water acumen

Memorandum 05

WA Ref:	WA/013
Date:	12 March 2024
To:	David Page: Neil Group
cc:	Chris Kennedy, Brian Jones, Matt Ashworth: Neil Group
From:	Robert White
Re:	Private Plan Change – Water and Wastewater Servicing Concept

Private Plan Change Water and Wastewater Servicing

Area to be serviced:

Neil Construction Ltd are seeking a Private Plan Change for the rezoning of 98-100 and 102 Totara Road, comprising 16.15 ha, from Future Urban to Residential – Mixed Housing Urban. The Proposed Precinct Plan is provided in Appendix A for information.

This area is expected to yield approximately 430 dwellings. The site location is shown in Figure 1.

Figure 1: Aerial photo of the site at 98-100, 102 Totara Road, Whenuapai, Auckland (encircled in blue) - (Source; Auckland Council GIS)

A holistic servicing strategy has been considered that allows for servicing the wider area and the integration of infrastructure.

The wider wastewater catchment is identified in Figure 2.

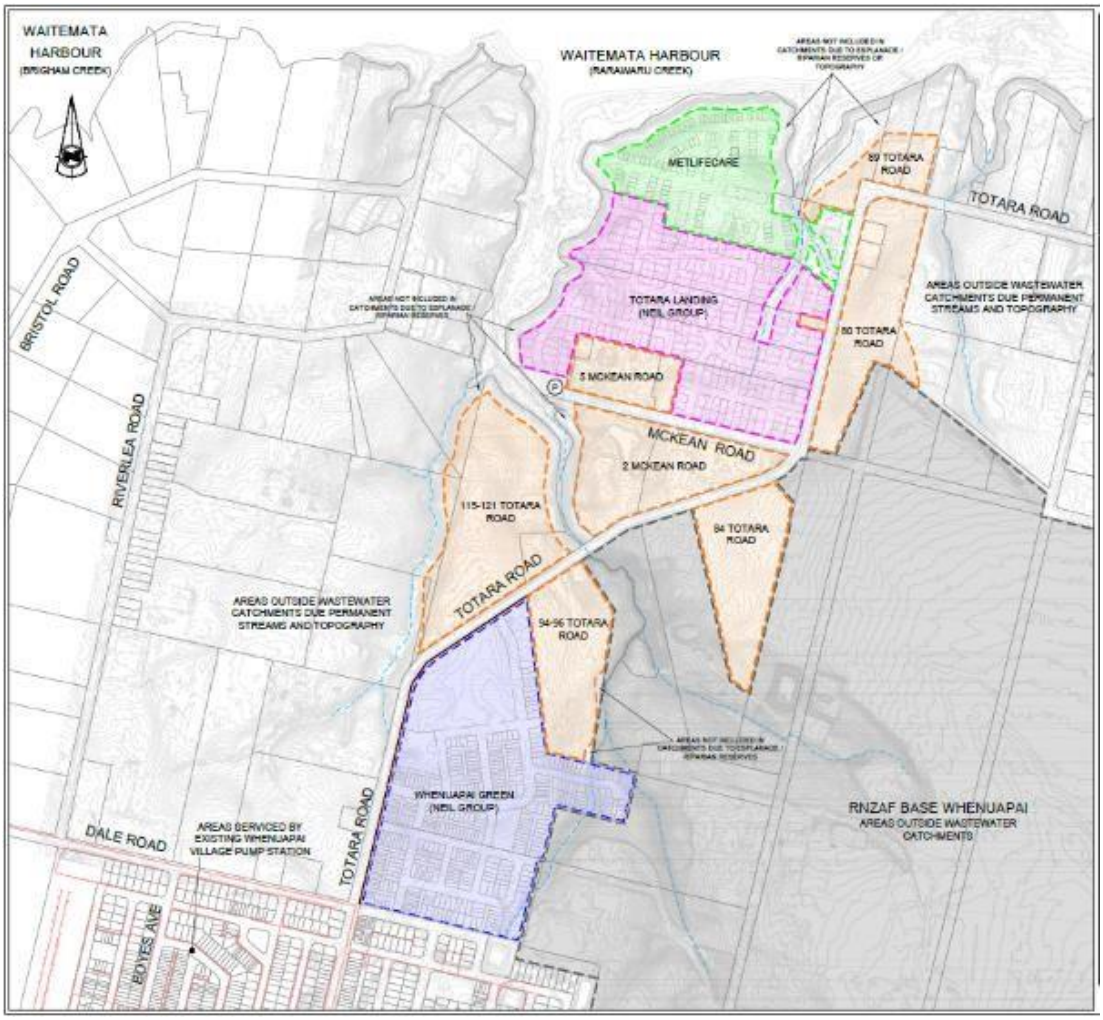


Figure 2: Wider Wastewater Catchment

The purpose of this report is to summarise the assessment for the existing and required water and wastewater infrastructure for the proposed Plan Change Area (PCA). Final water and wastewater reticulation for the PCA is subject to detailed design at the Resource Consent and Engineering Approval stage.

Water

Design Criteria

The design criteria are adopted from The Auckland Code of Practice for Land Development and Subdivision Water and Wastewater Code of Practice for Land Development and Subdivision Chapter 6: Water

6.3.5.3 Peak flows

Water demands vary on a regional basis depending on a variety of climatic conditions and consumer use patterns. Watercare will provide historically-based demand information appropriate for design.

Where peak demands are required for the design of a distribution system, the value shall be calculated from the following formulae:

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

Peak Hourly Demand = Average Hourly Demand (on peak day) x PF (over a 24-hour period)

Unless specified otherwise by Watercare, the peaking factor shall be 2.5

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:

(a) 5 m/km for DN ≤150;

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

6.3.5.6 Minimum water demand

[ ]

Demand estimation shall be based on:

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

(b) [ ]

(c) Firefighting demands as specified in SNZ PAS 4509;

(d) The network shall be designed to maintain appropriate nominated pressures for both peak demand (average daily demand in L/s x peaking factor) and firefighting demand scenarios. These figures should be applied to mains of 100 mm diameter or greater. Mains less than 100 mm in diameter can be sized using the multiple dwellings provisions of AS/NZS 3500.1 table 3.2.

(e) Occupancy of schools, hospitals and commercial buildings must be confirmed on a case-by-case basis. See (f) to (h) below. The design occupancy rates for residential properties and apartments shall be as per table 6.1.a below:

Table 6.1.a - Design residential occupancy allowances

Number of bedrooms	*Occupancy for design purposes (i.e. people)*
2-4	*3*

Existing Water Infrastructure

The Whenuapai area is fed via two 315 PE water mains, one from the west and one from the east. The two pipes originate from:

- Fred Taylor Drive to the west
- Hobsonville Road to the east

Two pipes, a 315 PE and 180 PE, are installed in Totara Road, from the intersection with Brigham Creek Road towards the PCA.

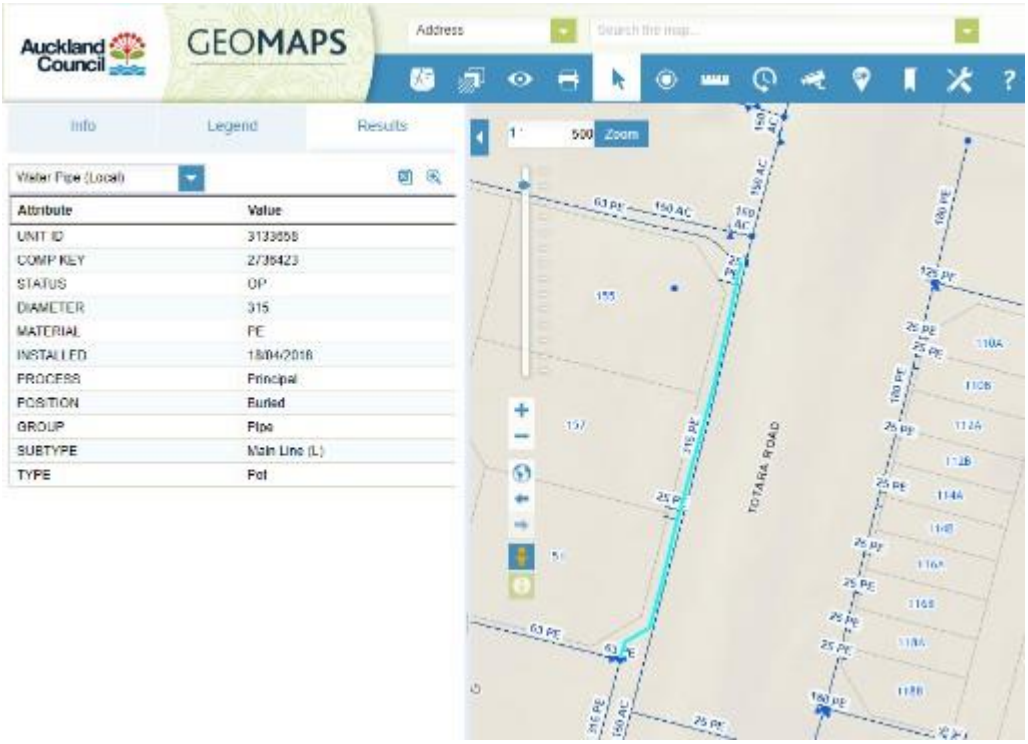


Figure 3: Totara Road – 315 and 180 PE pipe terminating at Dale Road intersection.

Design

Design Populations / Flow projections

Plan Change Area

Peak day demand for the plan change area is as calculated below.

Peak Day	Dwellings (DUE)	People / DUE	People	L/p/day	m^3/day	
Houses	430	3	1290	220	283.8	m^3/day
				pf	2.00	
				Peak Day	567.60	m^3/day

Population is less than 2,000 such that Peak Day factor = 2

Peak Day and Fire Flow Requirements (Based on FW2)

Peak day / Peak hour demand for the plan change area is as calculated below.

Peak Hr / Peak Day	People	L/p/day	pf	m^3/day	L/s	
Average	1290	220		283.8	3.3	
Peak Day			2.00	567.6		
Peak Hour			2.50			
			5.00		**16.4**	L/s
60% Peak Demand					9.9	
Fire Flow	FW2				25.0	
					34.9	L/s

Capacity of 315 PE pipe

At the maximum headloss of 3 m/km in a pipe >150mm and a friction coefficient (Hazen Williams) of 140, the maximum flow in a 315 PE100 SDR13.6 pipe is calculated to be 53 L/s (See Appendix B).

Peak Day	Dwellings (DUE)	People / DUE	People	L/p/day	m^3/day	Comments
	1506	3	4,518	220	993.96	m^3/day
					1.84	Peak day factor
				Peak Day	**1,831.50**	**m^3/day**

Peak Day Factor	**People**		Peak Factor			
	10000		1.50			
	4518		**1.84**	1.84		
	2000		2.00			

Peak Hr / Peak Day	People	L/p/day	pf	m^3/day	L/s	Comments
Average	4,518	220		994.0	11.5	
Peak Day			1.84	1,831.5		
Peak Hour			2.50			
Combined Peak Hr / Peak Day			4.61		**53.0**	**L/s**

A flow of 53 L/s is calculated to represent a peak hour / peak day demand generated by a population of 4,500 people or 1,500 Dwelling Unit Equivalents (DUE).

The theoretical maximum DUE supplied via two 315 PE pipes is 3,000 DUE.

The existing Whenuapai development is understood to have in the order of 1,200 dwellings (or DUE). With the addition of the expected yield of 430 DUE for the proposed plan change area there is still surplus capacity within the supply mains.

Required pipe upgrade - Hobsonville

It is acknowledged that there is currently a section of 150mm AC Pipe from the BSP at the intersection of Hobsonville Road and Brigham Creek Road that would need to be upgraded (conceptually to a 355 DN PE pipe), and that this is to be at the developer's expense if not already upgraded by others.

Figure 4 – Section of 150mm AC pipe to be upgraded in Brigham Creek Road.

It is understood that this is also a requirement of a separate Private Plan Change for Whenuapai Business Park also being progressed by Neil Construction Limited.

Required Pipe commissioning – Fred Taylor Drive

It is understood that a new watermain has been installed along Fred Taylor Drive, and this would require commissioning to increase capacity and provide resilience, if not ready commissioned.

Figure 5 – Pipe to be commissioned in Fred Taylor Drive.

315 DN Extension – Totara Road

A 315 pipe would be installed to replace the existing 150 AC water main along Totara Road to the northern extent of the plan change area.

The plan change area would be serviced via the 315 DN pipe in Totara Road combined with cross connection to the 180 pipe in Totara Road and potentially the 125 pipe in McCaw Avenue.

The installation of the 315 pipe would remove the network constraint and enable servicing of the wider area.

Local reticulation.

Local reticulation within the development would be designed and constructed in accordance with Watercare's Code of Practice for Land Development and Subdivision Water and Wastewater Code of Practice for Land Development and Subdivision Chapter 6: Water

Wastewater

Design Criteria

The design criteria are adopted from The Auckland Code of Practice for Land Development and Subdivision Water and Wastewater Code of Practice for Land Development and Subdivision Chapter 5: Wastewater, 5.3.5 Design criteria.

Table 5.1.1 – Design residential design wastewater flow allowance and peaking factors

Residential property type	Design wastewater flow allowance	Design wastewater peaking factors	
	Litres per person per day (L/p/d)	Peaking factor: Self-Cleansing Design Flow (Normal PDWF)	Peaking factor: Peak Design Flow (PWWF or Exceptional PDWF)
Up to three storey residential development	180	3.0	6.7
High-rise residential (or mixed-use) buildings four storeys and above	180	3.0	5.0

Design Populations / Flow projections

Table 1: Plan Change Area

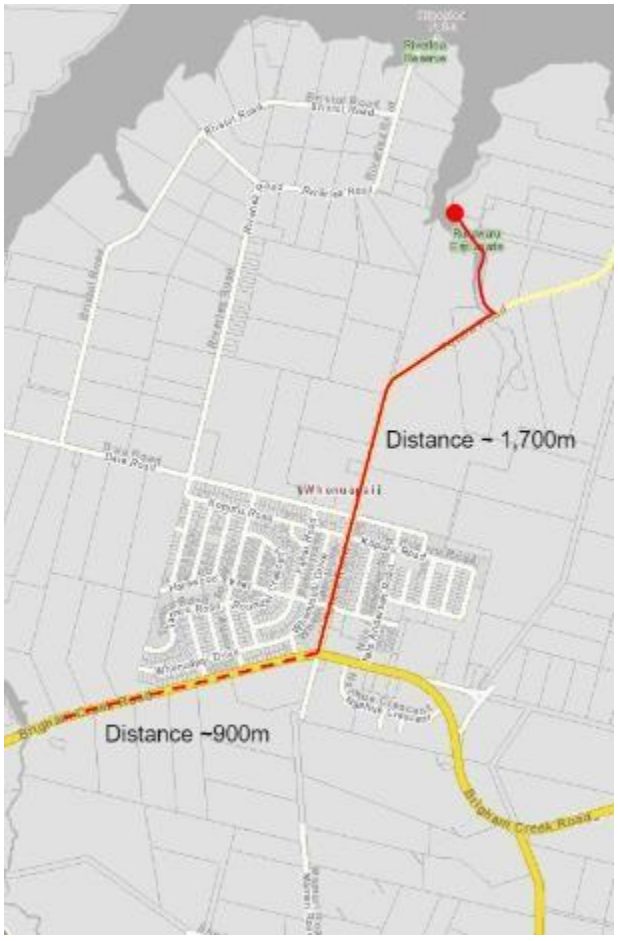
	ha	DUE/ha	DUE	People	L/p/day	ADWF (L/s)	peak factor	PWWF (L/s)
Plan Change Area								
Residential	16.15	26.63	430	1290	180	2.69	6.7	18.01
TOTAL			**430**			**2.69**		**18.01**

Scheme Overview

It is proposed that the wider catchment would be serviced via gravity feeding into a new wastewater pump station located in McKean Road, rising main(s) from the WWPS to the Intersection of Totara and Brigham Creek Roads, followed by a gravity sewer along Brigham Creek Road into the proposed gravity line being constructed from the existing Tamiro WWPS and the proposed Slaughterhouse Creek WWPS.

The gravity section of pipe in Brigham Creek Road would also service 41 – 43 and 45 Brigham Creek Road, covered by PC86, from the connection point from the site to the wastewater pump station location.

It is noted that there is no capacity within the existing Tamiro WWPS and connection to the wastewater network would only be available after construction and commissioning of the proposed Slaughterhouse Creek WWPS and Massey Connector, programmed for delivery in 2027.



Solid Line = Rising Main

Dashed Line = Gravity Sewer

Dot = WW Pump Station

Figure 6: Wastewater Scheme Overview

McKean Road Wastewater Pump Station.

It has been determined, by others*, that a single pump station located in McKean Road can service the wider area via gravity. A gravity line from the plan change area to the pump station is proposed to be installed within the road embankment at 90-92 Totara Road and through the Rurawaru Esplanade.

The pump station would include emergency storage equal to 8 hours Average Dry Weather Flow (ADWF).

Table 3: Peak Wet Weather Flows and Emergency Storage

	DUE	People / DUE	L/p/day	ADWF (L/s)	pf	PWWF (L/s)	Emergency Storage (m^3)
Plan Change Area Only	430	3	180	2.69	6.7	18.01	77.4
Full Catchment, including Plan Change Area	1,281	3	180	8.01	6.7	53.66	230.7

The proposed wastewater pump station location is as shown as N34 within the **Auckland Wastewater Network Comprehensive Wastewater Network Discharge Permit**. The Proposed Assets Map – Upper Harbour West Catchment is included as Appendix C.

The consent states:

> *Future Network*
>
> *30. The Consent Holder may discharge from any New Engineered Overflow Point which is zoned for urban activity under the relevant Resource Management Act statutory document, and is within a Future Network provided that:*
>
> *a) The New Engineered Overflow Point is located in the location shown on the relevant map of the Indicative Future Urban Area in Attachment 1 or a Similar Location; and*
> *b) The New Engineered Overflow Point is designed and managed to achieve the discharge frequency set out in condition 9a; and*
> *c) A minimum of four (4) hours storage at Dry Weather Flow is provided at or near the New Engineered Overflow Point.*

* Local wastewater network concept design has been developed by Neil Construction Ltd.

Rising Main(s):

Twin Rising Mains, conceptually 160 and 225DN PE100 / SDR11 are proposed of the wider catchment. Initially the 160 DN would be utilised, prior to switching to the 225DN, and ultimately utilising both pipes simultaneously.

The key factors are:

- Maximising velocity (achieving 0.9m/s min and 2.0m/s max.)
- Minimising retention time within the rising main
- Operating at a suitable pump head (static lift plus friction losses)

Table 4: Rising Main Staging - Concept

		Pump Rate	Velocity	Pump Head	PWWF DUE	8 Hr Retention (DUE)	Self-Cleansing Achieved?	Slime Shear	
		(L/s)	(m/s)	(m)	(No.)			Achieved?	(L/s)
Phase 1 160 DN	Min	8.50	0.63	36.2	203	127	Yes	No	12.5
	Max	16.00	1.19	56.4	382		Yes	Yes	
Phase 2 225 DN	Min	17.00	0.64	33.4	406	251	Yes	No	26.3
	Max	38.00	1.42	54.2	907		Yes	Yes	
Phase 3 160+225	Min	38.00	0.81/1.02	41.4	907	378	Yes	No / Yes	44.5
	Max	53.66	1.15/1.44	54.5	1,281		Yes	Yes	

- PWWF DUE No. — Number of properties that achieve the PWWF matching the pump rate.
- 8 Hr Retention DUE — Number of properties to be connected to result in a retention time within the pipeline of 8 hours (at 1 DUE = 3 people x 180 L/person/day).

Table 5: Rising Main Staging – Achieving minimum 0.9 m/s.

		Pump Rate	Velocity	Pump Head	PWWF DUE	8 Hr Retention (DUE)	Self-Cleansing Achieved?	Slime Shear	
		(L/s)	(m/s)	(m)	(No.)			Achieved?	(L/s)
Phase 1	Min	12.11	0.90	44.4	289	127	Yes	No	12.54
Phase 2	Min	23.96	0.90	38.5	572	251	Yes	No	26.25
Phase 3	160	12.11	0.90	44.4	1,004	378	Yes	No	38.79
	225	29.95	1.13				Yes	Yes	
Phase 4	160	15.46	1.15	54.5	1281		Yes	Yes	
	225	38.20	1.44				Yes	Yes	

Gravity Sewer – Brigham Creek Road

The proposed Plan Change 86 includes for the provision of a pump station servicing 41 – 43 Brigham Creek Road and a proposed supermarket at 45 Brigham Creek Road, with a rising main discharging into the proposed Slaughterhouse WWPS. This includes a downhill section along Brigham Creek Road.

https://www.aucklandcouncil.govt.nz/UnitaryPlanDocuments/10-pc-86-appendix-8-infrastructure-report.pdf

Figure 7: Plan Change 86 – Proposed Wastewater Ring Main Overview Plan

Watercare's submission on Plan Change 86 (Private): 41-43 Brigham Creek Road, Whenuapai, dated 21 October 2022, includes:

> ***2.4.2. Wastewater***
>
> *b. A gravity main will be required in Brigham Creek Road to connect the Plan Change to the Slaughterhouse Pump Station. The gravity main should be sized for catchment flow, which may include land north of Whenuapai Village.*

Final wastewater reticulation for the PCA is subject to detailed design at the Resource Consent and Engineering Approval stage.

Conclusions and Recommendation

The required water and wastewater infrastructure for the proposed plan change area (PCA) has been assessed, and can be summarised as follows:

Water

The existing 150mm AC section of pipe from the BSP at the intersection of Hobsonville and Brigham Creek Roads would be replaced, at the developer's cost (if not previously upgraded), conceptually to a 355 DN PE pipe.

The section of upgraded main in Fred Taylor Drive would need to be commissioned (if not already commissioned) to provide additional supply and resilience to the wider area.

The twin 315 PE pipes feeding the wider Whenuapai development and the 315 and 180 PE pipes in Totara Road are sufficiently sized to service the plan change area in addition to the existing development, subject to the work detailed above.

The 315 pipe in Totara Road would be extended along Totara Road to the northern extent of the plan change area, replacing the respective section of 150mm AC pipe.

The plan change area would be serviced via the 315 DN pipe in Totara Road combined with cross connection to the 180 DN pipe in Totara Road and potentially the 125 DN pipe in McCaw Avenue.

Local reticulation within the plan change area would be designed to the Code of Practice requirements.

Wastewater

This proposal considers servicing the plan change area along with the wider catchment.

It is noted that there is no capacity within the existing Tamiro WWPS and connection to the wider wastewater network would only be available after construction and commissioning of the proposed Slaughterhouse Creek WWPS and Massey Connector, programmed for delivery in 2027.

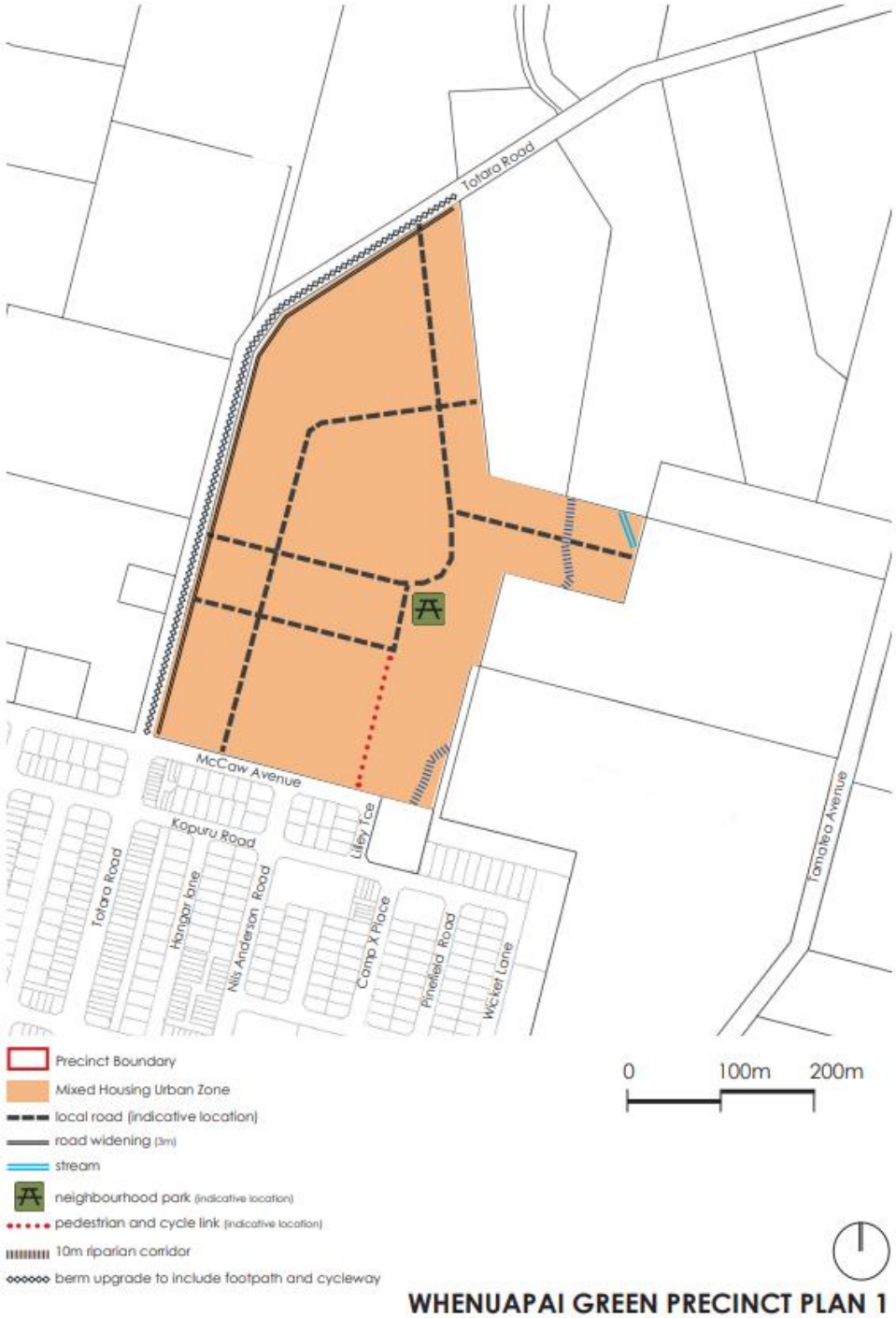
The recommended infrastructure would include:

- a new Wastewater Pump Station in McKean Road, with emergency storage equal to 8 hours Average Dry Weather Flow (ADWF).
- twin rising mains from the WWPS to the intersection of Totara and Brigham Creek Road (provisionally 160DN and 225DN rising mains)
- a new gravity main located within Brigham Creek Road to the Slaughterhouse Wastewater Pump Station

This infrastructure would service the entire plan change area, along with the wider catchment that is able to be connected to the proposed wastewater pump station location.

Considering the above, the existing and proposed water and wastewater infrastructure is adequate to allow for the PCA to be rezoned.

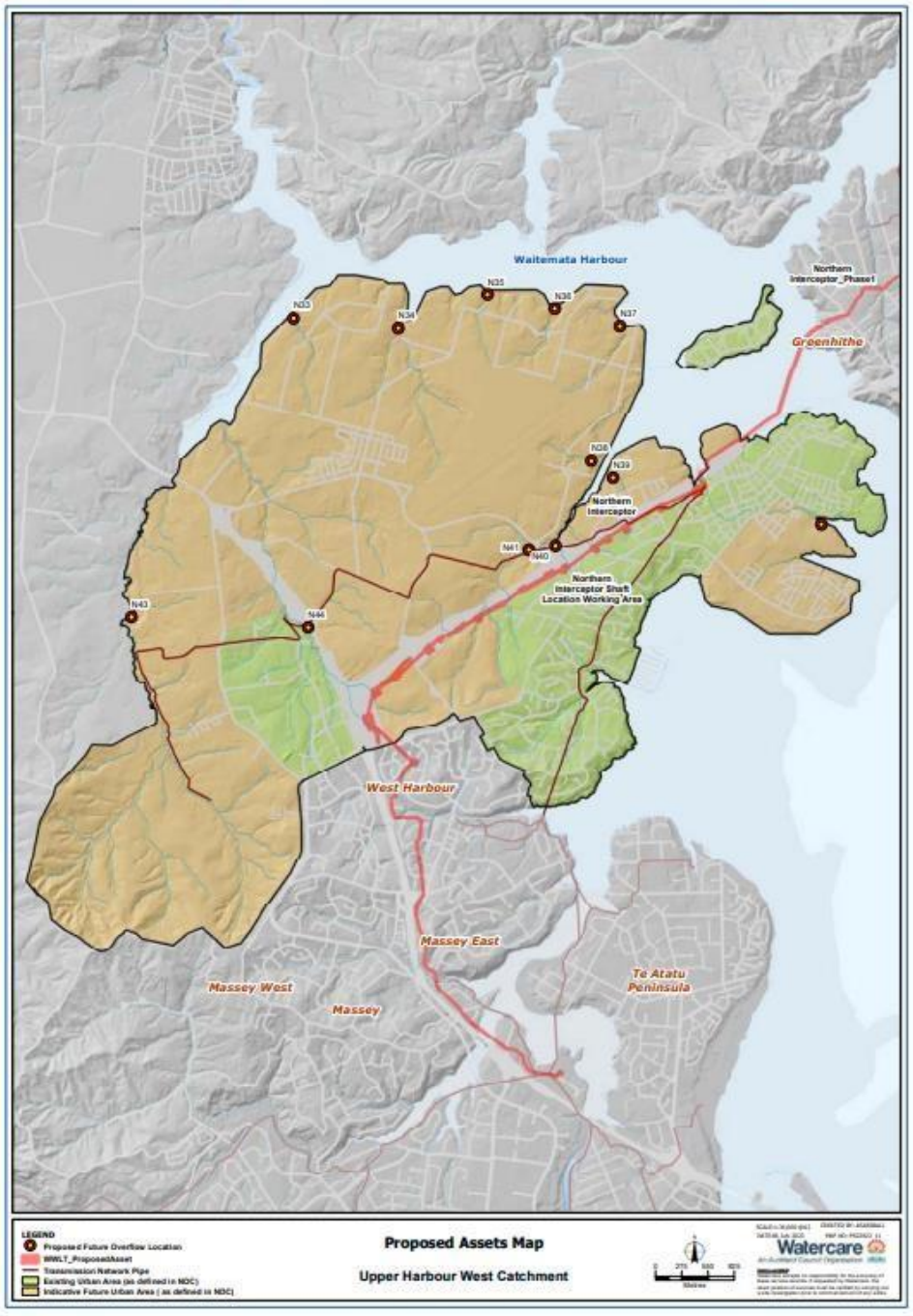
Appendix A – Proposed Precinct Plan



Appendix B – Hydraulic Calculation 315 DN PE100 SDR13.6 Pipe

COLEBROOK-WHITE CALCULATION						
(Unverified calc - Please verify before use)						
ENTER	Internal pipe dia	268.68	mm		315.00	DN
					13.60	SDR
	Flowrate	0.053	m^3/s			
		53.36	L/s		268.68	ID
		192.10	m^3/hr			
		4.61	MLD			
	Length	1,000.00	m			
	Pipe roughness	0.1	mm			
Assuming	Poly viscosity	0.00000114	m^2/s			
	g	9.81	m^2/s			
Answer	Flow velocity	0.9412	m/s			
	Losses	3.02	m			
		0.30	bar			
Check Calculations						
	Velocity	0.94118088	using Flow / Area			
	Velocity	0.94118088	using Colebrrok White Equation			
	VARIATION	-1.03251E-14				
Hazen Williams Calculation						
(Unverified calc - Please verify before use)						
ENTER						
	Flowrate	0.053	m3/s			
	Length	1000	m			
	Internal pipe dia	0.268676471	m			
	Friction Coefficient	140				
Answer						
	Losses	**3.00**	m			
		0.29	bar			
COLEBROOK-WHITE CALCULATION		3.02	m			
Hazen Williams Calculation		3.00	m			
	Variation	15.17	mm			
	Percentage Variation	0.50%				

Appendix C – Proposed Assets Map – Upper Harbour West Catchment



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