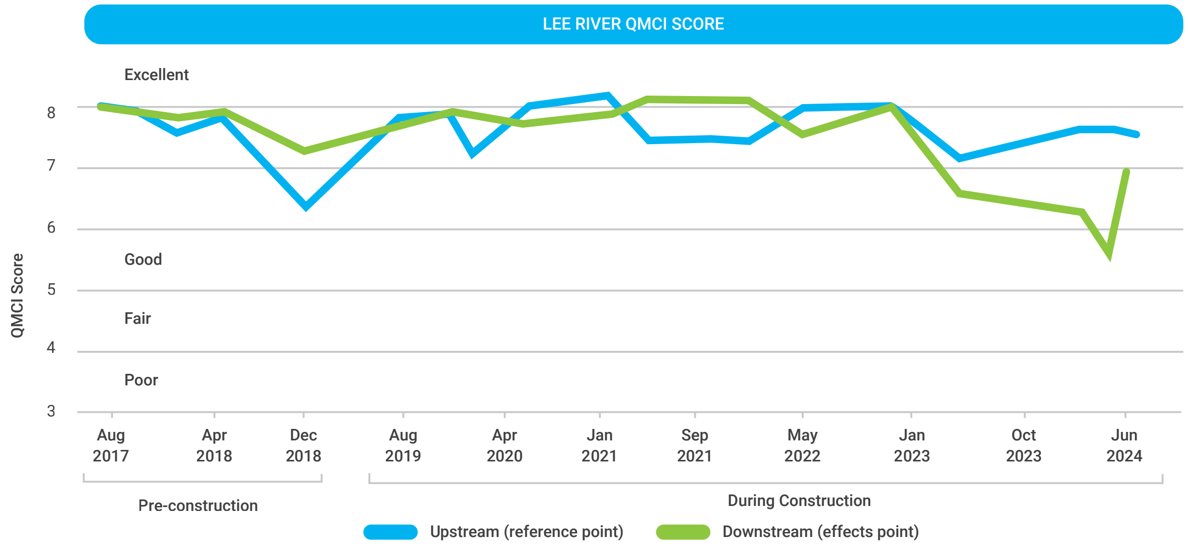
To achieve this, experienced independent specialists were engaged and river health was continuously audited and monitored.

One measure of river health is the Quantitative Macroinvertebrate Community Index (QMCI). Macroinvertebrates are the wide range of small insect species that live in waterways and are an essential part of the food chain. The QMCI measures how many of these small water insects are living in the river. Before construction began, the QMCI for the Lee River was classed as 'excellent'. Regular tests during the project saw the Lee River's QMCI remain 'excellent' during construction. With the dam now operational, water quality monitoring continues.

*Independent ecologists regularly verified river health indicators during construction.*




*Sediment in the Lee River was monitored and recorded during construction.*

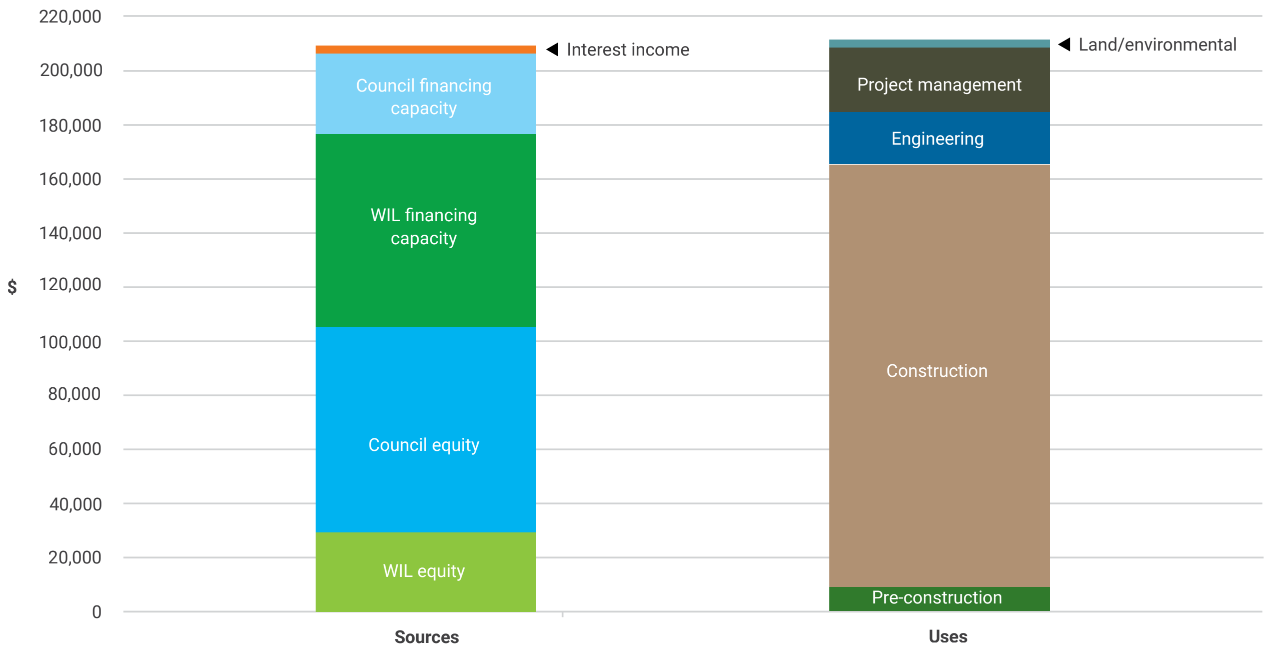



*QMCI scores since the project started.*

# HOW DAM CONSTRUCTION WAS FUNDED

Project funding was sourced from ~50 per cent equity and debt. Council and WIL provided equity, with contributions from the Ministry for the Environment and NCC. Loans were provided by Council and the Local Government Funding Agency (LGFA). A key source of the project funding also came from Crown Irrigation Investments Ltd (CIIL) loans. CIIL is a commercially orientated Crown-owned company set up specifically to support the development of water storage infrastructure for both economic and environmental outcomes.

Financing costs are shared between shareholders via water charges.




*Water flowing down the spillway from the full reservoir, January 2024.*

"CIIL provided targeted financing to both shareholders to enable the project to proceed. The financing bridged the gap in the project's economics and capital structure due to unused water capacity. CIIL is pleased to have contributed to enabling the project and its success."

**Murray Gribben, CEO, Crown Irrigation Investments Ltd (CIIL)**

# HOW MUCH THE DAM COST

The project budget approved at financial close on 30 November 2018 was $104.4 million. The project cost increased incrementally during the project for the reasons listed below, with the final cost being $211 million.

**Encountered geology: +$43 million**

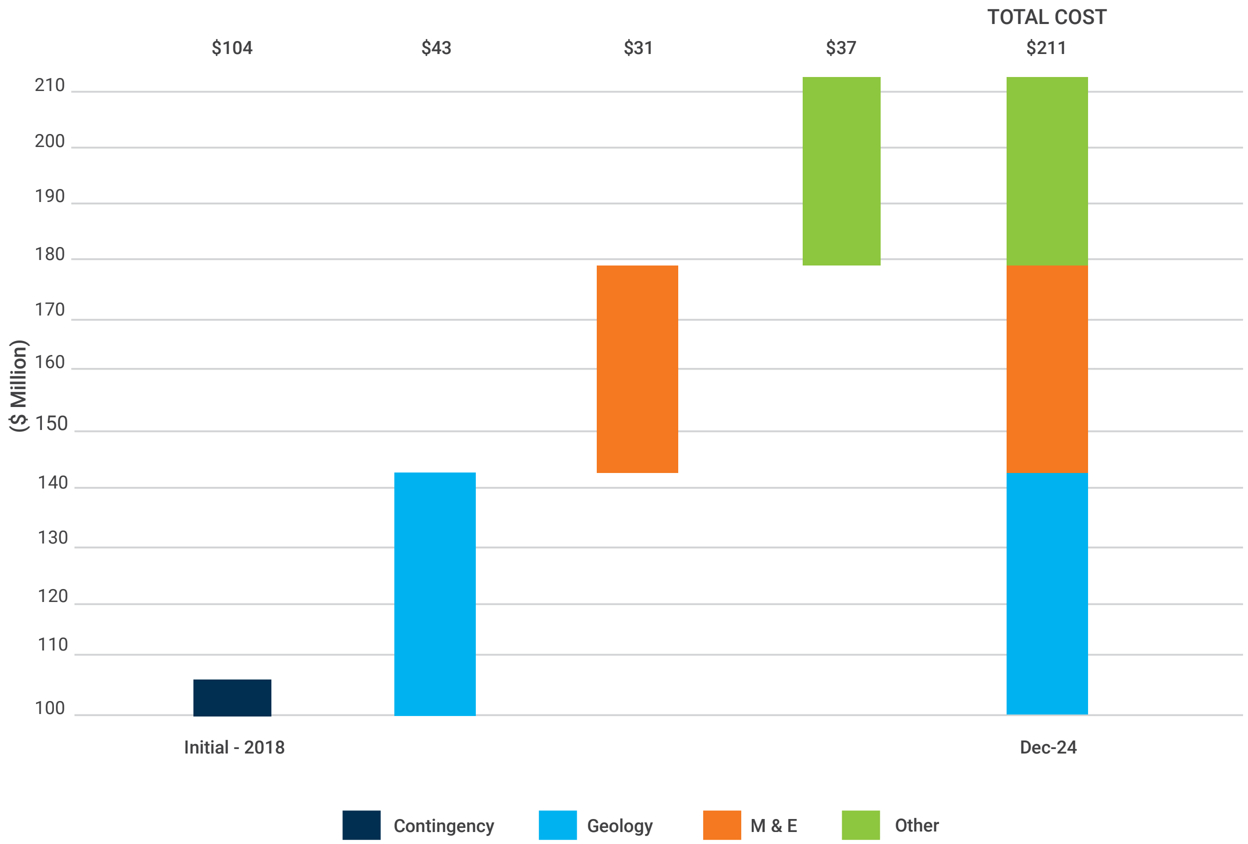
Accommodating the encountered geology by importing drainage material and sand, adding an impermeable apron to the approach channel, enlarging the cut-off wall beneath the spillway, increasing left abutment stabilisation, foundation treatment and installing a greater subsurface grout curtain resulted in a $43 million cost increase.

**Mechanical and electrical costs: +$31 million**

The mechanical and electrical systems were not designed or procured at project funding in 2018 and were a provisional sum. Their design was completed during the 2020/2021 financial year and procured during the 2021/2022 financial year. These unbudgeted costs were then exacerbated by the post-COVID inflationary environment.

**Other project costs: +$37 million**

Other costs, either underbudgeted or not contemplated at project funding, cost an additional $37 million. These included dam engineering and construction supervision, project services and legal support to assist with contract management and disputes, project delays, COVID-19 costs and associated Contractor payments, and new public holidays.

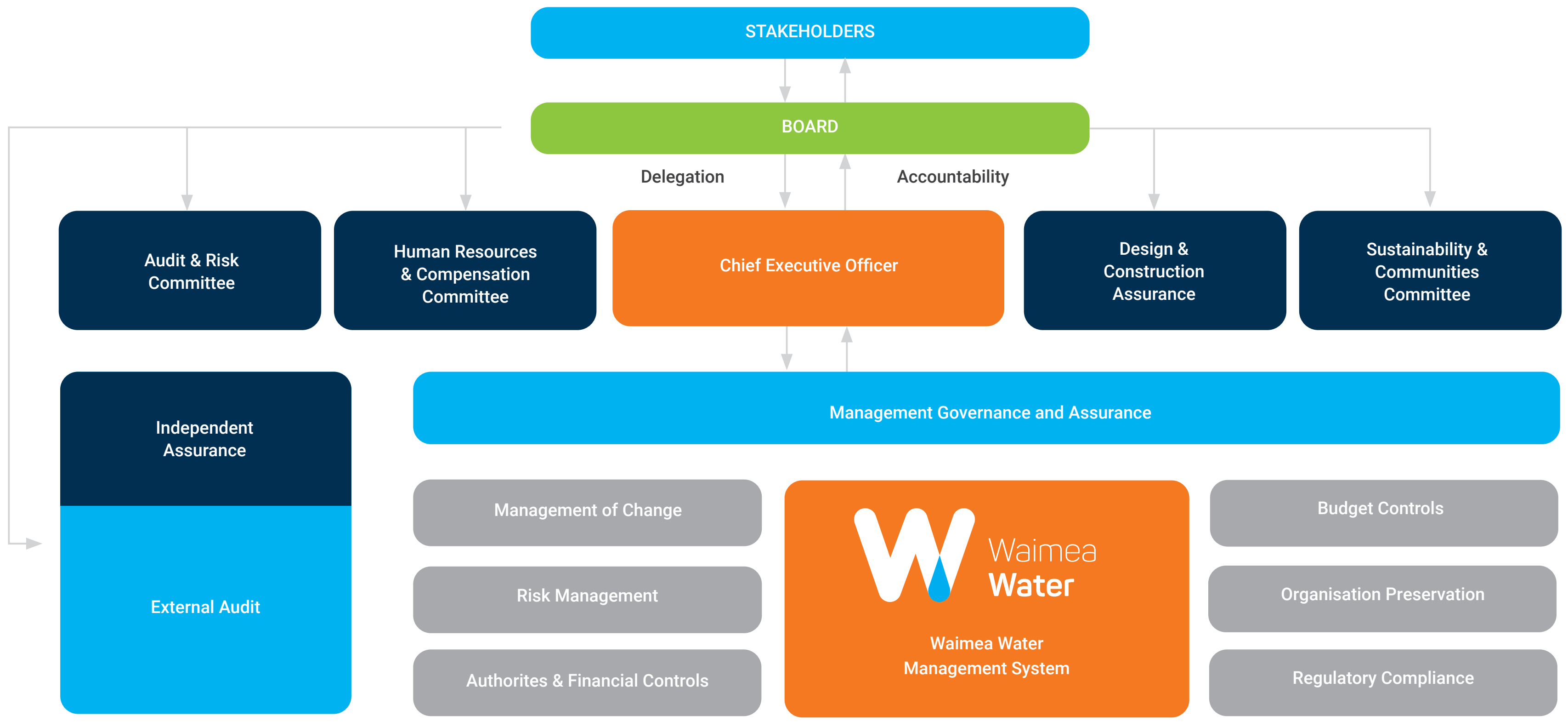


*Waimea Community Dam team members sitting on the ogee weir, 2023.*

# GOVERNANCE

WWL is governed by a board of directors appointed by shareholders and Ngāti Koata.

During construction, the WWL board of seven was supported by four committees that consisted of subgroups of directors and staff. The committees provided governance and assurance across audit and risk, human resources, engineering and construction, and sustainability and communities.



# BOARD OF DIRECTORS

**Karen Jordan**
**Inaugural Chair**

The inaugural board Chair until early 2020, bringing vast governance experience.

**David Wright**
**Chair**

A Council appointee with a background in water utilities and governance. Took up the Chair role in 2020.

**Bruno Simpson**
**Deputy Chair**

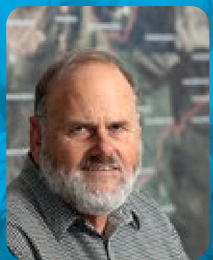
A WIL appointee in 2018 with a background in accounting, finance and business. Deputy Chair and Chair of the Audit & Risk Committee.

**Julian Raine**
**Director**

A WIL appointee in 2018 with a background in irrigation, governance and business. Chair of the Sustainability & Communities Committee.

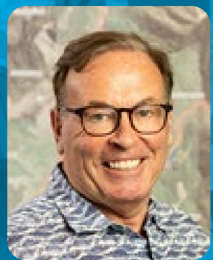
**Doug Hattersley**
**Director**

A Council appointee in 2018 with a background in civil dam engineering and international projects. Chair of the Design & Construction Committee.



**Ken Smales**
**Director**

A Council appointee for three years before stepping off the board and into a management role for WWL from 1 July 2022.



**Graeme Christie**
**Director**

A Council appointee in 2023. A barrister specialising in construction law.

**Andrew Spittal**
**Director**

A Ngāti Koata appointee in 2018 with a background in construction and close relationships with iwi.

**Margaret Devlin**
**Director**

A Council appointee from July 2020 until June 2024 and Chair of the Human Resources & Compensation Committee.

# SENIOR MANAGEMENT: 2019–2025

Key personnel of the WWL management team remained throughout the construction and commissioning of the dam.

**Mike Scott**
Chief Executive Officer
*Master of Engineering (Civil)*

Led the organisation to ensure WWL delivered on its objectives of a safe, reliable and efficient dam.

**Iain Lonie**
Engineering and Project Manager
*Bachelor of Engineering (Civil), Master of Engineering Science (Geotechnical)*

Responsible for dam design and dam safety management systems.

**Richard Greatrex**
Construction Manager
*Bachelor of Engineering with Hons (Civil), Chartered Professional Engineer International Professional Engineer*

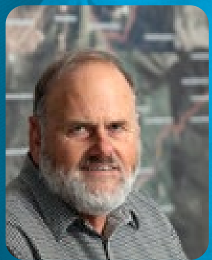
Oversaw construction and worked with the Contractor and sub-contractors through any technical issues.

**Daniel Murtagh**
Projects Manager
*Bachelor of Engineering with Hons (Mechanical)*

Had two roles during the project, Construction Manager and then Projects Manager overseeing construction.

**Alasdair Mawdsley**
Operations Manager
*Bachelor of Science (Geography and Environmental Management)*

Had two roles, first as the Environmental Manager, then Operations Manager to prepare for and then manage dam operations.



**Ken Smales**
**Project Director**

From July 2022, led dam design, construction and commissioning activities towards the dam's completion.

**Andrew Busfield**
Mechanical and Commissioning Engineer
*Bachelor of Engineering (Mechanical)*

Managed the design, procurement, and construction of the mechanical, electrical and control elements of the dam.

**Dave Ashcroft**
Chief Financial Officer

Managed the company's accounts and financial obligations.

**Richard Timpany**
Commercial Manager and Company Secretary
*Bachelor of Laws, Bachelor of Commerce (Finance)*

Acted as the Commercial Manager and Company Secretary.

# OPENING CEREMONY

The dam was officially opened on Friday 7 February 2025 by Prime Minister Rt Hon Christopher Luxon, Tasman Mayor Tim King, WIL Chair Murray King and WWL Chair David Wright.

*Above: Dignitaries, WWL and WIL directors and staff.*

Joining the Prime Minister at the opening ceremony was Minister for Infrastructure Hon Chris Bishop, South Island Minister Hon James Meager, Nelson MP Rachel Boyack, Nelson Mayor Hon Dr Nick Smith, Koata Ltd Chief Executive Hemi D Toia, and many WWL directors, staff and guests.

The ceremony was a chance to say thank you and congratulations to all the people who made this much-needed infrastructure project possible.

WWL Chair David Wright.

With Prime Minister Rt Hon Christopher Luxon in attendance, WIL Chair Murray King, (left) and Tasman Mayor Tim King (right) press the valve buttons to release water downstream.


From left to right: WIL Chair Murray King, WWL Chair David Wright, Prime Minister Rt Hon Christopher Luxon, and Tasman Mayor Tim King unveil the plaque for the site.

Rt Hon Christopher Luxon cuts the ribbon to officially open the dam.

# ACKNOWLEDGEMENTS

Thank you to our shareholders for their vision, commitment and support during the project.

Thank you to our community for their support and patience.

Thank you to our main dam Contractors Fulton Hogan and Taylors Contracting Ltd and the many sub-contractors and consultants who worked hard over the five-year project in difficult circumstances.

Thank you to our dam designers Damwatch Engineering Ltd, who helped us solve many engineering challenges, and for the collaborative approach that allowed site challenges to be recognised and mitigated as early as possible during construction.

Thank you to our WWL team for their large effort, resilience, dedication and problem solving abilities.

“I am proud of the way we solved and engineered our way out of the challenges we encountered. We now have a well-built contemporary dam that will serve the region for many generations. Thank you.”

Mike Scott, CEO, WWL


Water security will support the prosperity of the region for many generations.

# GLOSSARY

**Annual Exceedance Probability (AEP):**
The estimated probability that an event of specified magnitude will be equalled or exceeded in any year.

**Fast Lagrangian Analysis of Continua (FLAC):**
2D numerical modelling software for advanced geotechnical analysis of soil, rock, groundwater and ground support.

**Inflow Design Flood (IDF):**
The flood flow above which the incremental increase in water surface elevation due to a dam failure is no longer considered to present an unacceptable threat to downstream life or property. The IDF of a dam flood hydrograph is used in its design, particularly for sizing the spillway and outlet works, and for determining maximum height of a dam, freeboard and temporary storage requirements.

**Operating Basis Earthquake (OBE):**
That earthquake which, considering the regional and local geology and seismology and specific characteristics of local subsurface material, could reasonably be expected to affect the dam site during the operating life of the dam.

**Potential Impact Category (PIC):**
A system of classifying dams according to the incremental consequences of dam failure, so that appropriate dam safety criteria can be applied.

**Probable Maximum Flood (PMF):**
The theoretical greatest depth of rain for a given duration that is physically possible over a given storm size area at a particular geographic location at a certain time of year under modern climate conditions.

**Safety Evaluation Earthquake (SEE):**
The earthquake that would result in the most severe ground motion which a dam must be able to endure without uncontrolled release of the reservoir, and for which the dam should be designed or analysed.

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