SECURING KĀPITI COAST'S WATER SUPPLY FOR 100 YEARS

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ABSTRACT

Water supply on the Kāpiti Coast has been contentious for many years, with a number of setbacks since Kāpiti Coast District Council's application to augment the supply from the Otaki River was declined in 2001. As a result the Council developed a groundwater supply in the Waikanae area for augmentation, but the water quality of that source was disliked by the community. As the population of the community continued to grow through the 2000s, the capacity of the supply was once again under pressure, and planning commenced on a long term sustainable solution. In 2009 the Council committed to a well-resourced project that aimed to bring the community on board and deliver a 50-year water supply solution.

The paper describes Kāpiti Coast District Council's journey from a position where historically it was grappling with the future of its water supply, to the point where it had consents for the next 35 years, and a water supply plan for the next 100 years. That journey included optioneering, investigations, involvement of iwi/community/stakeholders, modelling, concept design, assessment of environmental effects, consenting. The paper concludes with the lessons learned during the course of the project; with particular reference to resilience planning, infrastructure planning, and the sweating of existing assets.

KEYWORDS

water supply, Kāpiti Coast, infrastructure, river recharge, consultation, consenting

1 INTRODUCTION

Water supply on the Kāpiti Coast for the communities of Waikanae, Paraparaumu and Raumati (WPR) has been a publicly contentious issue for over 20 years. The supply has had a number of setbacks since the Kāpiti Coast District Council (Council) application to augment the supply from the Otaki River was declined in 2001. The consequence of that application being declined was that Council developed a groundwater supply in the Waikanae area for augmentation, but the water quality of that source (hardness and saltiness) was disliked by the community.

As the population of the community continued to grow through the 2000s, the capacity of the supply was once again under pressure, and planning commenced on the search for a community-endorsed long term sustainable solution. Because of the high level of interest in water supply from the community, and the controversial history, in 2009 Council committed to a well-resourced project that would bring the community on board and deliver a 50-year water supply solution.

The paper describes Council's journey from a position where historically it was grappling with the future of its water supply, to the point where it had consents for the next 35 years, and a water supply plan for the next 100 years. The lessons learnt on that journey illustrate and inform the essential attributes of long term infrastructure planning for resilience and sustainability.

2 OPTIONEERING AND INVESTIGATIONS

2.1 DEMAND FORECASTING

Water demands were forecasted for the WPR community for the next 50 years (to 2060). Future gross peak day demand for the WPR water supply was set by Council at 490 L/person/day for forecasting. This assumed that demand management, water conservation measures and loss reduction work will achieve savings to reduce the current peak demands to 490 L/person/day or less. After the local body elections in 2010 the new Council took a fresh look at universal metering, and resolved to introduce it to help manage demand and better understand water losses. Council anticipates that it will take two years from the commencement of volumetric charging (July 2014) for peak demand to reduce from current levels (being around 590 L/person/day) to the target of 490 L/person/day.

This gross per capita demand target was applied to Council's population projection data to derive a peak daily demand for WPR through to 2060. Council's policy is to allow for a medium population growth scenario in its forecasting (26,000 people in the 50 year planning horizon). Headroom has also been included to account for uncertainty in the population and demand forecasts – this equates to about 6,000 m^3/day.

The 50 year planning horizon forecasted demand is 32,300 m^3/day, which is about 40% more than the existing consents for the abstraction from both the Waikanae River and the borefield (a total of 23,000 m^3/day).

2.2 SHORT-LISTING

The first stage of the optioneering involved reviewing and consolidating over 150 reports that had been prepared over the previous 25 years, and developing a long-list of 41 options. The long-list was reviewed for high level fatal flaws and reduced down to 32 options.

The second stage involved extensive community and stakeholder consultation to establish local values, as well as criteria and weightings against which those values could be measured. The criteria included: affordability, reliability of supply, water quality (including taste), technical, environmental and social. The value of water quality was viewed as the most important by the community.

Multi-criteria analysis (MCA) was used to shortlist down from the 32 options to eight options (three dam options, two storage pond options, and three groundwater options). Those eight options were carried forward into the next stage.

2.3 INVESTIGATIONS

The third stage, which commenced in April 2010, involved a wide range of investigations, further consultation, preliminary statutory planning, concept design, and cost estimating. This was undertaken for all the eight options carried forward from the previous stage.

For the four dam locations (one of the options had an upper and a lower location) the investigations included the following:

- Walkover geological inspection, surficial mapping and interpretation, seismic assessment, and dam potential impact category (PIC) classification
- Physical investigations (drilling, lugeon tests, test pits) and geotechnical interpretation
- Hydrology in terms of yield and flood flows
- Selection of dam type (embankment type at one site, and roller compacted concrete at the other three sites), and concept design of two dam capacity alternatives – 1.4 and 1.9 million m^3 of live storage.

For the storage pond location the investigations were similar to those above, with two live storage capacity options considered – 0.51 million m^3 and 0.86 million m^3 with a 9m water depth. The design included earth embankments with a synthetic liner overlaid with stone protection, and inlet/outlet structures. The storage capacity options relied on blending with groundwater to produce a drinking water of acceptable quality, and so required less stored volume than the dam options.

The three groundwater options were: Waikanae Borefield and Treatment (softening the groundwater), River Recharge with Groundwater, and Aquifer Storage and Recovery (managed aquifer recharge). River Recharge with Groundwater involved using the groundwater to provide the minimum flow in the river, thereby allowing more river water to be abstracted. For these groundwater options the investigations included the following:

- Desk-top review of existing geology and hydrogeology
- Full pumping tests (including monitored recovery) of three existing bores in the target aquifer
- Development of a hydrogeological model in Visual Modflow Pro covering an area of 150 km^2
- Modelling of a large number of scenarios to abstract up to 32,000 m^3/day from the target aquifer
- Concept design of borefield expansion, pipelines, and upgrading of the water treatment plant

For all options the investigations also included:

- Preliminary assessment of environmental effects – aquatic and terrestrial ecology
- Consultation with stakeholders and community
- Risk assessment
- Construction cost estimates (conventional and risk-based), and operation & maintenance cost estimates.

These eight options were all from within the WPR catchment. The Otaki River, about 15 km north of the Waikanae River, had previously been ruled out as a water source as it was not consistent with Council's Water Strategy preference for in-catchment sources. To ensure that Council had sufficient information in front of it to make the best decision possible, two options to take water from the Otaki River were added into Stage 3 for consideration.

2.4 RANKING AND SELECTION

The key output from the Stage 3 work was the ranking of the options following a detailed evaluation on the basis of risk-based cost estimates and a range of other values determined from the consultation criteria.

River Recharge with Groundwater (River Recharge) was the top ranked, followed by a 2 million m^3 dam on the Maungakotukutuku Stream (a tributary of the Waikanae River). River Recharge came out on top because it made prudent use of the infrastructure of the existing borefield and could be efficiently staged over time to meet increasing demand, therefore being more economically viable than the immediate high upfront cost of building a dam. River Recharge had no identified fatal flaws, and achieved the highest ranking in terms of the values.

The Maungakotukutuku Dam (the second ranked option) was the culmination of extensive investigations of all possible dam sites in the area. Council realised that this site represented a way of further future-proofing the WPR water supply. So, although the project's planning horizon was 50 years, this realisation allowed a 100-year vision to be locked in by Council resolving to purchase the land and signal its intention to develop a dam on the site in about 50 years' time in the District Plan. The land purchase involved negotiating with five landowners, removal and biodiversity offsetting of a conservation covenant, and the development of a three way land management agreement between DOC, a private landowner and Council.

It is important to emphasis the breadth and depth of the work undertaken during the three stages of the project leading to the selection of River Recharge. Council sought to ensure that every possible option was considered, the community was brought on board and carried forward with the project, and that the information used to inform the decision-making processes at each stage was robust.

Stage 3 was completed in September 2010 with Council unanimously adopting River Recharge as its preferred solution for the WPR water supply.

2.5 COMMUNITY ENGAGEMENT AND IWI PARTNERSHIP

The issue of water supply for the district has high community awareness and a long history of debate. This project needed to systematically build the case towards a water supply solution. Engagement with the community and a partnership approach with iwi was a critical success factor to this project.

The earlier stages of consultation (Stages 1 and 2 of optioneering) focused on what values were important to the community for their water supply. These values were then used to inform the development of selection criteria for the shortlisting of options. The key values of water quality, technical performance, economics, environmental and social factors were identified through community engagement and relevant Council documents such as the Long Term Plan and Water Matters Strategy.

Consultation then moved to discussing the short-listed options with iwi, affected landowners, stakeholders and the wider community to inform the selection of a preferred option or options. Unsurprisingly, the key community messages largely related to people and groups wanting to ensure a secure and affordable supply of good quality water (including taste and removing the problems of bore water hardness).

There was also community support for investigating in-catchment options as a first priority before looking to out-of-catchment options. That said, there was also an element of 'consultation fatigue' in terms of some people just wanting Council to get on and deliver a solution. Equally, some people remained wedded to previously debated options such as the Otaki River source to supply the WPR area or were more keen to see a dam built at a higher upfront expense as a tried and tested concept for capturing and storing river water.

The importance of water conservation was an ongoing theme during the community consultation for this project, with both Council and the community raising a range of methods to achieve lower consumption rates of potable water.

As the short-list of options was refined a range of consultation activities were undertaken; including public meetings, information days, stakeholder meetings and workshops, water taste testing, community newsletters and newspaper articles, local radio messages, hui at the Whakarongotai Marae, interest group and stakeholder meetings, one-on-one meetings with interested and affected parties, and Council's website.

As River Recharge became the preferred solution, the focus shifted onto consulting with river users and interest groups, ecologists and technical experts to inform the identification of issues and investigations around potential effects.

In order to provide independent advice on the project, well-respected residents of the district with technical skills were asked to form a Technical Advisory Group (TAG). This group volunteered their time to provide a range of local expertise in engineering, environmental, economic and technical fields. Using the TAG as a local sounding board provided a 'local endorsement' to the technical merits of the River Recharge proposal and helped lessen local politics and concern around an innovative water supply option. The project group took milestone reports to the TAG for their review and feedback prior to seeking endorsement at Council meetings.

Council and Te Āti Awa ki Whakarongotai worked in partnership. In the spirit of a partnership, a Memorandum of Understanding in Relation to Water was entered into. Iwi established a Water Working Group to work with the project team through the assessment of options and undertook a Cultural Impact Assessment for Council to inform the resource consent application.

The inclusion of the dam as the second preferred option in the wider story of water management was in response to community and iwi feedback that a dam site should be secured. Thinking outside of the box and not simply only consenting a preferred option, but also future-proofing the dam site by purchasing it, showed the Council was listening to the community and thinking ahead.

3 HOW RIVER RECHARGE WORKS

River Recharge with Groundwater is a novel solution that uses groundwater (pumped from the existing borefield) to recharge the Waikanae River and maintain the river's residual flow requirements. This will enable continued abstraction from the preferred Waikanae River source during times of low river flows, rather than switching over to the groundwater source for supply as happens now.

As the Waikanae River flow naturally recedes towards its minimum flow of 750 L/s, groundwater will be discharged to the river immediately downstream of the water treatment plant intake. The groundwater discharge (i.e. the river recharge) bolsters river flows at this point and thus enables the equivalent amount of additional water to be taken from the river while maintaining the minimum flow (or natural flow if that is lower). Figure 1 below illustrates the basic concept of River Recharge.

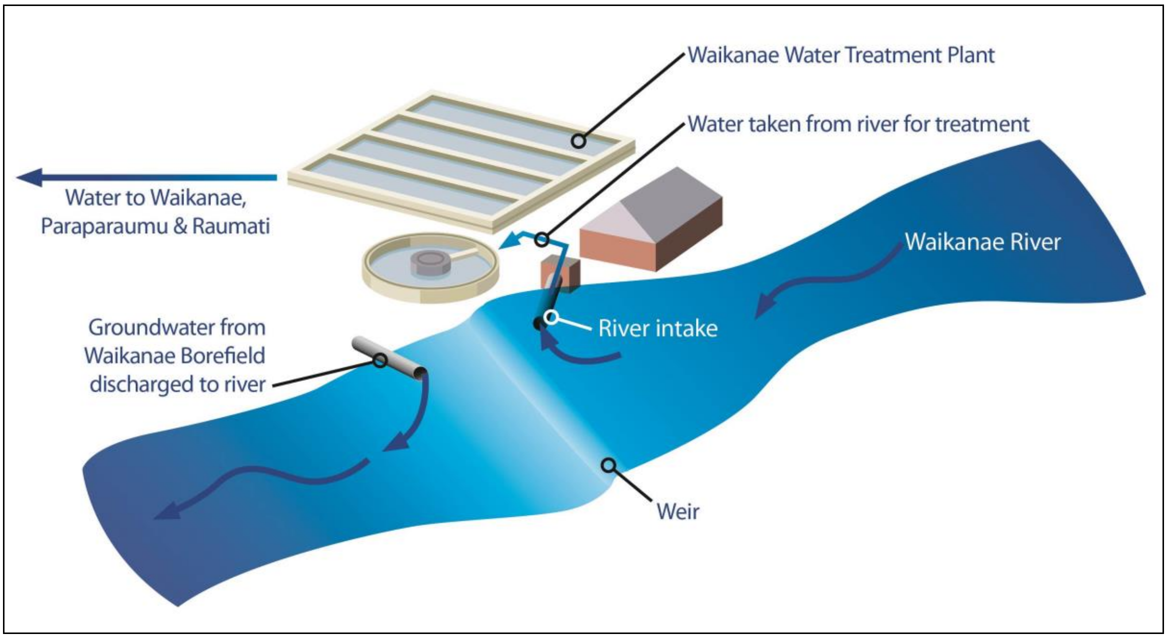

Figure 1: Concept Schematic of River Recharge

For River Recharge groundwater is abstracted from the deeper Waikanae groundwater zone between approximately 40 m and 100 m below ground level. Council currently has six production bores that are operational for taking water in this zone. River Recharge will decommission one of these bores (due to its high mineral content and proximity to the coast) and ultimately add a further six bores into the scheme. When groundwater is required for river recharge, the production bores will be pumped according to a hierarchy influenced by bore water quality, bore yield, hydraulics, and groundwater drawdowns.

Groundwater will be pumped from the borefield to the Waikanae WTP site and then discharged (without any treatment) into an open channel that will direct the recharge water to an outfall near the top of the river bank immediately downstream of the existing intake structure. The design of the discharge and open channel structure was modified in response to recommendations by the Water Working Group (WWG) to 'normalise' the water by exposing it to air and land prior to entering the Waikanae River. "Normalise" is the term used in the Cultural Impact Assessment commissioned by the WWG to cover the reintroduction of groundwater to the surface and allow for naturalisation through aeration and temperature moderation before discharge to the river, rather than being directly piped and discharged to the river.

The rate of groundwater discharge is dependent on the river flow and the amount of river water needed to meet demand. If the river flow is high enough or demand is low enough such that abstraction will not result in there being less than 750 L/s in the river downstream of the intake, then river recharge is not required. However if the river flow is naturally at or below 750 L/s, then every litre of water taken from the river must be matched by an equivalent litre of groundwater discharge so that the river's natural flow is not altered. The calculation for determining the required river recharge rate is shown in Figure 2. At higher river flows (>1400 L/s) an increased rate of abstraction is permitted which provides flexibility for shutdowns and outages.

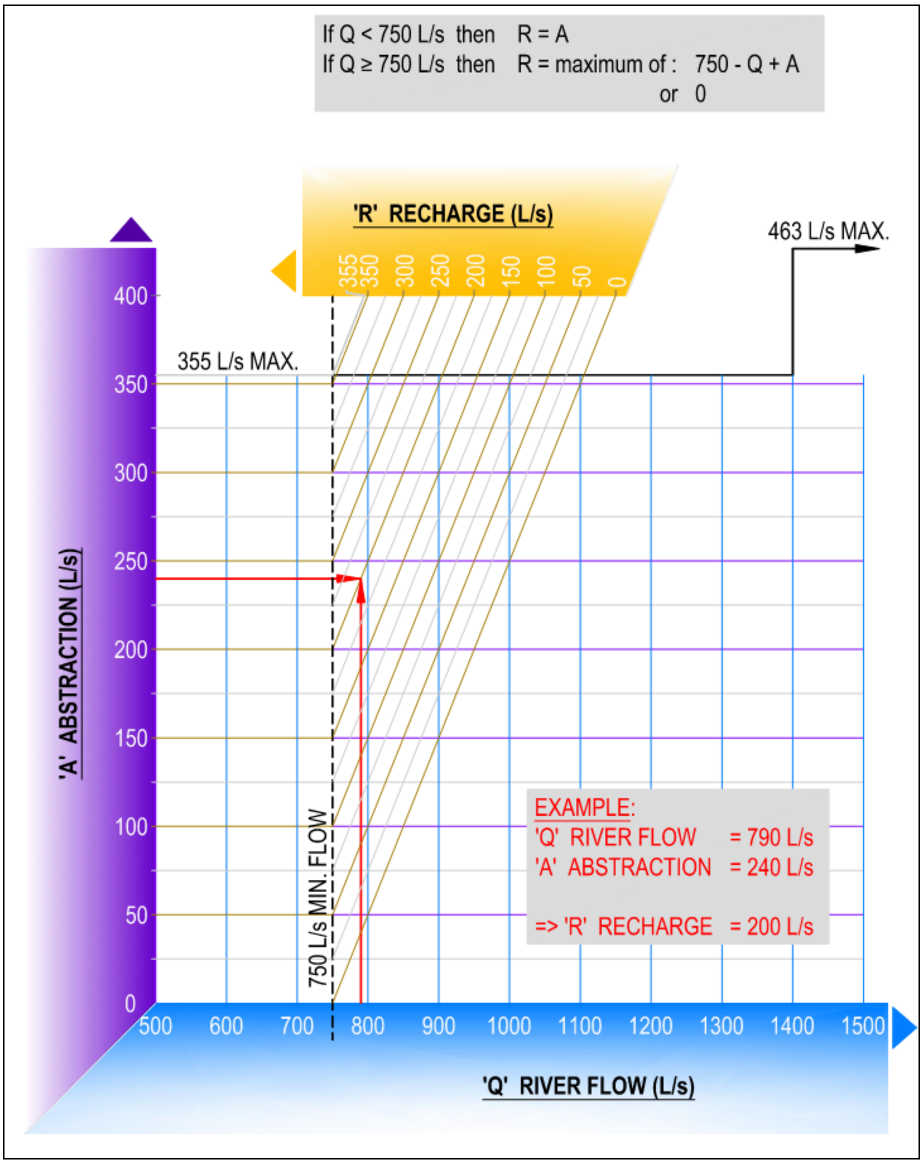

Figure 2: River Recharge Rate Calculation

In rare cases where river water cannot be used (e.g. flood damage to intake or severe algal bloom event in river), groundwater is still available to be used for emergency water supply.

4 CONSENTING

4.1 INVESTIGATIONS

Following Council's adoption of River Recharge as its preferred solution, an extensive period of further investigations and consultation was commenced, to inform and support the consenting process. The investigations included:

- Demand Modelling: Development of an algorithm that predicts daily water demands based on climate variables. Incorporation of that algorithm into a model to produce a time series of demand that matched the 36-year historic record for the Waikanae River flows, which in turn was input into a surface water model. The demand model was set-up to account for different population growth and demand scenarios.

- Hydrology and Yield Modelling: Development of a surface water model to calculate the frequency and magnitude of river recharge events using the 36 years of river flow data and the demand model through to 2060.

- Aquifer Testing and Groundwater Modelling: Investigation drilling, one new production well (N2), pumping tests, electrical conductivity surveying; and groundwater model construction, calibration and model runs of four scenarios using the output from the surface water model. The interpretation of the outputs from the model formed the basis of the hydrogeological component of the AEE

- Aquatic Ecology: Field trials by NIWA including within-river and off-river experiments in autumn 2011, and replicate channel experiments off-river in 2012. These trials, and the interpretation of the results, were to assess the impact of groundwater on the ecology of the Waikanae River.

- Wetland Ecology: Assessment of the effects of the drawdowns derived from the groundwater model on the 47 wetlands in and around the area of the extended Waikanae borefield (by Boffa Miskell).

- Cultural Impact: Assessment of the cultural impacts of the project undertaken by the Water Working Group of iwi.

Further consultation was undertaken with river users and interest groups, ecologists and technical experts to inform the shaping of the investigations, to report the results of the investigations as they came to hand, and to feed into the AEE.

4.2 CONSENTS SOUGHT

Council sought the following resource consents from Greater Wellington Regional Council (GWRC) for the River Recharge project:

- To take and use up to a maximum of 30,700 m^3/day of groundwater from within the Waikanae borefield for the purpose of supplementary water supply through river recharge or emergency water supply for 35 years;

- To construct and operate bores within the Waikanae borefield;

- To take and use up to a maximum of 30,700 m^3/day of water from the Waikanae River at the Waikanae Water Treatment Plant for the purpose of water supply for 35 years;

- To discharge groundwater up to a maximum of 30,700 m^3/day from the Waikanae borefield to the Waikanae River immediately downstream of the Waikanae Water Treatment Plant intake weir for 35 years;

- Works and structure within the bed of the Waikanae River (for minor modifications to the existing intake structure and a new discharge structure at the Waikanae Water Treatment Plant site);

- To inject up to a maximum of 10,000 m^3/day of water from the Waikanae River into the Waikanae aquifer through bores within the Waikanae borefield.

Council's reason for seeking a 35 year duration for the water take permits and the discharge permits, the maximum duration provided for under the RMA, reflected Council's considerable investment in investigating the feasibility of the project and its commitment to deliver the project in a staged manner over 50 years to meet demand.

4.3 ASSESSMENT OF ENVIRONMENTAL EFFECTS

4.3.1 SCOPE AND STAGING

The Assessment of Environmental Effects (AEE) drew together the work on the first three stages, and the various strands of the investigations and the consultation described above. It also included a statutory assessment and proposed conditions of consent.

Based on the forecasted peak water demand for the WPR area out to 2060, the project was broken down into four stages as summarised in Table 1 below.

Table 1: Staging of River Recharge

Stage	***Indicative Scope of Work***	***Total Yield (m^3/day)***	***Estimated Timing***
1	Wellheads for bores Kb7, K12 and N2 Pipeline from bore N2 along Ngarara Road and End Farm Road to Smithfield Road Pipeline from bore K12 along Smithfield Road to bore K6 on Ngarara Road Duplicate or upgrade existing pipeline along Ngarara Road Further develop bore K10 and replace pump to increase yield Bore K13 taken out of service due to poor water quality New pipework within Waikanae WTP and recharge outfall Modifications to existing river intake at Waikanae WTP	23,600	2014
2	Construct and develop production bore N3, including wellhead Pipeline from N3 to N2 Further duplicate or upgrade existing pipeline along Ngarara Road Replace pumps in bores, Kb4, K4 and K5 to increase yield	28,800	2033
3	Construct and develop production bore S1, including wellhead Pipeline from bore S1 to M2PP Expressway corridor, over Waikanae River to Te Moana Road and connecting to existing pipeline	30,900	2041
4	Construct and develop production bore S2, including wellhead Pipeline from bore S2 to bore S1	32,700	2051

Stage Four fell outside of the timeframe of a 35-year consent, and therefore did not form part of the application but was included to provide the complete picture. The application made clear that the stages related to the yield required and not to the specific bores, as the order of bore development in each stage was based on what was known at that point in time. It may be that as a result of monitoring of effects that Council needs to commission new bores earlier and then spread the same rate of abstraction over a larger area in order to, for example, reduce effects on wetlands or saline intrusion risk.

A good portion of the project was already consented. Council had existing consents expiring in July 2025 for the groundwater take from the Waikanae borefield and Waikanae River up to a combined maximum take of 23,000 m^3/day. Council was therefore seeking to increase its existing consent by one third.

4.3.2 OVERALL EFFECTS

Overall, the AEE concluded that the environmental effects of the project are acceptable and can be sufficiently managed by way of conditions of consent, including a comprehensive monitoring and adaptive management framework to provide for sustainable management.

The AEE also concluded that the positive effects of the project were significant. By delivering a reliable and sustainable water supply for the WPR community that best meets its drinking water quality expectations, the project enabled the community to provide for its social, economic, and cultural well-being. The other benefits of the project were:

- providing additional resilience, compared with the dam option, by using two sources of water
- being readily stage-able to match the actual increases in demand, and therefore being the most cost-effective solution.

4.3.3 GROUNDWATER

Based on the demand/surface water/ groundwater modelling, the proposed average withdrawal represented 7.3% of the total allocation for the lower aquifers and 2.6% of the total safe yield of the Waikanae groundwater zone as identified in the Regional Freshwater Plan. The proposed maximum allowable annual volume of groundwater take was 2.3 million cubic metres per year, which included a contingency in case the 50 year drought pattern is longer than the modelled 90 days, or in case river water cannot be used and groundwater is needed for emergency water supply (e.g. severe algal bloom in river).

In terms of the effects on the Waikanae borefield, the groundwater modelling showed the following under the worst-case scenario (demand in year 2060 with high population growth, and a 50 year drought):

- A total of 49 existing wells completed to depths of 20 m or less (in the Holocene Sand or Upper Pleistocene Sand aquifers) could potentially be affected by summer-long water level reductions of up to 0.5 m. The expected drawdowns in wells completed in the shallowest aquifer (the Holocene sand) are less than recorded natural variations in groundwater level and are likely to be unnoticed.
- Two non-Council wells completed in the Parata aquifer (a unit of 9 to 41 m in thickness, with the top of the unit between 10 and 25 m below ground level) in the northeast portion of the borefield could experience drawdowns of up to 5 m.
- Some 18 non-Council wells completed in the Pleistocene Sand and Waimea aquifers to depths of greater than 40 m could be affected by drawdowns of greater than 5 m - these wells have already been operational and such effects would already have been experienced to some extent.
- Drawdown of 5+ m in the deeper Pleistocene Sand and Waimea aquifers in coastal wells, which is equivalent to a water level in the deep aquifer of about 2 m below mean sea level. Although this may allow saline water to begin to move inland if sustained for a period of weeks, because water level recovery occurs relatively quickly in these aquifers after pumping ceases, groundwater will return to its “normal” off-shore flow direction within weeks of the cessation of pumping. Therefore, the long-term risk of intrusion of marine (saline) water is considered to be low.

There are 47 wetlands which are potentially affected by the River Recharge. The modelling of effects showed the worst-case drawdowns beneath wetlands range between 0 mm and 210 mm, being much less than the observed normal variations in water levels of 1 m to 2 m.

The AEE concluded that drawdown effects on existing well users, wetlands and surface waters within the Waikanae borefield area could be carefully monitored and managed to ensure any adverse effects are avoided, remedied or mitigated. Any adverse effects over and above natural variations in groundwater levels due to drought are able to be sufficiently managed through adaptive management.

4.3.4 WAIKANAE RIVER

The recharge to the Waikanae River will occur during low river flow periods caused by extended periods of dry weather. Yield modelling under a medium population growth scenario shows that at year 2060:

(a) the recharge is expected to be needed on average for 16 days per year, and

(b) under a 50-year drought the use of recharge peaks at 86 days, and the longest period of continuous recharge is 59 days.

These statistics are the worst-case scenario at 2060, but show that even then recharge will occur only during summer and autumn low flows rather than continuously throughout the year. In reality, River Recharge will be staged over time to incrementally match the increase in population and corresponding increase in demand. For example, with medium population growth at year 2016, the average recharge would be 12 days per year, with a maximum recharge (if a 50-year drought occurred) of 77 days and a longest continuous recharge period of 58 days.

The extensive aquatic ecology investigations undertaken by NIWA to support the application demonstrated that the environmental effects of the discharge of groundwater to the Waikanae River would be minor and manageable.

4.3.5 CULTURAL

In terms of cultural effects, Council and Te Āti Awa ki Whakarongotai had worked together in the spirit of partnership to explore practical, innovative, and culturally appropriate management of water, including the supply of drinking water to all communities within the WPR catchment area. This partnership is underpinned by the Memorandum of Understanding in Relation to Water. The Cultural Impact Assessment set out a range of recommendations for Council and iwi to work together on water management. Council plans a comprehensive approach to sustainably managing the Waikanae River catchment over the long term in partnership with iwi, and has committed funding to catchment management activities.

4.3.6 UNCERTAINTY

The AEE demonstrated that the process to assess alternative water supply options for the WPR community had been comprehensive and forward thinking. Council had effectively mapped out a 100-year solution, with the staged River Recharge scheme and the future dam. The process had involved an appropriate degree of technical investigations matched to the scale and nature of the proposal. It also benefitted from extensive stakeholder consultation, a partnership approach with iwi and independent scrutiny from the Technical Advisory Group.

Inherent to any project of this nature and scale, there was a degree of uncertainty around the actual effects of River Recharge over time. While the extensive investigations undertaken had significantly narrowed that uncertainty, some did remain. The AEE acknowledged that uncertainty, and proposed a monitoring and adaptive management approach to deal with that uncertainty. Adaptive management is recognised as being precautionary and is consistent with sustainable resource management. The adaptive management approach included the establishment of an Adaptive Management Group to specifically address, and ideally reduce, uncertainty over time in relation to River Recharge.

The environmental assessments presented in the AEE were also precautionary. Given the 50-year planning horizon, the AEE was based on a conservative scenario of a 1 in 50 year drought and projected water demand of 32,300 m^3/day in the year 2060. However, the nature of the scheme itself, and the fact that a demand of 32,300 m^3/day will not be achieved until 2060, means that in some years over the 35 year consent period there will be no need for recharge at all, whilst in other years the groundwater take and recharge would be at lower volumes and for shorter periods of time. In this context, the staged nature of River Recharge and with demand increasing over time is well suited to adaptive management. The monitoring, with a hierarchy of alert/action/cease triggers, will not only protect the environment but also reveal any effects as they emerge, allowing the staging and mitigation measures to be re-assessed and an appropriate response implemented.

4.3.7 COMMUNITY NEED

The AEE made the strong case that a safe and secure public water supply is a fundamental priority for the people that live, work and visit the WPR area. That community need was pressing - projections showed that even with conservation improvements, additional supply will be needed by 2015. When that priority was balanced with the full range of uses and values of the Waikanae River and Waikanae borefield and environment, it argued that the granting of a consent for River Recharge would promote the purpose of the RMA. Section 5 of the RMA sets out that purpose, being fundamentally about achieving the sustainable management of natural and physical resources.

River Recharge is in essence a community water supply project, for the well-being and health and safety of the community (current and future generations) that safeguards the environment and the life-supporting capacity of the Waikanae River and aquifer system. The inclusion of an adaptive management regime, the management framework set by conditions of consent, and GWRC's ability to review those conditions pursuant to section 128 of the RMA provide further security and control to give grounds for the granting of a 35-year consent duration.

4.4 DECISION-MAKING PROCESS

The consent application and supporting AEE were lodged in November 2012.

Following the lodgement of the AEE there was a period of responding to section 92 queries, as well as analysing and responding to the submissions received. In terms of the section 92 queries it took a couple of months of clarifications for GWRC to be sufficiently comfortable with the information provided and that the effects had been adequately addressed. In terms of submissions, for such a high profile project it received relatively few submissions (a total of 23, with 18 opposed, 3 in support and 2 neutral). This was a testament to the comprehensive options assessment process and the community engagement undertaken for the project.

Detailed briefs of evidence were prepared by the various experts in the team for the hearing before independent commissioners, which commenced in June 2013.

A number of technical matters were raised during the hearing around groundwater modelling and the predicted effects. One of the complicating factors in this was the fact that GWRC latterly developed its own groundwater model for the purposes of informing its groundwater allocation on the Kāpiti Coast, whereas Council already had its own model for the purposes of modelling the effects of River Recharge. These issues were resolved by negotiation, which was informed by further hydrogeological analysis and modelling.

One of the significant challenges during the hearing was convincing the commissioners that the effects of periodically discharging the groundwater into the Waikanae River would be transient and no more than minor. The fact that there was no precedent for this kind of activity in New Zealand seemed to drive a need to set a high hurdle, as has been commented elsewhere – refer for example to Smellie (2014). In its closing submission, Council made the point that the groundwater discharge very nearly complied with the permitted activity Rule 1 in the Regional Freshwater Plan, and that compared with a discharge from a wastewater treatment plant the extent of the conditions being proposed were very onerous. As an example, the discharge consents granted by the GWRC for the Western WWTP into the Karori Stream included:

- monitoring for 3 quality parameters (biochemical oxygen demand, suspended solids, and faecal coliforms), as compared with the 37 quality parameters agreed on for the bore water quality analysis for river recharge;

- no prohibition on the discharge until baseline monitoring had been undertaken or until monitoring plans were approved, as compared with these being required upfront for River Recharge;

- only requiring limited ecological monitoring "a survey of marine intertidal and subtidal communities" be undertaken twice during the 25 year duration of the consent, as compared with a substantial baseline and ongoing monitoring programme for River Recharge.

It would seem that where a discharge of a WWTP effluent to the environment is required, the potential adverse effects are better understood and accepted. Also, that such common discharges can be managed through environmental standards as best as possible within the constraints of technology and affordability. In the case of River Recharge there was not that acceptance, and GWRC and the commissioners took a highly precautionary approach by seeking a very comprehensive monitoring regime for the project compared to the WWTP example given above.

The application for 10,000 m^3/day of aquifer injection was proposed as a prudent measure to mitigate against possible long term saline intrusion risks. It was modified during the hearing into an application for an injection trial should the long term monitoring show injection could be needed to help mitigate those risks. The

Commissioners determined that the uncertainty of the effects of injection were too great, and declined that particular application, taking the view that should it ever be needed in the future, Council should rather apply for aquifer injection as a separate consent with more a robust assessment of effects at that time.

At the conclusion of the hearing process, which took place over a three month period, a 35 year consent for River Recharge was granted in September 2013. There were no appeals to the Environment Court.

4.5 LESSONS FROM CONSENTING PROCESS

In hindsight there were several important lessons from the consent application and hearing process.

The first was that Council committed to a 50-year water supply solution and to support that time horizon the project team based the long term assessment of environmental effects on a scenario of a 1 in 50 year low flow (as that was the desired level of service) and projected water demand of 32,300 m^3/day in the year 2060. This scenario allowed the effects of the scheme to be assessed for its life from 2060 and beyond, well beyond the 35 year maximum RMA consent duration. In the context of that 35-year duration, the scenario is extremely conservative. In reality, in some years there will be no need for recharge at all, whilst in other years recharge may be discharged at lower volumes and for only short periods of time. Presenting the long term (2060 and beyond) scenario under an RMA consenting process proved challenging, as the consenting issue to determine was "what will the effects of the project be within the duration of up to 35 years consentable under the RMA". The 50-year worst-case scenario became the starting point for the environmental effects assessment, rather than a distant future possibility.

Secondly, there was considerable debate around the groundwater modelling. Different models were in play between the project team and the consenting authority. This demonstrated the critical need to have consistency and agreement for the model used. There appears good reason to work towards the development and adoption of national groundwater modelling guidelines that provide a consistent framework for the development of groundwater models and their use.

Thirdly, inherent to any project of this nature and scale, there is a degree of uncertainty around the actual effects over time. While the extensive investigations undertaken for River Recharge significantly narrowed that uncertainty, some remained. The challenge during consenting was to demonstrate that uncertainty was occurring only 'at the fringes' of either natural effects, and/or at the limits of the science; or within minor effects as provided for under the RMA.

To resolve the concerns around uncertainty, significant effort was made to develop a monitoring framework up front for the hearing that explained how the effects of the project could be distinguished from the natural effects during summer dry periods of low river flows and drawdown of aquifers. A range of draft monitoring plans were developed for the hearing, and these were ultimately required through consent conditions.

Developing the monitoring framework and the environmental triggers for alert/action/cease responses demonstrated that there is still significant work to be done in New Zealand to define a nationally consistent framework for monitoring. A range of methods, differing expert advice on what should be monitored, and when and how the monitoring should be done, all add to the uncertainty around environmental effects assessment. Significantly, it also adds to the uncertainty for Council asset managers, unclear on the level of monitoring and associated costs that can be expected for major infrastructure projects of this nature.

Overall, however, the resource consent application and evidence at hearing demonstrated that the adaptive management approach proposed by Council was precautionary and consistent with sustainable resource management.

5 LESSONS LEARNED

The lessons learned through the course of the project; from the project set-up, through option assessment, concept development, investigations and consenting were:

i. Major infrastructure projects, especially ones which have a troubled history or other sensitivities, need to be resourced well and set up correctly right at the start. The River Recharge project illustrates that making that early investment pays dividends in terms of the final outcomes.

ii. Work in a close and long-term partnership with iwi and the wider community, by:

   a. Backing the process and understanding it may take years rather than months for major community projects involving resource management.

   b. Engaging early and working with the community to establish their values. These values can then be used as the basis for a multi-criteria analysis of options, which leads to greater buy-in to the outcome.

   c. Putting in as much energy as is necessary to build a partnership approach with iwi on matters of water management, respecting local knowledge and the guardianship approach of kaitiakitanga.

   d. Using local knowledge and expertise in the form of TAGs or reference groups to harness the wisdom already in the community, and to help with community endorsement.

iii. Look for new ways to sweat existing assets. The innovative River Recharge scheme largely uses existing infrastructure in a different way from what was originally intended, but the outcome is prudent in both financial and resilience terms.

iv. When planning major infrastructure, be prepared to be open-minded. In this case Council not only sought consent for the preferred scheme, but also moved to future-proof a dam site to present to the community a comprehensive 100-year water supply solution.

v. Develop long-term solutions, but pick a suitable environmental scenario for the basis of obtaining consents under the RMA. Relate effects assessment to the 35 year maximum and be prepared to determine potential effects over shorter timeframes with likely consent durations in mind.

vi. There is a need for national consistency in groundwater modelling and environmental monitoring for water resource management projects.

vii. Uncertainty for resource management projects of this nature is inherent and should be expected. When that uncertainty is more related to whether project effects can be detectable over natural effects, rather than whether effects will be minor or more than minor, then adaptive management through monitoring is an acceptable approach.

viii. 35-year consents are achievable for municipal water supply projects, and given the push for long-term planning for local government infrastructure, they should be the norm.

6 CONCLUSIONS

The process to assess alternative water supply options for the community was comprehensive and forward thinking. Council effectively now has the means available to provide a 100-year solution, with the staged River Recharge scheme and the future dam option. The Kāpiti Water Supply Project delivered on the challenge and opportunity to identify a water supply solution that could best deliver on the full range of economic, social, cultural, technical and environmental requirements.

The River Recharge project secures a reliable and sustainable water supply for the Kāpiti Coast area that best meets community expectations for quality of its drinking water. It also provides additional resilience by using two sources of water, the Waikanae River and the Waikanae Borefield.

River Recharge is readily stage-able and can therefore be implemented in steps over time to match the actual increases in population, providing a cost-effective solution that best meets the community's changing water supply needs.

The additional achievement of securing a dam site for a combined 100-year water supply solution shows that Council's journey over the past few years has been a great success.

REFERENCES

Smellie, P (2014). "Environmental protection v economy - a fine balance", Dominion Post, 4 July 2014