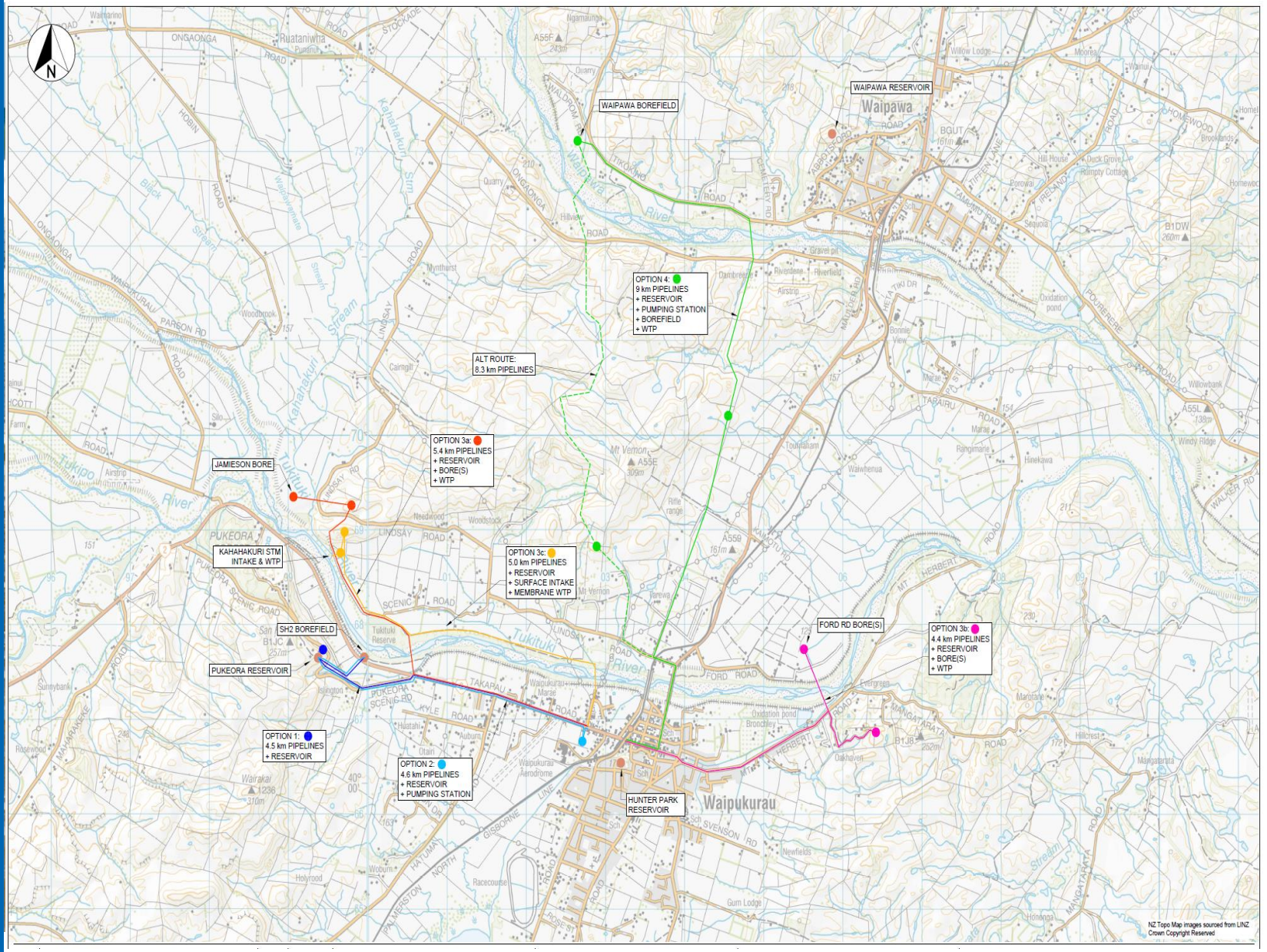
CENTRAL HAWKE'S BAY DISTRICT COUNCIL

Waipukurau Second Water Supply

Preferred Option Recommendation

23 April 2020

Finance and Infrastructure Committee



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Purpose

- To remind council of the origins of the project and the budget outlined in LTP 2018.
- To explain the journey to date, and the process to identify the preferred option.
- To outline the preferred option, the benefits, trade-offs and expected project outcome.

- Today we need your input into a discussion that will give us direction on the NEXT Steps for this project…

Context

- 2018 Water AMP – No massive burning platform for change..

- **2018 LTP** - A significant project is to provide a second supply for the District's largest township including treatment plant and pumping station and additional reservoir. The new reticulation will provide additional flows for the town to meet demand in particular for enabling industrial development.

Waipukurau Water Supply: Second Supply			
Most Likely Scenario	A project to construction a second supply to Waipukurau including new pump station, treatment plant and reservoir to provided security of supply and increased demand.	2019/20	$5.7m

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Context

- Big Water Story
  - Signalled as Key Project – Delivery Pressure
  - We have learnt a lot through our other projects

- Affordability
  - $5.7m in LTP 2018 – doesn't address all problems...
  - Benefits Realisation into Value (Achieves significant improvements in key outcome areas: resilience, consistent levels of services and supporting growth)

- Risk
  - Reservoir/ Trunk Mains Failure
  - Water Usage/ Loss Management
  - Source Resilience
  - Getting ahead of ourselves
  - Other Factors

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Context

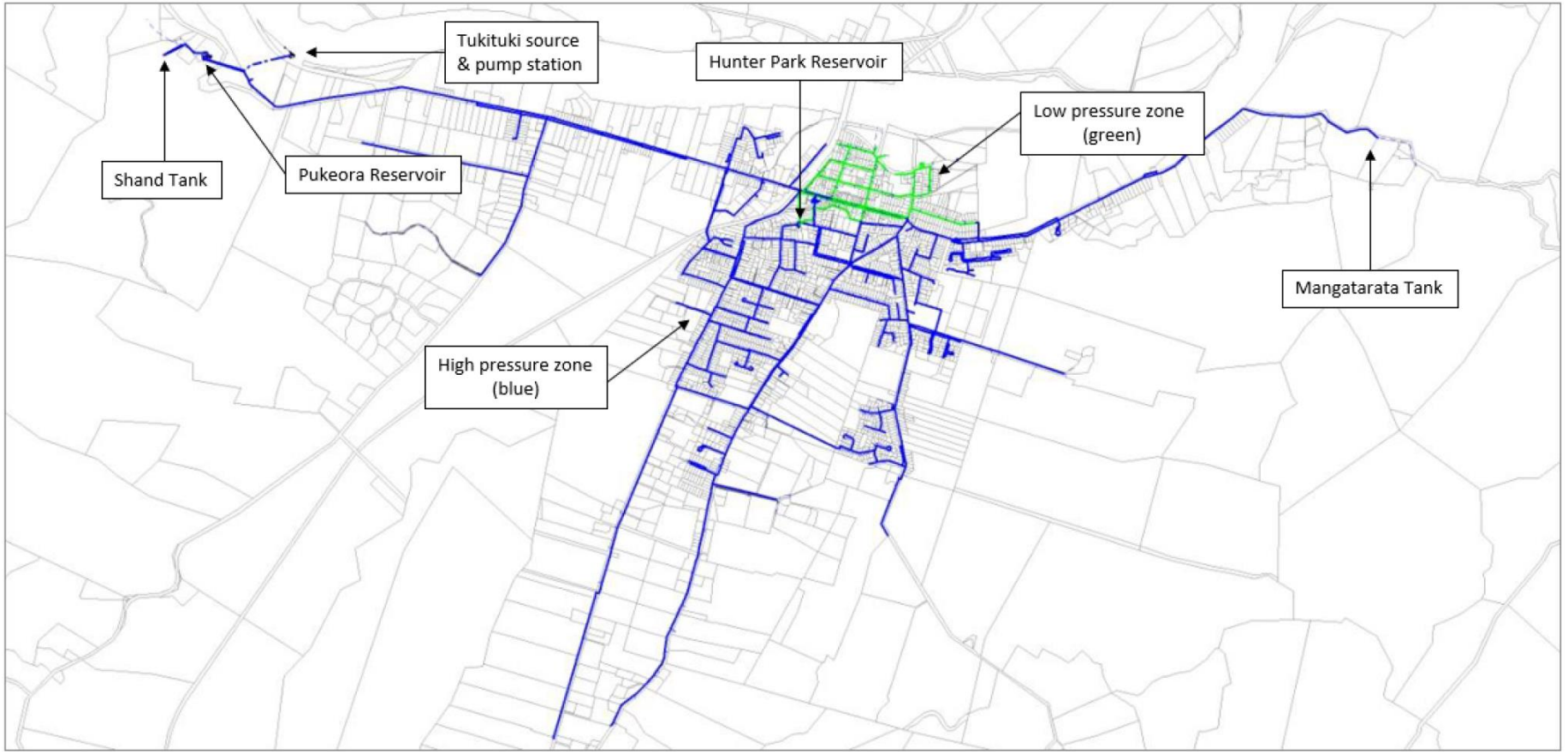
- **LTP Cycle**
  - Updating Growth Assumptions
  - Asset Managament Plan Updates
  - Spatial Plan in progress
  - Affordability

- **3 Waters Review**
  - The unknown

Background

- The Waipukurau water network

Demand Actual	Avg. per day	Annual (cm3)
Sep 2015 – Aug 2016	3,943 cm3	1,443,339
Sep 2016 – Aug 2017	4,151 cm3	1,510,899
Sep 2017 – Aug 2018	4,224 cm3	1,541,726
Sep 2018 – Aug 2019	4,395 cm3	1,604,074



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Background

What we thought we knew

- In 2016, CHBDC engaged Opus International Consultants to construct a hydraulic model of the water supply. The model identified several issues with Waipukurau's water supply:
  - A lack of strategic storage
  - Risks to security of supply if there are issues with the existing source, reservoir or trunk main
  - Constraints to servicing planned future growth and infill
  - Areas of insufficient fire flow.

- We thought we knew there was water on the Eastern side of Waipukurau to kick the project off and implement the improvements

Background

The exploratory work…

Following the 2016 model and findings, in 2017 works commenced to investigate a second water supply involving a staged investigation that included:

- A hydrological assessment to determine suitable locations to drill a water supply bore.
- Assisting CHBDC to engage a suitable drilling contractor to drill an investigation bore, followed by a production bore if indications were favourable.

Three investigation bores were drilled near the river on the eastern edge of town, each with insufficient yield to be pursued further. CHBDC then **paused** future phases to take stock of the project and revaluate potential water sources and project objectives.

In 2019 CHBDC, went through a robust procurement process and re-engaged WSP to carry out this strategic assessment, review the previous options in the context of the strategic assessment to determine a preferred option and to design the required improvements. With a new team dedicated to this project.

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Background

What we know now

- Lack of resilience creates a risk that the water supply system is compromised – failure of pipeline/ reservoir
- Inability to consistently service demand leads to level of service and compliance failures
- Inability to provide enough water to service the growth of urban areas limits CHBDC's ability to influence development patterns.
  - more about the structure of the network – long 'spine' system – limiting ability to service growth areas
- Parts of the network are nearing the expected service life (in particular the reservoirs) which is a risk to the supply.

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What we know now

- Population/ Household Growth Assumptions

Forecast Parameter	2013	2017	2018	2023	2028	2033	2038	2043	2046	2048
Population (Stats NZ)	3900		4220	4340	4430	4470	4450	4410		
Population (Bevin 2017)	4825	5035	5080		5250					5560
Population (CHBDC 2016)	5333								6524 7250	
Household Connections CHBDC LTP (2018-2019)			2172							
Households (Bevin 2017)	1970	2040	2065		2295					2527
People per household (Bevin 2017)	2.5	2.5	2.5		2.3					2.2

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What we know now

- Current Water Supply and Demand

Available usage data provided by CHBDC from September 2015 to 2019 (Figure 2-2) indicates the average daily use for Waipukurau is 4,107m³/day. Across 2173 properties, this equates to a daily use of 1.89m³ per connection. This is marginally higher than the targeted level of service.

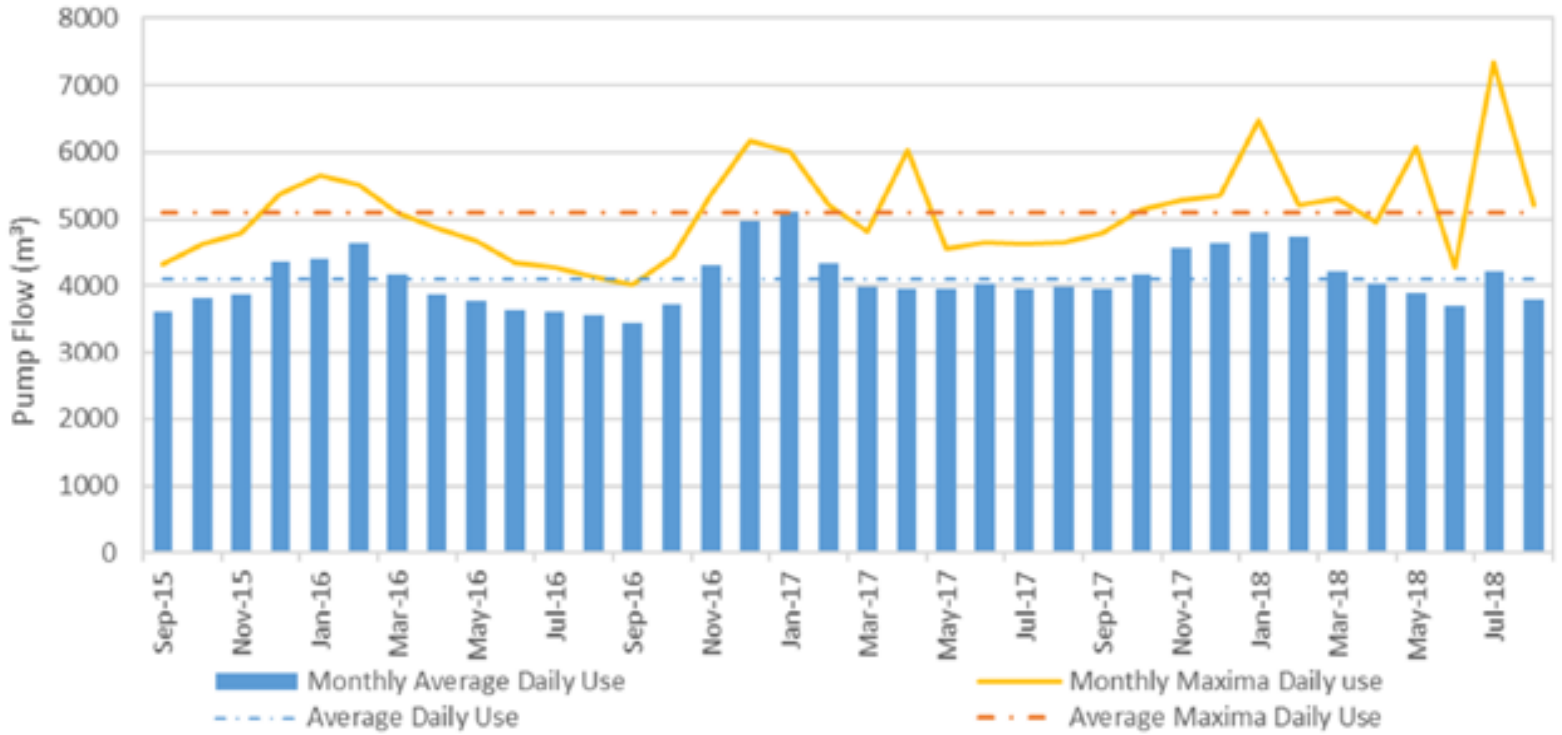

Figure 2-2: Monthly average daily water use and monthly maxima daily water use used at Waipukurau.

Storage	Size	Storage
Pukeora Reservoir	2,700 cm3	8-12 hours
Hunter Park	900 cm3	40 hours
	3,600 cm3	
Supply	**Capacity**	**Consent**
Borefield (Now)	80-100 l/s	100 l/s
Borefield (Post Upgrade)	170-190 l/s	100 l/s
Borefield (Now)		8,640m³/day
Borefield (Post Upgrade)		8,640m³/day
Demand Assumptions	**Connections**	**Use**
1.89cm3 (2015 - 2019)	2,173	4,107m3/d
1.89cm3 (2048)	2,635	4,980m3/d
Demand Actual	**Avg. per day**	**Annual (cm3)**
Sep 2015 – Aug 2016	3,943 cm3	1,443,339
Sep 2016 – Aug 2017	4,151 cm3	1,510,899
Sep 2017 – Aug 2018	4,224 cm3	1,541,726
Sep 2018 – Aug 2019	4,395 cm3	1,604,074

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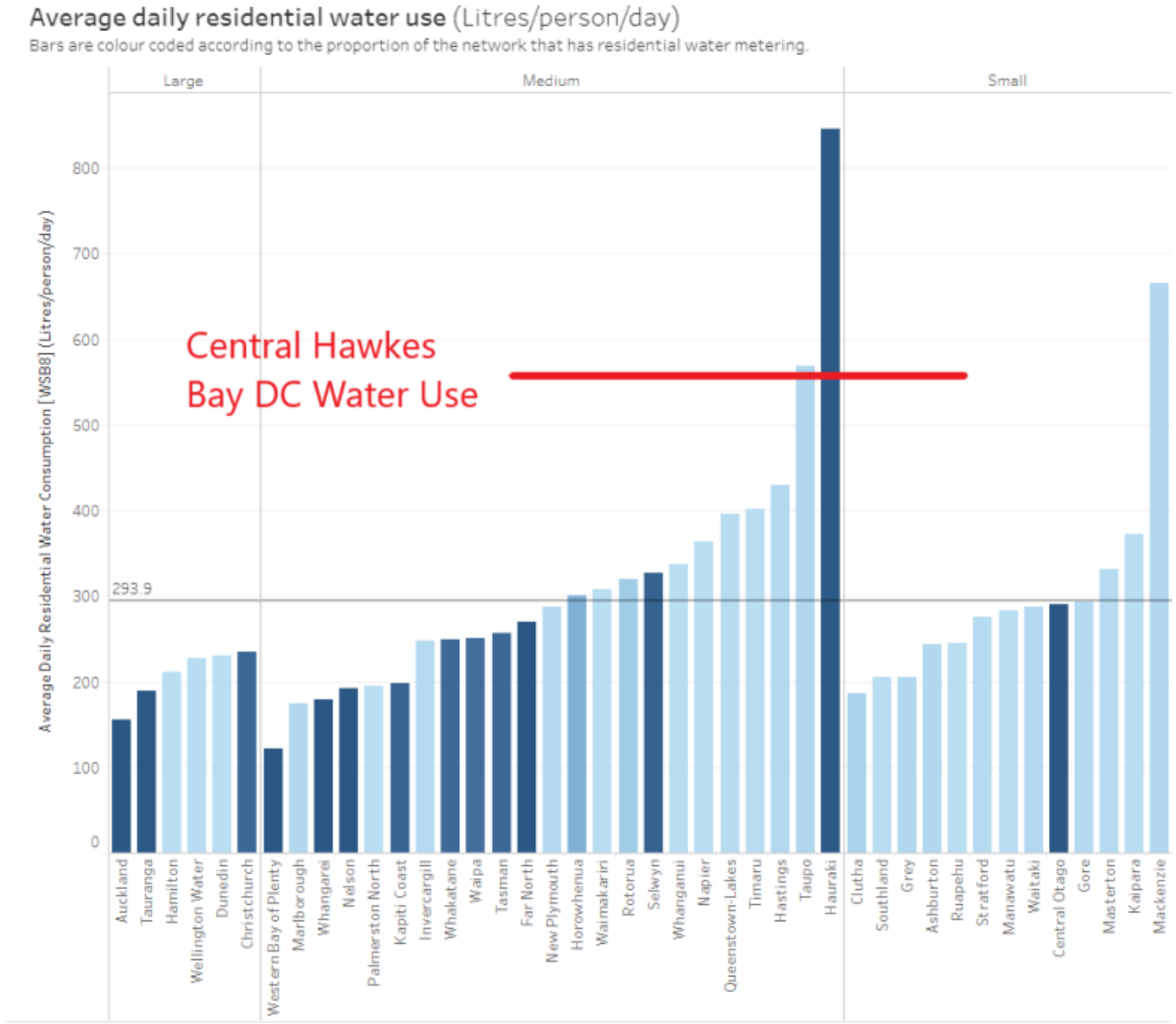
What we know now

- High Water Usage
- Leakage is present
- Water Demand is Increasing
- We are Growing



Source: https://www.waternz.org.nz/residentialefficiency

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What we know now

- Water Supply and Demand
  - The targeted level of service is **1.8m³/ connection/day**. The current average and peak daily use is about **1.89 and 3.0 m³**/property/day respectively.
  - Based on the Bevin 2048 growth forecast (extra 462 connections), the Year 2048 average and peak daily use could increase to 4,743 m³ and 7,980 m³/day respectively.
  - The current consented supply (i.e. 8,640m³/day) should provide sufficient water to meet the increase in demand associated with growth, providing this volume can be abstracted.
  - We need updated growth assumptions.

- It is not as easy as drilling a hole close to the river and finding the right quality and quantity of water.

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What we know now

- Projected Water Supply and Demand
- Water Take Consented Allowance
  - Currently CHBDC has consent (WP030775Ta) to abstract a total of up to 100L/s from five wells (5676, 5677, 15107, 15108, and 15409), a combined 7-day volume of 60,480m³ (8,640m³/day). Three wells to be replaced within 6 months.
- Climate Change
  - As a condition of CHBDC resource consent (WP030775Ta), when river flows fall below 2,300L/s at Tapairu Road CHBDC must implement demand management and water conservation measures as set out in the CHBDC Water Management Strategy (2019). The river low-flow trigger had previously been 1,900 L/s but was increased in July 2018 to coincide with minimum flows required for 90% habitat protection for longfin eel.
  - WSPs climate change assessment indicated that river flows may drop below the threshold more often, refer Table 3.3

Table 2.2: Future demand projections at 2048 for Waipukurau.

Households (2048)	*Targeted level of service and peak daily flow*	*Average use 2015-2019 and peak daily flow*	*Peak use over 2015-2019 and peak daily flow*
2,635	1.8	1.89	3.0
	4,743 m³	4,980 m³	7,905 m³

Table 3.3: Modelled effect of Climate Change on increasing the number of days were flows fall below consented thresholds in the Tukituki Rivet at Tapairu

Summary Statistic	*2009-2019*	*2040-2059*	*2080-2099*
Days below 2,300L/s	18	22	30

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Our Water Source – The Tukituki River

- There are a number of risks associated with the current raw water source connected to the Tukituki River:
  - Contamination such that the water can't be used – either through gradual deterioration (catchment effects) or a one-off event like a contamination spill – unlikely but serious consequences.
  - Flooding of the borefield (overtopping or failure of the stopbank) – would be a significant temporary impact but unlikely.
  - Failure / collapse of the bores following a seismic event – likely in an earthquake but the existing wells are shallow and are therefore relatively quick to redevelop or re-drill.
  - Reduced river thresholds or higher consent restrictions – it is possible that this will occur, however reasonable to expect that water takes for potable water will be given higher priority.
- Adding a new source not connected to the Tukituki would mitigate these risks (eg. Waipawa connection or deep groundwater), but no obvious low risk source has been identified. It is often difficult and expensive to identify and develop a satisfactory source of potable water.

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What we know now - Other Risks

- Seismic Risks
- The current system has a moderately high failure risk profile, with a single ended supply, aging infrastructure and a lack of strategic water storage.
- Water Loss and Management – needs work to prolong life of an asset.
- Current Asset Management Plans doesn't support the project
- Future Growth – Spatial Plan Considerations
- Funding Application to CIP being successful

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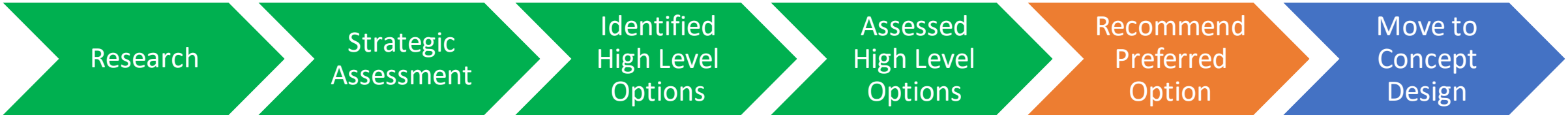
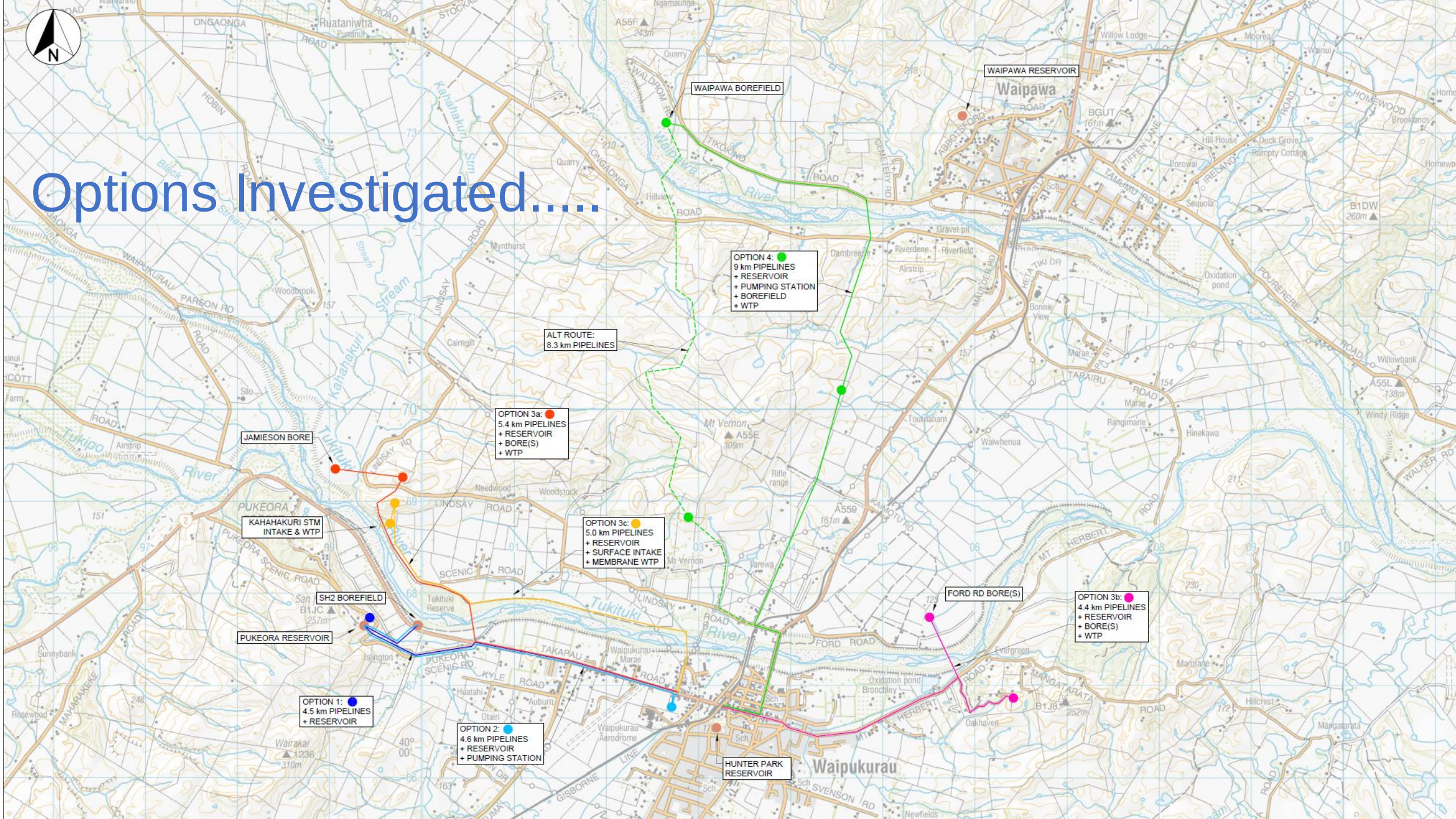
Process

- We essentially went back to the drawing board;
  - To confirm what we needed to achieve for this project to add value and be successful
  - Ensured we considered bigger picture thinking
  - Listened to stakeholders
  - Ensure we considered budget/ funding
  - Clear criteria to assess options against

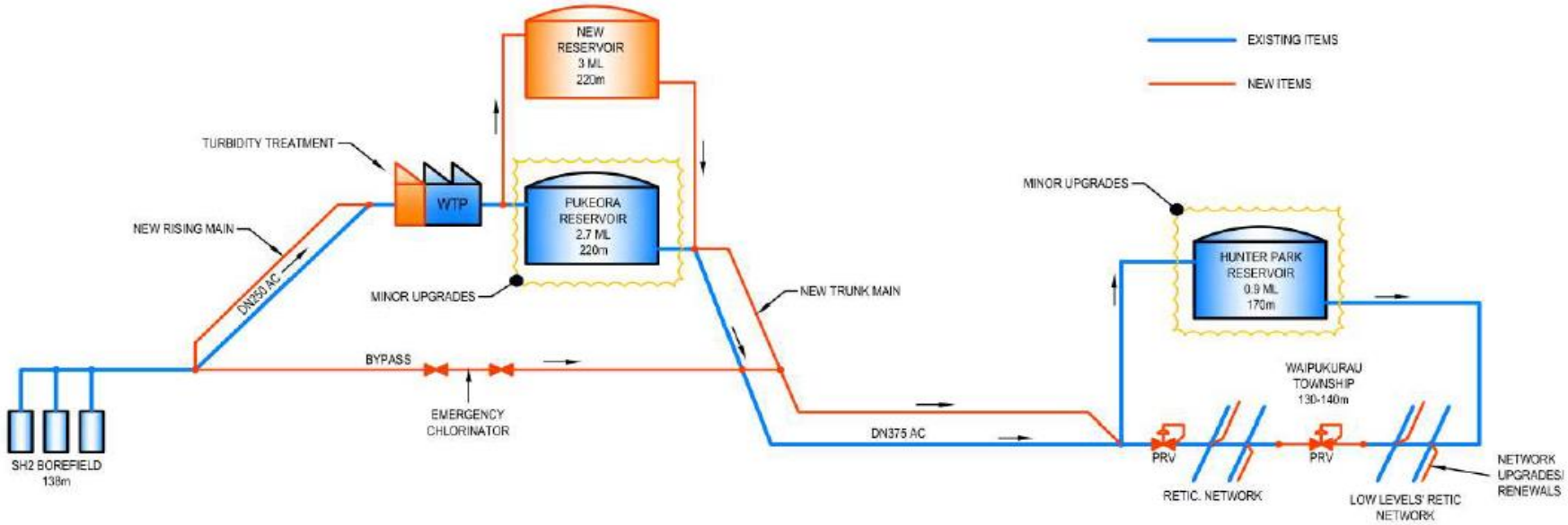


Options Investigated.....



Option 1: Enhanced Status Quo

- This option replaces the vulnerable trunk mains and adds storage at Pukeora. The reticulation network is enhanced with the addition of pressure reducing valves to provide more consistent service levels and to provide a secondary low-level supply. An emergency bypass is provided to enable the SH2 borefield to supply directly in the event of a significant failure at the Pukeora WTP and reservoirs.



Schematic of Option 1

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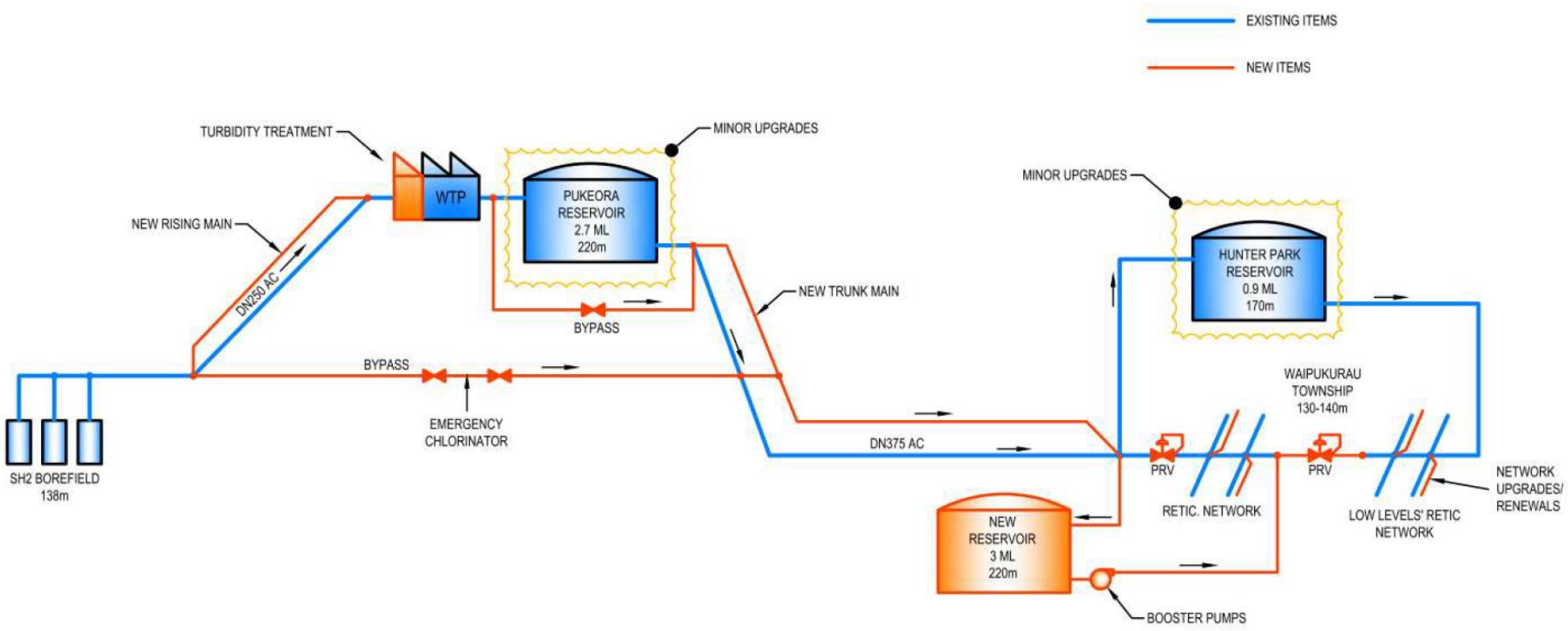
Option 2: Town Storage

- Same as option 1, but Option 2 provides significant storage at a low level within the township. This requires pumping to provide service pressure. It also allows for an injection of supply into other points within the network to improve pressure and for the failure of existing pipeline or reservoirs



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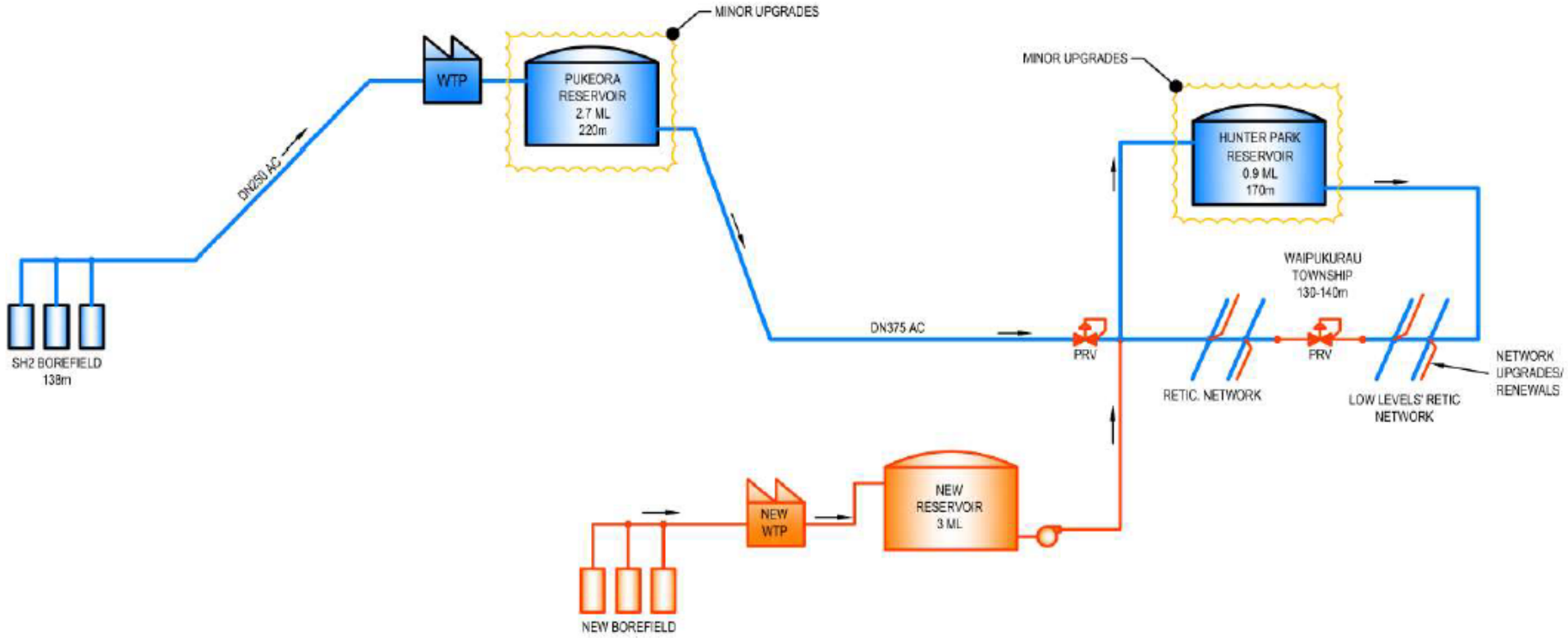
Option 3: Second Supply (three sub-options involving different water sources)

- Three sub-options have been assessed with a second water source from Ford Road (Same Source), Jamiesons Farm (over allocated Aquifer, very Hard Water), and Kahahakuri Stream (High E-coli, and Turbidity Spikes).



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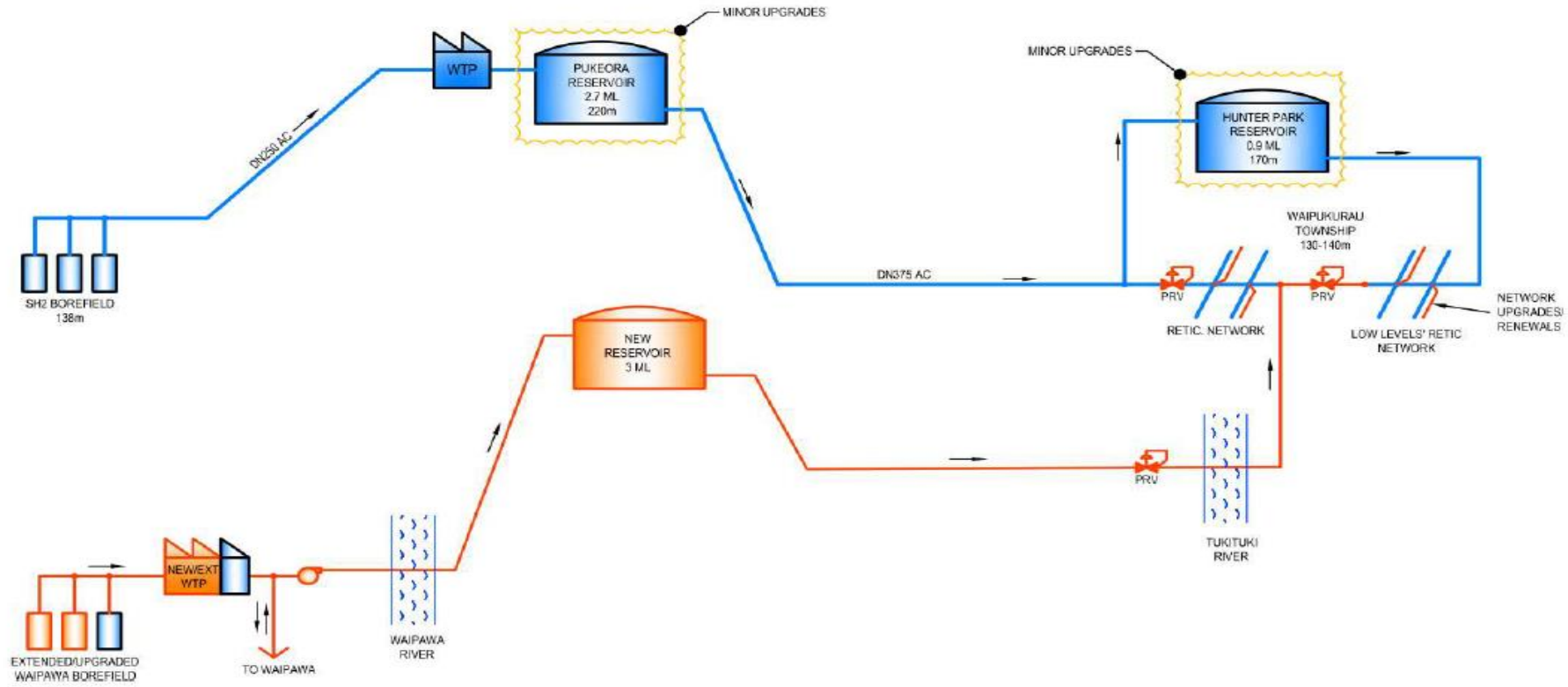
Option 4: Waipawa Link

- It requires a long pipeline from the existing Waipawa borefield, and the borefield would need to be developed or extended to provide the sufficient water for Waipukurau which has water demand that is 200-250% higher than Waipawa. We note there may be spare capacity at Waipawa which may reduce the amount of extra capacity required.



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Approach / Methodology - Strategic Assessment

- Other factors that are likely to be importance when choosing between options are listed below:
  - Cost – whole of life capital and operating costs
  - Staging - Ability to stage implementation to stagger expenditure
  - Delivery risk – the risks associated with delivering the solution (for example the risk of finding a new water source or the risk of obtaining consents and approvals).

Table 2 – Problems, investment objectives and outcomes sought for Waipukurau's water supply.

Problem Statement	Benefit Statement / Outcome Sought	Investment Objective
Lack of resilience creates a risk that the water supply system is compromised	A more resilient water supply system *(50%)*	• More robust infrastructure with lower risk of damage • Improved network redundancy to reduce reliance on any one component • Increase time available to respond to a component failure
Inability to consistently service demand leads to level of service and compliance failures	*Consistently* compliant Level of Service *(40%)*	• Consistent compliance with DWSNZ (Drinking Water Standards NZ) • Consistent water supply provided at the right quantity and pressure
Inability to provide sufficient water to service the growth of urban areas limits CHBDC's ability to influence development patterns	Support socially and economically sustainable growth in a planned fashion *(10%)*	• Sufficient water available for sustainable growth • Infrastructure that delivers water to areas of desired growth

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Approach / Methodology

Known Challenges

1. Little margin between the capacity of the SH2 Borefield/ storage and peak demand.
2. Water restrictions triggered by the Regional Council water take conditions.
3. High per-capita water demand and leakage rates.
4. A single water source and single-thread trunk reticulation pipelines which are vulnerable to seismic and other events which may interrupt supply for an extended period.
5. Treatment that is unable to meet drinking-water standards when the source water is turbid.
6. Aging infrastructure which has suffered from historical under-investment and is rapidly approaching the end of its useful life. In particular, the storage reservoirs are very old (ca. 100 years) and would not meet present-day seismic standards for critical infrastructure.
7. A lack of water storage which does not provide adequate time to respond to major incidents without loss of service.
8. Insufficient fire-fighting water supply to part of town, particularly high-risk industrial areas.
9. Inability to service growth and development in the water supply area.

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Approach / Methodology - MCA Criteria

Criteria	Weighting
Resilience The extent to which the option satisfies the following objectives: - More robust infrastructure with lower risk of damage - Improved network redundancy to reduce reliance on any one component - Increase time available to respond to a component failure	25
Consistent Level of Service The extent to which the option satisfies the following objectives: - Consistent compliance with DWSNZ (Drinking Water Standards NZ) - Consistent water supply provided at the right quantity and pressure	20
Support sustainable growth The extent to which the option satisfies the following objectives: - Sufficient water available for sustainable growth - Infrastructure that delivers water to areas of desired growth	10
Cost - Whole of life capital and operating costs - Cost relative to available budget	15
Staging - The extent to which the option can be staged to stagger expenditure	15
Delivery risk - the risks associated with delivering the solution that may lead to delays and or costs. For example risks like; - finding a new water source - obtaining consents - access agreements or land purchase	15
	100

Table 4 : MCA Outcomes (ranked in order of score)

Option	Score
2 – Town Storage	375
4 – Waipawa Link	330
1 – Enhanced Status Quo	320
3c – Kahahakuri Stream	315
3b – Ford Road	290
3a – Jamiesons Farm	285

Table 2 : High Level Capital Cost Estimates

Option 1 – Enhanced Status Quo	Option 2 – Town Storage	Option 3a – Jamieson Farm Supply	Option 3b – Ford Road Supply	Option 3c – Kahahakuri Stream Supply	Option 4 – Waipawa Link
$8.2 M	$7.3 M	$19.7 M	$9.2 M	$13.9 M	$11.8 M

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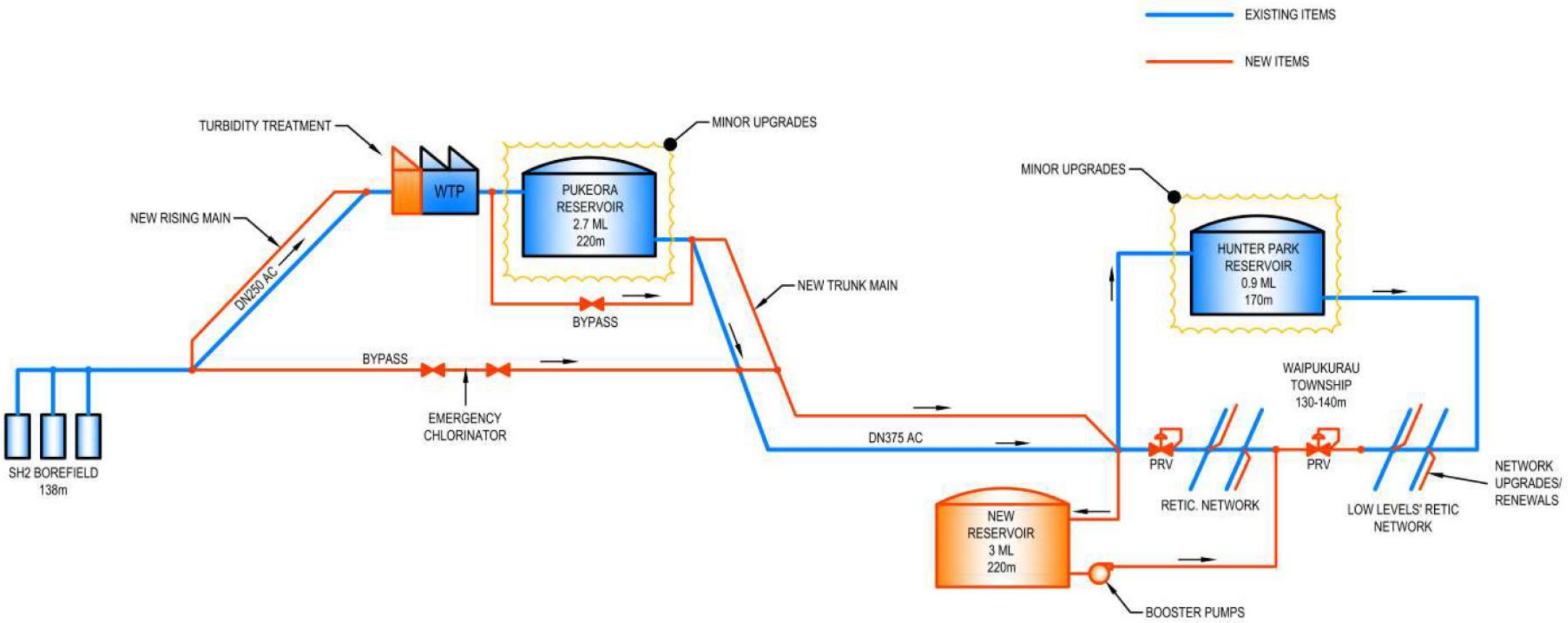
The Preferred Option – **Option 2**



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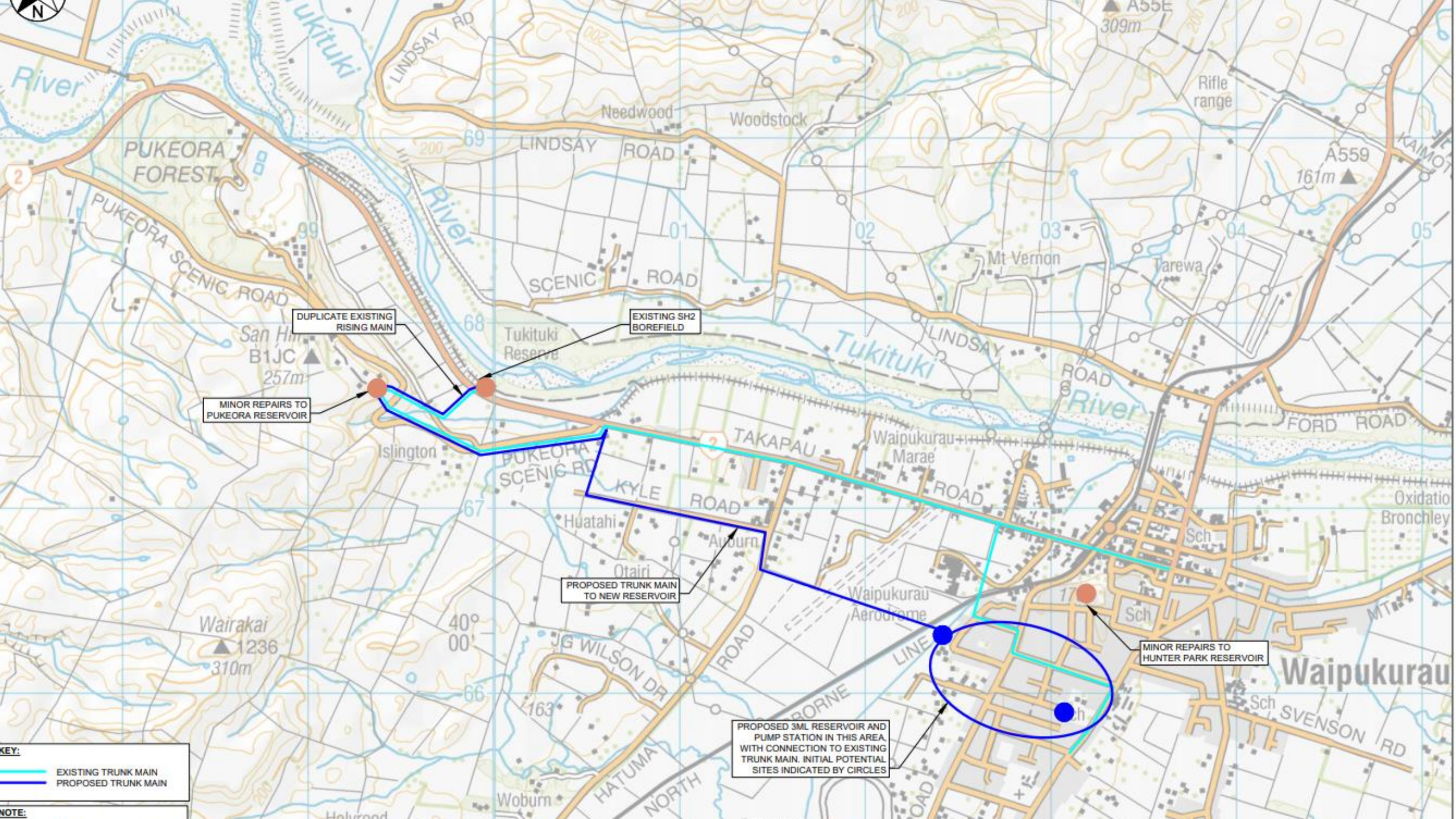
DUPLICATE EXISTING RISING MAIN
EXISTING SH2 BOREFIELD
MINOR REPAIRS TO PUKEORA RESERVOIR
PROPOSED TRUNK MAIN TO NEW RESERVOIR
PROPOSED 3ML RESERVOIR AND PUMP STATION IN THIS AREA, WITH CONNECTION TO EXISTING TRUNK MAIN. INITIAL POTENTIAL SITES INDICATED BY CIRCLES
MINOR REPAIRS TO HUNTER PARK RESERVOIR
KEY:
EXISTING TRUNK MAIN
PROPOSED TRUNK MAIN
NOTE:
PUKEORA FOREST
PUKEORA SCENIC ROAD
LINDSAY ROAD
SCENIC ROAD
TAKAPAU ROAD
KYLE ROAD
JG WILSON DR
HATUMA ROAD NORTH
SVENSON RD
FORD ROAD
Tukituki River
Waipukurau
Islington
Huatahi
Otairi
Auburn
Woodstock
Needwood
Mt Vernon
Tarewa
Rifle range
Waipukurau Marae
Waipukurau Aerodrome
Tukituki Reserve
Woburn
Wairakai 1236 310m
San Hill B1JC 257m
A559 161m
A55E 309m

The Preferred Option

Benefits	Trade-Offs/ Risks
Adds additional storage, providing additonal buffering at peak times plus enabling longer response times to repair network failures	Still relies on one raw water supply point. Risk of source contamination remains, but low and expensive to mitigate
The town can be served off the new reservoir, allowing the existing reservoirs to be taken off line for maintenance or for eventual replacement (no redundancy for this presently exists)	Source is still on one side of town
Duplicates the current trunk pipelines, allowing some redundancy, plus new pipelines will be more resilient (polyethelene vs current asbestos cement)	Some additonal operating cost (network pump station) but will be minimised through operational control set-up
Reservoir in town reduces reliance on SH2 supply main plus allows for better supply to the growth areas	Seismic Risks
Best value for nearly maximum benefit	

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The Preferred Option

- The new reservoir can be located close to/within the town. It is expected that this will provide more cost-effective storage compared to Option 1 although a new pump station is required.
- Pumping is required to provide storage pressure. To reduce operating costs, it is anticipated that only a relatively small area is normally serviced by the reservoir (enough to provide regular turnover), but full pumping capacity is available in the event of a failure in the network.
- A bypass is provided to enable raw water (with possible emergency chlorination) to be supplied to town in the event of an emergency. This will take advantage of the close proximity of the rising main and trunk main at the foot of the hill.
- The critical asbestos cement (AC) rising and gravity trunk pipelines will be replaced.
- Pressure-reducing valves in town will provide flexibility of supply, enabling the Hunter Park reservoir to be upgraded or replaced.
- Additional treatment is required to adequately treat the water during periods of high turbidity.
- We believe that there is scope to consider lower-cost construction options like steel reservoirs and optimize the design further generally to provide better value.

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The Preferred Option – Cost Estimate

Waipukarau Water Supply Upgrades - Comparative Cost Estimates										
		Option 1 - Enhanced Status Quo				Option 2 - Town Storage			
Item	Description	Unit	Qty	Rate	Amount	Unit	Qty	Rate	Amount
1	SUPPLY								
1.1	Land acquisition	LS			$ -	LS			$ -
1.2	New bores	LS			$ -				$ -
1.3	Headworks civil	LS			$ -				$ -
1.4	Headworks mechanical	LS			$ -				$ -
1.5	Headworks electrical	LS			$ -				$ -
1.6	Rising main	m	710	$ 450	$ 319,500	m	710	$ 450	$ 319,500
1.7	Emergency link	LS	1	$ 30,000	$ 30,000	LS	1	$ 30,000	$ 30,000
2	TREATMENT								
2.1	Land acquisition				$ -				$ -
2.2	Treatment civil				$ -				$ -
2.3	Turbidity removal	LS	1	$ 400,000	$ 400,000	LS	1	$ 400,000	$ 400,000
2.4	Disinfection (UV + Chlorine)				$ -				$ -
2.5	Additional Treatment (Fe/Mn/hardness)				$ -				$ -
3	DISTRIBUTION								
3.1	Land acquisition	LS			$ -	LS	1	$ 400,000	$ 400,000
3.2	Reservoir 3ML	LS	1	$ 4,000,000	$ 4,000,000	LS	1	$ 2,000,000	$ 2,000,000
3.3	Trunk main	m	3600	$ 450	$ 1,620,000	LS	3800	$ 450	$ 1,710,000
3.4	Pumping station	LS			$ -	LS	1	$ 750,000	$ 750,000
3.5	Retic PRVs	ea	2	$ 75,000	$ 150,000	ea	2	$ 75,000	$ 150,000
4	*Subtotal*				*$ 6,519,500*				*$ 5,759,500*
4.1	Design, P&G, Consenting	%	25%	$ 6,519,500	$ 1,629,875	%	25%	$ 5,759,500	$ 1,439,875
	TOTAL CAPEX				$ 8,149,375				$ 7,199,375
5	OPEX								
5.1	Net increase in treatment OPEX	%	5%	$ 400,000	$ 20,000	%	5%	$ 400,000	$ 20,000
5.2	Net increase in energy use	kWh		$ 0.25	$ -	kWh	40000	$ 0.25	$ 10,000
5.3	Net increase pump maintenance	%	1%	$ -	$ -	%	1%	$ 750,000	$ 7,500
	TOTAL OPEX INCREASE				$ 20,000				$ 37,500
	25-YEAR NPV (5% discount rate)				$ 8,431,254				$ 7,727,898

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Link to other projects (Current)

- **SH2 Borefield Upgrade** is one peice of this puzzle, adding the borefield resilience and security needed to supply current and future demand

- **Waipukurau Firefighting and Shortfalls** replaces and adds water mains over a 7 year period to increase pressure and add resilience

- **Waipukurau Water Main Renewals** is an ongoing programme to renew the network to improve water loss and improve levels of service

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Other Recommendations

- Complete projects
- Inspect and refurb the existing reservoirs
- Update and implement our water conservation and management strategies
- Investigate water meters
- Use the AMP to identify a clear water renewal programme to physically and proactive reduce water leaks and loss

Summary

- We thought, we knew some stuff, we did a bit of physical work, weren't successful - > Paused -> Reset, and Ensured we were clear on what we wanted to ACHIEVE.
- An ILM, and Strategic Assessment were undertaken to provide clarity on the problem, and the Criteria
- Options were identified, and evaluated against this Criteria.
- We have a Preferred Option that we can deliver within LTP budgets and delivers on nearly all outcomes, but doesn't provide a new SOURCE.
- Contamination and Source Risk Failure is There, But Low, and Expensive to Mitigate.

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Next Steps (If we Pause)

- Await Outcome of Funding Application to CIP/ PDU
- Factor Spatial Plan and Growth Assumptions into the Project
- Direction on whether we need a new source?
  - If yes, do we update the budget as part of LTP 2021 process?
  - If no, do we need to update the project scope/ budget in LTP 2021?
- Complete WPK Firefighting, and SH2 Borefield – and analyse results of these improvements
- Review, and Update Water Management Strategy
- Implement Water Management Strategy Actions incl… Reducing water Usage into Project Basis of Design

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Next Steps (If we Proceed)

- Confirm Basis of Design, proceed to Concept Design -> Detailed Design
- Identify Land, Negotiate as Required for Pipeline Route, Reservoir
- Plan and Commence Procurement for Construction
- Construct
  - Pipeline
  - Reservoir
  - Treatment Additions
- Implement Recommendations
- Complete Existing Projects

Questions?