ENVELOPE

INFRASTRUCTURE REPORT

234, Rangiuru Road, Otaki

DOCUMENT CONTROL RECORD

CLIENT	Classic Developments Rangiuru Road Limited
PROJECT	Rangiuru Road
PROJECT NO.	1678-02
DOCUMENT TYPE	Infrastructure Report, R001v1-1678-02
DATE ISSUED	05 December 2025
ADDRESS FOR SERVICE	Envelope Engineering Limited Level 1, 68 Dixon Street, Te Aro, Wellington
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ISSUE AND REVISION RECORD

DATE OF ISSUE	05 December 2025
STATUS	For Consent
ORIGINATOR	Kyle Dirse – Director, Senior Civil Engineer
REVIEWED	Andrew Jackson – Director, Civil
APPROVED FOR ISSUE	Kyle Dirse – Director, Senior Civil Engineer

CONTENTS

APPENDICES

1.0 INTRODUCTION

1.1 THE SITE

The development site is located at 234, Rangiuru Road, Otaki. The existing lot is formally described as Lot 2 DP 42874 and is 2.39 hectares in size.

The site is currently a vacant lot with no existing buildings or permanent structures, aside from some temporarily parked farm machinery. The proposed development comprises a 43-lot subdivision, which will be accessed via a new road connecting to Rangiuru Road at a single intersection.

Figure 1: Locality Plan

1.2 TOPOGRAPHY & ORIENTATION

The existing site is relatively flat and existing contours slopping away from Rangiuru Road towards an existing stream north of the site. The levels across the site are uniform with the neighbouring properties.

1.3 EXISTING LAND USE

The site is predominantly grass covered with a small number of livestock kept on site.

1.4 PROPOSED DEVELOPMENT

The proposed development will create:

- 43 residential lots, each with one residential dwelling.
- 1 Road to vest
- 1 Drainage Reserve to vest, contains 2 ponds and a swale.
- 1 JOAL

This report assesses feasibility of the stormwater and wastewater drainage, water supply and other associated infrastructure to cater for the proposed development.

2.0 EARTHWORKS

2.1 GENERAL DESCRIPTION

Earthworks are required to facilitate this development, and these are shown on our 200 series plans. Filling will be undertaken to enable the residential lots to have building platforms above the 1% AEP flood level (including freeboard).

To complete the site subdivision, minor earthworks will be required for the following activities within the site:

- Stripping topsoil and stockpile on site (0.3m cut depth).
- Import 26,050 m^3 of fill to site, with a maximum fill depth of 1.2m from the existing ground level.

Table 1: Earthwork Volumes

	Area (m^2)	Cut (m^3)	Fill (m^3)	Balance (m^3)
Bulk Earthworks	23,997	208	26260	26,050 (Fill)
Topsoil Strip	23,997	7,197	-	7,197 (Cut)
Import Fill	23,997	-	26,050	26,050 (Fill)

The earthwork volumes have been calculated to the finished subgrade level, assumed to be 200 mm below the finished ground level. This provides allowance for the import of road basecourse materials, building foundation preparation, and topsoil re-spread. It is anticipated that approximately 50% of the stripped topsoil will be removed from site.

We have allowed for a small amount of unsuitable and contaminated material to be cut and removed off site. Contaminated land and remedial works can be found in the PSI/DSI and RAP reports by ENGEO.

2.2 EARTHWORKS REPORT

A separate Earthworks Report has been prepared and is included in Appendix 2. It outlines the proposed earthworks construction methodology, and supporting erosion and sediment controls, including the sediment retention pond, diversion channels, stabilised access, and associated monitoring requirements necessary to complete the works efficiently and in accordance with Greater Wellington Regional Council's Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region.

3.0 ROADS AND ACCESS

3.1 GENERAL DESCRIPTION

Our 3000-series plans detail the proposed roading layout, which includes:

- One new public road to vest, connecting to Rangiuru Road via a new intersection.
- One JOAL accessed from Road 01.
- Four lots with new vehicle crossings directly onto Rangiuru Road. These lots will provide on-site turning areas to ensure no reversing onto Rangiuru Road, with detailed designs to be confirmed at the Building Consent Stage

Table 2: Road Dimensions

Road ID	Overall Legal Width (m)	Carriageway (m)	Parking/Berm	Footpath (m)
Road 1	15.0	6.0	2x2.25	2x 1.5
JOAL 1	4.5	3.6	-	-

Road gradients across the development are very flat, with a minimum grade of 0.5%. Several lots will be serviced by shared driveways, each supported by appropriate access easements.

Vehicle tracking for Road 01 has confirmed that a medium rigid truck can safely turn within the cul-de-sac. All lots will provide on-site turning areas to avoid any reversing movements onto public roads.

A total of 13 on-street parking spaces have been provided. Given the high number of driveways, parking locations have been carefully planned to avoid conflicts. We have worked closely with the landscape architect and traffic engineer to ensure all driveways and JOALs meet the required visibility standards.

4.0 WASTEWATER

4.1 EXISTING WASTEWATER

There are existing DN150 public wastewater mains within Rangiuru Road; however, due to the site's topography, a gravity connection to the existing network is not feasible.

4.2 PROPOSED WASTEWATER

As a gravity connection to the existing wastewater main is not feasible, a new wastewater pump station will be constructed as part of the development. This station will pump flows to a new manhole on the existing Rangiuru Road wastewater network. The pump station will be designed and constructed in accordance with Council standards, is intended to be vested to Council, and will be confirmed in detail through the Engineering Approval process. The pump station is proposed to be located within the drainage reserve.

Table 3: Wastewater Flows

ID	Number of Lots	Population per Lot	ADWF (Litres/Second)	PDWF (Litres/Second	PWWF (Litres/Second)
PS 1	43	2.5	0.313	0.781	1.56

Preliminary discussions have also considered the potential to service the eastern lot at 254 Rangiuru Road, currently being developed by KCDC, via a gravity connection to the proposed pump station. This may offer an opportunity for a shared asset; however, insufficient design information is available at this stage to confirm a connection. The high-water table may also make achieving the required depth challenging, though further discussions on this option are welcomed.

4.3 WASTEWATER IMPACT ASSESSMENT

The HAL Development Impact Assessment confirms that the proposed 43-lot subdivision can be serviced by the existing downstream wastewater network, with the development generating a PWWF of 1.56 L/s and sufficient capacity in the DN150 line and Pump Station 13 to accommodate additional flows. While surcharge occurs further downstream at the terminal pump station (OSP00012), this is an existing network constraint unrelated to the development and is expected to be resolved through KCDC's planned upgrades, including the Pump Station 13 diversion to the WWTP and Aotaki Street gravity upgrade, which together reduce overflow risk to acceptable levels.

The full assessment can be found in Appendix 5.

5.0 STORMWATER

5.1 GENERAL

The proposed stormwater management system is summarised as follows:

1. **Lot Runoff (10% AEP):** Stormwater from residential lots will be collected via roof downpipes and directed into individual rainwater reuse tanks. Overflow from these tanks will discharge into the underground piped network through lot-specific laterals.

2. **Road Runoff (10% AEP):** Road stormwater will drain to roadside raingardens, which provide the primary treatment function. Treated water will enter the network via subsoil drains, or overflow through the scupper manhole within each raingarden before being conveyed to the piped system.

3. **Major Flow (1% AEP):** During larger storm events, overland flow will be conveyed along road corridors and directed towards the two proposed attenuation ponds.

4. **Attenuation Ponds**: Two attenuation ponds are proposed to manage post-development peak flows and reduce them to pre-development discharge rates. Splitting attenuation across two ponds enables flows to be more evenly distributed and better reflect the natural catchment pattern.

5. **Discharge Swale:** A planted discharge swale is proposed along the northern boundary, equipped with a concrete level spreader to distribute flows evenly. As the ponds discharge into the swale via a bubble-up manhole, water will overtop the spreader bar uniformly, creating sheet flow which will convey across the 3m buffer zone to the boundary, then existing stream. This approach replicates pre-development sheet flow characteristics rather than concentrating flows at a single discharge point.

5.2 STORMWATER CATCHMENTS

The site comprises three primary pre-development catchments that currently discharge via overland sheet flow toward the stream to the north. The stormwater design methodology has been developed to replicate these pre-development flow patterns as closely as practicable. The existing catchment extents are shown in Figure 2.

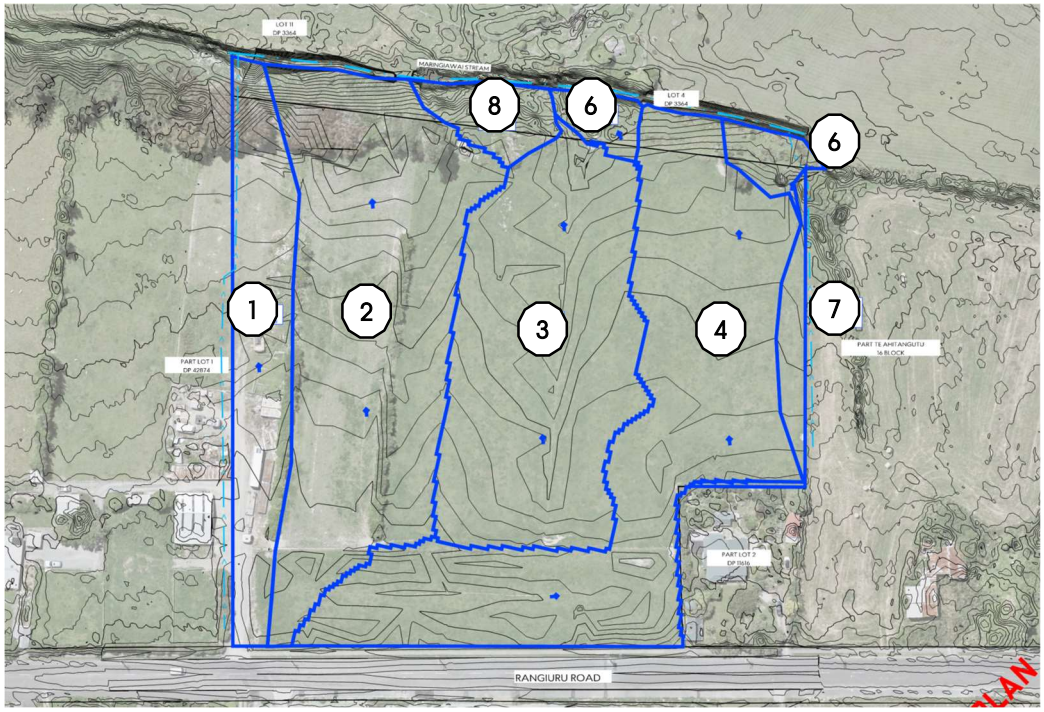

Figure 2: Catchment Plan

The tables below provide a summary of each catchment and its respective discharge characteristics, forming the basis for ensuring post-development flows align with pre-development conditions.

Table 1. Summary of Pre Development Catchment

Catchment ID	Area (ha)	Post Development Discharge Notes
01	0.27	Batters and back yards will discharge to the existing overland flow path on the western boundary
02	0.72	Discharge swale will match the pre-development sheet flow

Catchment ID	Area (ha)	Post Development Discharge Notes
03	0.60	Discharge swale will match the pre-development sheet flow
04	0.79	Discharge swale will match the pre-development sheet flow
05	0.04	This is a highpoint along the northern boundary. The swale will not discharge here and the post development catchment will generally remain unchanged.
06	0.04	Discharge swale will match the pre-development sheet flow
07	0.05	Batters and back yards will discharge to the existing overland flow path on the eastern boundary
08	0.08	Batters from the earthworks will discharge here. The catchment is small and will generally remain unchanged.

5.3 PRIMARY NETWORK

Stormwater runoff from events up to 10% AEP (with climate-change allowance) will be conveyed through kerb and channel conveying to raingardens then discharged to the attenuation ponds located at 2 different locations.

Raingardens are positioned at low points and along the road corridors to capture runoff. Each raingarden will be fit with a scruffy dome to capture excess stormwater past the WQF. The scruffy domes will also collect water from subsoils in the raingardens, then will discharge to the pipes network. Each residential lot will be provided with a lateral connection to the public piped stormwater network. The proposed network layout is shown on the 4000-series design drawings (Appendix 1).

5.4 SECONDARY NETWORK

The 1% AEP event will be conveyed as overland flow along the road corridors toward the two attenuation ponds. Minor ponding may occur within the roadway prior to overtopping the kerb and channel, however maximum depths are expected to remain shallow, generally up to 100mm.

5.5 STORMWATER TREATMENT

Stormwater treatment will be provided through three raingardens, which have been centralised where practicable to capture runoff from their contributing catchments. Each raingarden has been sized to treat the impervious road and parking areas that drain to it.

Additional treatment will be provided through low-flow channels within the ponds, as well as the planted swale, which will contribute to retention through evaporation and uptake by vegetation.

Each dwelling will also be required to install a rainwater re-use tank to support stormwater retention.

Table 4. Summary of raingardens

Raingarden ID	Road Area	Raingarden Area (m²)	% Check
RG-01	410	8.5	2.1 %
RG-02	390	8.8	2.3 %
RG-03	874	17.5	2.0 %

5.6 HYDRAULIC NEUTRALITY & ATTENUATION

The stormwater ponds have been designed in accordance with the Kapiti Coast District Council *Subdivision and Development Principles and Requirements*, using HEC-HMS hydrological modelling. Key model outputs are summarised in the tables and figures below. The pond design parameters and resulting hydrographs have been directly incorporated into the flood model to inform the flood risk

assessment, ensuring the system performs as intended during major flood events. No on-lot detention has been assumed in the design.

Each pond has a maximum water depth of 1.0 m, enabling full drainage and ensuring the base remains dry between storm events. The pond inverts are set at RL 4.10, with the discharge level spreader set at RL 4.05. A 300 mm freeboard is provided, and the ponds includes capacity to provide a total of 70 m^3 of flood-storage offset, as outlined in the flood assessment.

Tables 5 and 6 present the peak water levels, discharges, and storage volumes for each pond for the 2-, 5-, 10- and 100-year events.

Table 5. Pond 1 Summary

Pond 1	2 Year	5 Year	10 Year	100 Year
Peak Inflow	0.096	.118	0.163	0.255
Peak Discharge	0.049	.056	0.101	0.152
Pond Max. Depth (m)	0.24	0.32	0.42	0.67
Pond Volume (m^3)	55	72	94	151

Table 6. Pond 2 Summary

Pond 2	2 Year	5 Year	10 Year	100 Year
Peak Inflow	0.069	.085	0.119	0.190
Peak Discharge	0.045	.053	0.084	0.139
Pond Max. Depth (m)	0.21	0.28	0.43	0.64
Pond Volume (m^3)	21	34	51	77

Table 7 and Figures 2 and 3 illustrate the combined pre- and post-development flows for the site as a whole. These flows represent the total discharge from both ponds, conveyed to land via the level spreader.

Table 7. Pre/Post Development Discharge

Pre/Post	2 Year	5 Year	10 Year	100 Year
Pre-development Peak Flow (m^3/s)	.093	.123	.184	.323
Post-development Peak Flow (m^3/s)	.095	.109	.182	.288

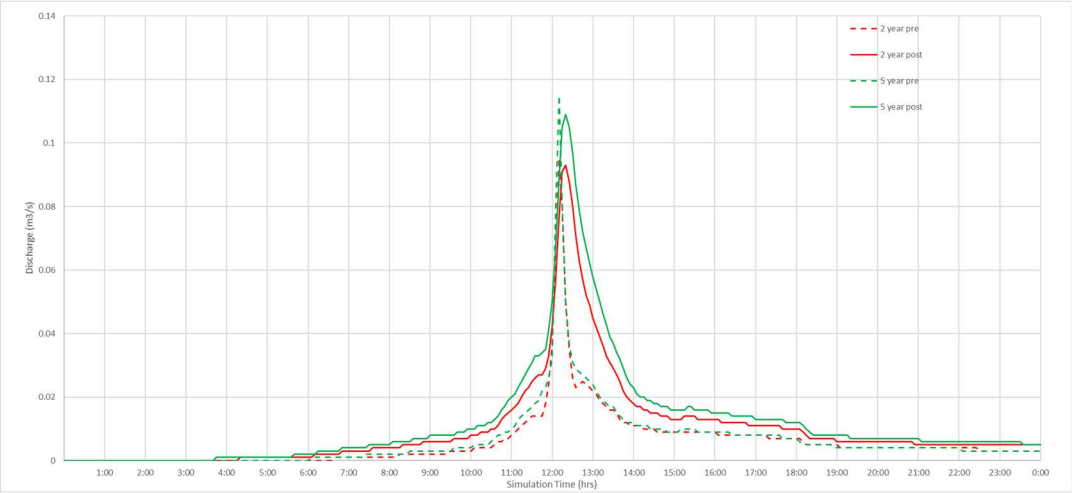

Figure 2: Pre and Post development peak flows. 2- and 5-year design event

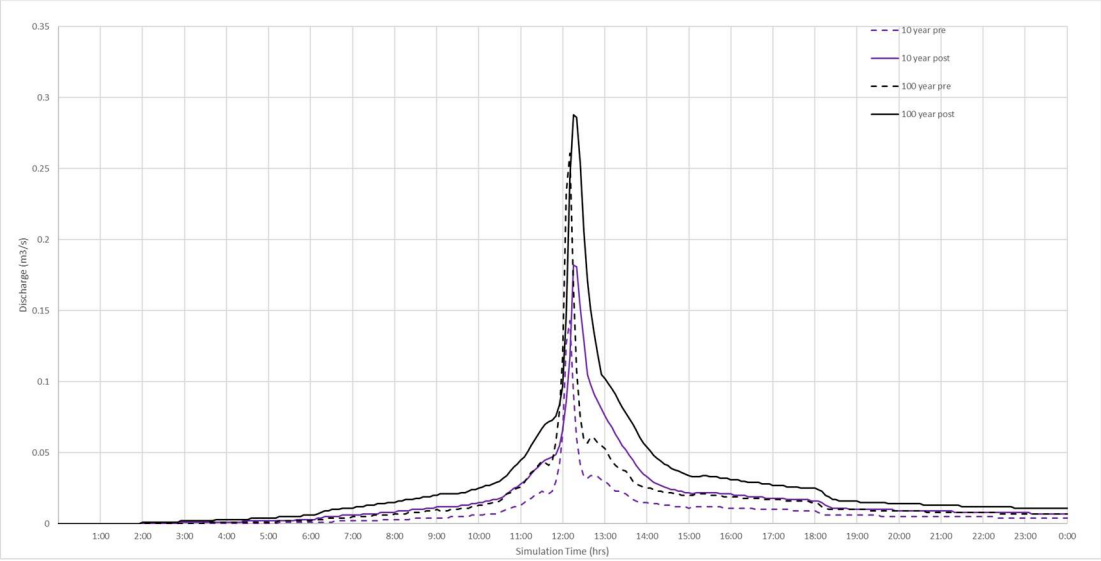

Figure 3: Pre and Post development peak flows. 10- and 100-year design event

These results show that the proposed ponds (228m^3 volume) is sufficient to attenuate stormwater from the site for storm events up to the 100-year event.

As stormwater from the development is disposed on site, the development meets the requirements for hydraulic neutrality in terms of peak flow and volume.

5.7 STORMWATER DISCHARGE

Stormwater will discharge via a dispersion swale and level spreader located 3 m south of the northern boundary. This design enables flows to be released as sheet flow, replicating pre-development conditions rather than concentrating runoff at a single outlet point. Three pre-development catchments naturally drain northwards, and the proposed system has been designed to maintain this distribution. Portions of the northern boundary are elevated and would not have received runoff under pre-development conditions; accordingly, the swale and spreader bar do not extend into these areas.

5.8 FLOOD RISK ASSESSMENT

An existing flood risk exists on the site. The flood risk can be alleviated by carrying out earthworks that will enable new dwellings to be constructed at proposed minimum recommended building levels (RBL's) that have been provide by KCDC GIS flood maps. Additionally, some lots have been raised along the east and west boundaries to account for updated flood modelling. 70m^3 of on-site

existing flood storage can be mitigated through the proposed stormwater attenuation ponds. A further detailed assessment has been provided by Envelope.

5.9 RAINWATER RE-USE

4,000l rainwater tanks are proposed for rainwater re-use, supplying outdoor tap and toilet water for houses at the site. The Kapiti Coast District Plan requires a potable water reduction of 30% in order to meet the requirements of rule INF-MENU-R35 as a Restricted Discretionary activity.

Historic annual rainfall in Otaki is 1098mm/year with average monthly rainfall greater than 50mm/month and most months greater than 60mm/month. Based on the proposed roof areas and assuming 8% losses, the roof will supply approximately 6m³ of water per, with most months supplying significantly more than this.

Outdoor and toilet use has been estimated at approximately 30-40% of daily use. The daily water demand calculated in accordance with the KCDC SPDR is 600l/house, meaning that the outdoor and toilet water use is approximately 190-250l/house/day. The proposed rainwater tanks will supply 15-20 days of water, which would provide adequate supply of water for outdoor and toilet use.

The proposed 4,000l rainwater tanks are suitable to meet the restricted discretionary activity requirements of rule INF-MENU-R35. Dependent on the final development water usage, additional measures to achieve water reduction could be considered including the use of water reduction fixtures within houses.

The tanks will be detailed at the building consent stage.

6.0 WATER RETICULATION

6.1 EXISTING WATER SUPPLY

There are existing public DN150 and DN200 water mains within Rangiuru Road, and an existing fire hydrant is located on the opposite side of the road from the development.

6.2 PROPOSED WATER SUPPLY

The proposed water design is shown on our 5000 series plans. We propose to connect a new 150mm diameter main to the existing main DN200 main within Rangiuru Road. A new ridermain will service lots fronting Rangiuru Road to avoid disturbance of the existing carriageway and footpath.

A new hydrant will be installed within the development.

6.3 WATER MODELLING ASSESSMENT

Modelling undertaken by Stantec (2024) confirms that the development can be fully serviced under both current (2018) and future (2051) network conditions. Minimum operating pressures remain well above the required levels (approximately 51m under current peak-day conditions and 40m under 2051 conditions), and FW2 fire-flow requirements are achieved at all hydrants within the development.

While cumulative growth across the Ōtaki network will require coordinated management, this development on its own has a negligible effect on the wider system. The planned 5,500 m³ Ōtaki Reservoir, scheduled for completion in late 2024, will provide additional storage to buffer peak demands and ensure long-term resilience and capacity for future growth.

The full assessment can be found in Appendix 4

7.0 UTILITY SERVICES

7.1 POWER

There is an existing overhead power pole along Rangiuru Road. We have liaised with Scanpower, who have confirmed that a connection from this pole can feasibly service the development. It is recommended that a new transformer be installed and appropriately sized to accommodate future development.

7.2 TELECOMMUNICATION

We have liaised with Chorus regarding providing fibre telecommunications to the development. Chorus have confirmed that the development can be adequately serviced from a telecommunications perspective.

8.0 CONCLUSIONS

Based on the above summary of our assessments, we conclude that there are no Infrastructure Servicing related issues which should affect the ability of the development proposal to be implemented.

Civil infrastructure will be designed in accordance with the Kapiti Coast District Council Subdivision and Development Principles and Requirements and NZS4404:2004

9.0 LIMITATIONS

9.1 GENERAL

This report is for the use of Classic Developments and Kapiti Coast District Council only and should not be used or relied upon by any other person or entity or for any other project.

This report has been prepared for the project described to us and its extent is limited to the scope of work agreed between the client and Envelope Engineering Limited. No responsibility is accepted by Envelope Engineering Limited or its directors, servants, agents, staff or employees for the accuracy of information provided by third parties and/or the use of any part of this report in any other context or for any other purposes.

APPENDICES

APPENDIX 1
APPLICATION DRAWING

Attached Separately

APPENDIX 2
CALCULATIONS

Client	Classic Developments
Project Site	Rangiuru Road
Envelope Ref	1678-02
Version	1
Date	28/11/2025

ENVELOPE

WATER SUPPLY - DEMAND ASSESSMENT

Existing Development Flows			
Development		**Units**	**Comments**
Number of units	0		Total freehold proposed dwellings
People per dwelling	0		Assumed
ADWF	0	litres/day/person	
PDWF Peaking Factor	0		
PWWF Peaking Factor	0		
Total ADWF	0.000	litres/second	
Total PDWF	0.000	litres/second	
Total PWWF	0.000	litres/second	

Propsoed Development Flows			
Development		**Units**	**Comments**
Number of units	43		Total freehold proposed dwellings
People per dwelling	2.5		Assumed
ADWF	250	litres/day/person	KCDC LDMR
PDWF Peaking Factor	2.5		KCDC LDMR
PWWF Peaking Factor	5		
Total ADWF	0.311	litres/second	
Total PDWF	0.778	litres/second	
Total PWWF	1.555	litres/second	

Total ADWF	**0.31**	litres/second	
Total PDWF	**0.78**	litres/second	
Total PWWF	**1.56**	litres/second	

Client	**Classic Developments**
Project Site	**Rangiuru Road**
Envelope Ref	**1678-02**
Version	**1**
Date	**28/11/2025**

ENVELOPE

WATER SUPPLY - DEMAND ASSESSMENT

Existing Development Flows			
Development		**Units**	**Comments**
Number of units	0		Existing Dwellings
People per dwelling	0		Assumed
Daily Consumption	0	person/litres/day	
Peak Demand (PD) peaking factor	0		
Average Daily Demand	0.000	litres/second	
Peak Demand	**0.000**	litres/second	

Proposed Development Flows			
Development		**Units**	**Comments**
Number of units	43		Total Proposed Dwellings
People per dwelling	2.5		
Daily Consumption	250	person/litres/day	KCDC LDMR
Peak Demand (PD) peaking factor	5		KCDC LDMR
Average Daily Demand	0.311	litres/second	
Peak Demand	**1.555**	litres/second	

Proposed Developemnt ADD	**0.311**	litres/second	
Proposed Developemnt PD	**1.555**	litres/second	

Client	Classic Developments
Project Site	Rangiuru Road
Envelope Ref	1678-02
Version	1
Date	27/11/2025

ENVELOPE

HEC - INPUTS

Pre-Development								
Catchment	Area (m ^{2})	Area (km²)	Impervious (%)	CN	Ia (mm)	tc (mins)	lag time (hrs)	Storage Value
Input	23883	0.023883	0	69	5	10	0.1	0.0714

Pre-Development								
Catchment	Area (m ^{2})	Area (km²)	Impervious (%)	CN	Ia (mm)	tc (mins)	lag time (hrs)	Storage Value
Input	23883	0.023883	56%	84.9	2.22	10	0.1	0.0714

Rainfall Data - HIRDS V4				
ARI	2 year	5 year	10 year	100 year
Depth	65	75	95	135
Duration	Normalized rainfall			
(mins)	2 year	5 year	10 year	100 year
5	5.2	6	7.6	10.8
15	9.1	10.5	13.3	18.9
60	16.9	19.5	24.7	35.1
120	24.7	28.5	36.1	51.3
180	29.9	34.5	43.7	62.1
360	39	45	57	81
720	52.65	60.75	76.95	109.35
1440	65	75	95	135

Catchment	Area (m²)	CN	Adjusted
Roofs	9990	98	979020
Paved Surfaces	2206	98	216188
Lawn/garden	10601	69	731469
Ponds	1086	92	99912
Total Catchment	23883		2026589
Weighted CN		84.9	
Impervious Area	13282	56%	
Pervious Area	10601	44%	

STORMWATER PIPE SIZE CALCUATIONS - 1 IN 10 YEAR EVENT

ENVELOPE					Project Name: Rangiuru									Project No: 1678-02				
Stormwater Design Chart - Mannings Formula					Location: OTAKI									Date: 28-11-2025				
DRAIN SECTION	SUB-CATCHMENT DETAILS	SUBCATCHMENT AREA (A)	COEFF OF RUNOFF (C)	EFFECTIVE AREA (CA)	TIME OF CONC (tc)	RAINFALL INTENSITY (i) (Including 16% Climate)	CUMMULATIVE EFFECTIVE AREAS (CA)	**DESIGN DISCHARGE Q= 2.78CiA**	**TOTAL DISCHARGE**	PIPE CROSS-SECTIONAL AREA	PIPE MATERIAL	'n' FACTOR	**PIPE SIZE**	ACTUAL SLOPE OF SECTION	VELOCITY	**CAPACITY**	**SPARE CAPACITY**
SW LINE 1		ha		ha	min	mm/hr	ha	l/s	l/s	m			mm	%		l/s	l/s
SWMH1-3 to SWMH1-2	CM 1-3 A	0.4000	0.63	0.2520	10	89.4	0.2520	**62.63**	**62.63**								
	CM 1-3 B	0.4000	0.63	0.2520	10	89.4	0.2520	**62.63**	**125.26**								
	CM 1-3 C	0.0300	0.63	0.0189	10	89.4	0.0189	**4.70**	**129.96**	0.110	RCRRJ	0.013	**375**	**0.50**	1.62	**124.0**	**-6.0**
SWMH1-2 to SWMH1-1	CM 1-2	0.1200	0.63	0.0756	10	89.4	0.0756	**18.79**	**148.75**								
	CM SUMP 6	0.0800	0.63	0.0504	10	89.4	0.0504	**12.53**	**161.27**	0.159	RCRRJ	0.013	**450**	**0.50**	1.83	**201.6**	**40.3**
SWMH1-1 to HM OUT 1	CM SUMP 6	0.1000	0.63	0.0630	10	89.4	0.0630	**15.66**	**164.40**								
	CM 1-1 B	0.0300	0.63	0.0189	10	89.4	0.0189	**4.70**	**169.10**	0.159	RCRRJ	0.013	**450**	**0.50**	1.83	**201.6**	**32.5**
SW LINE 3																	
SWMH3-1 to SWMH2-2	CM 2-2	0.2900	0.63	0.1827	10	89.4	0.1827	**45.41**	**45.41**	0.071	RCRRJ	0.013	**300**	**0.50**	1.40	**68.4**	**23.0**
SW LINE 2																	
SWMH2-3 to SWMH2-2	CM 2-3	0.1400	0.63	0.0882	10	89.4	0.0882	**21.92**	**67.33**	0.071	RCRRJ	0.013	**300**	**0.50**	1.40	**68.4**	**1.1**
SWMH2-2 to SWMH2-1	CM 2-2A	0.1000	0.63	0.0630	10	89.4	0.0630	**15.66**	**82.98**								
	CM 2-2B	0.0700	0.63	0.0441	10	89.4	0.0441	**10.96**	**93.95**	0.110	RCRRJ	0.013	**375**	**0.50**	1.62	**124.0**	**30.0**
SWMH2-1 to HM OUT 1-1	CM 2-1	0.1800	0.63	0.1134	10	89.4	0.1134	**28.18**	**122.13**	0.110	RCRRJ	0.013	**375**	**0.50**	1.62	**124.0**	**1.8**
	CM SWMH 61	0.1600	0.63	0.1008	10	89.4	0.1008	**25.05**	**25.05**	0.040	RCRRJ	0.013	**225**	**0.50**	1.16	**31.8**	**6.7**

APPENDIX 3
EARTHWORKS REPORT

Attached Separately

APPENDIX 4
WATER MODELLING ASSESSMENT

Water Network Assessment - 234 Rangiuru Road, Otaki

Report

05/07/2024

Ref: 310101208

PREPARED FOR:

Kapiti Coast District Council
Hemraj Kunwar

PREPARED BY:

Ben Davies

Stantec

Revision Schedule

Revision No.	Date	Description	Prepared by	Quality Reviewer	Project Manager Final Approval
1	25/06/2024	Draft for client comment	K Waterland	B Davies	C Xaba
2	05/07/2024	Final	B Davies	K Waterland	C Xaba

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1. Introduction

Stantec has been engaged to undertake an assessment of the water supply network for a proposed development at 234 Rangiuru Road, Otaki. The location of the development is shown in Figure 1-1. This document describes the requirements for water supply at the development.

Figure 1-1: Location of proposed 234 Rangiuru Road development

1.1 Model Setup

For our own reference, the study model used for this work is **KCDC WS MPL06 C19.**

The master planning model KCDC WS MPL06 is an all-mains model in WS Pro and was rebuilt and calibrated in 2016. Growth scenarios have been created using the Sense Partners growth projections recently adopted by KCDC.

Modelling for the current scenario is based on the 2018 current day planning horizon in MPL06. For the future planning horizon, modelling is based on the model KCDC WS MPL06 C08 – a study model developed to confirm the operation of the proposed Otaki Reservoir. For full details of this model see the report *Otaki Reservoir and Mains Upgrades* (Stantec, August 2022).

1.2 Growth

KCDC has adopted growth projections developed by Sense Partners for 2051. The Sense Partners figures were used to estimate future demand in the existing Otaki water network. A summary of the future growth in the existing Otaki network is shown below (Table 1-1).

Table 1-1: Sense Partners population prediction

Sense Partners area	Otaki Beach	Otaki Main	Waitohu Plateau
Population 2016 (in model)	1,672	3,329	883
Population 2051 (sense partners)	2,852	7,422	1,357
Change (2016 to 2051)	1,180	4,093	474

For “infill” growth (growth within existing developed areas and served from existing infrastructure) such as this, it was assumed that new households will use the same amount of water as existing households, so for the future scenario the existing demand was simply scaled up relative to the growth in population.

No “greenfield” growth (growth within new areas and requiring new infrastructure) is set out in the Sense Partners numbers.

The demand changes for the growth scenarios are as follows:

- Current demand: 3,466 m^3/day
- Future demand: 5,435 m^3/day
- Change in demand from current to future: 1,982m^3/day

For future technical reference, growth was added in the model by directly scaling up the specific consumption at each customer point. A demand scaling factor object is used in simulations, but this only represents scaling from average to peak summer demand.

2. Network configuration and constraints

The proposed development sits in the Otaki 'low level zone' and will be supplied by the Otaki Main water network, with no connections to the high-level zone.

2.1 Current network

The Otaki network is supplied from the Tasman and Rangiuru Bores, which sit between the main township and the beach. Water is pumped through reticulation towards the beach and towards the town where supply is boosted to the higher elevation supply zone and the Waitohu Reservoir (shown in Figure 2-1).

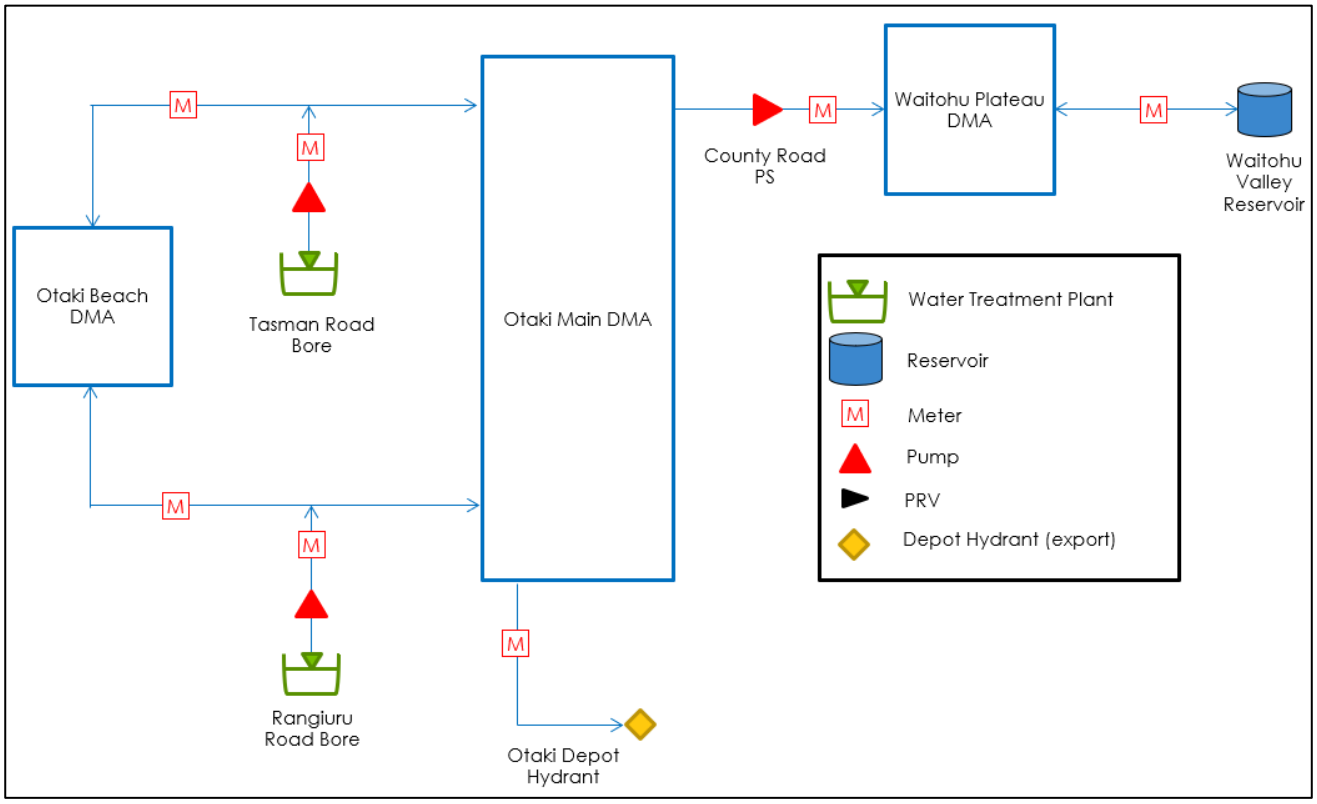

Figure 2-1: Otaki Water Network Schematic

The new 300mm main recently constructed in Tasman Road between the bore and Main Street has been added to the model.

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2.2 Current network constraints

The current consent for the existing bores at Tasman Road and Rangiuru limits combined instantaneous flow at the two bores to 115 l/s (48 l/s ant Rangiuru and 68 l/s at Tasman). However, a new resource consent is proposed limiting abstraction to a combined flow of 83 l/s.

Recent flow data from the two bores indicates peak combined output of around 55 l/s. This indicates there is some room to go before the sources reach even the proposed lower consent limit. However, as a number of new developments are planned care should be taken to ensure the total combined increase in peak instantaneous demand from all proposed developments does not exceed 28 l/s.

Although the current storage on the network is limited, additional storage is proposed in the near future which will provide a buffer to reduce the instantaneous load on the bores even further, so this constraint does not apply to future growth.

2.3 Future network configuration

In July of 2022, KCDC engaged Stantec to investigate the operation of the water supply network following the addition of the proposed Otaki Reservoir, including dedicated inlet and outlet mains and a new source.

The reservoir will be 5,500 m^3 in size and will supply the Otaki Main water network; however, it is noted that the reservoir sits on the Waitohu Plateau. A new NRV will ensure the County Road pump station can only draw water from the reservoir. This will ensure turnover of the reservoir and will limit the effects of the pump station on the Otaki Main network. The future network configuration is shown in Figure 2-2.

To support growth, a new source will be required. From the work in July 2022, this is assumed to connect into Otaki Main network in Main Highway (the old SH1), near Riverbank Road. With the reservoir in place, the new source (and existing bores if required) operates in an on/off configuration, turning on to refill the reservoir when the reservoir level is low and off again when the reservoir is full. When the bore pumps are off, the Otaki Main network is supplied by gravity only, with all water coming from the reservoir.

The new configuration requires a new main (proposed as a 300mm ID watermain) along Main Highway to take water from the proposed source to the proposed reservoir. The reservoir also connects at the County Road PS inlet, so capacity to supply the Plateau will no longer be a concern.

Other network upgrades recommended in the July 2022 study within the Otaki Main network have also been included in the model used for this study. These include the Otaki Fire Main around Riverbank Road and Aotaki Street, and the Spine upgrades in Mill Road.

The proposed infrastructure has been included in this study in the future (2051) planning horizon only.

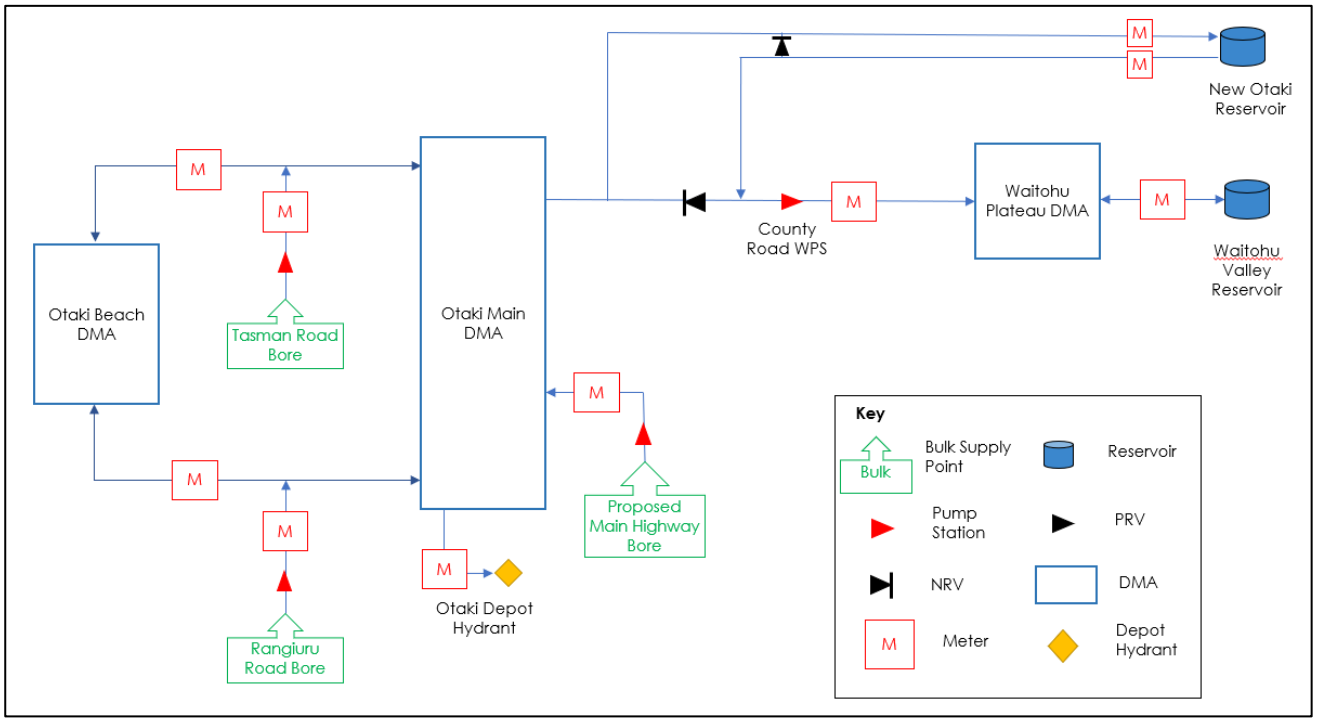

Figure 2-2: Future Otaki Network Schematic

3. 234 Rangiuru Road Development

The proposed development consists of 43 dwellings. These properties sit at an elevation of approximately 4m. No non-residential development is proposed.

The development is proposed to connect to the existing 200mmID PVC main on Rangiuru Road through a proposed 150mmOD main. Hydrants for the internal development have been proposed as per the requirements of the Fire Code. The proposed layout of the development can be seen in Figure 3-1 (received from the developers) and the modelled development can be seen in Figure 3-2.

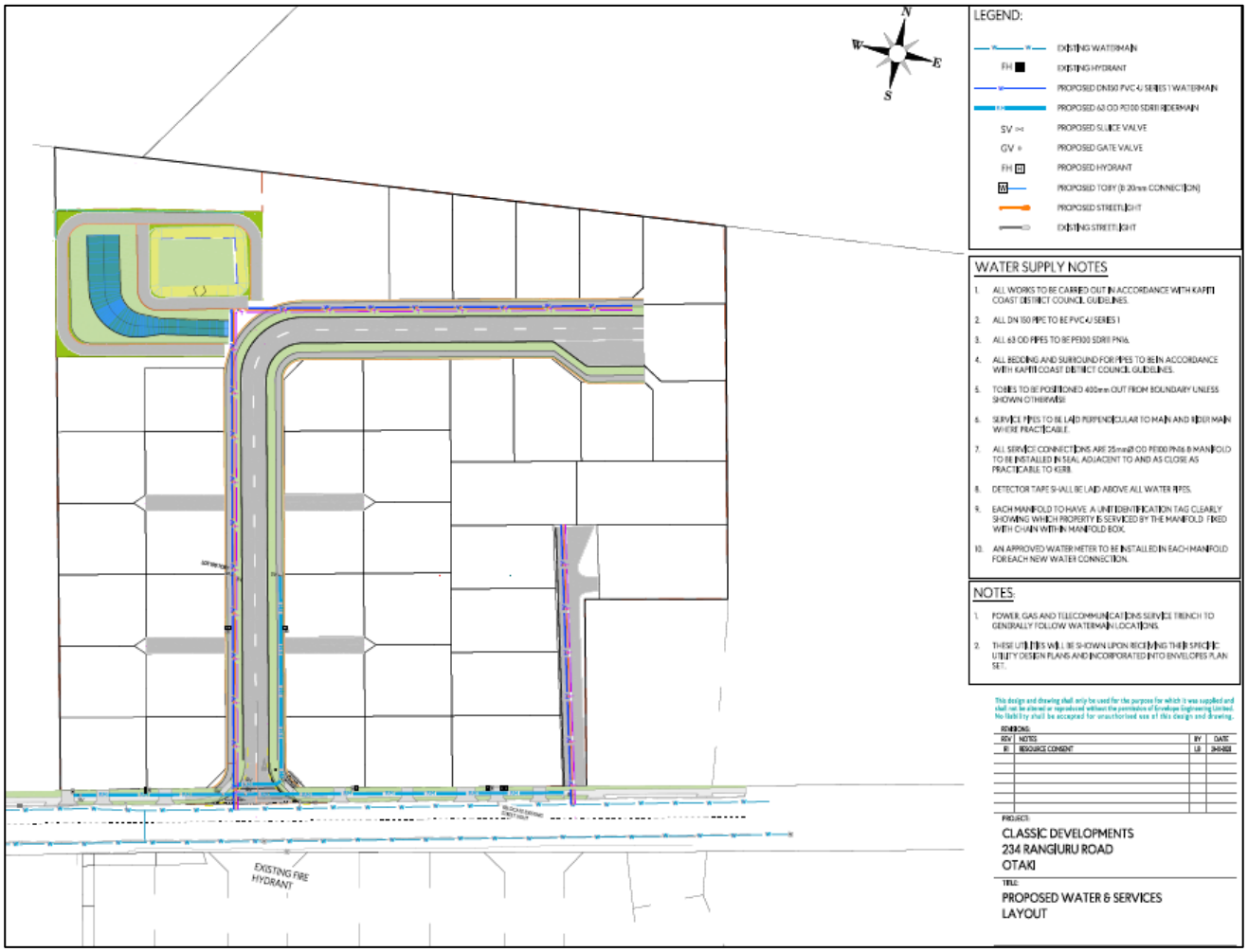

Figure 3-1: Proposed site layout (from Developer)

Figure 3-2: Proposed development layout as modelled

3.1 234 Rangiuru Road Demand

In both current and future models, demand has been allocated individually to the 43 properties in the development.

3.1.1 Peak Summer Day

Demand has been developed from the NZS 4404 using the following:

- 250l/person/day for average day demand
- Average occupancy of 2.5 people per property
- A peak summer day demand of twice the average day demand.

From this a specific consumption of 1250l/property/day has been added to each dwelling. The total peak summer demand of the development is 54m3/day and demands used in the model are as follows:

- Current demand no development: 3,475 m^3/day
- Current demand with development (43 properties): 3,529 m^3/day
- Future demand no development: 5,435 m^3/day
- Future demand with development (43 properties): 5,488m^3/day

3.1.2 Peak Instantaneous Flow

Also in line with NZS 4404, a peaking factor of 5 from the average demand is assumed for instantaneous peak demand. However, because the stated peaking factor relates to the average day demand, the instantaneous peak demand in the peak summer day scenario was given a peaking factor of 2.5. From this, we calculate the increase in the peak instantaneous load on the network will be 1.56 l/s.

A standard residential demand pattern was assumed for all customer in the proposed development.

4. Performance Criteria

Pressure, fire flow, pipe head loss and resilience were reviewed in this assessment, with the criteria set out below.

- **Pressure -** a minimum pressure of 25m must be maintained under peak summer demand. In scenarios reflecting temporary pipe failures, lower pressures may be acceptable but must always remain positive. An absolute lower limit of 10m pressure was used to allow for model uncertainties.

  A maximum pressure criteria of 90m was also set for properties in the new development, and for properties affected by proposed changes in existing network configuration.

- **Fire flow –** it was assumed that the new development will be classified as FW2 (the Fire Code SNZ PAS 4509:2008 sets FW2 as a requirement for residential properties). This requires 25l/s total fire flow on top of 60% peak instantaneous demand.

- **Pipe head loss –** new pipes should be designed to have less than 5m/km head loss. Any other head losses which directly result in failure of minimum pressure requirements were also identified.

- **Resilience –** failure of a single pipe should not result in the risk of loss of supply (modelled pressure of less than 10m) to more than 50 properties.

    - This development is less than 50 properties; therefore, resilience has not been reviewed.

- **Storage –** storage is considered sufficient if there is enough stored water to support both of:
    - 24 hours of demand on a peak summer day
    - An allowance for fire flow in line with Table 2 of the Fire Code (SNZ PAS 4509:2008). For Otaki, FW4 fire class is assumed, requiring 540m3 of storage.

5. System Performance

5.1 Current Peak Day (2018)

The network can maintain levels of service with the proposed development with the network as currently modelled. Pressure at an existing node outside of the development does not decrease significantly, and minimum pressure within the development is approximately 51m. Pressure during the current peak day and pressure with the proposed development can be seen in Figure 5-1.

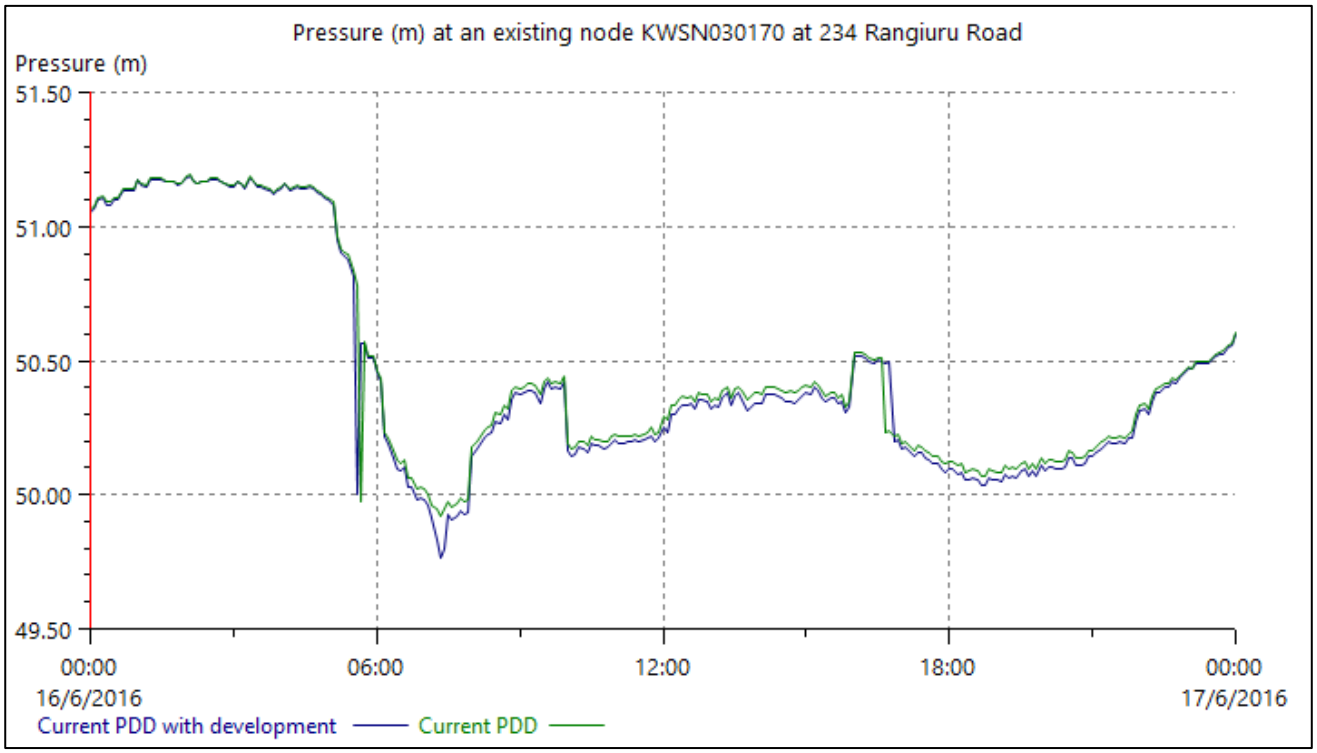

Figure 5-1: Pressure (m) in current peak day and current peak day with the development

Total flow through to the development is 54m3/day and minimum pressure inside the development is approximately 51m.

Fire flow requirements can be met at all hydrants within the development.

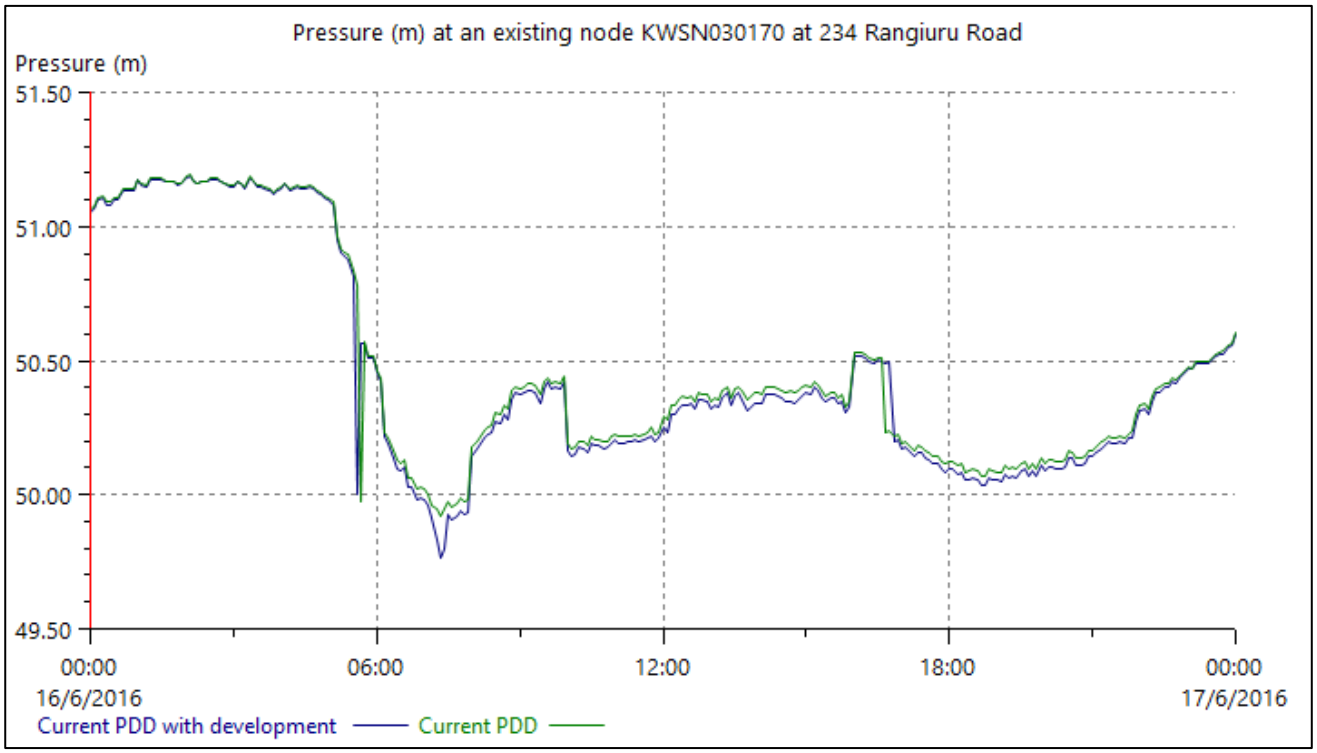

Figure 5-1: Pressure (m) in current peak day and current peak day with the development

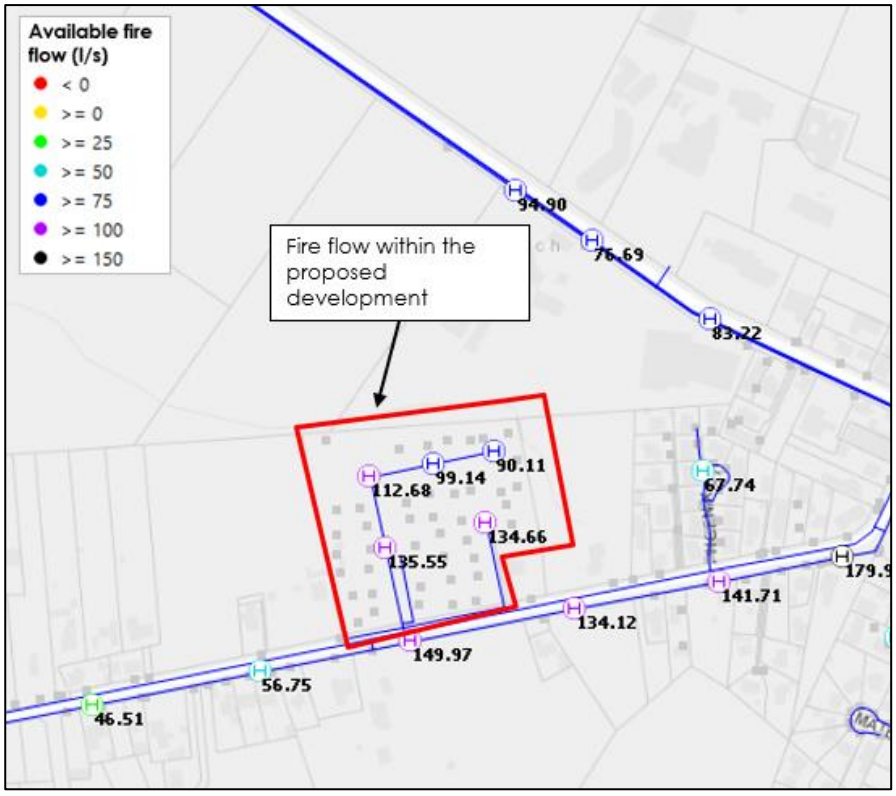

Figure 5-2: Fire flow with the proposed development

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5.1.1 Network Capacity – Existing Bores and Storage

Any additional demand on the network increases the load on the existing bores and storage. Although the effects of this development alone are negligible, the compounding effects of multiple developments increase the risk of either draining the existing storage or breaching consent conditions for abstraction.

The proposed Otaki Reservoir will address this issue as it will address this issue as it will provide a buffer for peak demand and ensure the bore flows remain under their consent limits.

5.2 Future Peak Day (2051)

In the future peak day scenario, the upgraded network (which includes the Otaki Reservoir and Loop Mains upgrades) has been used for this assessment. The 2051 scenario also includes anticipated growth (described in Section 1.2). The 234 Rangiuru Road development was modelled in addition to the growth already in the model.

The addition of the 234 Rangiuru Road development has negligible effects on the wider network and minimum pressure requirements can be met at all nodes throughout the development (Figure 5-3). Minimum pressure at the development is approximately 40m.

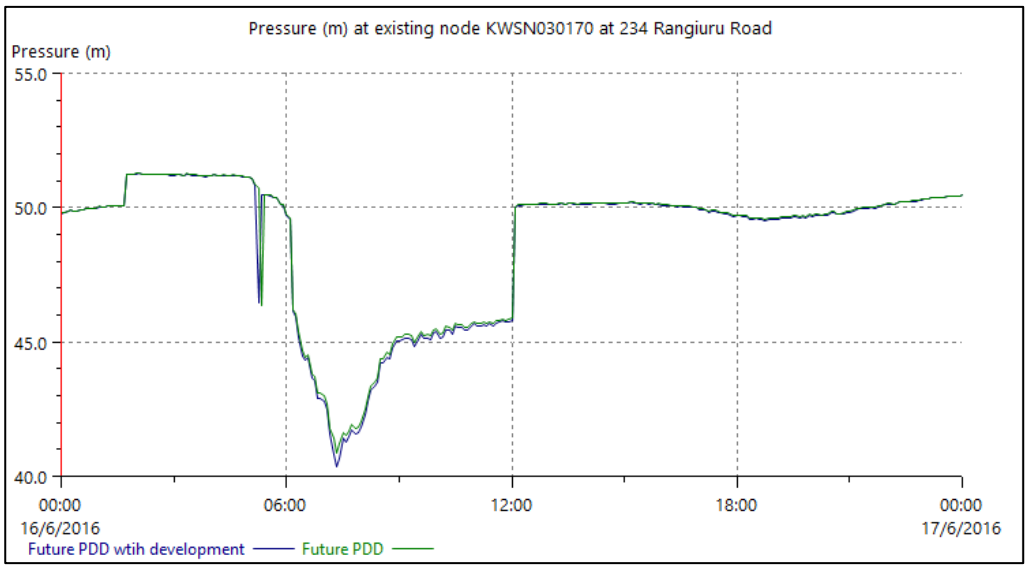

Figure 5-3: Future peak day pressure (m) with the proposed development

Fire flow can be met at all hydrants within the development (Figure 5-4)

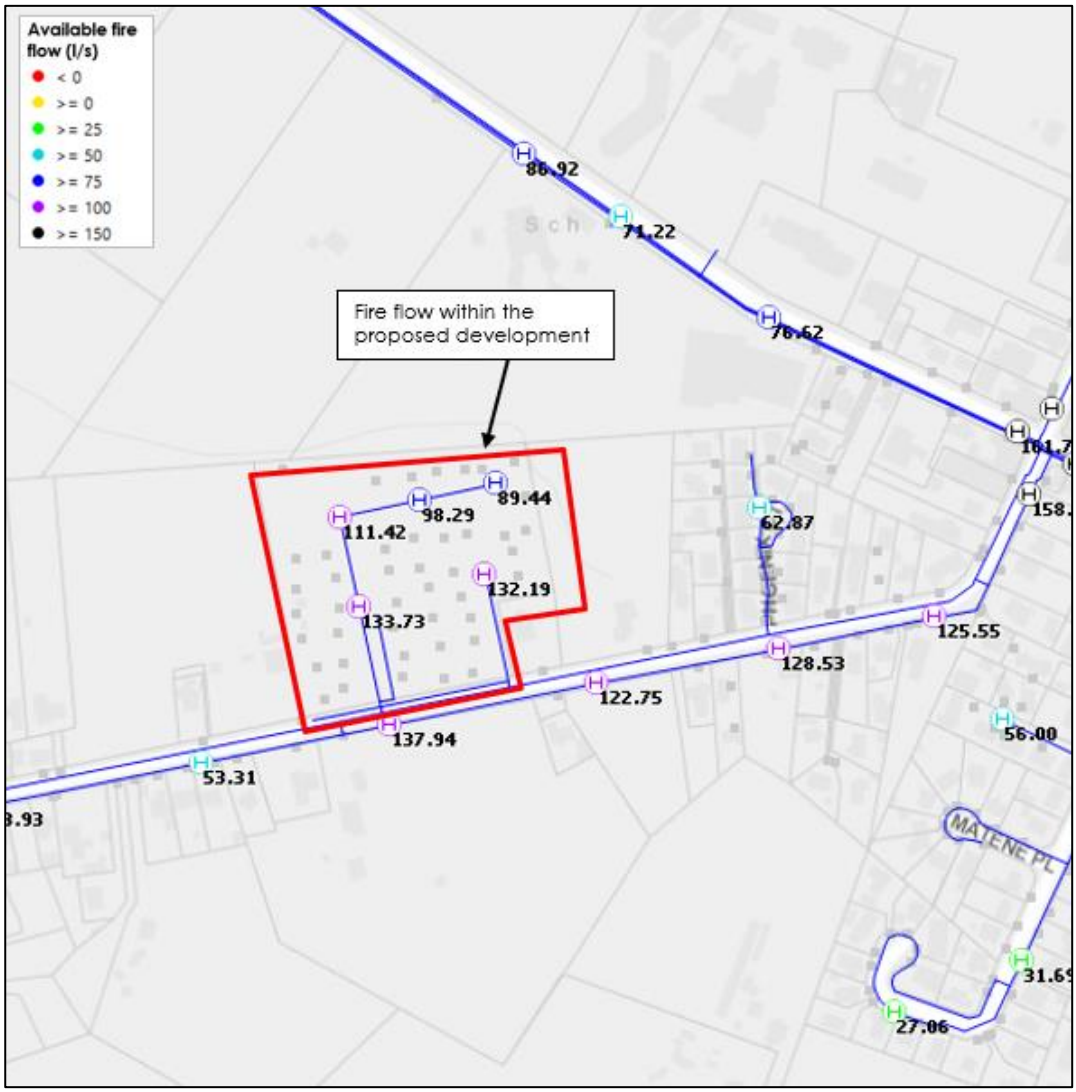

Figure 5-4: Future peak day fire flow (l/s) with proposed development

6. Conclusion

A network layout has been proposed for the 234 Rangiuru Road development and modelling suggests no issues with pressure, fire flow or resilience either within the development or across the wider network.

Calculations suggests that the increase in peak load on the bores of 1.56 l/s will consume around 5-6% of the current available surplus in instantaneous supply from the bores before the proposed reduced resource consent limit is reached. Although the effects of this development in itself are almost negligible, we recommend careful consideration of the combined effects of developments in this network to ensure growth is controlled and network performance remains acceptable.

With the Otaki Reservoir in place with 5,500m^3 of extra storage, the instantaneous load on the bores can be buffered, and the proposed consented supply (83l/s total) will be sufficient to support more growth. The reservoir is scheduled for completion at the end of 2024.

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APPENDIX 5
WASTERWATER IMPACT ASSESSMENT

KAPITI COAST DISTRICT COUNCIL

234 Rangiuru Road Development Impact Assessment

JANUARY 2025

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Document Title	234 Rangiuru Road Development Impact Assessment
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Revision Schedule

Rev	Date	Description	Prepared by	Checked by	Reviewed by	Approved by
1	05/07/2024	Draft for Client comment	KM	BDR	BDR	BDR
2	09/12/2024	Revised Draft including impact of Aotaki gravity upgrade	KM	BDR	BDR	BDR
3	13/12/2024	FINAL REPORT incorporating client comments	KM	BDR	BDR	BDR
4	31/01/2025	FINAL REPORT incorporating client comments	KM	BDR	BDR	BDR

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1 Introduction

1.1 Objective

The objective of this study is the utilise the existing Otaki wastewater network (Aurecon, 2009, with 2020 updates undertaken by HAL) to assess the impact of the proposed 234 Rangiuru Road development. The existing modelled populations have been updated by HAL to provide an estimated existing (2018) population scenario.

1.2 Background

Otaki is the third largest township in the Kapiti region with a 2018 population of 7,300 (2018 census). The topography of the Otaki catchment is relatively flat and is separated into two parts on the east and west by a green belt. Otaki Beach is located to the west of the catchment and the Otaki River to the south. The bulk of the sewerage system was laid in the early part of the 1980s and incorporates a number of pumping stations (32 at the time of writing) to support development in low lying areas of the catchment.

The discharge to the Otaki Wastewater Treatment Plant (WWTP) is controlled by a major pumping station (Otaki Terminal Station PS12 - OSP00012). The wastewater from this system is treated by a combination of oxidation pond, clarifier and aerated lagoon at the Otaki WWTP before discharging to a landfill disposal system (Source: Otaki Sewerage System Model Build & Calibration Report, Aurecon 2009).

Significant growth is forecast for Otaki over the next 25 years, with KCDC's latest 'medium growth scenario' estimates showing a projected population of the Otaki catchment of 10,400 in 2043 (a 42% increase from 2018).

The proposed development site is located on 234 Rangiuru Road. The proposal seeks to develop an existing vacant site into 43 residential lots. The development has proposed to connect into manhole KWWN000136 through a rising main from a pump station on site that receives the flows from the proposed development.

2 Scope

The following tasks were undertaken as part of this assessment:

- Calculation of design flows for the 234 Rangiuru Road development
- Assessment of the 234 Rangiuru Road development impact on the existing network for the current (2018) population scenarios

Each of these tasks is discussed in more detail in the following sections

3 234 Rangiuru Road Design Flows

3.1 Overview

The 234 Rangiuru Road proposal seeks to develop an existing vacant site into a 43-lot residential development. The location of the proposed development is shown in Figure 1 below.

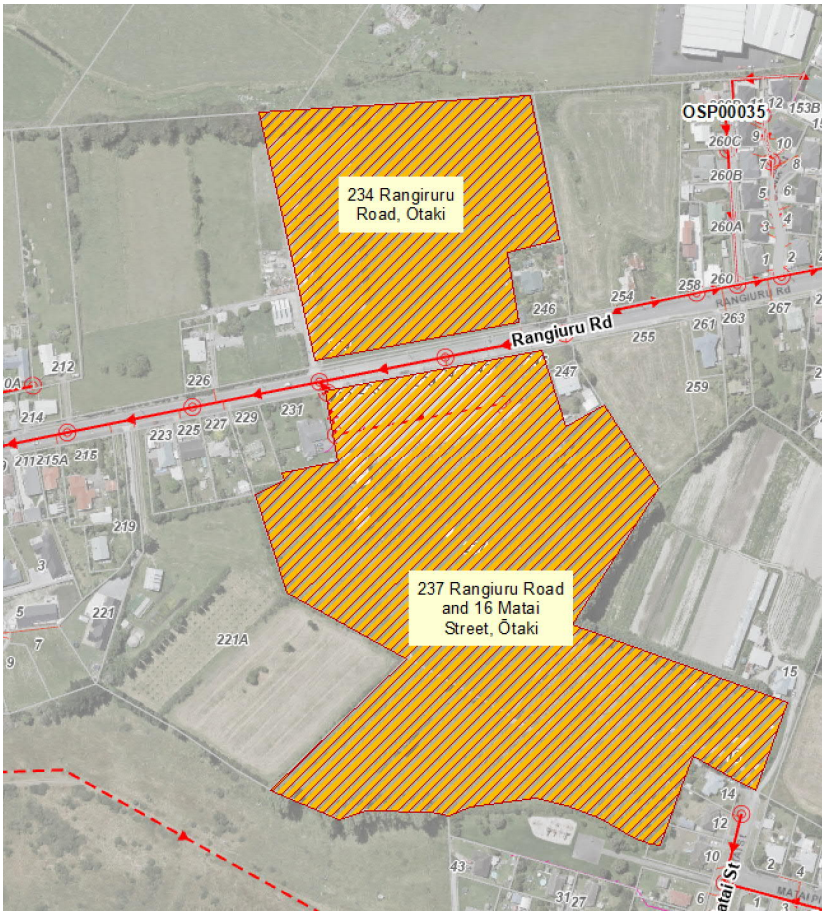

Figure 1: Proposed 234 Rangiuru Road Development location

The development (including all 43 lots) will be serviced by a DN160mm diameter wastewater pipeline connecting to the existing KCDC 150mm PVC wastewater line at MH ID: KWWN000136, which is located outside 246 Rangiuru Road. The downstream network connects to Pumpstation Otaki 13 (OSP00013), which in turn pumps to the terminal Otaki pump station (OSP00012) prior to being pumped to the WWTP.

The feasibility and sizing of the internal site connections, particularly with respect to adequate grade for gravity flow and capacity of private pumping stations, has not been assessed as part of this study.

3.2 Development Design Flows

The PWWF for this development assessment has been calculated using the proposed 43 residential lot yield provided in the concept plan

Following the KCDC 'Land Development Minimum Requirements : 2022' code the design flow formulas as shown below in Table 1 can be used to calculate a proposed residential Peak Wet Weather Flow (PWWF) of 1.56 l/s for the development.

Table 1: 234 Rangiuru Road Design Flows

Hotel	Residential Lots
No. of Units	43
Occupancy	2.5
Population	108
ADWF (l/p/day)	*250*
ADWF (l/s)	0.313
DWF Peaking Factor	*2.5*
PDWF (l/s)	0.781
WWF Peaking Factor	*x5*
PWWF (l/s)	1.56

4 234 Rangiuru Road Development Impact

4.1 Pre-Development Scenario

The Otaki wastewater model (Aurecon, 2009) with HAL 2020 updates, was run for a 24-hour, 5- year ARI nested design storm to assess how the local network performs during storms of this magnitude, without the proposed development.

The standard design storm of 5-year ARI (which is the level of service (LOS) adopted by KCDC) has been used as the containment standard for this assessment. As seen in Figure 1, there is a previous development, which is almost completed, adjacent to the proposed development on 237 Rangiuru Road. The expected flows from this development of 3.26 l/s were incorporated into both the pre and post development scenarios that were modelled. The previous development on 237 Rangiuru Rd was connected to MH ID KWWN000100.

Figure 2 shows that there is capacity from MH ID KWWN000136, the receiving manhole, up until Pump Station Otaki 13 with only minor surcharging in Pipe ID KWWP007252. However, between Pump Station Otaki 13 and the terminal Otaki Pump Station (OSP00012), major surcharging occurs as a result of back-up from OSP00012 with overflows predicted at two of the manholes. This issue is a well-known constraint in the Otaki network and KCDC are investigating the feasibility of options to resolve it, with a proposed solution of Pump Station Otaki 13 being diverted towards the WWTP to take flows away from the constraint at OSP00012, however at this stage there isn't a committed timeframe for when this constraint

will be resolved. However as it is a network wide constraint affecting all developments in Otaki, this assessment will only assess the capacity of the line between the receiving manhole and Pump Station Otaki 13.

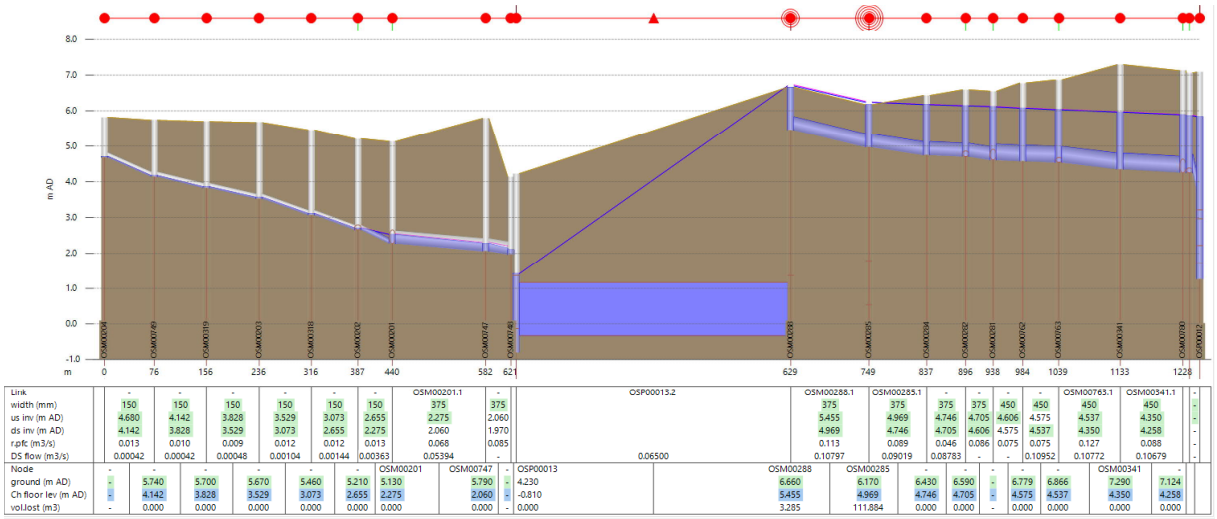

Figure 2: Pre-Development Flows to OSP00013 – 5-year ARI design storm

4.2 Post-Development Scenario

The Otaki wastewater model (Aurecon, 2009) with HAL 2020 updates was run for a 24-hour, 5- year ARI nested design storm to assess how the local network performs in the post development scenario. The standard design storm of 5-year ARI has been used as the containment standard for this assessment.

Figure 3: EXISTING Scenario with POST-Development Flows to OSP00013 – 5-year ARI design storm

Under the existing post-development scenario, the developments have minimal impact on the line from

the receiving manhole up until Pump Station Otaki 13, with only a small increase in surcharging compared to pre-development flows, and most pipes having sufficient capacity. As previously mentioned, solutions to alleviate the overflows in the line downstream of Pump Station Otaki are being explored by KCDC, and that constraint has not been considered further as part of this assessment.

5 Stn 13 Otaki Pump Station (OSP00013) Assessment

From the proposed development sites, the 150mm wastewater network flows via gravity to Stn 13 Otaki (OSP00013), which has a modelled capacity of 107 l/s during normal pump rate (based on KCDC records).

When the cumulative flows from the new developments were modelled, the peak incoming flow into OSP00013 was 60.5 L/s, meaning there is ample capacity in the pump station for incoming flows from the new development.

6 Mitigation Options

6.1 Diversion of Pump Station 13 to WWTP

The proposed solution being explored by KCDC to address the overflows upstream of Pump Station Otaki 13 is to divert flows from the pump station directly to the WWTP. The Otaki wastewater model (Aurecon, 2009) with HAL 2020 updates was run for a 24-hour, 5- year ARI nested design storm to assess how the local network performs in the post development scenario incorporating the proposed diversion to the WWTP.

Figure 5 shows the modelled flows up until Pump Station Otaki 13, and Figure 6 shows the modelled flows to the terminal pump station, Pump Station Otaki 12, with the proposed diversion of Pump Station Otaki 13 to the WWTP. The proposed solution addresses the issues of overflows between Pump Stations Otaki 12 and 13 that were previously modelled, with sufficient capacity in both lines. There is surcharging in Pipe ID KWWP007252, it is however only a small amount, likely due to inaccurate invert levels.

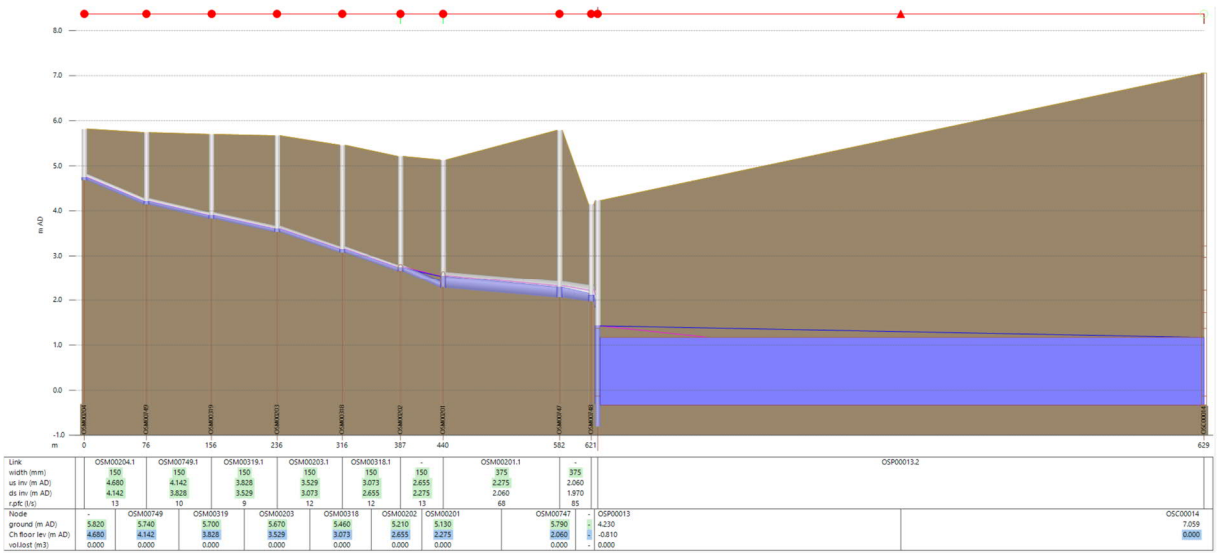

Figure 4: EXISTING Scenario including diversion with POST-Development Flows to OSP00013 – 5-year ARI design storm

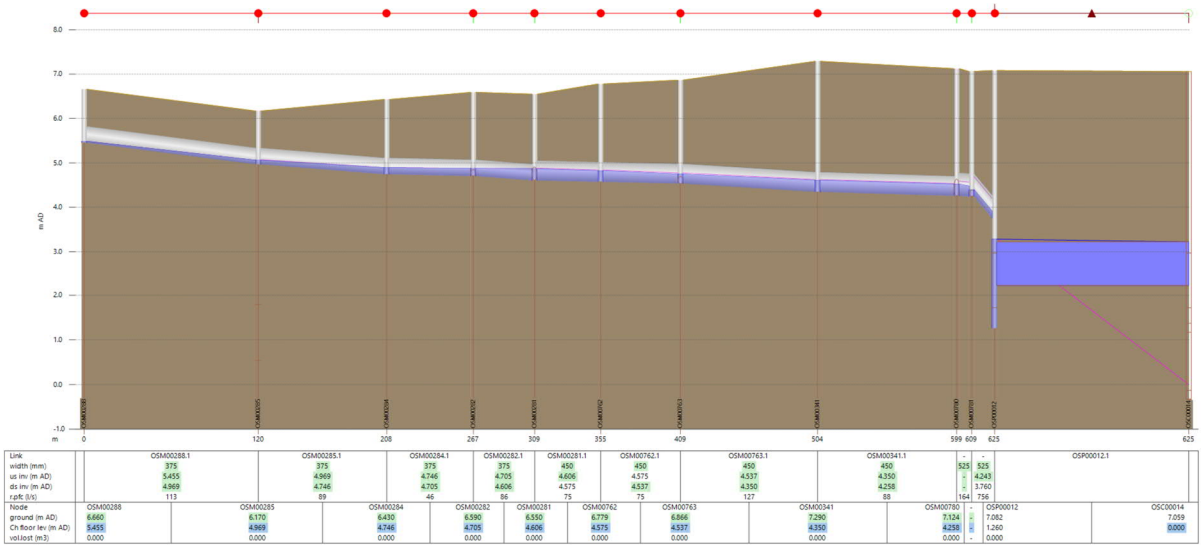

Figure 5: EXISTING Scenario including diversion with POST-Development Flows to OSP00012 – 5-year ARI design storm

6.2 Additional Storage provided with Aotaki St gravity upgrade

A sensitivity run scenario was also undertaken to account for the impact of the additional storage available within the planned gravity upgrades along Aotaki St in the short term, before a long term solution to the constraint at the terminal pump station is implemented. As seen in Figure 7, the predicted surcharge at the terminal pump station is significantly reduced as a result of the additional storage provided in the Aotaki St gravity upgrades, and no overflows are predicted, such that the risk of overflows occurring is be considered in the short term whilst a long term solution to address the inadequate capacity of the terminal pump station is implemented. There may be potential to further reduce the risk of overflows by reducing the capacity of Pump Station 13 and utilising the available storage to avoid surcharge in the downstream 375mm gravity line if a long term solution is not able to be implemented in the medium term.

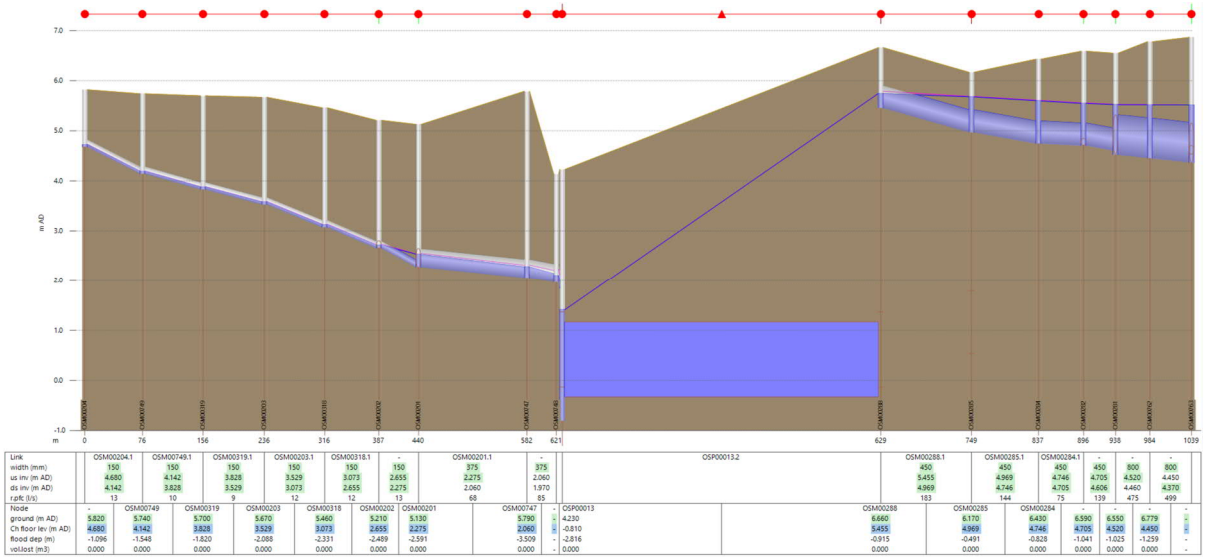

Figure 6: EXISTING Scenario including upgrades on Aotaki St with POST-Development Flows to OSP00012 – 5-year ARI design storm

7 Model Assumptions and Limitations

The following assumptions should be read in conjunction with the following reports:

- Aurecon's report 'Otaki Wastewater System – Model Build and Calibration' Report, June 2009
- Watershed's Model Update Report (2016)
- Watershed's Model Recalibration and System Performance Report (2017)
- Morphum's report 'Setting a containment standard based on a cost benefit analysis and confirming the 10 year works programme' Report, February 2021

The following limitations apply to the modelling undertaken as part of these studies:

- The model has been verified (and recalibrated) against flows developed from KCDC pump station SCADA data, and as such has an inherent limitation to the degree of accuracy able to be achieved.
- The distribution of the modelled population is an approximation based on the population increase between the 2006 and 2018 census. No allowance has been made for additional growth since 2018 which is considered to be minor.
- Pump station model parameters are based on information provided by KCDC operations, and its accuracy has not been validated as part of these studies.

8 Conclusion

The objective of this study is to utilise the existing hydraulic model of the Otaki wastewater network to assess the impact of the proposed 234 Rangiuru Road development. The proposal seeks to develop an existing vacant site into a 43-lot residential development.

The model was run for the existing population scenarios, with the additional PWWF of 1.56 l/s from the proposed 234 Rangiuru Rd development. The development impact on the immediate network was assessed against a 5-year ARI design storm.

The post-development scenario downstream shows ample capacity in the 150mm network immediately downstream from the discharge point flowing to Pump Station Otaki 13 (OSP00013) including an allowance for expected flows from a potential KCDC development on a neighbouring property, with minimal surcharge in the post-development scenario.

Whilst the model showed surcharge issues and overflows in the line between Pump Station Otaki 13 and the terminal Otaki Pump Station (OSP00012), if the proposed diversion of Pump Station Otaki 13 towards the WWTP is carried out as is being investigated by KCDC the issues will be remedied.

In the short term, the soon to be completed Aotaki St gravity upgrade project will provide a significant amount of additional storage volume which can be utilised when inflows to the terminal Otaki Pump Station (OPS00012) exceed capacity which will result in a significant reduction in surcharge in the modelled 5 year design storm, such that the risk of overflows is considered acceptable in the short term whilst a long term solution to the capacity constraint at the terminal pump station (OSP00012) is implemented.

Therefore, this assessment shows there is capacity in the network immediately downstream of the development, and the risk of overflows upstream of the terminal pump station (OSP00012) is considered acceptable in the short term provided that the capacity constraint at the terminal pump station (OSP00012) are resolved by KCDC in the medium/long term, either by diverting flows entering Pump Station Otaki 13 to the WWTP as is currently proposed, or by an alternative solution.