Notice is given that an ordinary meeting of the Full Council will be held on:

Date:	**Wednesday 14 June 2017**
Time:	**11.30 am**
Meeting Room:	**Tasman Council Chamber**
Venue:	**189 Queen Street Richmond**

Full Council

AGENDA

MEMBERSHIP

Mayor	Mayor Kempthorne	
Deputy Mayor	Cr King	
Councillors	Cr Brown	Cr McNamara
	Cr Bryant	Cr Ogilvie
	Cr Canton	Cr Sangster
	Cr Greening	Cr Tuffnell
	Cr P Hawkes	Cr Turley
	Cr Maling	Cr Wensley

(Quorum 7 members)

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Note: The reports contained within this agenda are for consideration and should not be construed as Council policy unless and until adopted.

AGENDA

1 OPENING, WELCOME

2 APOLOGIES AND LEAVE OF ABSENCE

Recommendation
That apologies be accepted.

3 PUBLIC FORUM

4 DECLARATIONS OF INTEREST

5 LATE ITEMS

6 CONFIRMATION OF MINUTES

That the minutes of the Full Council meeting held on Thursday, 25 May 2017, be confirmed as a true and correct record of the meeting.

7 PRESENTATIONS

Nil

8 REPORTS

9 CONFIDENTIAL SESSION

8 REPORTS

8.1 WAIMEA WATER AUGMENTATION PROJECT - NEXT STEPS

Decision Required

Report To:	Full Council
Meeting Date:	14 June 2017
Report Author:	Lindsay McKenzie, Chief Executive
Report Number:	RFC17-06-01

1 Summary

1.1 Negotiations on the funding, financing and governance of the proposed Waimea Water Augmentation Project (the Project, WWAP or Waimea Community Dam) have been ongoing for most of this year. The purpose of this report is to formally report back on the negotiations and to seek a mandate to continue negotiating, albeit on a different basis.

1.2 Councillors were briefed on progress with the negotiations at a workshop on 31 May 2017. The briefing also covered the review of the urban water demand assumptions, and the augmentation options if the Project does not proceed. Councillors were advised about the decisions that would be needed to move the project ahead. As decisions cannot be taken at workshops, this report provides the opportunity for the debate and decision-making.

1.3 The report also considers the impacts of the water allocation regime in the Tasman Resource Management Plan on domestic and business water users in the event the Project does not proceed. Staff advise that the cut backs in the water supply to households and businesses that are required by that Plan (if there is no dam) far exceed what could be achieved by controlling demand or onsite storage. A large-scale water augmentation scheme is the only viable option; otherwise, it is hard to imagine the Council realising its vision for the district.

1.4 The negotiators' feedback is that unless the partners' negotiating positions shift, the Project will not proceed. On the other hand there are compelling reasons why the Project should proceed. The main reason why the Council should want the project to go ahead is because the alternatives to the Project will cost the domestic and business urban water consumers more. In addition, the alternatives don't deliver the same supply security and long term growth benefits that the project does nor the social, environmental, economic and cultural co-benefits. A no dam scenario is untenable.

1.5 The Council should reconsider the funding contribution it proposed in the Long Term Plan 2015-2025 and indicate a willingness to increase it, especially in relation to the share of operating cost. Waimea Irrigators Ltd will also need to consider their position. The following draft resolutions ask the Council to mandate the JV Working Group that has been negotiating terms, to reach an agreement (for Council approval) that enables the project to be delivered. The recommendations also deal with the implications for community consultation and engagement. You should discuss the specifics of your negotiating position with the public excluded.

2 Draft Resolution

That the Full Council

1. **receives the Waimea Water Augmentation Project - Next Steps report; and**
2. **requests that the Council members on the Joint Venture Working Group try and reach a draft agreement with the funding partners that provides for an increase in capital funding and operating cost share by the Council and credit support for the Crown Irrigation Investments Ltd loan from the Council; and**
3. **notes that the reasons for reviewing the Council's negotiating position include the broad range of benefits offered by the proposed dam compared to the alternatives; the cost of and risks associated with the alternatives, and the obligation to provide good quality infrastructure that is most cost effective for households and businesses; and**
4. **notes that Waimea Irrigators Limited and Crown Irrigation Investments Limited will also need to review their position if there is to be an agreement; and**
5. **notes that any agreement will need to be approved by the Council and that any such agreement will form the basis for a Statement of Proposal relating to the Project; and**
6. **requests staff to review and report to the Council on the advice that has been received on the alternatives for augmenting the urban water supplies sourced from the Waimea River catchment; such advice is to enable the Council to assess the alternatives against the Waimea Water Augmentation Project on cost, benefits and risks.**
7. **requests staff to commence work on a Statement of Proposal for community consultation on the Waimea Water Augmentation Project including covering the proposed financing, funding and governance arrangements for the proposed council controlled organisation; and**
8. **notes the proposed amended timetable for community consultation and that staff will revise the timeline once the Joint Venture Working Group has concluded their negotiations.**

3 Purpose of the Report

3.1 The purpose of this report is to formally update the Council on the negotiations that the Joint Venture (JV) Working Group has been undertaking with Waimea Irrigators Ltd and Crown Irrigation Investments Ltd (CIIL). The report also seeks a mandate to continue negotiating, albeit on a different basis. In this report, the Project is the 53m high storage dam in the Lee Valley.

3.2 This report also covers the Council's decision making obligations. This is because the project is 'in the balance', unless the Council agrees to go back to the negotiating table with a view to meet the additional costs and providing the credit support being requested of it.

4 Background and Discussion

4.1 The case for building the Waimea Community Dam i.e. implementing the Waimea Water Augmentation Project is compelling. A large-scale water augmentation scheme needs to be built if the Council is going to meet its obligation to provide households and businesses with a reliable water supply at least cost. The Project is also needed to enable the Council to meet its freshwater management obligations. The Project is also critical to the future viability of local industry and rural land users. Without a dam, the water supplies in the area of the district supplied from the Waimea aquifers will fail to meet people's needs from as early as November 2018 and into the future.

4.2 As unpalatable as the choices may seem, they have to be made.

4.3 As large and as complex as the Waimea Water Augmentation Project may seem, the reality is that the Council's proposed capital contribution to the Project is only about 6% of its likely capital works budget over the next 10 years.

4.4 That noted, the Project will not proceed unless the partners (primarily Waimea Irrigators Ltd, the Council and Crown Irrigation Investments Ltd) move from their previous negotiating positions. The case for all of the partners continuing to work together and collaborating on the Project is strong.

4.5 The Council cannot meets its urban water supply needs now and in the future, without water augmentation on the scale that the Project provides. Demand control measures, even the most severe, will not reduce demand from households and businesses to the extent that the water allocation rules in the Tasman Resource Management Plan require if there is no dam.

4.6 The alternatives to the proposed dam are either more costly, don't provide the same protection against droughts, don't provide for the increase in future demand, or don't meet the Council's obligations under the National Policy Statement on Freshwater Management. Some of the alternatives fail on all counts. The options for industrial and rural water users are also limited if there is no dam or if the Council decides not to proceed with the proposed dam in the Lee Valley.

4.7 By collaborating on the Waimea Water Augmentation Project as proposed, everyone gets a solution that delivers the direct benefits needed for less cost than going it alone. As a bonus, the scheme delivers a suite of environmental, social, cultural and economic benefits that no other option does. To realise those benefits, all the partners need to reconsider the limits they previously placed on their contributions to the Project.

4.8 The Council needs to rethink its rationale for the funding in the Long Term Plan 2015-2025. A small increase in capital contribution is likely. A more significant increase in the Council's share of operating costs is needed. Waimea Irrigators Ltd are similarly placed and need to reconsider their position.

4.9 Even with an increased Council contribution, the Project is still the most effective way of meeting the current and future water supply needs of the households and businesses in the area. The Project is capable of supplying water for less than half of the cost to users of the realistic alternatives. All of the alternatives carry risk; most are actually 'unrealistic' and none deliver the same level of water supply security now or in the future or the co-benefits that the Project does.

4.10 This report makes the case for re-mandating the JV Working Group to negotiate an agreement for the Council (and other partners') approval as a pre-requisite to further community engagement. All of the relevant issues are discussed.

4.11 In summary, the situation appears to be -

- it is agreed by almost everyone that we need more water;
- there isn't a better option than the one on the table – demand measures can't bridge the without dam gap and the alternatives are either more costly or don't deliver the same level of service or co-benefits or all three;
- the JV Working Group has done what the Council has asked and advise that agreement on the terms set isn't possible;
- Waimea Irrigators Limited are at (or near) the limit of their ability to pay;
- unless the Council steps up and carries more cost and provides strong credit support, the project is over;
- the Council needs to mandate the JV Working Group to carry on and negotiate the terms of an increased contribution to capital and operating costs and credit support;
- there are benefits to the urban water users that outweigh the additional costs; and
- an outcome that is mutually beneficial and delivers wider community benefits (social, economic, environmental and cultural) is still possible.

5 Funding and Finance

Overview

5.1 This project has an overall project cost estimated at $82.5m including costs to date. Several funding proposals have been advanced over the years but none have been successful. The underlying challenge is that this is a large infrastructure project based on estimated water demand circa 100 years out.

5.2 Reducing the size of the proposed dam significantly does not reduce the costs proportionally. This is because most of the cost is in the lower parts of the dam and most of the storage capacity is in the higher areas. The design capacity of the dam (hectare equivalents (hae)) provides for 7,765 hae of extractive capacity. That capacity is currently under subscribed with 5,000 hae being taken up by irrigators, 1,400 hae by Tasman District Council and probably 515 hae by Nelson City Council. That leaves 850 hae (11%) of the capacity unsubscribed. The costs for this unsubscribed capacity must be met by those who do subscribe. The proposed dam also provides for environmental flows in the river and a public good contribution to the district. These two components have been assessed as 30% of the capital cost of the project.

5.3 Following the unsuccessful Council-proposed fully rates-funded approach consulted on in 2014, irrigators undertook to develop an investment ready proposal for consideration by the Council. That proposal was subsequently received and rejected by the Council. Over the last four to five months the Council, irrigators, CIIL and our advisors have been meeting to develop a proposal that would see this key project proceed. That work has identified a need by all parties to move significantly from their opening positions. In essence we all get there together or we don't get there at all. That means that the Council and the irrigators will both need to make a larger financial contribution to the project.

Increase in Opex and Capex

5.4 The initial focus was on funding capital costs of the project. Operating costs were modelled roughly on a much smaller and older district dam project at $700,000-$750,000 per annum. In the last three months a full review of likely operating costs has been undertaken. These estimates now include costs not included in the original estimates. They have been peer reviewed and are still being finalised.

5.5 With a more complete analysis, the annual operating costs are now estimated to be in the order of $1.3 million to $1.4 million. Key changes are the costs of governance (company board), public liability and material damage insurance, and Council rates.

5.6 IN order to leverage a better deal by using the Council's buying power, the Council is considering the implications of including the dam's material damage and public liability insurance cover under its own policies. That would be a major departure from current Council policy and could have flow-on implications. As a result of the magnitude of the increase, the operating costs cannot be met in full by extractive users as was originally proposed by the Council. Capital costs to project completion are also being reassessed. If costs increase above original estimates and/or other parties do not contribute as expected e.g. Nelson City Council, the Freshwater Improvement Fund, then the Council will be called upon to increase its capital contribution above the current $25 million.

Allocation of costs

5.7 As part of the 2014 consultation on the rates funding proposal, the Council developed its current policy on cost allocations for this project. The policy is that extractive users (irrigators and Tasman District Council/Nelson City Council community water supplies) would contribute one-third of the capital costs of the environmental flows/public good, 30% of the project costs, i.e. 10% of the project costs. All operating costs were to be met by extractive users. That meant that the Council would not contribute operating costs relating to the environmental flow capacity.

5.8 Under this approach irrigators were expected to contribute 75% of the operating costs, the Council 18% and Nelson City Council 7%. It would have also seen the irrigators contribute $5-$6m towards the $23m capital cost of the environmental flow capacity. That approach to cost allocation on extractive use has been deemed unaffordable to irrigators especially in light of the increase in estimated operating costs.

5.9 The JV Working Group is developing an alternative for consideration by all parties that involves the Council covering the full costs of the environmental flows. The Council is also being asked to meet the operating costs on the environmental capacity. The Council's additional capital costs for the environmental flow capacity would be partly offset by the potential Government funding of up to $7 million over three years from the Freshwater Improvement Fund.

5.10 The revised allocation of operating costs would see the Council contribute 52% of operating costs and irrigators 48%. This approach would see the Council's operating cost contribution increase by an estimated $460,000 per annum to $675,000 per annum based on current LTP and dam operating cost estimates. This assumes that Tasman District Council meets Nelson City Council's dam capacity operating costs and that Nelson City Council makes a capital grant of $5 million. The final arrangements with Nelson City Council are subject to the successful completion of negotiations over the cross-boundary water supply.

Credit Support

5.11 The irrigator capital contribution is proposed at $40 million made up of $15 million cash raised and a loan from CIIL of $25 million. CIIL require security (credit support for the loan). That will include the loan being secured over the whole dam and given a dam is an illiquid asset (you can't sell it easily) additional credit support by the Council.

5.12 A key component in arriving at an acceptable funding and finance outcome is the commercial negotiations with CIIL to achieve acceptable loan conditions. We are working actively with CIIL and WIL on the rate, tenor and structures/security for the loan.

5.13 The level of credit support provided by the Council and whether the loan is made to WIL or directly to the joint venture (DamCo) will impact directly on loan costs. A loan directly in to the JB will incur lower transaction costs. In order to make the project affordable to irrigators, to ensure that there is adequate irrigator uptake and to ensure that there is an adequate level of loan principal repayment, the Council will need to provide a high level of credit support. CIIL also requires a financial exit strategy when the loan matures in (say) 15 years.

5.14 At that time the outstanding loan will need to be refinanced at commercial rates. The request for a high level of Council credit support should be seen in light of the fact that the Council in any case would step in in a financial crisis to protect its own investment and the benefits the project provides for the wider community. Funding through CIIL is also being compared to the cost of the Council directly funding the $25 million irrigator loan through the Local Government Funding Agency.

6 Council's Financial Strategy and Revenue and Financing Policy

Financial strategy

6.1 The Council's current strong financial position, in particular it's lower than budgeted debt level puts it in a position where it can accept the irrigator funding debt being held within the Joint Venture. Debt in the JV or in WIL will be treated as Council debt by credit rating agencies. Initial estimates show all other things being equal, the Council will not breach the $200 million limit on debt set in its LTP 2015-2025 and Financial Strategy.

6.2 Keeping within the 3% (plus growth) annual limit on increases in rates income will be more challenging. But this is a multigenerational infrastructure investment. The rating levels will need to be managed in conjunction with the other capital and operational projects being considered as part of the Long Term Plan 2018-2028. Re-prioritisation and phasing will be required to ensure that the current fiscal envelope is not breached.

Revenue and Financing Policy

6.3 The current policy position on funding this project was built around a different proposal to that now being advanced. As a result the Council will need to re-evaluate how it will distribute the costs including the significantly increased operational costs.

6.4 This will be a principles-based exercise as Councillors step through the statutory considerations set out in the Local Government Act S101(3). The statutory considerations include identifying beneficiaries and exacerbators. This process will likely lead to a proposal for a range of targeted and general rates to be levied across the District in order to fund the project. It is expected that this work will start soon, as it needs to be included in the Statement of Proposal for the Council's investment in the dam.

6.5 While it is too early to say what the outcome of the further negotiations will be, should the Council mandate them, your decisions on the allocation of Council's costs will need to:

6.5.1 revisit the rationale for the cost apportionment following the community consultation in late 2014;

6.5.2 consider who the beneficiaries of any increased capital, operating cost share and of the credit support are;

6.5.3 think about the obligations under the National Policy Statement on Freshwater Management and how they may change your views on environmental flow cost apportionment;

6.5.4 reflect on the various economic reports and where they point to benefits (or costs) accruing;

6.6 In the end the Council has broad discretion to allocate cost in order to moderate the impact on the community.

7 Consultation and Community Engagement

7.1 The Council has decided that it will follow the Special Consultative Procedure process in relation to community consultation on the Project. The current financial commitment in our Long Term Plan 2015-2025 (LTP) is up to $25 million. The Council is now being asked make a larger financial contribution to the project as described above.

7.2 In terms of the Local Government Act and our Significance and Engagement Policy, staff can advise that the increase in both the capital and operational funding that may be sought and/or agreed is not significant or material. Therefore, an amendment to the LTP 2015-2025 is not required. Each of the relevant matters and issues as set out in our Significance and Engagement Policy are assessed as follows:

7.2.1 Financial Impact - staff consider that the increased capital contribution (up to $3 million) and operational contribution (up to $460,000) to be of moderate significance. Both the increase in capital and operational spend (to the $25 million already budgeted in the LTP), will only have a minor effect on rates for residents and Council's debt which will remain within our financial debt limit of $200 million. The rates increase may exceed 3%.

7.2.2 Community Interest - we anticipate that the level of community interest will be of a moderate to high level, depending on proposals relating to cost allocation. Those directly affected, including urban water users, irrigators, and those in the Waimea Augmentation Area are likely to have a higher level of interest.

7.2.3 Changes to Levels of Service – staff anticipate that this is of low significance as there will be only minor effects, if any, in terms of the levels of service provided by the Council in the LTP.

7.3 We have previously advised our community that we are likely to be able to consult on the proposal in August and October this year. The topics for discussion are the structure for the ownership and governance of the Dam, the capital and operational contributions from each of the funding parties and the key commercial terms. Due to a number of issues still to be resolved between the funding parties, we are unlikely to get closure on these in time to meet this timeline.

7.4 Given the complexity of the negotiations and the recent firming up of associated operational costs, it is likely that the Council will not be in a position to start consultation until early November 2017. This means that the Council cannot make a final decision until late February/early March 2018. With this timing, the Council may decide that it is in the best interests of all parties to delay consultation and consult on the Dam proposal as part of the LTP 2018-2028 in March/April 2018.

7.5 The following is a proposed timeline for community consultation based on the Joint Venture Working Group concluding their negotiations by end of July/early August 2017.

Date	Task
August – October 2017	Council workshops/finalise SOP and summary information
2 November 2017	Full Council – Adopt Consultation Document and SOP (after Consultation Document)
6 November – 18 December 2017 (6 weeks)	Public consultation - submissions and public meetings
18 December – 1 February 2018	No Council meetings – Christmas break
early – mid February 2018	Hearings and deliberations
Late February/early March 2018	Council Decision

8 Water Demand and Rationing

8.1 Staff recently commissioned modelling work by MWH/Stantec to:

8.1.1 update growth and water demand estimates for the Council's water schemes that will be reliant on the Waimea Community Dam; and

8.1.2 to assess the immediate and long term impact of the no-dam water rationing rules under the new rules in Tasman Resource Management Plan.

8.2 The report is appended as **Attachment 1**.

8.3 This work confirmed that the Council's water supply subscription for capacity in the Waimea Community Dam (1,400 hectares equivalent) is adequate for 100 years, even after accounting for high levels of uncertainty.

8.4 The modelling also highlighted the challenge the Council will face in meeting water supply constraints placed on it under the Tasman Resource Management Plan (TRMP) if the

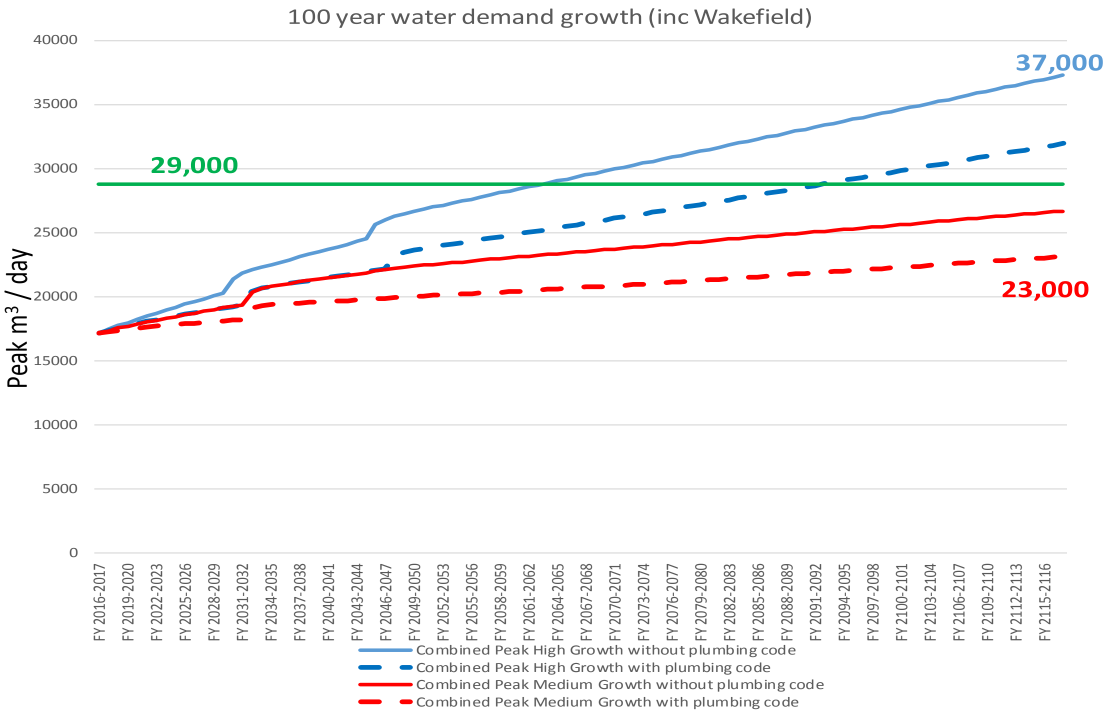
Waimea Community Dam does not proceed. The impact of the 'no dam' rules on the Council and our community are very significant and will occur not later than November 2018.

Growth and water demand estimates

8.5 Staff sought updated growth and water demand forecasts following the recent update to the Council's growth supply and demand model. The update was required to test that the Council's need for capacity in the Waimea Community Dam was adequate. The capacity subscribed for was based on a peak week average daily demand of 60,000 m^3.

8.6 The new forecasts have been built from the 'ground up' using a new model, which can test how water saving techniques and technology could potentially affect long term water demand. A medium and high growth scenario was tested for the serviced communities - Mapua, Richmond, Brightwater, Redwood Valley and Wakefield. Under the medium growth scenario, the total population in these communities increased by approximately 40% in 100 years compared to today, while it roughly doubled under the high growth scenario.

8.7 The model results are below and indicate that future peak week average daily demand of between 23,000 m^3 and 37,000 m^3 for the scenarios modelled (the green line at 29,000 m^3 is approximately the Council's total consented supply per day at present). This is a 10-14% difference compared to the last modelling undertaken in 2011 and below the 60,000 m^3 used as the basis for the Council's subscription in the dam.



8.8 The report notes that 100 year forecasts contain a very high level of uncertainty. Any number of factors could change this forecast significantly including changes in population trends, the establishment of large "wet" industries or climate change. Consequently, staff consider that a peak week average daily demand of 60,000 m^3 is still appropriate as a basis for the Council's subscription in the Waimea Community Dam. I therefore recommend retaining the urban water supply capacity of 1,400 hectares equivalent from the dam. This provides a low risk water future for the Council's water supply and a hedge against future uncertainty.

No dam water challenge

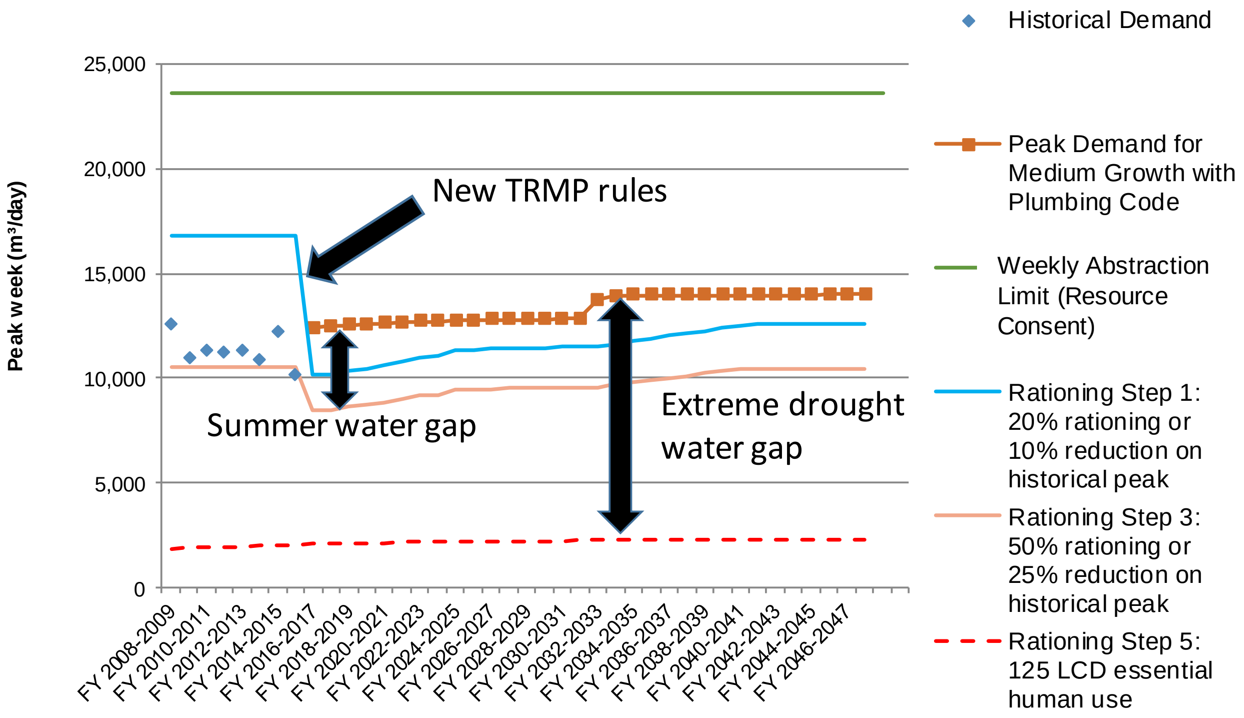
8.9 The modelling has highlighted the major challenge the Council will face in meeting our customers' needs if the Waimea Community Dam does not proceed. Under the TRMP, the Brightwater, Redwood Valley, Richmond, and Mapua water supplies will be severely rationed almost every year, starting no later than November 2018. The rationing steps that apply to these water supplies are.

- Step 1 rationing, greater of:
  - 10% of consumption reduction (average last eight years)
  - 20% of consent
- Step 2 rationing, greater of:
  - 17.5% of consumption reduction (average last eight years)
  - 35% of consent
- Step 3 rationing, greater of:
  - 25% of consumption reduction (average last eight years)
  - 50% of consent
- Step 4 (does not apply to community water supplies)
- Step 5 - essential human health only – 125 litres/day/person

8.10 Given past river flow data, rationing up to and including step 3 is likely to occur most years. The impact of step 3 rationing during a peak week is likely to require an effective reduction in consumption of between 25%-50%, depending on the scheme. Should the long term growth forecasts discussed above eventuate, all schemes will require at least a 50% reduction at step 3 in the future.

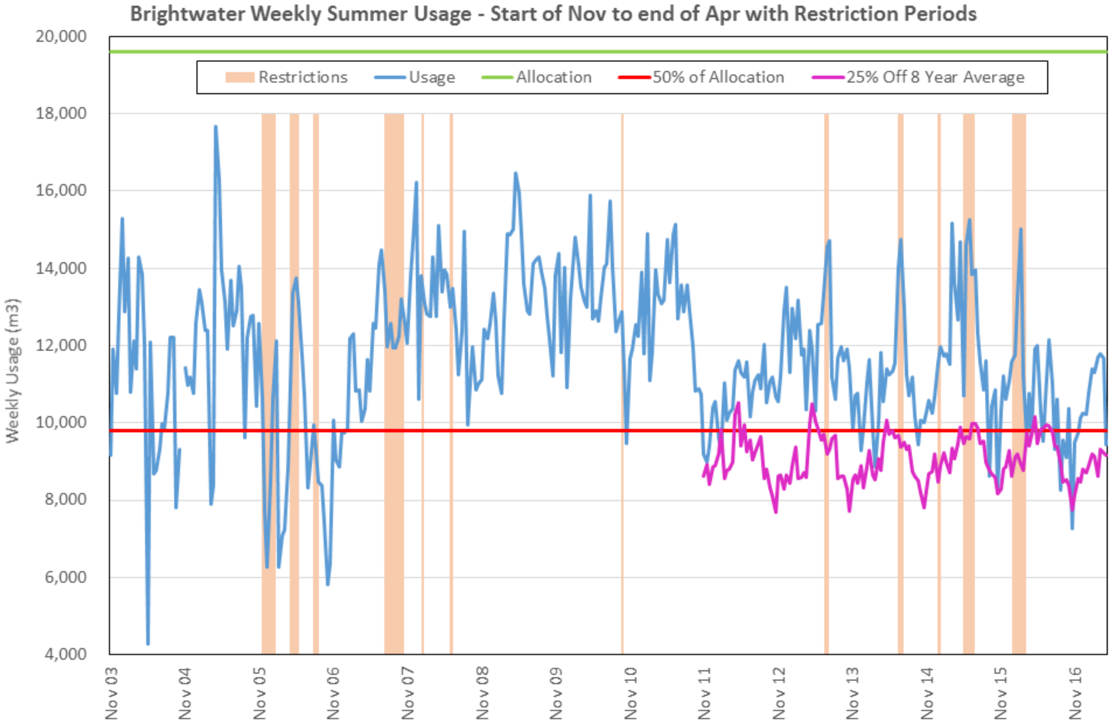
8.11 Step 5 rationing will likely occur every 10-20 years and require consumption/demand to be reduced by around 80%. This essentially provides water for drinking, food preparation, bathing/showering, sanitation and hygiene and medical purposes only. The level of water rationing contemplated by step 5 rationing would be unprecedented in New Zealand outside of an emergency.

8.12 To illustrate the impact of the new rules, the gap between peak week demand and the Council's permitted water take for the next 30 years is graphed below for the medium growth scenario for Brightwater. It shows the impact of the new TRMP rationing rules and the size of the water reductions required for steps 1, 3 and 5 rationing.



8.13 The challenge in meeting these restrictions, and the disruption it will cause the Council and our community is likely to severely affect the quality of life. The Council is very dependent on our customers restricting their water uses to meet these reductions. These reductions will not eventuate with "soft" water conservation initiatives, and potentially costly "hard" measures to compel reductions will not be tolerated by our community.

8.14 To illustrate this problem, the graph below for Brightwater shows just how difficult it has been to change water consumption behaviour during past rationing and compares it to what would be the limits under the new TRMP rules for step 3 rationing. Past rationing has been ineffective at changing water demand behaviour. Households and businesses seem to largely ignore rationing as a whole and actually increase their water demand in many instances. This creates a very significant gap between water actually used by our customers, and our permitted water take under the new TRMP rules - represented by the lower of the red or pink lines.



8.15 If the Council is unsuccessful in meeting its rationing obligations, it will face the prospect of taking enforcement action against itself, potentially leading to prosecution.

8.16 This situation is not sustainable. If the dam does not proceed, the Council will need to invest in new technology to enforce rationing such as electric metering alongside policing and investing in another scheme to supplement its principal water supply. The prospects for and costs of an alternative to the Waimea Community Dam are discussed below.

9 Alternatives to the Waimea Community Dam

9.1 From about 2002 until 2012, the Waimea Water Augmentation Committee worked on water augmentation options as the alternative to regulatory controls on water takes that the community had rejected. That committee's efforts focused on an irrigator/urban supply solution. Looking back, it is clear that the committee foresaw the consenting challenges the scheme would face. The solution was to provide water storage to augment rivers flows in the proposal. By taking this step, they effectively obtained a social license to operate and ensured the scheme's ability to be consented.

9.2 The alternative solutions (to the Waimea Community Dam) for providing urban water supply security and growth have been separately investigated by the Council.

9.3 Staff commissioned preliminary investigations by MWH into alternatives to the Waimea Community Dam in 2014/2015. The scope of this work was limited to Tasman "going it alone", and did not consider larger schemes together with Nelson City Council or irrigators. Schemes that offered benefit to others were not considered.

9.4 These preliminary investigations listed a series of options that largely revolved around water harvesting and storage. The preferred option at the time was a 500,000 m^3 storage lake on the Waimea Plains which would be filled during winter for use in summer. This would only provide security to supplement the Council's principal water supplies for existing customers (and growth for the next decade) for 100 days up to step 3 rationing. Additional storage would be needed to provide for longer term growth and may need to be larger to account for the greater proportion of water for future customers that would need to come from a supplementary supply.

9.5 There are a number of hurdles this potential scheme, or any of the other options, would need to overcome. The key risks relate to the quality of the water and the likelihood of actually securing consents for additional water in a no-dam world. It is difficult to say what the overall likelihood of success would be, given the preliminary nature of the investigative work to date. Significant additional investigation would be required to understand and confirm the feasibility of any of the options. Moreover, any scheme will take several years to investigate, design and consent before construction could start.

9.6 Assuming feasibility, the short term capital cost for any of these options is estimated to be at least $20 million, with ongoing operational and renewal costs. In the case of the storage lake option, additional lakes would be needed in 15-20 year intervals. Assuming a similar cost for the additional lakes, the estimated capital cost over 50 years would be $71 million and whole of life costs would be over $100 million. This has a present value of close to $40 million and $50 million respectively. This excludes the cost of any additional reticulation that would be required for Redwood Valley or Brightwater.

	Capex	Opex	Total
50 year nominal cost	$71m	$35m	$106m
50 year present value cost (5% discount rate)	$39m	$10m	$49m

9.7 None of the options offer a good alternative for augmenting the Council’s water supplies compared to the Waimea Community Dam. They offer higher costs, additional risks, less water at a lower quality, fewer benefits and feasibility is yet to be confirmed. It would be several years before any alternative was constructed. In the interim, the issues outlined above regarding water rationing would play out in our community.

9.8 The Waimea Community Dam is the best, lowest cost option available to the Council for securing the current and future water needs of the households and businesses that draw water from the Waimea Basin.

9.9 As a guide to the Council’s members on the JV Working Group and to enable the SOP to present information on options, I recommend the reports on the alternatives be reviewed and reported back to the Council. Some of the early assessment of the costs of water stored and the security of supply provided by the alternative options are not robust enough to be relied on for the next steps.

10 Options and Decision Making Matters

Decision Making Generally

10.1 Given that this report and the draft resolutions put the Waimea Water Augmentation Project at the crossroads, it is appropriate to revisit the Council’s decision making options and obligations.

10.2 Councillors have the options of agreeing to the draft resolutions, amending them or voting one or more of them down. Staff advise the Council against taking a decision that would effectively end the project. Such a decision is likely to be contrary to what the LTP 2015-2025 provided and carry a similar community consultation obligation to the path proposed.

10.3 There are common law and other precedents to meet. Some examples are –

- correct procedure must be followed;
- conflicts must be managed;
- decision needs to be 'within remit';
- reasoning and evidence must prevail (the Wednesbury reasonableness test);
- relevant matters but not the irrelevant must be considered.

LGA Decision Making

10.4 Councils have an obligation to be aware of community views when decision making under the Local Government Act 2002 (LGA). That requires the Council to seek information or advice, or to take into consideration the views of others – not to let 'others decide'. These provisions are a mechanism for citizens' participation which can inform and assist councils in decision-making.

10.5 Staff reports cover LGA compliance matters but as a prompt, you/we are required to –

- identify what the decision is or is not that is being taken and consulted on e.g. to build a dam or carry a greater share of the cost of building a dam;
- identify the reasonably practical options and their pros and cons including in relation to Maori and water;
- consider the views and preferences of people with an interest or likely to be affected;
- make judgements about the extent of community engagement based on significance (or proportionality) and in particular consider the:
  - options to be assessed and identified;
  - costs and benefits to be quantified;
  - extent and detail of information required;
  - council's resources;
  - nature of the decision and in particular whether, in the circumstances there is scope and opportunity (or not) to consider a range of options or views and preferences of others;
  - consequences of any decisions and how these might impact the community or parts of it;
- apply the principles in S14 of the LGA including sound business practice but especially relating to openness and transparency;
- undertake consultation in accordance with the principles in S82 LGA;

- identify any decisions that are significantly inconsistent with any council policy or plan. (A decision to 'pull the pin' on the WWAP is arguably one of those decisions and may carry a similar consultation obligation to a decision to put more money in!!)

Council's Purpose

10.6 The Council's purpose (S10 LGA) includes meeting the current and future needs of communities for good quality local infrastructure in a way that is most cost effective for household and businesses. Good quality means effective, efficient and appropriate to present as well as future circumstances. Network infrastructure is a core service and includes water collection and management. This section was amended and inserted into the LGA on 5 December 2012. It is therefore a relatively recent amendment and 'on point' in relation to this decision.

10.7 The section means that:

- there is an obligation to meet the current and future water supply needs of our communities (within any demand management strategy of course);
- doing nothing or a Plan B must be a more cost effective way for the Council to provide for the future water supply needs of the communities than the proposed WWAP;
- being more cost effective requires the overall capital and operating costs to be assessed as well the costs to customers;
- you should take advice on the Plan B options and their relative costs so that you know what your least cost alternatives are, remembering that how the cost is allocated and who to, is part of the most cost effective test. Non-financial benefits and dis-benefits of the alternatives must also be considered.
- non-financial considerations are still relevant – levels of service, growth capacity, consenting and planning frameworks risks, co-benefits gained or lost and so on.

The LGA Principles

10.8 In performing its role, the Council must act in accordance with certain principles. The overarching principle is that the Council conduct its business in an open, transparent and democratically accountable manner. The other principles that are especially relevant in this case include:

- undertaking commercial transactions according to sound business practices;
- cooperating with other councils and bodies;
- achieving its priorities and outcomes (e.g. LTP key issues and community outcomes);
- delivering on your infrastructure strategy;
- maintaining and enhancing the natural environment;
- taking a sustainable development approach especially taking into account the needs of future generations.

11 Strategy and Policy Matters

Key Strategic Issues

11.1 Our community outcomes relate to the health and protection of the natural environment; efficient cost effective infrastructure that meets current and future needs among other outcomes.

11.2 An amendment to the LGA required that our consultation document on the LTP 2015-2025 summarise the key issues facing the district and the options for dealing with them. Developing resilience communities was one our five issues. Water security was the key to that along with hazard planning and recovery.

11.3 The Waimea Water Augmentation Project has been identified in successive LTPs as the solution to the:

- needs of the community for a safe and secure future water supply;
- water (over) allocation issues;
- desire to improve the poor state of the Waimea River for environmental and recreational reasons;
- water supply security and the future growth needs of water users (primarily irrigators but also industry and urban growth) on and around the Waimea Plains.

11.4 The TRMP, as well as our Financial Strategy and Infrastructure Strategy are relevant. The decision taken needs to be consistent with those. If an inconsistent decision is made then the Council has a duty to identify the inconsistency, the reasons for it and the need to amend any policy or plan to accommodate the decision.

Our Unitary Council Functions

11.5 The Council can look to the law in other ways and to Parliament for guidance in decision-making in this matter. The WWAP is to help meet the Council's obligations as an urban water supply authority but also help deliver its regional council obligations under the Resource Management Act especially. The importance of water to community well-being (the word is still in the LGA), to environmental well-being and life itself, is also relevant. Matters to consider include the:

- functions, powers and duties of the Council under S30 of the RMA especially relating to water and as reflected in the Council's own Tasman Resource Management Plan;
- NPS for Freshwater Management;
- NPS on Urban Development Capacity;
- NES for Sources of Drinking Water;
- Proposed NES on Ecological Flows and Water Levels;

The Nature of Public Investments

11.6 Concerns have been raised in the past about the Council's investment in the WWAP being a subsidy to irrigators. What is proposed is not that but is an increased Council contribution to get a project over the line. The Council should be motivated to do that (within limits) because the do nothing and alternative augmentation options cost the community more and/or deliver less value.

11.7 Public capital investment in government-owned assets creates the opportunity for private investment and productivity – that is why councils and central governments do it. The effect of public capital investment on economic growth is hotly debated. While analysts debate the magnitude, the evidence is that there is a statistically significant positive relationship between infrastructure investment and economic performance.

11.8 In the case of the WWAP the investment opportunities are for the irrigators and others to take. Some may argue that there is an element of exclusivity here in that ‘affiliation’ and a water supply agreement is required to gain access to the benefits. In other words, access is available for a fee.

11.9 Other public investments in assets such as roads, airports, ports, transit systems, and even community facilities create investment opportunities for and ‘subsidise’ someone. Our consenting and regulatory work enables developers and others to profit also. While some may be genuine public good and access is ‘free’ there are many other examples where a fee is needed to particulate.

11.10 There are various reports about the nature and extent of the economic benefits that will accrue from the WWAP and who will derive them. The cost of not proceeding with the WWAP on the economy and sectors of the economy has also been quantified. NZIER, Northington and Partners and John Cook and Associates have all written reports.

11.11 As noted earlier, academics and practitioners will debate and attempt to quantity these costs and benefits so long as someone commissions them. However, there should be no debate about the principles.

11.12 Trying to quantify the costs and benefits beyond the established principles is unproductive. There is so much we don’t know about production methods, crops of the future, markets, the climate, the choices entrepreneurs will make, capital and labour availability and so on to be certain.

11.13 What we do know is that without a dam (or an alternative) there will be a negative impact, the urban footprint in the Waimea Basin area will be locked into its 2013 configuration, there will be no wet industries and so on.

The Science

11.14 The science underpinning the augmentation/recharge model has been challenged. A review of the science and in particular the recharge modelling was carried out in response to Mr Murray Dawson and Dr Heath’s advocacy. The review upheld the model as have successive formal planning and consenting processes including in front of highly qualified and experienced independent people.

11.15 ‘Who should you rely on?’ The answer to that is that you should rely on your consultants, contractors and staff advisers. They owe you a duty, must meet professional standards and can be held to account. You have a defence if you act on their advice that is not available to you otherwise. That’s not to say that the advice you receive from them shouldn’t be tested and scrutinised - it absolutely must be.

11.16 You are at risk however if you were to determine the future of the project on the basis that you prefer what ‘so and so’ has to say about the aquifer or the likelihood of an earthquake damaging the structure. That is because ‘so and so’ isn’t likely to be professionally accountable for their advice/opinion nor owe a duty to you. You owe advocates a duty to listen to them and ask questions of your advisers of course.

Co-benefits and Dis-benefits

11.17 The WWAP is unique in several ways. It is a hard sell, compared to brownfield proposals, because of the fact that people have water now and are slow to see the value in security and future growth opportunities.

11.18 On the other hand, it should be an easy sell because (subject to the financial arrangements being agreed) the direct benefits are being delivered to consumptive users (urban, industry and irrigation) at marginal cost. In addition, the level of security of supply far exceeds the alternatives. On top of that, the WWAP delivers a suite of environmental and recreational benefits that none of the alternatives do.

11.19 The marginal cost issue is especially relevant to Council, as you must provide the infrastructure solution to the urban water users that is the most cost effective to households and businesses.

12 Significance and Engagement

12.1 A decision to mandate the JV Working Group to continue their negotiations albeit on a different basis to the past is a decision of low significance. That is especially the case given the limits on the JV Working Group's powers (they have to report back and get the Council's approval for any draft agreements) and because whatever is agreed by the Council will be the subject of community consultation using the special consultative process in the LGA.

12.2 A decision that had the effect of bringing an end to the WWAP would be highly significant. If the Council is minded to decide that then you should take advice on process before committing unequivocally.

13 Conclusion

13.1 Here are some thoughts on a path forward. My view is that:

13.1.1 an increase in both the capital and operating cost contributions to the WWAP should be seriously considered;

13.1.2 you should mandate the JV Working Group to negotiate those matters;

13.1.3 more work should be done on the overall approach to allocating project costs through s101(3) of the LGA;

13.1.4 more information about the costs and benefits and risks of a Plan B should be sought before a decision is made that amounts to a point of no return on the WWAP;

13.1.5 there will still be a high level of uncertainty about comparative financials and risks of a Plan B and we do not have the luxury of the 13 years we have spent on the WWAP to provide certainly;

13.1.6 your 'prudent stewardship of resources' and 'sound business practice' obligations must be met;

13.1.7 the cost to the 'urban water account' of the solution chosen must be the most cost effective to households and business;

13.1.8 the benefits of any increased funding to irrigators (and others) should be assessed under the LGA in accordance with S101(3);

13.1.9 you resist the notion that any increased funding be seen as a subsidy to irrigators but rather is a public investment of the sort governments make virtually every day from which the private sector derives benefit;

13.1.10 you do consider how to fund any increased contribution based on a S101(3) LGA analysis;

13.1.11 the urban water users and wider community must see value in and get value from any agreement to increase funding;

13.1.12 given the additional Council funding and credit support, the JV Working Group needs to ensure that the draft agreement it proposes to the Council does not allow for the scheme to be privatised.

14 Attachments

MWH now part of Stantec

REPORT

WAIMEA 100-YEAR WATER DEMAND AND SUPPLY MODELLING

Prepared for the Tasman District Council

May 2017

MWH. now part of Stantec

Waimea 100-Year Water Demand and Supply Modelling

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Executive Summary

Water security on the Waimea Plains has long been recognised as an issue and the Tasman District Council (the Council) has been looking to ensure there will be enough water in the future since the drought of 2001. Water security on the Waimea Plains was identified as one of three significant infrastructure issues in the Council's 2015 Infrastructure Strategy and Long Term Plan 2015-25. Extended periods of dry weather or drought have occurred nearly every summer since 2001, with impacts on the Waimea River, related aquifers, the environment and associated communities and businesses.

The Council engaged MWH, now part of Stantec (MWH) to provide an update of the Waimea Basin water demand forecast and prepare water supply demand balance forecast graphs for the 100-year horizon under different scenarios. The previous Waimea Basin water demand forecast was prepared in 2011 for the MWH 2011 report "100-year water demand projection for the Council Supplies in the Waimea Basin".

The water supply schemes included in this Waimea Basin water demand forecast are as follows:

1. Richmond/Waimea (including Mapua and the Nelson South contract)
2. Brightwater/Hope
3. Wakefield
4. Redwood Valley.

The four water supply schemes all source their water from groundwater and the bore water takes have weekly abstraction limits based on the highest weekly demand in a year.

The objective of this Waimea Basin water demand forecast report is to present a 100-year water supply demand balance forecast for each of the four schemes using an end-use model, the Maddaus Water Management Inc.'s Demand Side Management Least Cost Planning Decision Support System Model (DSS Model). The updated Waimea Basin 100-year water demand forecasts prepared in the DSS Model in 2017 include multiple key improvements and innovations over the previous forecast prepared in 2011 as follows.

- Sector based demand forecasts based on the historical analysis of metered demands split into the customer sectors (previously there were no customer categories recorded against the meter readings).
- Accounting for the impacts of measures that affect specific residential end-uses such as toilets (the DSS Model includes modelling of the market share for different fixture types).
- Allows for passive water savings from the changes in toilets, urinals, faucets, clothes washers, and showerheads that are expected to occur as property owners' shift to more water efficient devices due to the Water Efficiency Labelling Standards and other possible changes in the future plumbing code.
- Allows for the interaction of multiple demand management measures that affect the same end-use.
- Has the capability to provide a benefit-cost analysis of measures that includes both the utility cost perspective and the community (utility and customers) cost perspective.

From the demand perspective, two growth scenarios were modelled, high and medium, along with different scenarios for demand management. Three drought scenarios were modelled for the supply limits for each scheme as follows (in increasing order of severity).

- Step 1 rationing.
- Step 3 rationing.
- Step 5 (worse than Step 4) rationing.

The growth scenarios, water demand management programmes and drought scenarios are described in detail in the report.

The supply limits for the three schemes with Waimea Plains water takes have been graphed under the three drought scenarios for the critical 30-year horizon (coinciding with the next infrastructure strategy from 2018-2048) and for the 100-year horizon to 2117/2118 (for sizing of the municipal demand for the Waimea Community Dam).

The 30-year forecasts show that the Richmond/Waimea scheme has a current supply deficit immediately, under Step 1 rationing and greater (ie. recent and forecast peak week demands exceed the rationed water supply limits by at least 2,000 m³/day). The scheme remains in deficit under rationing for the next 30-years under all demand management programmes given high growth, and is very marginal for most demand management programmes under medium growth. This is primarily because the new Tasman Resource Management Plan (TRMP) rules applying in the "No Waimea Community Dam" scenario require the most severe of either a reduction in the take limit or a reduction in the eight-year average of the peak week (where the peak week is the week with the highest water demands during the year). For Step 1, the reductions are either a 20% reduction of maximum take limit or a reduction in actual usage by 10% of the equivalent week averaged over the previous 8 years.

The new TRMP rules also apply to the Brightwater/Hope and Redwood Valley schemes. The Brightwater/Hope and Redwood Valley schemes have a supply deficit immediately under Step 1 rationing (at least 500 m³/day for Brightwater/Hope and at least 300 m³/day for Redwood Valley). This continues to worsen throughout the planning horizon for both schemes regardless of the growth scenario or the demand management programme (see Figures 5-3, 5-4 and 5-7).

The Wakefield scheme is the only scheme with available water supply capacity (ie. supply in excess of demand during rationing). It has a supply excess for the full 30-years, even under Step 3 rationing (but not under step 5 rationing). (See Figures 5-5, 5-6). This is primarily due to its different water source, the Wai-iti Dam Service Zone. The Wai-iti Dam Service Zone does not have the more strict rationing rules associated with the Waimea Plains water sources. The Wakefield limits under the two more severe drought scenarios are Council's best estimate for the rationing that would be applied (in reality the plan is currently not prescriptive for the Wai-iti Dam Service Zone beyond Step 2 and the rationing limits would be decided by the Dry Weather task force). The Brightwater to Wakefield scheme connection is the only inter-scheme connectivity that has the potential to assist in addressing the existing supply demand balance deficit for the Brightwater/Hope scheme in the short term (but not under step 5 rationing).

The water demand forecasts show a range in amounts that Council will need to secure from either the operation of the Waimea Community Dam or otherwise, for its community water supplies over the next 100-years. The 2118 peak week demand forecasts under the high growth scenario range from 25,000 m³/day to 37,300 m³/day for the combined demand from all four schemes. The 2118 peak week demand forecasts under the medium growth scenario range from 16,200 m³/day to 26,700 m³/day for the combined demand from all four schemes. These peak forecasts are based on the average of historical peak week factors under the previous TRMP rationing rules.

The growth projections underpinning the water demand forecasts are based on a methodology agreed with Council (including Council's 2018 Growth Model Projections for new residential connections, economic growth projections for new commercial and industrial connections and assumptions for new large industries). Actual growth in new residential and non-residential connections could be higher or lower than forecast. Council should review and update the water demand forecasts on at least the three-yearly Long Term Plan cycle and also after completion of the structure plans for growth.

There is also high uncertainty for the unconstrained demands that could occur if the Waimea Community Dam is built, particularly the timing and demand from new large industries. Higher peak week factors would be likely in the absence of rationing. The highest historical peak week factors were approximately 15% higher than the adopted peak factors for the modelling. This additional 15% would result in high growth scenario forecasts ranging from 30,000 m³/day to 43,000 m³/day for the combined demand from all four schemes.

Tasman District Council

Waimea 100-Year Water Demand and Supply Modelling

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1 Introduction

1.1 Purpose of this Report

Water security on the Waimea Plains has long been recognised as an issue and the Tasman District Council (the Council) has been looking to ensure there will be enough water in the future since the drought of 2001. Water security on the Waimea Plains was identified as one of three significant infrastructure issues in the Council's 2015 Infrastructure Strategy and Long Term Plan 2015-25. Extended periods of dry weather or drought have occurred nearly every summer since 2001, with impacts on the Waimea River, related aquifers, the environment and associated communities and businesses.

The Council engaged MWH, now part of Stantec (MWH) to provide an update of the Waimea Basin water demand forecast and prepare water supply demand balance forecast graphs for the 100-year horizon under different scenarios. The previous Waimea Basin water demand forecast was prepared in 2011 for the MWH 2011 report "100-year water demand projection for the Council Supplies in the Waimea Basin"[1] (MWH, 2011).

This 2016 Waimea Basin water demand forecast update needs to achieve four aims.

1. Estimate the amount of water that the Council is required to secure either from the operation of the Waimea Community Dam or otherwise, for its community water supplies, over the next 100-years (demand modelling).
2. Identify when this demand is predicted to exceed the current supply regime for the schemes within the Waimea Basin, accounting for the event of "no Waimea Community Dam" and the Tasman Resource Management Plan (TRMP) provisions for water take rationing restrictions to be expected in a drought (supply modelling).
3. In carrying out supply modelling, account for the integrity of each water source during droughts and analyse and group schemes in accordance with their physical and consent limitations, and assess options for maximising supplies across these schemes.
4. Feed into long term water supply management planning.

The objective of this Waimea Basin water demand forecast report is to present a 100-year water demand forecast using an end-use model.

1.2 Introduction to the Water Supply Schemes

The water supply schemes included in this Waimea Basin water demand forecast are as follows.

1. Richmond/Waimea (including Mapua and the Nelson South contract).
2. Brightwater/Hope.
3. Wakefield.
4. Redwood Valley.

The Richmond, Waimea and Mapua schemes are grouped as Richmond/Waimea throughout this report to reflect that they share a common water source; the water abstracted from the Richmond and Waimea bores.

Richmond/Waimea, Brightwater/Hope and Wakefield are full urban supplies. Redwood Valley is a rural supply. The approximate location of each scheme is shown in Figure 1-1. The existing water supplies close to the coast, particularly Richmond/Waimea and Redwood Valley, are vulnerable to saline intrusion during severe droughts.

[1] This 2011 report "100-year Water Demand Projection for Council Supplies in the Waimea Basin" is referred to as the "2011 report" throughout this document.

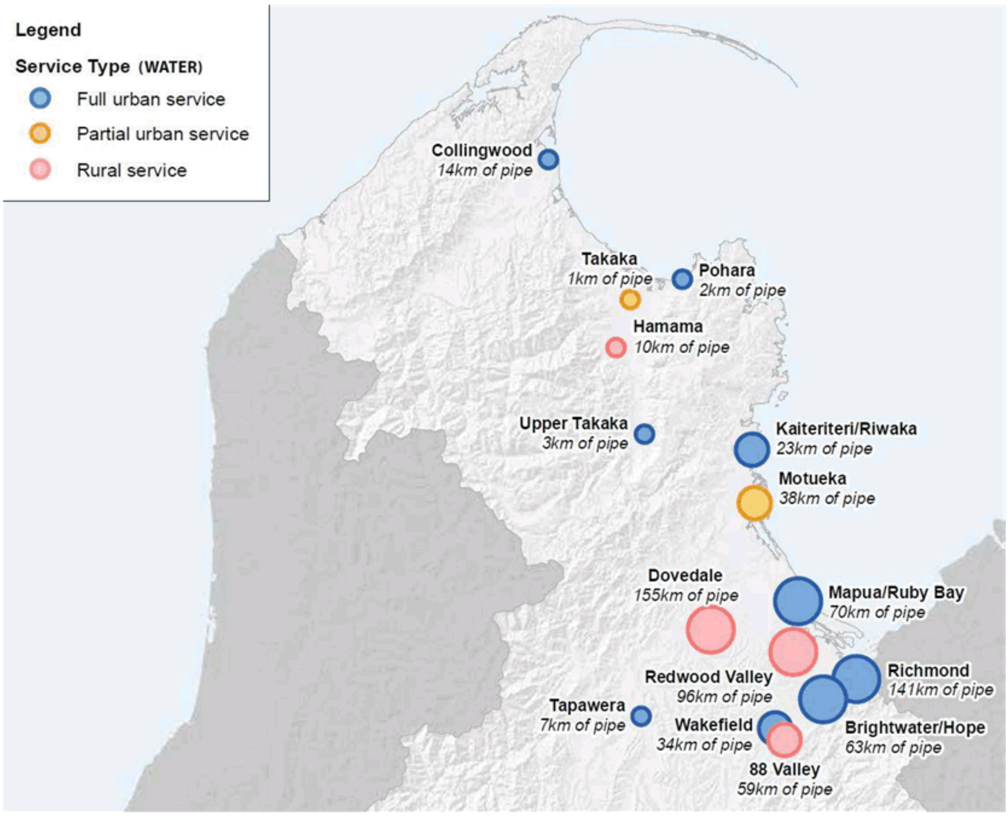

Figure 1-1: Water Supply Schemes (2015 Water Supply Activity Management Plan).

1.3 Modelling Scenarios

Council asked MWH to consider two overall modelling scenarios briefly described as follows.

- Unconstrained growth that does not limit the demand from large water users. This scenario will likely need medium and high population growth forecasts.
- Constrained growth acknowledges that if a dam is not constructed, less water will be available for horticultural purposes, and therefore the demand for wet industries/fruit processing will be less. This scenario will likely need low and medium population growth forecasts.

Council initially asked MWH to prepare three growth scenarios for residential and non-residential demand: low, medium and high. The low growth population projections were for a significant reduction in the Richmond/Waimea population. It was agreed through discussion with Council staff that the low growth projections are not relevant for modelling in the water demand forecasts. The low growth population projections appear to ignore external immigration to the region and rely on the assumption that the future demographics and growth will be based solely on the current population.

The demand forecasts also consider:

- the impact of passive water savings due to improvements in the water efficiency of appliances and fixtures
- demand management programmes with increasing cost and focus on water efficiency and conservation measures.

On the water supply side, the Council asked MWH to analyse three drought scenarios to identify constraints and risks with the current supply sources. These scenarios consider the functionality of the water sources under drought (e.g. under severe drought, some of the well fields are likely to be unavailable due to their proximity to the sea and the risk of saline intrusion). The three drought scenarios (in increasing order of severity) are as follows.

- Step 1 rationing.
- Step 3 rationing.
- Step 5 (worse than Step 4) rationing.

Step 1 rationing typically occurs every summer. Step 3 rationing occurs most summers. Step 5 rationing would occur infrequently during a very severe drought. The most recent occurrence of this drought severity was in 2000/01. The likely occurrence of each drought scenario is further discussed in Section 5.2.

1.4 Demand Forecast Methodology

There are three primary methods employed by water utilities for water demand forecasting (Institute for Sustainable Futures, 2011).

1. The simple litres per capita per day method of analysing historical bulk water demand to determine an overall litres per capita per day figure, which is then multiplied by the projected population. It is interesting to note that the Australian best practice is for the historical demand to be corrected for the influence of climate and weather using regression techniques to obtain a "climate neutral" average litres per capita per day demand for forecasting.

2. A sector-based approach, which at a minimum investigates residential demand (single and multi-residential properties), non-residential demand (commercial, industrial and institutional sectors and subsectors) and non-revenue water (real and apparent losses). With a better understanding of how water is being used, demand is then projected according to population growth or other sector-specific base units (for example floor space), as deemed appropriate.

3. An end-use analysis, which uses a "bottom-up" approach to explain historical demand associated with typical end-uses such as toilets, washing machines, showers, process water etc. The demand for that end-use is translated into aggregate demand by multiplying an individual end-use demand in each customer category by the frequency of usage, projected demographic growth (population, single and multi-residential dwelling numbers, and occupancy as appropriate) or business growth (numbers of businesses and employees), and functions that reflect changes in the efficiency of the technology and mix of stock over time.

For more details of the above methods, please refer to publications such as the Guide to Demand Management published by the Water Services Association of Australia (Turner, 2008).

The methodology adopted for the 2011 forecast combined elements of all three methods described above to estimate the impact of water demand management measures on future demands on a bulk per capita (LCD) basis.

This 2017 Waimea Basin water demand forecast is based on an end-use model and is a more sophisticated and innovative method than the 2011 approach. The end-use model adopted for this forecast is Maddaus Water Management Inc.'s Demand Side Management Least Cost Planning Decision Support System Model (DSS Model). The DSS Model is discussed further in Section 4.1.

The advantages of the DSS Model over the previous approach are discussed in Section 2.2.

The DSS Modelling process undertaken for the Waimea Basin water demand forecast is summarised in Figure 1-2.

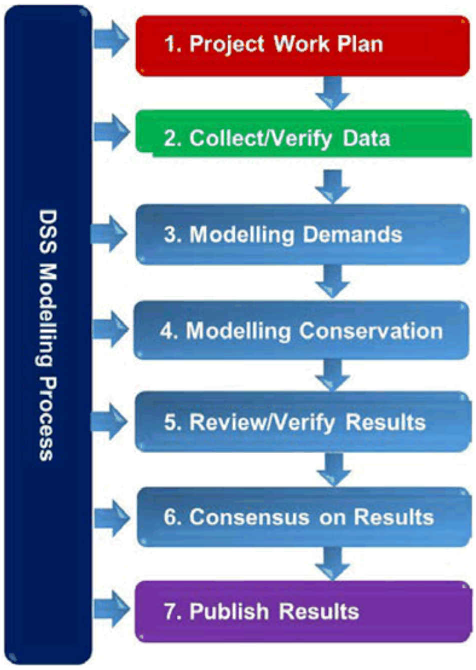

Figure 1-2: Overview of the DSS modelling process.

1.5 Limitations of the Forecasts

Uncertainties are inherent in any forecast as recognised by the Office of the Auditor General in their report on water demand forecasting in New Zealand (Office of the Auditor General, 2010). When forecasting over such a long timeframe (100-years), the uncertainties are significantly increased.

The most significant uncertainty lies in the growth forecasts, particularly the population projections. The population projections were provided to 2043 and extrapolated to the 100-year horizon. The peak factor could vary significantly in the future. Anyone using these projections needs to take account of the significant uncertainties inherent in these assumptions.

If the forecasts are to be used for anything other the apportioning of the dam costs in the near future, then regular monitoring of input assumptions and observed demands should be input to re-forecasts. Urban water supply is required 365 days a year. Irrigation is not required year round and is limited to the irrigation season during the warmer months.

1.6 Reference Reports

The following reference reports/documents were used to inform this 2017 Waimea Basin Water Demand Forecast report.

- Tasman Resource Management Plan (TRMP) (most recent version December 2016).
- Tasman District Council Water Supply Activity Management Plan 2015-2045 (2015 AMP).
- Tasman District Council Long Term Plan 2015-2025, June 2015 (2015 LTP).
- Water Bylaw 2016.
- MWH report for Council "Evaluation of Options for Waimea Basin Urban Water Supplies in the Event Waimea Community Dam Does Not Proceed", July 2015.
- MWH report for Council "Assessment of Base Case for Waimea Basin Urban Water Supplies in the Event Waimea Community Dam Does Not Proceed", July 2015.

- MWH report for Council "100-year Water Demand Projection for Council Supplies in the Waimea Basin", October 2011.

1.7 Layout of this Report

This report is structured with the following remaining sections.

Section 2 discusses the Council's water demand management journey and history of the Waimea Basin water demand forecasts.

Section 3 discusses the historical water demand trends and key conclusions.

Section 4 presents the demand forecasts including the key inputs and assumptions.

Section 5 presents the water supply limits, the water supply demand balance forecast graphs and key results from the DSS Model.

Section 6 presents the conclusions.

Section 7 presents the recommendations.

Section 8 provides a list of references used in preparation of this report.

Section 9 includes a glossary of terms.

2 Tasman District Council's Water Demand Management Journey

2.1 Background History

In times of dry weather, there is a shortage of water in the Waimea River and aquifers. There is not enough water to provide for a healthy river ecosystem while at the same time meeting the demands of reticulated urban and rural water users. The Council uses water from the Waimea River system to supply the Richmond, Brightwater, Mapua/Ruby Bay, Redwood Valley and surrounding low-flow rural reticulated community water supply networks. The Council also has a role in protecting the environmental values of the Waimea River and much of the local economy is based on the primary sector, which relies on a secure water supply.

The Council has been looking to ensure a future water supply for the Waimea River since the drought of 2001. The Council has allocated an amount of up to $25 million towards the Waimea Community Dam in their 2015 LTP. The 2015 LTP states that the funding is expected to be used to secure water for the Council's reticulated water supply users and contribute to the environmental health of the Waimea River. The 2015 LTP states that if the funds are not used for the Waimea Community Dam they will be needed to meet the cost of an alternative community water supply.

The Council has historically had a strong focus on demand management, and was recognised in the Office of the Auditor General's (OAG) 2010 report on drinking water demand forecasting as managing their drinking water supplies effectively to meet future demand for drinking water (Office of the Auditor General, 2010). The Council was one of only three of eight local authorities reviewed by the OAG who were recognised as managing their water supplies effectively.

Key milestones in the Council's water demand management journey since 2008 are shown in Table 2-1.

Table 2-1: Key Milestones in the Council's Water Demand Management Journey (2008 to 2017)

Year	Water Demand Management Planning Documents	Key Progress in Water Demand Management Measures
2008	Developed a programme of works for water demand management improvement for inclusion in the 2009 Water Demand Management Plan.	
2010	First Wakefield Demand Management Plan.	Mapua major leak repair. (700 m³/day).
2010	First Richmond and Brightwater/Hope Demand Management Plan.	Residential meter renewal programme began.
2011	First Demand Management Plans for Waimea and Mapua.	Bulk metering of rural extensions.
2011	First District Wide Demand Management Plan.	Leak detection and repairs in Wakefield.
2011	100-year demand forecast for Lee Valley Dam.	
2012	Embedding demand management into AMP.	Metering of rural bulk extensions. Leak detection and repairs in Wakefield
2013	Stepped increase in water charges for large industry.	Study into Wakefield leak detection and night flows.
2013	District wide Demand Management Plan Updated.	Analysis of metered rural extensions.
2014	District wide water balances.	Leak detection and repairs in Wakefield. 2014 demand management studies including pressure management, commercial meter renewal, rural zones monitoring.
2014	Water demand management cost benefit summary report.	Setting up zone flows in SCADA for night flow monitoring.
2015	First Demand Management Plans for Collingwood and Murchison.	
2016	First Tapawera Demand Management Plan.	
2017	First Motueka Demand Management Plan.	
2017	Updated Richmond/Waimea Demand Management Plan.	Leak detection in all of Richmond.

2.2 Improvement in the Demand Forecast

The Council needs a robust water demand forecast for the Waimea Basin water supply schemes to help determine whether or not the Waimea Community Dam proceeds. The previous Waimea Basin water demand forecast was prepared in 2011 for the MWH report "100-year water demand projection for the Council Supplies in the Waimea Basin", October 2011.

The updated Waimea Basin 100-year water demand forecasts prepared in the DSS Model in 2017 include the following improvements and innovations over the previous forecast prepared in 2011:

- Includes a sector based demand forecasts based on the historical analysis of metered demands split into the customer sectors (previously there were no customer categories recorded against the meter readings).
- Accounts for the impacts of measures that affect specific residential end-uses such as toilets (the DSS Model includes modelling of the market share for different fixture types).
- Allows for passive water savings from the changes in toilets, urinals, faucets, clothes washers, and showerheads that are expected to occur as property owners' shift to more water efficient devices due to the Water Efficiency Labelling Standards and other possible changes in the future plumbing code.
- Allows for the interaction of multiple demand management measures that affect the same end-use.
- Includes a benefit-cost analysis of measures that includes both the utility cost perspective and the community (utility and customers) cost perspective.

Note that the updated demand forecast includes a financial perspective for the water demand management options but the potential environmental, social and cultural impacts of the various options are outside the scope of this study. The Tasman District Council is a unitary authority and a regional council and has a responsibility beyond municipal water supply.

The potential influence of long term climate change has not been quantified in the forecasts but is not expected to have a significant influence on demands (and the supply yield) by the end of the 30-year horizon.

3 Analysis of Historical Water Demand

3.1 Introduction to the Demand Analysis

Section 3 outlines the analysis of trends in the combined Waimea Basin water demands from 1 July 2008 to 30 June 2016. The section begins with a list of data sources in Section 3.2 and a discussion of the key terms and assumptions in Section 3.3. The water demand drivers are discussed in Section 3.4. The historical population and accounts are presented in Section 3.5 and historical employees are presented in Section 3.6. The water restrictions are discussed in Section 3.7.

The demand analysis results for individual schemes (or scheme groupings) are presented in Appendix A. A list of large customers is presented in Appendix B.

The analysis was undertaken at six levels.

1. abstraction – the recorded abstraction flows from the groundwater sources
2. customer sector demands
3. non-revenue water and leakage
4. metered residential demands
5. large industrial demands
6. peak week factors.

The demand analysis results are presented for the Waimea Basin area with the following parameters:

- abstraction monthly and annual volumes
- abstraction per person per day
- metered customer demands per day (by sector)
- annual volume of non-revenue water
- non-revenue water as a percentage of total abstraction
- non-revenue water per connection per day
- metered residential demands per account per day
- large industrial demands per day
- peak week factors.

3.2 Data Sources for the Demand Analysis

The following data sources were used for the water demand analysis.

- Eight years (2008 to 2016) of six-monthly customer meter reading totals provided by the Council's billing department.
- Customer classifications and individual six-monthly customer meter readings from 2014-2016.
- Eight years (2008 to 2016) of weekly readings from the historical bulk meter production records (abstraction bores and bulk water supply meters).
- Eight years (2008 to 2016) of monthly customer meter readings from the large industry meter reading records.
- September 2016 rural-restrictor database.
- Statistics New Zealand Census data for 2006 and 2013.
- The Tasman District Council Growth Demand and Supply Model supplied 23 September 2016.

3.3 Key Terms and Assumptions

3.3.1 Key Terms

The demand sectors analysed for this study are as follows.

1. residential
2. commercial
3. industrial
4. large industrial
5. rural-restricted
6. non-revenue water (including leakage, apparent losses and unbilled consumption).

The first four customer sectors are metered. The rural-restricted customer sector is not metered as it is restricted to a trickle flow (customers need to provide their own on-site storage). The commercial and industrial customer sectors are collectively referred to as the "small business" category by the Council. The large industrial sector is comprised of the five large customers read monthly.

The term "accounts" is based on the sum of the number of meters using water (all customer categories) and the number of rural-restricted properties. Some of the metrics are shown as L/customer account/day, where the customer accounts are specific to the customer category, for example, the residential consumption in L/residential account/day.

Annual data is typically shown for the "water year" or financial year, running from 1 July to 30 June. For example the 2015/16 year is from 1 July 2015 to 30 June 2016 and includes the complete summer period for 2015/16.

Additional terms and acronyms are described in Section 9.

3.3.2 Estimates for Unmetered Rural-restricted Demands

The rural-restricted property demands are flow controlled through a trickle feed but are not metered. The historical rural-restricted demand volumes needed to be estimated. This is especially significant for the Redwood Valley scheme where all the properties are rural-restricted. For the Redwood Valley scheme historical demands, it was assumed that 75% of the historical production volume was rural-restricted demand and 25% was non-revenue water (ie. constant non-revenue water over the eight-year period of historical data). We calculated the average monthly rural-restricted demand as a percentage of the combined allocation for the Redwood Valley rural-restricted connections as shown in Table 3-1.

Table 3-1: Redwood Valley Rural-Restricted Demand as a Percentage of Allocation

Month	% of Allocation
January	76%
February	79%
March	70%
April	65%
May	58%
June	60%
July	57%
August	56%
September	58%
October	64%
November	72%
December	73%

The monthly percentages of allocation were multiplied by the rural-restricted allocations (in m^3/day) in the other schemes in order to estimate the historical monthly rural-restricted demands. The resulting monthly pattern of rural-restricted demand is shown in Figure 3-1.

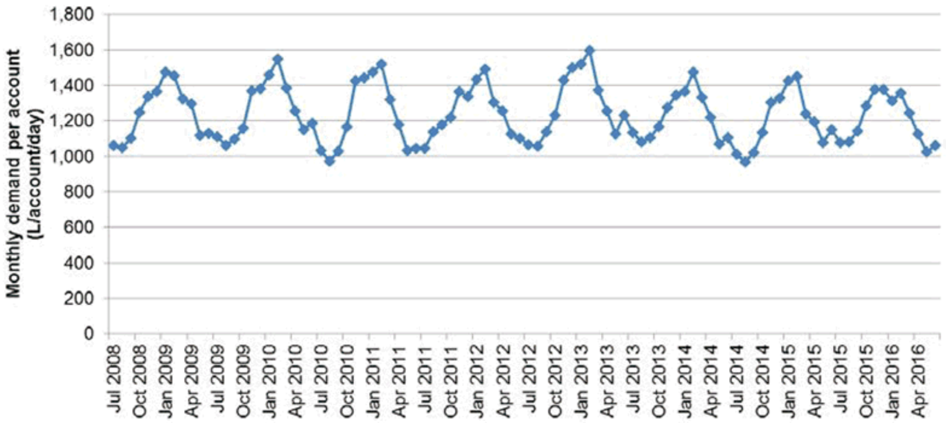

Figure 3-1: Estimated monthly rural-restricted demand per account from 2008 to 2016.

3.4 Water Demand Drivers

A wide range of drivers have the potential to impact historical and future water demands, as shown in Figure 3-2. An improved understanding of the factors influencing demand will allow more accurate demand forecasts and appreciation of the historical and future trends in water use. This section of the report analyses trends in water demands in the Waimea Basin in order to improve understanding of historical demand drivers. The demand forecasts were then prepared based on projected changes in the demand drivers, particularly population, demographic drivers, economic drivers and demand management measures.

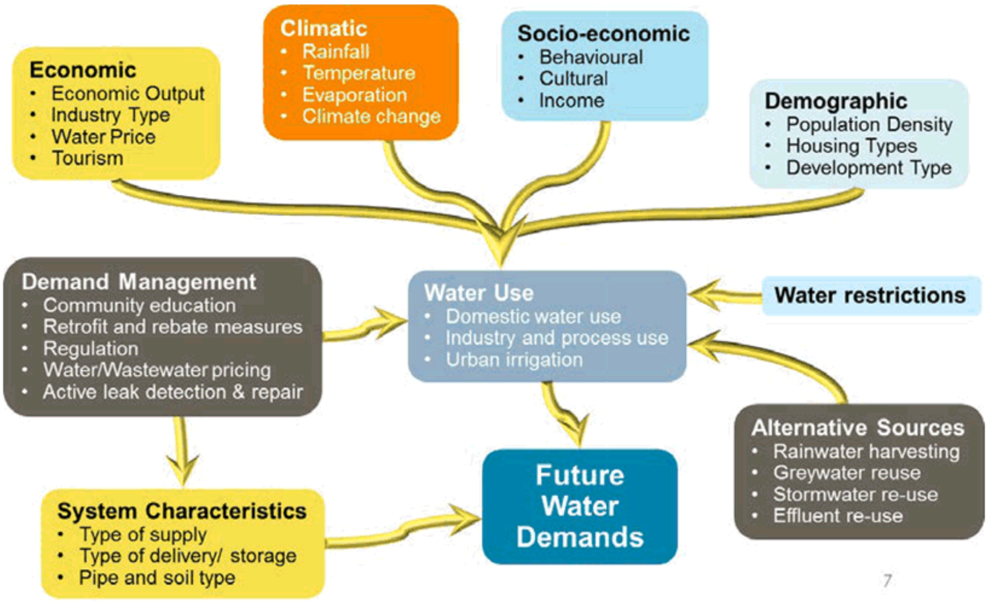

Figure 3-2: Water demand drivers.

Of all the water demand drivers in Figure 3-2, climate influences can have a significant impact on water demands, particularly in areas with high seasonal outdoor water use including garden watering. Hotter and drier summers than normal usually result in higher peak day demands which are often managed through water restrictions.

MWH have developed an in-house software Water Demand Trend Tracking and Climate Correction package called WaterTrac which is used to monitor trends in bulk water production. There are two versions of WaterTrac, a daily model and a monthly model. This software is designed to provide water utilities with information about climate influences on water demands and underlying trends in water demands after climate correction.

The purpose of the WaterTrac model is to provide information that will enable water suppliers to answer questions like.

- "I have to prepare forecasts of future water demand but I have been told that the last few years were cool with higher than average rainfall. What correction to the historical records do I need to make?"
- "We have had pay for use pricing in place for a number of years now, but demands seem to be trending up again. Is this a "rebound" effect or have the last few years just been hot and dry?"
- "Last year we ran a community education campaign. What impact on water production did it have?"
- "I am trying to determine the safe yield of my existing headworks using computer simulation. What equation can I use to predict demands?"

The climate correction of bulk water demands seeks to remove the influence of climate and reveal the underlying trends. This is an important part of demand management planning, in that short and medium term climate cycles have the potential to distort historical trends. By removing the climate influence, we gain a better understanding of trends and also ensure that the current demand estimate, which is the starting point for projections, is no higher or lower than the climate normalised demand. Climate correction of the water abstracted for the Richmond scheme is discussed in Appendix A.

3.5 Historical Population

Table 3-2 shows the historical population figures derived from the Statistics New Zealand Census data for the Richmond/Waimea, Wakefield and Brightwater settlement areas. See Appendix C for more details including the relevant Census Area Units for each scheme. The Redwood Valley population is not identified as a separate Census settlement area. The estimated population of 550 people stated in the 2015 AMP was adopted for Redwood Valley.

It was agreed through discussion with Council staff that the high growth projection provided the best estimate of the current 2016/17 population in each scheme.

Table 3-2: Historical Population

Year	Richmond/Waimea	Brightwater/Hope	Wakefield	Redwood Valley
2006	14,695	3,162	1,875	550
2013	16,026	3,202	2,190	550
2016/17	16,742	3,468	2,309	550

3.6 Historical Employees

The historical number of jobs in the Waimea Basin was sourced from the Statistics New Zealand data on annual employee counts in each Census Area Unit. The Census Dataset is titled: Geographic units by employee count size, industry and area unit 2000-2016. The detail behind the relevant Census Area Units for each scheme is included in Appendix C. There is no data for Redwood Valley employees, an assumption was made of 24 employees (based on an assumption of 2 employees for each of the 12 large rural-restricted connections). The adopted numbers of employees in each of the remaining three schemes is shown in Table 3-3.

Table 3-3: Historical Employees

Year	Richmond/Waimea	Brightwater/Hope	Wakefield
2006	5,597	934	360
2007	5,678	921	330
2008	5,952	882	370
2009	5,703	1,002	330
2010	5,655	993	320
2011	5,698	1,043	330
2012	6,075	1,033	300
2013	6,371	1,044	290
2014	6,798	1,084	380
2015	6,812	1,124	270
2016	6,737	1,194	350

The 2016 employee count for each scheme was used as the start year number of employees in the DSS Model.

3.7 Water Restrictions

Customer water restrictions are a key influencing factor that dampen peak summer demands. Water restrictions in the Waimea Basin area are applied as a reduction in the allowed water take volume and as customer restrictions. When droughts occur, rationing is applied (through Part V of the TRMP) to water takes in affected Water Management Zones, including the Tasman District Council's water supply water takes for all schemes within the Waimea Basin area. The relevant water management zone boundaries for the Waimea Basin water supply schemes are shown on the TRMP maps in Appendix D.

3.7.1 Water Takes Affected by the Waimea Community Dam Rules

The bores for the Richmond/Waimea, Brightwater/Hope and Redwood Valley schemes all lie within the Water Management Zones affected by the Waimea Community Dam rules added to the TRMP in 2016. Depending on the duration and severity of the drought, the water rationing steps 1 to 3 in the first row of Table 3-4 were applied at the discretion of the Council up until 2016. The current TRMP provisions for water take allocation allow for the event of the Waimea Community Dam and where there is no Dam, with a focus on community water supplies and future urban development in the district (see second row of Table 3-4). The paragraphs below Table 3-4 describe the additional TRMP rules for Community Water Supply Rationing applicable since 2016.

Table 3-4: Rationing Steps on Water Takes Affected by the Waimea Community Dam Rules (Clause 31.1.2.2 (b))

Water Management Zone	Rationing Steps
Reservoir, Waimea West, Golden Hills, Delta, Hope and Eastern Hills, Upper Catchments and Upper and Lower Confined Aquifer	Step 1 – Allocation less 20% = (quantity) m³ per week Step 2 – Allocation less 35% = (quantity) m³ per week Step 3 – Allocation less 50% = (quantity) m³ per week Where there is no Waimea Community Dam or until the Waimea Community Dam commences operation for permits not affiliated to the Waimea Community Dam: In addition to Steps 1 to 3: Step 4 – Allocation less 70% = (quantity) m³ per week After the Waimea Community Dam commences operation for permits not affiliated to the Waimea Community Dam: Step 1 – Allocation less 20% = (quantity) m³ per week Step 2 – Allocation less 50% = (quantity) m³ per week Step 3 – Cease Take

Water Management Zone	Rationing Steps
Note: (1) If minimum water flows or levels given in Schedule 31C decrease beyond the provisions of these rationing steps, the Council may issue water shortage directions in accordance with Policy 30.2.3.1. (2) Where there is no Waimea Community Dam or until the Waimea Community Dam commences operation for permits not affiliated to the Waimea Community Dam, progression from steps 1 to 4 including cease take may be at the discretion of the Council during times of low water flows or levels, in consultation with current water user committees or as specified in a water permit. Step 1 rationing may be introduced once the specified trigger for rationing (see Schedule 31C) is reached. The need for steps 2, 3 and 4 will be subject to the extent and duration of the low flow period. (3) Where there is no Waimea Community Dam or until the Waimea Community Dam commences operation for permits not affiliated to the Waimea Community Dam, rationing beyond Step 4 will be imposed through water shortage directions by Council where it is necessary to avoid saltwater intrusion, or to protect minimum water levels or flows as specified in Schedule 31C and according to the priorities specified in policy 30.2.3.1.	

In addition to the restrictions in Tables 3-4, the following TRMP rules apply to the water takes for the Richmond/Waimea, Brightwater/Hope and Redwood Valley schemes (since 2016):

Community Water Supply Rationing
Clause 31.1.2.2 (c) For any taking and use of water for community water supply, any rationing required to maintain minimum water flows or levels specified in Schedule 31C, comprises the following series of cuts in authorised usage except for that required to provide for maintenance of human health and animal welfare from the maximum weekly authorised:
(i) Either as listed in Figure 31.1C, but not including any step 4:
or
(ii) As follows:
Step 1: Reduce usage by 10% compared with the usage of the equivalent week averaged over the previous eight years.
Step 2: Reduce actual usage after implementing Step 1 by a further 7.5%.
Step 3: Reduce actual usage after implementing Step 2 by a further 7.5%.

<u>**Whichever of (i) or (ii) is the greater reduction in actual water use**</u>, provided that after Step 3, water shortage directions as described in policy 30.2.3.1 and as shown in Schedule 31C may further limit amount of water abstracted.

3.7.2 Water takes in the Wai-iti Dam Service Zone

The water takes for the Wakefield scheme are in the Wai-iti Dam Service Zone and are not affected by the low flow restrictions applying to the other Waimea Plains zones. The rationing steps for the Wai-iti Dam Service Zone are shown in Table 3-5.

Table 3-5: Rationing Steps on Water Takes in the Wai-iti Dam Service Zone (Clause 31.1.2.2 (b))

Water Management Zone	Rationing Steps
Wai-iti Dam Service Zone	Rationing in the Wai-iti Dam Service Zone will be through rostering implemented by the Wai-iti Zone Water User Committee in accordance with the trigger and low flow specified in Schedule 31C[2].

The level of "Water Rationing" is decided by a "Dry Weather Task Force" and is advertised through local media. As the Regional Council side of Tasman District Council start to implement "Water Rationing" through the TRMP through the steps, the water supplier (Tasman District Council Engineering) starts applying restrictions on customers as outlined in the 2015 Water Bylaw and shown in Table 3-6.

[2] Schedule 31C has a 20% rationing for the first step.

The impact of the water rationing steps on the available water supply in each scheme is presented in Section 5.2.

3.7.3 Customer Level Restrictions

The customer level restrictions are applied in six stages. Stage 3 customer water restrictions (Hand-held hosing only on odd and even days of the week corresponding to the street number) are frequently imposed most summers.

Table 3-6: Stages of Water Restrictions at the Customer Level

Restriction stage	Rationing
Stage 1	Conserve water wherever possible.
Stage 2	No use of permanently installed irrigation systems, dripper irrigation systems or soak hoses. (Hand-held hosing permitted).
Stage 3	Hand-held hosing only on odd and even days of the week corresponding to the street number.
Stage 4	Hand-held hosing of productive gardens only on odd and even days of the week corresponding to the street number.
Stage 5	Hand watering of productive gardens only on odd and even days of the week corresponding to the street number.
Stage 6	Water only to be used for personal hygiene use.

Table 3-6 shows the historical timing of customer water restrictions and the associated rationing stage for the water takes. There is not always a clear link between the customer water restrictions and the rationing steps (for example the customer water restrictions escalated to Stage 4 during March 2013, while the rationing step was only at Step 1). The customer water restriction level is not conveyed to the public, they are only aware of the rationing step for water takes (and the message of what they are allowed to do as shown in Table 3-5).

Table 3-7: Historical Dates of Customer Water Restrictions

Summer	Rationing Step for Water Takes	Customer Water Restriction Stage	Time Period	Duration
2005/06	2	3	Nov to Dec 2005	25 days
2005/06	2	3	Jan to Feb 2006	35 days
2005/06	2	3	Mar to Apr 2006	28 days
2006/07	1	3	Mar to Apr 2007	49 days
2007/08	1	3	Nov to Dec 2007	21 days
2007/08	1	3	Feb 2008	14 days
2009/10	1	3	Mar 2010	14 days
2010/11	1	3	Feb to Mar 2011	14 days
2012/13	1	3	Feb to Mar 2013	16 Days
2012/13	1	4	13th-16th Mar	6 Days
2013/14	2	3	Feb to Mar 2014	21 Days
2014/15	1	3	Dec 2014	17 Days
2014/15	2	3	Jan to Mar 2015	19 Days
2014/15	2	4	16th Feb to 9th Mar 2015	21 Days
2015/16	2	4	7th Dec 2015 to 18th Jan 2016	43 Days
2015/16	1	1	Feb 2016	8 Days

3.8 Abstraction

The abstraction analysis is presented for the following schemes (and scheme groupings).

- Richmond/Waimea.
- Brightwater/Hope.
- Wakefield.
- Redwood Valley.

Figure 3-3 shows the monthly abstraction by scheme for the eight years from 1 July 2008 to 30 June 2016, including 12 month rolling average trend lines.

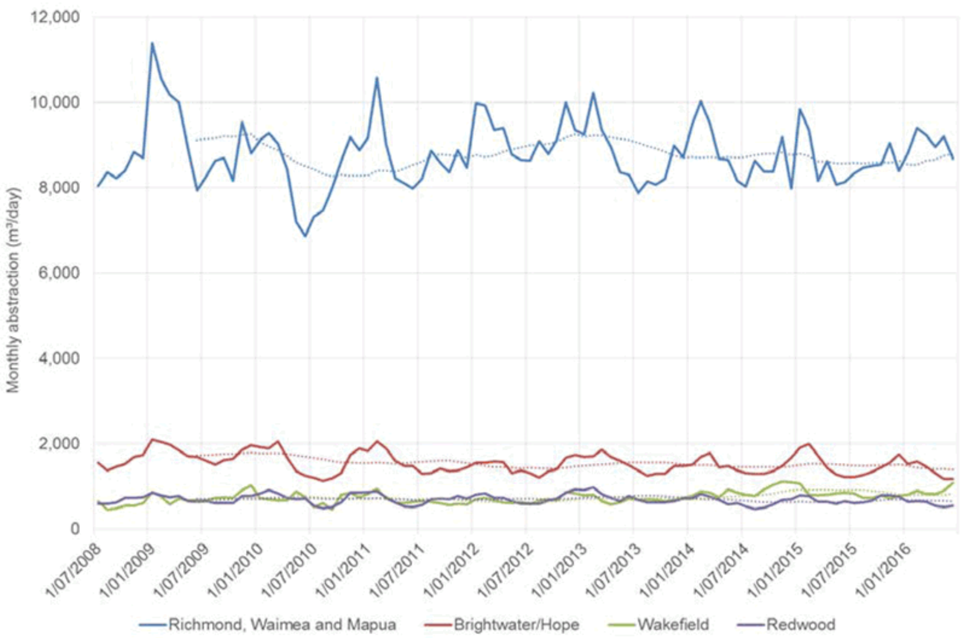

Figure 3-3: Combined monthly abstraction and by scheme 2008 to 2016.

Figure 3-3 shows that the Richmond/Waimea area has the largest scheme demands in the Waimea Basin, abstracting 75% on average of the total water abstracted from the four Waimea Basin schemes in this study. The highest monthly abstraction for the Richmond/Waimea area occurred in January 2009. Peak monthly abstraction rates have been lower for the Richmond/Waimea area in recent summers. Peak factors are discussed further in Section 3.14.

3.9 Sector Demands

The demand sectors analysed for this study are as follows:

1. residential
2. commercial
3. industrial
4. large industrial
5. rural-restricted
6. non-revenue water (NRW: including leakage, apparent losses and unbilled consumption).

The graphs below show combined residential, commercial and industrial demands as one customer category as the residential, commercial and industrial demands were not separated into separate customer categories until 2014. Figure 3-4 shows the Richmond/Waimea demands by sector from 2008 to 2016. Figure 3-5 shows the Brightwater/Hope demands by sector from 2008 to 2016. Figure 3-6 shows the Wakefield demands by sector from 2008 to 2016. There is no graph shown for Redwood Valley as the sector demand split into rural-restricted and NRW is only estimated.

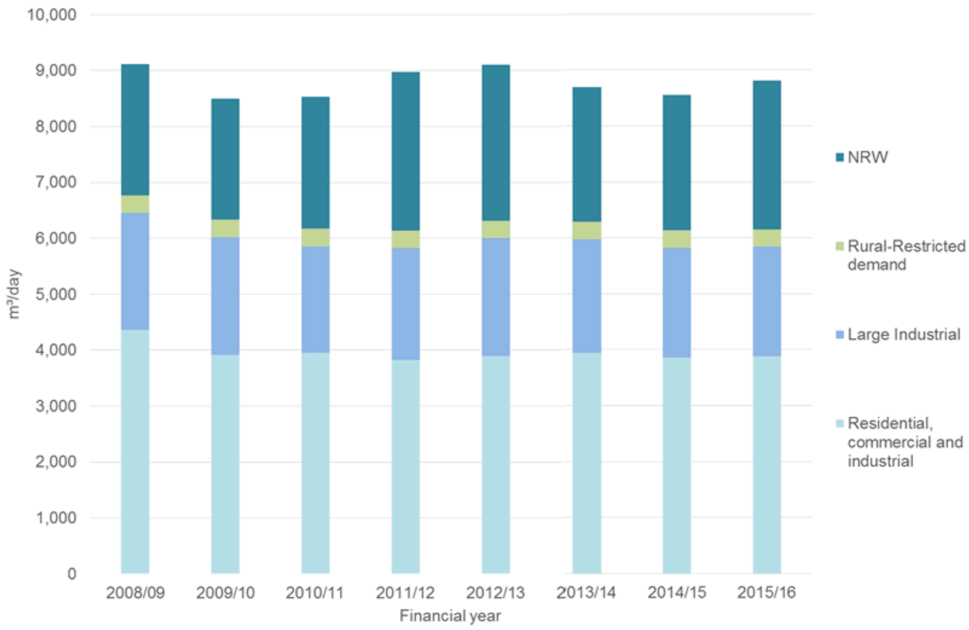

Figure 3-4: Sector demands for Richmond/Waimea from 2008 to 2016.

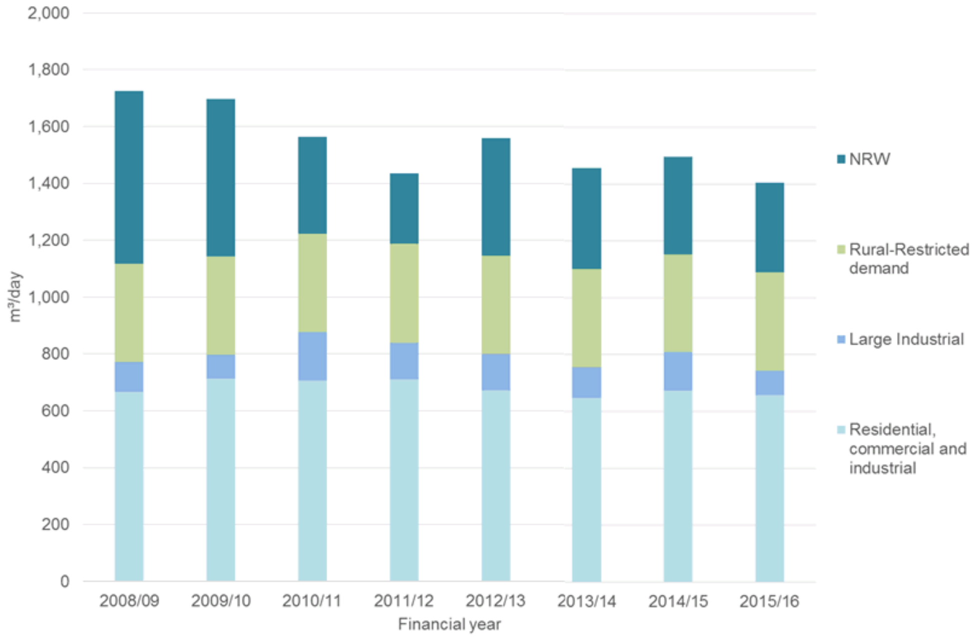

Figure 3-5: Sector demands for Brightwater/Hope from 2008 to 2016.

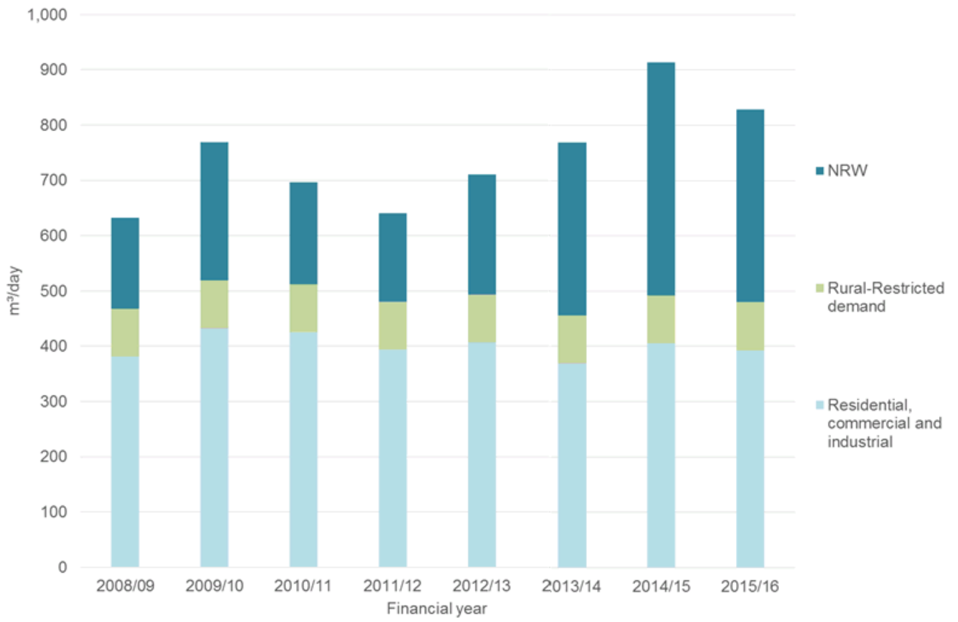

Figure 3-6: Sector demands for Wakefield from 2008 to 2016.

3.10 Non-revenue Water

The non-revenue water volume is calculated from the total water abstracted for each scheme, minus the metered customer consumption and an estimated for the unmetered rural-restricted demands.

Non-revenue water (NRW) includes unbilled authorised consumption (fire-flows etc.), apparent losses (customer meter under-registration and unauthorised consumption) and real losses (leakage). Non-revenue water can be expressed in a volume per day and in a normalised volume per connection (or per kilometre of pipe) per day. The DSS Model also shows the NRW volume as a percentage of the total water supplied.

Figure 3-5 shows the NRW in L/connection/day for all schemes over the eight-year period (where connections = number of accounts = sum of meters using water and rural-restricted connections). The combined Waimea Basin non-revenue water is shown with the dashed line series. There is no obvious trend in combined NRW when expressed in L/connection/day.

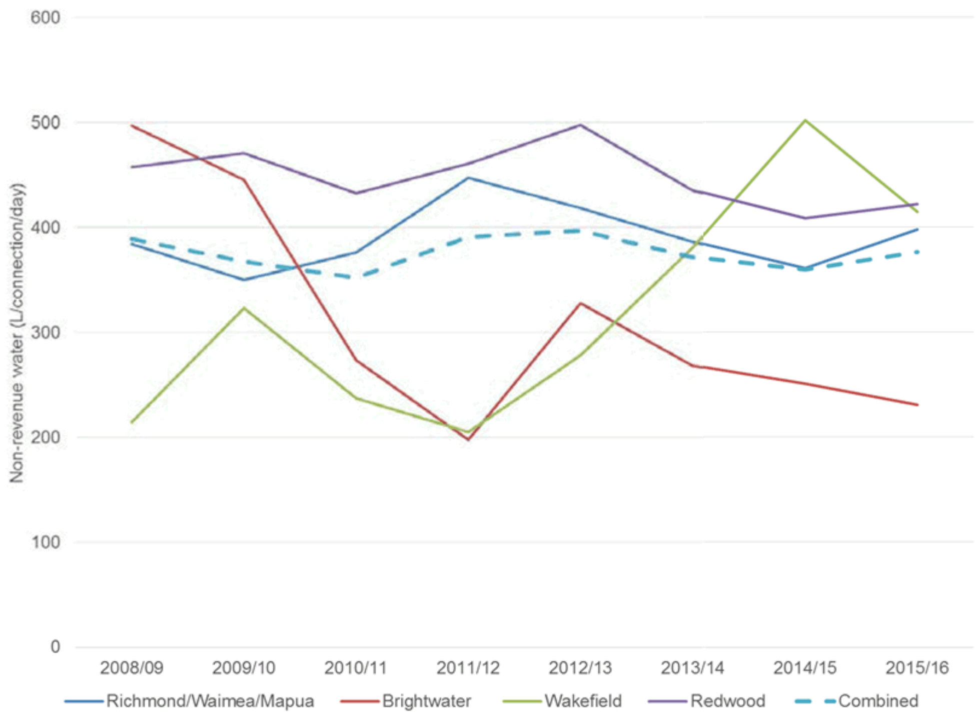

Figure 3-7: Non-revenue water in L/connection/day from 2008 to 2016.

The Council set targets for leakage as a subset of NRW (ie. real water losses, typically the largest component of NRW, which also includes apparent water losses, unbilled consumption etc.) in their District Wide Water Demand Management Plan and in the 2015 AMP, as follows.

- Richmond/Waimea <150 L/connection/day.
- Mapua/Ruby Bay <150 L/connection /day.
- Brightwater/Hope <300 L/ connection /day.
- Wakefield <200 L/ connection /day.

This analysis has provided estimates for the total NRW but not for leakage. Since leakage is typically the largest component of NRW, comparison of the NRW values in Figure 3-5 against the targets for leakage suggests that Brightwater/Hope is the only scheme that is likely to have achieved its leakage target during the past three years (typically at least 80-90% of the NRW volume will be attributed to leakage). The Richmond/Waimea NRW has been consistently more than double its leakage target. The Wakefield NRW has increased over the last four years to above its leakage target.

Figure 3-6 shows the volume of non-revenue water in m³/day from 2008 to 2016. In this graph, the scale of the Richmond/Waimea NRW becomes clear. The combined NRW is clearly influenced by the Richmond/Waimea NRW as it represents 70% to 80% of the combined NRW volume on an annual basis. The Wakefield NRW has shown an increasing trend and the Brightwater/Hope NRW has shown a decreasing trend but the scale of the NRW from these two schemes in minor compared with the Richmond/Waimea NRW volume. It is evident from this graph that the Richmond/Waimea area should be a priority for reduction in NRW and leakage. The estimated current volume of leakage in the Waimea Basin schemes (after subtraction of apparent losses) is expected to be over 3,000 m³/day.

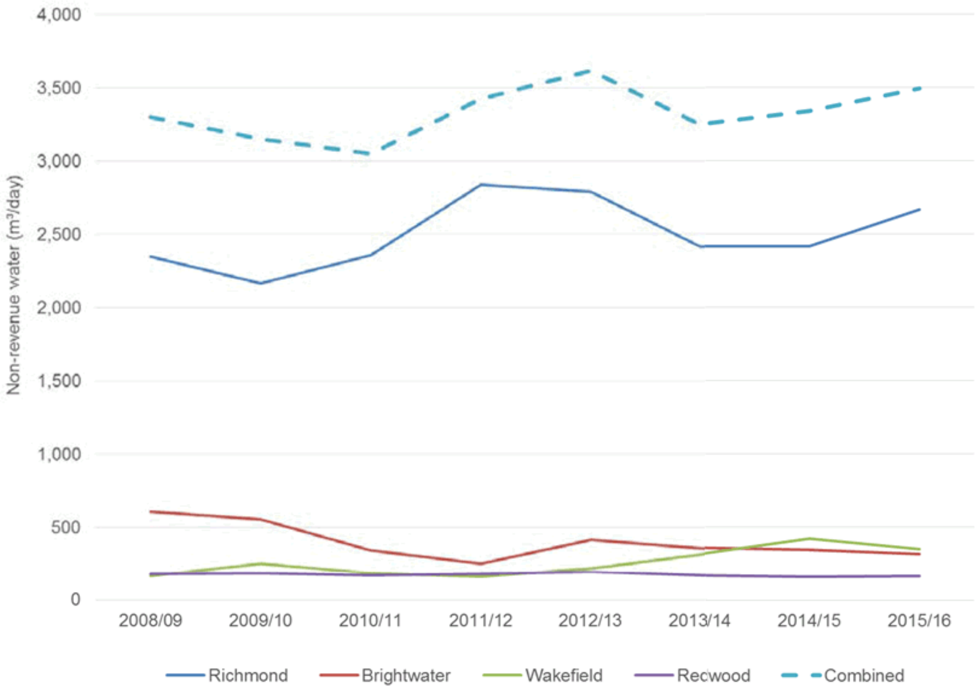

Figure 3-8: Volume of non-revenue water in m³/day from 2008 to 2016.

3.11 Residential Demands

Figure 3-7 to Figure 3-11 show the annual average metered residential demands per account over the eight-year period for the three urban schemes, along with the average residential demand assumptions adopted for the start year in the model. The graphs appear to show a declining trend in residential per account however the sector split into residential and small business demands is estimated for all but the last two years (residential, commercial and industrial demands were not separated into separate customer categories until 2014).

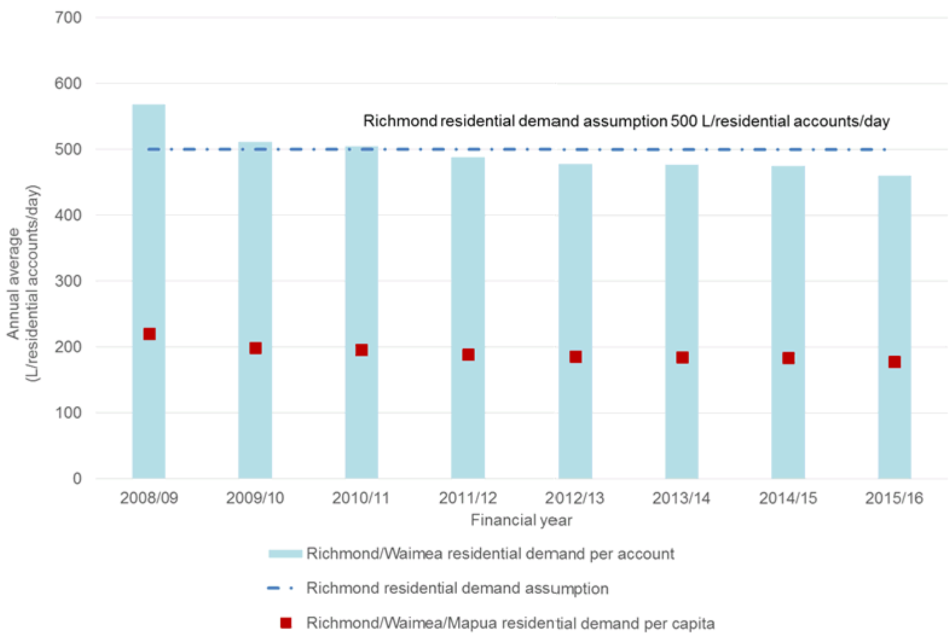

Figure 3-9: Historical Richmond/Waimea metered residential demand and modelling assumption.

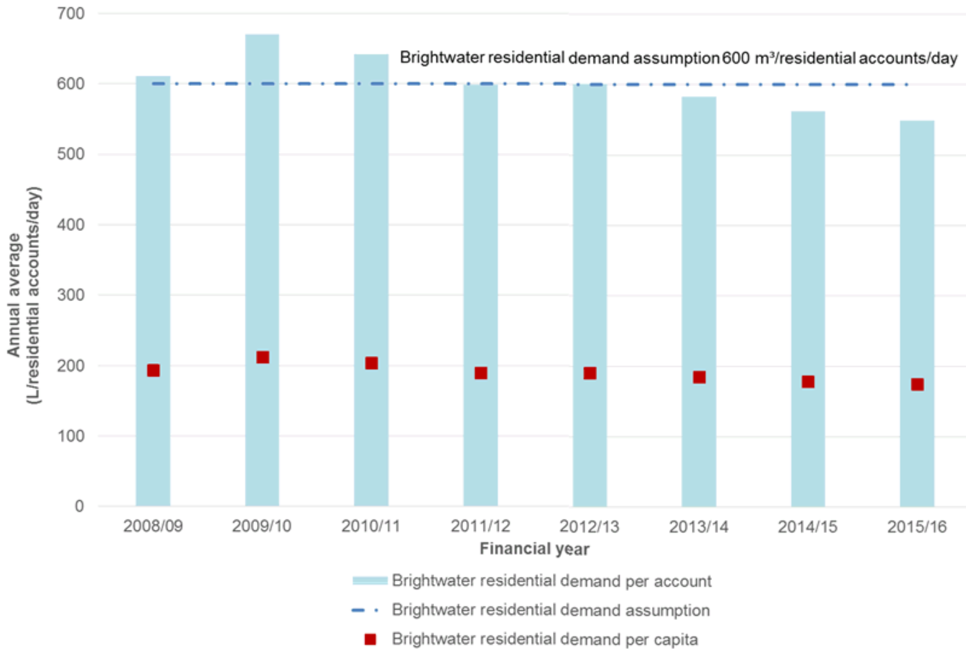

Figure 3-10: Historical Brightwater/Hope metered residential demand and modelling assumption.

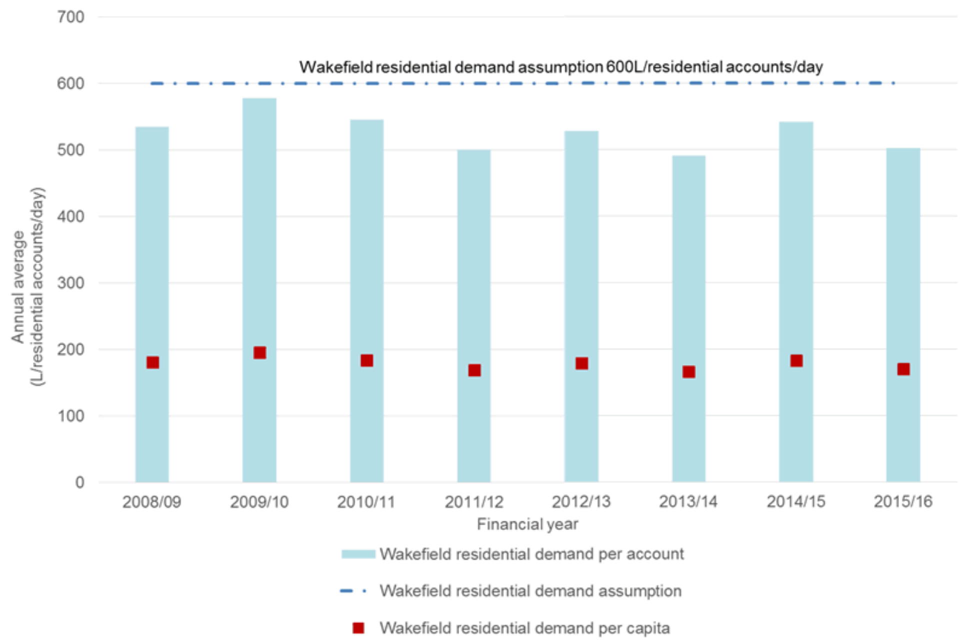

Figure 3-11: Historical Wakefield metered residential demand and modelling assumption.

The Council set targets for metered residential demand per person in their District Wide Water Demand Management Plan and in the 2015 AMP, as follows.

- Richmond/Waimea <200 L/capita/day.
- Mapua/Ruby Bay <200 L/capita/day.
- Brightwater/Hope <250 L/capita/day.
- Wakefield <200 L/capita/day.

Figures 3-7, 3-8 and 3-9 show residential demands per capita as well as per account. The residential demands per capita were estimated by dividing the demands per residential account by the scheme specific average household occupancy. The annual average metered residential demand per person per day has declined to slightly below 200 L/person/day by June 2016 for all three schemes, which demonstrates that the targets have been met for each scheme.

3.12 Small Business Demands

Figure 3-12 to Figure 3-14 show the annual average metered small business (commercial and industrial but not large industrial) demands per account over the eight-year period for the three urban schemes, along with the average small business demand assumptions adopted for the start year in the model. The graphs show more variability in demand per account than residential but the overall trend appears to be towards a declining demand per small business account. The Brightwater/Hope and Wakefield small business demand assumptions are significantly higher than historical demands. This will lead to a conservative assumption for small business demand in the DSS Models.

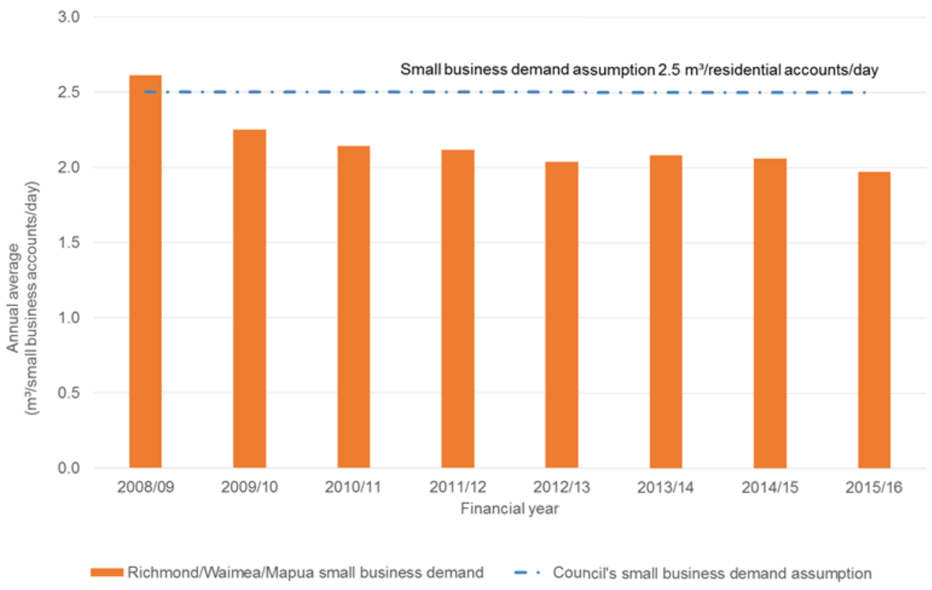

Figure 3-12: Historical Richmond/Waimea metered small business demand per account.

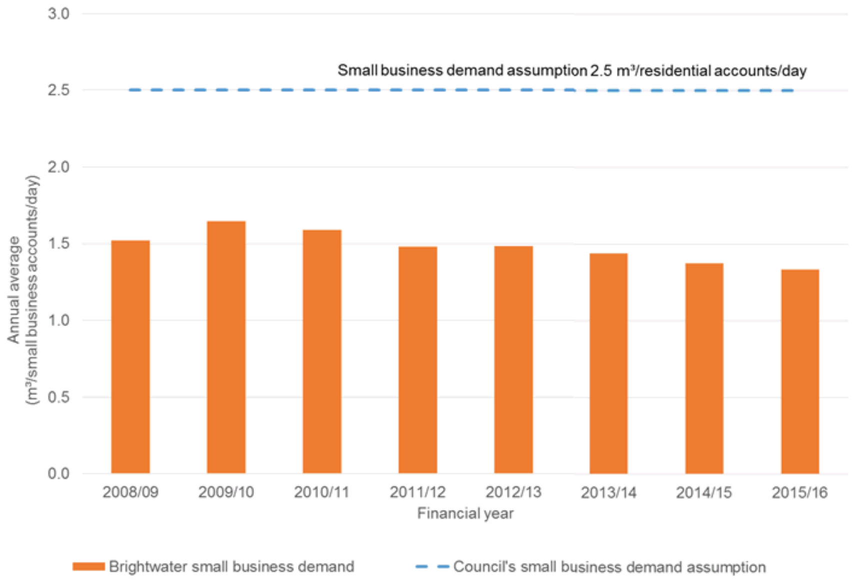

Figure 3-13: Historical Brightwater/Hope metered small business demand per account.

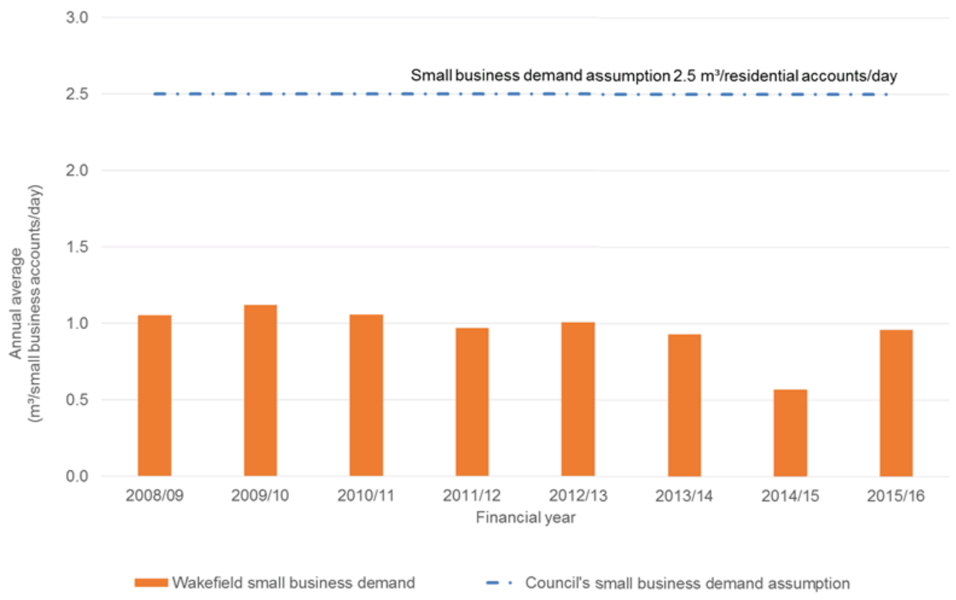

Figure 3-14: Historical Wakefield metered small business demand per account.

3.13 Large Industrial Demand

There are five large wet industries in the Waimea Basin area that are read monthly. Within this group there are three very large wet industries: Alliance (meat processing), ENZA (fruit processing) and Nelson Pine (wood processing); and two smaller wet industries: AICA (resin plant) and Fonterra (milk powder processing). The monthly demands from 2014 to 2016 for these five large industries are shown in Figure 3-15 (solid lines), along with the twelve monthly moving averages (dotted lines).

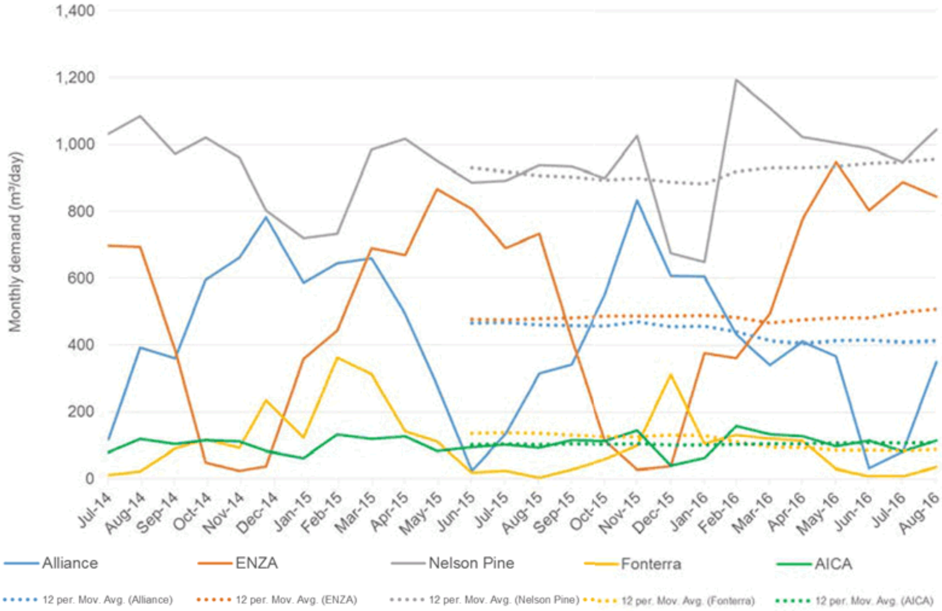

Figure 3-15: Monthly demands for five large industries from 2014 to 2016.

Figure 3-15 shows a decreasing twelve month moving average trend line for Alliance and Fonterra. Fonterra have their own bore supply as well as the municipal supply. Fonterra typically use their own bore less during rationing and rely more on municipal supply.

The remaining three large industries have shown more steady demands with a slight increase for the year to August 2016. Water efficiency improvements are believed to be a primary cause of the decreasing annual demands for these two customers. Large industrial users are billed on a volumetric rate and subject to trade waste charges. The pricing structures provides incentive for users to use water efficiently. Nelson Pine is the largest wet industry and has implemented water saving measures over the past eight years, reducing the water required to produce MDF from 8 m³ of water per tonne of MDF to 1 m³ of water per tonne of MDF. Most of the wet industries have stated that they believe they have implemented all the possible water saving measures for now.

Figure 3-16 shows the average monthly demand for the two-year period from July 2014 to August 2016 for the large wet industries, along with the total demand.

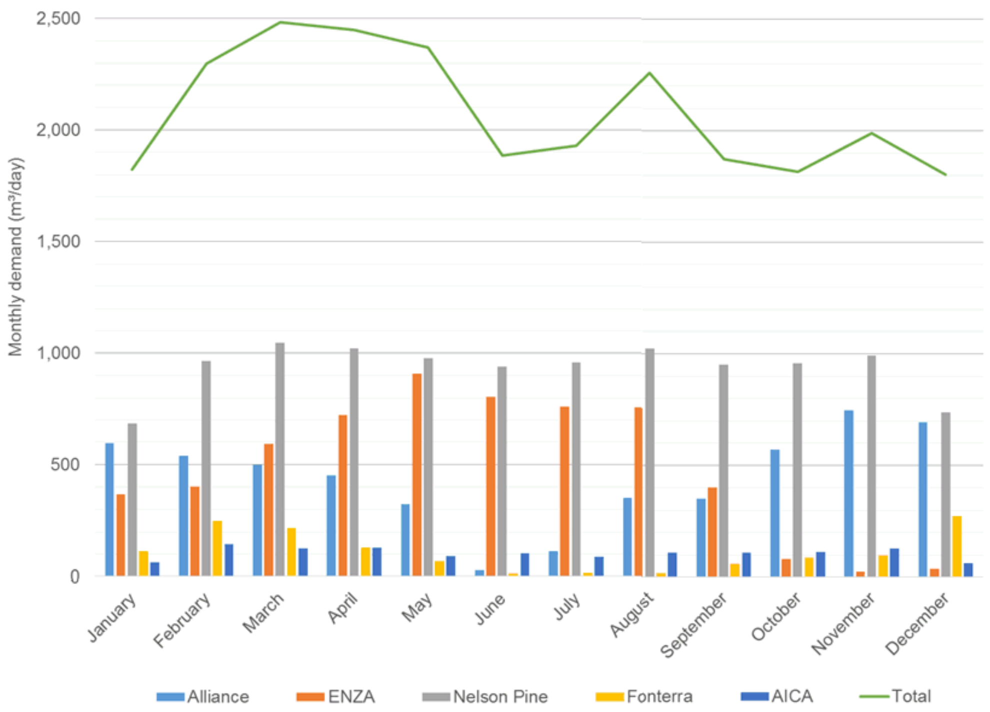

Figure 3-16: Two-year average monthly demand for the large wet industries.

Figure 3-16 shows the seasonal patterns in the demands from ENZA (peak demands from April to August) and Alliance (peak demands from October to February). Nelson Pine is the largest wet industry and has more consistent year round demands. Most of the wet industries show a dip in demand in December which is expected to be due to the Christmas holiday break. Table 3-8 shows the average annual demand for the three largest wet industries. The assumption for new wet industry demand in the DSS Model was 680 m³/day per new wet industry based on the assumption adopted in the 2011 report.

Table 3-8: Average Annual Demand for the Three Largest Wet Industries

Year	ENZA (m³/day)	Nelson Pine (m³/day)	Alliance (m³/day)	Total for three largest wet industry (m³/day)
2011/12	538	931	438	635
2012/13	502	972	520	664
2013/14	528	955	457	647
2014/15	477	930	466	624
2015/16	482	945	414	613
Average	**505**	**946**	**459**	**637**

3.14 Peak Week Factors

Table 3-8 shows the peak week factors for each scheme from 2008/09 to 2015/16, along with the five-year average peak week factors. The five-year average of the schemes' peak week factors were adopted for the DSS Model input assumption (this assumes that low level restrictions continue). The highest peak factors over the eight years were only in the order of 15% higher than the five-year average. Wakefield and Redwood Valley had the higher maximum peak week factors which could be due to the absence of large industrial customers in those schemes (the large industrial customers often have different timing for their peak demands than residential customers).

Table 3-9: Historical Peak Week Factors for Each Scheme (2008 to 2016)

Year	Richmond/Waimea	Brightwater/Hope	Wakefield	Redwood Valley
2008/09	1.40	1.38	1.55	1.42
2009/10	1.31	1.8	1.48	1.30
2010/11	1.35	1.41	1.55	1.52
2011/12	1.28	1.22	1.29	1.28
2012/13	1.26	1.37	1.52	1.39
2013/14	1.27	1.47	1.32	1.31
2014/15	1.45	1.48	1.32	1.40
2015/16	1.17	1.37	1.24	1.35
5-year average	**1.29**	**1.38**	**1.34**	**1.34**

3.15 Conclusions from the Demand Analysis

The preceding sub-sections have presented the historical analysis of demands for the overall Waimea Basin water supply schemes. The metered residential demands and the NRW volumes were compared to the Council targets set in the 2015 AMP. Overall, the metered residential demands are at the Council target level however the leakage in most schemes appears to be above (or significantly above) the Council targets. It was evident from the NRW analysis that the Richmond/Waimea area should be a priority for reduction in NRW, and particularly leakage. Leak detection has recently been undertaken in the Richmond scheme but the impact on NRW has not yet been quantified.

The key demand parameters resulting from the historical analysis are shown in Table 3-10 and

Table 3-11.

Table 3-10 Start Year Demand Assumptions for each Water Supply Scheme

Customer Sector	Units	Richmond / Waimea	Brightwater / Hope	Wakefield	Redwood Valley
Commercial	L/small business account/day	2,500	2,500	2,500	9,400 large RR
Industrial	L/small business account/day	2,500	2,500	2,500	
Residential	L/residential account/day	500	600	600	
Large industrial	L/large industrial account/day	503,590	116,500		
Rural restricted	L/RR account/day	1,360	1,275	1,480	1,900
Non-revenue water	L/total number of accounts/day	335	434	360	236

Table 3-11: Adopted Peak Week Factors for each Water Supply Scheme

Scheme	Peak Week Factor
Richmond/Waimea	1.29
Brightwater/Hope	1.38
Wakefield	1.34
Redwood Valley	1.34

4 Demand Forecasts

4.1 Demand Forecast Model Overview

The end-use model adopted for this forecast is Maddaus Water Management Inc.'s Demand Side Management Least Cost Planning Decision Support System Model (DSS Model). The DSS Model was developed in 1999 and significantly updated in 2013 and is recognised as an innovative end-use model worldwide. There have been over 400 applications in the United States and internationally, including New Zealand and Australia.

The DSS Model enables the user to prepare long-range, detailed water demand projections. The purpose of the extra detail is to enable a more accurate assessment of the impact of water demand management programmes on demand. A rigorous modelling approach is especially important if the project will be subject to regulatory or environmental review.

The DSS Model can provide:

- 30-100-year Water Demand Forecasts.
- 30-100-year Water Conservation Savings.
- 30-100-year Benefit-Cost Ratios of Conservation Measures and Programs.

The DSS Model is an end-use model that breaks down total water production (water demand in the service area) to specific water end-uses. End-use analysis begins by considering a water supplier's entire water production; that amount is then broken up into consumption and NRW. Consumption use is then broken down into customer categories by internal and external use, which is further broken down by specific end-use, such as toilets, showers, laundry, etc. An example of this breakdown of total water production into consumption by customer category and single family residential end-uses is shown in Figure 4-1.

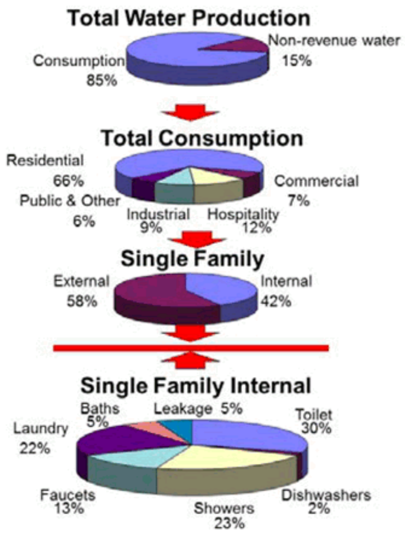

Figure 4-1: Example breakdown of water production into specific end-uses for single family.

The model uses a bottom-up approach that allows for multiple criteria to be considered when estimating future demands, such as the effects of natural fixture replacement, plumbing codes, and conservation efforts.

To forecast urban water demands using the DSS Model, the historical demand trends for each customer category are reconciled with available demographic and employment data to characterize the water usage for each customer category in terms of number of users per account and per capita water use. The data are also further analysed to approximate the split of indoor and outdoor water usage in each customer category. The indoor/outdoor water usage was further divided into typical end-uses for each customer category.

Published data on average per-capita indoor water use and average per-capita end-use were combined with the number of water users to calibrate the volume of water allocated to specific end-uses in each customer category. In other words, the DSS Model checks that social norms from end studies on water use behaviour (eg. toilet flushes per person per day) are not exceeded.

The end-use assumptions for the DSS Model Waimea Basin water demand forecast are discussed in Appendix E.

The graphic below shows the overall modelling process in the DSS Model.

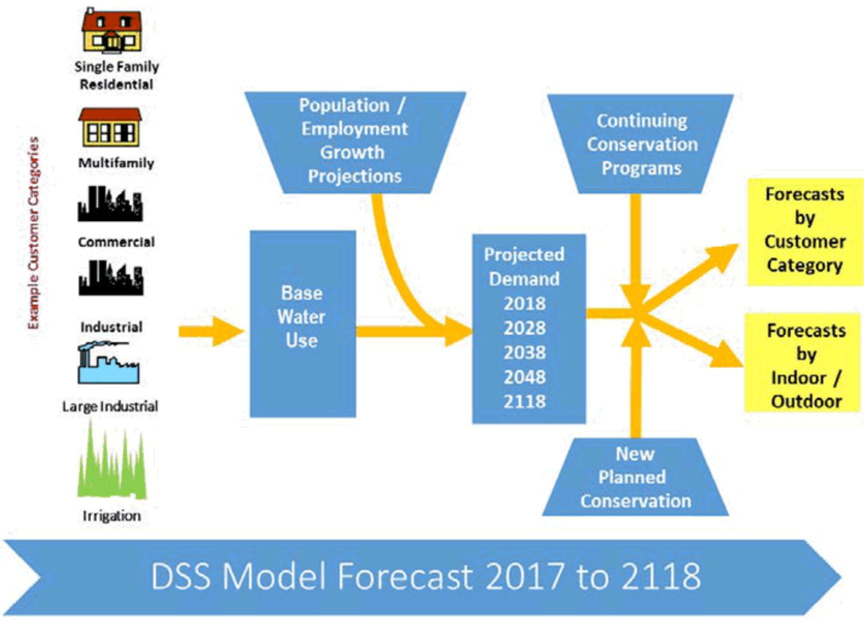

Figure 4-2: Modelling process for the DSS model.

4.2 Annual Average Start Year Demands

As described in Section 4.1, end-use modelling begins by considering the total water abstraction volume in each scheme and then breaking it up into consumption (by customer category) and NRW for the start year.

The start year in the DSS Model is the current financial year of 2016/17. The 100-year forecast runs from 2017/18 to 2117/18. The start year volume was based on the sum of the annual average demands by sector. The basis for the annual average start year demands for each sector were agreed with Council. The annual average start year assumptions are shown in the tables below for each scheme.

Table 4-1: Start Year Inputs to Richmond/Waimea DSS Model in L/account/day and Volume

Sector	Start Year Number of Accounts	Start Year Volume (ML/year)	Start Year % of Consumption Volume	Start Year Volume per Account	Units for Start Year Volume per Account
Commercial	391	357	13.5%	2,500	L/small business account/day
Industrial	232	212	8.0%	2,500	L/small business account/day
Residential	6,134	1,120	42.4%	500	L/residential account/day
Large industrial	4	736	27.9%	503,587	L/large industrial account/day
Rural restricted	423	211	8.0%	1,364	L/rural-restricted account/day
Sub-total consumption	**7,184**	**2,636**	**100%**	**510,786**	
Non-revenue water		880		335	L/total account/day
Total		**3,514**			

Table 4-2: Start Year Inputs to Brightwater/Hope DSS Model in L/account/day and Volume

Sector	Start Year Number of Accounts	Start Year Volume (ML/year)	Start Year % of Consumption Volume	Start Year Volume per Account	Units for Start Year Volume per Account
Commercial	80	73	17.3%	2,498	L/small business account/day
Industrial	38	35	8.2%	2,498	L/small business account/day
Residential	948	208	49.0%	600	L/residential account/day
Large industrial	1	43	10.0%	116,501	L/large industrial account/day
Rural restricted	141	66	15.5%	1,275	L/rural-restricted account/day
Sub-total consumption	**1208**	**425**	**100%**	**123,806**	
Non-revenue water		191		434	L/total account/day
Total		**616**			

Table 4-3: Start Year Inputs to Wakefield DSS Model in L/account/day and Volume

Sector	Start Year Number of Accounts	Start Year Volume (ML/year)	Start Year % of Consumption Volume	Start Year Volume per Account	Units for Start Year Volume per Account
Commercial	44	40	16.9%	2,482	L/small business account/day
Industrial	9	8	3.5%	2,480	L/small business account/day
Residential	701	153	64.5%	596	L/residential account/day
Rural restricted	66	36	15.1%	1,482	L/rural-restricted account/day
Sub-total consumption	**820**	**237**	**100%**	**7,400**	
Non-revenue water		106		360	L/total account/day
Total		**343**			

Table 4-4: Start Year Inputs to Redwood Valley DSS Model in L/account/day and Volume

Sector	Start Year Number of Accounts	Start Year Volume (ML/year)	Start Year % of Consumption Volume	Start Year Volume per Account	Units for Start Year Volume per Account
Single family rural restricted	352	242	85.7%	1,882	L/residential account/day
Large rural restricted	12	40	14.3%	9,183	L/rural-restricted account/day
Sub-total consumption	**364**	**282**	**100.0%**	**11,301**	
Non-revenue water		25		236	L/total account/day
Total		**307**			

A conservative approach was adopted for the Redwood Valley, the only fully rural scheme. The start year assumptions are based on the expectation that the peak demand is based on 100% of the rural-restricted allocation plus an allowance for NRW. The average demand assumptions in the table above are estimated from the peak demand divided by the Redwood Valley peak factor. Historically, the peak Redwood Valley demands have been significantly below the full allocation.

Consumption use is then broken down into customer categories by internal and external use, which is further broken down by specific end-use, such as toilets, showers, laundry, etc. These model input assumptions are detailed in Appendix E.

4.3 Growth Scenarios

The medium and high growth scenarios for the water demand forecasts are shown in Table 4-5. The table shows the assumptions for the three largest customer sectors under each growth scenario. Zero growth was assumed for rural restricted accounts to reflect that there is currently no allocation available for additional rural-restricted properties in any scheme.

Table 4-5: Growth Scenarios for Water Demand Forecasts

Growth Scenario	Residential	Small Business (Commercial and Industrial)	Large Industry
Medium	Medium population growth.	Medium growth in employees.	One new large industry from year 15 (2033) with an average day demand of 680 m³/day (based on the previous average of the three largest Waimea wet industries).
High	High population growth.	High growth in employees	Two new large industries. One new large industry from year 15 (2033/34) and one new large industry from year 30 (2048/49), each with an average day demand of 640 m³/day (based on the 5-year average of the three largest Waimea wet industries).

4.4 Growth Projections

4.4.1 Population growth projections

The high and medium growth projections for population were sourced from the Tasman District Council 2018 Growth Model Projections (supplied on 14 March 2017, file name "Population projections (medium and high growth rate) at Area Unit level - revised as at December 2016"). The growth projection data was provided in five-year projection horizons from the year 2013 to the year 2043.

The projections to 2043 are tabulated in Table 4-6 and Table 4-7. Future growth in Richmond South (ie. the area that is current supplied by the Brightwater/Hope scheme) could be supplied by the Richmond/Waimea scheme (this change in scheme area has not been allowed for in the forecasts).

The extrapolation beyond 2043 to the 100-year horizon of 2117/18 was based on the average growth for the 10 years to 2043. The historic population (2006 to 2016) and the population growth forecasts to 2118 for all four schemes are shown in Figure 4-2.

Further detail behind the growth projections is included in Appendix C including scheme specific graphs.

Table 4-6: Forecast Population for High Growth Scenario to 2043

Year	Richmond/ Waimea	Brightwater/ Hope	Wakefield	Redwood Valley
2016/17	16,742	3,468	2,309	550
2018	17,272	3,645	2,389	550
2023	18,262	4,214	2,566	550
2028	18,918	4,816	2,752	550
2033	19,505	5,396	2,927	550
2038	19,940	5,960	3,085	550
2043	20,268	6,524	3,222	550

Table 4-7: Forecast Population for Medium Growth Scenario to 2043

Year	Richmond/ Waimea	Brightwater/ Hope	Wakefield	Redwood Valley
2016/17	16,742	3,468	2,309	550
2018	16,742	3,468	2,309	550
2023	16,997	3,589	2,356	550
2028	17,634	3,891	2,473	550
2033	17,936	4,290	2,588	550
2038	18,136	4,683	2,714	550
2043	18,171	5,037	2,805	550

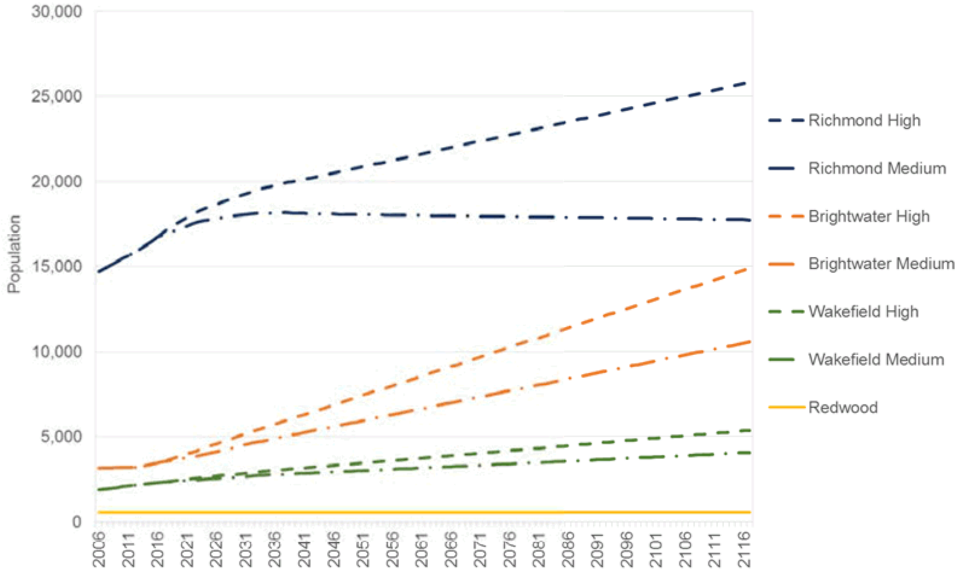

Figure 4-3: Historic population (2006 to 2016) and population growth forecasts to 2118.

The forecast for household occupancy is shown in **Figure 4-4**. The forecast is for declining household occupancy to 2043. Household occupancy was assumed to flat-line from 2043 to 2118 (rather than continuing to decline at the same rate). Household occupancy was assumed to be constant in Redwood Valley.

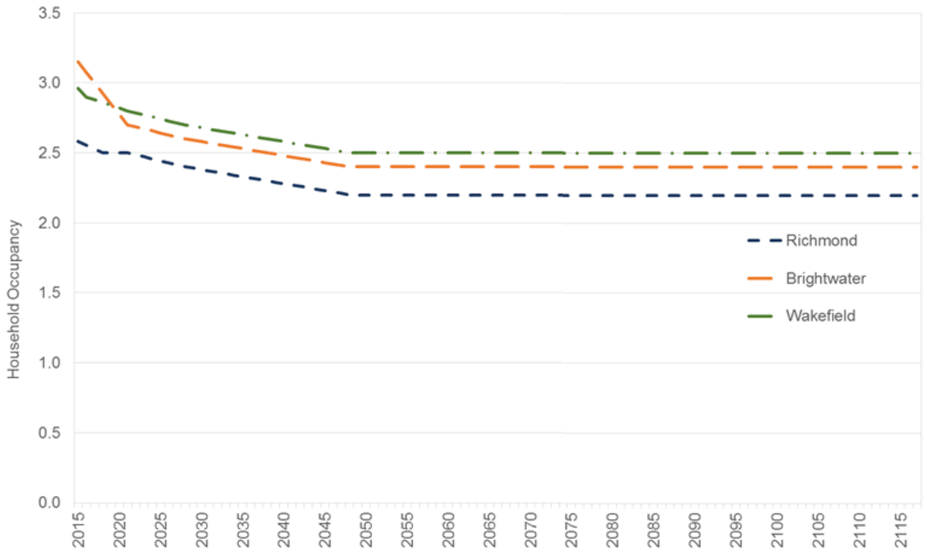

Figure 4-4: Household occupancy for each scheme from 2015 to 2118

4.4.2 Economic Growth Projections

The economic growth scenarios for the commercial and industrial sectors (ie. increase in number of jobs) are based on the job forecasts for the combined Tasman Nelson region presented in the report "Tasman Regional Economic Forecasting Model Report V1 July 2016" provided by the Council. The report shows a maximum net employment increase from 2015 to 2038 of 13,000 jobs in the Tasman Nelson Region (High Scenario in Figure 23 of the report). The Waimea Basin job growth was pro-rated from the Tasman Nelson Region totals based on the percentage of the population in the Waimea Basin to the Tasman and Nelson regions, with an additional 10% increase to the Waimea Basin job growth to represent the bias towards this area.

The historical employees and the forecast growth are graphed for each scheme in Appendix C and summarised in the figure below.

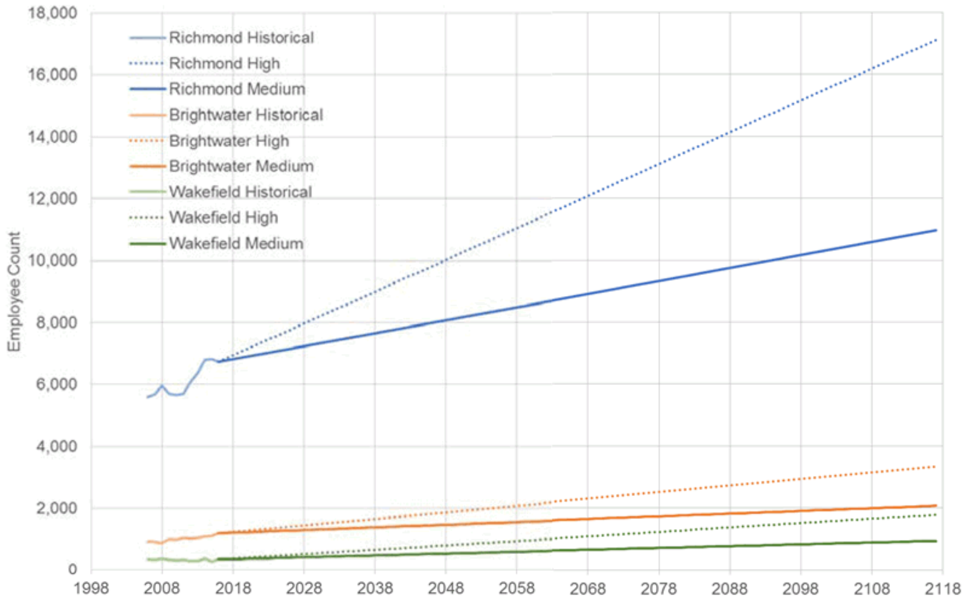

Figure 4-5: Historical employees and forecast growth

4.4.3 Impact of Growth

It is worth noting the impact of growth is not just the additional customer demands but also the expansion of the water supply network (new pipes, fittings, connections etc.). Additional water supply network length and connections will mean more potential for leakage and other types of NRW including apparent losses due to customer meter under-registration.

4.5 Baseline Annual Average Demand Forecasts

The baseline annual average demand forecasts were prepared based on the start year demand assumptions in Section 4.2 and the two growth forecast scenarios in Section 4.4.1 and Section 4.4.2. The baseline annual average demand forecasts in ML/year for the two growth scenarios are shown in Figure 4-4 through Figure 4-9, along with the historical demands. The stepped changes due to the assumed timing and demand from new wet industries are evident in the Richmond/Waimea graph. Appendix F includes graphs showing the breakdown of the baseline consumption forecasts into the different customer categories for each scheme (ie. excluding non-revenue water).

The graphs also show that the start year annual demands are typically slightly higher than the historical demands. This is due to the conservative start point of the residential and small business start year demands (ie. higher than historical averages).

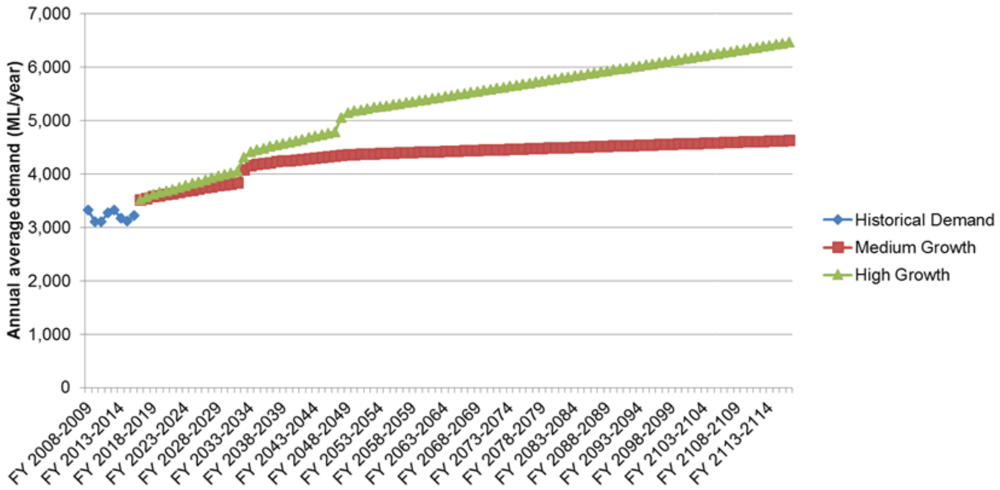

Figure 4-6: Baseline Richmond/Waimea demand forecasts without plumbing code.

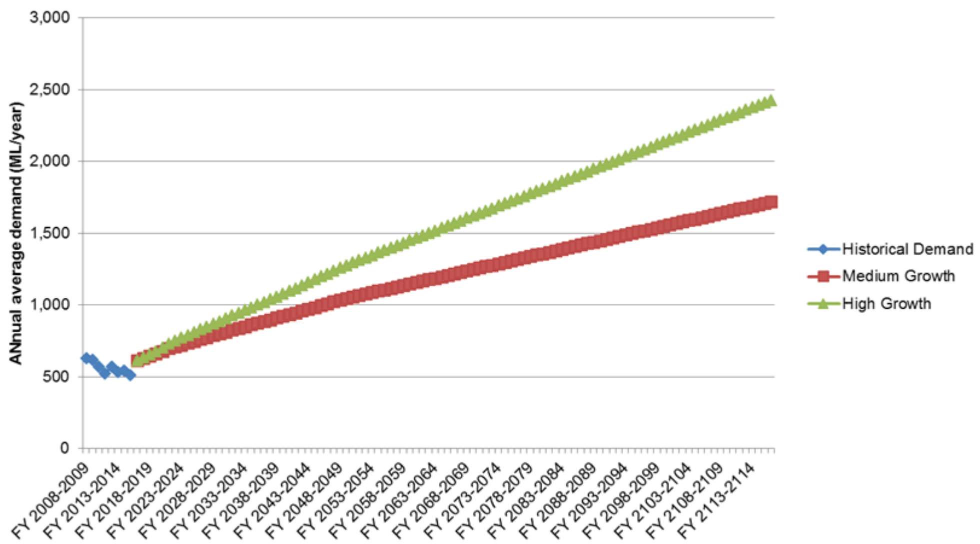

Figure 4-7: Baseline Brightwater/Hope demand forecasts without plumbing code.

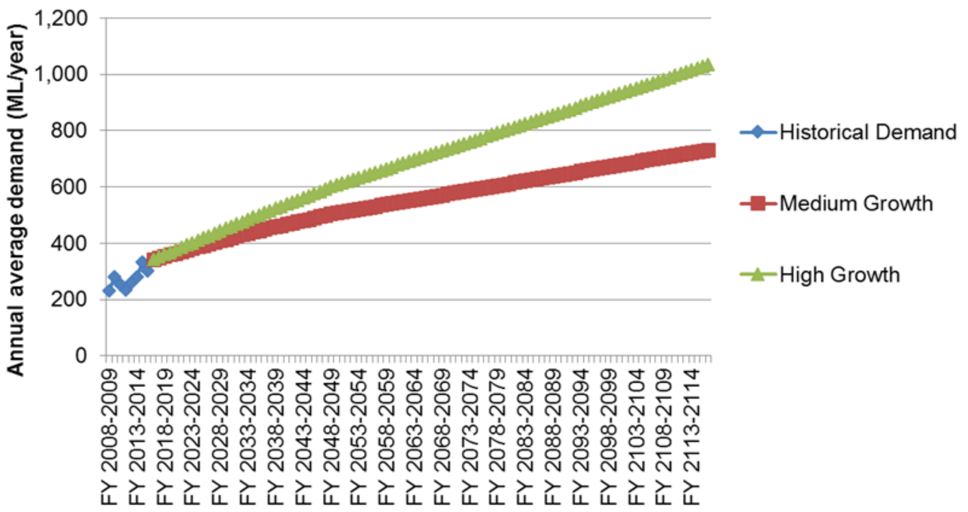

Figure 4-8: Baseline Wakefield demand forecasts without plumbing code.

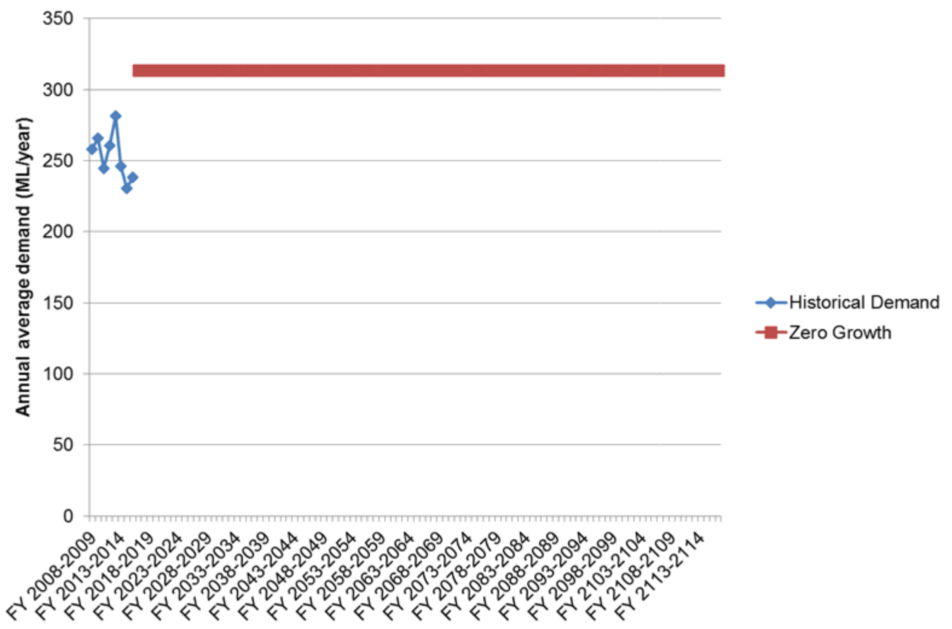

Figure 4-9: Baseline Redwood Valley demand forecasts without plumbing code[3].

[3] As discussed earlier, a conservative approach was adopted for the Redwood Valley rural scheme. The start year assumptions are based on the expectation that the peak demand is based on 100% of the rural-restricted allocation plus an allowance for NRW. The annual average was estimated from the peak demand divided by the peak factor which is higher than historic demands.

4.6 Baseline Annual Average Demand Forecasts with Plumbing Code

Baseline demand forecasts that allow for the impact of plumbing code changes to more water efficient fixtures over time (ie. passive water savings) are also typically modelled in the DSS Model.

Currently, neither the New Zealand plumbing standards nor the Building Code mandate the use of water efficient fixtures. The Building Code is seen as a minimum for the construction of residential houses. The population is gradually becoming interested in building more energy efficient and water efficient homes, particularly in areas with universal metering and volumetric pricing, like Tasman District Council.

The New Zealand Water Efficiency Labelling Scheme (WELS) has been in place since 2011 and is designed to provide information, through labelling at the point of sale, to consumers buying products that use water. The labels enable consumers to identify how water efficient a product is. The aim of the rating scheme is to encourage consumers to purchase products that use less water and to encourage suppliers to design products which are more water efficient. The WELS label displays a star rating to demonstrate how water efficient the product is, and a figure which states how much water it uses. The higher number of stars shows the more water efficient products.

The New Zealand WELS is like the Australian WELS introduced in 2005. In Australia, there are mandated minimum WELS ratings in many areas. In Australia the products must be listed in an online national database of products and their ratings. New Zealand consumers can use the Australian database to compare products which are sold in both Australia and New Zealand.

The WELS applies to six product classes:

- clothes washing machines
- dishwashers
- lavatories
- showers
- taps
- urinals.

The WELS is expected to encourage consumers to gradually install more water efficient fixtures over time and to encourage manufacturers to design more water efficient fixtures and appliances. The introduction of WELS and education around the limited water supply are expected to have contributed to the declining trend in residential demand that has been seen in the historical Waimea Basin schemes. This declining residential demand trend is also seen in a number of other universally metered schemes around New Zealand.

The expected savings from WELS has been modelled in the DSS Model using the initial fixture models and projected changes over time. Projected water savings for the High Growth Scenario due to changes in the plumbing code (WELS) are shown in Figure 4-10 through Figure 4-13 (note the different scales for the y-axis in the larger schemes versus the smaller schemes). The average annual projected plumbing code (WELS) savings over the planning horizon are around 0.2% of the total demand for the High Growth Scenario. Passive savings are expected in both indoor residential and indoor non-residential water demands in the future.

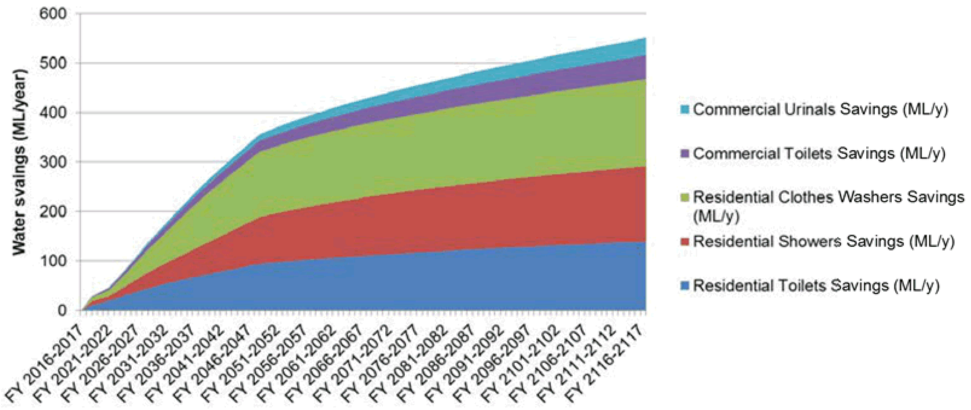

Figure 4-10: Projected annual average water savings for Richmond/Waimea High Growth Scenario due to changes in plumbing code.

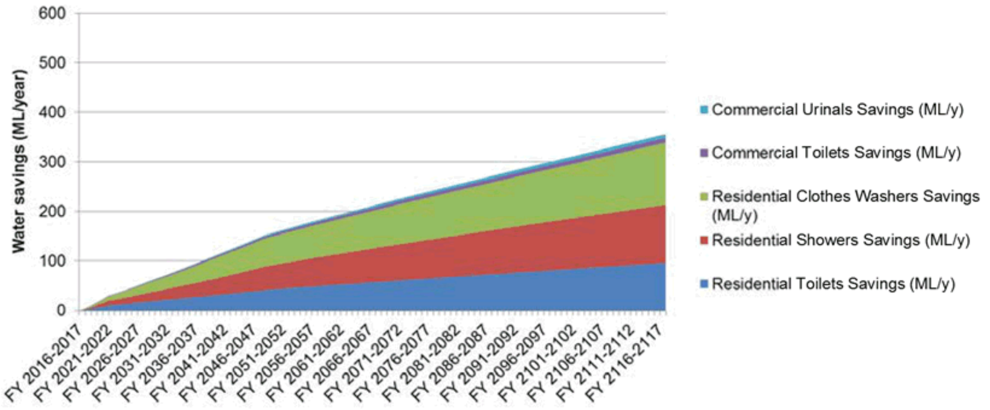

Figure 4-11: Projected annual average water savings for Brightwater/Hope High Growth Scenario due to plumbing code.

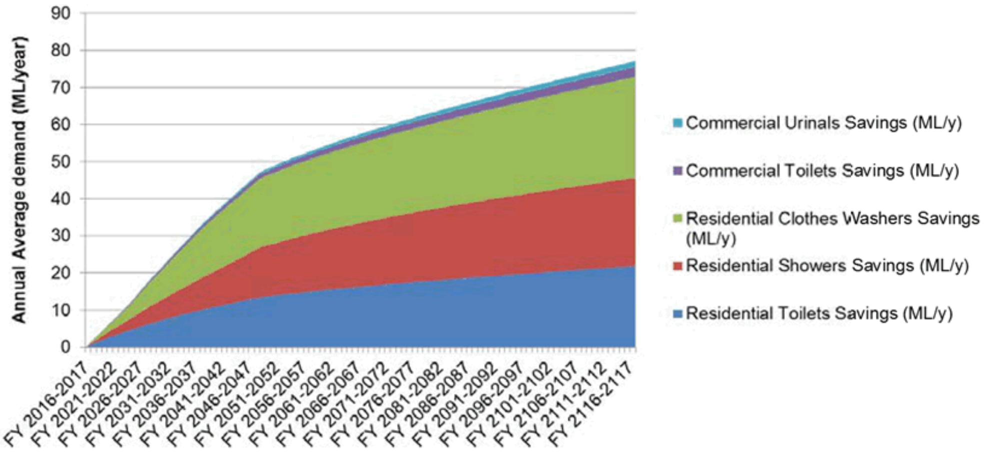

Figure 4-12: Projected annual average water savings for Wakefield High Growth Scenario due to plumbing code.

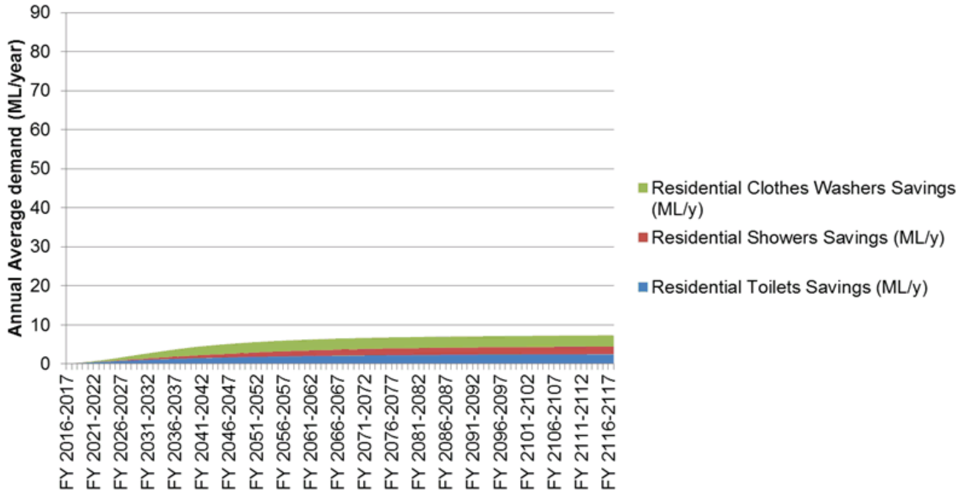

Figure 4-13: Projected annual average water savings for Redwood Valley Zero Growth Scenario due to plumbing code.

The baseline annual demand forecasts for the two growth scenarios and allowing for the impact of WELS are shown in the graphs in Figure 4-14 to Figure 4-17, along with the historical demands. This graph includes the projected impact of the passive savings due to WELS.

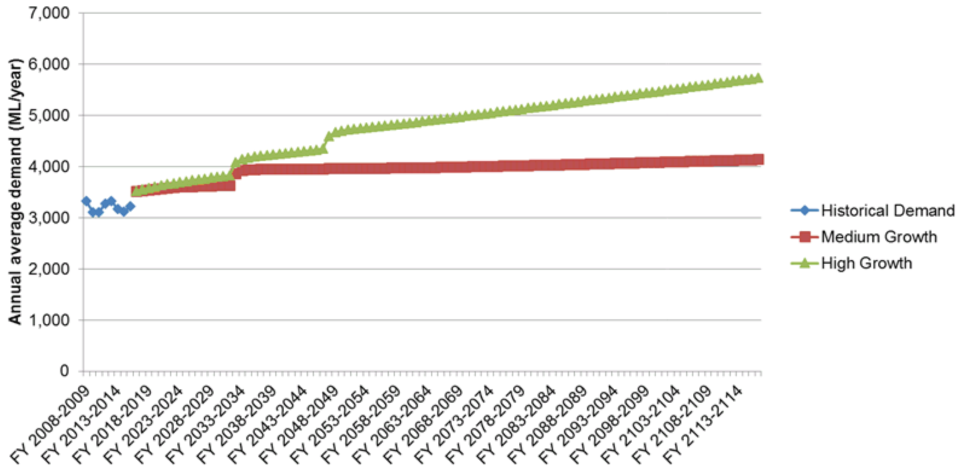

Figure 4-14: Baseline Richmond/Waimea annual demand forecasts with plumbing code.

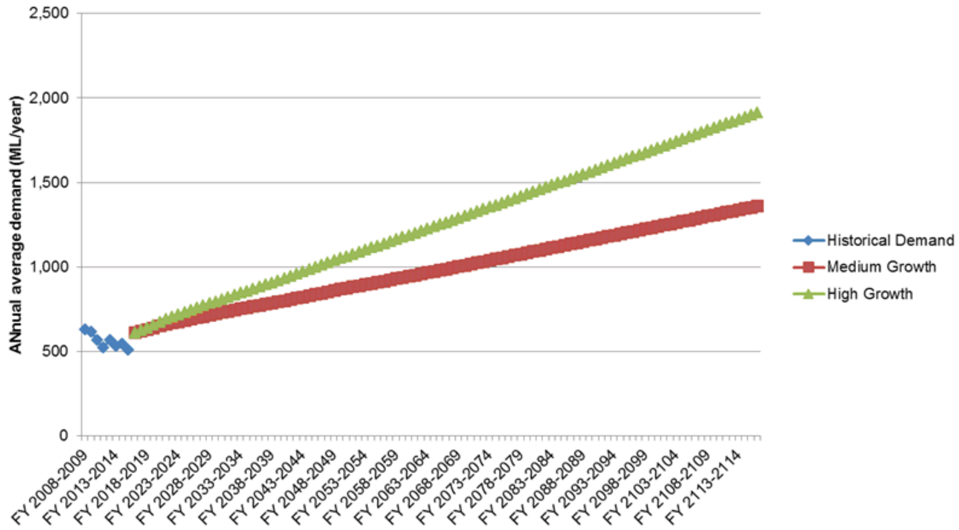

Figure 4-15: Baseline Brightwater/Hope annual demand forecasts with plumbing code.

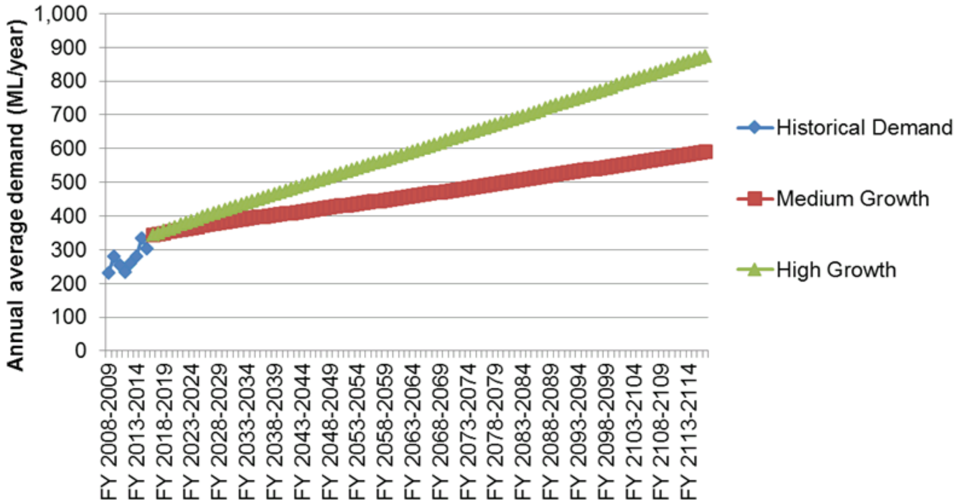

Figure 4-16: Baseline Wakefield annual demand forecasts with plumbing code.

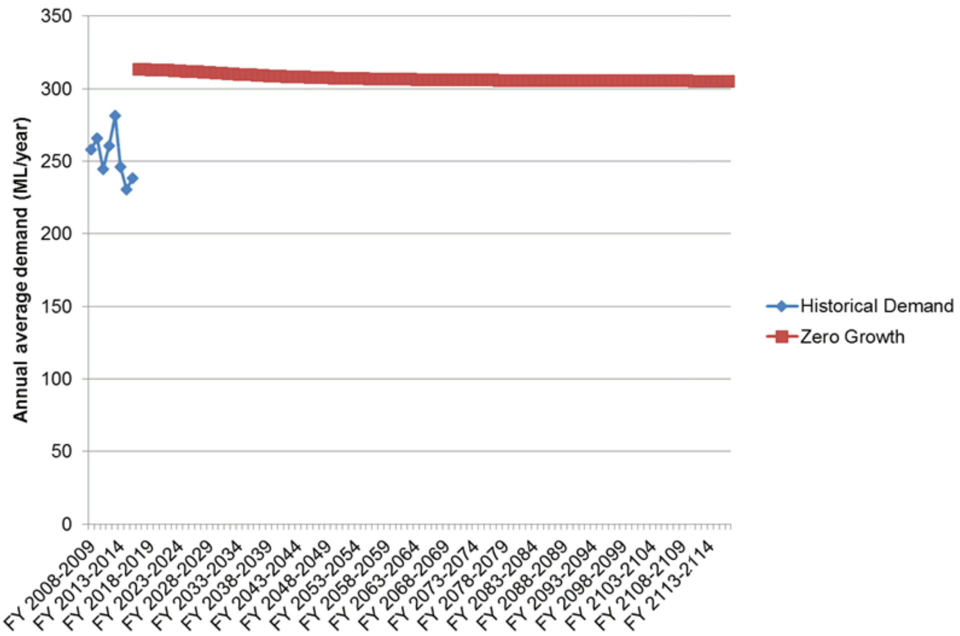

Figure 4-17: Baseline Redwood Valley demand forecasts with plumbing code.

4.7 Impact of Demand Management on the Demand Forecasts

4.7.1 Individual Demand Management Measures

Up to 13 individual demand management measures were set up in the DSS Models, as follows.

1. Education programme.
2. Water restrictions with enforcement.
3. Pricing increases.
4. Mandate efficient fixtures.
5. Rainwater harvesting new homes.
6. Rainwater harvesting existing homes.
7. Leakage reduction through pressure management (Richmond/Waimea scheme only).
8. Leakage reduction to the ELL.
9. Customer meter renewal (residential).
10. Customer meter renewal (business).
11. Business water saving initiative.
12. Residential shower retrofit programme.
13. Residential toilet retrofit programme.

These measures were based on the shortlisted measures from the July 2015 report "Evaluation of Options for Waimea Basin Urban Water Supplies in the Event Waimea Community Dam Does Not Proceed", plus a few additional targeted measures (eg. residential shower retrofit programme). An education programme is a foundation measure and always needs to be considered to enable success of a water conservation programme.

The input assumptions for each demand management measure are tabled in Appendix G.

The financial benefits and costs of water demand management have been modelled using several input assumptions for avoided costs as shown in Appendix G. The utility benefits are based on the water production unit operational costs for energy costs (treatment costs are insignificant compared to energy costs and have been excluded from the models). Capital costs have not been considered as it is not possible for the Council to postpone the Waimea Community Dam by water demand management. Other significant capital costs for water supply are largely driven by water treatment requirements and cannot be postponed by water demand management. The customer benefits are based on the unit costs for saving water (based on volumetric water charges) and energy from hot water reduction. Community benefits and costs are the sum of benefits and costs for both the utility and the customer.

The benefits and costs of the modelled water demand management measures for the High Growth Scenario are tabled in Table 5-1. Typically, there are only two measures that have a modelled benefit cost ratio of at least 1, the leakage reduction to the economic level of leakage (this must have a benefit cost ratio of 1), and the measure to mandate customers to install water efficient fixtures.

The highest community benefit cost ratio is typically the residential shower retrofit programme, due to the hot water savings for the consumer. The measures with the next highest community benefit cost ratios are mandating efficient fixtures and rainwater harvesting for new homes. As the cost of supplying water increases over time the benefit cost ratio of the individual measures will also increase.

4.7.2 Demand Management Programmes

Three programmes were considered for water demand management as follows:

Programme A	Status quo Business as Usual including education, residential meter renewal and leakage reduction to the ELL in each scheme
Programme B	Programme A plus water restrictions with enforcement, measures targeting businesses and residential retrofit programmes
Programme C	Programme B plus all remaining measures

The measures selected for each programme are shown in the screen shot below.

Program Scenarios				
	Measures	Program A	Program B	Program C
Program Scenarios	Education programme	☑	☑	☑
	Water restrictions with enforcement	☐	☑	☑
	Pricing increases	☐	☐	☑
	Mandate efficient fixtures	☐	☐	☑
	Rainwater harvesting new homes	☐	☐	☑
	Rainwater harvesting existing homes	☐	☐	☑
	Leakage reduction through pressure ma	☑	☑	☑
	Leakage reduction to the ELL	☑	☑	☑
	Customer meter renewal (residential)	☑	☑	☑
	Customer meter renewal (business)	☐	☑	☑
	Business water saving initiative	☐	☑	☑
	Residential shower retrofit programme	☐	☑	☑
	Residential toilet retrofit programme	☐	☑	☑

Figure 4-18: Measure list for each demand management programme

The modelled present value of water savings and utility costs are shown Figure 4-19 for the Richmond/Waimea scheme as an example, along with the water utility benefit cost ratio. The current low cost of producing water in the Richmond/Waimea scheme is evident in the very low utility benefit cost ratios for the three selected programmes (all have a benefit cost ratio less than 1).

Conservation Program	Present Value of Water Savings	Present Value of Utility Costs	Water Utility Benefit/Cost Ratio
Program A with Plumbing Code	$1,267,716	$6,189,137	0.20
Program B with Plumbing Code	$2,093,437	$15,034,328	0.14
Program C with Plumbing Code	$3,419,891	$32,966,047	0.10

Figure 4-19: Utility benefits and costs for the three demand management programmes for Richmond/Waimea.

5 Supply Demand Balance Forecasts

5.1 Abstraction Limits

The water abstraction limits without rationing are shown in Table 5-1 for each scheme. The River Road, O'Connors and Waimea bores have new consents since the 2011 report and are all in the Delta zone. The Roding Dam is the Nelson City Council supply and is expected to be available under normal conditions but not during rationing.

Since the 2011 report, the Council have consented a new bore at Spring Grove for the Wakefield water supply scheme, although this is still in the process of being connected to the Wakefield supply.

Table 5-1: Water Abstraction Limits under the Rationing Rules Prior to the 2016 TRMP Changes

Scheme and Bores	Water Management Zone	Peak week (m^3/day)	Step 1 rationing at 80%	Step 3 rationing at 50%
Pigeon Valley Road	Wai-iti	1,300	1,040	650
Spring Grove	Wai-iti	3,070	2,456	1,535
Wakefield		**4,370**	**3,496**	**2,185**
Brightwater		**2,800**	**2,240**	**1,400**
Redwood – River Road	Delta	600	480	300
Redwood – Golden Hills	Delta	200	160	not available under Step 3
Redwood – O'Connors	Delta	350	280	not available under Step 3
Combined Redwood		**1,150***	**920**	**300**
Waimea	Delta	13,750	11,000	6,875
Richmond – Appleby/Cargill	Delta	7,272	5,818	3,636
Roding dam (NCC supply at set cost)	Delta	909	not available under Step 1	not available under Step 3
Combined Richmond Waimea		**21,931**	**16,818**	**10,511**

* Note that River Road and O'Connors have newer consents that allow Council to 'well share' when rationing occurs (as they are all in the Delta Zone). This means that during Step 1 rationing, Council can add up these two consents and as long as demands do not exceed the total limit of all two at 80% Council still comply. Without rationing Council cannot exceed the individual consented take at any point. This well sharing was required as Redwood demands are often at their take limit, and sometimes it is difficult for operations to balance out the flows from River Road bore to the O'Connor's and Golden Hills road sites.

The impact of the water rationing steps on the available water supply in each scheme is discussed in Section 5.2.

5.2 Drought Scenarios

The three drought scenarios (in increasing order of severity) modelled for the 100-year water supply demand balance forecasts are as follows.

- Step 1 rationing.
- Step 3 rationing.
- Step 5 (worse than Step 4) rationing.

Council have advised that Step 1 rationing typically occurs during peak summer periods. Step 3 rationing is also triggered almost every summer. The trigger for Step 3 rationing for the Waimea Plains water takes is a flow below 2,300 L/s for Wairoa at Irvines. Appendix H shows the historical river flows from 1999 to 2016. The table in Appendix H shows that Step 3 rationing has been triggered 15 out of the 17 summers from 1999 to 2016.

The droughts that occurred during the 2000/01 summer and the 1972/73 summer would have triggered Step 5 rationing (ie. the flows would have been worse than the trigger for Step 4 rationing. In the Step 5 rationing scenario, some of the well fields are unlikely to be available due to their proximity to the sea and the risk of saline intrusion. This is reflected in the tables below.

The TRMP contains additional clauses for the "no Waimea Community Dam" scenario which would apply even more severe rationing than modelled for this report.

The supply limits for the three drought scenarios are shown in the tables below. The Wakefield limits under the two more severe drought scenarios are Council's best estimate for the rationing that would be applied (in reality the plan is currently not prescriptive for the Wai-iti Dam Service Zone beyond Step 2 and the rationing limits would be decided by the Dryweather Task Force).

5.2.1 Step 1 Rationing

Maximum take amount is the amount in the column "Rationed bore take" (ie. the supply limit for these schemes).

Table 5-2: Step 1 Rationing

Scheme	Bores Available	Rationed Bore Take
Brightwater	Brightwater bores	Whichever achieves the greater reduction of either the bore allocation reduced by 20% of its maximum take limit (ie. 0.8*19,600 m³/week = m³/week). OR reduction in actual usage by 10% of the equivalent week averaged over the previous eight years.
Richmond/ Waimea/ Mapua	Waimea and Mapua bores (not emergency bores)	Whichever achieves the greater reduction of either the bore allocation reduced by 20% of its maximum take limit (ie. 0.8*(50,900+96,250) m³/week = m³/week). OR reduction in actual usage by 10% of the equivalent week averaged over the previous eight years.
Redwood	All bores	Whichever achieves the greater reduction of either the bore allocation reduced by 20% of its maximum take limit (ie. 0.8*4,200 m³/week = m³/week). OR reduction in actual usage by 10% of the equivalent week averaged over the previous eight years.
Wakefield (within the Wai-iti Dam)	Pigeon Valley Road and Spring Grove	Bore allocation reduced by 20% of its maximum take limit (ie. 0.8*30,590 m³/week = 24,472 m³/week).

5.2.2 Step 3 Rationing

Maximum take amount is the amount in the column "Rationed bore take" (ie. the supply limit for these schemes). Step 3 is expected to be reached every summer for the supplies in the Waimea zone.

Table 5-3: Step 3 Rationing

Scheme	Bores Available	Rationed BoreTake
Brightwater	Brightwater bores	Whichever achieves the greater reduction of either the bore allocation reduced by 50% of its maximum take limit (ie. 0.5*19,600 m³/week = 8,800 m³/week). OR reduction in actual usage by 25% of the equivalent week averaged over the previous eight years.

Scheme	Bores Available	Rationed BoreTake
Richmond/ Waimea Mapua	Waimea and Mapua bores (not emergency bores)	Whichever achieves the greater reduction of either the bore allocation reduced by 50% of its maximum take limit (ie. 0.5*(50,900+96,250) m³/week = 73,575 m³/week). OR reduction in actual usage by 25% of the equivalent week averaged over the previous eight years.
Redwood	Rivers Road bore only	Whichever achieves the greater reduction of either the bore allocation reduced by 50% of its maximum take limit (ie. 0.5*4,200 m³/week = 2,100 m³/week). OR reduction in actual usage by 25% of the equivalent week averaged over the previous eight years.
Wakefield (within the Wai-iti Dam)	Pigeon Valley Road and Spring Grove	Bore allocation reduced by 50% of its maximum take limit (ie. 0.5*30,590 m³/week = 15,295 m³/week).

5.2.3 Step 5 Rationing

Maximum take amount is shown in the column "Amount for maintenance of human health and animal welfare".

Table 5-4: Step 5 rationing

Scheme	Amount for maintenance of human health and animal welfare*	Bores available	Rationed bore take
Brightwater	125 L/capita/day X population (ie. maintenance of human health).	Brightwater bores.	No allowable take under Step 5 rationing.
Richmond/ Waimea/ Mapua	125 L/capita/day X population (ie. maintenance of human health).	Backup wells only (WW1413 and 1408)[4] All other bores will be unavailable due to the risk of saline intrusion.	No consented take under Step 5 rationing.
Redwood	125 L/capita/day X population (ie. maintenance of human health).	Rivers Road bore only.	No allowable take under Step 5 rationing.
Wakefield (within the Wai-iti Dam)	125 L/capita/day X population (ie. maintenance of human health).	Pigeon Valley Road and Spring Grove.	Depends on Dry Weather Task Force, assume 125 LPCD.

* Excludes the stock requirement defined under maintenance of animal welfare (for rural restricted properties with stock) due to a lack of information on stock numbers.

Under Step 5 rationing, the TRMP rules limit the abstraction to 125 LCD. Limiting the take to this amount will result in less than 125 LCD delivered to households in reality as water supply networks will always have water loss through leakage. In addition, there is only so much that the water network supplier can do to restrict each connected customer to their allocated amount (which will be less than 125 LCD at the tap due to network leakage).

[4] Council analysis has shown that each of the two emergency bores (backup wells) could pump at least 220 m³/hour. Each bore pump would need to run for almost five hours to achieve a total supply of two,100m³/day to provide 125 LCD for the start year population.

5.3 30-year Supply Demand Balance Forecast Graphs to 2048

5.3.1 Introduction to the Supply Demand Balance Forecast Graphs to 2048

The supply limits for the three schemes with Waimea Plains water takes have been graphed under the three drought scenarios outlined above for the critical 30-year horizon (coinciding with the next infrastructure strategy from 2018-2048). The supply limits in the SDB graphs are based on the assumption that the peak week (using the peak demand with plumbing code scenario, ie. no demand management programme) occurs with the same timing every year (this is the worst case for the most rigorous rationing). But they are also realistic, ie. they do not show the ever decreasing limits that would result if there were no exceedances (in other words, it is realistic to expect that there would be occasional exceedances of the supply limits under the rationing steps). The ever decreasing limits are due to the TRMP clause that requires a reduction in actual usage by 10% of the equivalent week averaged over the previous eight years.

5.3.2 Richmond/Waimea supply demand balance forecasts

The graphs below show the Richmond/Waimea water supply demand balance forecasts under the high and medium growth scenarios to 2048. The high growth scenario graph clearly shows that the Richmond/Waimea scheme has a current supply deficit immediately, under Step 1 rationing and greater. The supply demand balance remains in deficit for the next 30-years under all demand management programmes given high growth, and is very marginal for most demand management programmes under medium growth. This is primarily because the new TRMP rules applying in the "No Waimea Community Dam" scenario require the most severe of either a reduction in the take limit or a reduction in the eight-year average of the peak week.

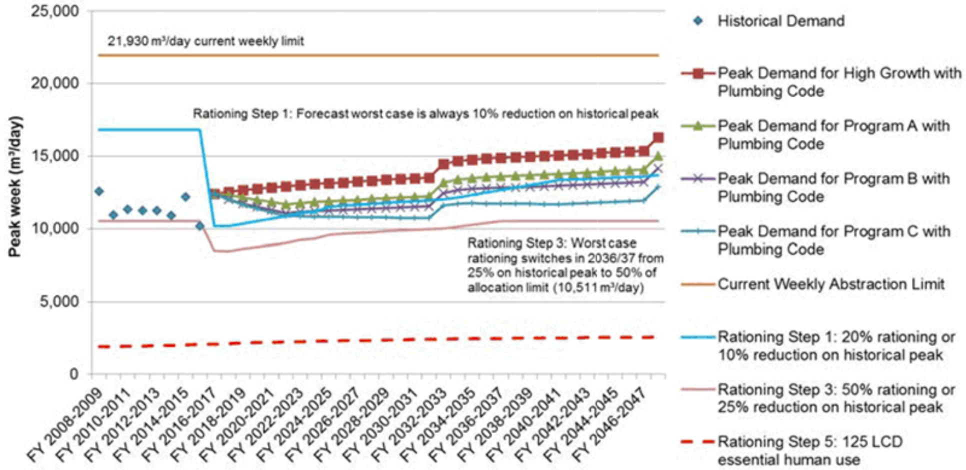

Figure 5-1: Richmond/Waimea peak week supply demand balance forecast for high growth to 2048.

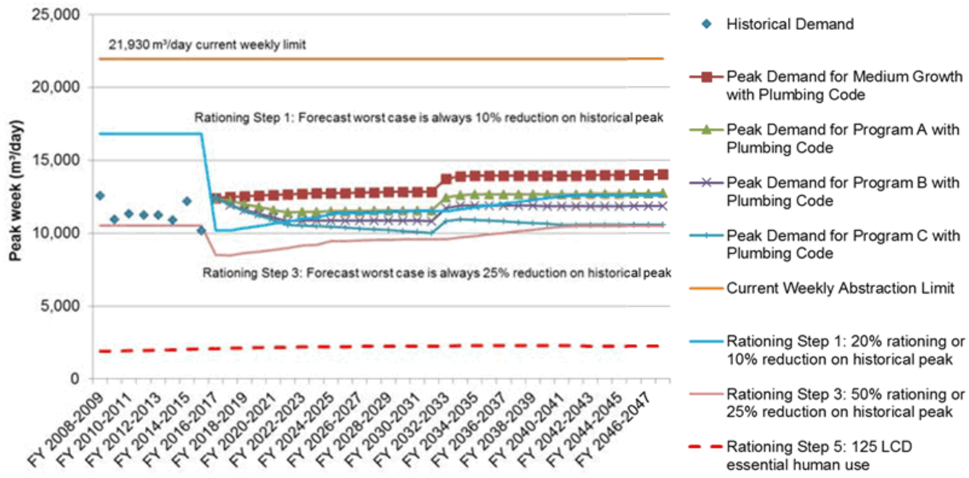

Figure 5-2: Richmond/Waimea peak week supply demand balance forecast for medium growth to 2048.

5.3.3 Brightwater/Hope Supply Demand Balance Forecasts

The graphs below show the Brightwater/Hope water supply demand balance forecasts under the high and medium growth scenarios to 2048. The Brightwater/Hope scheme has a supply deficit immediately under the Step 1 rationing, and this continues to worsen throughout the planning horizon regardless of the growth scenario or the demand management programme. Again, the supply limitations are primarily because of the new TRMP rules applying in the "No Waimea Community Dam" scenario.

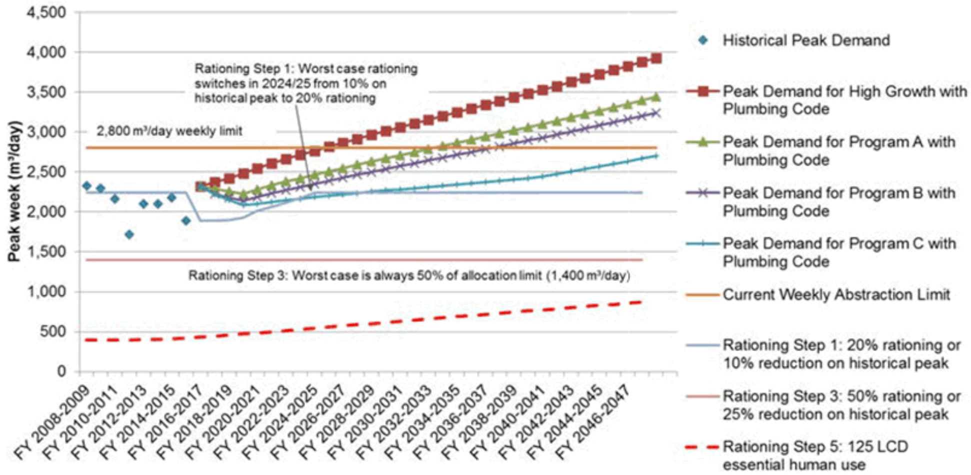

Figure 5-3: Brightwater/Hope Peak week supply demand balance forecast for high growth to 2048.

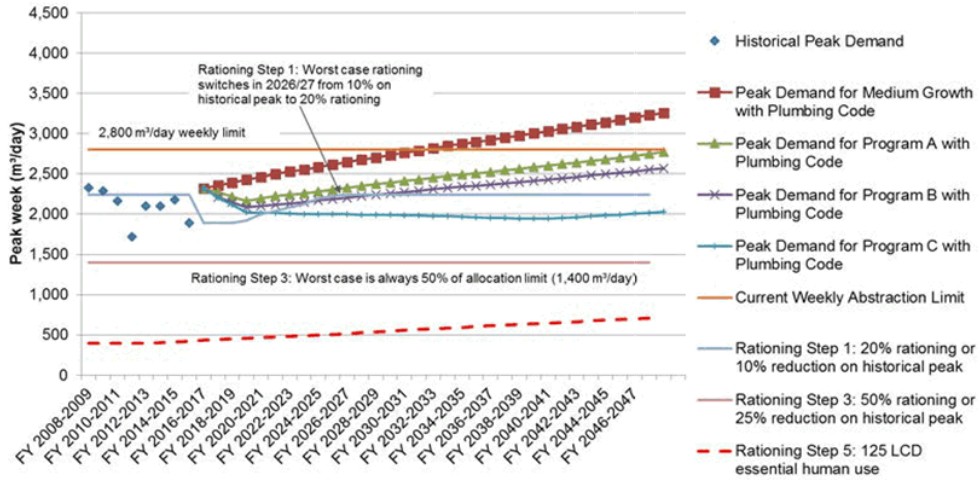

Figure 5-4: Brightwater/Hope peak week supply demand balance forecast for medium growth to 2048.

5.3.4 Wakefield Supply Demand Balance Forecasts

The graphs below show the Wakefield water supply demand balance forecasts under the high and medium growth scenarios to 2048. The Wakefield scheme is the only scheme with headroom in the SDB graphs (ie. supply in excess of demand during rationing). It has a supply excess for the full 30-years, even under Step 3 rationing (but not under Step 5 rationing). This is primarily due to its different water source, the Wai-iti Dam. The Wai-iti Dam Service Zone does not have the more strict rationing rules associated with the Waimea plains water sources. The Wakefield limits under the two more severe drought scenarios are Council's best estimate for the rationing that would be applied (in reality the plan is currently not prescriptive for the Wai-iti Dam Service Zone beyond Step 2 and the rationing limits would be decided by the Dry Weather task force).

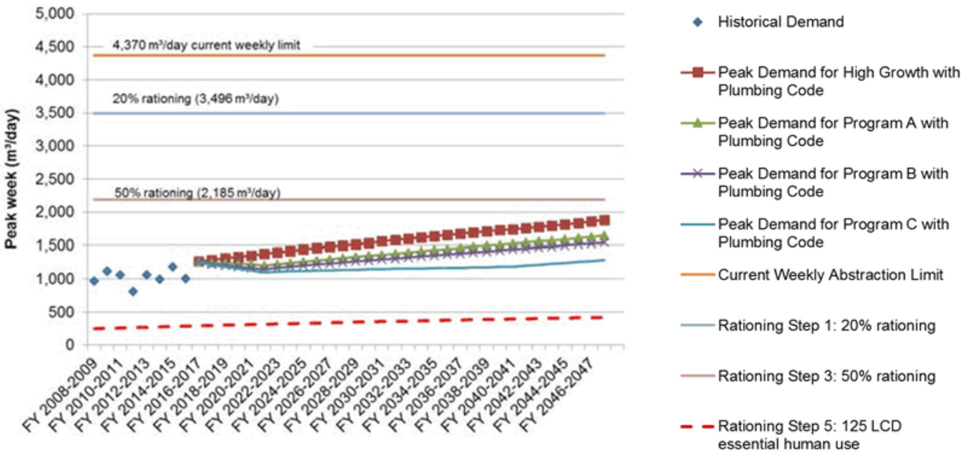

Figure 5-5: Wakefield peak week supply demand balance forecast for high growth to 2048.

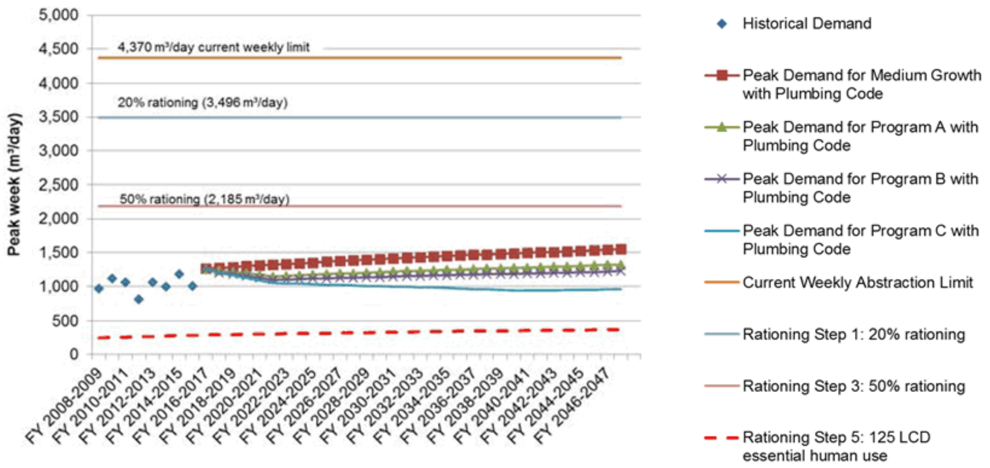

Figure 5-6: Wakefield peak week supply demand balance forecast for medium growth to 2048

5.3.5 Redwood Valley Supply Demand Balance Forecasts

The graphs below show the Redwood Valley water supply demand balance forecasts under the high and medium growth scenarios to 2048. The Redwood Valley schemes have a supply deficit immediately under the Step 1 rationing, and this continues to worsen throughout the planning horizon regardless of the growth scenario or the demand management programme. The forecast shows a starting year peak week demand assumption that matches the sum of the water take abstraction limits (1,190 m³/day[5]). The graphs show a large decrease in the supply limits for Step 3 and Step 5 rationing. For these two drought scenarios, only the Rivers Road bore is assumed to be available.

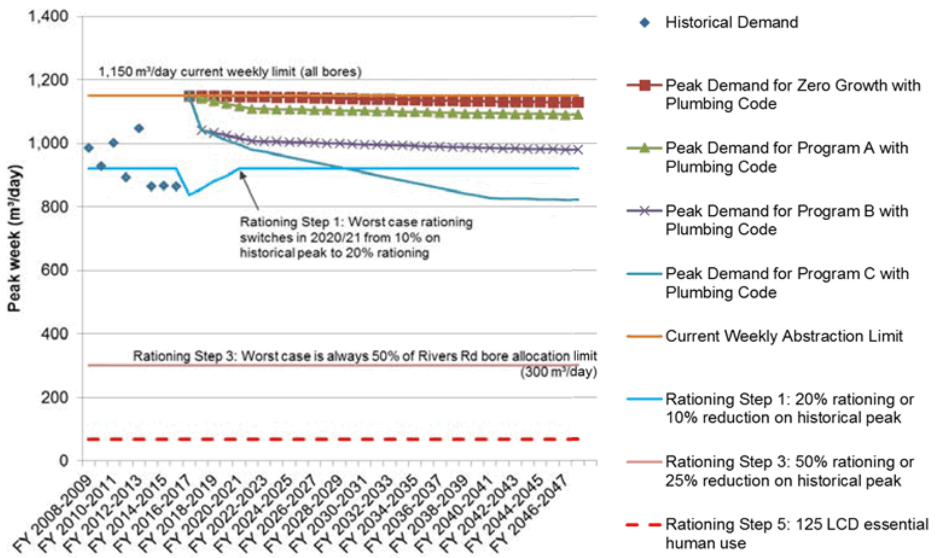

Figure 5-7: Redwood Valley peak week supply demand balance forecast for zero growth to 2048.

[5] Council cannot exceed the individual consented take at any point but during rationing, the take limits for River Rd, O'Connors and Waimea can be shared to assess compliance.

5.4 100-year Supply Demand Balance Forecasts to 2118

The SDB graphs for 100-years are shown below for all four schemes under the two growth scenarios and allowing for passive water savings (ie. with plumbing code).

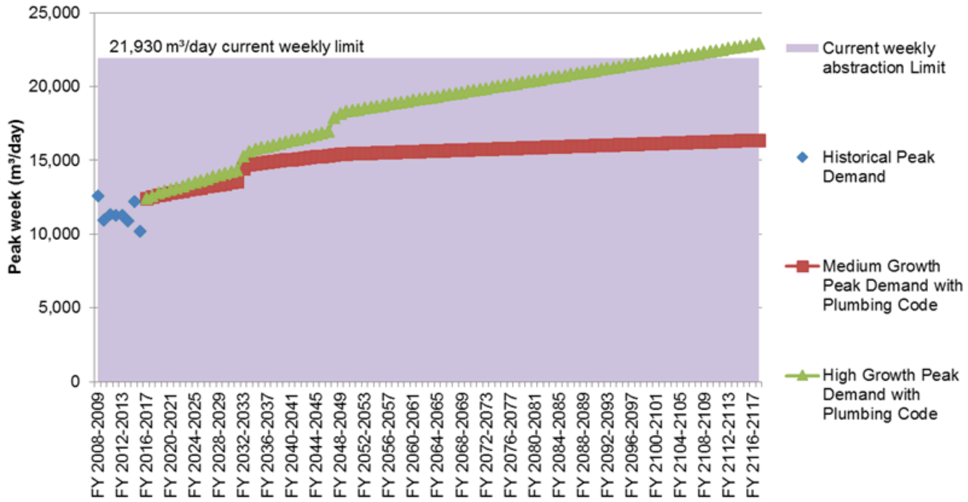

Figure 5-8: Richmond/Waimea 100-year Peak Week Supply Demand Balance Forecasts.

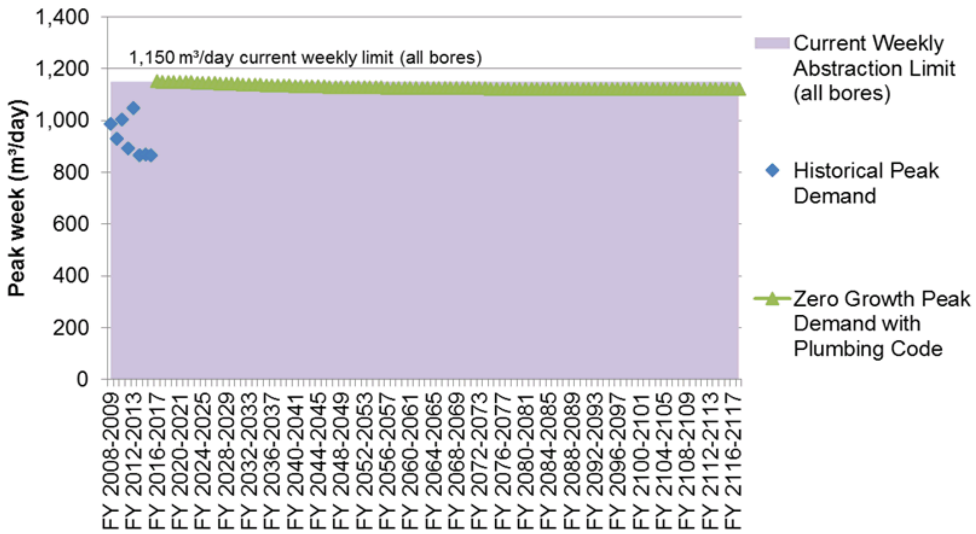

Figure 5-9: Brightwater/Hope 100-year Peak Week Supply Demand Balance Forecasts.

Figure 5-10: Wakefield 100-year Peak Week Supply Demand Balance Forecasts.

Figure 5-11: Redwood Valley 100-year Peak Week Supply Demand Balance Forecasts.

5.5 Combined 100-year Supply Demand Balance Forecasts to 2118

The combined SDB graphs for 100-years present the sum of the demand forecasts for all four schemes under the two growth scenarios and the three water demand management programmes (and allowing for passive water savings). The 100-year forecast is the planning horizon for the Waimea Community dam. The stepped change shown in the forecasted demands in the graphs below is due to the assumed timing and demands for new large industries.

An additional two graphs are included below to show the sum of the demand forecasts excluding Wakefield (Combined excluding Wakefield graphs). These graphs show the reduction in future demand if Wakefield continued to be supplied from the Wai-iti Dam Service Zone.

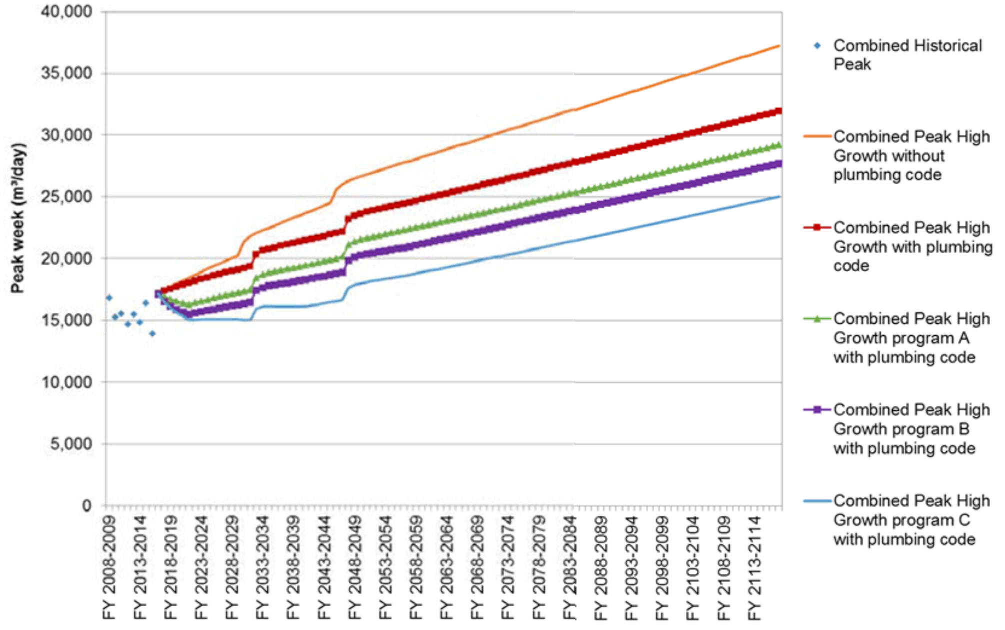

Figure 5-12: Combined 100-year Peak Week Supply Demand Balance Forecast for High Growth.

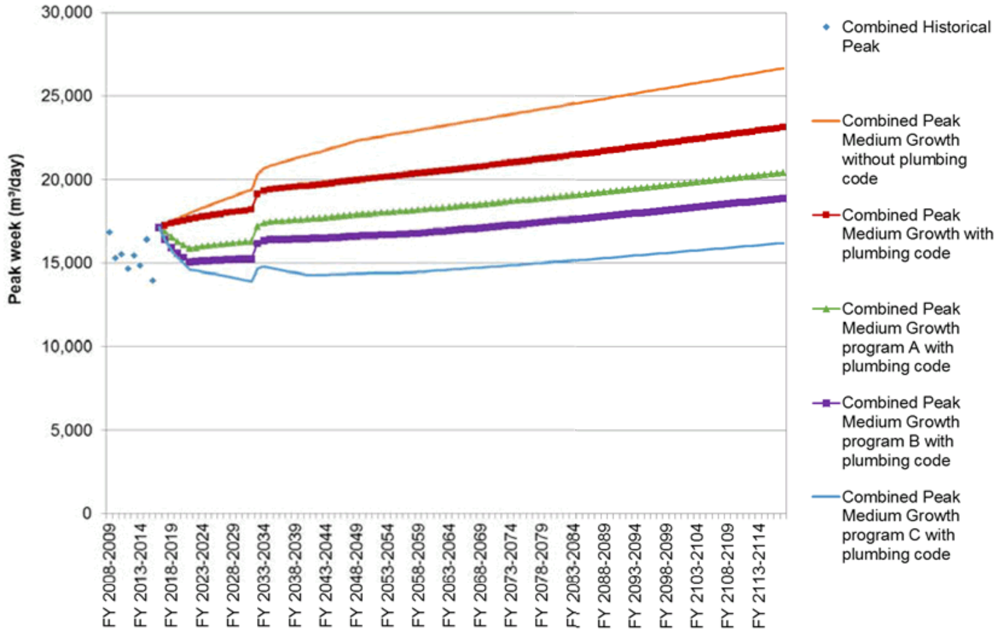

Figure 5-13: Combined 100-year Peak Week Supply Demand Balance Forecast for Medium Growth.

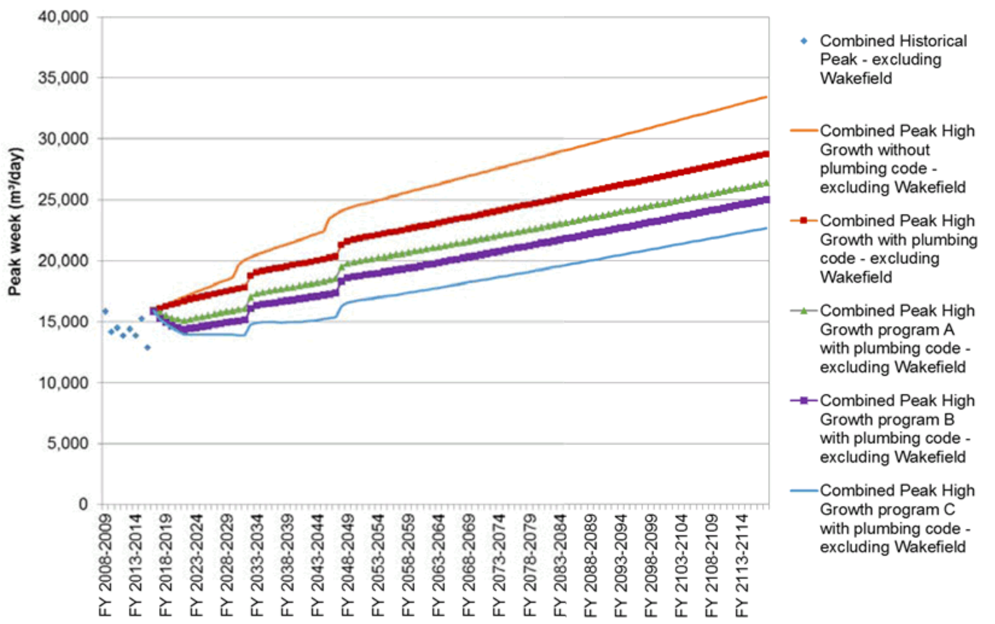

Figure 5-14: Combined excluding Wakefield 100-year Peak Week Supply Demand Balance Forecast for High Growth.

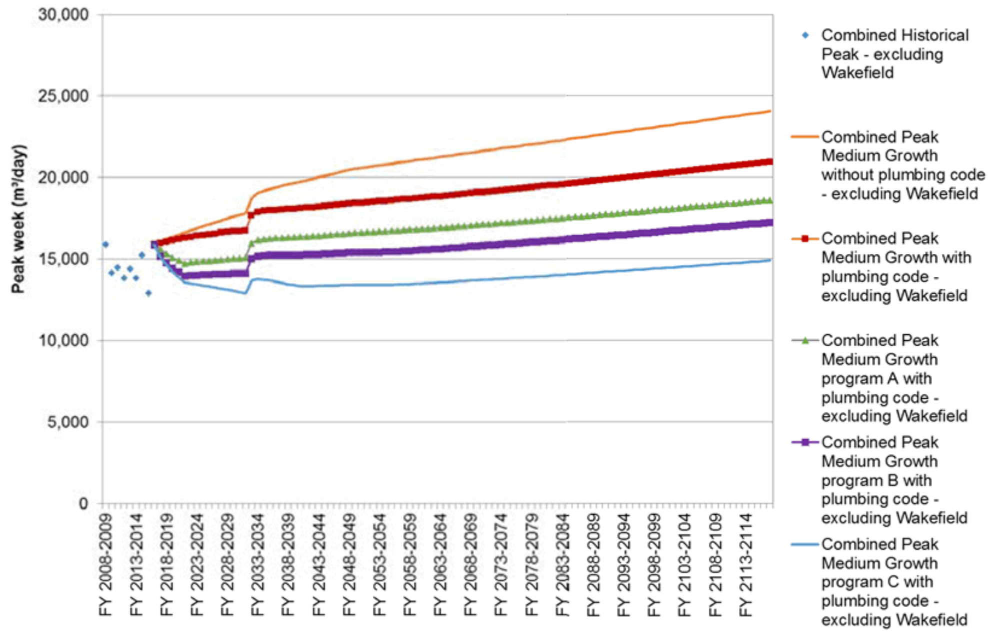

Figure 5-15: Combined excluding Wakefield 100-year Peak Week Supply Demand Balance Forecast for Medium Growth.

The tables below show the 2118 peak week demand forecasts under the different scenarios. These tables provide a range in amounts that Council will need to secure from either the operation of the Waimea Community Dam or otherwise, for its community water supplies over the next 100-years. The existing water takes near the coast may be subject to increased saline intrusion with climate change. The current coastal water takes have uncertain availability over the 100-year timeline.

The 2118 peak week demand forecasts under the high growth scenario range from 25,000 m³/day to 37,300 m³/day for the combined demand from all four schemes. The 2118 peak week demand forecasts under the medium growth scenario range from 16,200 m³/day to 26,700 m³/day for the combined demand from all four schemes. These peak forecasts are based on the average of historical peak week factors under the previous TRMP rationing rules.

There is high uncertainty for the unconstrained demands that could occur if the Waimea Community Dam is built, particularly the timing and demand from new large industries. Higher peak week factors would be likely in the absence of rationing. The highest historical peak week factors were approximately 15% higher than the adopted peak factors for the modelling. This additional 15% would result in high growth scenario forecasts ranging from 30,000 m³/day to 43,000 m³/day for the combined demand from all four schemes.

Table 5-5: Future Peak Week Demand in 2118 under High Growth Scenario (m³/day)

	Richmond / Waimea	Brightwater / Hope	Wakefield	Redwood Valley	TOTAL m³/day
Peak Week High Growth without Plumbing Code	23,050	9,240	3,820	1,150	**37,260**
Peak Week High Growth with Plumbing Code	20,310	7,290	3,230	1,120	**31,950**
Peak Week High Growth Programme A with Plumbing Code	19,060	6,260	2,860	1,080	**29,260**
Peak Week High Growth Programme B with Plumbing Code	18,120	5,920	2,710	970	**27,720**
Peak Week High Growth Programme C with Plumbing Code	16,840	5,020	2,360	810	**25,030**

Table 5-6: Future peak week demand in 2118 under medium growth scenario (m³/day)

	Richmond / Waimea	Brightwater / Hope	Wakefield	Redwood Valley	TOTAL m³/day
Peak Week medium Growth without Plumbing Code	16,370	6,540	2,610	1,150	**26,670**
Peak Week medium Growth with Plumbing Code	14,640	5,180	2,180	1,120	**23,120**
Peak Week medium Growth Programme A with Plumbing Code	13,390	4,150	1,810	1,080	**20,430**
Peak Week medium Growth Programme B with Plumbing Code	12,450	3,810	1,670	970	**18,900**
Peak Week medium Growth Programme C with Plumbing Code	11,180	2,910	1,310	810	**16,210**

5.6 Inter-Scheme Connectivity

5.6.1 Richmond to Brightwater Scheme Connectivity

Brightwater currently supplies water to Three Brothers Corner (SH6- SH60 intersection). The Brightwater scheme is close to its take limits, and could not provide additional water to Richmond except in an emergency and the capability would be limited.

Richmond could, if required, probably push water towards Brightwater but until the Richmond West/South pipeline and reservoir is constructed the capacity is limited by the capacity of the Queen Street supply. Potentially capacity may reach to Clover Road but would need to be modelled to confirm that levels of service could be met.

5.6.2 Brightwater to Wakefield Scheme Connectivity

There is a current connection between Wakefield and Brightwater with a gravity supply from Wakefield to Brightwater and a pumped connection (booster pump at Bird Road) from Brightwater to Wakefield.

5.6.3 Redwood Valley

The Redwood Valley scheme stands on its own so cannot get water from other schemes but there are three bore sites. River Road bore supplies both O'Connor and Golden Hills. Currently demands are close to the take limit at River Road so the potential to assist either Redwood 1 or 2 is limited.

Redwood 1 and 2 are connected with closed valves between them so water can be supplied from one to another in emergency.

5.6.4 Conclusions on Inter-Scheme Connectivity

The Brightwater to Wakefield scheme connection is the only inter-scheme connectivity that has the potential to assist in addressing the supply demand balance deficit for the Brightwater/Hope scheme in the short term.

5.7 Comparison with the 2011 Supply Demand Balance Forecasts

The following points provide an overview of the SDB Forecast methodology in this report.

- The DSS Model was set up for two growth scenarios for the demand forecasts for each sector: Medium and High Growth. The population growth forecasts were based on the Tasman District Council Growth Demand and Supply Model supplied in March 2017. Three demand management programmes were also modelled, labelled Programme A, Programme B and Programme C (see Section 4.7.2 for details).

- Three drought scenarios were modelled for the supply limits, based on increasing severity from Step 1 rationing (occurs every summer), to Step 3 rationing (occurs most summers) and finally Step 5 rationing (infrequent severe drought, last occurred in 2000/01). The potential influence of long term climate change has not been quantified in the forecasts but is not expected to have a significant influence on demands (and the supply yield) by the end of the 30-year horizon. (See Section 5.2 for details)

- The supply limits under rationing that were graphed for these three schemes are based on the assumption that the peak week (using the peak demand with plumbing code scenario, ie. no demand management programme) occurs with the same timing every year (this is the worst case for the most rigorous rationing). But they are also realistic, ie. they do not show the ever decreasing limits that would result if there were no exceedances (in other words, it is realistic to expect that there would be occasional exceedances of the supply limits under the rationing steps).

A comparison with the 2011 report shows that the 2011 report concluded that the Council take a precautionary approach to the amount of water reserved from the Lee Valley Dam and adopt a 100-year peak day demand forecast of at least 30,000 m^3/day for its "expected growth scenario". This is equivalent to a peak week demand at 100-years of 25,200 m^3/day. The 2011 "expected growth scenario" corresponded to the medium growth forecast at that time and inclusion of only three schemes (Richmond/Waimea, Brightwater/Hope and Redwood Valley). Wakefield and Mapua were only included in the high growth scenario in the 2011 report. The high growth scenario in the 2011 report had a peak day 100-year forecast of around 50,000 m^3/day (and an equivalent peak week of 42,000 m^3/day).

The 2011 expected growth forecast corresponds most closely to the "Combined excluding Wakefield" forecasts under medium growth in this report. In Table 5-6 of this report, the 2118 forecast under Medium Growth Scenario without plumbing code and excluding Wakefield is around 24,000 m^3/day (this is quite similar to the 2011 expected growth forecast for the peak week of 25,200 m^3/day which also includes one new wet industry).

There are many differences in assumptions (population and business growth projections, start year demand per customer, impact of water demand management etc.) between the 100-year water demand forecasts prepared for the 2011 report and the 100-year water demand forecasts prepared for this 2017 update. The significant improvements in modelling approach for the 2017 update are outlined in Section 2.2 of this report. Most of the customer sectors have shown a declining trend in average and peak demands over the six years since the 2011 report and this is reflected in the lower start year assumptions in this 2017 update. Likely causes of the declining trend in recent demands since 2011 include:

- water price increases
- increases in trade waste charges for the large industries
- improvements in the number of water efficient devices and
- lower peak residential demands due to frequent summer rationing and additional communications to improve public awareness of the need to conserve water.

6 Conclusions

Our independent technical analysis for the 2017 Waimea Basin water demand forecast update has reached the following conclusions.

1. The Richmond/Waimea scheme has a supply deficit immediately, under Step 1 rationing and greater. It remains in deficit for the next 30-years under all demand management programmes given high growth, and is very marginal for most demand management programmes under medium growth. This is primarily because the new TRMP rules applying in the "No Waimea Community Dam" scenario require the most severe of either a reduction in the take limit or a reduction in the eight-year average of the peak week (see Figures 5-1 and 5-2).

2. Brightwater/Hope and Redwood Valley schemes have a supply deficit immediately, under the Step 1 rationing and greater. This continues to worsen throughout the planning horizon regardless of the growth scenario or the demand management programme. The new TRMP rules also apply to these schemes (see Figures 5-3, 5-4 and 5-7).

3. The Wakefield scheme is the only scheme with available water supply capacity (ie. supply in excess of current demand during rationing). It has a supply excess for the full 30-years, even under Step 3 rationing (but not under step 5 rationing). (See Figures 5-5, 5-6). This is primarily due to its different water source, the Wai-iti Dam Service Zone. The Wai-iti Dam Service Zone does not have the more strict rationing rules associated with the Waimea Plains water sources. The Wakefield limits under the two more severe drought scenarios are Council's best estimate for the rationing that would be applied (in reality the plan is currently not prescriptive for the Wai-iti Dam Service Zone beyond Step 2 and the rationing limits would be decided by the Dry Weather task force). The Brightwater to Wakefield scheme connection is the only inter-scheme connectivity that has the potential to assist in addressing the supply demand balance deficit for the Brightwater/Hope scheme in the short term (but not under step 5 rationing).

4. The water demand forecasts show a potential range in amounts that Council will need to secure from either the operation of the Waimea Community Dam or otherwise, for its community water supplies over the next 100-years. The 2118 peak week demand forecasts under the high growth scenario range from 25,000 m^3/day to 37,300 m^3/day for the combined demand from all four schemes. The 2118 peak week demand forecasts under the medium growth scenario range from 16,200 m^3/day to 26,700 m^3/day for the combined demand from all four schemes.

5. The growth projections underpinning the water demand forecasts are based on a methodology agreed with Council (including Council's 2018 Growth Model Projections for new residential connections, economic growth projections for new commercial and industrial connections and assumptions for new large industries). Actual growth in new residential and non-residential connections could be higher or lower than forecast.

6. There is high uncertainty for the unconstrained demands that could occur if the Waimea Community Dam is built, particularly the timing and demand from new large industries. Higher peak week factors would be likely in the absence of rationing. The highest historical peak week factors were approximately 15% higher than the adopted peak factors for the modelling. This additional 15% would result in high growth scenario forecasts ranging from 30,000 m^3/day to 43,000 m^3/day for the combined demand from all four schemes. The unconstrained future demands cannot be modelled with any certainty.

7. This 2017 update includes a number of significant improvements in the demand forecasting approach since the 2011 report. The new forecast is a more robust demand forecast that is based on both bottom up end-use demands and top-down customer sector demands (See Section 2.2). The 2011 report estimated at least 25,000 m^3/day would be required for the 100-year peak week forecast for its "expected growth scenario" (based on the medium growth forecast at that time and inclusion of only three schemes Richmond/Waimea, Brightwater/Hope and Redwood Valley). This figure is of a similar order of magnitude to the combined peak week forecast excluding Wakefield and for medium growth in this 2017 update.

8. The historical analysis of demands for the Waimea Basin water supply schemes found that the metered residential demands appear to have shown a declining trend and are currently at the Council target level set in the 2015 AMP. (See Section 3.11). While it is useful to understand historical demands, it should be noted that future demands may be different, particularly as the triggers for rationing recently changed in 2016 (leading to more severe rationing).

9. The historical analysis found that most schemes have leakage levels above (or significantly above) the Council targets set in the 2015 AMP. The estimated current volume of leakage in the Waimea Basin schemes (after subtraction of apparent losses) is expected to be over 3,000 m^3/day (See Section 3.10). Reduction of leakage and apparent losses should be a priority for Council to demonstrate water use efficiency. The Richmond/Waimea area should be a priority for further water loss reduction, followed by the Wakefield scheme. Leak detection has recently been undertaken in the Richmond scheme but the impact on NRW has not yet been quantified.

7 Recommendations

From the forecasts presented in this report (based on the input assumptions agreed with Council), MWH recommend that the Tasman District Council.

1. Proceeds with Plan A presented in Council's 2015 LTP; ie. securing a municipal demand allowance in the Waimea Community Dam - within the next six months.
2. Considers the 100-year demand forecasts under the different growth and water demand management scenarios (see Table 5-5 and Table 5-6) and decides on a municipal demand allowance in the Waimea Community Dam. (Note given the potential impacts of climate change and the significant uncertainty in the forecasts over the 100-year planning horizon, we suggest a precautionary approach is taken to the amount of water reserved for Council. Although a larger amount of water may cost the community, it may be the cheapest water future communities have access to and a good investment for the future of the district.)
3. Provides an alternative water supply option for the Richmond/Waimea, Brightwater/Hope and Redwood Valley schemes as soon as possible to avoid frequent exceedances of the water take consent limits. Consideration of alternative water supply options to the Waimea Community Dam is outside the scope of this study and would duplicate efforts covered by other reports.
4. Reviews and updates the water demand forecasts on at least the three-yearly Long Term Plan cycle and also after completion of the structure plans for growth.

8 References

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9 Glossary of Terms

Word or Acronym	Definition
AADD	Annual average daily demand.
ADD	Average daily demand (usually this is the annual average daily demand).
ADPW	Average day for the peak week (calculated by the maximum seven day rolling average of daily demands).
AMP	Activity Management Plan.
Baseline	Baseline water demand forecasts exclude the impact of demand management activities, eg. implementation of universal metering and volumetric pricing.
Business as usual	Business as usual water demand forecasts include the impact of demand management activities that the water provider has committed funds to.
CWS	Community water supply.
Demand management	Water conservation and source substitution approaches to reduce water supply demands.
DSS Model	Maddaus Water Management Inc.'s Demand Side Management Least Cost Planning Decision Support System Model.
LCD	Litres per capita per day.
LTP	Long Term Plan. A plan that describes what the Council is planning to do for the next 10 years and how they will pay for it. Prepared every three years.
NCC	Nelson City Council.
NRW	Non-revenue water. Total water production less billed authorised consumption. The NRW volume includes: leakage, unbilled authorized consumption (eg. firefighting, mains flushing etc.); and apparent losses (customer meter under-registration, systematic data handling errors in customer billing systems and unauthorized consumption).
OAG	Office of the Auditor General.
PDD	Peak day demand.
Rural-restricted	Rural property receiving water via a trickle flow restrictor. Rural-restricted connections are not metered.
SDB forecast	Supply Demand Balance forecast graphs show the forecast water supply availability against the forecasted water demands over the planning horizon.
TRMP	Tasman Resource Management Plan.
Water losses	Water supply system losses. A combination of real losses (leakage) and apparent losses (unauthorised consumption and meter inaccuracies).
Water year	The water year or financial year typically runs from 1 July to 30 June. For example the 2015/16 year is from 1 July 2015 to 30 June 2016 and includes the complete summer period for 2015/16.
WDMP	Water Demand Management Plan.
WELS	Water Efficiency Labelling Scheme.
WTP	Water treatment plant.

Appendix A Historical Demand Analysis by Scheme

A.1 Overview

The demand analysis graphs are presented for the following schemes (and scheme groupings).

1. Richmond/Waimea.
2. Brightwater/Hope.
3. Wakefield.
4. Redwood Valley.

Richmond/Waimea Scheme Grouping

The Richmond, Waimea and Mapua schemes are jointly supplied from the Waimea and Richmond bores. Figure A-1 shows the current configuration of the Richmond, Waimea and Mapua schemes (since the commissioning of the new Richmond water treatment plant in March 2015).

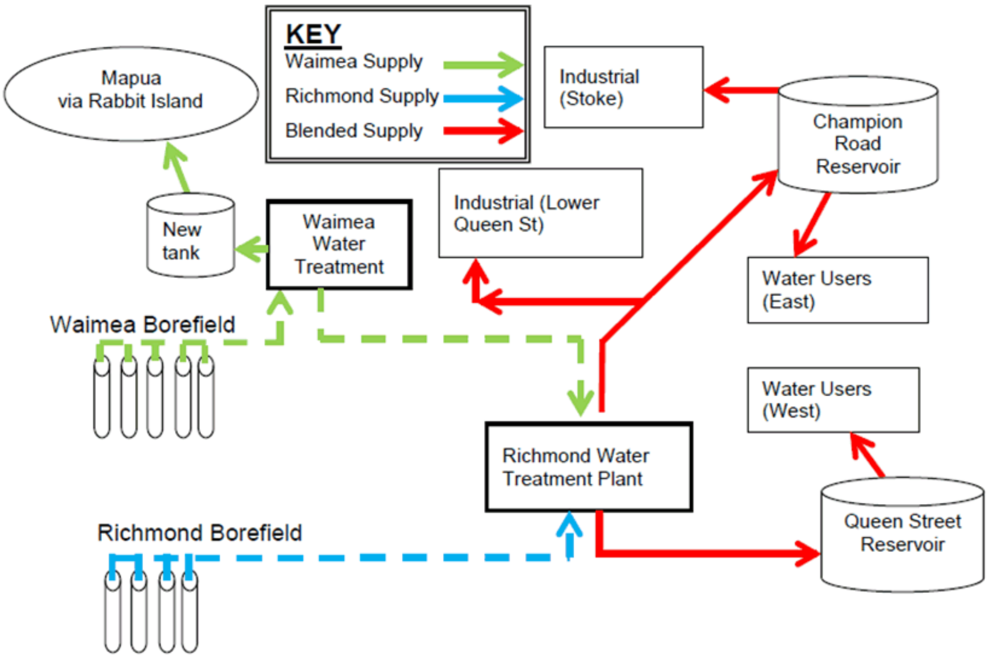


Figure A-1: Richmond/Waimea average annual demand by sector including non-revenue water.

The Richmond/Waimea scheme also supplies water to a small number of Nelson City customers.

A.2 Sector Demands

The sector demand graphs are presented for the following schemes (and scheme groupings).

1. Richmond/Waimea.
2. Brightwater/Hope.
3. Wakefield.
4. Redwood Valley.

Richmond/Waimea Demands by Sector

Figure A-2 shows the average annual demand by sector for the combined Richmond, Waimea and Mapua schemes. The non-revenue water calculations for Richmond/Waimea were based on the total water abstracted from the Richmond and Waimea bores. The non-revenue water trend is shown by the dashed red lines in each graph.

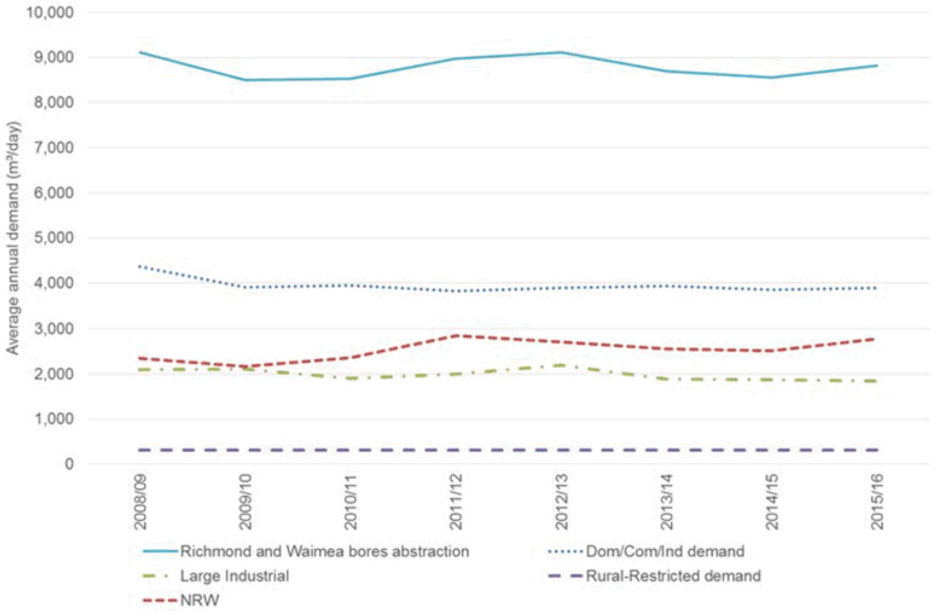


Figure A-2: Richmond/Waimea average annual demand by sector including non-revenue water.

Figure A-2 shows that the average annual demands for Richmond, Waimea and Mapua have not changed significantly from 2008/09 to 2015/16 (3% decrease from the 2008/09 figure to 2015/16). Lower annual demands were seen in 2009/10, 2010/11 and 2014/15.

Overall, Richmond, Waimea and Mapua's metered customer demands have decreased (-11%) over the eight-year period while the estimated non-revenue water has increased. Large industrial demand has fluctuated over the period but overall has decreased 12% from 2008/09 to 2015/16. The non-revenue water volume has increased from an average annual figure of 2,350 m^3/day in 2008/09 to 2,770 m^3/day in 2015/16 (an 18% increase).

The Council's 2015 Water Supply Asset Management Plan (AMP) noted pipe condition issues for all three schemes.

- The condition of most of the Richmond pipework is average. There are areas of pipe which are causing problems and many of the copper laterals and old AC pipes are coming to the end of their life. Some old mains and rider mains require renewal. Most pipe repairs are on old PE pipes (rider mains and service laterals and larger AC pipes from the 1960s). Many of the original PE rider mains have been renewed through the process of breakage and repair.
- The condition of most of the Waimea scheme reticulation is good, however the pH of the water is low and considered 'aggressive'. This results in copper laterals leaking and needing replacement. Note that this 2015 AMP comment was written prior to commissioning of the Richmond Water Treatment Plant which blends the Richmond and Waimea bore sources and reduces the corrosivity of the water which should result in reduced failures of copper laterals.
- The Mapua reticulation is mostly in average condition. There are areas of poor quality, fragile pipeline in Mapua. A section of trunk main from the treatment plant to the Pomona Road reservoir has burst a number of times since its construction. The first kilometre section of this main has been replaced. Other risk areas are Aranui Road, Stafford Drive, Pomona Road, Rabbit Island and Best Island Road.

It is likely that the frequent breaks in the Richmond and Mapua schemes are a contributing factor to the reasonably high leakage volumes.

The overall decrease in demand for the large Industrial users could be attributed to water price increases, change in economy, increase in water efficient devices, etc.

Brightwater/Hope Demands by Sector

Figure A-3 shows the average annual demand by sector for Brightwater/Hope.

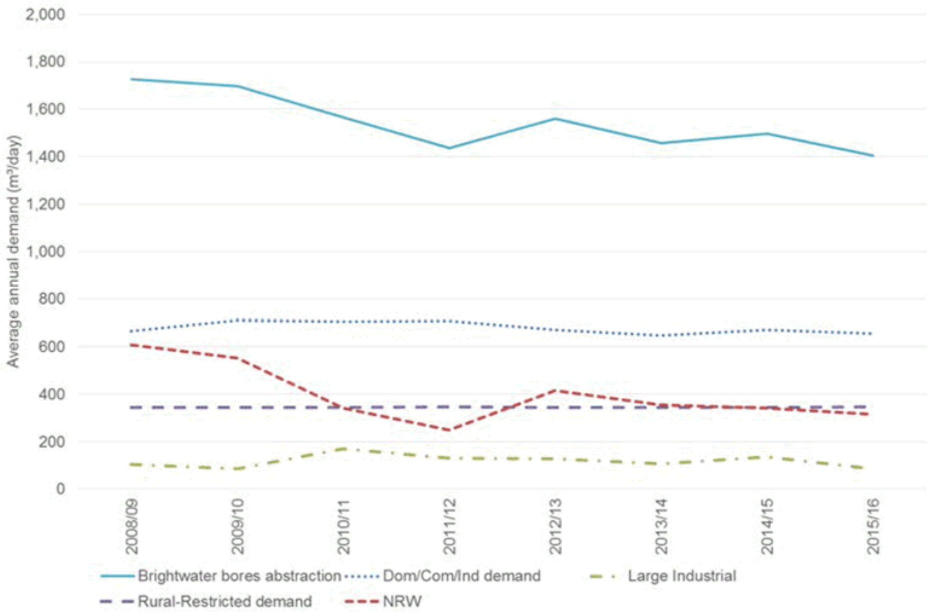


Figure A-3: Brightwater average annual demand by sector including non-revenue water.

Figure A-3 shows that the average annual demands for Brightwater have decreased significantly from 2008/09 to 2015/16 (-19%).

Overall, Brightwater's metered customer demands have decreased slightly (-4%) over the eight-year period while the estimated non-revenue water has decreased significantly. Large industrial use fluctuates has fluctuated over the period but overall has decreased 18% from 2008/09 to 2015/16. The highest average annual volume of non-revenue water was 600 m³/day in 2008/09. Non-revenue water decreased to a low of 249 m³/day in 2011/12 and has risen in recent years to 315 m³/day in 2015/16 (from 2008/09 to 2015/16 the non-revenue water volume has decreased by 48%).

The Council's 2015 Water Supply AMP noted the following key issue "the ageing reticulation system will need to be replaced in the future".

Wakefield Demands by Sector

Figure A-4 shows the average annual demand by sector for Wakefield. The known timing of leak detection and repair work are also shown on the graph for correlation with trends in non-revenue water.

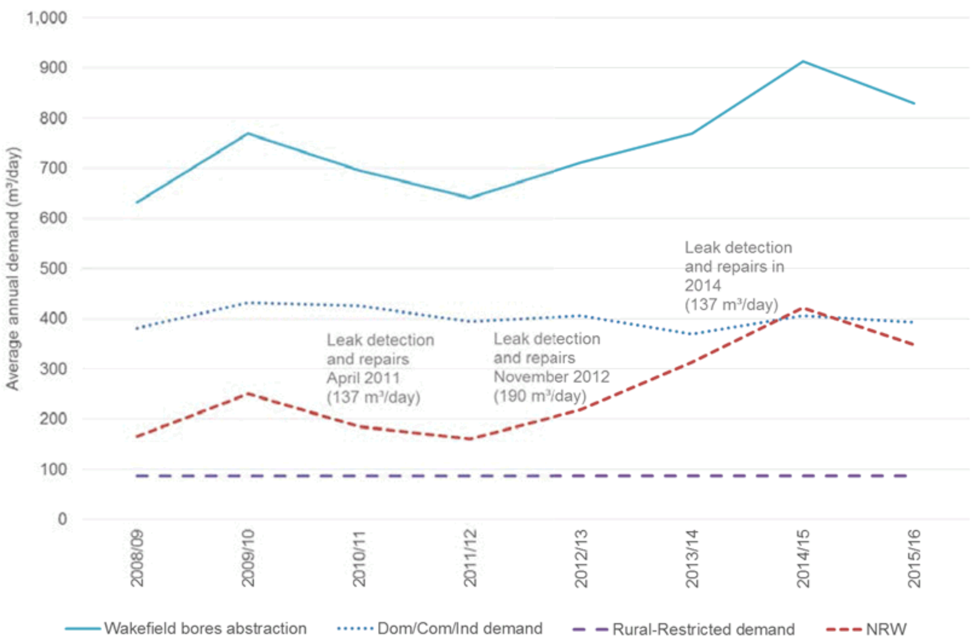


Figure A-4: Wakefield average annual demand by sector including non-revenue water.

Figure A-4 shows that the average annual demands for Wakefield have increased significantly from 2008/09 to 2015/16 (31%).

Overall, Wakefield's metered customer demands have increased slightly (3%) over the eight-year period while the estimated non-revenue water has increased significantly. The highest average annual volume of non-revenue water was 422 m³/day in 2014/15. Non-revenue water decreased to a low of 159 m³/day in 2011/12 and has risen in recent years to 349 m³/day in 2015/16 (from 2008/09 to 2015/16 the non-revenue water volume has decreased by 112%). Detection Services undertook leak detection work in April 2011, November 2012 and again in 2014.

The estimated volumes of leakage detected are stated on the graph. The Council's 2015 Water Supply AMP noted leakage as a key issue for the Wakefield Scheme ("The reticulation has a high leakage rate."). The pipe materials are noted as a contributing factor in the AMP, "the majority of the reticulation is asbestos cement and polythene for the smaller rider mains making them unreliable with problems typical to those material pipes. Frequent repairing and replacement of copper and polyethylene rider mains prone to leakage and breaks has helped reduce the issue. Many of the original polyethylene rider mains have been renewed through the process of breakage and repair."

Redwood Valley demands by sector

Figure A-5 shows the average annual demand by sector for Redwood Valley.

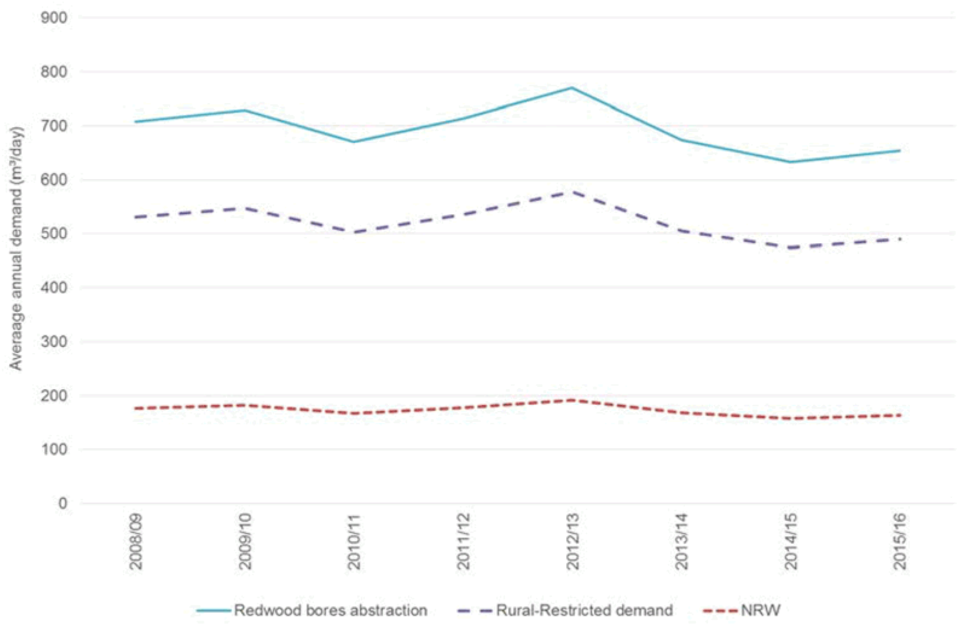


Figure A-5: Redwood Valley average annual demand by sector including non-revenue water.

Figure A-5 shows that the annual water abstracted has decreased from 2008/09 to 2015/16 after a peak in 2012/13. The sector breakdown is based on constant assumptions for rural-restricted demand (75% of water abstracted) and NRW (25% of water abstracted), therefore the trends for rural-restricted demands and NRW mirror the trend in annual water abstracted.

A3 Climate Corrected Demands

Climate Corrected Demands for the Richmond Scheme

The Richmond scheme was selected for climate corrected demand analysis as it is the largest scheme within the Waimea Basin.

We completed a time series analysis of Richmond's bulk water abstraction records using a regression analysis of daily per capita demands with climate variables (evaporation, rainfall, maximum temperature and soil moisture index) in the monthly WaterTrac model.

Figure A-6 shows the climate corrected abstraction for the Richmond scheme from 2007 to early 2015 in L/capita/day. The time period was selected based on excluding the Waimea industrial demands which were added to the scheme after commissioning of the Richmond Water Treatment Plant.

The abstraction figures also represent the total demands; ie. including metered residential, commercial, industrial and large industrial use, unmetered rural-restricted demands and non-revenue water (including leakage, apparent losses and unbilled consumption).

The climate corrected demand modelling showed reasonable calibration with a R^2 value of 78%, indicating that up to 78% of the monthly demands are influenced by climate variation. The climate corrected 12-month trend line of total demand shows a definite declining trend from 320 L/capita/day to 275 L/capita/day over the eight years.

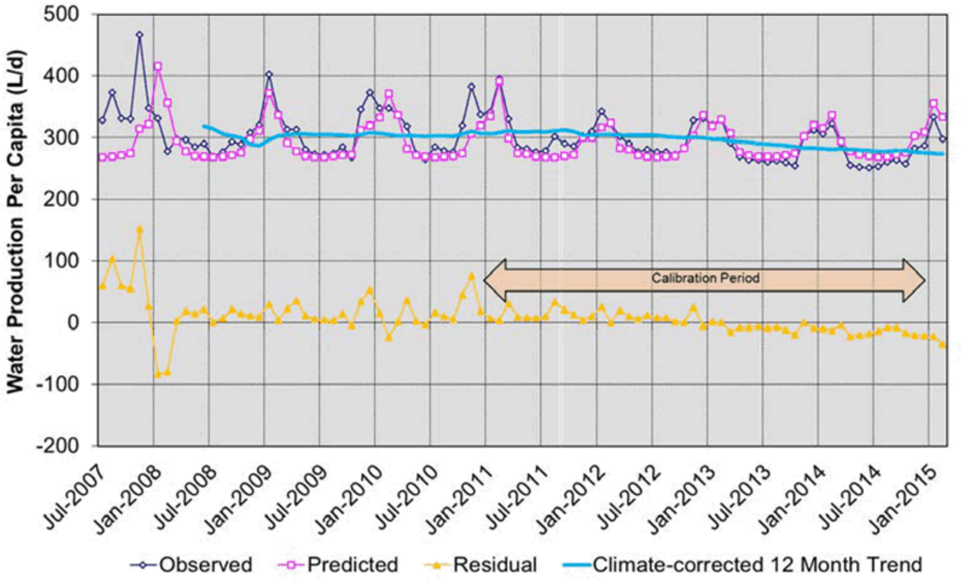


Figure A-6: Climate corrected abstracted demands for Richmond from 2007 to 2015.

A.4 Non-revenue Water

The non-revenue water estimates are discussed below for the following schemes.

1. Richmond/Waimea.
2. Brightwater/Hope.
3. Wakefield.
4. Redwood Valley.

Richmond/Waimea

Figure A-7 shows the breakdown of the 2015/16 water abstracted for Richmond/Waimea into the customer sectors including NRW. The graph shows an estimated 31% NRW for the 2015/16 water abstracted for Richmond/Waimea. The NRW volumes are converted into L/connection/day in Figure A-8.

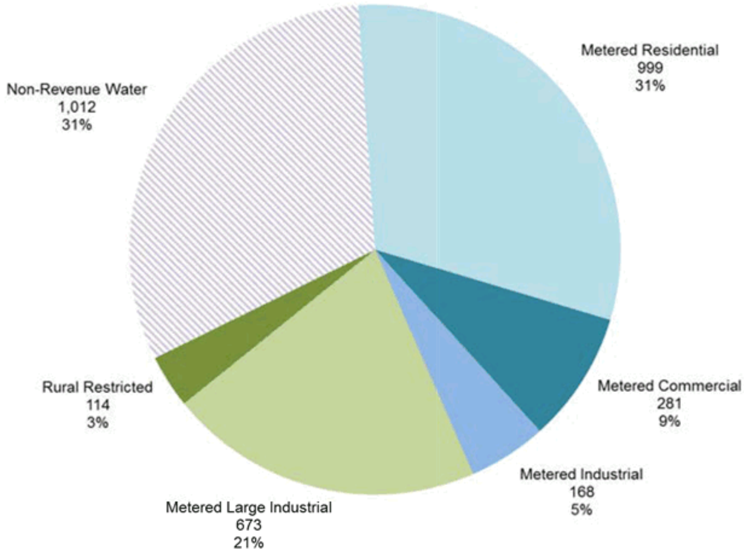


Figure A-7: Richmond, Waimea and Mapua 2015/16 pie chart by sector (ML and %).

In addition to the Richmond/Waimea graph in Figure A-7. Figure A-8 shows a 2015/16 pie chart for the Richmond and Waimea schemes based on the water produced from the Richmond Water Treatment Plant (which only supplies Richmond, Waimea and a small number of Nelson City customers).
Figure A-8 is based on the Benchloss New Zealand spreadsheet and includes the estimates for leakage, apparent losses and unmetered unbilled consumption (this chart was prepared separately for the Richmond Water Demand Management Plan 2017 Update). In this pie chart, the NRW has decreased to 27% of water abstracted (showing the contribution of the Mapua leakage).

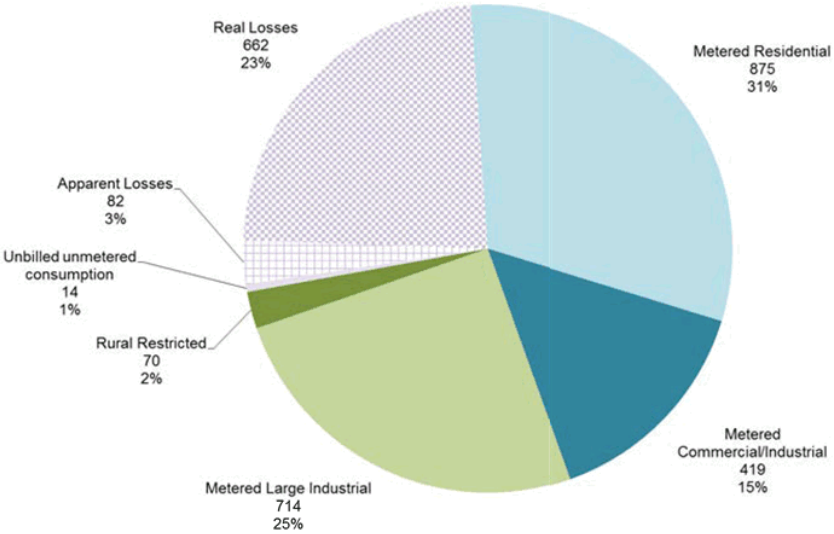


Figure A-8: Richmond and Waimea 2015/16 pie chart by sector (ML and %) (from Benchloss).

The Benchloss calculations gave an estimated real loss (leakage) of 311 L/connection/day for the Richmond and Waimea schemes with an Infrastructure Leakage Index of 4 (with confidence limits of ± 25%).

Brightwater/Hope Non-revenue Water

Figure A-9 shows the breakdown of the 2015/16 water abstracted for Brightwater into the customer sectors including NRW. The graph shows an estimated 22% NRW for 2015/16.

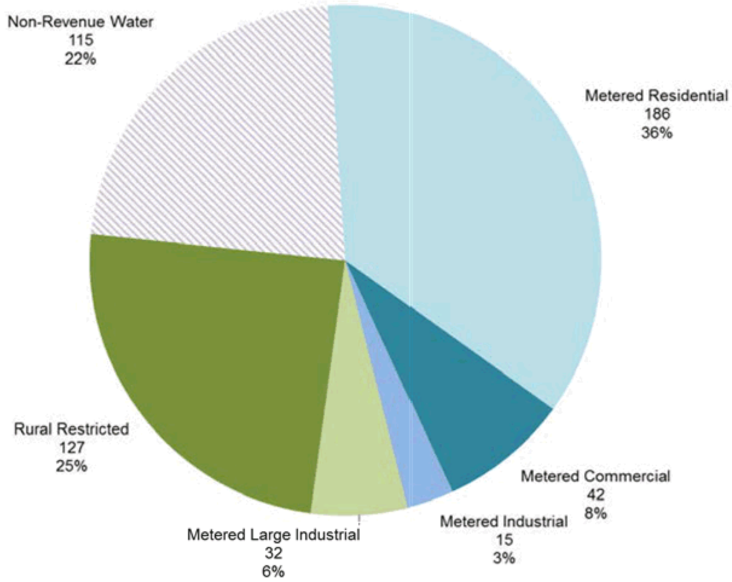


Figure A-9: Brightwater 2015/16 pie chart by sector (ML and %).

Wakefield Non-revenue Water

Figure A-10 shows the breakdown of the 2015/16 water abstracted for Wakefield into the customer sectors including NRW. The graph shows an estimated 42% NRW for 2015/16 and confirms the significant leakage in this scheme.

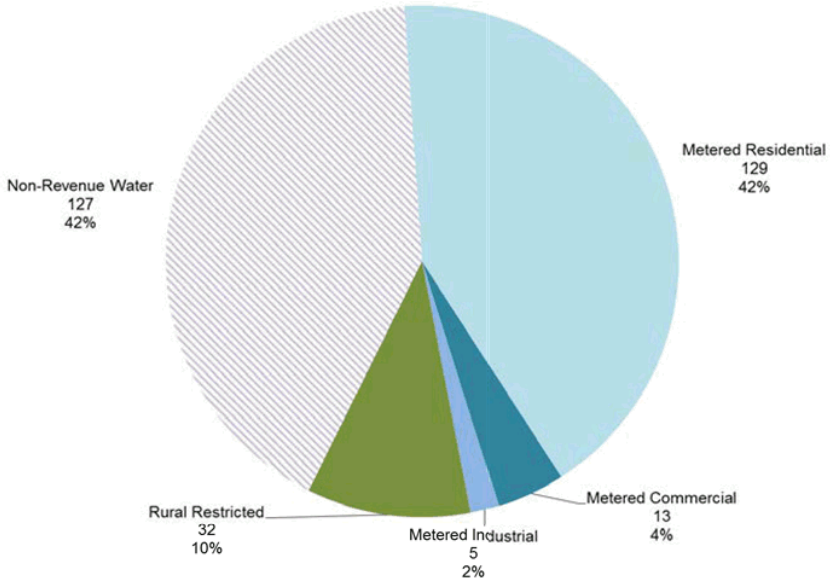


Figure A-10: Wakefield 2015/16 pie chart by sector (ML and %).

Redwood Valley Non-revenue Water

The breakdown of the 2015/16 water abstracted for Redwood Valley has not been graphed as both customer demand and non-revenue water are unknown due to the rural-restricted properties not being metered. Non-revenue water assumed to be 25% of the Redwood Valley water abstracted. Figure 3-5 shows the NRW for each scheme in L/connection/day. Note, Redwood Valley is a rural scheme and it would be more appropriate to show the NRW figure in m^3/km/day as its connection density is less than 20 connections per kilometre.

A.5 Peak Week Factors for Individual Schemes

Figure A-11 shows the peak week factors for each scheme and for the overall Waimea Basin from 2008/09 to 2015/16. The overall Waimea Basin peak week factor in this graph was derived from the sum of the peak week in each scheme divided by the average production volumes for all schemes (ie. assumes a worst case scenario of all schemes having their peak day concurrently. This is unlikely and the DSS Model input assumption is based on the timing of the Richmond/Waimea peak demand). The highest peak week factor by this method occurred in 2014/15 (1.44) and the lowest in 2015/16 (1.21). The timing of the different stages of customer water restrictions needs to be taken into consideration in analysis of the peak week factors.

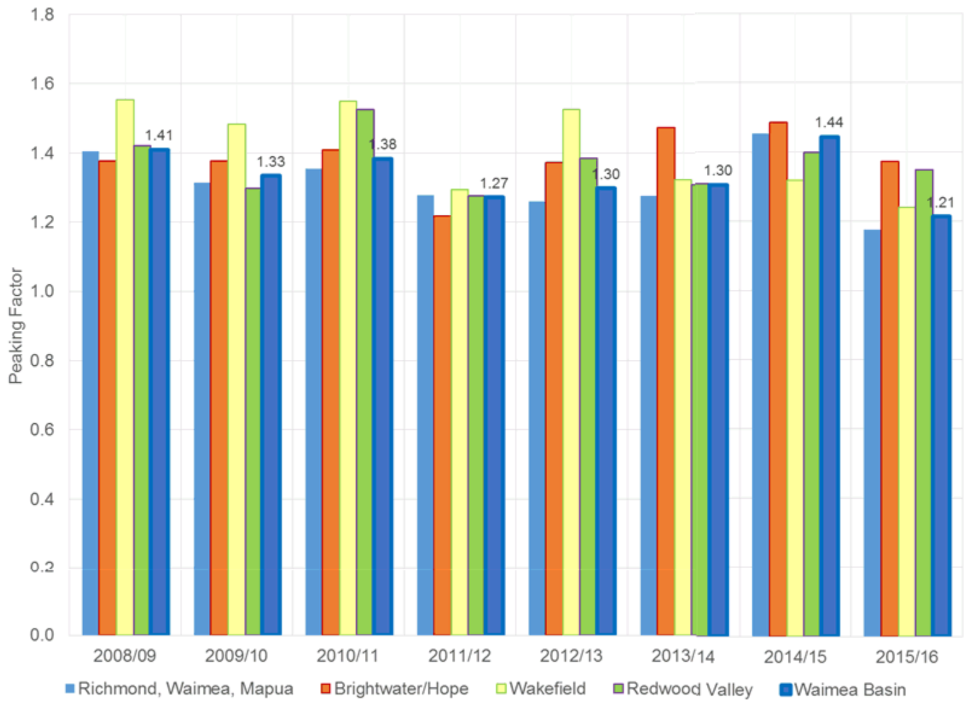


Figure A-11: Peak week factors by scheme and overall.

Table A-1: Richmond/Waimea Peak Week Timing and Peak Week Factors (2008 to 2016)

Year	Start Date of Peak Week	Peak Week Demand (m^3/day)	Average Day Demand (m^3/day)	Peak Week Factor
2008/09	20-Jan-09	12,565	8,943	1.40
2009/10	29-Jan-10	10,962	8,339	1.31
2010/11	14-Feb-11	11,326	8,366	1.35
2011/12	18-Jan-12	11,248	8,805	1.28
2012/13	26-Nov-12	11,257	8,938	1.26
2013/14	13-Jan-14	10,881	8,536	1.27
2014/15	19-Jan-15	12,194	8,394	1.45
2015/16	12-Jan-16	10,164	8,652	1.17

Table A-2: Brightwater/Hope Peak Week Timing and Peak Week Factors (2008 to 2016)

Year	Start Date of Peak Week	Peak Week Demand (m^3/day)	Average Day Demand (m^3/day)	Peak Week Factor
2008/09	3-Feb-09	2,331	1,693	1.38
2009/10	22-Mar-10	2,292	1,666	1.38
2010/11	28-Feb-11	2,163	1,535	1.41
2011/12	2-Apr-12	1,717	1,409	1.22
2012/13	18-Mar-13	2,101	1,531	1.37
2013/14	10-Mar-14	2,104	1,429	1.47
2014/15	23-Feb-15	2,180	1,469	1.48
2015/16	21-Dec-15	1,892	1,378	1.37

Table A-3: Wakefield Peak Week Timing and Peak Week Factors (2008 to 2016)

Year	Start Date of Peak Week	Peak Week Demand (m^3/day)	Average Day Demand (m^3/day)	Peak Week Factor
2008/09	4-Feb-09	963	620	1.55
2009/10	18-May-10	1,119	755	1.48
2010/11	21-Feb-11	1,059	683	1.55
2011/12	6-Feb-12	813	628	1.29
2012/13	3-Dec-12	1,064	698	1.52
2013/14	3-Mar-14	997	754	1.32
2014/15	1-Dec-14	1,182	896	1.32
2015/16	15-Feb-16	1,007	813	1.24

Table A-4: Redwood Valley Peak Week Timing and Peak Week Factors (2008 to 2016)

Year	Start Date of Peak Week	Peak Week Demand (m^3/day)	Average Day Demand (m^3/day)	Peak Week Factor
2008/09	15-Feb-09	986	694	1.42
2009/10	21-Feb-10	928	715	1.30
2010/11	5-Dec-10	1,002	658	1.52
2011/12	9-Feb-12	893	700	1.28
2012/13	26-Feb-13	1,047	756	1.39
2013/14	22-Dec-13	864	661	1.31
2014/15	19-Jan-15	867	620	1.40
2015/16	27-Oct-15	864	641	1.35

Appendix B List of Large Customers

Top Water Users

Top 100 CII Users

Legend of Cell Colors:
Calculation (*Do not change)
Data Entry Required
Data Entry Requested

#	Customer Id	Business Type	Billing Category	Demand Jan-June 2016 (m3/6 months)	Meter ID	Scheme	Address	Average demand	Units
1	1	NN Pine	LI	101,519	W00910	Waimea	520 Lower Queen Street	558	m^3/day
2	2	MDF	LI	79,184	W00899	Waimea	520 Lower Queen Street	435	m^3/day
3	3	Alliance	LI	66,498	W00904	Waimea	Main Road	365	m^3/day
4	4	ENZA	LI	57,149	W00903	Waimea	Nayland Road	314	m^3/day
5	5	ENZA	LI	56,398	W00902	Waimea	Nayland Road	310	m^3/day
6	6	AICA	LI	21,026	W00906	Waimea	35 Sandeman Road	116	m^3/day
7	7	Sportsgrounds	C	16,052	W40004	Richmond	Jubilee Park South	88	m^3/day
8	8	Fonterra	LI	15,393	W00898	Brightwater	30 Factory Road	85	m^3/day
9	9	Oakwoods Retirement Village	C	11,450	W40100.1	Richmond	357 Lower Queen Street	63	m^3/day
10	10	Ministry of Education	C	8,575	W42667	Richmond	72 Salisbury Road	47	m^3/day
11	11	Cold Storage Nelson Limited	I	8,054	W40011	Richmond	83 Beach Road	44	m^3/day
12	12	Sea Health Foods Limited	I	7,934	W55067	Waimea TDC	24 McPherson Street	44	m^3/day
13	13	ENZA	I	7,828	W50018	NCC	Nayland Road-Coolstore	43	m^3/day
14	14		C	7,609	W45268	Richmond	141 Salisbury Road	42	m^3/day
15	15	Compass Fruit Limited	I	7,551	W44134	Richmond	79 Beach Road	41	m^3/day
16	16	Tinline Properties Limited at Nelson	C	5,022	W40092	Richmond	218 Queen Street	28	m^3/day
17	17	Ewing Douglas Lloyd	C	4,666	W30853	Brightwater	83 Main Road Hope	26	m^3/day
18	18	Nelpak Group Ltd	C	4,271	W50043	NCC	491 Nayland Road	23	m^3/day
19	19	Metlifecare	C	4,221	W40100	Richmond	357 Lower Queen Street	23	m^3/day
20	20	Talaford Investments Limited	I	4,003	W40018	Waimea	21 McPherson Street	22	m^3/day
21	21	Stillwater Gardens Retirement Village Limited	C	3,982	W45288	Waimea	Stillwater Gardens Retirement	22	m^3/day
22	22	Stillwater Gardens Retirement Village Limited	C	2,760	W45287	Waimea	Stillwater Gardens Templemore	15	m^3/day
23	23	Stillwater Gardens Retirement Village Limited	C	1,018	W45438	Waimea	44 Templemore Drive	6	m^3/day
24	24	Stillwater Gardens Retirement Village Limited	C	613	W45286	Waimea	Stillwater Gardens Retirement	3	m^3/day
25	25	Waimea Town & Country Club Incorporated	C	3,060	W40028	Richmond	345 Lower Queen Street	17	m^3/day
26	26	Tinline Properties Limited at Nelson	C	2,895	W44231	Richmond	12 Sundial Square	16	m^3/day
27	27	Compass Fruit Limited	I	2,890	W40059	Richmond	79 Beach Road	16	m^3/day
28	28	Ministry of Education	R	2,812	W40083	Richmond	67 Salisbury Road	15	m^3/day
29	29	Baigent Anthony Neil	R	2,808	W30978	Brightwater	62 River Terrace Road	15	m^3/day
30	30	TNL Freighting	I	2,755	W45601	Richmond	15 Artillery Place	15	m^3/day
31	31	Coutts Rowan James	I	2,617	W30664	Brightwater	5 Factory Road Lot 1	14	m^3/day
32	32	Sollys Freight Service Limited	I	2,501	W44571	Waimea	32 McPherson Street	14	m^3/day
33	33	Wensley House Holdings 2004 Limited	C	2,455	W43166	Richmond	16/49 Wensley Road	13	m^3/day
34	34		C	2,452	W43910.1	Richmond	13 Oxford Street - Washbourn G	13	m^3/day
35	35	Nelson Regional Sewerage Business Unit	I	2,436	W55083	Waimea TDC	Regional Sewage Auth Bells Isl	13	m^3/day
36	36	Tinline Properties Limited at Nelson	C	2,429	W40020	Richmond	216 Queen Street - Freshchoice	13	m^3/day
37	37	Rasmussen Karina Lee	R	2,316	W70240	Wakefield	2 Harcourt Place	13	m^3/day
38	38	Holdwell Ltd	I	2,297	W50098	NCC	3 Kotua Place-Scallop Factory	13	m^3/day
39	39	Mapua leisure park	C	2,197	W20095.1	Mapua	33 Toru Street	12	m^3/day
40	40	Mapua leisure park	C	1,102	W20095	Mapua	33 Toru Street	6	m^3/day
41	41		R	2,025	W20429	Mapua	44 Stafford Drive	11	m^3/day
42	42	The Stables (2005) Limited	C	2,002	W44069	Richmond	1 McGlashen Avenue	11	m^3/day
43	43	Hoddy's Orchard Limited	C	1,793	W31220	Brightwater	16 Aniseed Valley Road	10	m^3/day
44	44	Frances Holdings Limited	I	1,760	W40240	Waimea	86 Beach Road	10	m^3/day
45	45	Tasman District Council	C	1,731	W55085	Waimea TDC	Rabbit Island-Houses & Compoun	10	m^3/day

Appendix C Detailed Growth Projections

Population growth projections

Council's 2018 Growth Model Projections were used as the basis for the population growth projections by Census Area Unit. The percentages of the Census Area Unit populations assumed to be supplied by each Water Supply Scheme are shown in Table C-1. The Census Area Unit maps are located on the Statistics New Zealand website.

http://www.stats.govt.nz/StatsMaps/Home/People%20and%20households.aspx

Table C-1: Percentage of Census Area Unit Populations in each Water Supply Scheme

CAU	Richmond/Waimea	Brightwater/Hope	Wakefield
581717 Aniseed Hill	45%	5%	
581720 Hope		100%	
581724 Best Island	100%		
581726 Ranzau	5%	20%	
581822 Brightwater		100%	
581823 Wakefield			100%
581825 Mapua	100%		
584201 Richmond East	100%		
584202 Richmond West	100%		

The growth projection data was provided in 5-year projection horizons from the year 2013/14 to the year 2043 for the low, medium and high growth scenarios. All three projections were based on the 2013/14 population as the starting point. This resulted in different populations for the current 2016/17 year. The modelling requires a consistent population assumption for the start year. It was agreed through discussion with Council staff that the high growth projection provided the best estimate of the current 2016/17 population in each scheme. The transition from the 2016/17 population to the future lower growth projections under the medium and low growth scenarios was smoothed through an approach agreed with Council staff. The extrapolation beyond 2043 to the 100-year horizon of 2017/18 was based on the average growth for the 10 years to 2043.

The graphs below for the three largest schemes show both the original projections and the agreed model inputs. No changes were required to the original high growth projections. It was agreed through discussion with Council staff that the low growth population projections are too pessimistic and will not be modelled in the water demand forecasts. The low growth population projections appear to ignore external immigration to the region and rely on the assumption that the future demographics will be based solely on the current population. This is evident in the Richmond/Waimea scheme which shows a 50% reduction in population over the 100-year timeframe (the Richmond/Waimea scheme has a high percentage of people in the oldest demographic).

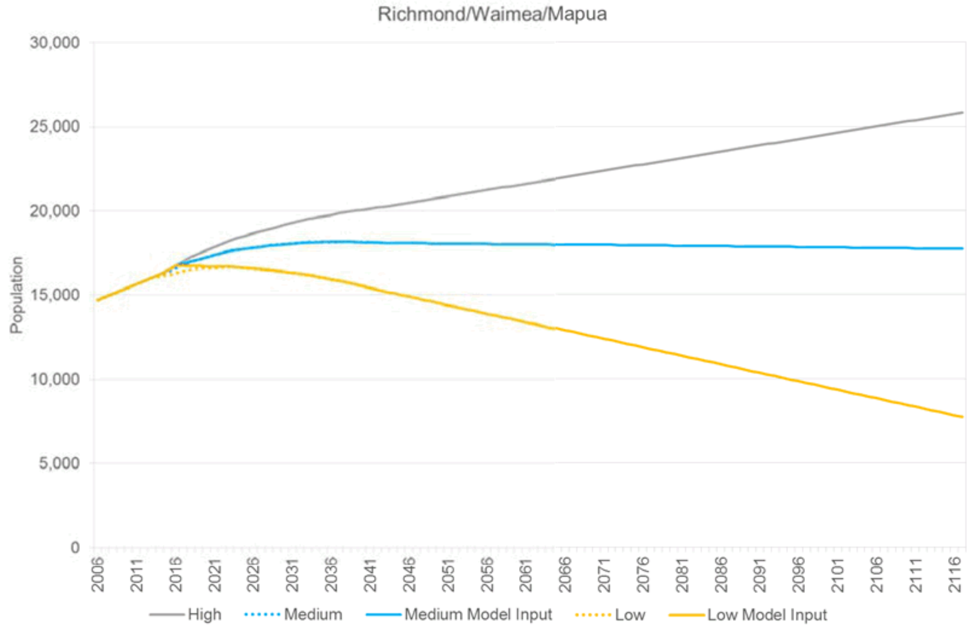


Figure C-1: Richmond/Waimea population growth projections to 2118.

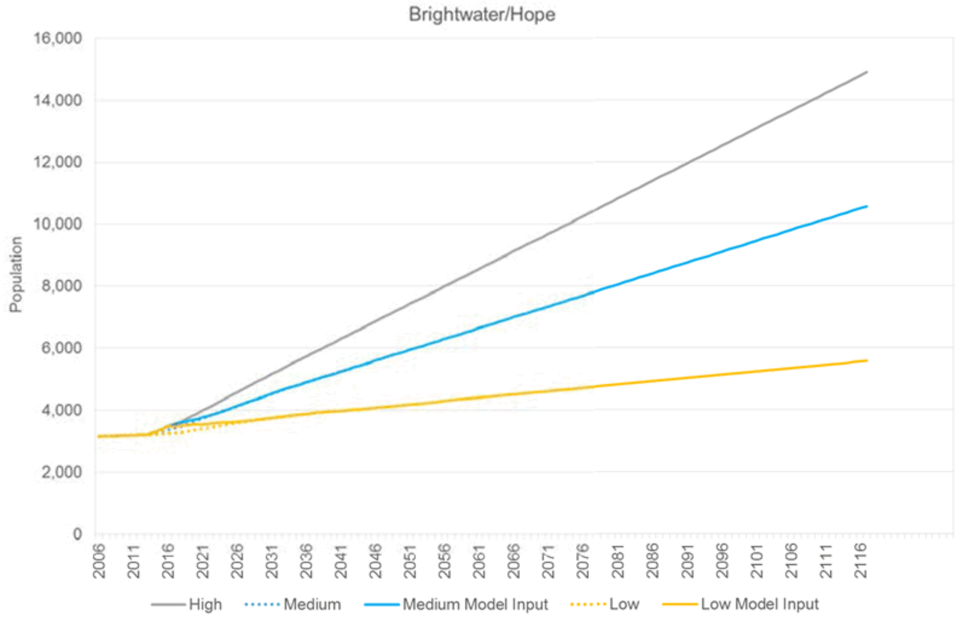


Figure C-2: Brightwater/Hope population growth projections to 2118.

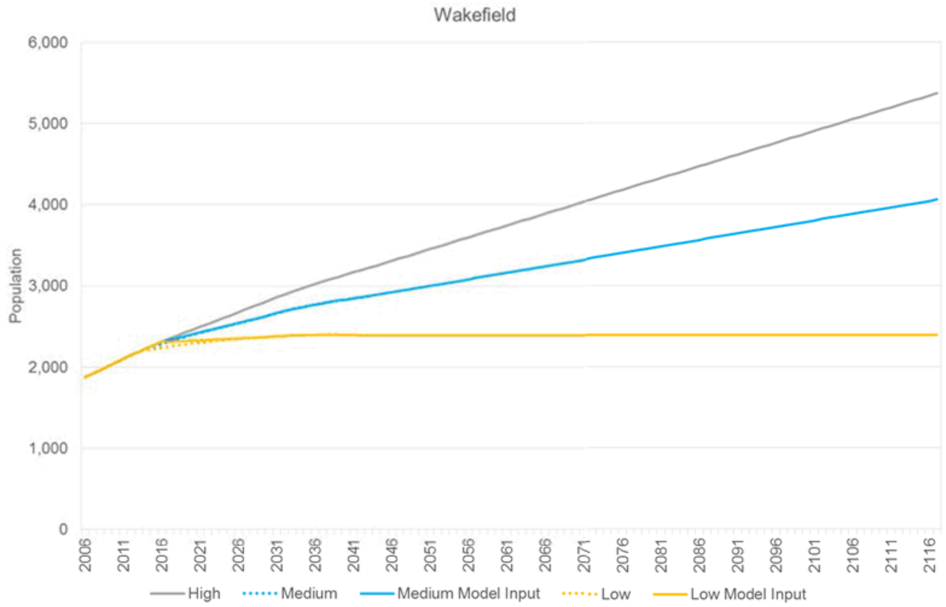


Figure C-3: Wakefield population growth projections to 2118.

The occupancies in each scheme were calculated from the known number of residential accounts and the residential population in the year 2015/16. Future occupancy projections were provided by the Tasman District Council. Similar to the population growth scenarios, the calculated 2015/16 occupancy was interpolated between the different occupancy projection horizons for each scheme depending on the rate of change of occupancy; Wakefield was interpolated directly to the 2016/17 projection as the change in occupancy was minor, Brightwater/Hope was interpolated to the 2021/22 projection as the change in occupancy from the calculated 2015/16 to the projected horizons was large, and Richmond/Waimea was interpolated to the 2018/19 projection horizon.

The population high projection for each scheme was further split into rural-restricted population and residential population.

Employment Growth Projections

The historical employment counts are available for each Census Area Unit (CAU) from 2006 to 2016. As some CAUs partially overlap the scheme boundaries, some assumptions were made as to the proportion of the employee count in each CAU that is attributed to each scheme. These assumptions are shown in Table C-2. The employee account in Redwood was estimated at 24 based on 2 employees for 12 large rural-restricted properties (these properties were assumed to not have dwellings).

Table C-2: Percentage of Census Area Unit Employee Counts in each Water Supply Scheme

CAU	Wakefield	Brightwater/Hope	Richmond/Waimea
Wakefield	100%	-	-
Hope	-	100%	-
Aniseed Hill	-	5%	45%
Brightwater	-	100%	-
Mapua	-	-	100%
Richmond East	-	-	100%
Richmond West	-	-	100%
Saxton	-	-	16%
Ranzau	-	-	15%

The Saxton and Ranzau CAUs partially overlap the Richmond/Waimea scheme and also contain three large wet industries (but no residential population connected to the water supply scheme). The large wet industries were contacted and provided rough employee counts at each plant, and it was assumed the employee count in each CAU was twice the number of employees at the large wet industries.

- Alliance Nelson plant – 150 employees.
- ENZA Nelson plant – 150 employees.
- Nelson Pine plant – 210 employees.

Employment growth projections are graphed below.

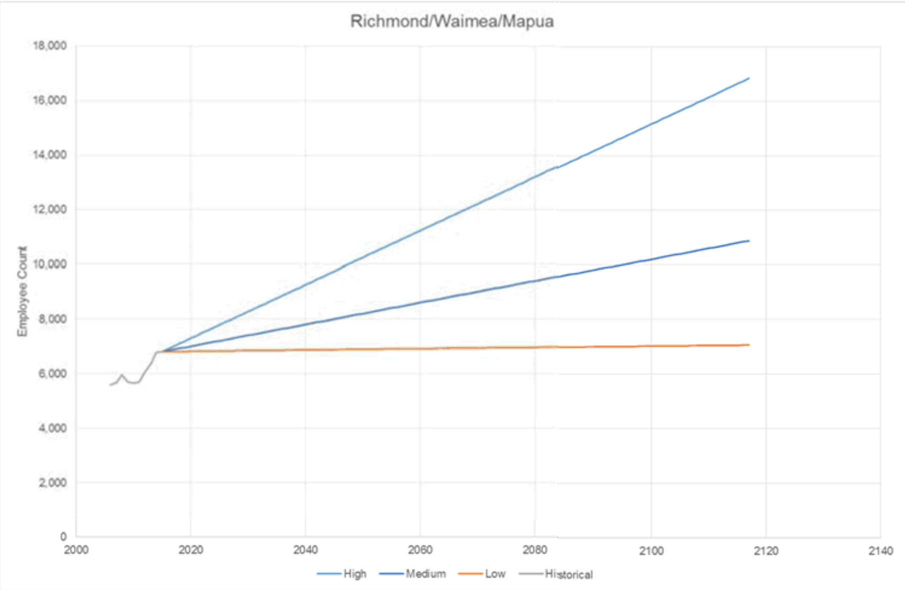


Figure C-4: Richmond/Waimea employee growth projections to 2118.

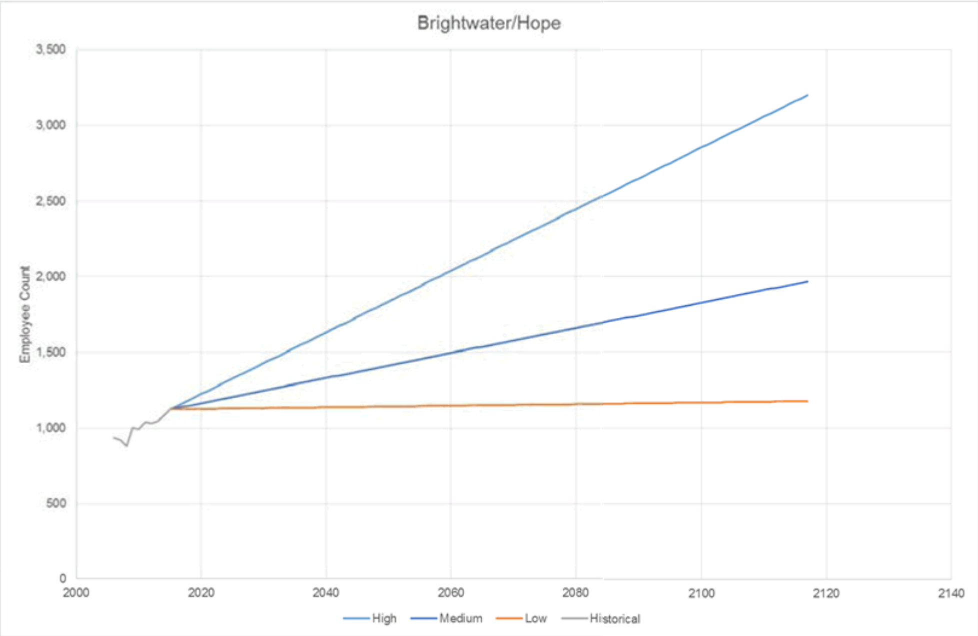


Figure C-5: Brightwater/Hope employee growth projections to 2118.

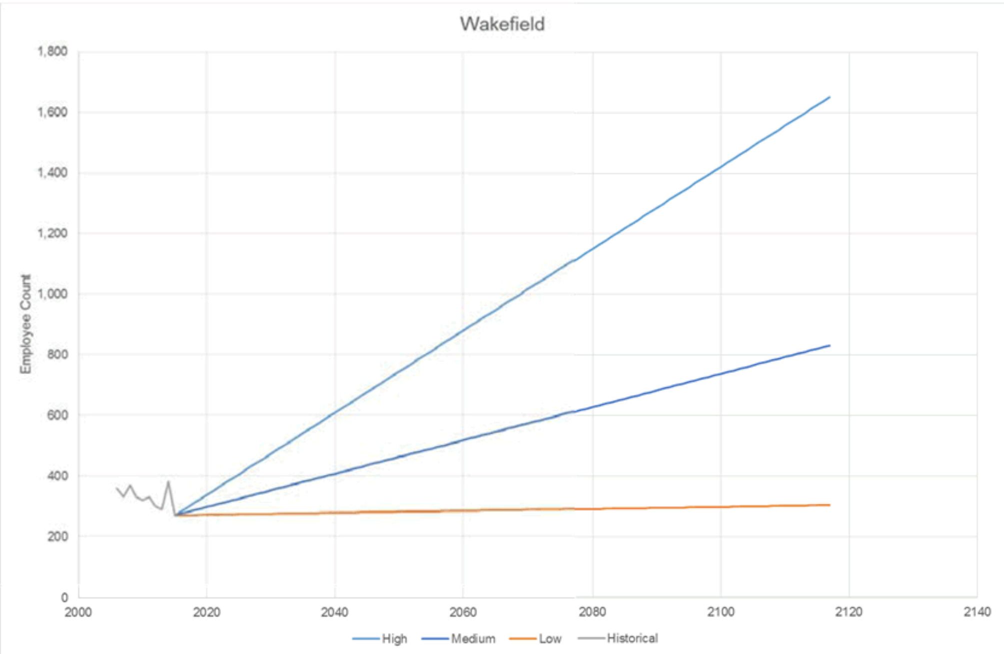
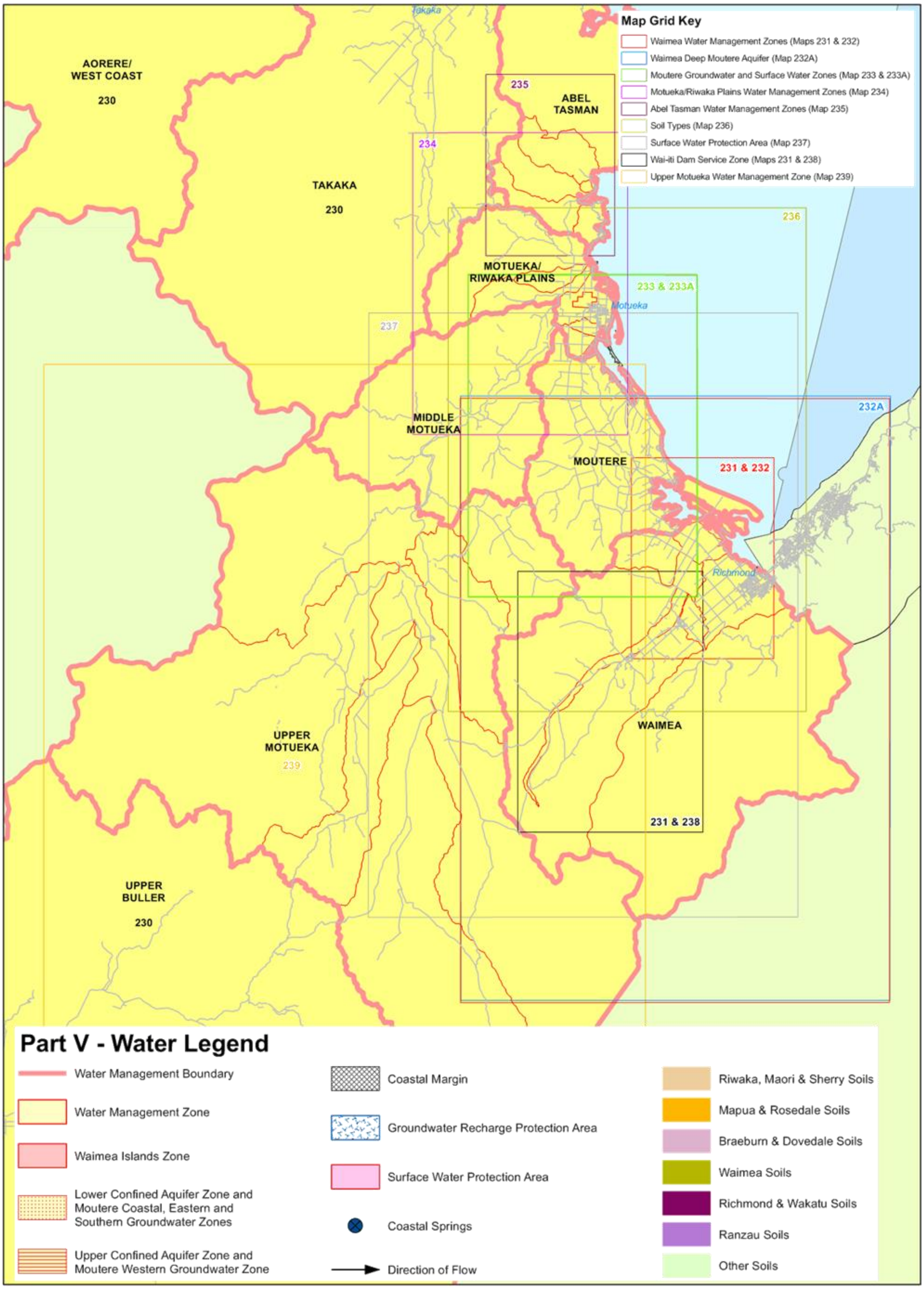


Figure C-6: Wakefield employee growth projections to 2118.

Table C-3: Additional Growth Projections used in the DSS Models

Growth Projection	Description
Zero Growth	The zero growth projection was used for the Rural Restricted accounts to reflect that there is currently no allocation available for additional rural-restricted properties in any scheme. The Redwood Valley reticulation system cannot accommodate additional flow.
Res Accounts High, Medium	Derived from Residential Population High and Medium growth projection divided by the forecasted household occupancies.

Appendix D Water Management Zone Maps



tasman lifestyle

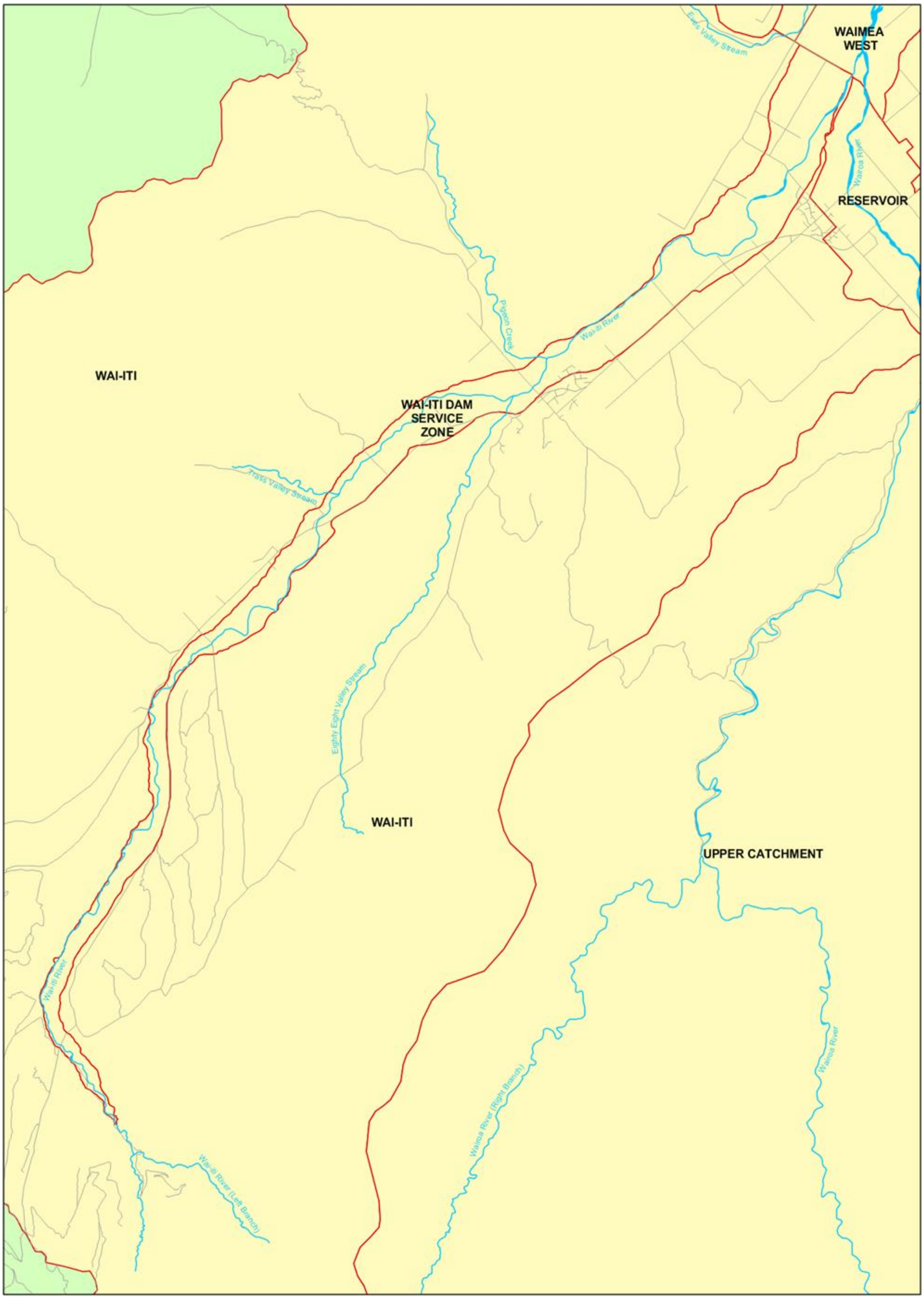
TASMAN RESOURCE MANAGEMENT PLAN
31 January 2015

PART V: WATER

0 10 20 30 40 km

Scale 1:320,000

Map Locator and Legend



TASMAN RESOURCE MANAGEMENT PLAN
Operative 26 February 2011

0 1 2 3 4 km
Scale 1:65,000

Sourced from Land Information New Zealand data.
Crown Copyright reserved. Original paper size is A3.

WAI-ITI DAM SERVICE ZONE

Map 238
Maps affected: 230, 231

Appendix E Assumptions for the DSS Model

E.1 Production

Production volumes are sourced from the works weekly and the summer weekly reading production data for each water abstraction bulk meter from 2008 to 2016.

E.2 Consumption

The number of accounts is based on the number of meters using water during that year. Meters that had zero use have been excluded from the number of accounts.

Metered consumption volumes for each category were derived as follows.

- Residential, commercial and industrial were each sourced from Tasman District Council's six-monthly and yearly demand summaries. The meters have been categorised since 2014. For years prior to 2014, the demand proportion for each of these categories was based on the average demand proportion for the 2014-16 individual meter reading data.
- Large Industrial monthly demands were sourced from historical monthly meter readings.

Rural Restricted demands were based on the 2016 Restrictor units billing data as described in Section 3.3.2.

E.3 Internal and External Use Percentage

The breakdown of the sector demands per account into internal and external use has been determined and entered in the DSS Model as follows:

Table E 1: Indoor Use Percentage

Sector	Indoor Use Percentage	Source
Commercial	80%	Best estimate from Maddaus Water Management experience.
Industrial	90%	Best estimate from Maddaus Water Management experience.
Residential	80%	The average indoor use per person figure of 153L/capita/day from the BRANZ "Water use in Auckland households 2008" study was used to determine the indoor use L/residential account/day for each scheme. These scheme specific figures were then used to determine the indoor use as a percentage of that scheme's residential demand per account per day.
Large industrial	90%	Best estimate from Maddaus Water Management experience.
Rural restricted	31%	Based on the estimated residential indoor volume of 450L/residential account/day as a percentage of start year rural-restricted volume per account (taking into account only the rural-restricted accounts with dwellings). Indoor use percentage for the rural-residential properties in each scheme is estimated based on the 450 L/account/day as a percentage of the assumed rural residential demand per rural-restricted account with a dwelling. The Redwoods Valley scheme population was based on the 2015 AMP estimate of 550. With a household occupancy of 2.5 people, this population translates to 220 houses in the Redwoods area out of 364 rural-restricted properties (ie. subtract 144 rural-restricted accounts without dwellings). Richmond settlement area has no rural-restricted accounts recorded. 100% of the rural-restricted accounts (properties) within the Mapua, Wakefield and Brightwater settlement areas have 1 house per account (property).

E.4 Internal and External Use Breakdown into End-uses

The breakdown of internal and external uses for the Residential and Rural-Residential sectors into the various end-use categories was derived primarily from the BRANZ "Water use in Auckland households 2008" study. These figures were compared to other sources and adjusted slightly to calibrate the model. The Commercial, Industrial and Large Industrial internal and external end-use category breakdowns were based on recommendations from Maddaus Water Management based on their extensive experience on water demand management projects around the world. The assumptions are documented in Tables E-2 and E-3. The residential indoor demand by end-use is graphed in Figure E-1.

Table E-2: Breakdown of Indoor Use into End-Uses by Customer Sector

End-use Name	Commercial	Industrial	Residential	Large Industrial	Rural-Restricted
Toilets	20.0%	15.0%	18.0%	15.0%	18.0%
Urinals	6.0%	6.0%		6.0%	
Taps	12.0%	14.0%	16.0%	14.0%	16.0%
Showers	9.0%	3.0%	32.0%	3.0%	32.0%
Dishwashers	6.0%	4.0%	1.0%	4.0%	1.0%
Clothes Washers	15.0%	8.0%	28.0%	8.0%	28.0%
Process	12.0%	30.0%		30.0%	
Kitchen Spray Rinse	5.0%				
Internal Leakage	12.0%	10.0%	3.0%	10.0%	3.0%
Baths			1.5%		1.5%
Other	3.0%	10.0%	0.5%	10.0%	0.5%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

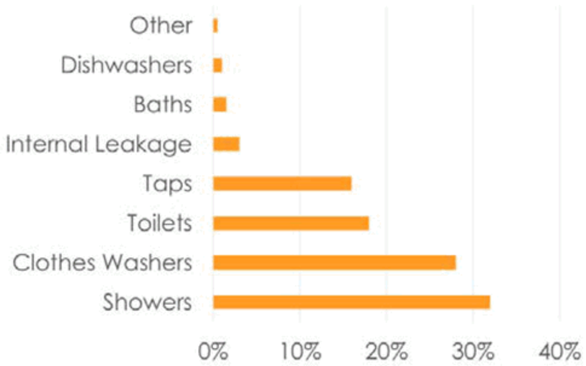


Figure E-1: Residential indoor demand by end-use.

Table E-3: Breakdown of Outdoor Use into End-Uses by Customer Sector

End-Use Name	Commercial	Industrial	Residential	Large Industrial	Rural-Restricted
Irrigation	78.0%	73.0%	83.0%	73.0%	83.0%
Pools			2.0%		2.0%
Wash Down			4.0%		4.0%
Cooling	15.0%	20.0%		20.0%	
Car Washing			4.0%		4.0%
External Leakage	7.0%	7.0%	7.0%	7.0%	7.0%
Irrigation	78.0%	73.0%	83.0%	73.0%	83.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

E.5 Fixtures

Introduction to Fixture Models

Fixtures models were set up in the DSS Model to determine the projected savings from changes in fixture market share percentages. Fixture models were set up for toilets, urinals, showers and clothes washing machines. A fixture model was not set up for taps as tap water use is primarily driven by behavioural factors (ie. the length of time that a person runs a tap) rather than the fixture efficiency (flow rate per minute of the tap).

Toilets

The average water use for the different types of toilets were derived from the values used in the 2008 Christchurch DSS Model. Base year fixture proportions were determined from the house age data received from the Council combined with the timing of new dual flush toilet types in the Australia/New Zealand markets. The timing of new dual flush toilet types was sourced from the Australian Government report "Scoping Study to Investigate Measures for Improving the Water Efficiency of Buildings" prepared by GHD Pty Ltd for the Department of the Environment and Heritage in December 2006. The graph is copied below in Figure E-2.

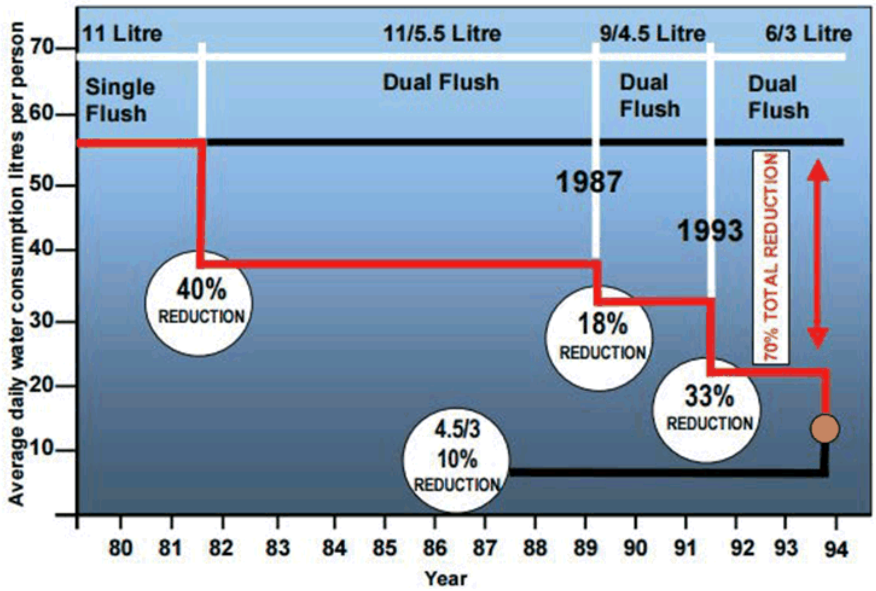


Figure E-2: Timeline for the introduction of new dual flush toilet types.

The methodology is further explained in Table E-4 below.

Table E-4: Initial Fixture Proportions

Toilet type name in DSS Model	Initial Proportion of toilets	Methodology for determining initial proportion
High Use Toilet Residential	20%	Approximately 50% of the houses in the assessment area were constructed prior to the 1980s. It is assumed that all of these houses originally had single flush (High Use) Toilets installed. Based on an expected toilet life of 25 years, the High Use toilets in these houses would have been progressively replaced since the 1980s (when the dual flush toilets first became available). We estimated that 20% of current toilets are still High Use.
9/4.5 Dual Flush	10%	Approximately 10% of the houses in the assessment area were constructed during the 1990s. We assumed that all of these houses would have installed this toilet type and that these toilets would not yet have been replaced.
6/3 Dual Flush	65%	Calculated as the remainder of toilets after subtracting the percentages for the other toilet types.
4.5/3 Dual Flush	5%	Assumed 5% as this toilet type has only recently become available.

The forecast changes in the fixture market share for residential toilets as a result of WELS over the planning horizon are shown in Figure E-3 for Richmond/Waimea (as the biggest scheme in the Waimea Basin area).

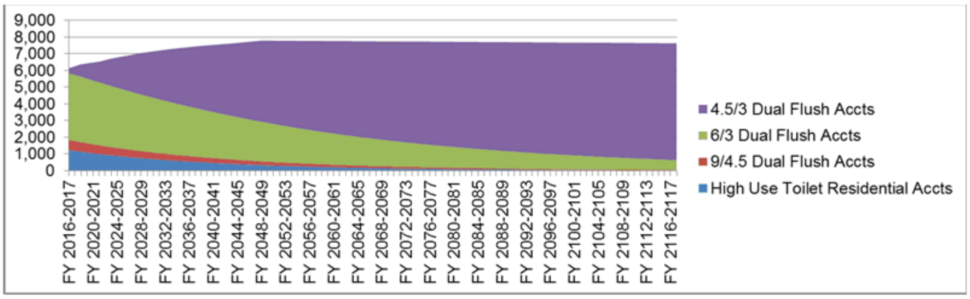


Figure E-3: Number of residential accounts in Richmond/Waimea with each toilet type to 2118 (medium growth)

The forecast changes in the fixture market share for commercial toilets as a result of WELS over the planning horizon are shown in Figure E-4 for Richmond/Waimea.

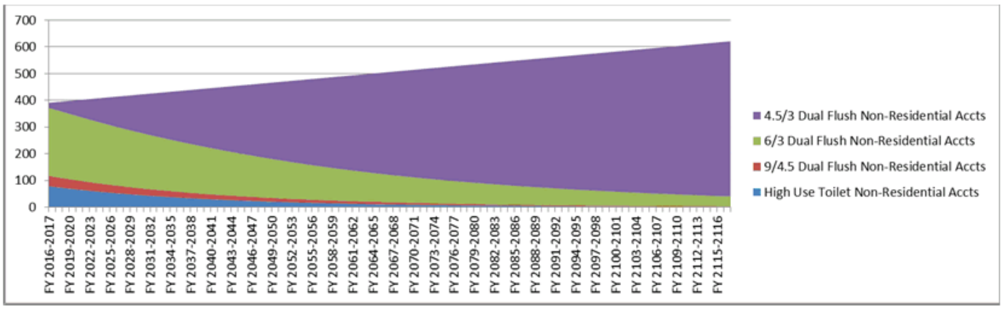


Figure E-4: Number of commercial accounts in Richmond/Waimea with each toilet type to 2118 (medium growth)

Urinals

The fixture average water uses, base year fixture proportions and forecast replacement and new appliance market shares were derived from the original DSS Model assumptions provided by Maddaus Water Management.

The forecast changes in the fixture market share for commercial urinals as a result of WELS over the planning horizon are shown in Figure E-5 for Richmond/Waimea.

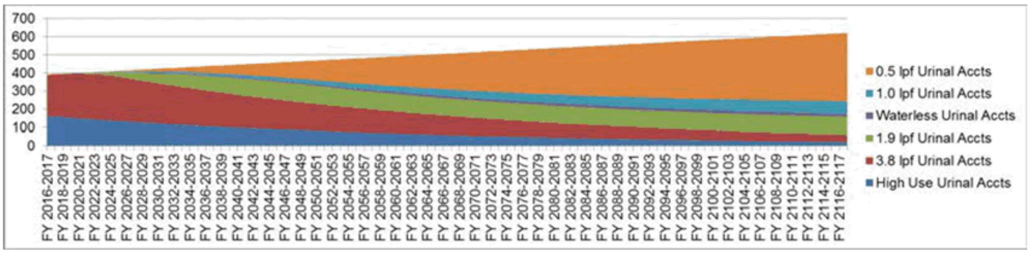


Figure E-5: Number of commercial accounts in Richmond/Waimea with each urinal type to 2118 (medium growth).

Clothes washing machines

The average water use for the different types of clothes washers were derived from appliance water use information available online. The initial fixture proportions were updated from the original MWM DSS Model values to more closely represent typical New Zealand proportions (proportions of top loaders versus front loaders in New Zealand).

The changes in the fixture market share for residential washing machines as a result of WELS over the planning horizon are shown in Figure E-6.

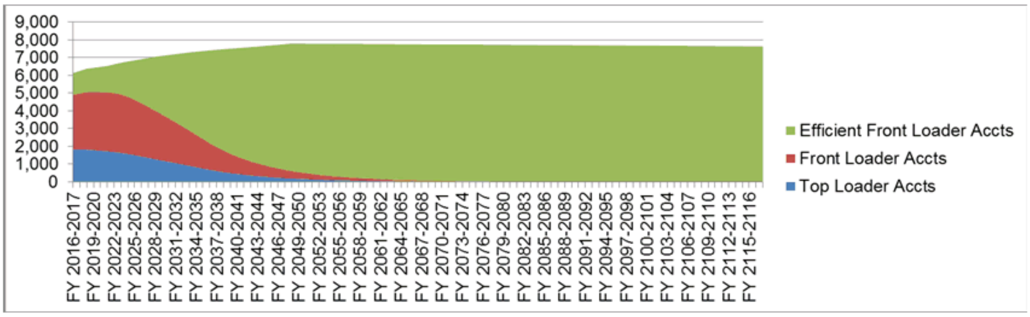


Figure E-6: Number of residential accounts in Richmond/Waimea with each clothes washing machine type to 2118 (medium growth).

Showers

Data was available in the Auckland Household Water Use 2008 BRANZ study on the penetration of shower fixtures for the various WELS star ratings of fixture flow rates as shown in Figure E-7. The WELS star ratings were used to categorise the shower fixtures and the litres per use was calculated based on an average shower length of 6.5 minutes.

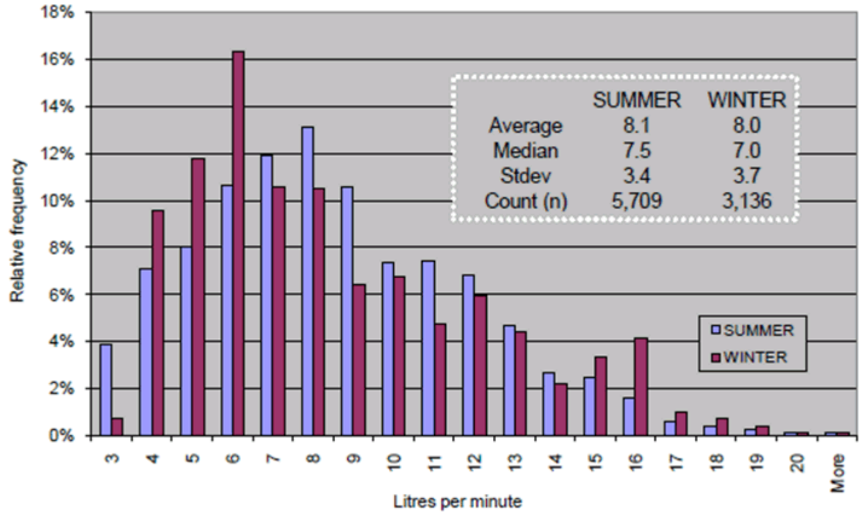


Figure 83: Shower flow rates – summer / winter comparison

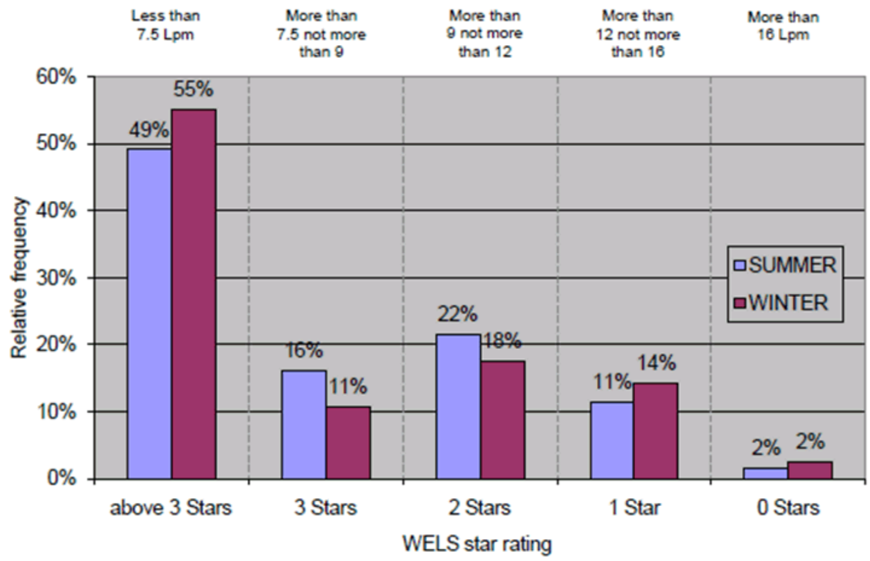


Figure 84: Shower flow rates according to WELS

Figure E-7: Shower Information from the Auckland Household Water Use Study (BRANZ, 2008).

The forecasted replacement and new appliance market shares were converted from the original DSS Model shower fixtures to the nearest equivalent WELS rated shower fixture.

The changes in the fixture market share for residential showers as a result of WELS over the planning horizon are shown in Figure E-8.

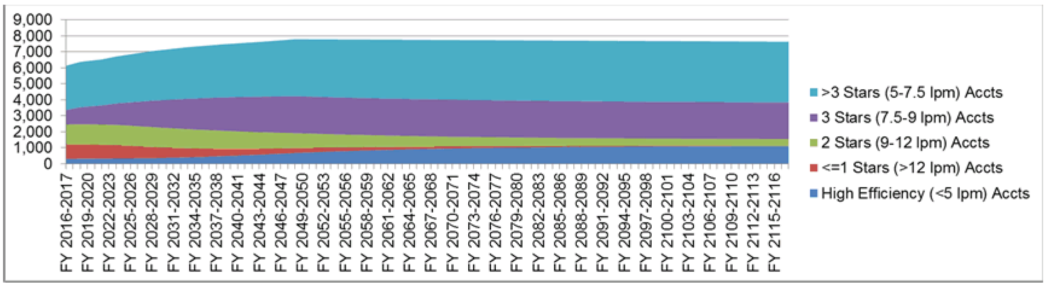


Figure E-8: Number of residential accounts in Richmond/Waimea with each shower type to 2118 (medium growth).

Appendix F Additional Demand Forecast Graphs

The graphs below show the breakdown of the baseline consumption forecasts without plumbing code into the different customer categories for each scheme (ie. these graphs exclude non-revenue water as total demand = consumption for each customer category plus non-revenue water).

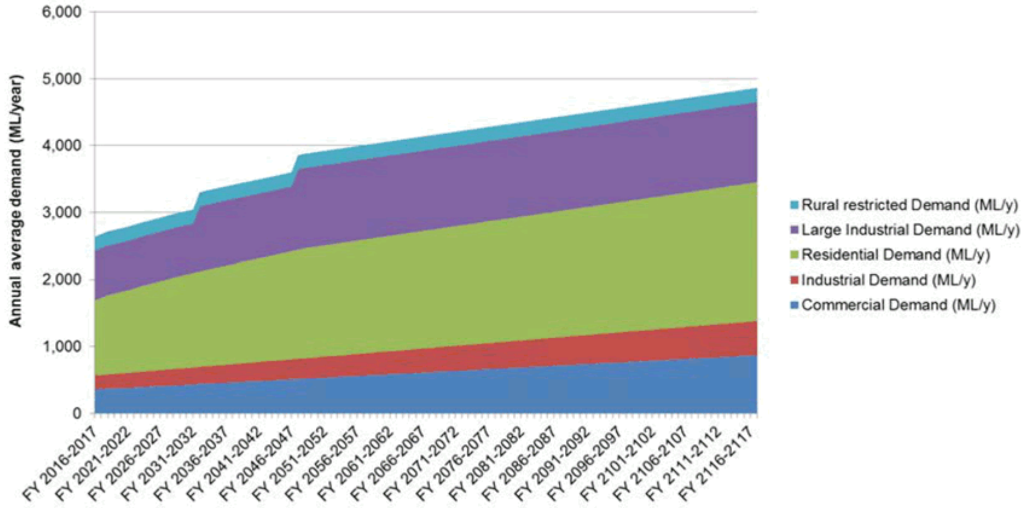


Figure F-1: Breakdown of baseline Richmond/Waimea consumption forecasts for High Growth without plumbing code.

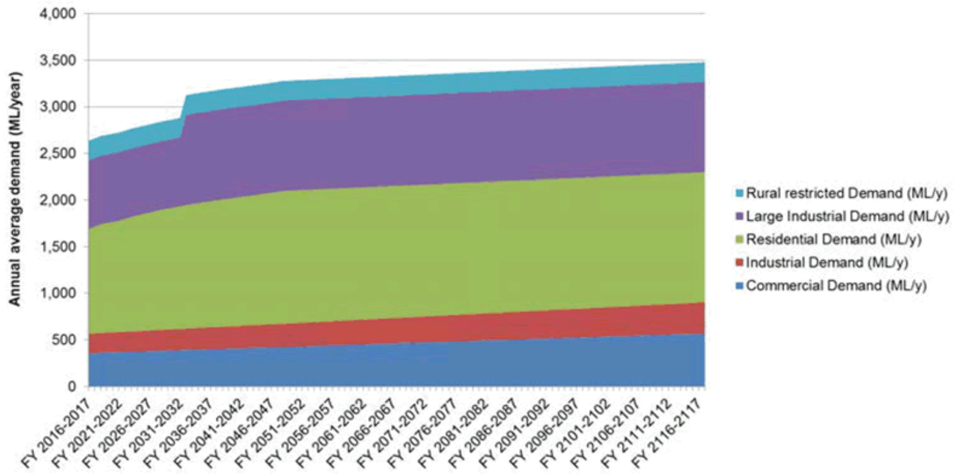


Figure F-2: Breakdown of baseline Richmond/Waimea consumption forecasts for Medium Growth without plumbing code.

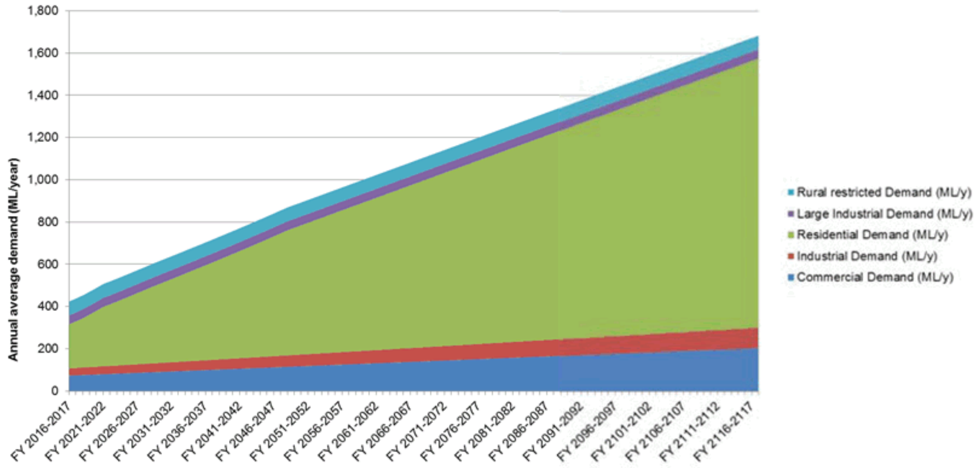


Figure F-3: Breakdown of baseline Brightwater/Hope consumption forecasts for High Growth without plumbing code.

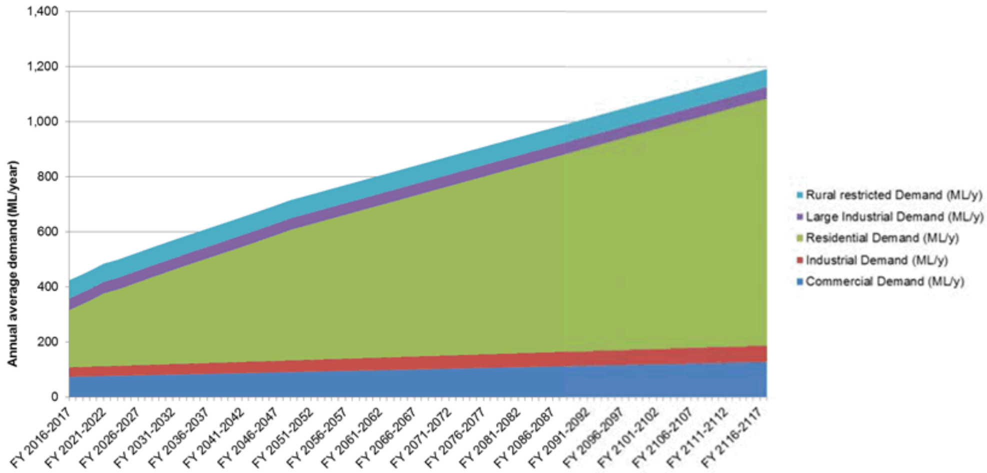


Figure F-4: Breakdown of baseline Brightwater/Hope consumption forecasts for Medium Growth without plumbing code.

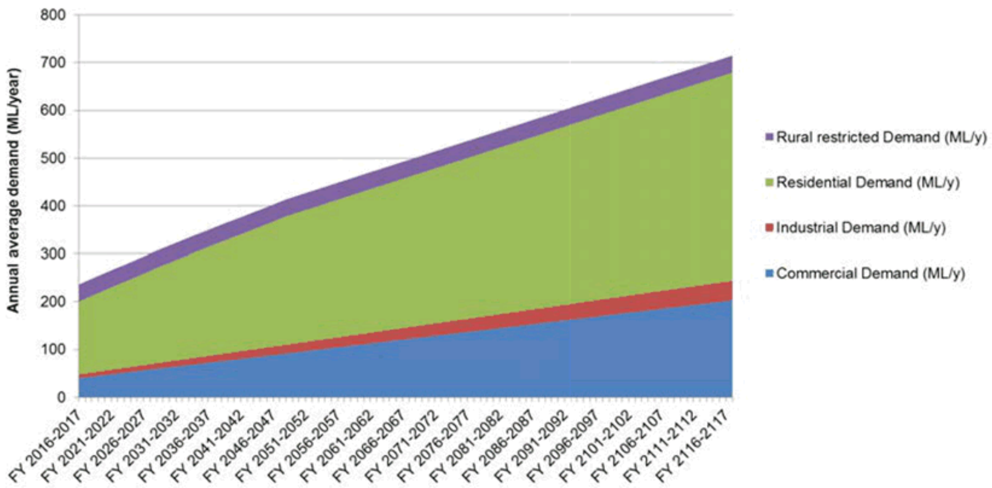


Figure F-5: Breakdown of baseline Wakefield consumption forecasts for High Growth without plumbing code.

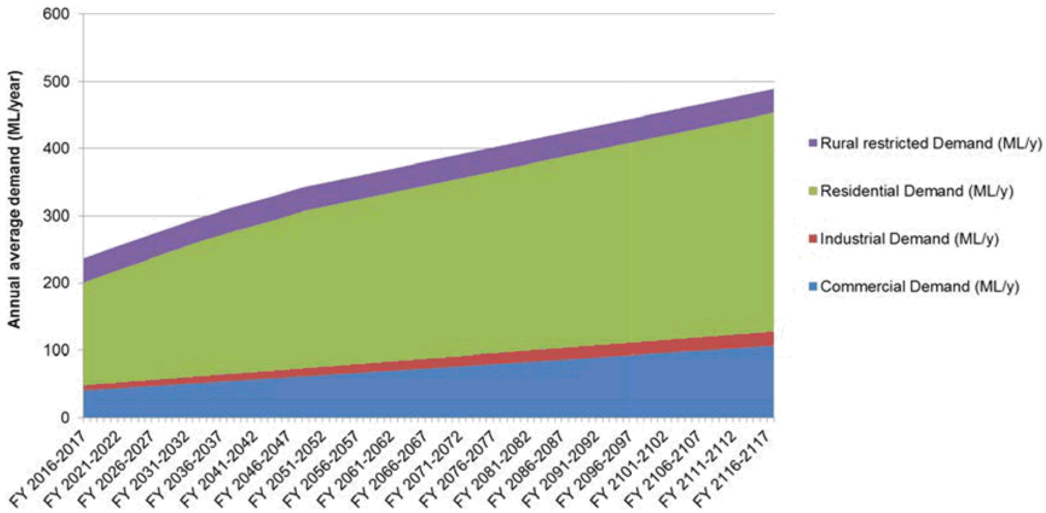


Figure F-6: Breakdown of baseline Wakefield consumption forecasts for Medium Growth without plumbing code.

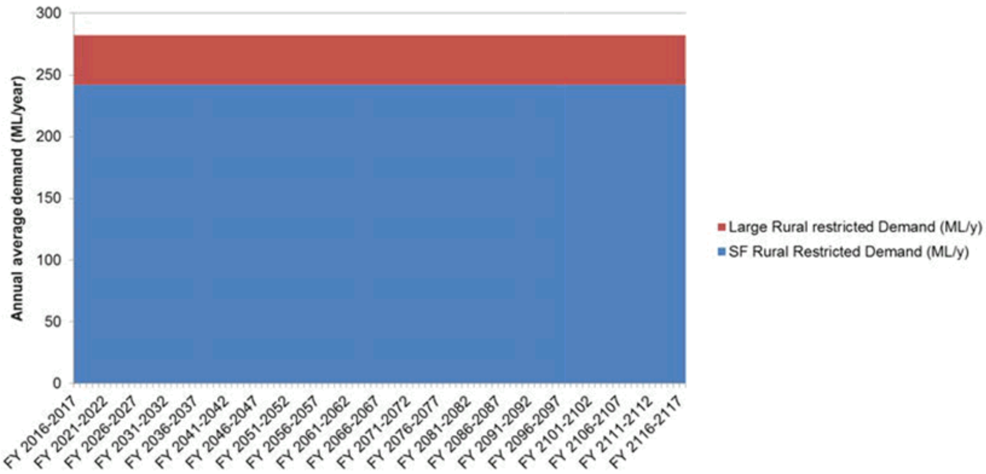


Figure F-7: Breakdown of baseline Redwood Valley consumption forecasts without plumbing code.

Appendix G Historical River Flows and Rationing Triggers

The triggers for Step 1 to Step 3 Rationing for the Waimea Plains Zones water takes are based on the Wairoa at Irvines flow. The trigger for Step 3 Rationing is based on a Wairoa at Irvines flow below 2,300 L/s.

Wairoa at Irvines - Number of days a Year Flow is Below Thresholds (2000 - 2016)

Year	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16
Days < 3000 l/s	6	131	73	90	41	56	128	97	87	45	89	52	29	58	38	59	44
Days < 2750 l/s	0	117	59	81	32	41	110	75	70	30	72	42	5	45	32	41	31
Days < 2300 l/s	0	101	27	64	10	14	75	42	33	6	46	19	0	20	13	16	11

The trigger for Step 4 Rationing for the Waimea Plains Zones water takes is based on the flow in the Lower Waimea River and salinity levels.

Lower Waimea - Number of days a Year Flow is Below Thresholds (2000 - 2016)

Year	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16
Days < 800 l/s	0	73	0	38	0	0	24	0	2	0	11	0	0	0	0	0	0

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8.2 REAPPOINTMENT OF INDEPENDENT MEMBER TO COMMERCIAL COMMITTEE

Decision Required

Report To:	Full Council
Meeting Date:	14 June 2017
Report Author:	Lindsay McKenzie, Chief Executive
Report Number:	RFC17-06-02

1 Summary

1.1 The Commercial Committee's function is to monitor and improve the performance of the Council's commercial and semi-commercial activities; review new commercial investments; and recommend on investments and resourcing to manage the financial and non-financial risks associated with these activities.

1.2 The Committee has three independent non-elected members. These appointments were confirmed by resolution at the 4 April 2013 Full Council meeting. The rotation of the independent members' terms was staggered to provide continuity.

1.3 One of the independent members, Mr Roger Taylor, retires by rotation this month. Mr Taylor is eligible to be reappointed and has confirmed he is offering himself for a further term.

1.4 The process in the Policy on the Procedure for Appointment of Directors and Trustees has been followed.

1.5 The Mayor and Chief Executive have made confidential enquiries of the Chairperson and other members of the Committee. Everyone supports Mr Taylor's reappointment. He brings a wealth of commercial knowledge and business acumen to the Commercial Committee table.

1.6 The recommendation to the Council is to appoint Mr Taylor for a further term of five years.

2 Draft Resolution

That the Full Council

1. **receives the Reappointment of Independent Member to Commercial Committee report; and**
2. **appoints Mr Roger Taylor to the Commercial Committee for a term of five years from 14 June 2017.**

3 Purpose of the Report

3.1 The purpose of this report is to recommend that Council reappoint Mr Roger Taylor to the Commercial Committee for a further term of five years.

4 Background and Discussion

4.1 The Commercial Committee's function (prior to the 2016 elections called the Commercial Subcommittee) is to monitor and improve the performance of the Council's commercial and semi-commercial activities; review new commercial investments; and recommend on investments and resourcing to manage the financial and non-financial risks associated with these activities.

4.2 The Committee has three independent non-elected members. These appointments were confirmed by resolution at the 4 April 2013 Full Council meeting.

4.3 The initial appointment process required one non-elected member to be appointed for three years, one for four years and one for five years to ensure appropriate rotation of non-elected members. This was to provide consistency, continuity of skill set and knowledge to the committee, especially over the election cycle. On retirement the member is eligible for reappointment should they wish to offer themselves.

4.4 At the inaugural meeting of the Commercial Subcommittee on 14 May 2013, Mr Roger Taylor was appointed for an initial term of four years. This year his term expired.

4.5 Mr Taylor has confirmed he is offering himself for reappointment. He brings a wealth of knowledge and business acumen to the Commercial Committee table. Further detail is provided in section 4.9 of this report.

4.6 Mr Taylor's reappointment has been considered according to the process in the Policy on the Procedure for Appointment of Directors and Trustees.

4.7 In accordance with 6.2.1 of this Policy the Mayor has made enquiries of the Chairperson and other members of the Committee. The response has been in full support of Mr Taylor's reappointment.

4.8 The recommendation to the Council is to approve Mr Taylor's reappointment for a further term of five years. The relevant section of the Policy follows -

6 Reappointment of Directors/Trustees

6.1 No Director/Trustee may be reappointed for a fourth successive term, unless there are special circumstances.

6.2 Subject to the constitution of the organisation concerned, where a Director/Trustee's term of appointment has expired and they are offering themselves for reappointment, the Mayor and/or the Chief Executive:

6.2.1 May make confidential enquiries from the Chairperson and other members of the Governing Board as necessary, including:

- whether the skills of the incumbent add value to the work of the Governing Board;
- whether there are other skills which the Governing Board needs; and
- whether a change to the existing Directors/Trustees would compromise the Governing Board's ability to pursue a desired vision and long term strategy, or whether there is a need for new skills and ideas on the Board;

6.2.2 Must consider any information obtained and form a view on the appropriateness of reappointment or making a replacement appointment; and

6.2.3 If reappointment is not appropriate, the appointment process outlined in Section 5 will be followed.

4.9 A short bio follows -

Bio - Mr Roger Taylor
Mr Taylor is a financial consultant who lives at Mapua. Roger has a Master of Commerce degree and a Bachelor of Arts degree. In addition to his consulting work he is a current Director of Port Taranaki and the Eastland Group. He also has extensive governance experience in education and the arts. He has received the honour of the Member of the New Zealand Order of Merit for this work.

4.10 The next meeting of the Commercial Committee is on 11 August 2017. It would be prudent to confirm Mr Taylor's reappointment, if successful, prior to this meeting in order for him to be able to make arrangements to attend and participate.

5 Options

5.1 There are two options for the Council:

5.1.1 Option 1 (preferred option): to **approve** the reappointment of Mr Taylor to the Commercial Committee for a further term of five years.

5.1.2 Option 2: to **not approve** the reappointment of Mr Taylor, and through the appropriate recruitment process, instead select and appoint a new independent member to the Committee. This recruitment process could take several weeks, noting that the next Commercial Committee meeting is on 11 August 2017.

6 Strategy and Risks

6.1 There is a low risk that if Mr Taylor is not reappointed, and the position is vacant for an interim period until a new appointment is made, there would be a loss of combined commercial acumen to be applied to Commercial Committee decision making.

7 Policy / Legal Requirements / Plan

7.1 The process followed is as per the Policy on the Procedure for Appointment of Directors and Trustees.

8 Consideration of Financial or Budgetary Implications

8.1 Nil

9 Significance and Engagement

9.1 The significance of this decision is considered low and no formal engagement is necessary.

Issue	Level of Significance	Explanation of Assessment
Is there a high level of public interest, or is decision likely to be controversial?	Low	
Is there a significant impact arising from duration of the effects from the decision?	Low	If Mr Taylor is not reappointed, and one independent member position is vacant for an interim period until a new appointment is made, there would be a loss of combined commercial acumen to be applied to decisions made about the commercial assets of Council.
Does the decision relate to a strategic asset? (refer Significance and Engagement Policy for list of strategic assets)	No	
Does the decision create a substantial change in the level of service provided by Council?	No	
Does the proposal, activity or decision substantially affect debt, rates or Council finances in any one year or more of the LTP?	No	
Does the decision involve the sale of a substantial proportion or controlling interest in a CCO or CCTO?	No	
Does the proposal or decision involve entry into a private sector partnership or contract to carry out the deliver on any Council group of activities?	No	
Does the proposal or decision involve Council exiting from or entering into a group of activities?	No	

10 Conclusion

10.1 The Council needs to make a decision on the reappointment of Mr Taylor to the Commercial Committee for a further term, based on the recommendation of the Mayor, Chair and Committee members.

11 Next Steps / Timeline

11.1 Mr Taylor will be notified by letter of the outcome of the decision of the Council. This will also be noted at the next Commercial Committee meeting.

12 Attachments

Nil

9 CONFIDENTIAL SESSION

9.1 Procedural motion to exclude the public

The following motion is submitted for consideration:

THAT the public be excluded from the following part(s) of the proceedings of this meeting. The general subject of each matter to be considered while the public is excluded, the reason for passing this resolution in relation to each matter, and the specific grounds under section 48(1) of the Local Government Official Information and Meetings Act 1987 for the passing of this resolution follows.

This resolution is made in reliance on section 48(1)(a) of the Local Government Official Information and Meetings Act 1987 and the particular interest or interests protected by section 6 or section 7 of that Act which would be prejudiced by the holding of the whole or relevant part of the proceedings of the meeting in public, as follows:

9.2 Environment and Planning Manager's Report - Addendum Private Plan Change Request 62

Reason for passing this resolution in relation to each matter	Particular interest(s) protected (where applicable)	Ground(s) under section 48(1) for the passing of this resolution
The public conduct of the part of the meeting would be likely to result in the disclosure of information for which good reason for withholding exists under section 7.	48(i)(d) - To deliberate in private in a procedure where a right of appeal lies to a Court against the final decision.	s48(1)(a) The public conduct of the part of the meeting would be likely to result in the disclosure of information for which good reason for withholding exists under section 7.