Riverhead Future Urban Zone

Water and Wastewater Servicing Strategy Development

Riverhead Landowners Group

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→ The Power of Commitment

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1. Introduction

The Riverhead Future Urban Zone (FUZ) is an area of approximately 80 Ha to the west of the Riverhead township (Figure 1). The current Unitary Plan identifies this area zoned as a future urban zone. The Riverhead Landowners Group comprising Fletcher Residential Ltd, The Neil Group Ltd and Matvin Group Ltd (the applicants) are applying for a plan change of this area to Residential. It is anticipated to be a mixture of Mixed Housing Suburban, Mixed Housing Urban, Terraced Housing and Apartment Buildings, Local Centre and Neighbourhood Centre Zones, including a retirement village.

In applying for the plan change, applicants must demonstrate to Watercare that it is feasible to service the development from a water and wastewater perspective. This report is a development of the report "*Riverhead Future Urban Zone Water and Wastewater Capacity Review*", dated 13 December 2021, previously submitted to Watercare.

Additional work has identified the proposed ultimate population of the Future Urban Zone area is estimated to be 5,900 people or 1,966 Dwelling Unit Equivalent (DUE), based on three people per DUE.

This report has focussed on servicing the proposed additional 1,966 DUE and the staging of required upgrades.

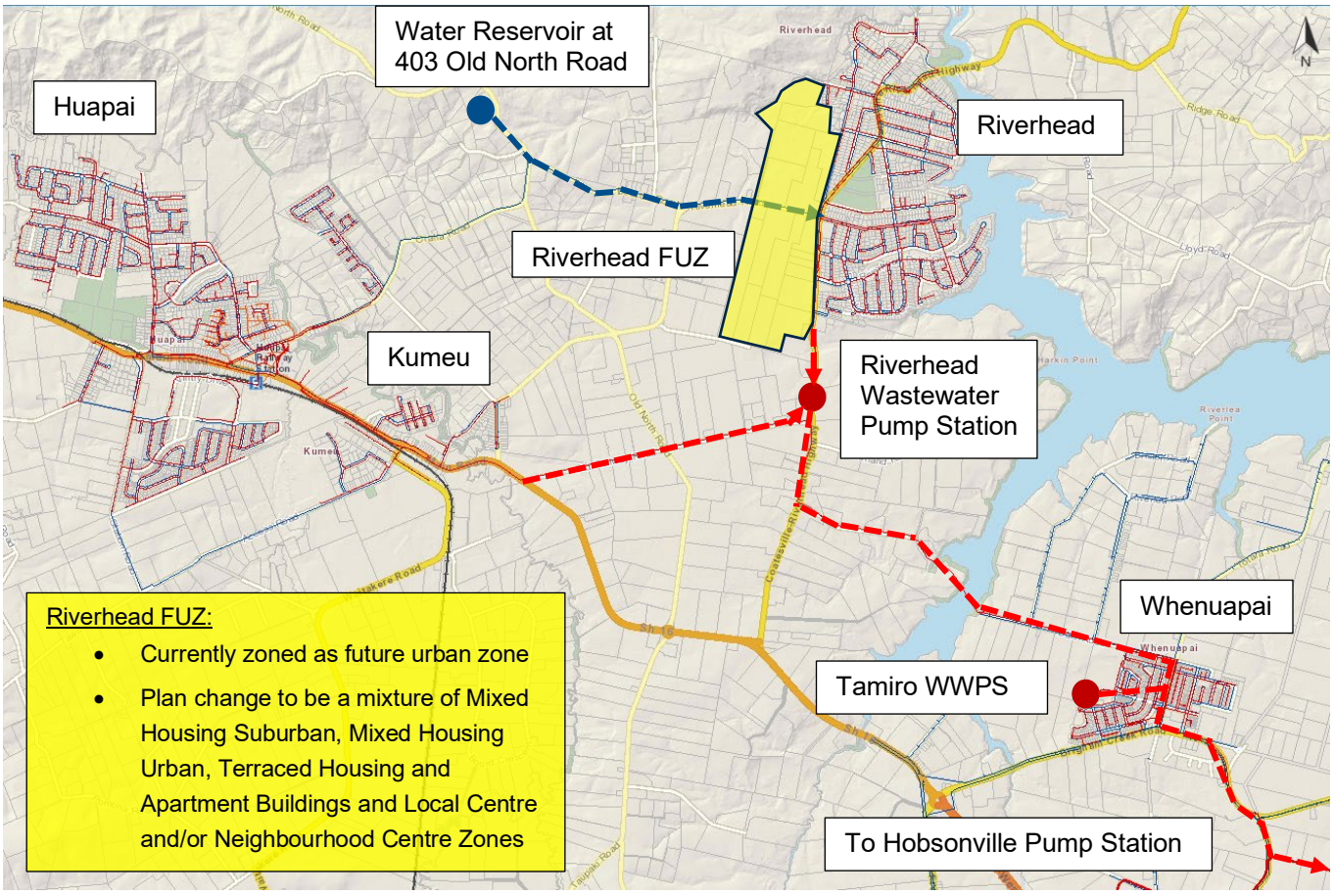


Figure 1 *Wider Riverhead, Huapai/Kumeu and Whenuapai Catchments*

1.1 Purpose of this report

Th report aims to identify the capacity of the existing water and wastewater infrastructure servicing the Riverhead catchment. This assessment will identify potential upgrades to allow servicing of the ultimate development proposed as part of the Plan Change Application to rezone the Riverhead Future Urban Zone to live zoned land, based on the updated proposed development numbers.

This report is a development of the report "*Riverhead Future Urban Zone Water and Wastewater Capacity Review*" dated 13 December 2021, previously submitted to Watercare.

1.2 Scope and limitations

This report: has been prepared by GHD for Riverhead Landowners Group and may only be used and relied on by Riverhead Landowners Group for the purpose agreed between GHD and Riverhead Landowners Group as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Riverhead Landowners Group arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1.3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

The Riverhead Landowners Group comprises Fletcher Residential Ltd, The Neil Group Ltd and Matvin Group Ltd.

1.3 Assumptions

Assumptions are detailed within the report and Appendices.

2. Populations

2.1 Existing populations

2.1.1 Riverhead

2018 Census = 2,802 people / 867 dwellings.

Table 1 Private dwellings - Riverhead

	Riverhead count
Occupied dwelling	867
Unoccupied dwelling	66
Dwelling under construction	48
Total private dwellings	978

https://www.stats.govt.nz/tools/2018-census-place-summaries/riverhead

Assuming a 5% pa. growth of Riverhead gives a 2021 population estimate of approximately 3,250 (1,083 DUE).

The number of properties connected to the pressure sewer system is noted to be 970 properties (2020).

2.1.2 Kumeū -Huapai

2018 Census = 3,432 people / 1,113 dwellings.

Table 2 Private dwellings – Kumeu-Huapai

	Kumeu-Huapai count
Occupied dwelling	1,113
Unoccupied dwelling	87
Dwelling under construction	132
Total private dwellings	1,335

https://www.stats.govt.nz/tools/2018-census-place-summaries/kumeu-huapai

Assuming a 5% pa. growth of Kumeū-Huapai gives a 2021 population estimate of approximately 4,000 (1,330 DUE).

The number of properties connected to the pressure sewer system is noted to be 980 properties (2020).

2.2 Development scenario

The developed population projection is as detailed below.

Table 3 Proposed development

Development type	Units	People / unit	L/p/day	L/day	Due
Lower density dwellings	440	3	180	237,600	440
Medium density dwellings	830	3	180	448,200	830
Higher density	80	3	180	43,200	80
Apartments	50	3	180	27,000	50
	1,270				

Development type	Units	People / unit	L/p/day	L/day	Due
Primary school (700 pupils)	1,100	1	15	16,500	31
Primary school (35 staff 1:20 ratio)	55	1	45	2,475	5
	m^2		**L/m^2/day**		
Supermarket (dry retail - 4,000 m^2)	4,000		1.30	5,200	10
Retail (dry retail - 500 m^2)	500		1.30	650	1
Café (wet retail - 150 m^2)	150		15.00	2,250	4
Offices (2,000 m^2)	1,000		4.33	4,330	8
Retirement - villas	158	3	180	85,320	158
Retirement - apartments	310	2	180	111,600	207
Retirement - care (beds)	1	90	570	51,300	95
Retirement - care (20 staff - 3 shifts)	1	60	45	2,700	5
	588				
Medical centre (assumed as wet retail)	250		45	11,250	21
Childcare (100 children)	100	1	45	4,500	8
Childcare (10 staff 1:10 ratio)	10	1	45	450	1
Retail (dry retail - 150 m^2)	150		1.30	195	0
Café (wet retail - 450 m^2)	450		15.00	6,750	13
				Riverhead Fuz excluding The Botanic	**1,458**
				The Botanic	**508**
				787,405	**1,966**
				Population Eq.	5,900

At this time, a conservative approach has been taken for the Retirement Village, The Botanic (Concept Design) with three and two people assumed per villa and apartment, respectively. In reality, average people per villa or apartment in a retirement village is anticipated to be less than two, with average people per apartment considered closer to an average of one person rather than two. Refined populations will be developed for preliminary and detailed design stages.

3. Water network capacity assessment

3.1 Existing infrastructure configuration and capacity

Riverhead is currently supplied via a single nominal 200 ID (250DN SDR13.6 PN12.5) pipeline from the reservoir located at 403 Old North Road, Huapai (Figure 1).

The reservoir, which services Riverhead, Kumeū and Huapai, is understood to have a usable capacity in the order of 3,500 m^3, which effectively provides one days' supply for approximately 5,300 Dwelling Unit Equivalents (DUE). Kumeū, Huapai and Riverhead are noted as having in the order of 2,000 properties presently connected to the water network.

3.2 Design criteria

Design criteria is as stated in the Auckland Code of Practice for Land Development and Subdivision Water and Wastewater Code of Practice for Land Development and Subdivision Chapter 6: Water.

The ultimate population is projected to be 8,760, based on an existing population of 3,250 plus a potential further 5,900 people (an additional 1,966 DUE).

6.3.5.3 Peak flows

Peak Day Demand (over a 12-month period) = Average Day Demand x PF Unless specified otherwise by Watercare:

(a) PF = 1.5 for populations over 10,000
(b) PF = 2 for populations below 2,000
(c) Interpolated between 1.5 and 2 for populations between 10,000 and 2,000

6.3.5.4.1 Hydraulic roughness values

The Hazen-Williams formula and coefficients given in Table 6.1 shall be used.

Table 6.1 – Hydraulic roughness values

Material	Colebrook-White coefficient k (mm)	Manning roughness coefficient (n)	*Hazen Williams Coefficient (C)*
PE	0.003 – 0.015	0.008 – 0.009	*140*

6.3.5.6 Minimum water demand

(a) Daily consumption of 220 L/p/day

6.3.5.4 Head losses

The head loss through the local network pipes and fittings at the design flow rate for peak day - peak hour shall be less than:

(b) 3 m/km for DN >150.

3.3 Concept design

Based on an ultimate population of 9,150 (5,900 additional with 3,250 existing), the peak hour day (PHD) design flow is calculated to be 90.46 L/s.

Table 4 Water supply - peak flow

Peak flow calculation		
Population	**Peak factor**	
10,000	1.5	
9,150	1.55	
2,000	2.00	
Daily PF	2.5	
Peak factor	3.88	
Houses (due)	3,050	
People per house	3	
Litre / person / day	220	L
Daily demand	2,013	M^3/day
Average flow	23.30	L/s
Peak day hour flow	90.46	L/s
Fire flow (FW2)	25.00	L/s
60% peak	54.28	L/s

3.3.1 Hydraulic capacity of existing supply main

To meet compliance with the Watercare Code of Practice, with a headloss of <3 m/km for DN >150, the maximum flow within a 250 DN PE SDR13.6 / PN10 pipe is 29 L/s. Assuming Peak Day / Peak Hour (rather than the FW2 Fire Flow scenario) a per capita demand of 220 l/p/day and the calculated peak hour day factor results in a serviced population in the order of 2,300 (766 DUE) from the single 250 DN supply main.

The theoretical hydraulic capacity of the existing supply main is estimated to be in the order of 55 L/s, based on limiting headloss to <10m/km (See Appendix A - *Riverhead Future Urban Zone Water and Wastewater Capacity Review* -Appendix B) combined with the available static head within the system, allowing the servicing of approximately 1,400 DUE (an equivalent population of 4,220 people).

Assuming a current population of 3,250 (census plus allowance for growth), allows for servicing a further 325 DUE (population of 975) from the existing main, from a hydraulic perspective. It is noted, however, that not all current dwellings are connected such that the 325 DUE could be considered conservative.

3.3.2 Resilience

A single water supply pipe currently services Riverhead and as such there is no resilience built into the system. If this single source of supply was to fail, supply to Riverhead would be lost.

The Auckland Code of Practice for Land Development and Subdivision Water and Wastewater Code of Practice for Land Development and Subdivision, Chapter 6: Water states:

> *6.3.5.9 Watermain hydraulic design input and output*
>
> *[ ]*
>
> *(p) Reticulation layout that provides security of supply to end users*

Whilst no details are provided it has typically been considered as a “rule of thumb” that the maximum number of houses supplied by a single pipe should not exceed 1,000.

Single supply pipes are acceptable for small populations where the consequence is lower, but is not considered acceptable for larger populations. The length of the single main is also a factor, with the Riverhead single supply main being 2,000 metres long, this is a significant length.

Additionally, the proposed multi-storey apartment blocks within the retirement village are likely to accommodate individuals who are less mobile than those accommodated in the villas and reliant on lifts. These apartment blocks are to be protected with fire sprinkler systems and thus reliant on water supply. From a security of supply perspective, it is considered prudent that the second main be constructed prior to occupation of any of the apartment buildings.

A second pipe, to increase hydraulic capacity and provide resilience is therefore required and recommended.

It is also recommended that the pipeline be interlinked/cross connected at regular intervals (say every 700 metres – i.e., two intermediate connections) such that only 1/3 of the pipeline would be shut at any time. This limits headloss during high-demand periods when a section of pipe is isolated.

3.3.3 Additional supply main options

An additional pipe would provide resilience and increase the hydraulic capacity to service an increased population and required for the entire Future Urban Zone from a hydraulic and resilience perspective.

3.3.3.1 New BSP

The construction of a new Bulk Supply Point (BSP) on the 390 CLS main servicing Riverhead Reservoir, with a new main along Riverhead Road and Latrobe Road into the Future Urban Zone provides a secondary supply option separate from the existing supply main in Old North Road and Riverhead Road.

The BSP could be constructed with a Pressure Reducing Valve such that the principal supply to Riverhead was via the reservoir and existing supply pipe, with the PRV only opening during high demand periods when the pressure had dropped sufficiently.

It is noted that there is a High-Pressure Gas Pipeline within the northern berm of Riverhead Road and overhead powerlines on the southern side of the road.

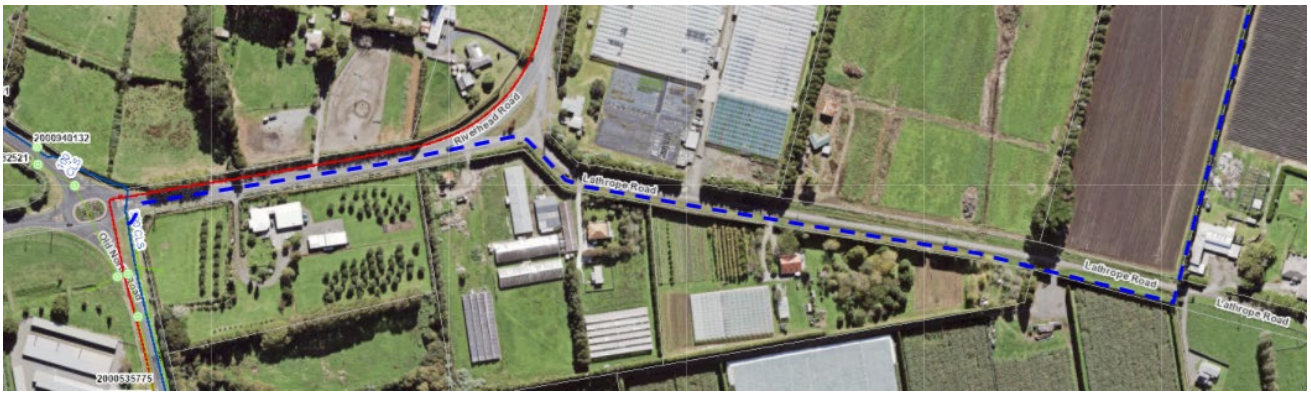


Figure 2 Additional supply – BSP and pressure reducing valve from transmission main

Phasing of this work would also need to be considered running through the southern section of the Future Urban Zone from Latrobe Road to Riverhead Road. This would effectively require a new road to be constructed and vested to allow the watermain to be constructed and vested to Council (Watercare) to meet Watercare's requirement that watermains are constructed in public land (not private land).

The Auckland Code of Practice for Land Development and Subdivision Water and Wastewater Code of Practice for Land Development and Subdivision Chapter 6: Water states:

> *6.3.8.4 Watermains in private property*
>
> *Watermains shall only be installed in the public road reserve. Public watermains in private property, right of ways (ROW) and private roads is not permitted.*

This option has potential advantages in minimising works in roads (H&S) and length of pipe to be constructed in roads (Carbon).

It is understood that this is not favoured by Watercare, with the preference not to supply directly off transmission mains and not construct additional BSPs. Additionally, agreement would need to be reached with Watercare regarding the pipeline installation within private property during the initial stages of the development.

3.3.3.2 Duplication of existing supply main

Duplication of the existing supply main along Old North Road, Deacon Road and Riverhead Road, potentially on the opposite side of the road from the existing pipe, or within the carriageway with separation from the existing main, would provide resilience with it unlikely that both pipes would fail simultaneously.

Figure 3 Duplication of supply main from the reservoir

Old North Road, Deacon Road and Riverhead Road are “rural” roads with limited infrastructure to impact a new pipe alignment. The pipeline could potentially be installed by directional drilling to minimise disruption and carbon implication associated with open cut installation.

This route is approximately 2,500 m long, assuming a connection at the reservoir site. This would require a new BSP at the reservoir site.

An alternative is to utilise the 250 connection to the Kumeū-Huapai main at the Old North Road and Deacon Road intersection, combined with installing a district meter adjacent to the existing Riverhead BSP, feeding the proposed new pipeline. The district meter would be required to allow the Riverhead demand to be deducted from the Kumeū-Huapai BSP. As power and communications are already available at the BSP site these could be utilised for the district meter.

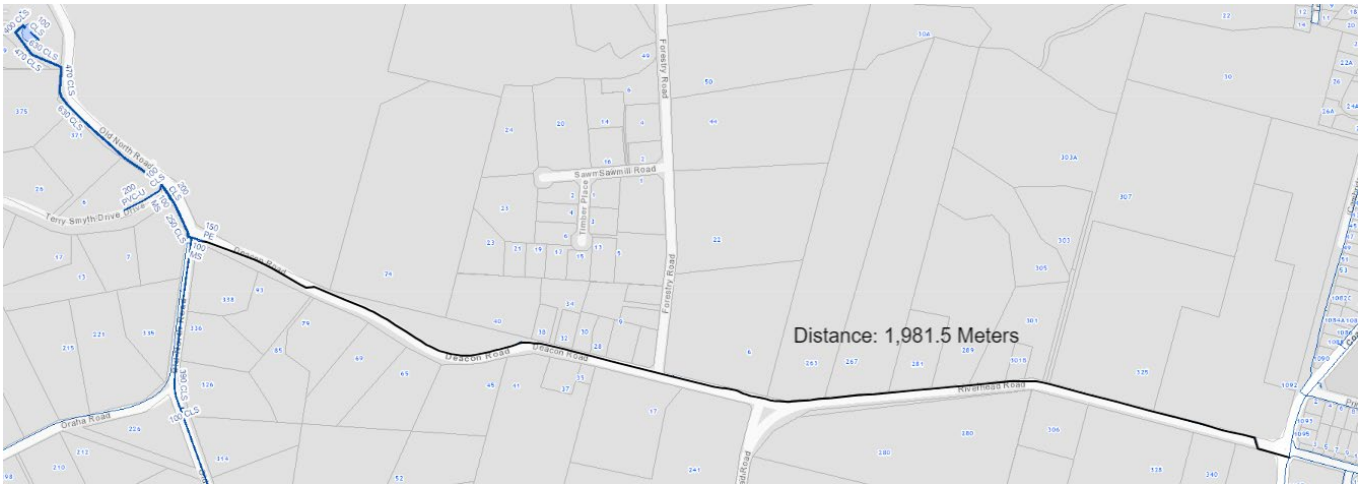


Figure 4 Pipe route and length

This results in a pipe length of approximately 2,000 m from the intersection of Old North Road and Deacon Road.

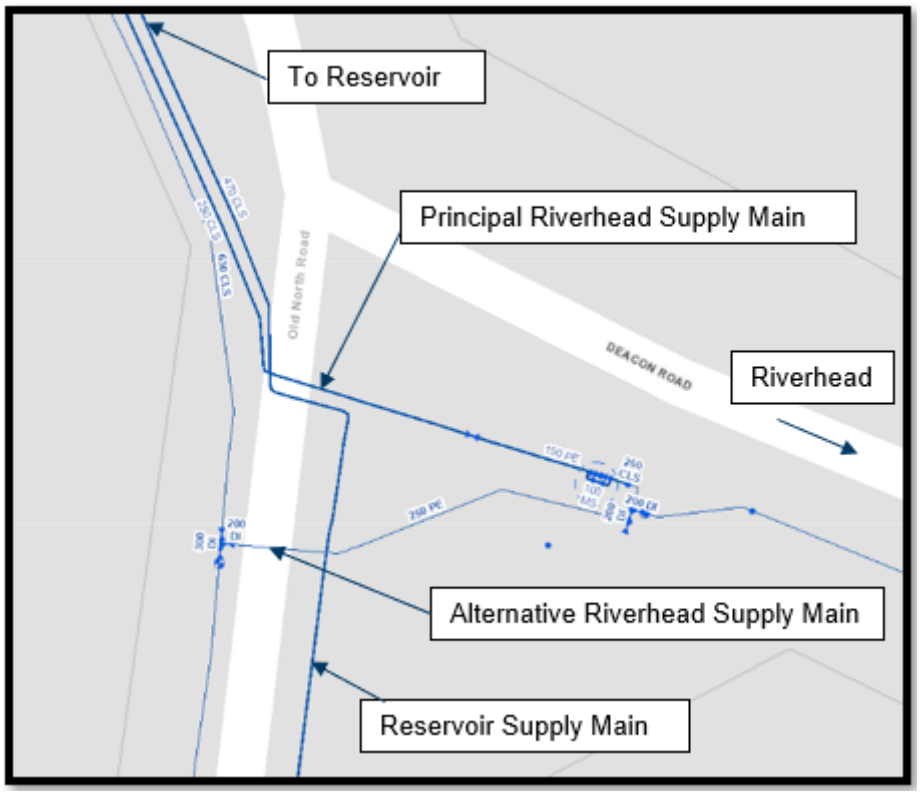


Figure 5 Pipe connection option

It is understood that there is a cross-connection between the reservoir supply transmission main and the 250 cross connection, which is normally isolated, but could be opened in the case of a failure of the reservoir outlet transmission main.

Due to the relative elevation of the Riverhead Reservoir (100m RL) to the development site (30 mRL), a pressure reducing valve would be required within the pipeline to limit the pressure (i.e., limit the hydraulic grade line to say 60 m).

It is noted that the High-Pressure Gas Main is located within Riverhead Road.

In order to meet the Code of Practice requirements of <3 m/km headloss, the existing 250 DN pipe would need to be augmented with a new 315 DN PE pipe to service the existing Riverhead area and the Riverhead Future Urban Zone.

Assuming that headloss can be accepted up to 10 m/km, twin 250 DN PE SDR13.6 / PN10 pipes could service the full development of Riverhead, including the Future Urban Zone and the Botanic.

The twin 250 DN PE SDR13.6 / PN10 pipe option is considered to have the following advantages:

– Reduced cost and carbon footprint
– Increased velocities (max. 1.25 m/s rather than 0.8 m/s for Peak Hour Peak Day at ultimate build-out)
– Reduced pipe volume and thus reduced water age, and
– The available head from Riverhead Reservoir (98 mRL) with highest ground level with Riverhead 37 mRL (with a minimum hydraulic grade line of 62 mRL), allows 38 m headloss through the system at peak flow.

3.4 Local Reticulation

Local reticulation within the Botanic Retirement Village would remain private with bulk supply meter(s) connected to the Watercare network. The internal reticulation would be designed in accordance with the Auckland Code of Practice for Land Development and Subdivision Water and Wastewater Code of Practice for Land Development and Subdivision Chapter 6: Water.

3.5 Transmission System

Riverhead, Kumeū and Huapai are serviced via a reservoir located at 403 Old North Road Huapai. The reservoir capacity is understood to be in the order of 4,600 m^3, with a usable capacity of 3,500 m^3 (1 days' supply for approximately 16,000 people or 5,300 DUE).

Table 5 Reservoir usable capacity

Reservoir capacity	3, 500 m^3
	220 L/p/day
	15,909 people
	5,303 DUE

This reservoir services the Riverhead, Kumeū and Huapai area, including lived zoned but undeveloped land.

Table 6 Reservoir supply population

Area	Population
Riverhead	3,250
Kumeu / Huapai	4,000
Live Zoned land	4,200 (1,400 DUE with 640 DUE consented)
Total	**11,450**
Additional capacity	4,550 (1,500 DUE)
Total	**16,000**

It is anticipated therefore that the reservoir can service an additional population in the order of 4,500 people (1,500 DUE) over and above the current population and servicing of live zoned land.

The capacity of the Water Transmission Main has not been analysed, but it is understood to have the capacity to service additional population.

With the significant growth planned for wider Kumeū-Huapai Future Urban Zone, the reservoir and transmission main will ultimately need to be upsized to service future demand. It is understood that Watercare are responsible for the upgrading or provision of bulk/transmission infrastructure. Timing of the upgrade is linked to the Future Urban Land Supply Strategy and as identified in the Watercare Asset Management Plan. If upgrades are required ahead of the programmed upgrades, they are anticipated to be carried out at the developer's cost.

4. Wastewater network capacity assessment

4.1 Existing infrastructure configuration and capacity

A pressure sewer system services Riverhead. Watercare has confirmed that the wastewater servicing of the Riverhead Future Urban Zone would be via an extension of the existing pressure sewer system.

Figure 6 *Riverhead pump station location*

Both the Riverhead and Kumeū-Huapai pressure sewer systems discharge at the existing Riverhead Wastewater Pump Station. The pump station is shown to be located within the road reserve and the golf course car park rather than a defined pump station site (Figure 3).

As-built drawings of the pump station identify a single storage tank that has been constructed within the golf club car park (and confirmed by the Engineer's Representative for the project), which is not shown within the GIS. The storage tank is an inline / balancing tank, with the 110 Riverhead main entering the tank opposite the outlet. The 225 Riverhead main and the Kumeū-Huapai Main is shown to connect at the pump station inlet end of the storage tank.

The tank effectively forms part of the wet well for the pump station, with the pump ON level being shown as higher than the storage tank invert.

The storage tank is shown as 16.5m long by 2.8 m diameter (~100 m^3). A copy of the relevant as-built drawing is included in Appendix A - Riverhead Future Urban Zone Water and Wastewater Capacity Review. The as-built drawings also identify space for two further storage tanks within the golf course car park, although it is not known if there is any agreement regarding the future construction of these tanks.

It is understood that it is proposed to ultimately separate the Kumeū-Huapai catchment from Riverhead, with the catchment to be connected to the proposed Slaughterhouse Pump Station[1] via a future Redhills gravity sewer.

The installed pump duty points have been identified as approximately 60 and 70 L/s (216 and 252 m^3/hr) at estimated pump head of 60 and 64 m, for duty and duty assist scenarios respectively, without the Whenuapai Tamiro WWPS operating.

The duty point is influenced by the operation of the Tamiro WWPS, which pumps into the common rising main.

When the Tamiro WWPS operates, pump heads are increased and thus, flows decrease. As part of the Whenuapai – Redhills upgrade, with the construction of the Slaughterhouse Creek WWPS, Tamiro WWPS is to be abandoned, with flows from Whenuapai gravitating into the new pump station. This will relieve pressure on the existing Riverhead rising main and Riverhead WWPS.

4.2 Existing issues

We are aware that issues have been experienced with the Riverhead pressure sewer catchment, with household pumps "tripping" on high pressure and alarming, particularly within Crabb Fields Lane at the northern extent of Riverhead.

The existing infrastructure includes twin mains along Riverhead – Coatesville Road from Duke Street to the pump station location. The section from Duke Street to Riverhead Road is shown to be comprised of 89 mm and 145 mm diameter pipes, with 110 mm and 200 mm from Riverhead Road to the Riverhead WWPS. It is understood that these are internal diameters. Historically, only the smaller of the two pipes have been in operation due to the historically low flows, resulting in low velocities and high retention times. With an increased number of properties being connected, flows have increased, leading to higher pump heads being recorded.

We understand that it is proposed to bring the larger of the twin mains into service from the intersection with Riverhead Road to the Riverhead WWPS. This would result in a significant reduction in friction losses, and household pumps would subsequently be operating at significantly lower pump heads, overcoming the noted issues.

4.3 Hydraulic aAssessment

The modelling has been based on a validated model of the existing Kumeū-Huapai / Riverhead pressure sewer network, with loading of 150 L/person/day and a 1.2 peaking factor, and design flows of 180 L/person/day and 1.2 peaking factor for the new development. As such, the model is considered conservative.

Modelling has been undertaken utilising the InfoWorks ICM modelling software, with the forced main model.

The Riverhead WWPS includes a standard wastewater wet well and inline storage tank that forms part of the wet well, with the pump ON level above the storage tank invert.

[1] Watercare Services Limited, Asset Management Plan 2018 to 2038 (Forecasts from I July 2018 to June 2038) https://wslpwstoreprd.blob.core.windows.net/kentico-media-libraries-prod/watercarepublicweb/media/watercare-media-library/reports-and-publications/asset_management_plan_2018-2038.pdf

4.3.1 SMART pressure sewers

The Botanic is a private development, with all onsite infrastructure not being vested in Watercare. They propose installing a SMART Pressure Sewer system where the individual pumps can be remotely monitored and programmed. This is considered to offer a number of advantages:

– Pumps can be programmed to operate simultaneously, particularly during early build out stages to ensure minimum velocities are achieved and any sedimentation / settlement is moved along the pipe, reducing the risk of septicity and odour, and
– –Pumps can be controlled to only pump during defined periods, i.e., not operate during morning or evening peaks. Wastewater is stored within the pump chambers, designed to store 24 hours flow, and discharged during off-peak hours. This effectively allows additional DUE to be connected to a system already at capacity (during the diurnal peak periods and/or wet weather events) without needing any wastewater network upgrades. If this were adopted, the Botanic Retirement Village could be serviced in addition to the additional 1,000 DUE, identified through the dynamic hydraulic modelling that the existing wastewater infrastructure could service without the need for any upgrades.

The SMART system also allows the village operation and maintenance staff to have full control of the pressure sewer network without any involvement of the residents, as opposed to the audible/visual alarms typical of a conventional pressure sewer system.

4.3.2 Pumps

A scenario was run to review the option to increase flows (pump rate) from the Riverhead WWPS to increase the number of DUE that could be serviced ahead of the construction of operational storage.

This included the adoption of “high head” pumps such as progressive cavity / Gorman Rupp type pumps or the option to operate pumps in series. Whilst this is not considered standard practice, this would only be required for the period between when existing capacity was reached and the Kumeū-Huapai network being separated from the Riverhead system

4.3.3 Modelling results

Table 7 Wastewater modelling results

Scenario		Kumeu / huapai	Khr growth	Riverhead (existing)	Botanic	Riverhead fuz	Depth in tank - 3m diameter	Depth in tank	Comment
		DUE	DUE	DUE	DUE	DUE	(m)	(%)	
Base	DUE	980	1400	970			0.531	18%	Current Scenario (2020) Tamiro WWPS Operating + build-out of live zoned land
	People / DUE	3	3	3	3	3			
	L/person/day	150	180	150	180	180			
	Peak Factor	1.2	1.2	1.2	1.2	1.2			
	L/DUE/day	540	648	540	648	648			
#1	DUE	980	1400	970		500	0.883	29%	Future - Tamiro WWPS Operating
	L/DUE/day	540	648	540	648	648			
#2	DUE	980	1400	970		1000	1.294	43%	Tamiro WWPS disconnected
	L/person/day	540	648	540	648	648			
#3	DUE	980	1400	970	473	1000	1.429	48%	#2 plus Botanic on Timer (i.e., no discharge during peak hours)
	L/person/day	540	648	540	648	648			
#4	DUE	980	1400	970	473	1750	0.515	17%	#3 plus pumps upgraded to 85 L/s @ 81m pump head
	L/person/day	540	648	540	648	648			
#5	DUE	980	1400	970	473	1750	0.767	26%	#4 plus with Tamiro Operating / pumps interlocked not to work simultaneously. 85 L/s @ ~ 90 m pump head.
	L/person/day	540	648	540	648	648			

4.4 Wider servicing strategy

It is noted that the Council's Future Urban Land Supply Strategy links the urbanisation of Kumeū-Huapai and Riverhead with the completion of the Northern Interceptor. The Future Urban Land Supply Strategy 2017 earmarked 800ha of Future Urban Zone in Kumeū-Huapai to be development ready (operative zoning and bulk infrastructure in place) between 2028-2032 **(**https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/place-based-plans/Documents/kumeu-huapai-centre-plan.pdf**).**

The Kumeū-Huapai FUZ is a significant area and is approximately ten times the size of the Riverhead FUZ of 80 ha.

The existing wastewater infrastructure downstream of Kumeū-Huapai is not able to service this growth. It is understood that the proposed wastewater servicing of the Kumeū-Huapai area is linked to the infrastructure development as below:

Phase 1:

– Construction and commissioning of the Slaughterhouse WWPS and Rising main / connector pipe
– Abandonment of the existing Tamiro WWPS in Whenuapai, and
– Construction and commissioning of the Northern Interceptor – Phase 2 tunnel from Westgate to Hobsonville.

Phase 2:

– Construction and commissioning of a gravity sewer from the interim Redhills WWPS to the Slaughterhouse WWPS and abandonment of the interim Redhills WWPS.

Phase 3:

– Construction and commissioning of a new Kumeū WWPS, rising main and gravity sewer from Kumeū to the Phase 2 gravity sewer in Redhills and abandonment existing rising main from Kumeū-Huapai i to Riverhead WWPS.

Figure 7 Regional wastewater upgrades - Kumeū-Huapai servicing (dash – rising mains; solid – gravity)

However, due to the relative size of the Riverhead FUZ, and as detailed by the modelling, the existing wastewater infrastructure can be upgraded to service the proposed 1,834 DUE within the Riverhead FUZ ahead of the completion of the Northern Interceptor.

5. Conclusions and recommendations

Development of the 80 ha Riverhead Future Urban Zone is anticipated to add a further 1,966 DUE to the existing water and wastewater infrastructure.

As outlined in the following sections, there is immediate capacity in the existing water and wastewater infrastructure for development of the Riverhead Future Urban Zone to commence. Upgrades and additional capacity would be required as development progresses. Several options exist for these upgrades and additional capacity, which would be developed and implemented in conjunction with Watercare as development progresses.

5.1 Water infrastructure

There is theoretical hydraulic capacity within the existing supply main to service an additional 325 DUE, based on the available head from the Riverhead Reservoir and ground levels within the Riverhead supply area, including the Future Urban Zone. This is based on headloss of <10 m/km.

Additionally, a “rule-of-thumb” is that no more than 1,000 houses (or DUE) should be supplied via a single pipeline, with approximately 700 houses understood to currently be supplied within Riverhead. An additional 300 houses, or DUE, could therefore be serviced within the 1,000 “limit”. Accordingly, prior to full build-out, a second supply main would be required for both resilience and capacity.

Two options have been identified for the second supply main:

1. Direct feed from the transmission main from the intersection of Old North Road and Riverhead Road, or
2. (2Duplication of the existing supply pipe, from the intersection of Old North Road and Deacon Road.

Duplication of the existing supply pipe, from the intersection of Old North Road and Deacon Road is recommended to meet Watercare requirements.

A second 250 DN PE100 SDR13.6 is shown to meet hydraulic requirements (for the wider FUZ) except for the Watercare CoP requirement of <3 m/km headloss. There is, however, sufficient available head between the reservoir and the development site to allow the additional headloss. A 355 DN PE100 SDR13.6 pipe is shown to meet the Water CoP requirement of <3 m/km headloss in addition to the existing 250 pipe. Both pipeline options require Pressure Reducing Valves to limit the pressure head on the Riverhead reticulation.

The reservoir can support partial development, whilst providing storage for 1 days’ demand. The servicing of the Riverhead Future Urban Zone potentially requires duplication of the Reservoir for full build-out, with additional populations in excess of 5,900 people (1,966 DUE) projected for the Riverhead area. The existing reservoir storage drops below 1 days’ demand above 1,500 additional DUE within the Riverhead FUZ, to approximately 21:45 hours at ultimate build-out.

The transmission main and reservoir would ultimately need to be upgraded to service the wider Kumeū - Huapai Future Urban Zone development.

5.2 Wastewater infrastructure

Watercare have confirmed that Riverhead is to be serviced by an extension of the pressure sewer system.

The modelling demonstrates that an additional 1,000 DUE within the Riverhead Future Urban Zone can be serviced by the existing Riverhead WWPS and rising main without the need for any upgrades, assuming adoption of a conventional pressure sewer system further to the abandonment of the Tamiro WWPS.

The wider Riverhead Future Urban Zone has an estimated additional DUE of approximately 1,966, including the Botanic development.

The Botanic retirement village is to be a private development with all infrastructure within the site to be retained in private ownership. In line with this, the Botanic is proposing to install a SMART system to assist with their own operation and maintenance of the system.

A modelled scenario identified that the Botanic Development could be serviced in addition to the 1,000 DUE that the existing wastewater infrastructure could service. This can be achieved by adopting a SMART pressure sewer system for the Botanic Development, allowing pumps to be programmed to not operate during daily peak flow periods.

The modelling has identified that 500 DUE within the Riverhead FUZ, in addition to the proposed ultimate Botanic Development serviced by a SMART system, with pumps to be programmed to not operate during daily peak flow periods, could be serviced ahead of the abandonment of the Tamiro WWPS without significant volumes being buffered in the existing Riverhead WWPS storage tank.

The modelling has also identified that the installation of “high head” pumps into the Riverhead WWPS, i.e., 85 L/s @ 85m pump head, in addition to the Botanic being serviced by a SMART system on timers as detailed above, would allow the additional 1,966 DUE within the Riverhead FUZ to be serviced without any other upgrades. This would also allow the ultimate development to be serviced ahead of the Tamiro WWPS being abandoned with the existing storage at Riverhead WWPS being utilised to buffer flows.

The modelling has been based on a validated model of the existing network, with 150 L/person/day and a 1.2 peaking factor, and design flow of 180 L/person/day and 1.2 peaking factor for the new development. As such, the model is considered conservative.

The proposed separation of the Kumeū - Huapai wastewater system from the Riverhead WWPS results in surplus capacity within the existing system to service the current Riverhead area and the full development of the Riverhead FUZ without any upgrades of the current system.

Additional capacity could also be made available prior to separation of the two systems by:

1. Not operating the Kumeū - Huapai Flushing system during peak periods, or
2. Constructing the proposed Kumeu - Huapai terminal WWPS, to allow velocities to be achieved in the rising main between Kumeū and the Riverhead WWPS without the need for flushing.

Appendices

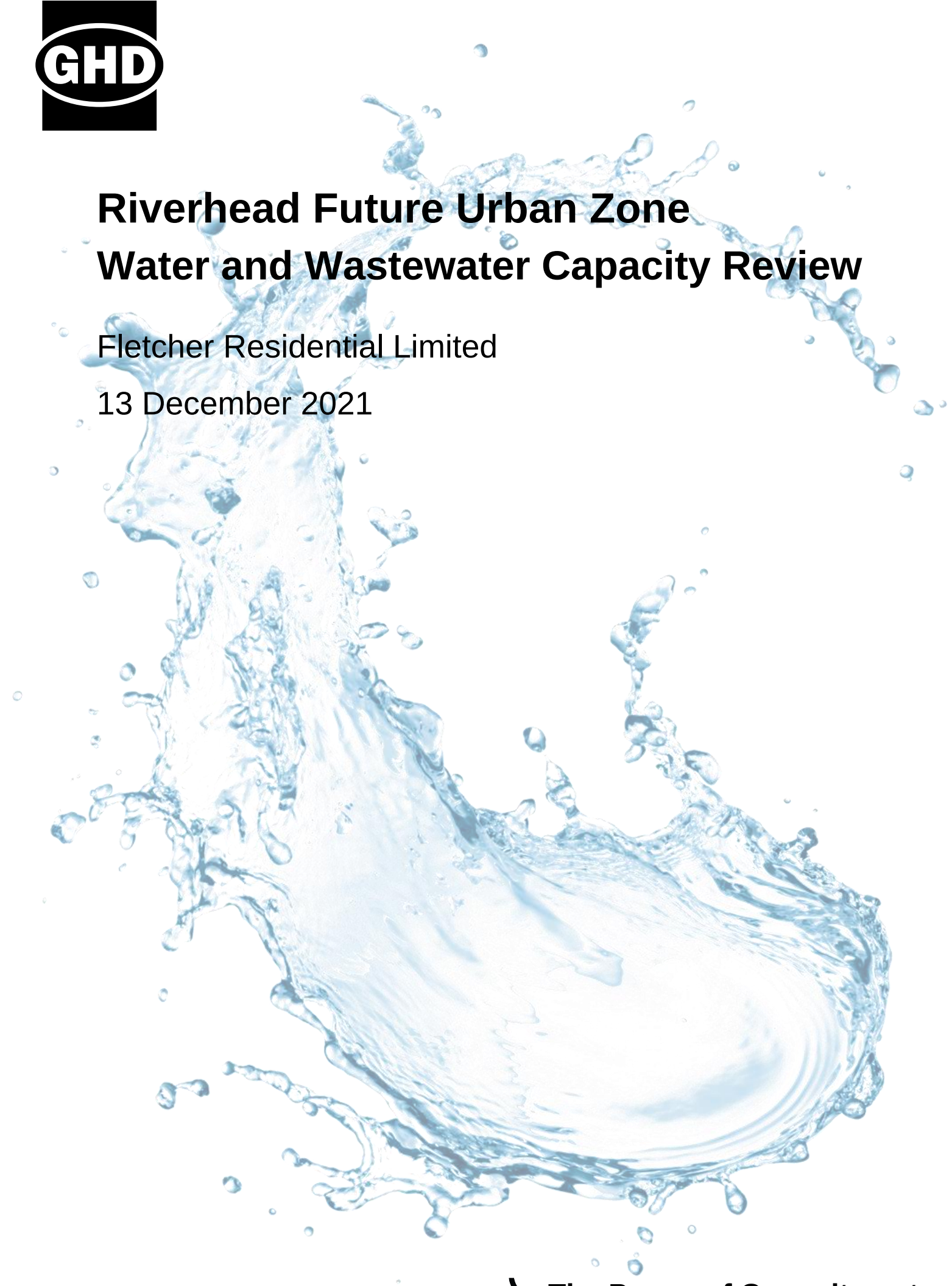
Appendix A

Riverhead Future Urban Zone Water and Wastewater Capacity Review dated 13 December 2021

Riverhead Future Urban Zone
Water and Wastewater Capacity Review

Fletcher Residential Limited

13 December 2021



The Power of Commitment

Limitations

This report: has been prepared by GHD for Fletcher Residential Limited and may only be used and relied on by Fletcher Residential Limited for the purpose agreed between GHD and Fletcher Residential Limited.

GHD otherwise disclaims responsibility to any person other than Fletcher Residential Limited arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible. The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared. The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

The Cost Estimate has been prepared by GHD for Fletcher Residential and may only be used and relied on by Fletcher Residential. The estimate has been prepared for the purpose of providing a preliminary indication of the order of magnitude capital costs for the proposed new water supply for Riverhead and must not be used for any other purpose. The estimate is suitable for providing an indication of whether initial cost estimates for the expansion are feasible. It is not suitable for meaningful economic evaluation or positive acceptance of design options.

The Cost Estimate is a preliminary estimate only. Actual prices, costs and other variables may be different to those used to prepare the Cost Estimate and may change. No detailed quotation has been obtained for the scheme. GHD does not represent, warrant or guarantee that the project can or will be undertaken at a cost that is the same or less than the Cost Estimate. The Cost Estimate does not include any effect on prices, costs and other variables arising from the effects of the spread of COVID-19 and any resulting disruption to the economy and markets, and consequential impacts on the availability and cost of labour and materials. Where estimates of potential costs are provided with an indicated level of confidence, notwithstanding the conservatism of the level of confidence selected as the planning level, there remains a chance that the cost will be greater than the planning estimate, and any funding would not be adequate. The confidence level considered to be most appropriate for planning purposes will vary depending on the conservatism of the user and the nature of the project. It is likely that the effect of COVID -19 will impact the actual cost. The user should therefore select appropriate confidence levels to suit their particular risk profile.

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Appendix A Riverhead Pump Station – As-built Drawings
Appendix B Riverhead Water Supply Calculations

1. Introduction

The Riverhead Future Urban Zone (FUZ) is an area of approximately 80 Ha, to the west of the Riverhead township (Figure 1). The current Unitary Plan has this area zoned as a future urban zone. Fletcher Residential Ltd, The Neil Group Ltd and Matvin Group Limited (the applicants) are applying for a plan change of this area to Residential, anticipated to be a mixture of Mixed Housing Suburban, Mixed Housing Urban, Terraced Housing and Apartment Buildings, Local Centre and Neighbourhood Centre Zones and include a retirement village.

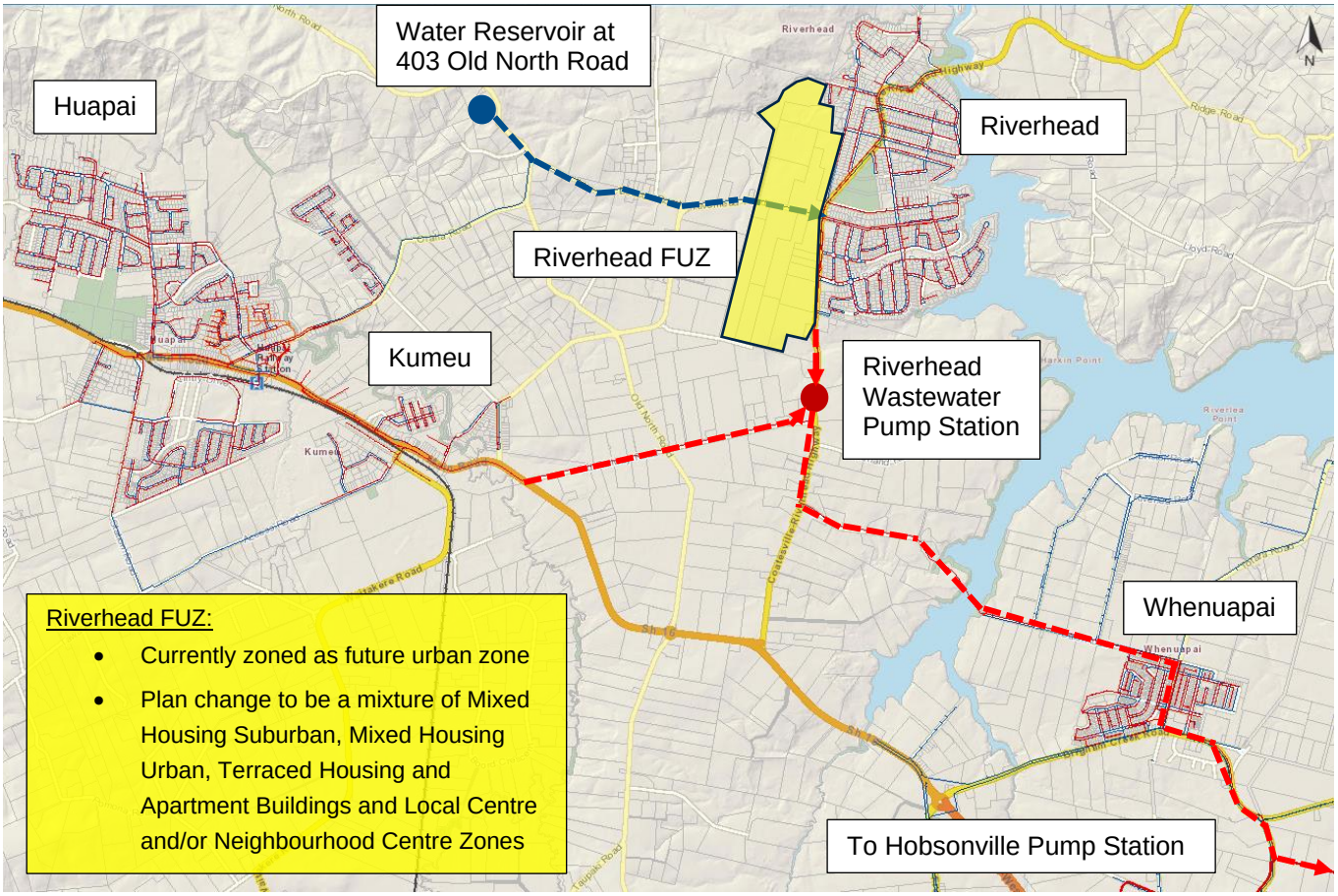


Figure 1 Wider Riverhead, Huapai/Kumeu and Whenuapai Catchments

The potential ultimate population of the Future Urban Zone area is estimated to be between 3,750 and 5,200 people or 1,250 and 1,750 Dwelling Unit Equivalent (DUE)

In applying for the plan change the applicants are required to demonstrate to Watercare that it is feasible to service the development from a water and wastewater perspective.

Therefore, this assessment includes:

- Identifying the capacity within the existing water and wastewater infrastructure to service development of the Riverhead FUZ area for residential development,
- confirming sufficient capacity to support the plan change,
- identifying feasible options to increase the capacity (if required).

1.1 Existing Populations

Riverhead

2018 Census = 2,802 people / 867 dwellings

	Riverhead (count)
Occupied dwelling	867
Unoccupied dwelling	66
Dwelling under construction	48
Total private dwellings	978

https://www.stats.govt.nz/tools/2018-census-place-summaries/riverhead

Assuming a 5% pa. growth of Riverhead gives a 2021 population estimate of approximately 3,250 (1,083 DUE). The number of properties connected to the pressure sewer system is noted to be 970 properties (2020).

Kumeu-Huapai

2018 Census = 3,432 people / 1,113 dwellings

	Kumeu-Huapai (count)
Occupied dwelling	1,113
Unoccupied dwelling	87
Dwelling under construction	132
Total private dwellings	1,335

https://www.stats.govt.nz/tools/2018-census-place-summaries/kumeu-huapai

Assuming a 5% pa. growth of Riverhead gives a 2021 population estimate of approximately 4,000 (1,330 DUE). The number of properties connected to the pressure sewer system is noted to be 980 properties (2020).

1.2 Yield Scenarios

Three yield scenarios have been developed for the area, with housing densities of between 15 and 50 houses per hectare (ha), along with the projected population for the proposed retirement village.

Yield Scenarios	Total	DUE	
	Population	FUZ	Total
Scenario 1 Low Road	7,050	1,260	2,350
Scenario 2 - Med Road	8,040	1,600	2,680
Scenario 3 - High Road	8,370	1,710	2,790

It is noted that these are indicative population and Dwelling Unit Equivalent numbers only.

1.3 Design Criteria

The concept design has been based on Dwelling Unit Equivalent (DUE) rather than a more detailed analysis that will be undertaken at the preliminary and detailed designed stages.

Initial analysis has identified a potential additional population of 5,120 people further to development of the Future Urban Zone, in addition to the current assumed Riverhead population in the order of 3,250.

2. Water Network Capacity Assessment

2.1 Existing Network Configuration and Capacity

Riverhead is currently supplied via a single nominal 200 ID (250DN SDR13.6 PN12.5) pipeline from the reservoir located at 403 Old North Road, Huapai (Figure 1).

The reservoir, which services Riverhead, Kumeu and Huapai, is understood to have a usable capacity in the order of 3,500 m^3, which effectively provides one days' supply for approximately 5,300 Dwelling Unit Equivalents (DUE). Kumeu, Huapai and Riverhead are noted as currently having in the order of 2,000 properties currently connected to the water network.

2.2 Design Criteria

Design criteria is as stated in the Auckland Code of Practice for Land Development and Subdivision Water and Wastewater Code of Practice for Land Development and Subdivision Chapter 6: Water.

The ultimate population is projected to be 8,370, based on an existing population of 3,250 plus a potential further 5,120 people (an additional 1,710 DUE).

6.3.5.3 Peak flows

[ ]

Peak Day Demand (over a 12-month period) = Average Day Demand x PF Unless specified otherwise by Watercare:

(a) PF = 1.5 for populations over 10,000
(b) PF = 2 for populations below 2,000
(c) Interpolated between 1.5 and 2 for populations between 10,000 and 2,000

6.3.5.4.1 Hydraulic roughness values

[ ]

The Hazen-Williams formula and coefficients given in Table 6.1 shall be used.

Table 6.1 – Hydraulic roughness values

Material	Colebrook-White coefficient k (mm)	Manning roughness coefficient (n)	*Hazen Williams Coefficient (C)*
PE	0.003 – 0.015	0.008 – 0.009	*140*

6.3.5.6 Minimum water demand

[ ]

(a) Daily consumption of 220 L/p/day;

6.3.5.4 Head losses

The head loss through the local network pipes and fittings at the design flow rate for peak day - peak hour, shall be less than:

[ ]

(b) 3 m/km for DN >150.

2.3 Concept Design

Based on an ultimate population of 8,370 (5,120 additional with 3,250 existing), the peak design flow (PHD) is calculated to be 85.35 L/s.

Peak Day		
Population	Peak Factor	
10,000	1.5	
8370	1.60	
2,000	2.00	
Daily PF	2.5	
Peak Factor	4.005	
Houses (DUE)	2,790	
people per house	3	
Litre / person / day	220	L
Daily Demand	1,841.40	m^3/day
Average Flow	21.31	L/s
Peak Factor	4.00	
Peak Day Hour Flow	85.350	L/s
Fire Flow	25.00	L/s
60% Peak	51.21	L/s
Total (fire)	76.210	L/s

Table 1 Calculated Peak Hour Day Demand

2.4 Hydraulic Capacity of Existing Supply Main

The theoretical hydraulic capacity of the existing supply main is estimated to be in the order of 56 L/s, based on the design criteria of <10m/km headloss (See Appendix B) and available static head within the system.

Assuming a per capita demand of 220 l/p/day and the calculated peak hour day factor results in a serviced population in the order of 4,800 from the single supply main.

Assuming a current population of 3,250, allows for the servicing of a further 515 DUE (population of 1,550) from the existing main, from a hydraulic perspective.

Peak Day		
Population	Peak Factor	
10,000	1.5	
4,824	1.82	
2,000	2.00	
Daily PF	2.5	
	4.56	
Houses (DUE)	1,608	
people per house	3	
Litre / person / day	220	L
Daily Demand	1,061.36	m^3/day
	12.28	L/s
Peak Factor	4.56	
Peak Flow	56.00	L/s
Fire Flow	25.00	L/s
60% Peak	33.60	L/s
Total (fire)	58.60	L/s

Table 2 Calculated population to match pipe hydraulic capacity of 56 L/s

2.5 Resilience

Riverhead is currently serviced by a single water supply pipe and as such there is no resilience built into the system. If this single source of supply was to fail, supply to Riverhead would be lost.

Single supply pipes are acceptable for small populations where the consequence is lower, but not acceptable for larger populations. A second pipe, to increase hydraulic capacity and provide resilience is therefore required and recommended.

2.6 Additional Supply Main Options

An additional 355 DN PE pipe would provide resilience and increase the hydraulic capacity to service a population in the order of 9,000, whilst meeting the criteria of less than 3m per kilometre friction head.

New BSP

The construction of a new Bulk Supply Point (BSP) on the 390 CLS main servicing Riverhead Reservoir, with a new main along Riverhead Road and Latrobe Road into the Future Urban Zone provides a secondary supply option separate from the existing supply main in Old North Road and Riverhead Road.

The BSP could be constructed with a Pressure Reducing Valve such that the principal supply to Riverhead was via the reservoir and existing supply pipe, with the PRV only opening during high demand periods when the pressure had dropped sufficiently.

It is noted that there is a High-Pressure Gas Pipeline within the northern berm of Riverhead Road and overhead powerlines on the southern side of the road.

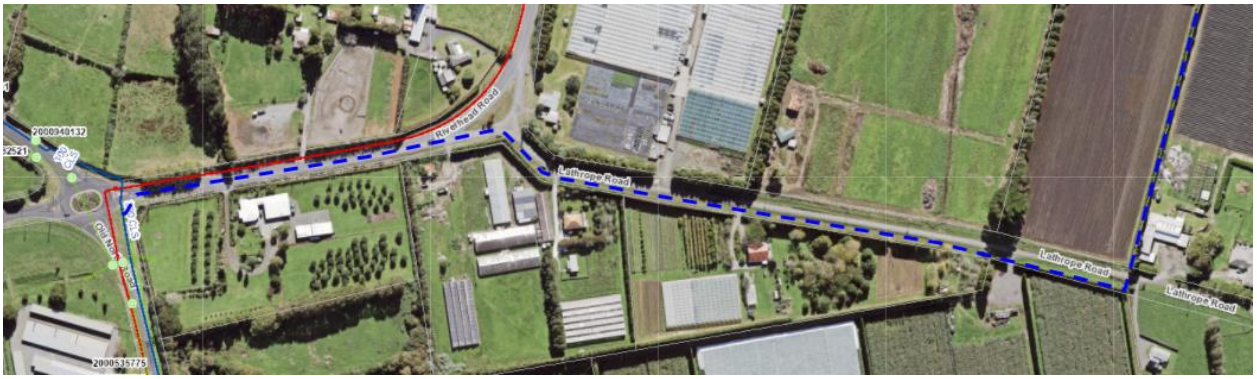


Figure 2 *Additional Supply – BSP and Pressure Reducing Valve from Transmission Main*

Phasing of this work would also need to be considered running through the southern section of the Future Urban Zone from Latrobe Road to Riverhead Road. This would effectively require a new road to be constructed and vested to allow the watermain to be constructed and vested to Council (Watercare) to meet Watercare's requirement that watermains are constructed in public land (not private land).

The Auckland Code of Practice for Land Development and Subdivision Water and Wastewater Code of Practice for Land Development and Subdivision Chapter 6: Water states:

> *6.3.8.4 Watermains in private property*
> *Watermains shall only be installed in the public road reserve. Public watermains in private property, right of ways (ROW) and private roads is not permitted.*

This option has potential advantages in minimizing works in roads (H&S) and length of pipe to be constructed in roads (Carbon).

It is understood that this is not favoured by Watercare, with the preference not to supply directly off transmission mains and not construct additional BSPs. Additionally, agreement would need to be reached with Watercare regarding the installation of the pipeline within private property during initial stages of the development.

Duplication of existing Supply main

Duplication of the existing supply main along Old North Road, Deacon Road and Riverhead Road, potentially on the opposite side of the road from the existing pipe, or within the carriageway with separation from the existing main, would provide resilience with it unlikely that both pipes would fail simultaneously.

Figure 3 *Duplication of Supply Main from Reservoir*

Old North Road, Deacon Road and Riverhead Road are “rural” roads with limited infrastructure to impact on a new pipe alignment. The pipeline could potentially be installed by directional drilling to minimize disruption and carbon implication associated with open cut installation.

This route is approximately 2,500m long, assuming connection at the reservoir site. This would require a new BSP at the reservoir site.

An alternative is to utilise the 250 connection to the Kumeu / Huapai main at the Old North Road and Deacon Road intersection, combined with the installation of a district meter adjacent to the existing Riverhead BSP, feeding the proposed 300 ID pipeline. The district meter would be required to allow the Riverhead demand to be deducted from the Kumeu / Huapai BSP. As power and communications are already available at the BSP site these could be utilised for the district meter.

This results in a pipe length of approximately 2,000 m.

It is understood that there is a cross connection from the reservoir supply transmission main and the 250 cross connection which is normally isolated but could be opened in the case of a failure of the reservoir outlet transmission main.

It is noted that the High-Pressure Gas Main in located within Riverhead Road.

2.7 Local Reticulation

Local reticulation would be designed in accordance with the Auckland Code of Practice for Land Development and Subdivision Water and Wastewater Code of Practice for Land Development and Subdivision Chapter 6: Water.

2.8 Transmission System

Riverhead, Kumeu and Huapai are serviced via a reservoir located at 403 Old North Road Huapai. The reservoir capacity is understood to be in the order of 4,600 m^3, with a usable capacity of 3,500 m^3 (1 days’ supply for approximately 16,000 people or 5,300 DUE).

Table 3 Reservoir Usable Capacity

Reservoir Capacity	3500	m^3
	220	L/p/day
	15,909	People
	5,303	DUE

This reservoir services the Riverhead, Kumeu and Huapai area, including lived zoned, but undeveloped land.

Table 4 Reservoir Supply Population

Area	**Population**
Riverhead	3,250
Kumeu / Huapia	4,000
Live Zoned land	4,200 (1,400 DUE – 640 DUE consented)
Total	**11,450**
Additional Capacity	4,550 (1,500 DUE)
Total	**16,000**

It is anticipated therefore that the reservoir can service an additional population in the order of 4,500 people (1,500 DUE) over and above the current population and servicing of live zoned land.

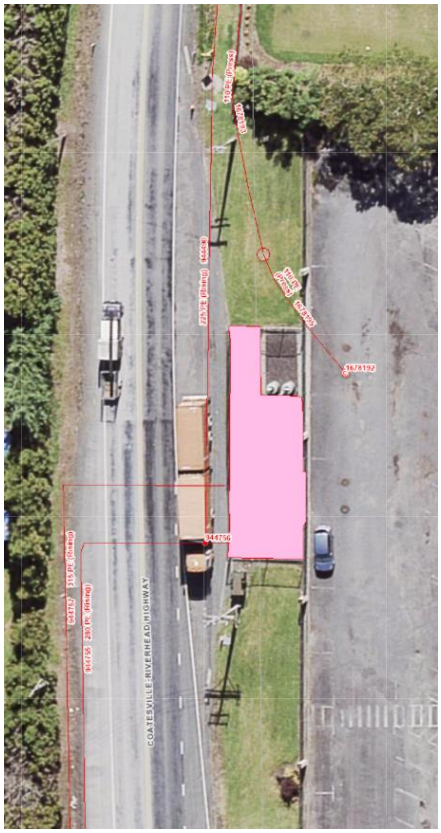
The capacity of the Water Transmission Main has not been analysed, but it is understood to have capacity to service additional population.

With the significant growth planned for wider Kumeu and Huapai Future Urban Zone, the reservoir and transmission main will ultimately need to be upsized to service the demand. It is understood that Watercare are responsible for the upgrading or provision of bulk / transmission infrastructure. Timing of the upgrade is linked to the Future Urban Land Supply Strategy and as identified in the Asset Management Plan. If upgrades are required ahead of the programmed upgrades, it is anticipated that these are carried out at the developers cost.

3. Wastewater Network Capacity Assessment

3.1 Existing Network Configuration and Capacity

A pressure sewer system currently services Riverhead. It is understood that Watercare has confirmed that the wastewater servicing of the Riverhead Future Urban Zone would be via an extension of the existing pressure sewer system.



Both the Riverhead and Kumeu/Huapai pressure sewer systems discharge at the existing Riverhead Wastewater Pump Station. The pump station is shown to be located within the road reserve and the golf course car park rather than a defined pump station site (Figure 3).

As-built drawings of the pump station identify a single storage tank that has been constructed within the golf club car park (and confirmed by the Engineer's Representative for the project), which is not shown within the GIS. The storage tank in an inline / balancing tank, with the 110 Riverhead main entering the tank at the opposite end to the outlet. The 225 Riverhead main and the Kumeu / Huapai Main is shown to connect at the pump station inlet end of the storage tank.

The storage tank is shown as 16.5m long by 2.8m diameter (~100m^3). A copy of the relevant as-built drawing is included in Appendix A. The as-built drawings also identify space for two further storage tanks within the golf course car park, although it is not known if there is any agreement regarding the future construction of these tanks.

It is understood that it is proposed to ultimately separate the Kumeu/Huapai catchment from Riverhead, with the catchment to be connected to the proposed Slaughterhouse Pump Station[1], via a future Redhills gravity sewer.

Figure 4 Riverhead Pump Station Location

The installed pump duty point (both pumps operating) has been identified as approximately 70 L/s (252 m^3/hr) at an estimated pump head of 63 m, without Tamiro Pump Station operating.

The duty point is influenced by the operation of the Whenuapai Tamiro WWPS which pumps into the common rising main. When the Tamiro WWPS operates, pump heads are increased and thus flows decrease. As part of the Whenuapai – Redhills upgrade, with the construction of the Slaughterhouse Creek WWPS, Tamiro WWPS is to be abandoned, with flows from Whenuapai gravitating into the new pump station. This will relieve pressure on the existing Riverhead rising main and impact on the Riverhead WWPS.

3.2 Hydraulic Assessment - Model Scenarios

A dynamic hydraulic model has been developed for the Riverhead WW Pump Station catchment and validated against recorded flow and pressure data. This model was developed to allow future scenarios to be analysed. Additional wastewater loading (for future development) was included in accordance with the Watercare Code of

[1] Watercare Services Limited, Asset Management Plan 2018 to 2038 (Forecasts from I July 2018 to June 2038) **https://wslpwstoreprd.blob.core.windows.net/kentico-media-libraries-prod/watercarepublicweb/media/watercare-media-library/reports-and-publications/asset_management_plan_2018-2038.pdf**

Practice (Sections 5.3.5 And 5.3.12.3.3) with 180 litres/person/day, three people per house and a capacity safety factor of 1.2.

The following scenarios were assessed (Table 2):

Table 5 Modelled Scenarios

Scenario	Description
1 – Existing Scenario	Existing network and population to validate model, based on recorded 140 L/person/day.
2 – Build-out Scenario	Existing scenario plus the addition of a further 1,400 properties in Kumeu/Huapai (at 180 L/p/day x 1.2 peak day factor) within existing "live zoned" land.
3 – Ultimate Scenario (Build-out + Riverhead FUZ)	Existing plus development of the live zoned land (as above) plus the development of the Riverhead Future Urban Zone land, comprising of (a) 1500, (b) 2000 and (c) 2500 DUE, respectively (at 180 L/p/day x 1.2 peak day factor)
4 – Separated Scenario (Riverhead only including FUZ)	Fully developed Riverhead only, further to Kumeu and Huapai being disconnected from the Riverhead system.

The Riverhead Pump Station has been modelled as per the as-built information (Appendix A) with a pump capacity of 64 l/s with one pump operating and ~70 L/s with both pumps operating, and without Tamiro WWPS operating.

3.3 Hydraulic Assessment - Model Results

The model results are summarised in Table 4 and Figure 4 below:

Table 6 Dwelling Unit Equivalents (existing based on numbers of connected "household" pump stations

	Scenario	Riverhead (Existing)	Kumeu / Huapai (Existing)	Kumeu / Huapai Live Zone Land	Riverhead Future Urban Zone	Total
1	Existing Scenario	970	980			1,950
2	Build-out Scenario	970	980	1,400		3,350
3a	Ultimate Scenario + 1500 HUE (FUZ)	970	980	1,400	1,500	4,850
3b	Ultimate Scenario + 2000 HUE (FUZ)	970	980	1,400	2,000	5,350
3c	Ultimate Scenario + 2500 HUE (FUZ)	970	980	1,400	2,500	5,850
4	Ultimate Scenario + 2000 HUE (FUZ) (Only Riverhead)	970			2,000	2,970

Table 7 Model Results

	Scenario	Number of Equivalent Properties	Peak Instantaneous Inflow (L/s)	Peak Hourly Inflow (m^3/hr)	Daily Volume (m^3/day)	"Surplus" Volume (m^3)
1	Existing Scenario	1,950	60	150	1528*	None
2	Build-out Scenario	3,350	75	230	2435*	
3a	Ultimate Scenario with 1500 HUE (FUZ)	4,850	100	290	3407*	205**
3b	Ultimate Scenario + 2000 HUE (FUZ)	5,350	125	300	3731*	402**
3c	Ultimate Scenario + 2500 HUE (FUZ)	5,850	145	370	4055*	416**
4	Ultimate Scenario + 2000 HUE (FUZ) (Only Riverhead)	2,970	40	70	1703	None

* Includes Kumeu Industrial and Huapai Line Flushing Volumes

** Existing Emergency Storage is approximately 125 m^3, within storage tank and pump chamber

The modelling demonstrated that peak day design scenarios of up to 1,000 DUE within the Riverhead Future Urban Zone, in conjunction with the full build-out (additional 1,400 DUE) of live zoned land in Kumeu/Huapai could be serviced by existing infrastructure without any surplus flow being recorded.

Table 8 Pump Upgrade Scenarios

Scenario	Scenario 3a Storage Required m^3	Scenario 3b Storage Required m^3	Scenario 3c Storage Required m^3	Pump Head (m)
Existing Operating Scenario***	205	402	416	~ 64 (two pumps)
Single Pump 60 L/s	163	380	402	49
Single Pump 70 L/s	59	202	216	63
Single Pump 75 L/s	32	127	141	69
Single Pump 80 L/s	0	65	79	79
Single Pump 90 L/s	0	0	0	97

*** Without Tamiro WWPS in Operation / assist pump only operates at high level in pump chamber

Current operation

Single Pump operating ~ 64 L/s @ 56m pump head (without Tamiro WWPS operating, ~60 L/s with Tamiro operating)

Two Pumps operating ~ 70 L/s @ 64m pump head

3.4 Existing Situation / Riverhead Pressure Sewer Zone

We are aware that issues have been experienced with the Riverhead pressure sewer catchment, with household pumps “tripping” on high pressure and alarming, particularly within Crabb Fields Lane at the northern extent of Riverhead.

The system includes twin mains along Riverhead – Coatesville Road from Duke Street to the pump station location. The section from Duke Street to Riverhead Road is shown to be comprised of 89 and 145 pipes, with 110 and 200 from Riverhead Road to the Pump Station. It is understood that these as internal diameters. Historically, only the smaller of the two pipes have been in operation due to the historically low flows, resulting in low velocities and high retention times. With increased number of properties being connected, flow have increased leading to higher pump heads being recorded.

We understand that the larger of the twin mains has recently been put into service from the intersection with Riverhead Road. This would have resulted in a significant reduction in friction losses and result in household pumps operating at significantly lower pump heads.

3.5 Discussions

The anticipated ultimate additional population is between 3,750 and 5,200 people (1,250 and 1,750 DUE).

The modelling demonstrates that an additional 1,000 DUE within the Riverhead Future Urban Zone can be serviced by the existing Riverhead Wastewater Pump Station and rising main without the need for any upgrades prior to the separation of Kumeu / Huapai from the Riverhead system.

On separation of Kumeu and Huapai from the Riverhead Network (Scenario 4), the peak inflow into the Riverhead Pump Station is shown to be 40 L/s in comparison to the pump duty point of 70 L/s.

For developments greater than 1,000 DUE, surplus flows are noted to occur. Additional capacity could be added to the system if / when considered necessary:

Pump Upgrade

Installation of larger pumps into the Riverhead Pump Station would reduce the volume of surplus flow experienced and needing to be stored during peak inflow periods.

Onsite Storage

Additional operational storage could be included at the Riverhead Pump Station to hold peak hour /wet-day inflows when the inflow exceeds the Riverhead Pump Station capacity. The as-built drawings (Appendix A) identify space for two further storage tanks (an additional 200 m^3) within the golf course car park. If additional storage were to be constructed, an agreement would need to be reached with the golf course to build the additional storage tanks within the car park.

Smart Pressure Sewer System

Adopting a smart pressure sewer system would allow household pumps to be turned off remotely and household storage used to hold peak hour/wet day inflow when inflow exceeds Riverhead Pump Station capacity. There is an additional cost associated with the construction of a Smart system in comparison to the conventional simplex system in the order of $1,400 per household.

The option of adopting a Smart Pressure Sewer System would need to be accepted by Watercare with an alternative ownership / operational model for pressure sewer systems adopted to allow Watercare to operate the household pumps. However, it includes the following advantages:

- The utilisation of onsite household storage, rather than the construction of additional operational storage
- Remote monitoring of alarms, rather than relying on a local alarm and residents calling in faults
- Remote control of pumps to allow flushing of pipelines (reducing the risk of sedimentation and associated odour and septicity issues, particularly during early build-out stages)
- Inflow and Infiltration monitored/minimised by comparing metered water consumption to wastewater flows

4. Conclusions and recommendations

4.1 Water Supply

There is hydraulic capacity within the existing supply main to service an additional 515 DUE, however, the single supply pipe does not provide any resilience. A second pipe is therefore recommended for resilience, as well as additional capacity.

Two options have been identified for the second supply main: direct feed from the Transmission main or duplication of the supply pipe from the reservoir. Duplication of the pipe from the reservoir is recommended to meet Watercare requirements.

The reservoir has capacity to support additional growth, but potentially requires duplication for full build out of Middle and High Road Options, with additional populations in excess of 4,500 people (1,500 DUE).

The transmission main and reservoir will ultimately need to be upgrades to service the wider Kumeu / Huapai Future Urban Zone.

4.2 Wastewater Infrastructure

Watercare have confirmed that Riverhead is to be serviced by an extension of the pressure sewer system.

The modelling demonstrates that an additional 1,000 DUE within the Riverhead Future Urban Zone can be serviced by the existing Riverhead Wastewater Pump Station and rising main without the need for any upgrades. The installation of larger pumps, the construction of additional storage capacity or the adoption of a smart pressure sewer system would allow the servicing of additional DUE. For example, the model identifies that Scenario 3c (2,500 DUE) can be serviced by installing larger pumps, increasing the pump duty point to 75 L/s at 69m pump head, and providing 150m^3 of operational storage.

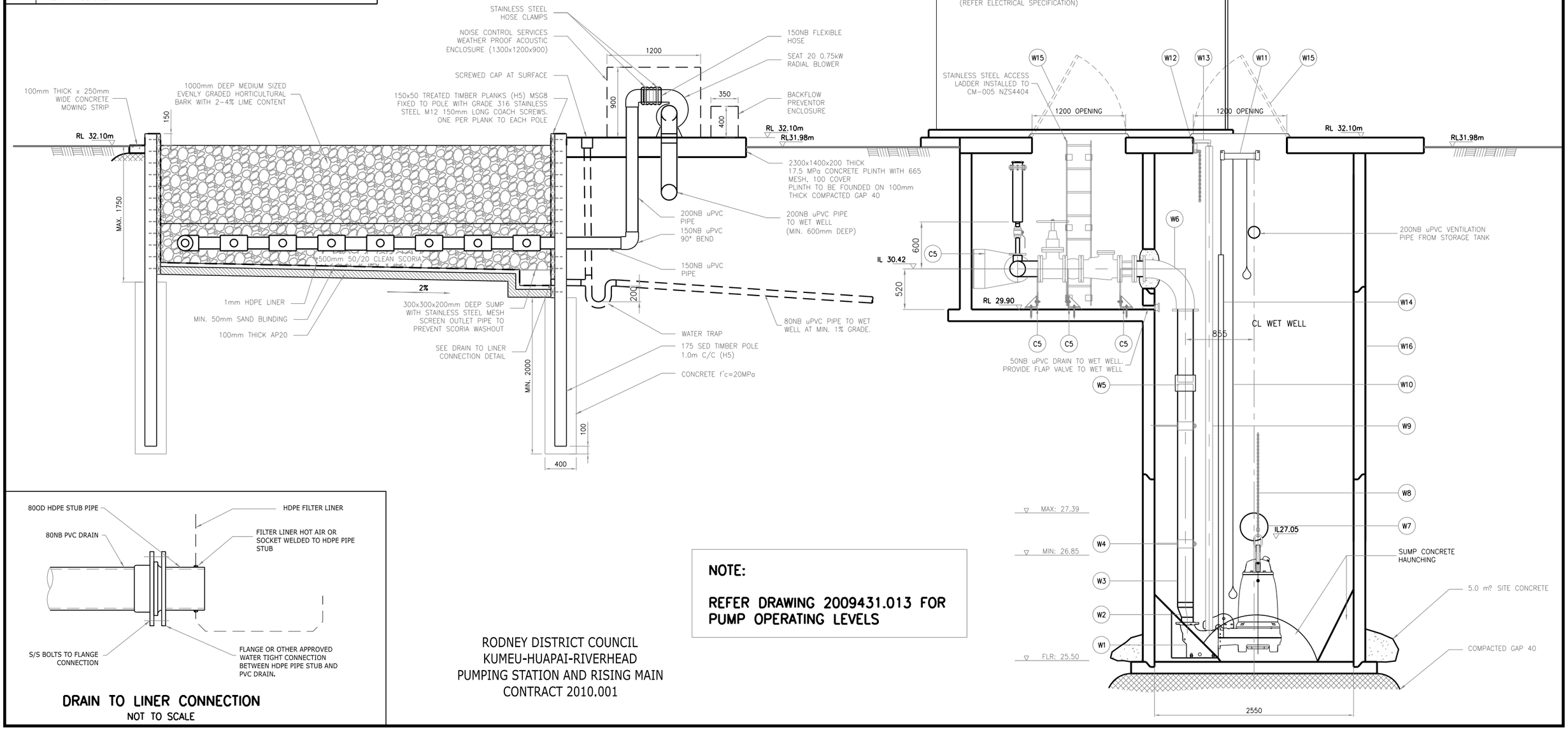
Kumeu and Huapai are to ultimately be separated from the Riverhead system. Once separated from Riverhead Pump Station is completed, there is “surplus” capacity within the existing system to service Riverhead under all growth scenarios.

Appendix A

Riverhead Pump Station – As-built Drawings

WET WELL MATERIAL SCHEDULE

ITEM	DESCRIPTION/SPECIFICATION
W1	FLYGT PUMP NP3301, 53-458-00-0150, 350mm IMPELLER, 150mm OUTLET
W2	150/200 GILLIES DUCTILE IRON ECCENTRIC REDUCER BOTH ENDS FLANGED
W3	200 NB CLMS PIPE ONE END GROOVED
W4	STAINLESS STEEL PIPE SUPPORT BRACKETS AT 1.5m CENTRES (REFER DETAILS)
W5	200 NB VITAULIC GROOVED COUPLER
W6	200 NB DUCTILE IRON LONG RADIUS 90° BEND BOTH ENDS FLANGED
W7	355 OD PE PIPE FROM SATELLITE MANHOLE
W8	GALVANISED STEEL LIFTING CHAIN (SHOWN SHORTENED FOR CLARITY)
W9	STAINLESS STEEL GUIDE RAIL
W10	FLOAT SWITCH
W11	FLOAT SWITCH BRACKET
W12	LIFTING CHAIN AND CABLE HOLDER
W13	GUIDE RAIL BRACKET
W14	65 NB PVC STILLING TUBE WITH PRESSURE TRANSDUCER & 2 x SS PIPE SUPPORT BRACKETS. TOP RL30.60 BOTTOM RL25.70
W15	PELTECH ACCESS HATCH FOR 1200x1900mm OPENING. REFER O&M MANUAL
W16	2550 NB PRECAST MANHOLE RISER WITH FLANGED BASE. MAXIMUM LENGTH OF WET WELL RISERS TO BE USED



DRAIN TO LINER CONNECTION
NOT TO SCALE

NOTE:

REFER DRAWING 2009431.013 FOR PUMP OPERATING LEVELS

RODNEY DISTRICT COUNCIL
KUMEU-HUAPAI-RIVERHEAD
PUMPING STATION AND RISING MAIN
CONTRACT 2010.001

ISSUE	DATE	AMENDMENT	BY	APPD.
A	04-12	AS BUILT	I.M.	L.F.

DESIGNED	H&G	2009	
DES. CHECKED			
DRAWN	H&G	2009	
DWG. CHECKED			
PROJECT LEADER			
INFRAST'R APP'D			

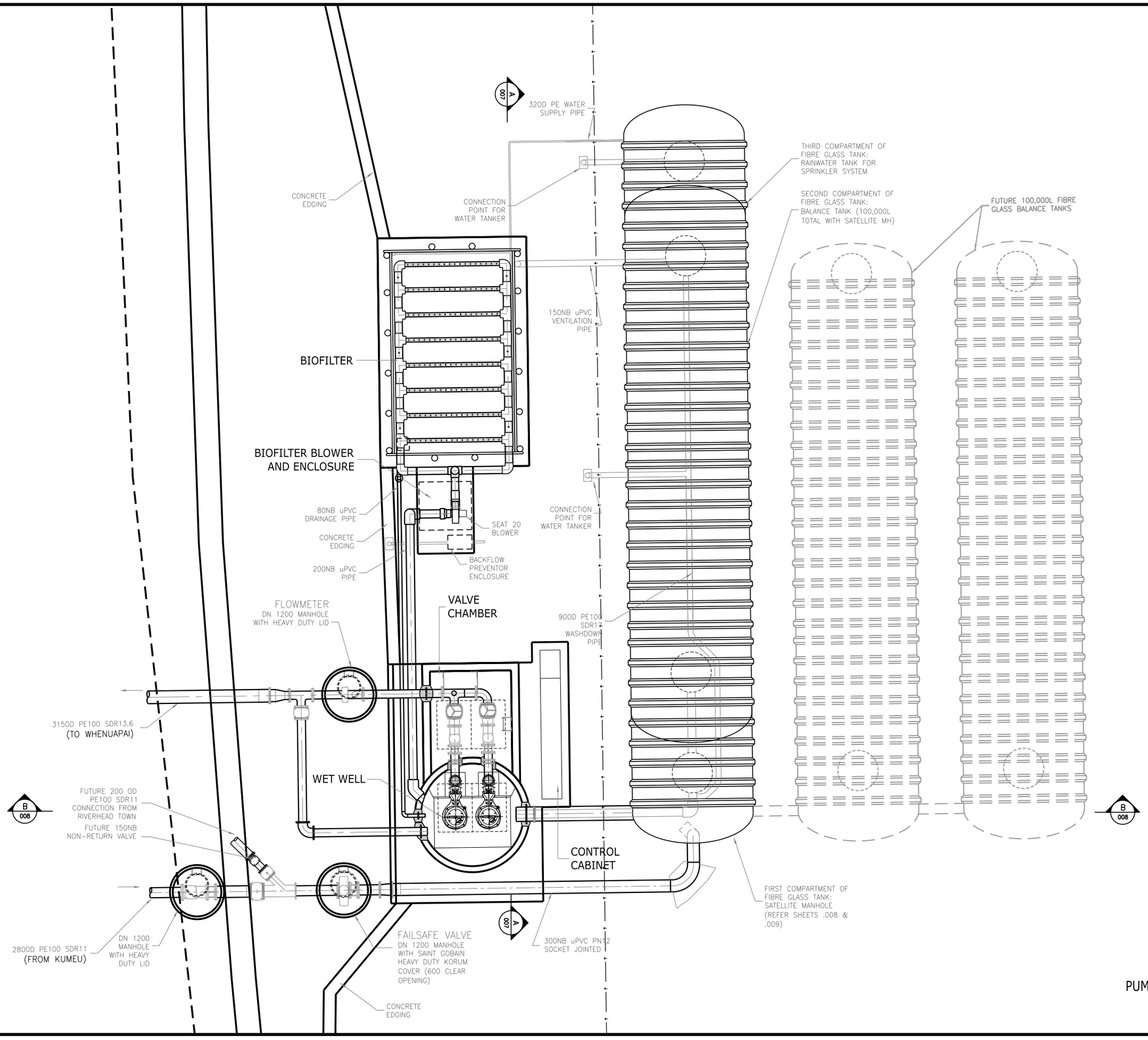
OPERATIONS
INFRASTRUCTURE

water Care services limited

RIVERHEAD WASTEWATER PUMPING STATION
KUMEU - HUAPAI - RIVERHEAD
SECTION A-A

AS BUILT

CAD FILE 2009431.007A	DATE 31-07-12
ORIGINAL SCALE A1 1:50 A3	CONTRACT No. -
REF. No.	ISSUE
DWG. No. 2009431 .007	A



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KUMEU-HUAPAI-RIVERHEAD
PUMPING STATION AND RISING MAIN
CONTRACT 2010.001

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DES. CHECKED		
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DWG. CHECKED		
PROJECT LEADER		
INFRAST'R APP'D		

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INFRASTRUCTURE

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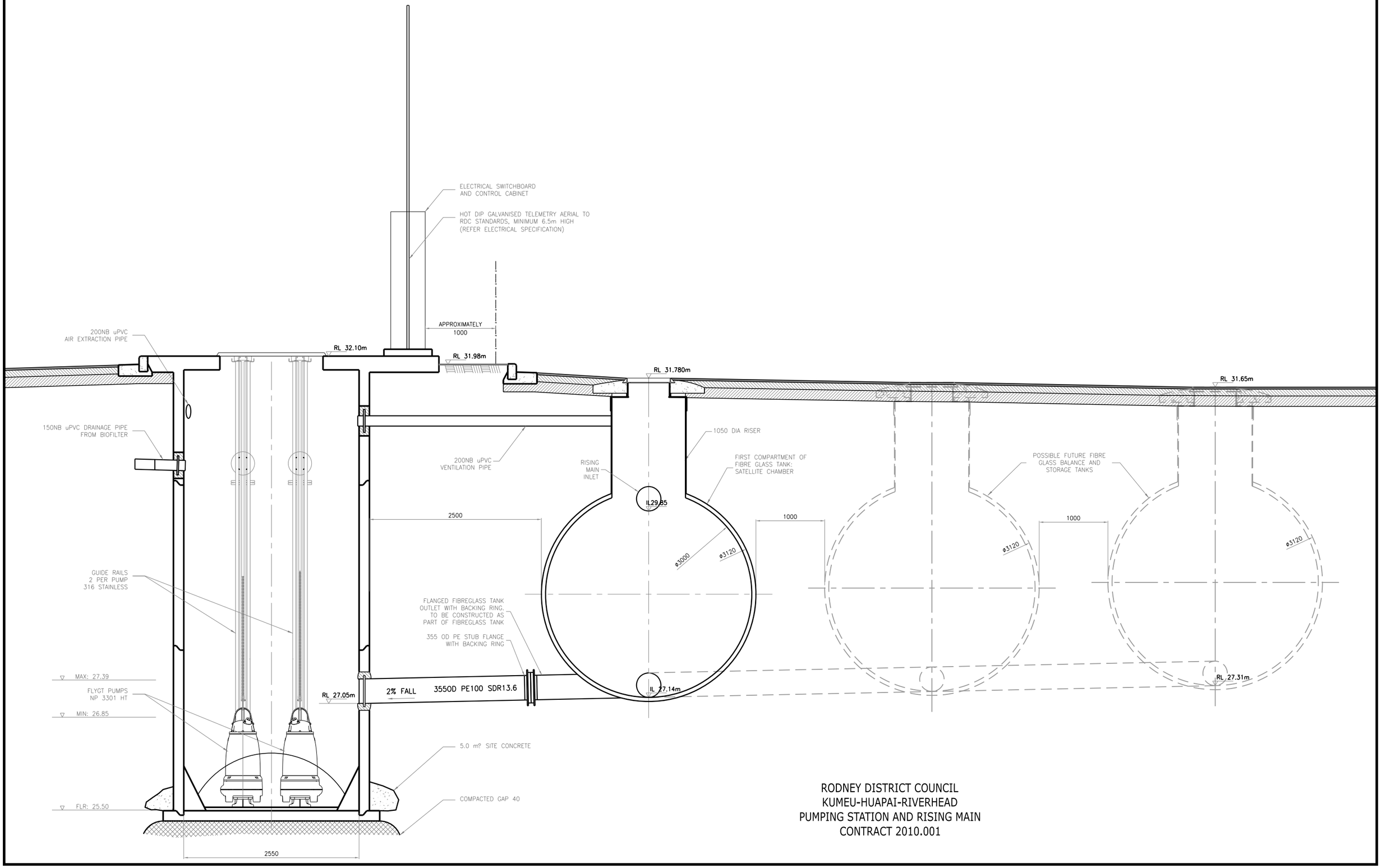
RIVERHEAD WASTEWATER PUMPING STATION
KUMEU - HUAPAI - RIVERHEAD
PUMPING STATION AND RISING MAIN - LAYOUT PLAN

AS BUILT

CAD FILE 2009431.004A	DATE 17-04-12
ORIGINAL SCALE A1 1:100 A3	CONTRACT No. -
REF. No.	ISSUE
DWG. No. 2009431 .004	A



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KUMEU-HUAPAI-RIVERHEAD
PUMPING STATION AND RISING MAIN
CONTRACT 2010.001

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A	04-12	AS BUILT	I.M.	L.F.

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DES. CHECKED		
DRAWN	H&G	2009
DWG. CHECKED		
PROJECT LEADER		
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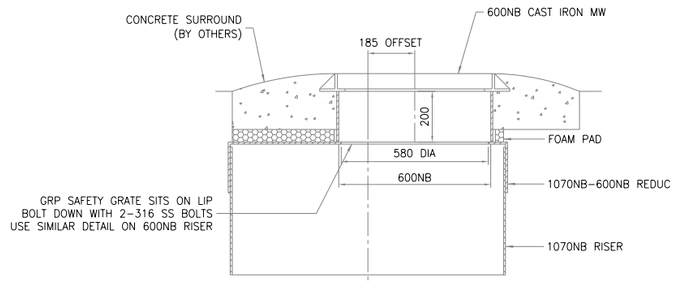
RIVERHEAD WASTEWATER PUMPING STATION
KUMEU - HUAPAI - RIVERHEAD
SECTION B-B

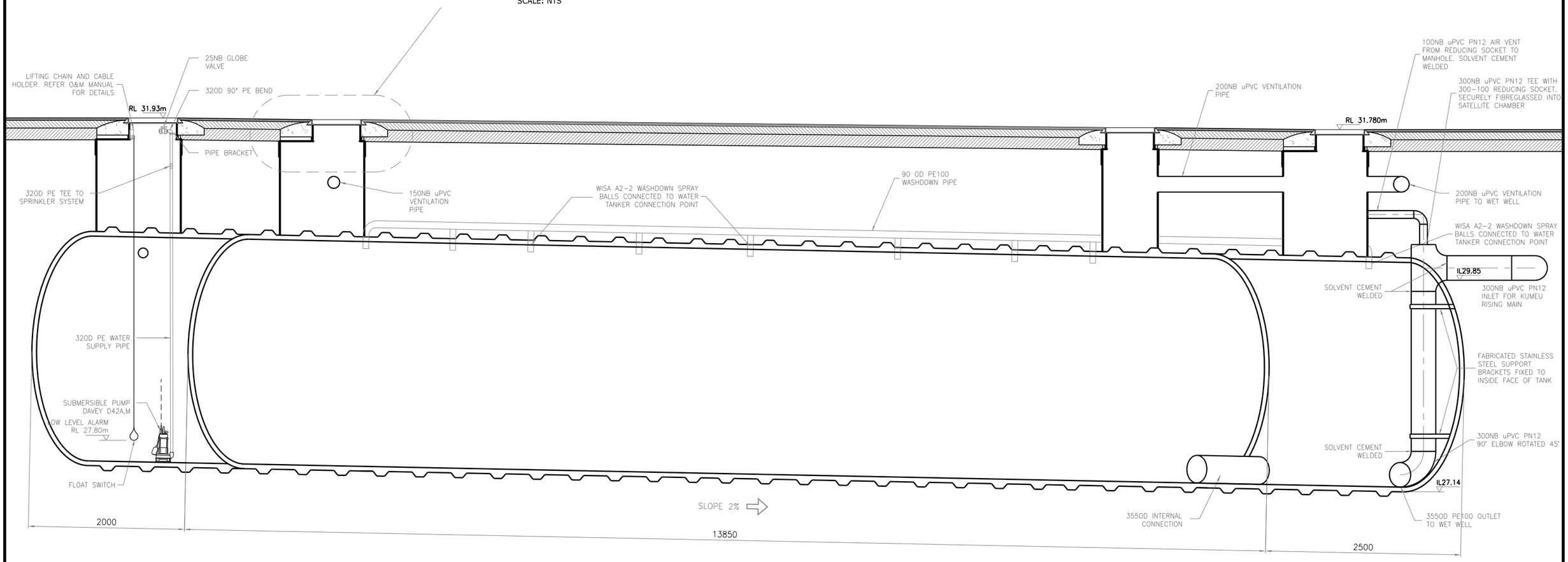
AS BUILT

CAD FILE 2009431.008A	DATE 31-07-12
ORIGINAL SCALE A1 1:50 A3	CONTRACT No. -
REF. No.	ISSUE
DWG. No. 2009431 .008	A



1070NB MANWAY RISER DETAIL

SCALE: NTS



WATER STORAGE | **STORAGE/BALANCE TANK** | **SATELLITE CHAMBER**

PUMPING STATION SECTION

SCALE:1:25-A1

RODNEY DISTRICT COUNCIL
KUMEU-HUAPAI-RIVERHEAD
PUMPING STATION AND RISING MAIN
CONTRACT 2010.001

ISSUE	DATE	AMENDMENT	BY	APPD.
A	04–12	AS BUILT	I.M.	L.F.

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DES. CHECKED		
DRAWN	H&G	2009
DWG. CHECKED		
PROJECT LEADER		
INFRAST'R APP'D		

OPERATIONS

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RIVERHEAD WASTEWATER PUMPING STATION
KUMEU – HUAPAI – RIVERHEAD

SECTION C-C

AS BUILT

CAD FILE 2009431.009A	DATE 17–04–12
ORIGINAL SCALE A1 1:50 A3	CONTRACT No. –
REF. No.	ISSUE
DWG. No. 2009431 .009	A

Appendix B

Riverhead Water Supply Calculations

Scenario 1 Riverhead - maximum Capacity of existing 250 DN pipe (10m/km headloss)

COLEBROOK-WHITE CALCULATION
(Unverified calc - Please verify before use)

ENTER	Internal pipe dia	212.40	mm
	Flowrate	0.055	m^3/s
	Length	1000	m
	Pipe roughness	0.06	mm
Assuming	Poly viscosity	0.00000114	m^2/s
	g	9.81	m^2/s
Answer	Flow velocity	1.5561	m/s
	Losses	9.83	m
		0.96	bar

Pipe Area	0.04	m^2
Loss / m	0.00983	m
1/ Loss per m	101.7728953	
Pipe volume	35.4	m^3

Known velocity and diameter - calculate gradient

Assume
f = 1

0.0150880394	1st Iteration
0.0170145518	2nd Iteration
0.0169056154	3rd Iteration
0.0169113248	4th Iteration
0.0169110244	5th Iteration
0.0169110402	6th Iteration
0.0169110394	7th Iteration
0.0169110394	8th Iteration
0.0169110394	9th Iteration
0.0169110394	10th Iteration
0.0169110394	Darcy's Coefficient
0.009825799	Hydraulic Graident (Loss / m)

lamda

Reservoir	98.00	m RL
Riverhead	39.00	m RL
Available	59.00	m
Friction Head	9.826	m
Residual	49.17	m

Water Supply

Peak Day

Population	Peak Factor
10,000	1.5
4,722	1.83
2,000	2.00

Daily PF	2.5	
Peak Factor	4.57	
Houses (DUE)	1,574	
people per house	3	
Litre / person / day	220	L
Daily Demand	1,038.74	m^3/day
Average Flow	12.02	L/s
Peak Factor	4.57	
Peak Day Hour Flow	55.00	L/s
Fire Flow	25.00	L/s
60% Peak	33.00	L/s
Total (fire)	58.00	L/s

Check Calculations

Velocity	1.55605715	using Flow / Area
Velocity	1.55605715	using Colebrrok White Equation
VARIATION	-1.55431E-14	

Hazen Williams Calculation
(Unverified calc - Please verify before use)

ENTER			
	Flowrate	0.055	m3/s
	Length	1000	m
	Internal pipe dia	0.21	m
	Friction Coefficient	140	
Answer			
	Losses	**9.99994303**	m
		0.98056923	bar

COLEBROOK-WHITE CALCULATION	9.83	m
Hazen Williams Calculation	10.00	m
Variation	174.14	mm
Percentage Variation	1.76%	

250	ND
13.6	SDR
213.24	ID

Scenario 2a Riverhead - maximum Capacity of existing 250 DN pipe (CoP <3m/km headloss)

COLEBROOK-WHITE CALCULATION
(Unverified calc - Please verify before use)

ENTER	Internal pipe dia	212.40	mm
	Flowrate	0.029	m^3/s
	Length	1000	m
	Pipe roughness	0.06	mm
Assuming	Poly viscosity	0.00000114	m^2/s
	g	9.81	m^2/s
Answer	Flow velocity	0.8117	m/s
	Losses	2.89	m
		0.28	bar

Pipe Area 0.04 m^2
Loss / m 0.00289 m

1/ Loss per m 346.5041577
Pipe volume 35.4 m^3

Known velocity and diameter - calculate gradient

lamda

Assume
f = 1

0.0153796821 1st Iteration
0.0184865583 2nd Iteration
0.0182376229 3rd Iteration
0.0182555022 4th Iteration
0.0182542075 5th Iteration
0.0182543012 6th Iteration
0.0182542944 7th Iteration
0.0182542949 8th Iteration
0.0182542949 9th Iteration
0.0182542949 10th Iteration
0.0182542949 Darcy's Coefficient

0.002885968 Hydraulic Graident (Loss / m)

Reservoir 98.00 m RL
Riverhead 39.00 m RL

Available 59.00 m

Friction Head 2.886 m

Water Supply

Check Calculations

Velocity 0.81168964 using Flow / Area

Velocity 0.81168964 using Colebrrok White Equation

VARIATION -2.99316E-13

Hazen Williams Calculation
(Unverified calc - Please verify before use)

ENTER			
	Flowrate	0.029	m3/s
	Length	1000	m
	Internal pipe dia	0.21	m
	Friction Coefficient	140	
Answer			
	Losses	**3.0000036**	m
		0.2941728	bar

COLEBROOK-WHITE CALCULATION	2.89	m
Hazen Williams Calculation	3.00	m
Variation	114.04	mm
Percentage Variation	3.87%	

250 ND
13.6 SDR
213.24 ID

Peak Day

Population	Peak Factor
10,000	1.5
9000	1.56
2,000	2.00

Daily PF 2.5

Peak Factor 3.91

Houses (DUE) 3,000
people per house 3
Litre / person / day 220 L

Daily Demand 1,980.00 m^3/day
Average Flow 22.92 L/s

Peak Factor 3.91

Peak Day Hour Flow 89.52 L/s

Fire Flow 25.00 L/s
60% Peak 53.71 L/s

Total (fire) 78.71 L/s

Scenario 2b Riverhead - New Main <3m/km headloss

COLEBROOK-WHITE CALCULATION
(Unverified calc - Please verify before use)

ENTER	Internal pipe dia	302.79	mm
	Flowrate	0.061	m^3/s
	Length	1000	m
	Pipe roughness	0.06	mm
Assuming	Poly viscosity	0.00000114	m^2/s
	g	9.81	m^2/s
Answer	Flow velocity	0.8438	m/s
	Losses	2.02	m
		0.20	bar

Pipe Area 0.07 m^2
Loss / m 0.00202 m

1/ Loss per m 495.8364094
Pipe volume 72.0 m^3

Known velocity and diameter - calculate gradient

lamda

Assume
f = 1

0.0142487267 1st Iteration
0.0170290019 2nd Iteration
0.0168155712 3rd Iteration
0.0168303082 4th Iteration
0.0168292829 5th Iteration
0.0168293542 6th Iteration
0.0168293492 7th Iteration
0.0168293496 8th Iteration
0.0168293495 9th Iteration
0.0168293495 10th Iteration
0.0168293495 Darcy's Coefficient

0.002016794 Hydraulic Graident (Loss / m)

Reservoir 98.00 m RL
Riverhead 39.00 m RL

Available 59.00 m

Friction Head 2.017 m

Check Calculations

Velocity 0.84376275 using Flow / Area

Velocity 0.84376275 using Colebrrok White Equation

VARIATION -2.02061E-13

Hazen Williams Calculation
(Unverified calc - Please verify before use)

ENTER			
	Flowrate	0.061	m3/s
	Length	1000	m
	Internal pipe dia	0.30	m
	Friction Coefficient	140	
Answer			
	Losses	**2.13233856**	m
		0.20909175	bar

COLEBROOK-WHITE CALCULATION	2.02	m
Hazen Williams Calculation	2.13	m
Variation	115.54	mm
Percentage Variation	5.57%	

355 ND
13.6 SDR
302.79 ID

Water Supply

Peak Day

Population	Peak Factor
10,000	1.5
9000	1.56
2,000	2.00

Daily PF 2.5

Peak Factor 3.91

Houses (DUE) 3,000
people per house 3
Litre / person / day 220 L

Daily Demand 1,980.00 m^3/day
Average Flow 22.92 L/s

Peak Factor 3.91

Peak Day Hour Flow 89.52 L/s

Fire Flow 25.00 L/s
60% Peak 53.71 L/s

Total (fire) 78.71 L/s

Scenario 3a Riverhead - Future Scenario / Full Length (250)

COLEBROOK-WHITE CALCULATION
(Unverified calc - Please verify before use)

ENTER	Internal pipe dia	213.24	mm
	Flowrate	0.025	m^3/s
	Length	2500	m
	Pipe roughness	0.06	mm
Assuming	Poly viscosity	0.00000114	m^2/s
	g	9.81	m^2/s

Answer	Flow velocity	0.7094	m/s
	Losses	5.59	m
		0.55	bar

Pipe Area	0.04	m^2
Loss / m	0.00223	m
1/ Loss per m	447.42775	
Pipe volume	89.3	m^3

Known velocity and diameter - calculate gradient

lamda

Assume
f = 1

0.0154511944	1st Iteration
0.0188516940	2nd Iteration
0.0185618768	3rd Iteration
0.0185838544	4th Iteration
0.0185821723	5th Iteration
0.0185823009	6th Iteration
0.0185822911	7th Iteration
0.0185822918	8th Iteration
0.0185822918	9th Iteration
0.0185822918	10th Iteration
0.0185822918	Darcy's Coefficient
0.002234998	Hydraulic Graident (Loss / m)

0.00

Reservoir	98.00	m RL
Riverhead	39.00	m RL
Available	59.00	m
Friction Head	5.587	m

Check Calculations

Velocity	0.70936205	using Flow / Area
Velocity	0.70936205	using Colebrrok White Equation
VARIATION	-4.91607E-13	

Hazen Williams Calculation
(Unverified calc - Please verify before use)

ENTER			
	Flowrate	0.025	m3/s
	Length	2500	m
	Internal pipe dia	0.21	m
	Friction Coefficient	140	

Answer			
	Losses	**5.8184882**	m
		0.5705463	bar

COLEBROOK-WHITE CALCULATION	5.59	m
Hazen Williams Calculation	5.82	m
Variation	230.99	mm
Percentage Variation	4.05%	

250	ND
13.6	SDR
213.24	ID

Water Supply

Peak Day

Population	Peak Factor
10,000	1.5
9000	1.56
2,000	2.00

Daily PF	2.5	
Peak Factor	3.91	
Houses (DUE)	3,000	
people per house	3	
Litre / person / day	220	L
Daily Demand	1,980.00	m^3/day
Average Flow	22.92	L/s
Peak Factor	3.91	
Peak Day Hour Flow	89.52	L/s
Fire Flow	25.00	L/s
60% Peak	53.71	L/s
Total (fire)	78.71	L/s

Scenario 3b Riverhead - Future Scenario / Full Length (355)

COLEBROOK-WHITE CALCULATION
(Unverified calc - Please verify before use)

ENTER	Internal pipe dia	302.79	mm
	Flowrate	0.064	m^3/s
	Length	2500	m
	Pipe roughness	0.06	mm
Assuming	Poly viscosity	0.00000114	m^2/s
	g	9.81	m^2/s
Answer	Flow velocity	0.8914	m/s
	Losses	5.59	m
		0.55	bar

Pipe Area	0.07 m^2
Loss / m	0.00223 m
1/ Loss per m	447.4409664
Pipe volume	180.0 m^3

Known velocity and diameter - calculate gradient

lamda

Assume
f = 1

0.0142213497	1st Iteration
0.0168985509	2nd Iteration
0.0166983189	3rd Iteration
0.0167118282	4th Iteration
0.0167109102	5th Iteration
0.0167109725	6th Iteration
0.0167109683	7th Iteration
0.0167109686	8th Iteration
0.0167109686	9th Iteration
0.0167109686	10th Iteration
0.0167109686	Darcy's Coefficient
0.002234932	Hydraulic Graident (Loss / m)

Check Calculations

Velocity	0.89136286	using Flow / Area
Velocity	0.89136286	using Colebrrok White Equation
VARIATION	-1.63314E-13	

Hazen Williams Calculation
(Unverified calc - Please verify before use)

ENTER			
	Flowrate	0.064	m3/s
	Length	2500	m
	Internal pipe dia	0.30	m
	Friction Coefficient	140	
Answer			
	Losses	**5.9005082**	m
		0.57858897	bar

COLEBROOK-WHITE CALCULATION	5.59	m
Hazen Williams Calculation	5.90	m
Variation	313.18	mm
Percentage Variation	5.45%	

355	ND
13.6	SDR
302.79	ID

Reservoir	98.00	m RL
Riverhead	39.00	m RL
Available	59.00	m
Friction Head	5.587	m

Water Supply

Peak Day

Population	Peak Factor
10,000	1.5
9000	1.56
2,000	2.00

Daily PF	2.5	
Peak Factor	3.91	
Houses (DUE)	3,000	
people per house	3	
Litre / person / day	220	L
Daily Demand	1,980.00	m^3/day
Average Flow	22.92	L/s
Peak Factor	3.91	
Peak Day Hour Flow	89.52	L/s
Fire Flow	25.00	L/s
60% Peak	53.71	L/s
Total (fire)	78.71	L/s

Appendix B

Watercare letter dated 17 December 2021

Watercare
An Auckland Council Organisation

Watercare Services Limited
Private Bag 94010
Auckland 2241
www.watercare.co.nz
Customer service line
Mon to Fri 7.30 to 6pm
09 442 2222
info@water.co.nz

Fault line
24 hours
09 442 2222
Free text 3130
faults@water.co.nz

17 December 2021

Darren Soo
Fletcher Residential Limited
810 Great South Road, Penrose, 1061
DSoo@frl.co.nz
021 511 164

Dear Darren,

Re: Your request for an assessment of water and wastewater servicing options

Address:

325, 307, 306, 328 & 340 Riverhead Road Riverhead 0892
30 Cambridge Road Riverhead 0892
22 Duke Street Riverhead 0820
1092 Coatesville-Riverhead highway Riverhead 0820
Lot 1 DP 164590, Coatesville-Riverhead highway Riverhead 0892
Lot 2 DP 164978, Lathrope Road Riverhead 0892
51 Lathrope Road Riverhead 0892
1140, 1156, 1158, 1170, 1186, 1194, 1200 & 1210 Coatesville-Riverhead highway Riverhead 0892

Watercare application number **CON-98352**

This assessment is independent of the Auckland Council consenting process. This letter does not constitute a pre-approval from Watercare, and the assessment is valid for two years from the date of this letter.

Watercare has undertaken an initial high-level assessment of the proposal for the **proposed development, 1500 DUES,** at the above addresses. Based on the information provided at this stage, in particular, insert a reference to reports/drawings/plans as appropriate, we confirm the following.

Water supply:

There are capacity constraints in the water supply network. The capacity constraints in the water supply network will need to be mitigated by the developer through public network extensions or upgrades, depending on the agreed solution with Watercare as part of the resource consent process.

A duplicate watermain is required, as detailed within the GHD report, to support growth and resilience. The preferred option is a second watermaain laid along Deacon Road and Riverhead Road in parallel to the existing 250PE WM. This would enable cross-connections between the two watermains so potential breaks/maintenance can be bypassed as required with short sections. This will also support a potential reduced diameter of the proposed 355mm PE, which would help with early water quality considerations. The appropriate pipe size can be investigated to ensure the most suitable size based on the full buildout of Riverhead / connections of current rain tank customers, resilience considerations with firefighting/sprinkler requirements.

It is expected that the watermain would need to feed back to the current BSP at the junction of Deacon Rd and Old North Road. As there is a single outlet from the reservoir, it will need a cross-connection to the inlet main for further resilience considerations.

Wastewater:

There are capacity constraints in the wastewater network. The capacity constraints in the wastewater network will need to be mitigated by the developer through public network extensions or upgrades, depending on the agreed solution with Watercare as part of the resource consent process.

The proposed development of 1,000 DUE can be serviced through the existing Riverhead PS in principal. Development above 1,000 DUE would require upgrades if it occurs prior to Kemeu/Huapai being diverted from Huapai.

This assessment is based on Torino PS being diverted to Slaughterhouse, which is expected to occur by 2025. Development prior to the diversion of Torino would need to be considered closely as the shared rising main has a significant impact on the system head of the Riverhead PS.

Yours Sincerely

Amir Karimi
Development Engineer | Developer Services

Watercare
An Auckland Council Organisation

GENERAL ENQUIRY
Infrastructure Assessment Form

Date of Application	23 September 2021
Address of Development	Riverhead Future Urban Zone

325 Riverhead Road Riverhead 0892	Lot 1 DP 109763
307 Riverhead Road Riverhead 0892	Lot 2 DP 109763
30 Cambridge Road Riverhead 0892	LOT 1 DP 499822
22 Duke Street Riverhead 0820	LOT 20 DP 499876
1092 Coatesville-Riverhead Highway Riverhead 0820	Lot 2 DP 164590
Lot 1 DP 164590, Coatesville-Riverhead Highway Riverhead 0892	Lot 1 DP 164590
306 Riverhead Road Riverhead 08	Lot 1 DP 164978
Lot 2 DP 164978, Lathrope Road Riverhead 0892	Lot 2 DP 164978
328 Riverhead Road Riverhead 0892	Pt Lot 2 DP 37432
51 Lathrope Road Riverhead 0892	Lot 1 DP 64605
340 Riverhead Road Riverhead 0892	Pt Lot 2 DP 4818
1140 Coatesville-Riverhead Highway Riverhead 0892	Lot 1 DP 61985
1156 Coatesville-Riverhead Highway Riverhead 0892	Lot 1 DP 77992
1158 Coatesville-Riverhead Highway Riverhead 0892	Lot 2 DP 77992
1170 Coatesville-Riverhead Highway Riverhead 0892	Lot 3 DP 63577
1186 Coatesville-Riverhead Highway Riverhead 0892	Lot 2 DP 63577
1194 Coatesville-Riverhead Highway Riverhead 0892	Lot 1 DP 113506
1200 Coatesville-Riverhead Highway Riverhead 0892	Lot 1 DP 66488
1210 Coatesville-Riverhead Highway Riverhead 0892	Lot 2 DP 113506

Layout Plan of Proposed Development clearly showing: • Aerial photograph • Road names • Boundary of development	Riverhead Future Urban Zone Plan change application See plan attached - Riverhead Future Urban Zone

	Description	**Comment**
Current Land Use	Rural	Residential (Single family dwellings), Residential (Multi-unit dwellings), Commercial. Including: Retirement village and potentially commercial centre and primary school.
Proposed Land Use	Residential (Single family dwellings), Residential (Multi-unit dwellings), Commercial.	
Total Development Area (Ha.)	Site area ~ 80Ha	
Estimated Number of Residential Households (Consent & Ultimate)	Population estimate of 4,500 (1,500 DUE)	

Refer to Water and Wastewater Code of Practice for Land Development and Subdivision Section 6 Water Supply

Water Supply Development Assessment		
Average and Peak Residential Demand (L/s)	21.1 L/s PDD, 52.8 L/s PHD	*Watercare CoP* Residential
Average and Peak Non-Residential Demand (L/s)		*Covered under residential*

Further Water Supply comments

Refer to Water and Wastewater Code of Practice for Land Development and Subdivision Section 5 Wastewater

Wastewater Development Assessment		
Peak DWF and WWF Residential Design Flows (L/s)	28.13 L/s PDWF, 33.75 L/s PWWF	*Watercare CoP* Residential (pressure sewer)
Peak DWF and WWF Non-Residential Design Flows (L/s)		*Covered under residential*
Further Wastewater comments		

For internal Watercare use only

Date Application Received	
Application Ref No.	
Assigned Connections Engineer	
Prior Developer Correspondence with Watercare	
Neighbouring developments to consider in capacity assessment	

Water

Houses (DUE)	1,500	
people per house	3	
Litre / person / day	220	L
Daily Demand	990.00	m^3/day
	11.46	L/s
Peak Factor	4.61	
Peak Flow	52.82	L/s
Fire Flow	25.00	L/s
60% Peak	31.69	L/s
Total (fire)	56.69	L/s

Peak Day

Population	Peak Factor
10,000	1.5
4500	1.84
2,000	2.00

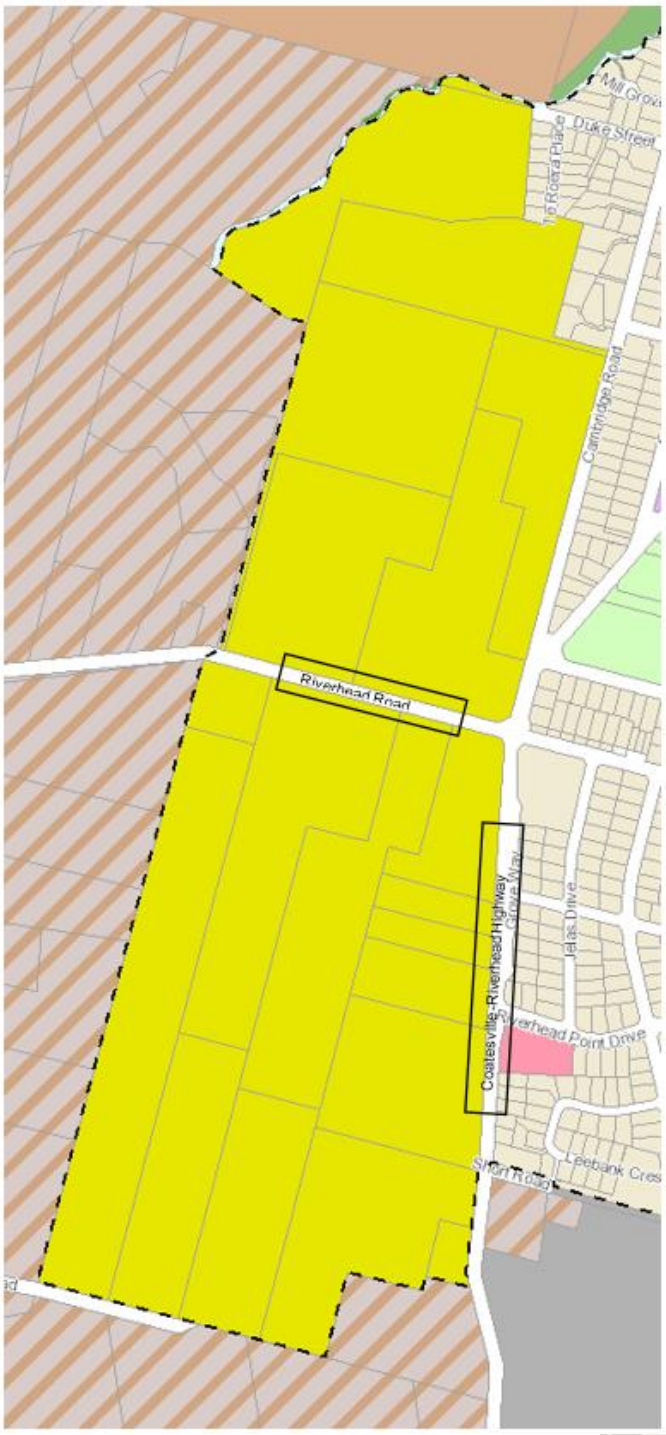
Daily PF 2.5

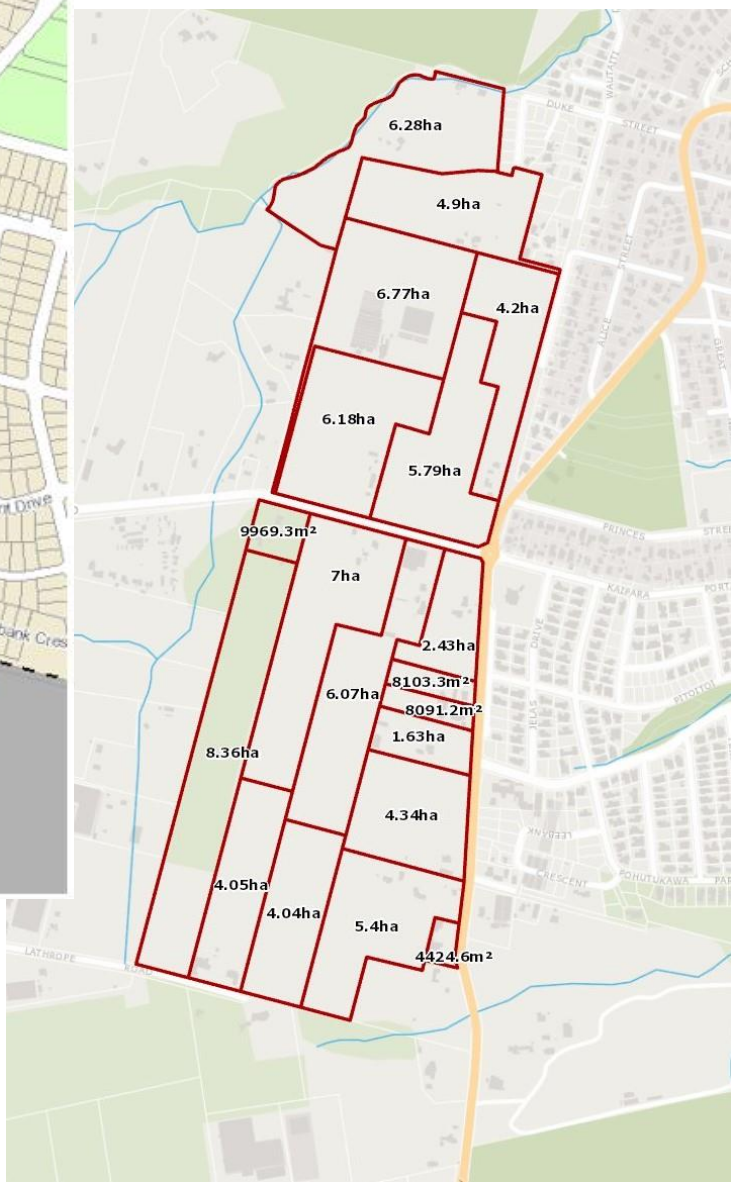
4.61

Wastewater

Houses (DUE)	1,500	
people per house	3	
Litre / person / day	180	L
Daily Flow	810.00	m^3/day
	9.38	L/s
Diurnal Peak Factor	3.00	
Peak Flow	28.13	L/s
Peak Day Factor	1.2	
(Pressure Sewer)		
Peak	33.75	L/s

Riverhead Future Urban Zone





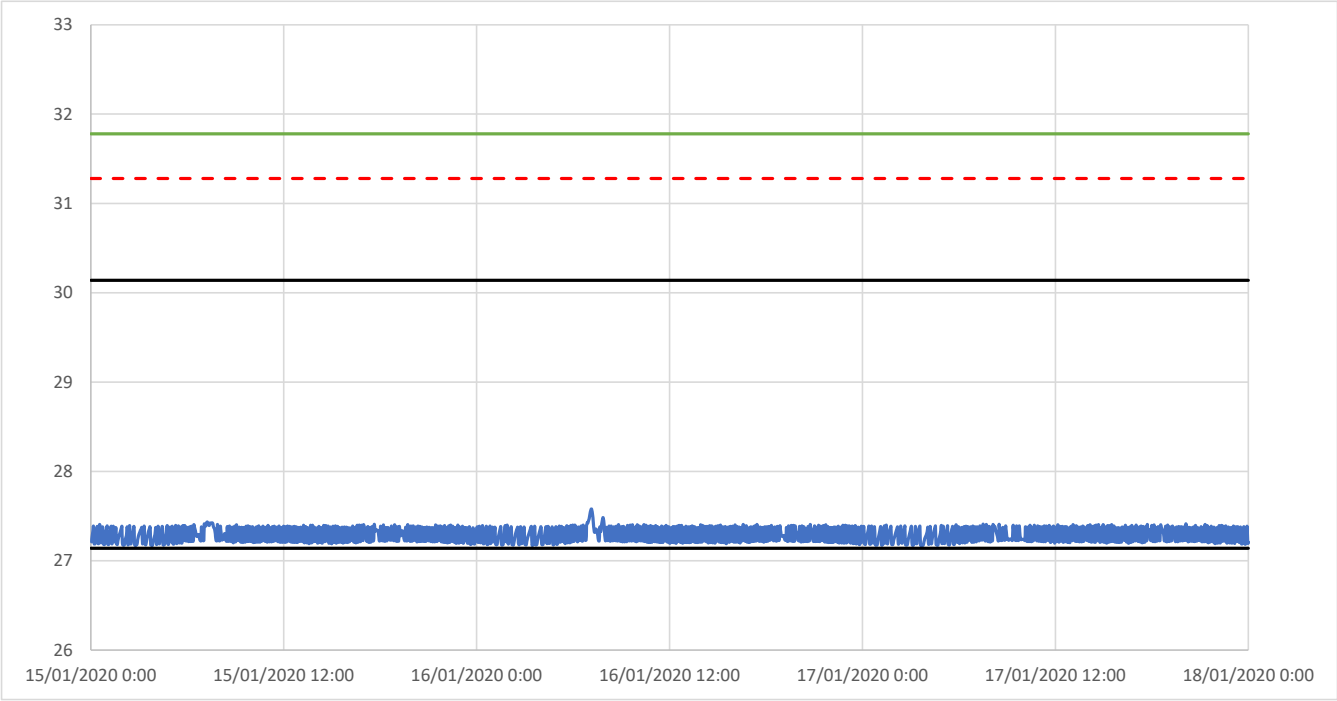
Appendix C

Pressure sewer modelling results

	Baseline			
	Riverhead Pump Station	Riverhead Storage Tank	Riverhead Receiving Manhole	
Ground Level (mRL)	32.1	31.78	32	
Storage Tank Obvert		30.14		
Maximum Water Level	27.564	27.581	30.961	
Storage Tank Invert		27.05		
Freeboard	4.536	4.199	1.039	
Maximum Depth		0.531		

	Kumeu + Huapai + Future (1,400) + 250m^3/day flushing volume	Riverhead FUZ	Riverhead	Total
Daily Volume (m^3/day)	1,685	-	528	2,213
Peak Inflow (L/s)	50	-	29	64
Peak Inflow (m^3/hr)	107	-	52	159
Maximum Pump Flow (m^3/hr)				197

Depth of wastewater (Blue) in Storage Tank (Black)

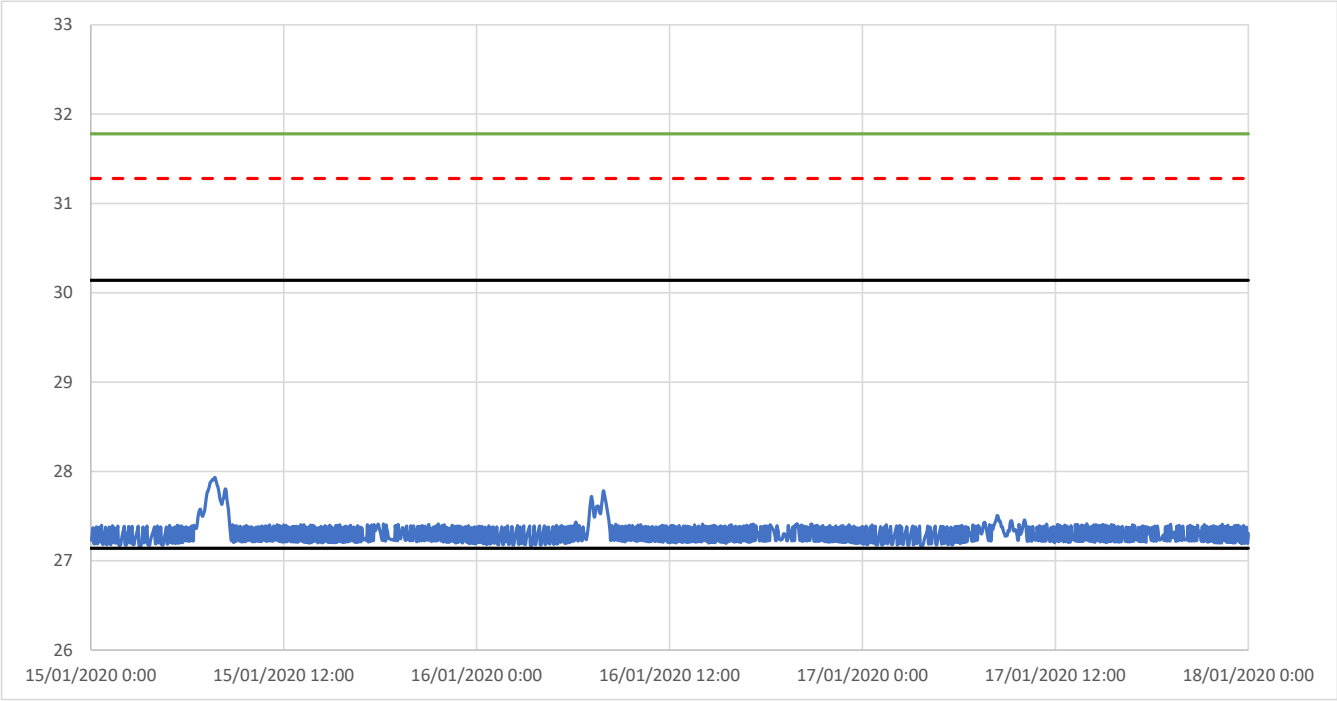


	GL	Freeboard Limit	Pump Station Outflow	Tank Base	Tank Obvert
15/01/2020 0:00	31.78	31.28	0.05473	27.14	30.14
18/01/2020 0:00	31.78	31.28	0.05473	27.14	30.14

	Scenario 1			
	Riverhead Pump Station	Riverhead Storage Tank	Riverhead Receiving Manhole	
Ground Level (mRL)	32.1	31.78	32	
Storage Tank Obvert		30.14		
Maximum Water Level	27.913	27.933	30.961	
Storage Tank Invert		27.05		
Freeboard	4.187	3.847	1.039	
Maximum Depth		0.883		

	Kumeu + Huapai + Future (1,400) + 250m^3/day flushing volume	Riverhead FUZ	Riverhead	Total
Daily Volume (m^3/day)	1,685	324	528	2,537
Peak Inflow (L/s)	50	17	29	74
Peak Inflow (m^3/hr)	107	36	52	195
Maximum Pump Flow (m^3/hr)				207

Depth of wastewater (Blue) in Storage Tank (Black)

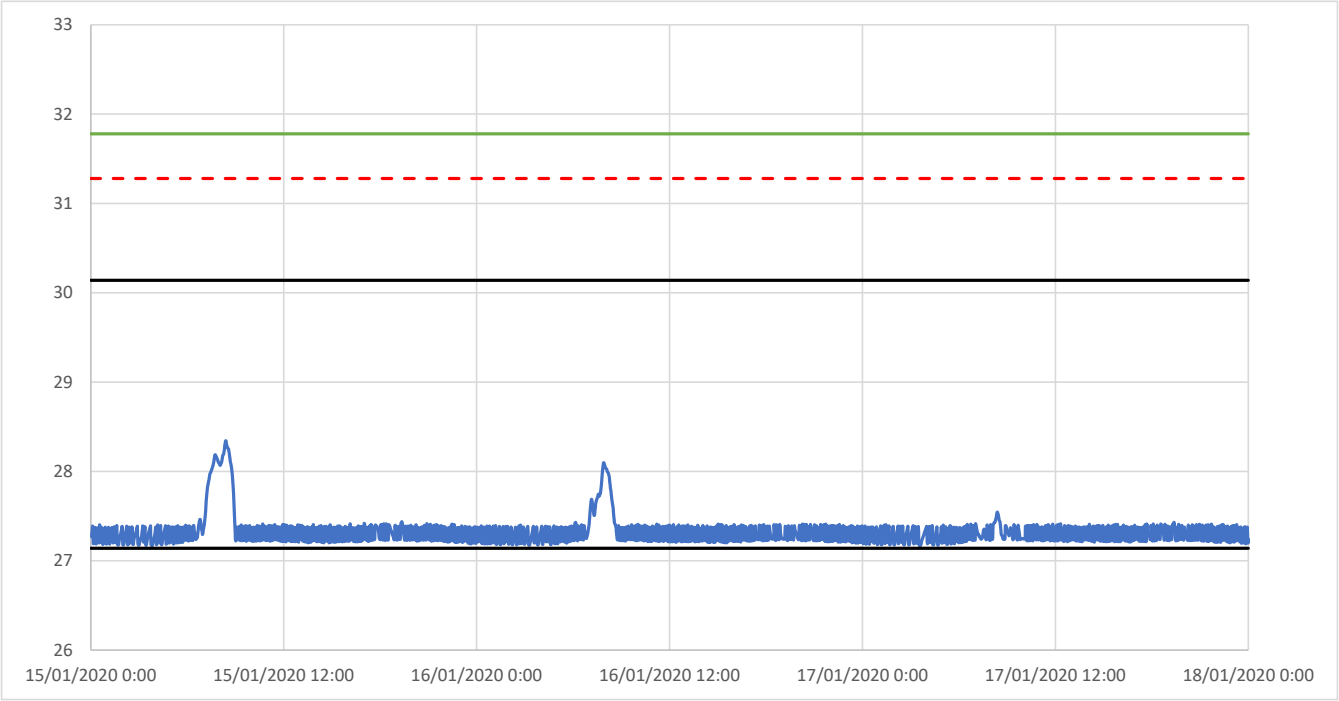


	GL	Freeboard Limit	Pump Station Outflow	Tank Base	Tank Obvert
15/01/2020 0:00	31.78	31.28	0.05737	27.14	30.14
18/01/2020 0:00	31.78	31.28	0.05737	27.14	30.14

	Scenario 2			
	Riverhead Pump Station	Riverhead Storage Tank	Riverhead Receiving Manhole	
Ground Level (mRL)	32.1	31.78	32	
Storage Tank Obvert		30.14		
Maximum Water Level	28.321	28.344	30.961	
Storage Tank Invert		27.05		
Freeboard	3.779	3.436	1.039	
Maximum Depth		1.294		

	Kumeu + Huapai + Future (1,400) + 250m^3/day flushing volume	Riverhead FUZ	Riverhead	Total
Daily Volume (m^3/day)	1,685	648	528	2,861
Peak Inflow (L/s)	50	34	29	87
Peak Inflow (m^3/hr)	107	71	52	231
Maximum Pump Flow (m^3/hr)				216

Depth of wastewater (Blue) in Storage Tank (Black)

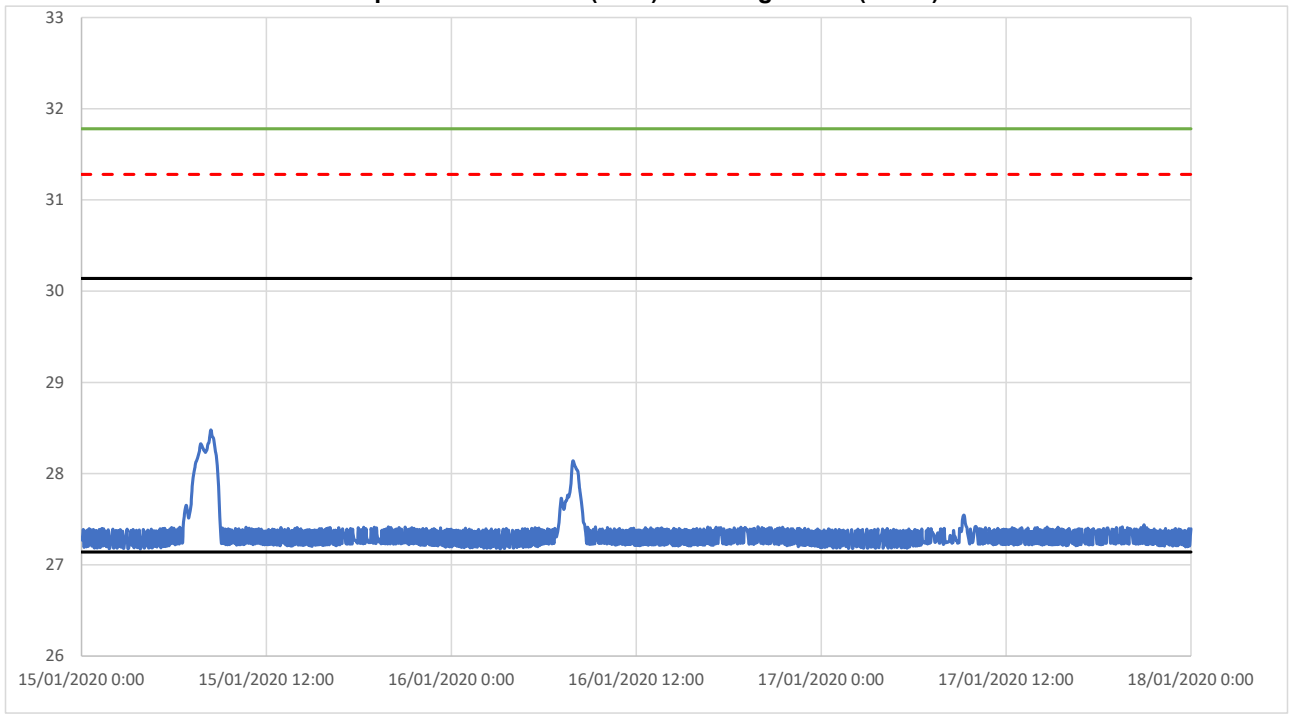


	GL	Freeboard Limit	Pump Station Outflow	Tank Base	Tank Obvert
15/01/2020 0:00	31.78	31.28	0.06	27.14	30.14
18/01/2020 0:00	31.78	31.28	0.06	27.14	30.14

	Scenario 3			
	Riverhead Pump Station	Riverhead Storage Tank	Riverhead Receiving Manhole	
Ground Level (mRL)	32.1	31.78	32	
Storage Tank Obvert		30.14		
Maximum Water Level	28.456	28.479	30.962	
Storage Tank Invert		27.05		
Freeboard	3.644	3.301	1.038	
Maximum Depth		1.429		

	Kumeu + Huapai + Future (1,400) + 250m^3/day flushing volume	Riverhead FUZ	Riverhead + Botanic	Total
Daily Volume (m^3/day)	1,685	648	726	3,060
Peak Inflow (L/s)	50	34	24	90
Peak Inflow (m^3/hr)	107	71	52	231
Maximum Pump Flow (m^3/hr)				216

Depth of wastewater (Blue) in Storage Tank (Black)

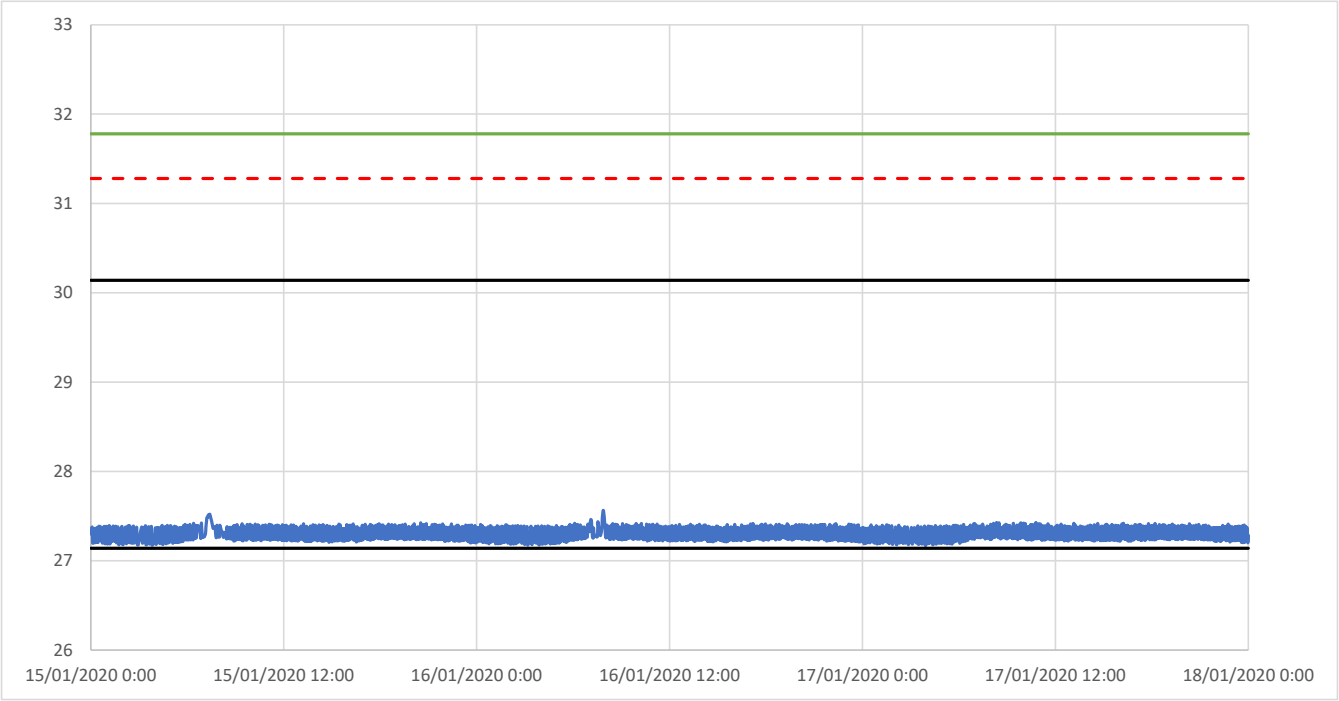


	GL	Freeboard Limit	Pump Station Outflow	Tank Base	Tank Obvert
15/01/2020 0:00	31.78	31.28	0.06	27.14	30.14
18/01/2020 0:00	31.78	31.28	0.06	27.14	30.14

	Scenario 4			
	Riverhead Pump Station	Riverhead Storage Tank	Riverhead Receiving Manhole	
Ground Level (mRL)	32.1	31.78	32	
Storage Tank Obvert		30.14		
Maximum Water Level	27.515	27.565	30.962	
Storage Tank Invert		27.05		
Freeboard	4.585	4.215	1.038	
Maximum Depth		0.515		

	Kumeu + Huapai + Future (1,400) + 250m^3/day flushing volume	Riverhead FUZ	Riverhead + Botanic	Total
Daily Volume (m^3/day)	1,685	1,134	726	3,546
Peak Inflow (L/s)	50	53	24	110
Peak Inflow (m^3/hr)	107	128	52	287
Maximum Pump Flow (m^3/hr)				306

Depth of wastewater (Blue) in Storage Tank (Black)

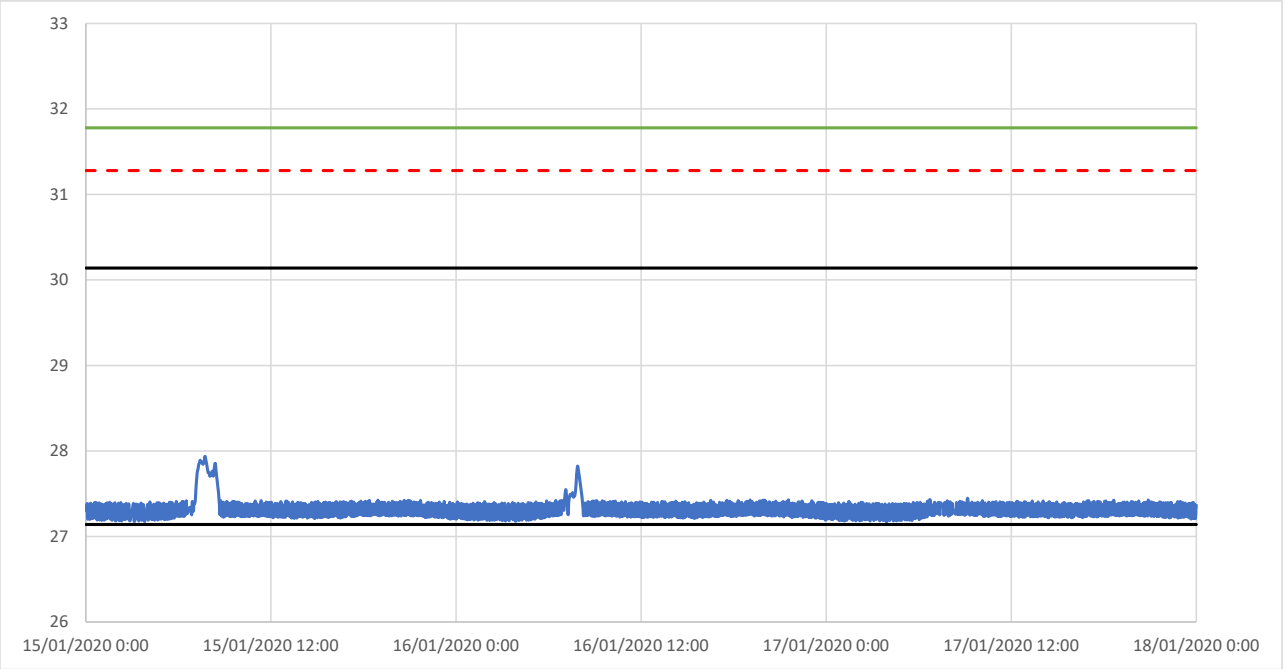


	GL	Freeboard Limit	Pump Station Outflow	Tank Base	Tank Obvert
15/01/2020 0:00	31.78	31.28	0.085	27.14	30.14
18/01/2020 0:00	31.78	31.28	0.085	27.14	30.14

	Scenario 5			
	Riverhead Pump Station	Riverhead Storage Tank	Riverhead Receiving Manhole	
Ground Level (mRL)	32.1	31.78	32	
Storage Tank Obvert		30.14		
Maximum Water Level	27.892	27.937	30.962	
Storage Tank Invert		27.05		
Freeboard	4.208	3.843	1.038	
Maximum Depth		0.887		

	Kumeu + Huapai + Future (1,400) + 250m^3/day flushing volume	Riverhead FUZ	Riverhead + Botanic	Total
Daily Volume (m^3/day)	1,685	1,296	726	3,708
Peak Inflow (L/s)	50	63	24	116
Peak Inflow (m^3/hr)	107	145	52	304
Maximum Pump Flow (m^3/hr)				306

Depth of wastewater (Blue) in Storage Tank (Black)



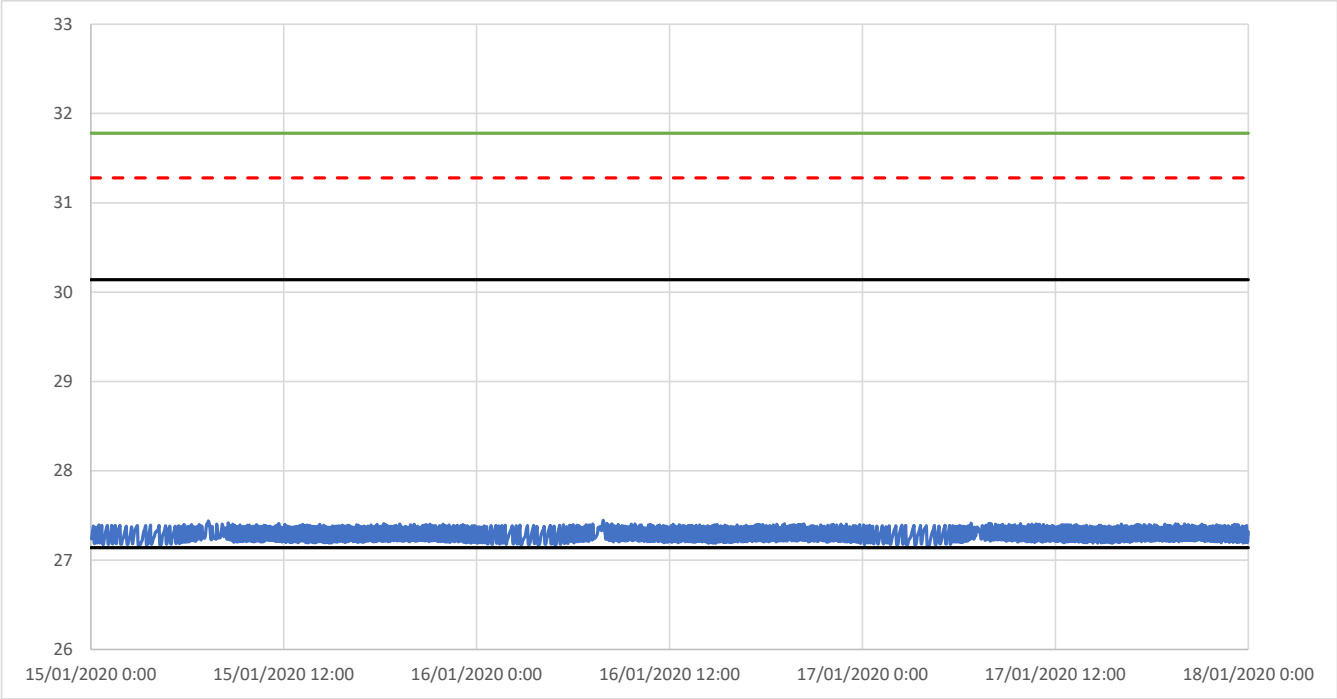
	GL	Freeboard Limit	Pump Station Outflow	Tank Base	Tank Obvert
15/01/2020 0:00	31.78	31.28	0.085	27.14	30.14
18/01/2020 0:00	31.78	31.28	0.085	27.14	30.14

NO additional Storage Required

	Ultimate - Kumeu-Huapai Separated			
	Riverhead Pump Station	Riverhead Storage Tank	Riverhead Receiving Manhole	
Ground Level (mRL)	32.1	31.78	32	
Storage Tank Obvert		30.14		
Maximum Water Level	27.421	27.447	30.945	
Storage Tank Invert		27.05		
Freeboard	4.679	4.333	1.055	
Maximum Depth		0.397		

	Kumeu + Huapai + Future (1,400) + 250m^3/day flushing volume	Riverhead FUZ	Riverhead + Botanic	Total
Daily Volume (m^3/day)	-	1,296	726	2,022
Peak Inflow (L/s)	-	63	24	77
Peak Inflow (m^3/hr)	-	145	52	197
Maximum Pump Flow (m^3/hr)				198

Depth of wastewater (Blue) in Storage Tank (Black)



	GL	Freeboard Limit	Pump Station Outflow	Tank Base	Tank Obvert
15/01/2020 0:00	31.78	31.28	0.05498	27.14	30.14
18/01/2020 0:00	31.78	31.28	0.05498	27.14	30.14

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