Wellington Water

WET WEATHER OVERFLOWS FROM THE PORIRUA AND WELLINGTON (Northern Suburbs) WASTEWATER NETWORKS

Assessment of Environmental Effects

PART 2 REPORT

May 2023

Our water, our future.

QUALITY CONTROL

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Abbreviations

ANZECC	Australian and New Zealand Water Quality Guidelines (2000)
ANZG	Australian and New Zealand Water Quality Guidelines (2018)
ARI	Average Recurrence Interval
BOD_5	Five-day biochemical oxygen demand
CMA	Coastal Marine Area
CIA	Cultural Impact Assessment
CMA	Coastal Marine Area
CCTV	Closed circuit television
COP	Constructed Overflow Point
E. coli	*Escherichia coli*
EOC	Emerging organic contaminant
GWRC	Greater Wellington Regional Council
HCC	Hutt City Council
I&I	Inflow and Infiltration
LTP	Long Term Plan
MCI	Macroinvertebrate community index
MFE	Ministry for the Environment
NIWA	National Institute of Water and Atmosphere
NOEC	No observable effects concentration
NES-F	National Environmental Standard Freshwater 2020
NPS-FM	National Policy Statement for Freshwater Management 2020
NZWERF	New Zealand Water Environment Research Foundation
PNEC	Predicted No Effect Concentration
pNRP	Proposed Natural Resources Plan, Appeals version 2019
PNEC	Predicted No Effects Concentration
PS	Pump Station
QMRA	Quantitative Microbiological Risk Assessment
RE	Receiving Environment
REC	River Environment Classification
RMA	Resource Management Act 1991
RPH	Regional Public Health
RWQE	River Water Quality and Ecology
SCADA	Supervisory Control and Data Acquisition
SMP	Stormwater Monitoring Plan
TSS	Total Suspended Solids

UHCC	Upper Hutt City Council
USGS	United States Geological Survey
Strategic Reduction Plan	Wastewater Network Overflow Strategic Reduction Plan
Sub-catchment Reduction Plan	Wastewater Network Overflow Sub-Catchment Reduction Plan
WNO	Wastewater network overflow
WOMP	Wastewater Overflow Monitoring Plan
WWTP	Wastewater Treatment Plant
Wellington Water	Wellington Water Limited
UHCC	Upper Hutt City Council

1.0 INTRODUCTION

1.1 PURPOSE OF THIS DOCUMENT

This Assessment of Environmental Effects (AEE) – Part 2 Report is the companion document to the Applications for Resource Consent and Assessment of Environmental Effects - Part 1 Report and has been prepared to support Wellington Water Ltd.'s (Wellington Water) application to consent overflows from the wastewater network in the Porirua catchment.

The purpose of this document is to outline the methodology that has been developed for the assessment of wet weather overflows and describe how the methodology has been applied to assess the level of adverse effect and to determine a ranking of overflow sites with the greatest potential to adversely impact the receiving environment.

This Part 2 Report covers the relevant information required under clause 6 (Information required in assessment of environmental effects) and clause 7 (Matters that must be addressed by assessment of environmental effects) of Schedule 4 of the Resource Management Act (RMA). The Part 1 Report covers all other information required under Schedule 4 of the RMA.

1.2 STRUCTURE OF AEE REPORT

This AEE (Part Two) is structured as follows:

Section 1	Describes the purpose of this report.
Section 2	Provides an overview of the methodology used to prepare this assessment. The same methodology will also be used to prepare AEE's for the Hutt/Wainuiomata, Wellington and Karori wastewater networks.
Section 3	Provides an assessment of effects of wet weather overflow discharges to various receiving environments within the Porirua WWTP catchment. It summarises the receiving environment values, overflow characteristics, potential magnitude and level of public health, ecological, cultural, and aesthetic effects.
Section 4	Provides an overall summary for all overflow locations and ranks the sites with the greatest potential to cause adverse effects on the receiving environment.
Section 5	Conclusion.
Appendix A	Summary of WNOs, receiving water values, and level of adverse effects.
Appendix B	Freshwater Fish Species Records.
Appendix C	Mass balance calculations of receiving water quality during overflow events.
Appendix D	Summary of uncontrolled overflow points.

2.0 METHODOLOGY

This section summarises the methodology used to prepare the Assessment of Effects (AEE) in Section 3 and Section 4 of this application document and details the key factors which were taken into consideration when adapting an existing and proven methodology to apply it in the context of the Porirua, Tawa and Johnsonville wastewater network and catchments.

2.1 CHARACTERISATION OF WASTEWATER OVERFLOWS

Wastewater systems usually use a large volume of water to carry a small quantity of solid and liquid wastes. A typical design dry weather flow for a wastewater system is around 225 litres per person per day, generating sewage (wastewater) with a solids content of around 0.1%.

Although municipal wastewater is dilute, it is also an unstable, offensive mixture of dissolved and suspended solids, containing human wastes with the potential for disease transmission. Municipal wastewater consists of faeces and urine as well as the water from baths, showers, domestic waste disposal machines, basins, dishwashers and washing machines. Wastewater also contains trade wastes from hotels, restaurants, shops, offices, laundries, and industries; and any other liquids people pour into or allow to enter the wastewater system.

Within Porirua City, trade waste is estimated to account for 4-5% of total wastewater flow. Most of Porirua's trade waste comes from small hospitality/service sector discharges. Wellington suburbs of Tawa, Grenada, Takapu Valley, Churton Park, Glenside, Grenada Village, Paparangi, Woodridge and Horokiri also discharge to the Porirua WWTP catchment. The majority of this wastewater is domestic in nature, with a minimal trade waste contribution. Trade waste discharges in these areas are received primarily from food premises in central areas and a handful of industrial businesses in Grenada North. It is estimated that 3% of the total wastewater flow from these areas is comprised of trade waste discharges (Chen, 2021).

Overall, it is estimated that trade waste currently accounts for approximately 5% of total flow to the Porirua WWTP. For the purposes of forward projections, the proportion of trade waste is assumed to remain at this level. This assumption is considered appropriate as there is no indication in either the city's growth planning or economic development strategies of significant growth in heavy, wet industries (Chen, 2021).

Wastewater flows for the Porirua, Tawa and Johnsonville network are characterised below. The quality of untreated wastewater received at Porirua WWTP is determined daily samples from April 2020 to August 2022 (n = 855). The faecal coliform and enteric virus values are from a generic characterisation of wastewater quality of influents to New Zealand WWTPs (Table 2-1).

Table 2-1: Wastewater flows to Porirua WWTP and characterisation of untreated wastewater quality

Metric	Parameter	Estimated number/volume/concentration
Residential population		84,800 residents (as of 2028)
Average daily flow		26,438 m^3/day or 306 L/s
Peak wet weather flow		1,275 L/s
Average wastewater quality	BOD_5	260 g/m^3
	Total suspended solids (TSS)	360 g/m^3
	Total nitrogen	43 g/m^3
	Ammonia nitrogen	27 g/m^3
	Total phosphorus	8.4 g/m^3

Metric	Parameter	Estimated number/volume/concentration
	Faecal coliform bacteria	10^6 to 10^7 per 100mL
	Enteric viruses	10^3 to 10^4 per 100mL

The methodology developed by NIWA for the generic assessment of effects for Auckland's wastewater network overflows (detailed further in Section 2.3 below) represents overflow discharge quality using the 90th percentile concentration of a range of constituents measured in influent to Watercare's Mangere Wastewater Treatment Plant (Table 2-2). The rationale is that those concentrations are appropriate for situations in which a 'plug' of relatively undiluted wastewater may be discharged at the onset of an overflow event. While actual concentrations are likely to be considerably lower most of the time, it was considered appropriate to adopt a conservative approach in the assessment of wastewater network overflows. Because the NIWA methodology is based on the Mangere data the same values have been adopted for the Porirua assessment. Table 2-2 indicates that contaminant concentrations in influent to Mangere WWTP are higher than those received at Porirua WWTP, making this a particularly conservative approach.

Table 2-2: Comparison 90th Percentile Concentrations in Influent to Mangere WWTP and Porirua WWTP

Constituent	90th Percentile Concentration	
	Mangere WWTP	Porirua WWTP
Total suspended solids (g/m^3)	531	360
BOD_5 (g/m^3)	550	260
Total ammonia nitrogen (g/m^3)	47	27
Total nitrogen (g/m^3)	78	43
Total phosphorus (g/m^3)	7.9	8.4
Sulphide (g/m^3)	5	No data
Copper (g/m^3)	0.096	No data
Zinc (g/m^3)	0.31	No data
Norovirus (n per L)	10^6	No data
E. coli (n per 100mL)	4×10^6	No data

The list of wastewater contaminants in Table 2-2 above is not exhaustive. A range of emerging organic contaminants (EOCs) that are not commonly monitored in wastewater or in the receiving environment are known to be present in untreated wastewater.

There are multiple definitions of emerging organic contaminants however a widely accepted definition from the United States Geological Survey (USGS) defines emerging contaminants as: "*…any synthetic or naturally occurring chemical or any microorganism that is not commonly monitored in the environment but has the potential to enter the environment and cause known or suspected adverse ecological and (or) human health effects. In some cases, environmental effect has likely occurred for a long time, but may not have been recognised until new detection methods were developed. In other cases, synthesis of new chemicals or changes in use and disposal of existing chemicals can create new sources of EC's.*" (USGS 2011, cited in *cited in Tremblay et al. 2011, p114*).

There are many known EOCs (and potentially many more which have not yet been identified), which makes it difficult to identify and analyse all possible EOCs existing in the environment. Analytical methods are also currently not available for some EOCs, or are still in their infancy (and therefore highly expensive, and restricted to advanced research laboratories).

Examples of substances containing EOCs include chemicals used in industrial and domestic cleaning products, textile manufacturing, paints, inks and surface treatments, kitchen and laundry detergents, personal care products, cosmetics, pharmaceuticals, and medicines. Products and medicines containing EOCs are used daily by the human population and enter domestic wastewater from bathing, laundry, and toileting activities. Treated urban wastewater is one of the major sources of EOCs to the environment in New Zealand.

Recent studies of EOC concentrations in wastewater include the municipal wastewater systems at Porirua City (Northcott, 2019) and Gisborne City (Stewart, 2020)r, while Olsen (2017) examined EOCs in subtidal sediments of Wellington Harbour.

Three samples of Porirua WWTP influent and treated wastewater were tested for a total of 85 individual EOCs. A total of 45 EOCs were detected in the influent samples over the three sampling occasions (Table 2-3).

Table 2-3: Concentrations of EOCs in the influent to the Porirua WWTP (Northcott 2019); those shaded blue required dilution to achieve no risk of toxicity.

Emerging Organic Chemical	Influent Concentrations (ng/L)			PNEC/NOEC (ng/L)	Dilution Required for no Risk	Source
	min	median	max			
Industrial alkylphenols						
Technical nonylphenol	470	494	573	330	1.7-fold	European Union 2002
Alkylphosphate Flame Retardants						
TnBP	237	261	426	660,000	none	Verbruggen 2005
TiBP	182	186	187	150,000	none	Verbruggen 2005
TBEP	7965	27324	40920	1,300	31.5-fold	Verbruggen 2005
TCEP	368	443	500	460,000	none	Verbruggen 2005
TCPP	3476	3640	3937	160,000	none	Verbruggen 2005
TDCP	636	666	718	1,300	none	Env Canada 2016
TPP	134	136	137	740	none	Verbruggen 2005
Phenolic Antimicrobials						
Triclosan	165	197	210	100	2.1-fold	WFD-UKTAG 2009
Polycyclic musks						
Galaxolide	3227	3317	4002	68,000	none	Hera 2004
Tonalide	92.3	96	110	3,500	none	Hera 2004
Pharmaceuticals						
Carbamazepine	626	684	846	9000	none	Zhao et al 2017
Diclofenac	382	502	556	9800	none	Zhao et al 2017
Ibuprofen	5538	7146	9323	13875	none	Ortez de Garcia, 2014
Naproxen	45.3	2620	2953	14,199	none	Ortez de Garcia, 2014
Salicylic acid	204	515	1151	118,700	none	Ortez de Garcia, 2014
Plasticisers						
Bisphenol-A	800	1446	2167	60	36.1-fold	Wright-Walters, 2011
Benzyl butyl phthalate	227	288	329	51,000	none	Staples 2000
Di-n-butyl phthalate	513	735	890	10,000	none	Staples 2011
Diethyl phthalate	6549	7322	7356	940,000	none	Staples 2000
Dimethyl phthalate	210	317	287	3,251,000	none	Staples 2000
Estrogenic steroid hormones						

Emerging Organic Chemical	Influent Concentrations (ng/L)			PNEC/NOEC (ng/L)	Dilution Required for no Risk	Source
	min	median	max			
17β-estradiol	1	28.3	34.5	2	17.3-fold	Caldwell et al 2012
Estrone	68.9	79	83	6	13.8-fold	Caldwell et al 2012

Northcott (2019) conducted a risk assessment for the twenty-three EOCs measured in Porirua wastewater for which 'Predicted No Effect Concentration' (PNEC) values are available. The concentration of all but six EOCs in the influent fell below their respective PNEC values, indicating they present no risk to aquatic organisms exposed to undiluted network overflows. The remaining six EOCs exceeded their respective PNEC values, indicating potential risk to aquatic organisms exposed to a network overflow. These include technical nonylphenol, TBEP, triclosan, bisphenol-A, 17β-estradiol and estrone. The calculated dilution required for these substances to present no risk to aquatic organisms in receiving waters is 36-fold, which is about the same level of dilution required to avoid toxic effects from ammoniacal nitrogen.

The Gisborne study (Stewart, 2020) identified 22 priority EOCs in Gisborne wastewater including many of those also detected in Porirua wastewater. Those contaminants that ranked as high risk across both the Porirua and Gisborne studies include:

- Industrial alkyphenols (technical nonylphenol)
- Phenolic antimicrobials (triclosan)
- Alkylphosphate flame retardants (TBEP, TCPP)
- Plasticer metabolites (monoethylhexyl phthalate acid ester, Bisphenol-A) and
- Estogenic steroids (17α-ethynylestradiol, 17β-estradiol, estrone).

Adverse effects associated with EOCs in the water column and sediments from overflows to streams are likely to be relatively minor because erosional conditions during wet weather overflows are more likely to transport these contaminants downstream, resulting in temporary, short-term exposure (NIWA 2013). The risks associated with EOCs are higher in downstream depositional environments including estuaries and sheltered harbours where contaminants can bind with particulates and may accumulate in marine sediments.

Sediment quality surveys have been conducted in Porirua Harbour on five occasions to date: 2008, 2009, 2010, 2015 and 2020. While none of these surveys have included analysis for EOCs, other trace contaminants including metals (copper, cadmium, chromium, nickel, lead and zinc) have been investigated. Forrest et al. (2020) compared trace metal concentrations against ANZG (2018) sediment quality guidelines and reported that mean concentrations were well below default guideline values (DFV) over all five surveys, and generally within the 'very good' condition bracket. While there was no evidence of widespread intertidal trace metal contamination, sediments at site Onep-B at the southern end of Onepoto Arm contained some metals (zinc, cadmium, lead) at up to twice the concentrations recorded at other sites, likely reflecting contributions from diffuse urban sources such as run-off from roads.

2.2 VALUES OF THE RECEIVING ENVIRONMENTS

Schedules of the pNRP identify sites with significant cultural, recreational, heritage and biodiversity values that require particular recognition or protection. Classification of receiving environment values, which is the first stage of this assessment of effects as detailed in the next section, was guided primarily by the pNRP Schedules and further informed by relevant technical reports and consultation with key stakeholders.

2.3 METHODOLOGY FOR ASSESSMENT OF EFFECTS OF WET WEATHER OVERFLOWS

This assessment of effects on the environment has been conducted in accordance with the 'Methodology for the Assessment of Wet Weather Wastewater Overflows' (Wellington Water 2020). The methodology has been specifically developed to allow for the comparative assessment of public health, ecological, cultural and aesthetic effects on aquatic receiving environments that may occur following a wet weather wastewater overflow.

The methodology is an important component of Wellington Water's overall approach to managing wastewater overflows from the public wastewater network (the Network) and prioritisation of Network improvement works. It provides a consistent, repeatable, and auditable process for broadly assessing the potential public health, ecological, cultural, and aesthetic effects of Network overflows during wet weather. It caters for a diverse range of aquatic receiving environments and considers the two most important characterises of wet weather overflows, namely frequency and volume.

The assessment process utilises existing information and data and recognises that the amount and quality of information on wastewater overflow characteristics and receiving environments varies significantly across the network and may be quite limited in some instances. It allows for the consideration of site-specific information while generating outputs that are comparable between individual overflow points as well as catchments.

2.3.1 Information required

Specific reference information is required to implement the Methodology and complete an aquatic Receiving Environment (RE) assessment:

1) Overflow volumes and frequency data. This may be modelled information or monitored (SCADA) data and can be obtained from the Wellington Water Wastewater Networks Overflow Database.
2) Receiving water quality monitoring data, flow monitoring data (WWL, GWRC, LAWA, and NZ River Maps, https://shiny.niwa.co.nz/nzrivermaps), benthic ecology data (periphyton, invertebrates), and fish records from the New Zealand Freshwater Fish Database (NZFFD) and technical reports.
3) The NIWA report entitled 'Auckland-wide Wastewater Network Discharge Consent Applications - Generic Assessment of Ecological and Recreational Effects' ((Moores, et al., 2013), to provide background and guidance for determining the potential public health and ecological effects associated with wet weather wastewater overflows.
4) The tables of public health and aquatic ecology effects from the NIWA report which score the magnitude of effects and provide a brief description of those effects for each permutation of overflow characteristics, receiving environment type and receiving environment values.
5) Recent aerial imagery and maps.
6) Wellington Water ArcGIS Online (Regional Water, Stormwater, Wastewater; Wastewater Overflows Dashboard).
7) The Proposed Natural Resources Plan (and any relevant appeal outcomes).

2.3.2 Overflow types

For the purposes of this report, wastewater network overflow points (WNOs) are categorised into the following types:

- Type 1: Associated with pump stations
- Type 2: Constructed gravity network reliefs
- Type 3: Uncontrolled overflows (confirmed)
- Type 5: Uncontrolled modelled overflows (unconfirmed).

Unconfirmed modelled overflows (Type 5) have not been considered as part of this assessment as these overflows are considered fictitious until further investigations verify overflow locations. A list of Type 5 WNOs and their associated modelled risks are provided in Appendix C.

2.3.3 Outline of the process

The Methodology used to assess the environmental effects of overflow discharges is described in detail in Attachment 3 to the proposed consent conditions.

A high-level overview is presented in Figure 2-1 below. In general terms the assessment for each individual overflow point includes identification of the relevant receiving environment (including direct, secondary, and ultimate), establishment of receiving environment type (small waterway, medium waterway, large waterway, lake, estuary, inner harbour, outer harbour, beach), identification of receiving environment values (recreational, ecological, cultural and aesthetic), determination of overflow characteristics (volume and frequency), assessment of potential magnitude of adverse effects and determination of an overall level of adverse effect (public health, aquatic ecology, cultural values and aesthetic). The methodology also includes an assessment of potential cumulative effects.

Scores were assigned by expert judgement, supported by prior knowledge of the physical, chemical, and biological processes and interactions operating in receiving waters. Ultimately each receiving environment is assigned a level of public health and ecological effects rating, and a pre-written assessment prepared by Moores, et al. (2013) for each permutation of the factors outlined above.

2.3.4 pNRP objectives and policies

An assessment of the current state of the receiving environment against pNRP Objective O18 (suitability for contact recreation) and Objective 019 (biodiversity, aquatic ecosystem health and mahinga kai) has been conducted for each sub-catchment, using existing information and data. It is recognised, however, that the amount and quality of information varies significantly across the wastewater catchment and is quite limited in some instances.

A generic assessment, rather than a site-specific assessment, has been conducted against pNRP Policy P93 water quality guidelines. Policy P93 is well suited to a continuous point-source discharge to a river where an upstream reference site, downstream impact site and intermediate mixing zone can be defined, and a routine monitoring programme can be implemented. Wet weather overflow discharges from a wastewater network are not of this type. They occur at multiple locations for a short period in response to a rainfall event, repeating intermittently over time. Identification of an upstream reference site, a zone of reasonable mixing, and implementation of a water quality monitoring programme are all problematic for this type of discharge. For these reasons the assessment against Policy P93 guidelines has been based on a series of representative discharge scenarios.

Figure 2-1: Overview of the methodology for assessing the level of adverse effects from wet weather overflows

2.3.5 Assessment steps

An explanation of the assessment steps is provided below.

Step 1 Identify receiving environment

Step 1 is the identification of the receiving environment for each individual overflow. It involves tracing the discharge from the wastewater network overflow point to the receiving environment. This step is automated in GIS and then checked visually by mapping.

Step 2 Establishment of receiving environment type

Once the receiving environment for each overflow is determined it is then classified as one of eight types. The receiving environment type is an important factor in determining the available dilution and potential magnitude of adverse effect. The receiving environment types are:

- Small waterway (order 1 or 2, <100 L/s)
- Medium waterway (order 3 or 4, 100 to 1000 L/s)
- Large waterway (order 5 or greater, >1000 L/s)
- Lake
- Estuary
- Beach (including open coast)
- Inner Harbour (sheltered, partially enclosed)
- Outer harbour (semi exposed).

These receiving environment types are based on those proposed by Moores et al. (2013) for Auckland, but several amendments have been made to better represent the Wellington situation:

a) A “Medium Waterway” type has been added to the “Small” and “Large” categories to better represent the wider size range of waterways in Wellington (there are no 5th order waterways in the Mangere catchment while Wellington has several).

b) The “Harbour” type has been split into “Inner Harbour” and “Outer Harbour” to represent the difference between the more enclosed waters of Evans Bay and Lambton Harbour, compared to areas more directly connected to Cook Strait.

Receiving environment types and size thresholds are otherwise the same as those used by Moores et al. (2013).

Step 3 Classification of receiving environment values

Information is compiled for each receiving environment from a variety of sources and used to describe the physical characteristics and current state of the environment. Where data allows the current state is benchmarked against pNRP objectives and NPS-FM attribute states. The environment is then rated in respect of recreational, ecological, cultural, and aesthetic values.

Worked example – Duck Creek:

Duck Creek is a 3rd order watercourse which drains a catchment of approximately 1,032 hectares in and beyond the Whitby urban area. The stream has an estimated mean flow of 184 L/s and mean annual low flow of 28 L/s. The River Environment Classification (REC2) classifies Duck Creek as having ‘warm wet climate/low elevation/hard sedimentary geology/urban landcover’.

Table 2-4 summarises the results of Wellington Water monthly *E. coli* monitoring in Duck Creek over the period from February 2020 to June 2022. The results indicate a moderate degree of faecal contamination. The site does not achieve pNRP objective O18 for contact recreation and is placed in NPS-FM Attribute State "E" indicating a predicted average risk of infection of >7% for full contact recreation users.

Table 2-4: Summary statistics and NPS-FM Attribute State for *E. coli* (WWL data 2020 -2022)

Site name	N samples	% exceedance over 540 CFU/100mL	% exceedance over 260 CFU/100mL	Median concentration CFU/100mL	95th percentile CFU/100mL	NPS-FM Attribute State	pNRP O18 (95th %ile ≤540)
Duck Creek (PAFW1)	**29**	**45**	**69**	**454**	**2,900**	E	Not meeting

Table 2-5: Summary of Duck Creek receiving environment characteristics and values

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Duck Creek	Medium Waterway	Class 1 (Known fishing site)	Class 1 (High ecological value)	Class 1 (Very important)	Class 1 (High value)

Step 4 Determination of WNO Characteristics

Determination of WNO characteristics is based on either monitoring data or output from modelling of the wastewater network. It includes estimates of the following:

a. Overflow volume and frequency (high, medium, low) as summarised in Table 2-6.

b. Spatial distribution of overflow points (receiving waters affected by single or multiple overflow points).

Table 2-6: Overflow volume and frequency ranges

Overflow range	Volume Definition	Frequency Definition
High	Actual or estimated annual volume of 6,000m³ or greater.	More than 10 overflow events per year.
Medium	Actual or estimated annual volume of between 600 and 6,000m³.	Between 3 and 10 overflow events per year.
Low	Actual or estimated annual volume of less than 600m³, including zero volume.	2 or fewer overflow events per year.

The volume threshold values defining high, medium, and low volumes (600m^3 and 6000m^3) have been adjusted downwards from those used by Watercare (1000m^3 and 10,000m^3). The rationale is that the lower thresholds better reflect the recorded spread of overflow volumes from the Porirua network (One WNO was high volume, five were medium volume and the remainder were low volume).

The frequency threshold value between high and medium number of overflows has also been adjusted downward from 12 to 10 events per year. The rationale for this is again that these thresholds better reflect the frequency distribution of overflow events in the Porirua network (One WNO operated at high frequency, six were at medium frequency and the remainder were low frequency overflows).

Lower thresholds could result in a slightly more conservative assessment of the 'level of adverse effect' at some WNO locations than was proposed by NIWA (2013), for instance where it causes a 'low' overflow volume/frequency to be reclassified as a 'medium'. In practice very few WNO sites are caught in this way and the overall effect on the assessment effects is negligible.

Worked example – asset ID 34, Duck Creek

A summary of wastewater network overflow characteristics for WNO 34 on Duck Creek is given in Table 2-7.

Table 2-7: Summary of Wastewater Network Overflow Characteristics, Duck Creek

Overflow ID	Direct/ indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	Number	Range		
34	Direct	763	Medium	4	Medium	Operative	WWL records and overflow forms (2015 – 2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)

Note: There are multiple WNOs to Duck Creek but for simplicity only WNO (34) is shown.

Step 5 Assessment of Potential Effects

5(a) Public Health Effects

The methodology for assessing public health effects is based on an approach developed by Moores, et al., (2013) and (Watercare, 2013) specifically for the purpose of determining the potential effects of wet weather overflows from the wastewater network on aquatic receiving environments. The assessment methodology focuses on contaminant load and concentration, and is based on a three-step process that:

a. Considers the potential physical, chemical and biological changes generated by wastewater overflows.

b. Determines the potential magnitude of effect which arises from these changes and the characteristics (type and values) of the receiving environment. A NIWA expert panel identified, assessed, and scored each of the potential effects. In total there are 54 variations of public health effects, which have been summarised as pre-written text in Appendix B of the Assessment of Effects Methodology included with the consent conditions.

c. Determines the overall level of adverse effect by combining the magnitude of effect and frequency of occurrence, the latter based on historic data and/or modelling.

Worked example – Duck Creek

Duck Creek is a known whitebaiting site and is assessed as having 'Class 1 recreational value'[1]. A 'Medium' volume discharge to a 'Medium waterway' with 'Class 1 recreational values' is assessed as having a 'Very High' potential effect on all recreational activities. This combination of factors automatically determines the 'magnitude of public health effect' assessment score and text included in Table 2-8.

Table 2-8 describes the potential magnitude of effect from a single overflow event but does not consider the frequency of occurrence. The combination of the magnitude of the event and the frequency of occurrence determines the overall level of effect. In this case, the magnitude of effect

[1] Class 1 recreational value is 'high', Class 2 is 'moderate' and Class 3 is 'low'.

is ‘Very High’, overflows have historically occurred a moderate frequency, resulting in an overall level of public health effect is also ’Very High’.

Table 2-8: Magnitude of Public Health Effects from Overflows Duck Creek

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**Very High potential effect (Effects Score of 5)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for collecting shellfish	**Very High potential effect (Effects Score of 5)** because shellfish have the potential to filter pathogens and metals from water and sediments.
Loss of suitability for fishing	**Very High potential effect (Effects Score of 5)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for harvesting watercress	**Very High potential effect (Effects Score of 5)** because seaweed can be a hydraulic trap for particulate contaminants

Table 2-9: Overall level of Public Health Effects in Duck Creek

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Level of Public Health Effect
34	Direct	**Very High**	Medium	**Very High**

5(b) Assessment of Magnitude of Ecological Effects

The assessment methodology for ecological effects is similar to that described above for public health effects. It focuses on contaminant load and concentration, and is based on a three-step process which:

a. Considers the potential physical, chemical and biological changes generated by wastewater overflows.

b. Determines the potential magnitude effect which arises from these changes and the characteristics (type and values) of the receiving environment. In total 54 variations of ecological effects have been determined by an expert panel (Moores, et al, 2013), which are summarised as pre-written text in Appendix C of the Methodology report.

c. Determines the overall level of adverse effect by combining the magnitude of effect and frequency of occurrence, the latter based on historic data and/or modelling.

Worked example – Duck Creek

Overflows into Duck Creek from WNO Site 34 which have a ‘Medium’ volume and frequency.

Discharges to medium waterways with a ‘Class 1’ recreational value are assessed as having ‘predominantly high’ potential effects on ecological values.

The level of ecological effects is defined as the combination of the likelihood of an event and the consequences of an event. The assessed level of ecological effect at Duck Creek is ‘High’.

Table 2-10: Magnitude of ecological effects of overflows to Duck Creek

Potential Effect	Magnitude of Ecological Effect
Change in physical habitat suitability	**Effects Score of 4 (High),** because of the extent of physical and chemical changes resulting from a wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Effects Score of 4 (High),** because toxicant concentrations and toxicants may increase up to 20-fold above background levels.
Change in community structure/loss of sensitive species	**Effects Score of 4 (High),** because changes in physico- chemical habitat suitability are likely.
Behavioural changes in fin fish	**Effects Score of 3 (Moderate),** because there changes in physico-chemical habitat suitability are likely.
Increase in nuisance plants	**Effects Score of 2 (Low),** because of the generally short residence time of elevated nutrient concentrations and other constraints on plant growth
Reduced quantities of fin fish	**Effects Score of 4 (High),** because of changes in physico-chemical habitat suitability are likely.
Growth of sewage fungus/Beggiatoa	**Effects Score of 4 (High),** because BOD enrichment is likely to stimulate the growth of these organisms.

Table 2-11: Overall level ecological effects at Duck Creek

Overflow ID	Direct/Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level of Ecological Effect
34	Direct	**High**	Medium	**High**

5(c) Assessment of Potential Cultural Effects

Potential cultural effects are determined from receiving environment cultural value class (1 or 2) and overflow volume range (low, medium, or high). The overall level of cultural effects is directly linked to overflow frequency (i.e., if the overflow frequency is high the level of adverse effect is high).

Worked example – Duck Creek

Duck Creek is assessed as having 'Very Important' cultural values (Class 1).

A 'Medium' volume overflow discharge to a waterway with 'Very Important' cultural values results in 'High' potential magnitude of cultural effects (Table 2-12). The combination of 'High' magnitude and 'Moderate' frequency of discharge results in a 'Moderate' overall **level** of cultural effect (Table 2-13).

Table 2-12: Cultural Effects Scale

Overflow Volume Range	Cultural Receiving Environment Class	
	Class 1: Very Important	Class 2: Important
High	Very High	High
Medium	High	Moderate
Low	Moderate	Low

Table 2-13: Overall Level of Cultural Effects

Overflow Frequency Range	Potential Cultural Effect			
	Very High	High	Moderate	Low
High	High	High	High	High
Medium	Moderate	Moderate	Moderate	Moderate
Low	Low	Low	Low	Low

5(d) Assessment of Potential Aesthetic Effects

The assessment of effects on aesthetic values relates to the loss of aesthetic enjoyment because of clearly visible and identifiable residue from wastewater overflows (visual effects) and readily detectable smell (odour effects). Visual and odour effects are primarily experienced by people and therefore these effects relate to public access. Where the location of the overflow is directly accessible or adjacent to a residential area there is potential for aesthetic effects to occur. The assessment is limited to two aesthetic value classes based on the level of public access – high or low (aesthetic effects only occur if people are there to experience them).

a. The assessment of the magnitude of effects is based on receiving environment aesthetic value class (level of public access) & overflow volume range.

b. The overall level of effect is determined from magnitude of effect and the frequency range.

Worked example – Duck Creek:

Duck Creek is assessed as having 'high' aesthetic value as the level of public access in high. 'Medium' volume discharges to such an environment have a 'high' potential to affect these values. Because overflows occur with a 'Moderate' frequency, the overall level of effect is 'Moderate' (Table 2-14 and Table 2-15).

Table 2-14: Aesthetic Effects Scale

Overflow Volume Range	Aesthetic Receiving Environment Class	
	Class 1: High Value	Class: Low Value
High	High	Low
Medium	High	Low
Low	High	Low

Table 2-15: Overall Level of Aesthetic Effects

Overflow Frequency Range	Potential Magnitude of Aesthetic Effect	
	High	Low
High	High	Low
Medium	Moderate	Low
Low	Low	Low

Step 6 Assessment of Potential Cumulative Effects

For the purpose of this methodology, cumulative effects apply to public health and ecological effects, and have been interpreted to mean effects arising in combination with other effects, namely when several wastewater overflows in close proximity to each other are likely to occur at the same time and together generate a larger volume than a single overflow would.

In many cases the overall level of effects score will not change where the cumulative effect is generated by one high volume and several low volume overflows, because the individual assessment is already based on a high-volume overflow. However, there may be instances where several low volume discharges overflow together and would increase the total volume of wastewater in the receiving environment to the medium volume range. In such cases the medium volume effects score is assigned to determine the potential cumulative effects.

Worked example – Duck Creek:

For the Duck Creek receiving environment, cumulative effects are considered possible because:

- There are six direct overflow points that could potentially discharge and may have a combined effect depending on the timing of wet weather events, spatial variation in rainfall during those events, and several other contributing factors such as wastewater network capacity and condition .
- WNO Site 34 is known to have a 'Medium' overflow volume.

For a cumulative effect to arise, most of the direct potential overflows would need to occur at the same time. The cumulative volume of the overflows is likely to fall within the 'Medium' volume range with an overall level of public health effect of 'Very High'. This is the same as the assessment in section 5.9.3 and so cumulative effects are unlikely to change the level of effect.

Step 7 Summary of Magnitude and Overall Level of Effects

The summary of the assessment of effects is provided in two ways, by receiving environment and by discharge point, as follows:

a. An effects score for the four key values and brief narrative at the end of each receiving environment assessment that focuses on the most significant effects, and

b. A table at the end of each wastewater catchment report listing overflow ID, the receiving environment, the volume and frequency range and the overall level of adverse effect assessed for public health, ecology, cultural values and aesthetic values.

Worked example – Duck Creek:

Summary table for the Duck Creek receiving environment (Table 2-16) and summary list of constructed overflow points based on the assessed level of adverse effect (Table 2-17)

Table 2-16: Summary of Potential Effects for Duck Creek

Value category	Potential magnitude of effect	Overall level of effect
Public health	Very High	Very High
Aquatic ecology	Very High	High
Cultural	High	Moderate
Aesthetic	High	Moderate

Table 2-17: Summary of the Overall Level of Adverse Effects for Each WNO

WNO number	Catchment	Pump Station	Assessed Volume Range	Assessed Frequency Range	Direct Receiving Environment	Public Health effects	Ecological Effects	Cultural Effects	Aesthetic Effects	Overall Effects Score	Level of adverse effect
64	Porirua	PS20	High	High	Porirua Stream	5	5	4	4	18	Very High
34	Duck	PS01	Medium	Medium	Duck Creek	5	4	3	3	15	High
84	Pāuatahanui	PS38	Medium	Medium	Pāuatahanui Stream	5	4	3	3	15	High
83	Porirua Coast	PS35	Medium	Medium	Titahi Bay	4	3	3	3	13	Moderate
45	Duck	PS02	Low	Low	Browns Bay Stream	4	4	2	2	12	Moderate
85	Duck	PS39	Medium	Medium	Bradeys Bay	3	3	3	3	12	Moderate
90	Porirua	PS6A	Medium	Medium	Onepoto Arm	3	3	3	3	12	Moderate

2.3.6 Ground truthing of AEE methodology

The methodology adopted for the assessment of effects of WNO's relies on a matrix in which the potential effects are scored from very high to very low for each of eight types of receiving environment, taking into account variations in receiving environment values, volume of discharges and dilution. Scores were assigned by expert judgement, supported by prior knowledge of the physical, chemical, and biological processes and interactions operating in receiving waters.

A sense check of this approach was conducted by mass balance calculation for several key contaminants, assuming low, medium, and high-volume discharges to small, moderate and large waterways, comparing calculated contaminant concentrations against water quality guideline criteria, and checking these values against the generic AEE output (Appendix C). This process provides some assurance that the level of effects indicated by the AEE methodology alignments reasonably well with the outcomes indicated by monitoring results and expert opinion.

For several of the impacted stream reaches, routine monthly monitoring data is available, and while that monitoring is not specifically focused on wet weather overflow events, some of the upper percentile values correlate with overflow events. Monitoring data, where available, is discussed for each of the sub-catchments included in this report and is considered in combination with the generic assessment.

3.0 EFFECTS OF WET WEATHER OVERFLOWS

This section describes the values of freshwater and coastal receiving environments that lie within and adjacent to the Porirua catchments; identifies potential effects of wet weather overflows on those values; assesses the potential magnitude of those effects which, in combination with frequency, determines the overall level of adverse to the receiving environment (and the identified values). Maps provided for each sub-catchment present the location of overflow points in relation to the receiving environment and pNRP scheduled values. This assessment is undertaken in accordance with the Methodology for the Assessment of Effects of Wet Weather Wastewater Overflows (Wellington Water, 2020).

Wastewater overflows from pumping stations and purpose-built overflow structures are typically channelled into waterways including freshwater streams, rivers, and coastal environments. Constructed overflows have been designed to mitigate the risk of overflows to private properties, buildings, footpaths, and roadways (see Figure 3-1). However, in the Porirua WWTP catchment, unlike the Hutt, Wainuiomata, Wellington and Karori catchments, most overflows are uncontrolled. Uncontrolled overflows may occur from surcharging manholes onto a road, for instance, and are then channelled into waterways via the stormwater network.

For the purposes of this report WNOs are categorised into:

- Type 1: Associated with pump stations
- Type 2: Constructed gravity network reliefs
- Type 3: Uncontrolled overflows (confirmed)
- Type 5: Uncontrolled modelled overflows (unconfirmed).

This assessment has identified 120 WNOs in six sub-catchments which discharge to 14 receiving environments as shown below in Table 3-1. It is noted that a discharge in the upper catchment can have a direct impact on the immediate receiving waters and an indirect impact on downstream receiving waters.

One hundred and twenty WNOs have been identified within the Porirua wastewater network. Of the 120 WNOs, 86 are associated with pump stations (Type 1), 3 are overflows from constructed network relief points (Type 2) and the remaining 31 sites are uncontrolled overflow points (Type 3). Eighty overflows are direct to a freshwater stream or river, while the remaining 40 discharge to coastal water bodies.

A list of all confirmed WNOs (Type 1, 2 and 3) in the Porirua network and their respective receiving environments is provided in Appendix A.

Unconfirmed modelled overflows (Type 5) have not been considered as part of this assessment as these overflows are considered fictitious until further investigations verify overflow locations. A list of Type 5 WNOs and their associated modelled risks are provided in Appendix C.

3.1 WASTEWATER CATCHMENTS AND SUB-CATCHMENTS

The catchment for the Porirua Wastewater Treatment Plant includes the urban areas of Porirua, Tawa and part of Johnsonville, which are described in this report as 7 sub-catchments, 6 of which include a local authority wastewater network. The sub-catchments mostly correspond with stream catchments, except the flat coastal areas without significant streams which are combined into ‘coastal’ catchments. The catchments, and their PNRP scheduled values are listed in Table 3-2 and illustrated in Figure 3-1.

Table 3-1: Constructed and uncontrolled overflow points and their receiving environments

Sub - Catchment	Overflow Point	Receiving Environment		
		Direct	Secondary	Ultimate
Taupo	53, 58, 86, 87, 89	Taupō Stream	Plimmerton Beach	Porirua Coast
Porirua	11, 14, 18, 19, 23, 25, 27, 28, 32, 35	Kenepuru Stream	Porirua Stream	Onepoto Arm
	15, 63	Mahinawa Stream /Kahutea Stream	n/a	Onepoto Arm
	12, 37, 64, 71, 384, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 429, 430, 431	Porirua Stream (including Rangituhi Stream)	n/a	Onepoto Arm
	7, 24, 59, 76, 77, 80, 81, 82, 88, 90, 383	Onepoto Arm	n/a	n/a
	1, 6, 10, 21, 31, 60	Onepoto Fringe Lagoons (Aotea Lagoon, Papakowhai Lagoon)	n/a	Onepoto Arm
Duck	45	Browns Bay Stream	n/a	Pāuatahanui Inlet
	26, 34, 41, 42, 43, 72	Duck Creek	n/a	Pāuatahanui Inlet
	5, 46, 47, 48, 49, 62, 85	Pāuatahanui Inlet	n/a	n/a
Kakaho	33, 50, 51, 52, 61, 75	Pāuatahanui Inlet	n/a	n/a
Pāuatahanui	8, 84, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428	Pāuatahanui Stream	n/a	Pāuatahanui Inlet
	74	Pāuatahanui Inlet	n/a	n/a
Porirua Coast	79	Titahi Bay	n/a	Porirua Coast
	83	Porirua Coast	n/a	n/a
	54, 55, 56, 57, 91, 92	Plimmerton	n/a	Porirua Coast
	65, 66, 67, 68, 69, 70, 73, 78	Pukerua Bay	n/a	Porirua Coast

Table 3-2: The wastewater sub-catchments

Sub-catchment	Catchment Area (km^2)	Local Authority Wastewater Network?	PNRP Schedules								
			A	F1	F1b	F2	F3	F4	F5	H1	I
1. Taupō	10.6	yes		✓	✓	✓		✓	✓		
2. Kakaho	14.8	yes	✓	✓	✓	✓	✓	✓			
3. Horokiri	41.0	no	✓	✓	✓	✓	✓	✓			
4. Pāuatahanui	81.2	yes	✓	✓	✓	✓		✓			
5. Duck	12.0	yes	✓	✓	✓	✓	✓	✓			
6. Porirua	66.5	yes		✓	✓	✓	✓				
7. Porirua Coast	14.4	yes				✓	✓		✓	✓	

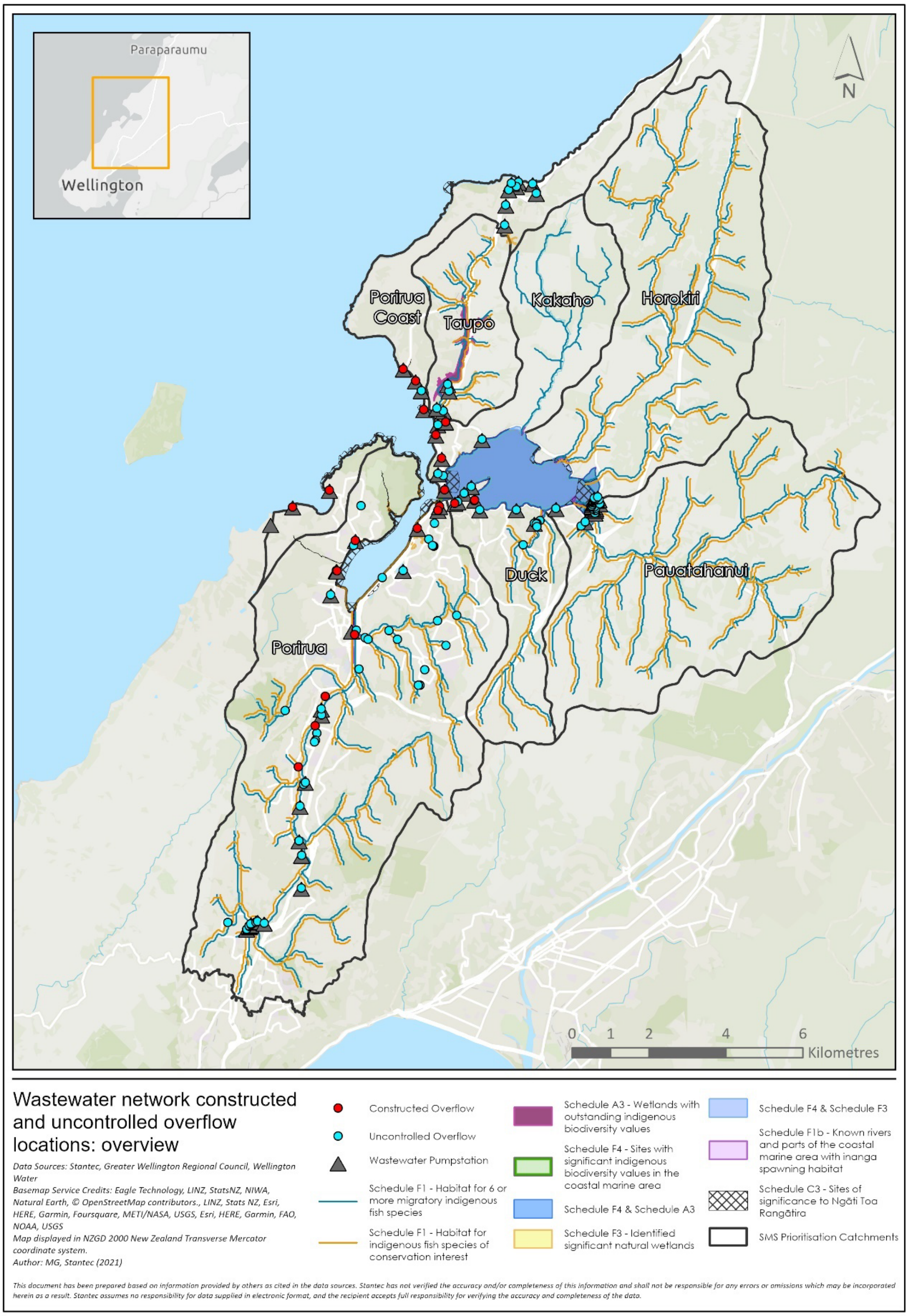

Figure 3-1: Overview of wastewater sub-catchments and wastewater network overflows (WNOs)

3.2 TAUPŌ – TAUPŌ STREAM

3.2.1 Description of the Receiving Environment

Taupō Stream is a 3rd order watercourse which runs approximately 6.5 kilometres from its headwaters south of Pukerua Bay to the coastal marine area at Southern Beach, Plimmerton (Figure 3-2). The stream has a total catchment area of 10.6 km^2 and an estimated mean flow of 180 L/s. The River Environment Classification (REC) is 'warm dry climate/low elevation/soft sedimentary geology/pastural and urban landcover'.

A central feature of the catchment is the 30-ha wetland area, which is the largest remaining harakeke (flax) swamp in the Wellington region. The Queen Elizabeth II National Trust (QEII) purchased Taupō Swamp in 1986 to protect its special values. The Taupō Swamp complex is listed in pNRP Schedule A3 as a wetland with outstanding biodiversity values.

Table 3-3 summarises the results of GWRC monthly *E. coli* monitoring in the Taupō Stream at Plimmerton Domain from July 2020 to January 2023. The results indicate a moderate degree of faecal contamination at the site. Taupō Stream does not meet pNRP objective O18 for *E. coli* and is in the NPS-FM lowest attribute band, E (red), indicating a predicted average risk of infection of >7% for full contact recreation users (although full contact recreation is unlikely in this watercourse).

Table 3-3: *E. coli* (CFU/100mL) water quality sampling results for Taupō Stream (July 2020 to January 2023)

Site name	N samples	% exceeding 540 CFU/100mL	% exceeding 260 CFU/100mL	Median concentration CFU/100mL	95th percentile CFU/100mL	NPS-FM Attribute State	pNRP O18 (95th %ile ≤540)
Taupō Stream @ Plimmerton Domain	30	30	53	290	3320	E	Not meeting

The ecological component of the RWQE program includes monthly monitoring of macroinvertebrate communities in the Taupō Stream at Plimmerton Domain. No periphyton assessments have been made due to water being too turbid. Two annual macroinvertebrate community surveys have been completed, which indicate that pNRP objective O19 is not achieved.

Table 3-4: Macroinvertebrate community metrics for Taupō Stream (2020/21 and 2021/22)

Site name	substrate	River class	Significant river	N samples	Taxa richness	%EPT (2-yr median)	MCI (2-yr median)	QMCI (3-yr median)	pNRP O19 – MCI	pNRP O19 – QMCI	Meeting O19
Plimmerton Domain	Soft	6	No	2	21	6	69	3.3	≥ 105	≥ 5.5	Not meeting

Seven native fish species were recorded in the Taupō Stream from six surveys conducted between 2000 and 2018: longfin eel, shortfin eel, inanga, giant kokopu, banded kokopu, redfin bully and common bully (NZ Freshwater Fish database, NIWA, 2021 (NZFFD, 2021). All these species except shortfin eel, banded kokopu and common bully are classified as either at risk or threatened (Dunn, et al. 2017). The calculated fish Index of Biotic Integrity (F-IBI) for Taupō

Stream is 52 which gives an NPS Attribute State of A and meets PNRP object O19 for fish (refer to Appendix B for details).

Significant values associated with Taupō stream as scheduled in The proposed Natural Resources Plan are summarised in Table 3-5 and categorised for the wastewater network overflow assessment in Table 3-6.

Table 3-5: Environmental and cultural values identified for Taupō in Schedules of pNRP

Schedule	Category	Significant sites
A	Outstanding water body	Taupō Swamp Complex
B	Ngā Taonga Nui a Kiwa	Taupō Swamp and Stream
C	Sites with significant mana whenua values - Ngāti Toa Rangātira	Taupō Stream Mouth: mahinga kai, puna raranga, rongoā, wai māori, wai ora, wāhi tüpuna, wāhi maumahara.
F1	Rivers and lakes with significant indigenous ecosystems	Taupō Stream has significant indigenous values including habitat for indigenous threatened or at-risk fish, and migratory fish habitat.
F1b	Inanga spawning habitat	Within the tidal reach of Taupō Stream
F4	Indigenous Biodiversity – Coastal	Taupō Stream mouth has significant indigenous biodiversity values in the CMA

Table 3-6: Taupō Stream receiving environment characteristics

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Taupō Stream	Medium Waterway	Class 1 (Known shellfish gather and/or known fishing site)	Class 1 (High value)	Class 1 (Very important)	Class 1 (High value)

3.2.2 Summary of Overflow Characteristics

There are 5 potential overflows to Taupō Stream. All potential overflows are direct overflows. Modelling and historical records shows that direct overflows are of 'Low' volume and 'Low' frequency. All of the potential overflows are located in the lower reaches of the stream, within 1 km of the stream mouth.

Table 3-7: Summary of overflow characteristics, Taupō Stream

Overflow ID	Direct/Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
53, 58, 86, 87, 89	Direct	-	Low	≤1	Low	Operative	WWL Records and Overflow Forms (2015-2020)

3.2.3 Potential Public Health Effects

Taupō Stream is assessed as an area with known contact recreation especially at the stream mouth. It is also a known fishing site and is used for flax gathering. 'Low' volume discharges to medium waterways with 'Class 1' recreational values are assessed as having a 'High' potential effect (Effects score of 4), as shown in Table 3-8.

The overall level of public health effect Taupō Stream is summarised in Table 3-9. Level of effect is defined as the combination of the likelihood of an event and the consequences of an event. The frequency of potential overflow events is 'Low' and the assessed level of public health effect at this location is 'Moderate' (refer to Table 3-9).

Table 3-8: Assessment of public health effects from overflows to Taupō Stream

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**High potential effect (Effects Score of 4)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for collecting shellfish	**High potential effect (Effects Score of 4)** because shellfish have the potential to filter pathogens and metals from water and sediments
Loss of suitability for fishing	**High potential effect (Effects Score of 4)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for harvesting watercress	**High potential effect (Effects Score of 4)** because watercress can be a trap for sediments and gross pollutants, and contaminants bound to them.

Table 3-9: Overall level of public health effects in Taupō Stream

Overflow ID	Direct/Indirect	Potential Magnitude of Public health Effect	Overflow Frequency Range	Level of Public Health Effect
53, 58, 86, 87, 89	Direct	**High**	Low	Moderate

3.2.4 Potential Ecological Effects

Taupō Stream is identified in the pNRP as having important and extensive ecological values. 'Low' volume discharges to medium waterways with 'Class 1' ecological values are assessed as having a 'High' potential effect on ecological values, as shown in Table 3-10.

In situations where potential ecological effects range across more than one effects score, the overall level of effect is determined by the dominant effects score. In this case, the overall level of ecological effect is 'High'.

The level of ecological effects is summarised in Table 3-11. Level of effect is defined as the combination of the likelihood of an event and the consequences of an event. The frequency of overflow events is 'Low' and the assessed level of ecological effect at this location is Moderate.

Table 3-10: Assessment of ecological effects of overflows to Taupō Stream

Potential Effect	Magnitude of Effect
Change in physical habitat suitability	**Effects Score of 4 (High)**, because of the extent of physical and chemical changes resulting from a wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Effects Score of 4 (High)**, because nutrient concentrations and toxicants are likely to increase up to 20-fold above background levels.
Change in community structure/loss of sensitive species	**Effects Score of 4 (High)** because changes in physico-chemical habitat are likely to affect sensitive species.
Behavioural changes in fin fish	**Effects Score of 3 (Moderate)**, because there may be changes in physico-chemical habitat suitability.
Increase in nuisance plants	**Effects Score of 2 (Low)**, because of the generally short residence time of elevated nutrient concentrations and other constraints on plant growth.
Reduced quantities of fin fish	**Effects Score of 4 (High)**, because changes in physico- chemical habitat suitability are likely.
Growth of sewage fungus/Beggiatoa	**Effects Score of 3 (Moderate)**, because BOD enrichment is likely to stimulate the growth of these organisms.

Table 3-11: Overall level of ecological effects in Taupō Stream

Overflow ID	Direct/Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level of Ecological Effect
53, 58, 86, 87, 89	Direct	**High**	Low	Moderate

3.2.5 Potential Cultural Effects

Water is considered by tangata whenua to be a taonga and the essential element of life, therefore all natural water bodies have cultural value. Taupō Stream is assessed as having 'Very Important' cultural values (Class 1).

As overflow discharges are of 'Low' volume; cultural effects are assessed as 'Moderate'. Because the overflows frequency is 'Low' frequency, the overall level of cultural effect is 'Low'.

3.2.6 Potential Aesthetic Effects

Taupō Stream is assessed as having a 'High' aesthetic value as they are easily accessible by the community from the beach, playing fields. 'Low' volume overflows have a 'High' potential to affect this value. As all potential overflows are 'Low' frequency, the overall level of effect is 'Low'.

3.2.7 Potential of Cumulative Effects

Cumulative effects are considered possible in Taupō Stream because:

- There are 5 of direct overflows that could potentially discharge into the Taupō Stream.
- All overflows have a 'Low' frequency.

For a spatially cumulative effect to arise, most of the direct potential discharges would need to occur at the same time, which is likely at times of peak wet weather flow. This could result in the total volume of wastewater overflow falling within the 'Moderate' volume range and result in 'High' potential public health and 'High' ecological effects. Therefore, the level of both recreational and ecological effects is assessed as 'High'.

3.2.8 Summary

The potential magnitude and level of effects of wastewater overflows to this receiving environment are summarised in Table 3-12.

Table 3-12: Summary of potential adverse effects for Taupō Stream

Value category	Potential magnitude of effect	Level of effect
Public health	High	High
Aquatic ecology	High	High
Cultural	Moderate	Low
Aesthetic	High	Low

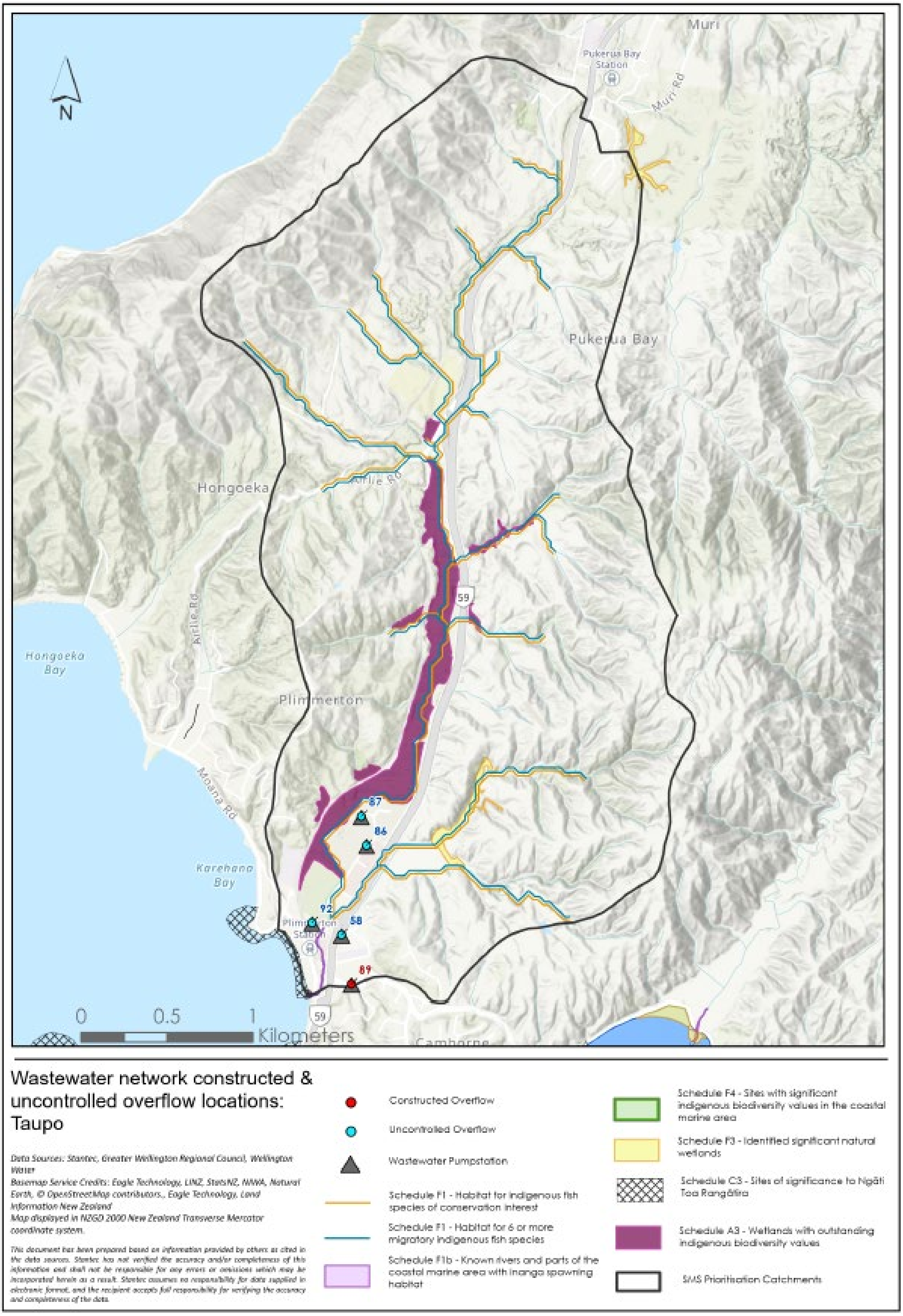

Figure 3-2: Wastewater network overflows in Taupō catchment

3.3 TAUPŌ – PLIMMERTON BEACH

3.3.1 Description of the Receiving Environment

Plimmerton North and Plimmerton South beaches are sandy beaches popular with swimmers, windsurfers, sunbathers and boating (Figure 3-2).

Table 3-13 summarises the results of GWRC recreational water quality monitoring at these beaches over the five-year period to end of December 2022. Plimmerton Beach at Bath Street and South beach have both consistently failed to achieve the pNRP objective, indicating poor water quality and probably a local source or sources of faecal contamination.

Table 3-13: Summary statistics for enterococci at Plimmerton Beach (GWRC data 2018- 2022)

Site Name	N samples	% over 140 CFU/100mL	% over 500 CFU/100mL	Median CFU/100mL	95th percentile CFU/100mL (3 years to March 2020, 2021, and 2022)			pNRP Objective O18 95th percentile
					2018-2020	2019-2021	2020-2022	
Plimmerton@ Bath Street	83	20	8	28	667	1576	1420	≤500
Plimmerton@ South Beach	171	28	13	40	653	751	791	≤500

Table 3-14 provides an assessment of the Plimmerton coastal area against pNRP Objective O19.

Table 3-14: Assessment of Plimmerton Coastal waters against pNRP Objective O19

	Macroalgae	Invertebrates	Mahinga kai species	Fish
pNRP Objectives	The algae community is reflective of a good state of aquatic ecosystem health with a low frequency of nuisance blooms	Invertebrate communities are resilient, and their structure, composition and diversity are reflective of a good state of aquatic ecosystem health	Mahinga kai species, including taonga species, are present in quantities, sizes and of a quality that is appropriate for the area and reflective of a healthily functioning ecosystem. Huanga of mahinga kai as identified by mana whenua area achieved	Fish communities are resilient, and their structure, composition and diversity are reflective of a good state of aquatic ecosystem health
Assessment	We have not sighted an any ecological survey data for the Plimmerton coastal area. However, based on the relatively low level of urban development at Plimmerton, and the lack of other known stressors, it is anticipated that objective O19 would be achieved in coastal waters around Plimmerton.			

Significant values associated with beaches on the east harbour coast as scheduled in the pNRP are summarised in Table 3-15 and categorised for Step 1 of the wastewater network overflow assessment in Table 3-16.

Table 3-15: Environmental and cultural values identified for Plimmerton Beach in Schedules of the pNRP

Schedule	Category	Location/value
B	Ngā Taonga Nui a Kiwa	Porirua Harbour and Cook Strait
C	Sites with significant mana whenua values - Ngāti Toa Rangātira	Tawhiti Kuri: kai moana, pā, mahinga kai, tohu whenua (Taupō block) "Pou Herenga Kingitanga", wāhi maumahara. Taupō pā: pā (Taupō domestic & defensive), ara hikoi, wāhi tapu, tohu tūpuna, taunga waka, Te Ara o Te Rauparaha, tohu ahurea
F4	Indigenous biodiversity coastal	Taupō Estuary
F5	Habitats with significant indigenous biodiversity values in the coastal marine area	Giant kelp, kelp beds, seagrass, subtidal rock reefs

Table 3-16: Plimmerton Beach receiving environment characteristics

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Plimmerton Beach	Beaches	Class 1 (Known contact recreation site)	Class 1 (High value)	Class 1 (Very important)	Class 1 (High value)

3.3.2 Summary of Overflow Characteristics

There are 3 direct potential overflows to Plimmerton Beach, all of which are 'Low' volume and Low frequency discharges.

In addition, there are 5 potential indirect overflows from Taupo Stream that discharge to Plimmerton Beach that could indirectly affect water quality at the coast. These indirect overflows are of 'Low' volume with all discharges having 'Low' frequency.

The direct overflows are spread across the bay while the indirect overflows all discharge at the Taupo Stream mouth.

Table 3-17: Summary of overflow characteristics in Plimmerton Beach

Overflow ID	Direct/ Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
54, 91, 92	Direct	-	Low	≤2	Low	Operative	WWL Records and Overflow Forms (2015-2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)
53, 58, 86, 87, 89	Indirect	-	Low	≤1	Low	Operative	WWL Records and Overflow Forms (2015-2020)

3.3.3 Potential Public Health Effects

All direct overflows to Plimmerton Beach are 'Low' volume and frequency discharges (see previous section). 'Low' volume discharges to beaches with 'Class 1' recreational values are assessed as having a 'Moderate' potential effect on all recreational activities, as shown in Table 3-18.

The level public health effect is summarised in Table 3-19. The level of effect is defined as the combination of the likelihood of an event and the consequences of an event. The assessed level of public health effect Karehana Bay and Plimmerton Beach is 'Low'. Note, this result is not consistent with the bathing beach monitoring results summarised in Table 3-18 which indicates significant but intermittent faecal contamination.

Table 3-18: Assessment of public health effects of overflows to Plimmerton Beach

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**Moderate potential effect (Effects Score of 3)** because microbial pathogen indicator contact recreation guidelines may be exceeded
Loss of suitability for collecting shellfish	**Moderate potential effect (Effects Score of 3)** because shellfish have the potential to filter pathogens and metals from water and sediments
Loss of suitability for fishing	**Moderate potential effect (Effects Score of 3)** because microbial pathogen indicator contact recreation guidelines may be exceeded
Loss of suitability for harvesting seaweed	**Moderate potential effect (Effects Score of 3)** because seaweed can be a hydraulic trap for particulate contaminants

Table 3-19: Level of public health effects for Plimmerton Beach

Overflow ID	Direct/Indirect	Potential Magnitude of Public Health Effect	Overflow Frequency Range	Level of Public Health Effect
55, 56, 57	Direct	**Moderate**	Low	Low
53, 58, 86, 87, 89	Indirect	**Moderate**	Low	Low

3.3.4 Potential Ecological Effects

All direct overflows to Plimmerton Beach are 'Low' volume and frequency discharges. Low volume discharges to beaches with 'Class 1' recreational values are assessed as having a 'Very Low' to 'Low' potential effect on all ecological values, as shown in Table 3-20. Beaches are likely to have high dilution rates and are generally able to absorb 'Low' volume overflows.

The level of ecological effects at beaches is summarised in Table 3-21. Level of effect is defined as the combination of the likelihood of an event and the consequences of an event. The assessed level of ecological effect at Plimmerton Beach is 'Very Low'.

Table 3-20: Assessment of ecological effects of overflows to Plimmerton Beach

Potential Effect	Magnitude of Ecological Effect
Change in physical habitat suitability	**Effects Score of 2 (Low),** because of the general lack of physical and chemical changes resulting from a Low volume wastewater overflow.

Potential Effect	Magnitude of Ecological Effect
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Effects Score of 2 (Low),** because the dilution of overflows means that nutrient and toxicant concentrations are unlikely to increase above background levels.
Change in community structure/loss of sensitive species	**Effects Score of 2 (Low),** because the limited extent of changes in physico- chemical habitat suitability are unlikely to affect sensitive species.
Behavioural changes in fin fish	**Effects Score of 1 (Very Low),** because the limited extent of changes in physico-chemical habitat suitability is unlikely to generate behavioural changes.
Increase in nuisance plants	**Effects Score of 2 (Low),** because the dilution of overflows means that nutrient concentrations are unlikely to increase above background levels.
More frequent phytoplankton blooms in the water column	**E Effects Score of 1 (Very Low),** because the dilution of overflows means that nutrient concentrations and temperature are unlikely to increase above background levels.
Reduced quantities of fin fish	**Effects Score of 2 (Low),** because of the lack of changes in physico-chemical habitat suitability.
Reduced quantities of shellfish	**Effects Score of 2 (Low),** because of the lack of changes in physico-chemical habitat suitability.
Growth of sewage fungus/Beggiatoa	**Effects Score of 1 (Very Low),** because the lack of BOD enrichment provides little opportunity for the growth of these organisms.

Table 3-21: Level of ecological effects at Plimmerton Beach

Overflow ID	Direct/Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level of Ecological Effect
54, 55, 56, 57, 91, 92	Direct	**Low**	Low	Very Low
53, 58, 86, 87, 89	Indirect	**Low**	Low	Very Low

3.3.5 Potential Cultural Effects

Plimmerton Beach is assessed as having ‘Very Important’ cultural values (Class 1) as listed in Table 3-16. The overflow discharges are of ‘Low’ volume and potential cultural effects are assessed as ‘Moderate’. Because the overflows occur at a ‘Low’ frequency, the level of cultural effects is assessed as ‘Low’.

3.3.6 Potential Aesthetic Effects

Plimmerton Beach is assessed as having a ‘High’ aesthetic value. Low volume discharges to such an environment have a ‘High’ potential to affect these values. As the overflows occur with ‘Low’ frequency, the level of effect is assessed as being ‘Low’.

3.3.7 Potential Cumulative Effects

Cumulative effects at Plimmerton Beach are possible because:

- There are 8 overflows that could potentially impact water quality at Plimmerton Beach (of which 3 are direct and the remaining 5 are indirect).
- All overflows are ‘Low’ volume and frequency.

For a spatially cumulative effect to arise, most of the direct and indirect potential discharges would need to occur at the same time, which is likely at times of peak wet weather flow. This would result in the total volume of wastewater overflow falling within the 'Moderate' volume range and result in 'High' potential public health and 'Moderate' ecological effects. The cumulative effect of these discharges is assessed as 'Moderate' for both public health and 'Low' for ecological effects.

3.3.8 Summary

The potential magnitude and level of effect of wastewater overflows in Plimmerton Beach is summarised in Table 3-22.

Table 3-22: Summary of potential effects for Plimmerton Beach

Value category	Potential magnitude of effect	Level of effect
Public health	High	Moderate
Aquatic ecology	Moderate	Low
Cultural	Moderate	Low
Aesthetic	High	Low

3.4 KAKAHO – KAKAHO STREAM

3.4.1 Description of Receiving Environment

Kakaho Stream is a 3rd order watercourse which runs approximately 5.5 kilometres from its headwaters south-east of Pukerua Bay to the coastal marine area in Pāuatahanui Inlet. The stream has a total catchment area of 12.5 km^2 and an estimated mean flow of 232 L/s. The River Environment Classification (REC) is 'cold wet climate/low elevation/hard sedimentary geology/pastural landcover'.

GWRC does not conduct RWQE monitoring in Kakaho Stream. The NZ Freshwater Fish database, NIWA, 2021 (NZFFD, 2021) does not include fish records for Kakaho Stream.

3.4.2 Summary of Overflow Characteristics

There is no local authority wastewater network within the Kakaho Stream catchment area and no wastewater discharges to Kakaho Stream. The Porirua wastewater network is limited to the urban area of Camborne, as discussed in the next section.

3.5 KAKAHO - PĀUATAHANUI INLET

3.5.1 Description of the Receiving Environment

The wastewater network in the urban area of Camborne includes several wastewater network overflow points that could potentially discharge at the western shoreline of Pāuatahanui Inlet, including at Dolly Varden Beach (Figure 3-3). This area is heavily used for a wide variety of recreational activities and is of regional significance for recreation values (Greenaway, 2018). These activities include small boat sailing, swimming, shellfish harvesting, floundering, set netting, jet skiing, flat water kayaking, waka ama, wind surfing, kite surfing, bird watching, stand-up paddle boarding and motor boating.

Te Awarua-o-Porirua Harbour, commonly known as Porirua Harbour, is a large, shallow, well flushed "tidal lagoon" type estuary consisting of two shallow drowned river valleys, the southern Porirua or Onepoto Arm and the northern Pāuatahanui Arm (Pāuatahanui Inlet), meeting at a deep narrow confluence which opens to the west coast of the lower North Island opposite Mana Island. The Harbour can be described as an estuary, as it has free exchange with marine water, which is appreciably diluted by freshwater inputs. The Harbour is thus influenced by fluvial and ocean processes, receiving water and sediment from both.

Porirua Harbour at 807ha (524ha in Pāuatahanui Inlet and 283ha in the Onepoto Arm) is moderate in size compared to other New Zealand estuaries but is the largest estuary system in the Wellington region (Robertson & Stevens, 2007).

Stevens and Robertson (2008) undertook broad-scale habitat mapping of the harbour in 2007/2008 and noted that, unlike other similar sized estuaries which largely drain at low tide, Porirua Harbour remains largely filled and is comprised of mainly sub tidal habitats (65%), particularly the Onepoto Arm. At the confluence of the two arms, water depth reaches at least 13 m. This characteristic is important as it influences the range of habitats and species occurring within the harbour. The authors observed that in relation to the major habitat types, the majority of the intertidal area in both arms was dominated by unvegetated, poorly sorted firm muddy sands (122ha in Pāuatahanui Inlet and 33ha in Onepoto Arm). Firm sands and mobile sands occupied 28ha and 4.4ha respectively, whereas soft muds occupied only 1.9ha and 1.5ha respectively.

The harbour environment provides a nursery area for juvenile elephant fish (*Callorhinchus milii*), rig (*Mustelus lenticulatus*), sand flounder (*Rhombosolea plebeia*), and kahawai (*Arripis trutta*) which support important customary, recreational and commercial fisheries off the shore of the west coast of the North Island. The inlet supports cockle beds (*Austrovenus stutchburyi*), and resident populations of various marine fish although there is no recreational fishing due to poor water quality and contaminants in sea floor sediments (Stevens & Robertson, 2008).

Opportunistic macro-algae have been found consistently throughout the estuary since 2008 which, together with the presence of high density intertidal macro-algal growths, show nutrient inputs to the estuary are sufficient to sustain elevated growths of macro-algae in Porirua Harbour, sometimes to nuisance levels. Since 2008 the Ecological Quality Rating for macro-algae in Porirua Harbour has deteriorated from 0.61 'Good' to 0.54 'Moderate' (Oliver & Conwell, 2017).

Table 3-23 summarises the results of GWRC recreational water quality monitoring in Pāuatahanui Inlet at Paremata Bridge, at the Water Ski Club over the five-year period to end of March 2021.

Microbiological water quality is good at Paremata Bridge which has achieved pNRP objective O18 throughout the monitoring period. Water quality has deteriorated at the Water Ski Club but improved at Browns Bay, with neither site consistently achieved objective O18.

Table 3-23: Summary statistics for enterococci at Pāuatahanui Inlet (GWRC data 2018- 2022; WWL data for Browns Bay March 2020 to June 2022)

Site name	N samples	% over 140 CFU/100mL	% over 500 CFU/100mL	Median CFU/100mL	95th percentile CFU/100mL (3 years to December 2020, 2021, and 2022)			pNRP Objective O18 95th percentile
					2018-2020	2019-2021	2020-2022	
Pāuatahanui Inlet at Paramata Bridge	76	7	0	4	59	327	358	≤500
Pāuatahanui Inlet at Water Ski Club	80	16	3	10	442	985	927	
Pāuatahanui Inlet at Browns Bay (PACW1)	32	18	2	40	847	499	406	

Table 3-24 provides an assessment of the current state of the marine ecology of Pāuatahanui Inlet against PNRP Objective O19. The available information suggests that PNRP Objective O19 is currently marginal in respect of macroalgae, and not met for invertebrate or mahinga kai species.

Table 3-24: Assessment of the Pāuatahanui Inlet against PNRP Objective O19

	Macroalgae	Invertebrates	Mahinga kai species	Fish
PNRP Objectives	The algae community is reflective of a good state of aquatic ecosystem health with a low frequency of nuisance blooms	Invertebrate communities are resilient, and their structure, composition and diversity are reflective of a good state of aquatic ecosystem health	Mahinga kai species, including taonga species, are present in quantities, sizes and of a quality that is appropriate for the area and reflective of a healthily functioning ecosystem. Huanga of mahinga kai as identified	Fish communities are resilient, and their structure, composition and diversity are reflective of a good state of aquatic ecosystem health

	Macroalgae	Invertebrates	Mahinga kai species	Fish
			by mana whenua area achieved	
Assessment	Nutrient inputs to the Pāuatahanui Arm are sufficient to sustain occasional elevated growths of macro-algae, sometimes to nuisance levels. Benthic invertebrate community health metric scores ranged from 'moderately healthy' to 'poor health' in 2020. The inlet supports cockle beds and resident populations of various marine fish although there is no recreational fishing due to poor water quality and contaminants in sea floor sediments. The available information suggests that PNRP Objective O19 is currently marginal in respect of macroalgae, and not met for invertebrate or mahinga kai species.			

Values associated with the Kakaho sub-catchment and Pāuatahanui Inlet as scheduled in the pNRP are summarised in Table 3-25 and categorised for the wastewater network overflow assessment in Table 3-26.

Table 3-25: Environmental and cultural values identified for the Pāuatahanui Inlet tidal Bays in Schedules of the pNRP

Schedule	Category	Significant sites
A	Outstanding Waterbodies	Pāuatahanui Inlet tidal flats, and saltmarsh at the mouth of Pāuatahanui Stream. Values are representativeness, diversity and rarity
B:	Ngā Taonga Nui a Kiwa – Ngāti Toa Rangatira	Te Awarua-o-Porirua (Porirua Harbour including contributing streams): Ngā Mahi a ngā Tūpuna: At Porirua, Ngāti Toa settlements were located exclusively in the coastal area around the harbour and outer catchment. The natural flows and processes of the harbour are a defining feature of traditional life. Te Mahi Kai: The abundance of natural life historically supported by the harbour provided a wealth of kai moana. This is recorded in numerous historical accounts by Ngāti Toa and early foreign visitors. The streams that feed into the harbour also provided a plentiful supply of freshwater fish, forest foods and rongoā. Te Mana o te Tangata: The abundance of kai moana provided by the harbour is renowned by iwi Māori and recorded in legend. In addition to providing sustenance for Ngāti Toa and guests, kai moana gathered from the harbour was an important commodity for trade and gifts. There are numerous accounts and images to support this. Te Manawaroa o te Wai: Despite excessive land reclamations, modification, and environmental damage the harbour continues to support a variety of endemic wildlife; including endangered species. There is vast potential for environmental restoration and this is a primary objective for Ngāti Toa. The only remaining traditional settlements of Ngāti Toa in the Wellington region are located in the coastal area around the harbour at Takapūwāhia and Hongoeka. Environmental issues continue to have a direct and significant impact on successive generations. Te Mana o Te Wai: A defining feature of Ngāti Toa settlement in the Wellington area and integral to Ngāti Toa identity. Wāhi Mahara: Numerous sites in and around the harbour foreshore bear testament to not only the history of Ngāti Toa, but also the formative history of New Zealand.
C	Sites with significant mana whenua values	Te Punga o Matahoaua Pāuatahanui Reserve. Values include pā, urupā, Te Ara o Kupe, wāhi maumahara, wāhi tūpuna, wāhi ahurea, mahinga kai, taunga waka, mahinga mataitai

Schedule	Category	Significant sites
	for Ngāti Toa Rangatira	
F1b	Inanga spawning habitat	Tidal reaches of Kakaho Stream
F2	Indigenous bird habitat	Porirua Harbour
F3	Significant natural wetlands	Kakaho Saltmarsh
F4	Indigenous biodiversity - coastal	Pāuatahanui Inlet: The estuary is nationally significant supporting; nursery for elephant fish, rig, sand flounder, kahawai; habitat for pied oystercatcher and bar-tailed godwit; longfin eel, giant kōkopu, short jaw kokopu, kōaro, inanga, redfin bully, torrentfish and lamprey
F5	Habitats with significant indigenous biodiversity values in the coastal marine area	Seagrass
J	Significant geological features in coastal marine area	Pāuatahanui Inlet: Drowned River valley, depositional sedimentary sequence relatively unmodified by recent tectonic uplift; Ohariu Fault trace; uplifted terraces; largest estuary in lower North Island.

Table 3-26: Summary of Kakaho - Pāuatahanui Inlet receiving environment characteristics

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Pāuatahanui Inlet	Estuaries	Class 1 (Known fishing site and/or shellfish gathering site with contact recreation)	Class 1 (High ecological value)	Class 1 (Very important)	Class 1 (High value)
Dolly Varden Beach	Beach	Class 1 (Known fishing site and/or shellfish gathering site with contact recreation)	Class 1 (High ecological value)	Class 1 (Very important)	Class 1 (High value)

3.5.2 Summary of Overflow Characteristics

There are 6 potential overflows to Kakaho – Pāuatahanui Inlet. All potential overflows are ‘Low’ volume and frequency discharges except for WNO Sites 50 and 75 which are assessed as being ‘Medium’ frequency. The overflow points are spatially separated across different beaches and bays. A summary of overflow characteristics is shown in Table 3-27.

Table 3-27: Summary of overflow characteristics in Kakaho – Pāuatahanui Inlet

Overflow ID	Direct/ Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
33	Direct	-	Low	-	Low	Operative	No data - assumed
51, 52, 61	Direct	-	Low	-	Low	Operative	WWL Records and Overflow Forms (2015-2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)
50, 75	Direct	-	Low	3	Medium	Operative	WWL Records and Overflow Forms (2015-2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)

3.5.3 Potential Public Health Effects

As described in Section 5.11.1 above, the Kakaho – Pāuatahanui Inlet is of regional significance for recreation values, with a wide range of activities being popular in the catchment (Greenaway, 2018).

All potential overflows are 'Low' volume and frequency discharges except for WNO sites 50 and 75 which are assessed to be a 'Medium' frequency. 'Low' volume discharges to estuaries with 'Class 1' recreational values are assessed as having a 'Low' effect on all recreational activities, as shown in Table 3-28.

The overall level for public health effects at Kakaho – Pāuatahanui Inlet is summarised in Table 3-29. Level of effect is defined as the combination of the likelihood of an event (frequency) and the consequences (magnitude) of an event. WNO sites 50 and 75 have a low magnitude and medium frequency, therefore level of public health effects at Pāuatahanui Fringe Bays is 'Low'.

Table 3-28: Assessment of public health effects from overflows to Kakaho – Pāuatahanui Inlet

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**Low potential effect (Effects Score of 2)** on all recreational activities (contact or partial contact recreation, shellfish collecting, fishing and/or watercress or seaweed collecting), because estuaries provide some dilution and/or flushing and are generally able to absorb low volume overflows.
Loss of suitability for collecting shellfish	
Loss of suitability for fishing	
Loss of suitability for harvesting seaweed	

Table 3-29: Level of public health effects of overflows to Kakaho – Pāuatahanui Inlet

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Level of Public Health effect
33	Direct	Low	Low	Very Low

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Level of Public Health effect
51, 52, 61	Direct	Low	Low	Very Low
50, 75	Direct	Low	Medium	Low

3.5.4 Potential Ecological Effects

All potential overflows are 'Low' volume discharges. 'Low' volume discharges to estuaries with 'Class 1' ecological values are assessed as having a predominantly 'Low' effect on all ecological values, as shown in Table 3-30.

The overall level for ecological effects at Kakaho – Pāuatahanui Inlet is summarised in Table 3-31. Level of effects is defined as the combination of the likelihood of an event and the consequences of an event. Well-mixed estuaries provide greater dilution for discharges and generally have higher resilience to the effects of 'Medium' volume overflows. The level of ecological effect at Pāuatahanui Inlet is 'Low'.

Table 3-30: Assessment of ecological effects of overflows to Kakaho – Pāuatahanui Inlet

Potential Effect	Magnitude of Ecological Effect
Change in physical habitat suitability	**Effects Score of 2 (low),** because of the general lack of physical and chemical changes resulting from a low volume wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Effects Score of 2 (low),** because the dilution of overflows means that nutrient concentrations and toxicants are unlikely to increase above background levels.
Change in community structure/loss of sensitive species	**Effects Score of 2 (low)**, because the limited extent of changes in physico- chemical habitat suitability is unlikely to affect sensitive species.
Behavioural changes in fin fish	**Effects Score of 2 (low),** because the limited extent of changes in physico-chemical habitat suitability is unlikely to generate behavioural changes.
Increase in nuisance plants	**Effects Score of 2 (low),** because the dilution of overflows means that nutrient concentrations are unlikely to increase above background levels.
Reduced quantities of fin fish	**Effects Score of 2 (low),** because of the lack of changes in physico-chemical habitat suitability.
Reduced quantities of shellfish	**Effects Score of 2 (low),** because of the lack of changes in physico-chemical habitat suitability.
Growth of sewage fungus/Beggiatoa	**Effects Score of 2 (Low),** because the lack of BOD enrichment provides little opportunity for the growth of these organisms.

Table 3-31: Level of ecological effects at Pāuatahanui Fringe Bays

Overflow ID	Direct/Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level Ecological Effect
33	Direct	Low	Low	Very Low
51, 52, 61	Direct	Low	Low	Very Low
50, 75	Direct	Low	Medium	Low

3.5.5 Potential Cultural Effects

Pāuatahanui Fringe Bays are assessed as having 'Very Important' cultural values (Class 1) as listed in Table 3-26. The overflow discharges are of 'Low' volume and cultural effects are assessed as 'Moderate'. Because the overflows occur at a 'Low' to 'Medium' frequency, the level of cultural effect is assessed as 'Moderate'.

3.5.6 Potential Aesthetic Effects

Pāuatahanui Fringe Bays are assessed as having a 'High' aesthetic value. 'Low' volume discharges to such an environment have a 'High' potential to affect these values. As overflows occur between a 'Low' to 'Medium' frequency range, the overall level of effect is assessed as being 'Moderate'.

3.5.7 Potential of Cumulative Effects

Cumulative effects at Kakaho – Pāuatahanui Inlet are unlikely because:

- There are only 6 potential overflows into Kakaho – Pāuatahanui Inlet. Four of the six overflows are 'Low' volume and 'Low' frequency.
- The overflow locations are spatially separated
- There is considered to be some dilution and flushing in the estuarine environment

Due to these considerations the cumulative effects are considered unlikely to change the risk to public heath or ecology at the Pāuatahanui Inlet in the Kakaho catchment.

3.5.8 Summary

The potential magnitude and overall level of effects of wastewater overflows in Kakaho – Pāuatahanui Inlet is summarised in Table 3-32.

Table 3-32: Summary of potential effects for Kakaho – Pāuatahanui Inlet

Value category	Potential magnitude of effect	Level of effect
Public health	Low	Low
Aquatic ecology	Low	Low
Cultural	Moderate	Moderate
Aesthetic	High	Moderate

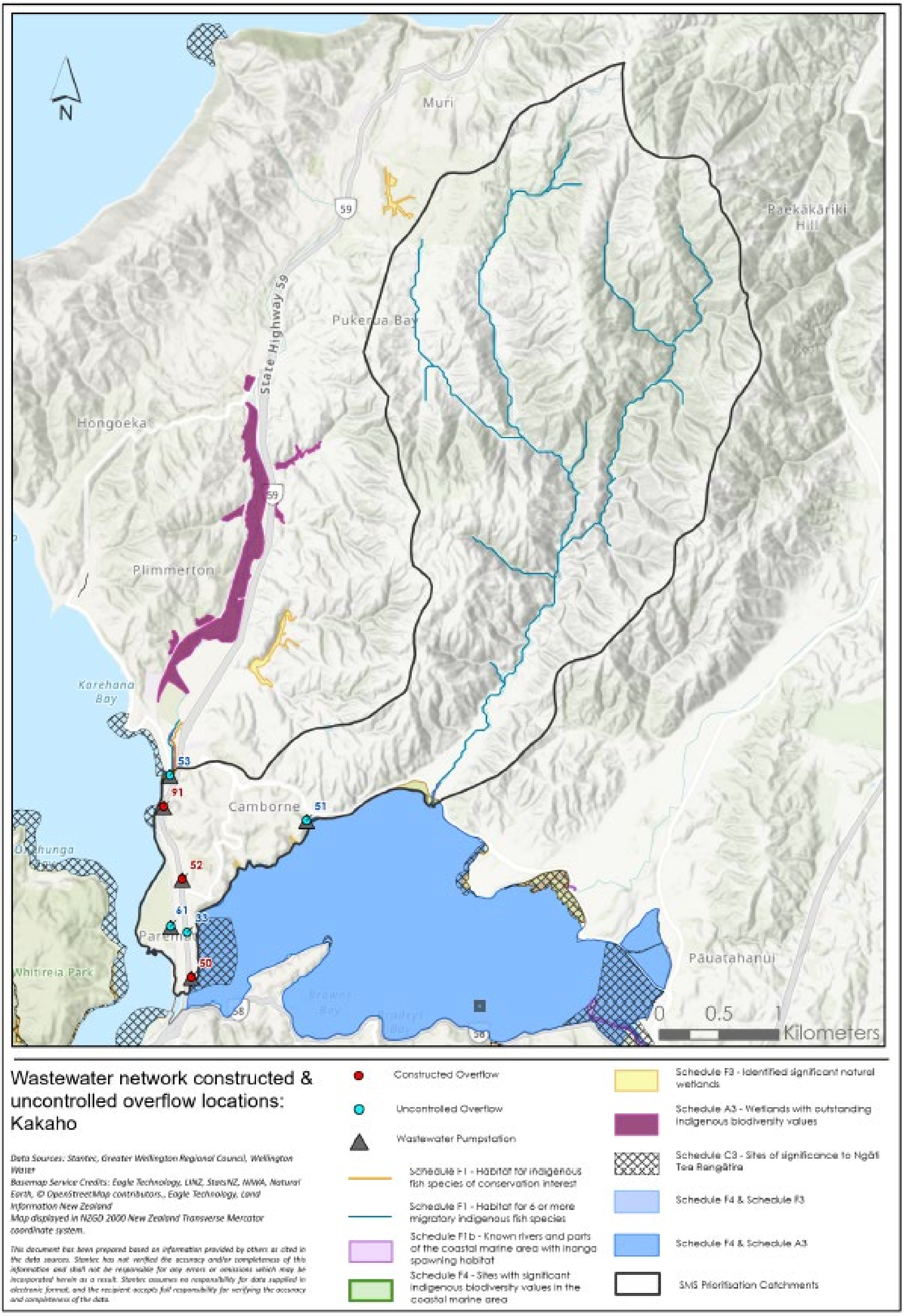

Figure 3-3: Wastewater network overflows in the Kakaho catchment

3.6 HOROKIRI

3.6.1 Description of Receiving Environment

Horokiri Stream is a 4th order watercourse which runs approximately 10.5km from its headwaters at the Wainui Saddle to the coastal marine area in Pāuatahanui Inlet. The stream has a total catchment area of 32 km^2 and an estimated mean flow of 610 L/s. The River Environment Classification (REC) is 'cold climate/low elevation/hard sedimentary geology/pastural landcover'.

GWRC does not conduct RWQE monitoring in Horokiri Stream.

Eleven native fish species have been recorded in the Horokiri Stream (NZ Freshwater Fish database, NIWA, 2021. The calculated fish Index of Biotic Integrity (F-IBI) for Horokiri Stream is 60 which gives an NPS Attribute State of A and meets PNRP object O19 for fish (refer to Appendix B for details).

Significant values associated with Horokiri Stream and the adjacent Pāuatahanui Inlet as scheduled in The PNRP are summarised in Table 3-33.

Table 3-33: Environmental and cultural values identified for the Horokiri sub-catchment from pNRP

Schedule	Category	Significant sites
A	Outstanding Waterbodies	Pāuatahanui Inlet tidal flats. Values are representativeness, diversity and rarity
B:	Ngā Taonga Nui a Kiwa – Ngāti Toa Rangatira	Te Awarua-o-Porirua (Porirua Harbour including contributing streams): Ngā Mahi a ngā Tūpuna: At Porirua, Ngāti Toa settlements were located exclusively in the coastal area around the harbour and outer catchment. The natural flows and processes of the harbour are a defining feature of traditional life. Te Mahi Kai: The abundance of natural life historically supported by the harbour provided a wealth of kai moana. This is recorded in numerous historical accounts by Ngāti Toa and early foreign visitors. The streams that feed into the harbour also provided a plentiful supply of freshwater fish, forest foods and rongoā. Te Mana o te Tangata: The abundance of kai moana provided by the harbour is renowned by iwi Māori and recorded in legend. In addition to providing sustenance for Ngāti Toa and guests, kai moana gathered from the harbour was an important commodity for trade and gifts. There are numerous accounts and images to support this. Te Manawaroa o te Wai: Despite excessive land reclamations, modification, and environmental damage the harbour continues to support a variety of endemic wildlife; including endangered species. There is vast potential for environmental restoration and this is a primary objective for Ngāti Toa. The only remaining traditional settlements of Ngāti Toa in the Wellington region are located in the coastal area around the harbour at Takapūwāhia and Hongoeka. Environmental issues continue to have a direct and significant impact on successive generations. Te Mana o Te Wai: A defining feature of Ngāti Toa settlement in the Wellington area and integral to Ngāti Toa identity. Wāhi Mahara: Numerous sites in and around the harbour foreshore bear testament to not only the history of Ngāti Toa, but also the formative history of New Zealand.

Schedule	Category	Significant sites
C	Sites with significant mana whenua values for Ngāti Toa Rangatira	Te Punga o Matahoaua Pāuatahanui Reserve. Values include pā, urupā, Te Ara o Kupe, wāhi maumahara, wāhi tūpuna, wāhi ahurea, mahinga kai, taunga waka, mahinga mataitai
F1b	Inanga spawning habitat	Tidal reaches of Horokiri Stream
F2	Indigenous bird habitat	Porirua Harbour
F3	Significant natural wetlands	Horokiri Saltmarsh
F4	Indigenous biodiversity - coastal	Pāuatahanui Inlet: The estuary is nationally significant supporting; nursery for elephant fish, rig, sand flounder, kahawai ; habitat for pied oystercatcher and bar-tailed godwit; longfin eel, giant kōkopu, short jaw kōkopu kōaro, inanga, redfin bully, torrentfish and lamprey

3.6.2 Summary of Overflow Characteristics

There is no local authority wastewater network within the Horokiri catchment area and no wastewater discharges to Horokiri Stream or Pāuatahanui Inlet.

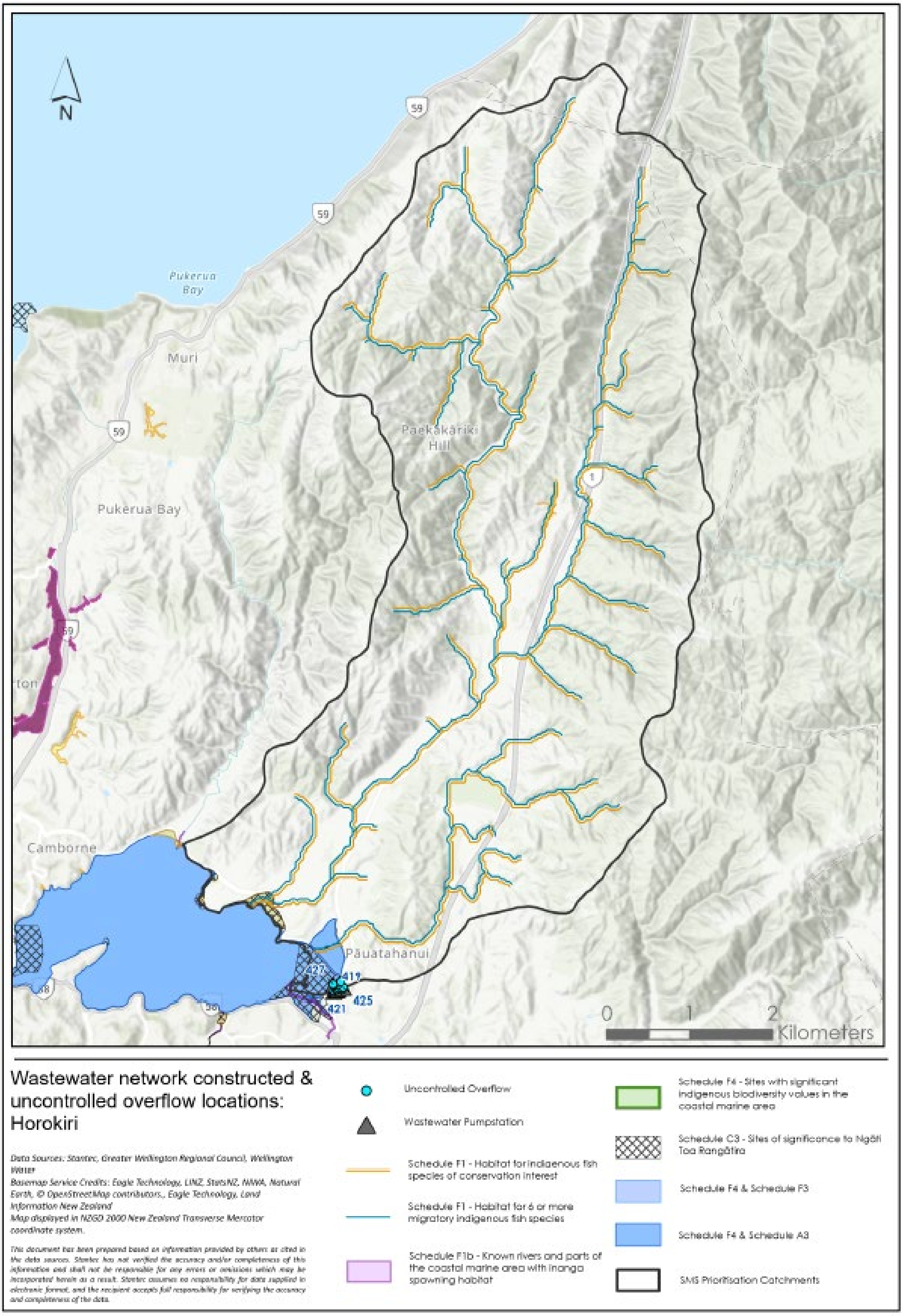

Figure 3-4: Wastewater network overflows in the Horokiri catchment

3.7 PĀUATAHANUI - PĀUATAHANUI STREAM

3.7.1 Description of the Receiving Environment

The Pāuatahanui Stream is a 4th order low elevation watercourse located to the east of Cannons Creek and Whitby (Figure 3-5). It is the largest freshwater course flowing into the Pāuatahanui Inlet. The stream catchment extends from the western face of Haywards Hill at a maximum elevation of 420m above sea level to the eastern end of the Pāuatahanui Inlet. It covers an area of 4,164ha, of which approximately 55% is in production pasture, 24% indigenous forest or scrub, 15% exotic forest and 2% urban land-use. The latter includes the small settlements at Pāuatahanui and Judgeford as well as part of Whitby. The mainstem of Pāuatahanui Stream has a length of 9.5km while tributaries have a combined length of 47.4km, giving a total stream length of approximately 56.9km for the sub-catchment. The mainstem has a mean flow of 870 L/s and a mean annual low flow of 140 L/s.

Table 3-34 summarises the results of GWRC RWQE monthly *E. coli* monitoring in Pāuatahanui Stream at Elmwood Bridge over the period from June 2018 to June 2022. The results indicate a Moderate level of faecal contamination. The site does not achieve pNRP objective O18 for contact recreation and is placed in NPS-FM attribute state 'E', indicating a predicted average of infection of >7% for full contact recreation users.

It is noted that all the WNO sites listed below are located on minor tributaries which join Pāuatahanui Stream downstream of the GWRC water quality monitoring station at Elmwood Bridge. The effects of WNO overflows are therefore not reflected in the water quality monitoring record.

Table 3-34: Summary statistics and NPS-FM Attribute State for *E. coli* (GWRC RWQE data June 2018 to 2022)

Site name	N	% exceedance over 540 CFU/100mL	% exceedance over 260 CFU/100mL	Median concentration CFU/100mL	95th percentile CFU/100 mL	NPS-FM Attribute State	pNRP O18 (95th %ile ≤540)
Pāuatahanui Stream at Elmwood Bridge	71	31	65	310	2,250	E	Not meeting

The ecological component of the RWQE program includes monthly monitoring of macroinvertebrate communities in Pāuatahanui Stream at Elwood Bridge. Monthly periphyton assessments conducted over the last three year indicate compliance with pNRP objective O19 for periphyton.

Table 3-35: Periphyton weighted composite cover (WCC) results from monthly sampling 2018 to 2021

Site name	N samples	Max WCC (%cover)	n ≥ 40% cover	pNRP O19 (no more than 8% of samples ≥40% cover)
Pāuatahanui Stream at Elmwood Bridge	35	0.0	0	meeting

Result from five annual macroinvertebrate community surveys have been completed, which indicate that pNRP objective O19 is not achieved for MCI or QMCI.

Table 3-36: Macroinvertebrate community metrics for Pāuatahanui Stream (2018 to 2022)

Site name	substrate	River class	Significant river	N samples	Taxa richness	%EPT (3-yr median)	MCI (5yr median)	QMCI 5-yr median)	pNRP O19 – MCI	pNRP O19 – QMCI	Meeting O19
Pāuatahanui Stream at Elmwood Bridge	Soft	6	No	5	11	33.3	99	3.9	≥ 105	≥ 5.5	Not meeting

Twelve species of indigenous fish were recorded in the Pāuatahanui Stream between 2005 and 2020: longfin eel, shortfin eel, lamprey, inanga, giant kokopu, banded kokopu, koaro, redfin bully, upland bully, giant bully, common bully and smelt (NZFFD 2021). All these species except shortfin eel, banded kokopu, upland bully, common bully and common smelt are classified as either at risk or threatened (Dunn, et al. 2017). The calculated fish Index of Biotic Integrity (F-IBI) for Pāuatahanui Stream is 42 which gives an NPS Attribute State of A and meets PNRP object O19 for fish (refer to Appendix B for details).

Significant values associated with the Pāuatahanui Stream as scheduled in the pNRP are summarised in Table 3-37 and categorised for the wastewater network overflow assessment in Table 3-38.

Table 3-37: Values identified for Pāuatahanui Stream in Schedules of the pNRP

Schedule	Category	Significant sites
A	Outstanding Waterbodies	Pāuatahanui Inlet saltmarsh at the mouth of Pāuatahanui Stream. Values are representativeness, diversity and rarity
B	Ngā Taonga Nui a Kiwa	Pāuatahanui Stream to Porirua Harbour
C	Sites with significant mana whenua values for Ngāti Toa Rangatira	Pāuatahanui Reserve. Values include mahinga kai, pā, kai moana, puna raranga
F1	Rivers and lakes with significant indigenous ecosystems	Pāuatahanui Stream has significant indigenous values including habitat for indigenous threatened or at-risk fish, habitat for migratory fish and inanga spawning habitat.

Table 3-38: Summary of Pāuatahanui Stream receiving environment characteristics

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Pāuatahanui Stream	Medium Waterway	Class 1 (Known fishing site)	Class 1 (High ecological value)	Class 1 (Very important)	Class 1 (High value)

3.7.1 Summary of Overflow Characteristics

There are 23 potential overflows to Pāuatahanui Stream, all of which are direct overflows. Historical information shows that all direct overflows are of 'Low' volume and frequency except for WNO Site 84 (Pump Station 38) which is of 'Medium' volume and 'Medium' frequency. All overflow sites are located in the downstream reaches within 1km of the stream mouth.

A summary of overflow characteristics is shown in Table 3-39.

Table 3-39: Summary of overflow characteristics in Pāuatahanui Stream

Overflow ID	Direct/Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
8, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428	Direct	-	Low[2]	-	Low[3]	Operative	No data - assumed
84	Direct	-	Medium[4]	3	Medium	Operative	WWL Records and Overflow Forms (2015 – 2020)

3.7.2 Potential Public Health Effects

Pāuatahanui Stream is a highly popular recreational area that includes whitebaiting, bird watching and fishing. 'Medium' volume discharge to medium waterways with 'Class 1' recreational values are assessed as having a 'Very High' potential effect on all recreational activities, as shown in Table 3-40

The overall level for potential public effects is summarised in Table 3-41. The level of effect is defined as the combination of the likelihood of an event and the consequences of an event. In this case, the frequency of overflows events range from 'Low' to 'Medium' and the public health effect is 'Very High'.

Table 3-40: Assessment of public health effects from overflows to Pāuatahanui Stream

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**Very High potential effect (Effects Score of 5)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for collecting shellfish	**Very High potential effect (Effects Score of 5)** because shellfish have the potential to filter pathogens and metals from water and sediments.
Loss of suitability for fishing	**Very High potential effect (Effects Score of 5)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for harvesting watercress	**Very High potential effect (Effects Score of 5)** because seaweed can be a hydraulic trap for particulate contaminants

Table 3-41: Overall level public health effects at Pāuatahanui Stream

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Potential level of Public Health Effect
8, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418,	Direct	High	Low	Moderate

[2] 'Low' annual overflow volume is defined as less than 600 m^3.
[3] 'Low' annual overflow frequency is defined as 2 or fewer overflows per year.
[4] 'Medium' annual overflow volume is defined as between 600 m^3 and 6,000m^3.

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Potential level of Public Health Effect
419, 420, 421, 422, 423, 424, 425, 426, 427, 428				
84	Direct	**Very High**	Medium	**Very High**

3.7.3 Potential Ecological Effects

All potential overflows into Pāuatahanui Stream are of 'Low' frequency and volume except WNO Site 84 which has a 'Medium' volume and frequency.

Discharges to medium waterways with a 'Class 1' recreational value are assessed as having 'predominantly high' potential effect on all ecological values, as shown in Table 3-42.

The level of ecological effects at Pāuatahanui is summarised in Table 3-43. Level is defined as the combination of the likelihood of an event and the consequences of an event. The overall level ecological effect at Pāuatahanui Stream is 'High'.

Table 3-42: Assessment of ecological effects of overflows to Pāuatahanui Stream

Potential Effect	Magnitude of Ecological Effect
Change in physical habitat suitability	**Effects Score of 4 (High),** because of the extent of physical and chemical changes resulting from a wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Effects Score of 4 (High),** because toxicant concentrations may increase up to 20-fold above background levels.
Change in community structure/loss of sensitive species	**Effects Score of 4 (High),** because changes in physico- chemical habitat suitability are likely.
Behavioural changes in fin fish	**Effects Score of 3 (Moderate),** because changes in physico-chemical habitat suitability are likely.
Increase in nuisance plants	**Effects Score of 2 (Low),** because of the generally short residence time of elevated nutrient concentrations and other constraints on plant growth
Reduced quantities of fin fish	**Effects Score of 4 (High),** because changes in physico-chemical habitat suitability are likely.
Growth of sewage fungus/Beggiatoa	**Effects Score of 4 (High),** because BOD enrichment is likely to stimulate the growth of these organisms.

Table 3-43: Overall level of ecological effects at Pāuatahanui Stream

Overflow ID	Direct/Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level of Ecological Effect
8, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428	Direct	**High**	Low	Moderate
84	Direct	**High**	Medium	**High**

3.7.4 Potential Cultural Effects

Potential overflow discharges volumes range from 'Low' to 'Medium' and as such cultural effects are assessed as 'High'. The level of cultural effects is assessed as 'Moderate'.

3.7.5 Potential Aesthetic Effects

Pāuatahanui Stream is assessed as having a 'High' aesthetic value. 'Low' to 'Medium' volume discharges to such an environment have a 'High' potential to affect these values. The level of aesthetic effect is assessed as being 'Moderate'.

3.7.6 Potential of Cumulative Effects

For the Pāuatahanui Stream receiving environment, cumulative effects are likely to occur because:

- There are a large number of overflow points that could potentially discharge (23 direct overflows) which may have a combined effect depending on the timing of wet weather events, spatial variation in rainfall during those events, and several other contributing factors such as wastewater network capacity and condition.
- All the potential overflow points are in close proximity to each other.

For a cumulative effect to rise, most of the potential direct overflows would need to occur at the same time, which is highly likely during extreme wet weather events. This would result in the total volume of wastewater overflows falling within the 'High' volume range and result in 'Very High' potential public health effects and 'Very High' ecological effects. Therefore, the cumulative effect of overflows is potentially greater than any individual overflow. The assessed potential level of effect for public health and ecological values is 'Very High'.

3.7.7 Summary

The potential magnitude and overall level of effects of wastewater overflows in Pāuatahanui Stream is summarised in Table 3-44.

Table 3-44: Summary of potential effects for overflows from Pāuatahanui catchment to Pāuatahanui Stream

Value category	Potential magnitude of effect	Level of effect
Public health	Very High	Very High
Aquatic ecology	Very High	Very High
Cultural	High	Moderate
Aesthetic	High	Moderate

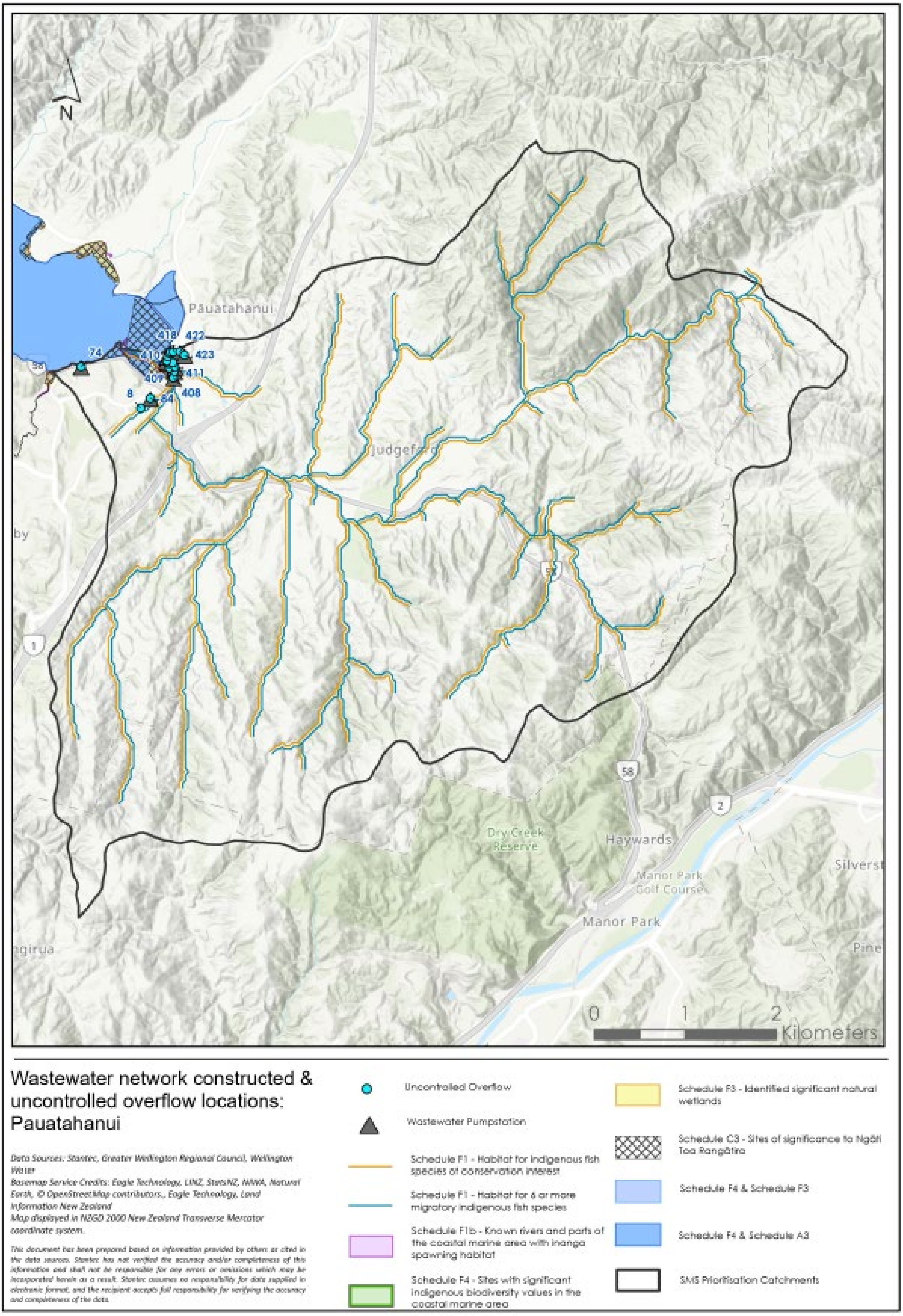

Figure 3-5: Wastewater network overflows for Pāuatahanui catchment

3.8 PĀUATAHANUI – PĀUATAHANUI INLET

3.8.1 Description of Receiving Environment

The wastewater network in the eastern part Whitby includes at least one overflow point that could potentially discharge via the stormwater system to Pāuatahanui Inlet, west of Pāuatahanui Stream mouth (Figure 3-5). The Pāuatahanui Inlet receiving environment has been described is section 3.4.

An assessment of the current state of the marine ecology of Pāuatahanui Inlet against PNRP Objective O19 has been provided in Table 3-24. The available information suggests that PNRP Objective O19 is currently marginal in respect of macroalgae, and not met for invertebrate or mahinga kai species.

Values associated with the Pāuatahanui Inlet as scheduled in the pNRP are summarised in Table 3-45 and categorised for the wastewater network overflow assessment in Table 3-46.

Table 3-45: Values identified for Pāuatahanui Inlet in Schedules of the pNRP

Schedule	Category	Significant sites
A	Outstanding Waterbodies	Pāuatahanui Inlet tidal flats, and saltmarsh at the mouth of Pāuatahanui Stream. Values are representativeness, diversity and rarity
B:	Ngā Taonga Nui a Kiwa – Ngāti Toa Rangatira	Te Awarua-o-Porirua (Porirua Harbour including contributing streams): Ngā Mahi a ngā Tūpuna: At Porirua, Ngāti Toa settlements were located exclusively in the coastal area around the harbour and outer catchment. The natural flows and processes of the harbour are a defining feature of traditional life. Te Mahi Kai: The abundance of natural life historically supported by the harbour provided a wealth of kai moana. This is recorded in numerous historical accounts by Ngāti Toa and early foreign visitors. The streams that feed into the harbour also provided a plentiful supply of freshwater fish, forest foods and rongoā. Te Mana o te Tangata: The abundance of kai moana provided by the harbour is renowned by iwi Māori and recorded in legend. In addition to providing sustenance for Ngāti Toa and guests, kai moana gathered from the harbour was an important commodity for trade and gifts. There are numerous accounts and images to support this. Te Manawaroa o te Wai: Despite excessive land reclamations, modification, and environmental damage the harbour continues to support a variety of endemic wildlife; including endangered species. There is vast potential for environmental restoration and this is a primary objective for Ngāti Toa. The only remaining traditional settlements of Ngāti Toa in the Wellington region are located in the coastal area around the harbour at Takapūwāhia and Hongoeka. Environmental issues continue to have a direct and significant impact on successive generations. Te Mana o Te Wai: A defining feature of Ngāti Toa settlement in the Wellington area and integral to Ngāti Toa identity. Wāhi Mahara: Numerous sites in and around the harbour foreshore bear testament to not only the history of Ngāti Toa, but also the formative history of New Zealand.

Schedule	Category	Significant sites
C	Sites with significant mana whenua values for Ngāti Toa Rangatira	Te Punga o Matahoaua Pāuatahanui Reserve. Values include pā, urupā, Te Ara o Kupe, wāhi maumahara, wāhi tūpuna, wāhi ahurea, mahinga kai, taunga waka, mahinga mataitai
F1b	Inanga spawning habitat	Tidal reaches of Pāuatahanui Stream
F2	Indigenous bird habitat	Porirua Harbour
F4	Indigenous biodiversity - coastal	Pāuatahanui Inlet: The estuary is nationally significant supporting; nursery for elephant fish, rig, sand flounder, kahawai; habitat for pied oystercatcher and bar-tailed godwit; longfin eel, giant kōkopu, short jaw kōkopu kōaro, inanga, redfin bully, torrentfish and lamprey
F5	Habitats with significant indigenous biodiversity values in the coastal marine area	Seagrass
J	Significant geological features in coastal marine area	Pāuatahanui Inlet: Drowned river valley, depositional sedimentary sequence relatively unmodified by recent tectonic uplift; Ohariu Fault trace; uplifted terraces; largest estuary in lower North Island.

Table 3-46: Summary of Pāuatahanui - Pāuatahanui Inlet receiving environment characteristics

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Pāuatahanui Inlet	Estuaries	Class 1 (Known fishing site and/or shellfish gathering site with contact recreation)	Class 1 (High ecological value)	Class 1 (Very important)	Class 1 (High value)

3.8.2 Summary of Overflow Characteristics

There is one direct potential overflow and 23 indirect potential overflows from Pāuatahanui catchment to Pāuatahanui Inlet. Historical information shows that all direct overflows are of 'Low' volume and frequency except for WNO Site 84 (Pump Station 38) which is of 'Medium' volume and 'Medium' frequency. All indirect overflows discharge at the Pāuatahanui Stream mouth while the direct overflow sits approximately 1km away. A summary of overflow characteristics is shown in Table 3-47.

Table 3-47: Summary of Overflow Characteristics, Pāuatahanui Inlet

Overflow ID	Direct/ Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
74	Direct	-	Low[5]	-	Low[6]	Operative	WWL Records and Overflow Forms (2015-2020), Stantec System Performance

[5] 'Low' annual overflow volume is defined as less than 600 m^3.
[6] 'Low' annual overflow frequency is defined as 2 or fewer overflows per year.

Overflow ID	Direct/ Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
							Report (2018), WCS Engineering NIP (2019)
8, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428	Indirect	-	Low	-	Low	Operative	No data - assumed
84	Indirect	-	Medium[7]	3	Medium	Operative	WWL Records and Overflow Forms (2015 – 2020)

3.8.3 Potential Public Health Effects

‘Medium’ volume discharge to estuaries with ‘Class 1’ recreational values are assessed as having a ‘Moderate’ potential effect on all recreational activities, as shown in Table 3-48.

The overall level for potential public effects is summarised in Table 3-49. The level of effect is defined as the combination of the likelihood of an event and the consequences of an event. In this case, the frequency of overflows events range from ‘Low’ to ‘Medium’ and the level public health effect is ‘Moderate’.

Table 3-48: Magnitude of Public Health Effects from Overflows to Pāuatahanui Inlet

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**Effects Score of 3 (moderate),** because microbial pathogen indicator contact recreation guidelines may be exceeded.
Loss of suitability for collecting shellfish	**Effects Score of 3 (moderate),** because shellfish have the potential to filter pathogens and metals from water and sediments.
Loss of suitability for fishing	**Effects Score of 3 (moderate),** because microbial pathogen indicator contact recreation guidelines may be exceeded.
Loss of suitability for harvesting watercress	**Effects Score of 3 (moderate),** because watercress or seaweed can be a hydraulic trap for particulate contaminants.

Table 3-49: Overall Level of Public Health Effects in Pāuatahanui Inlet

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Potential level of Public Health Effect
74	Direct	Low	Low	Very Low
8, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418,	Indirect	Low	Low	Very Low

[7] ‘Medium’ annual overflow volume is defined as between 600 m^3 and 6,000m^3.

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Potential level of Public Health Effect
419, 420, 421, 422, 423, 424, 425, 426, 427, 428				
84	Indirect	Moderate	Medium	**Moderate**

3.8.4 Potential Ecological Effects

'Medium' volume discharges to estuaries with a 'Class 1' recreational value are assessed as having 'predominantly moderate' potential effect on all ecological values, as shown in Table 3-50.

The level of ecological effects is summarised in Table 3-51. Level is defined as the combination of the likelihood of an event and the consequences of an event. The overall level ecological effect of discharges from Pāuatahanui catchment to Pāuatahanui Inlet is 'Moderate'.

Table 3-50: Magnitude of Ecological Effects of Overflows to Pāuatahanui Inlet

Potential Effect	Magnitude of Ecological Effect
Change in physical habitat suitability	**Effects Score of 3 (moderate),** because there may be physical and chemical changes resulting from a medium volume wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Score of 3 (moderate),** because nutrient concentrations and toxicants may increase above background levels.
Change in community structure/loss of sensitive species	**Effects Score of 3 (moderate),** because changes in physico- chemical habitat suitability may affect sensitive species.
Behavioural changes in fin fish	**Effects Score of 3 (moderate),** because there may be changes in physico-chemical habitat suitability.
Increase in nuisance plants	**Effects Score of 3 (moderate),** because elevated nutrient concentrations may stimulate plant growth.
Reduced quantities of fin fish	**Effects Score of 3 (moderate),** because there may be changes in physico-chemical habitat suitability.
Reduced quantities of shellfish	**Effects Score of 3 (moderate),** because there may be changes in physico-chemical habitat suitability.
Growth of sewage fungus/Beggiatoa	**Effects Score of 2 (low),** because the lack of BOD enrichment provides little opportunity for the growth of these organisms.

Table 3-51: Overall Level of Ecological Effects in Pāuatahanui Inlet

Overflow ID	Direct/Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level of Ecological Effect
74	Direct	Low	Low	Very Low
8, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428	Indirect	Low	Low	Very Low
84	Indirect	Moderate	Medium	**Moderate**

3.8.5 Potential Cultural Effects

Pāuatahanui - Pāuatahanui Inlet is assessed as having very Important cultural values (Class 1) as listed in Table 3-46.

Potential overflow discharges volumes range from 'Low' to 'Medium' and as such cultural effects are assessed as 'High'. The level of cultural effect is assessed as 'Moderate'.

3.8.6 Potential Aesthetic Effects

Pāuatahanui - Pāuatahanui Inlet is assessed as having a 'High' aesthetic value. 'Low' to 'Medium' volume discharges to such an environment have a 'High' potential to affect these values. The level of aesthetic effect is assessed as being 'Moderate'.

3.8.7 Potential Cumulative Effects

For WNO discharges from Pāuatahanui catchment to Pāuatahanui Inlet, cumulative effects are possible because:

- There are a large number of overflow points that could potentially discharge (1 direct and 23 indirect overflows) which may have a combined effect depending on the timing of wet weather events, spatial variation in rainfall during those events, and several other contributing factors such as wastewater network capacity and condition.
- All the indirect potential overflow points discharge into the inlet at the same location.

For a cumulative effect to rise, most of the potential overflows would need to occur at the same time, which is highly likely during extreme wet weather events. This would result in the total volume of wastewater overflows falling within the 'High' volume range and result in 'Very High' potential public health effects and 'Very High' ecological effects. Therefore, the cumulative effect of overflows is potentially greater than any individual overflow. The assessed potential level of effect for public health and ecological values is 'Very High'.

3.8.8 Summary

The potential magnitude and overall level of effects of wastewater overflows in Pāuatahanui Stream is summarised in Table 3-52.

Table 3-52: Summary of potential effects for overflows from Pāuatahanui catchment to Pāuatahanui Inlet

Value category	Potential magnitude of effect	Level of effect
Public health	Very High	Very High
Aquatic ecology	Very High	Very High
Cultural	High	Moderate
Aesthetic	High	Moderate

3.9 DUCK – DUCK CREEK

3.9.1 Description of the Receiving Environment

Duck Creek is a 3rd order watercourse which drains a catchment of approximately 1,032 hectares in and beyond the Whitby urban area (Figure 3-6). The stream has an estimated mean flow of 184 L/s and mean annual low flow of 28 L/s[8]. The River Environment Classification (REC2) classifies Duck Creek as having 'warm wet climate/low elevation/hard sedimentary geology/urban landcover'.

Table 3-53 summarises the results of Wellington Water monthly *E. coli* monitoring in Duck Creek over the period from February 2020 to June 2022. The results indicate a moderate degree of faecal contamination in Duck Creek. The site does not achieve pNRP objective O18 for contact recreation and is placed in NPS-FM Attribute State "E" indicating a predicted average risk of infection of >7% for full contact recreation users.

Table 3-53: Summary statistics and NPS-FM Attribute State for E. coli (WWL data 2020 -2022)

Site name	N samples	% exceedance over 540 CFU/100mL	% exceedance over 260 CFU/100mL	Median concentration CFU/100mL	95th percentile CFU/100mL	NPS-FM Attribute State	pNRP O18 (95th %ile ≤540)
Duck Creek (PAFW1)	**29**	**45**	**69**	**454**	**2,900**	E	Not meeting

Thirteen native fish species were recorded in the Duck Creek between 2005 and 2022 (NZFFD 2021). All these species except shortfin eel, banded kokopu, common bully and common smelt are classified as either at risk or threatened (Dunn, et al., 2017). The calculated fish Index of Biotic Integrity (F-IBI) for Duck Creek is 60 which gives an NPS Attribute State of A and meets PNRP object O19 for fish (refer to Appendix B for details).

Significant values associated with Duck Creek as scheduled in The pNRP are summarised in Table 3-54 and categorised for the wastewater network overflow assessment in Table 3-55.

Table 3-54: Environmental and cultural values identified for Duck Creek in Schedules of pNRP

Schedule	Category	Significant sites
B	Ngā Taonga Nui a Kiwa	Duck Creek to Porirua Harbour
C	Sites with significant mana whenua values for Ngāti Toa Rangatira	Wai-o-hata, Duck Creek: kāinga, wāhi tapu, wāhi tūpuna, puna raranga, wai māori, kai awa, kai ngahere, rongoā, wāhi maumahara
F1	Rivers and lakes with significant indigenous ecosystems	Duck Creek has significant indigenous values including habitat for indigenous threatened or at-risk fish, habitat for migratory fish and inanga spawning habitat.
F1b	Inanga spawning habitat	Tidally influenced reach of Duck Creek
F3	Significant natural wetlands	Duck Creek Saltmarsh: Representativeness, Rarity, Diversity, Ecological context
F4	Indigenous biodiversity - coastal	Duck Creek Estuary: Duck Creek Scenic Reserves was established under the Reserves Act (1977) in 1971. The reserve contains significant saltmarsh, rare plants and wildlife, and fragile habitats. A variety of estuarine birds use the reserve for feeding and nesting

[8] NZ River Maps (niwa.co.nz).

Table 3-55: Summary of Duck Creek receiving environment characteristics

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Duck Creek	Medium Waterway	Class 1 (Known fishing site)	Class 1 (High ecological value)	Class 1 (Very important)	Class 1 (High value)

3.9.2 Summary of Overflow Characteristics

There are 6 potential overflows into Duck Creek, all of which are direct overflows. All overflows are of 'Low' volume and frequency except WNO Site 34 (Pump Station 01) which has a 'Medium' volume and 'Medium' frequency. All overflow locations are within 1km of the creek mouth. Overflow characteristics are summarised in Table 3-56.

Table 3-56: Summary of overflow characteristics in Duck Creek

Overflow ID	Direct/ Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
26, 41, 42, 43, 72	Direct	-	Low[9]	-	Low[10]	Operative	No data
34	Direct	763	Medium	4	Medium	Operative	WWL Records and Overflow Forms (2015-2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)

3.9.3 Potential Public Health Effects

Duck Creek is assessed as a waterway in which contact recreation may occur. It is enjoyed for its natural values and is known for some whitebaiting and eeling. 'Medium' volume discharges to medium waterways with 'Class 1' recreational values are assessed as having 'Very High' potential effect (Effects score of 5), as shown in Table 3-57 . The overall level of public health effect is summarised in Table 3-57 as **'Very High'**.

Table 3-57: Assessment of public health effects from overflows to Duck Creek

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**Very High potential effect (Effects Score of 5)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for collecting shellfish	**Very High potential effect (Effects Score of 5)** because shellfish have the potential to filter pathogens and metals from water and sediments.
Loss of suitability for fishing	**Very High potential effect (Effects Score of 5)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded

[9] 'Low' annual overflow volume is defined as less than 600 m^3.
[10] 'Low' annual overflow frequency is defined as 2 or fewer overflows per year.

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for harvesting watercress	**Very High potential effect (Effects Score of 5)** because seaweed can be a hydraulic trap for particulate contaminants

Table 3-58: Overall level of public health effects at Duck Creek

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Level of Public Health Effect
26, 41, 42, 43, 72	Direct	High	Low	Moderate
34	Direct	**Very High**	Medium	**Very High**

3.9.4 Potential Ecological Effects

All potential overflows into Duck Creek are of 'Low' frequency and volume except WNO Site 34 which has a 'Medium' volume and frequency.

Discharges to medium waterways with a 'Class 1' recreational value are assessed as having 'predominantly high' potential effects on ecological values, as shown in Table 3-59.

The level of ecological effects at Duck Creek is summarised in Table 3-60. Level of effect defined as the combination of the likelihood of an event and the consequences of an event. The assessed level of ecological effect at Duck Creek is 'High'.

Table 3-59: Magnitude of ecological effects of overflows to Duck Creek

Potential Effect	Magnitude of Ecological Effect
Change in physical habitat suitability	**Effects Score of 4 (High),** because of the extent of physical and chemical changes resulting from a wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Effects Score of 4 (High),** because toxicant concentrations and toxicants may increase up to 20-fold above background levels.
Change in community structure/loss of sensitive species	**Effects Score of 4 (High),** because changes in physico- chemical habitat suitability are likely.
Behavioural changes in fin fish	**Effects Score of 3 (Moderate),** because there changes in physico-chemical habitat suitability are likely.
Increase in nuisance plants	**Effects Score of 2 (Low),** because of the generally short residence time of elevated nutrient concentrations and other constraints on plant growth
Reduced quantities of fin fish	**Effects Score of 4 (High),** because of changes in physico-chemical habitat suitability are likely.
Growth of sewage fungus/Beggiatoa	**Effects Score of 4 (High),** because BOD enrichment is likely to stimulate the growth of these organisms.

Table 3-60: Overall level ecological effects at Duck Creek

Overflow ID	Direct/Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level of Ecological Effect
26, 41, 42, 43, 72	Direct	High	Low	Moderate
34	Direct	**High**	Medium	**High**

3.9.5 Potential Cultural Effects

Duck Creek is assessed as having 'Very Important' cultural values (Class 1) as listed in Table 3-55.

The overflow discharges range from a 'Low' to 'Medium' volume; the magnitude of potential cultural effects is assessed as 'High'. The level of cultural effects is therefore assessed as being 'Moderate'.

3.9.6 Potential Aesthetic Effects

Duck Creek is assessed as having 'High' aesthetic value. 'Low' to 'Medium' volume discharges to such an environment could have a 'High' magnitude effect on those values. The overall level these effects occurring is assessed as being 'Moderate'.

3.9.7 Potential of Cumulative Effects

For the Duck Creek receiving environment, cumulative effects from wet weather overflows are considered to be possible because:

- There are six direct overflow points that could potentially discharge and may have a combined effect depending on the timing of wet weather events, spatial variation in rainfall during those events, and several other contributing factors such as wastewater network capacity and condition.
- WNO Site 34 is known to have a 'Medium' overflow volume.

For a cumulative effect to arise, most of the direct potential overflows would need to occur at the same time. The cumulative volume of the overflows is likely to fall within the 'Medium' volume range with an associated level of public health effect of 'Very High'. This is the same as the assessment in section 5.9.3 and so cumulative effects are unlikely to change the level of effect ratings.

3.9.8 Summary

The potential magnitude and level of effects of wastewater overflows in Duck Creek is summarised in Table 3-61.

Table 3-61: Summary of potential effects for Duck Creek

Value category	Potential magnitude of effect	Overall level of effect
Public health	Very High	Very High
Aquatic ecology	Very High	High
Cultural	High	Moderate
Aesthetic	High	Moderate

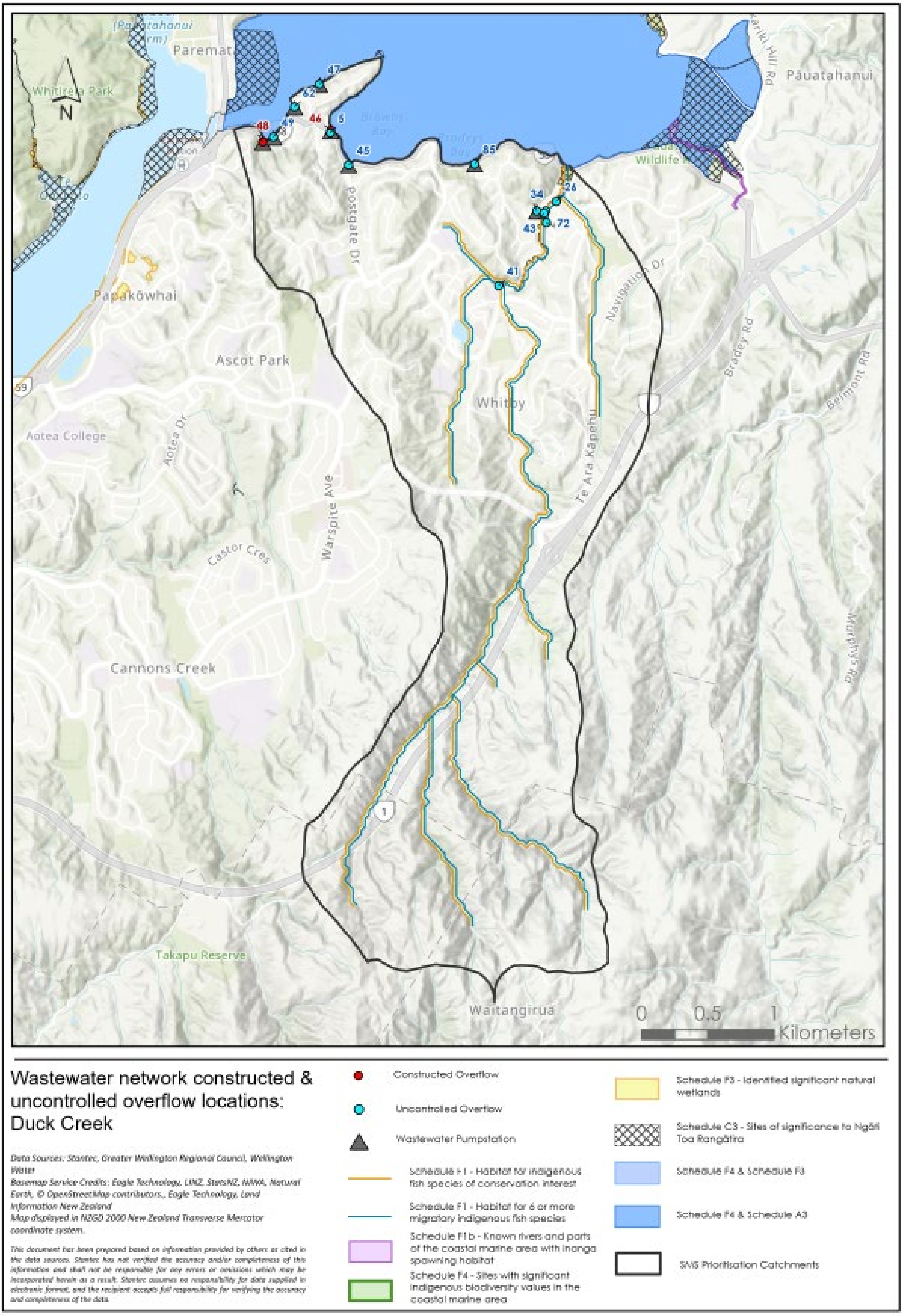

Figure 3-6: Wastewater overflows points in Duck catchment

3.10 DUCK - BROWNS STREAM

3.10.1 Description of the Receiving Environment

Browns Bay Stream is a minor 2nd order watercourse which drains a catchment of approximately 132 hectares in the Whitby urban area (Figure 3-6). The stream has an estimated mean flow of 22 L/s and mean annual low flow of 2 L/s. The River Environment Classification (REC) is 'warm dry climate/low elevation/hard sedimentary geology/urban landcover'.

Table 3-62 summarises the results of Wellington Water monthly *E. coli* monitoring in the Browns Bay Stream at site PAFW2 over the period from February 2020 to June 2022. These results indicate very high level of faecal contamination in both dry and wet conditions. The site does not achieve pNRP Objective O18 for contact recreation and is place in NPS-FM attribute state 'E', indicating a predicted average risk of infection of >7% for full contact recreation users.

Table 3-62: Summary statistics and NPS-FM Attribute State for *E. coli* (WWL data February 2020 – June 2022)

Site name	N samples	% exceedance over 540 CFU/100mL	% exceedance over 260 CFU/100mL	Median concentration CFU/100mL	95th percentile CFU/100mL	NPS-FM Attribute State	pNRP O18 (95th %ile ≤540)
Browns Bay Stream (PAFW2)	**35**	**74**	**94**	**1,500**	**18,960**	E	Not meeting

The NZFFD (2021) does not contain any records of fish surveys in Browns Bay Stream.

Significant values of Browns Bay Stream as scheduled in the pNRP are listed in Table 3-63. Stream values are categorised for the wastewater network overflow assessment in Table 3-64.

Table 3-63: Values/features identified for the Browns Bay Stream in Schedules of the pNRP

Schedule	Category	Significant sites
B	Ngā Taonga Nui a Kiwa	Browns Bay Stream to Porirua Harbour

Table 3-64: Summary of Browns Bay Stream receiving environment characteristics

Receiving Environment	Type	Recreation	Ecology	Cultural	Aesthetic
Browns Bay Stream	Small Waterway	Class 1 (High value)	Class 2 (some ecological value)	Class 1 (Very important)	Class 1 (High value)

3.10.2 Summary of Overflow Characteristics

One potential overflow is identified, which is direct overflow to Browns Bay Stream which has 'Low' volume and frequency (Figure 3-6). Overflow characteristics are summarised in Table 3-65.

Table 3-65: Summary of overflow characteristics, Browns Bay Stream

Overflow ID	Direct/ Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
45	Direct	-	Low	3	Low	Operative	WWL Records and Overflow Forms (2015-2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)

3.10.3 Potential Public Health Effect

Browns Bay Stream is a potential fishing area. 'Low' volume discharges to a small watercourse with 'Class 1' recreational values are assessed as having a 'Very High' potential effect (Effects score of 5), as shown in Table 3-66. The associated level of public health effect is summarised in Table 3-67. The assessed public health effect at this location is 'High'.

Table 3-66: Assessment of public health effects from overflows to Browns Bay Stream

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**Very High potential effect (Effects Score of 5)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for collecting shellfish	**Very High potential effect (Effects Score of 5)** because shellfish have the potential to filter pathogens and metals from water and sediments.
Loss of suitability for fishing	**Very High potential effect (Effects Score of 5)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for harvesting watercress	**Very High potential effect (Effects Score of 5)** because seaweed can be a hydraulic trap for particulate contaminants

Table 3-67: Level of public health effect at Browns Bay Stream

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Level of Public Health Effect
45	Direct	**Very High**	Low	**High**

3.10.4 Potential Ecological Effects

The potential overflow into Browns Bay Stream is of 'Low' frequency and volume.

Discharges to small waterways with a 'Class 2' ecological value are assessed as having a 'High' potential effect on all ecological values.

The level of ecological effect at Browns Bay Stream is summarised in Table 3-69. The level of effect is defined as the combination of the likelihood of an event and the consequences of an event. The assessed level of ecological effect at Browns Bay Stream is 'Moderate'.

Table 3-68: Assessment of ecological effects of overflows to Browns Bay Stream

Potential Effect	Magnitude of Ecological Effect
Change in physical habitat suitability	**Effects Score of 4 (High)**, because of the extent of physical and chemical changes resulting from a wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Effects Score of 4 (High)**, because nutrient concentrations and toxicants are likely to increase above background levels (up to 10-fold for nutrients and 2-to-100-fold for toxicants.)
Change in community structure/loss of sensitive species	**Effects Score of 4 (High)** because changes in physico-chemical habitat are likely to affect sensitive species.
Behavioural changes in fin fish	**Effects Score of 4 (High)**, because changes in physico-chemical habitat suitability are likely.

Potential Effect	Magnitude of Ecological Effect
Increase in nuisance plants	**Effects Score of 1 (very low)**, because of the generally short residence time of elevated nutrient concentrations and other constraints on plant growth.
Reduced quantities of fin fish	**Effects Score of 4 (High)**, because changes in physico- chemical habitat suitability are likely.
Growth of sewage fungus/Beggiatoa	**Effects Score of 3 (moderate)**, because BOD enrichment may provide opportunities for growth of these organisms.

Table 3-69: Level of ecological effect at Browns Bay Stream

Overflow ID	Direct/Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level of Ecological Effect
45	Direct	**High**	Low	**Moderate**

3.10.5 Potential Cultural Effects

Browns Bay Stream is assessed as having 'Very Important' cultural values (Class 1) as listed in Table 3-64. Cultural effects for discharges with a 'Low' volume is assessed as 'Moderate'. The overall level of cultural effects is assessed as 'Low'.

3.10.6 Potential Aesthetic Effects

Browns Bay Stream is assessed as having 'High' aesthetic value. 'Low' volume discharges to such an environment have a 'High' potential to affect these values. The overflow is of 'Low' frequency, the overall level of aesthetic effect is assessed as 'Low'.

3.10.7 Potential of Cumulative Effects

As there is only one potential overflow to Browns Bay Stream which is of 'Low' volume and frequency the risk of cumulative effects in Browns Bay Stream are considered unlikely.

3.10.8 Summary

The potential magnitude and overall level effect of wastewater overflows in Browns Bay Stream is summarised in Table 3-70.

Table 3-70: Summary of potential effects for overflows from Duck catchment to Browns Bay Stream

Value category	Potential magnitude of effect	Level of effect
Public health	Very High	High
Aquatic ecology	High	Moderate
Cultural	Moderate	Low
Aesthetic	High	Low

3.11 DUCK – PĀUATAHANUI INLET

3.11.1 Description of the Receiving Environment

The wastewater network in the Duck catchment includes 7 overflow points that could potentially discharge directly to Pāuatahanui Inlet (Figure 3-6). The Pāuatahanui Inlet receiving environment has already been described is section 3.4.

An assessment of the current state of the marine ecology of Pāuatahanui Inlet against PNRP Objective O19 has been provided in Table 3-24. The available information suggests that PNRP Objective O19 is currently marginally achieved in respect of macroalgae, and not met for invertebrate or mahinga kai species.

Values associated with the Pāuatahanui Inlet as scheduled in the pNRP are summarised in Table 3-71 and categorised for the wastewater network overflow assessment in Table 3-72.

Table 3-71: Values identified for Pāuatahanui Inlet in Schedules of the pNRP

Schedule	Category	Significant sites
A	Outstanding Waterbodies	Pāuatahanui Inlet tidal flats. Values are representativeness, diversity and rarity
B:	Ngā Taonga Nui a Kiwa – Ngāti Toa Rangatira	Te Awarua-o-Porirua (Porirua Harbour including contributing streams): Ngā Mahi a ngā Tūpuna: At Porirua, Ngāti Toa settlements were located exclusively in the coastal area around the harbour and outer catchment. The natural flows and processes of the harbour are a defining feature of traditional life. Te Mahi Kai: The abundance of natural life historically supported by the harbour provided a wealth of kai moana. This is recorded in numerous historical accounts by Ngāti Toa and early foreign visitors. The streams that feed into the harbour also provided a plentiful supply of freshwater fish, forest foods and rongoā. Te Mana o te Tangata: The abundance of kai moana provided by the harbour is renowned by iwi Māori and recorded in legend. In addition to providing sustenance for Ngāti Toa and guests, kai moana gathered from the harbour was an important commodity for trade and gifts. There are numerous accounts and images to support this. Te Manawaroa o te Wai: Despite excessive land reclamations, modification, and environmental damage the harbour continues to support a variety of endemic wildlife; including endangered species. There is vast potential for environmental restoration and this is a primary objective for Ngāti Toa. The only remaining traditional settlements of Ngāti Toa in the Wellington region are located in the coastal area around the harbour at Takapūwāhia and Hongoeka. Environmental issues continue to have a direct and significant impact on successive generations. Te Mana o Te Wai: A defining feature of Ngāti Toa settlement in the Wellington area and integral to Ngāti Toa identity. Wāhi Mahara: Numerous sites in and around the harbour foreshore bear testament to not only the history of Ngāti Toa, but also the formative history of New Zealand.
F1b	Inanga spawning habitat	Tidal reaches of Duck Creek

Schedule	Category	Significant sites
F2	Indigenous bird habitat	Porirua Harbour
F4	Indigenous biodiversity - coastal	Pāuatahanui Inlet: The estuary is nationally significant supporting; nursery for elephant fish, rig, sand flounder, kahawai; habitat for pied oystercatcher and bar-tailed godwit; longfin eel, giant kōkopu, short jaw kōkopu kōaro, inanga, redfin bully, torrentfish and lamprey
F5	Habitats with significant indigenous biodiversity values in the coastal marine area	Seagrass
J	Significant geological features in coastal marine area	Pāuatahanui Inlet: Drowned river valley, depositional sedimentary sequence relatively unmodified by recent tectonic uplift; Ohariu Fault trace; uplifted terraces; largest estuary in lower North Island.

Table 3-72: Summary of Duck - Pāuatahanui Inlet receiving environment characteristics

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Pāuatahanui Inlet	Estuaries	Class 1 (Known fishing site and/or shellfish gathering site with contact recreation)	Class 1 (High ecological value)	Class 1 (Very important)	Class 1 (High value)

3.11.1 Summary of Overflow Characteristics

There are 14 potential overflows of which 7 are direct overflows and 7 indirect overflows to Pāuatahanui Inlet from the Duck catchment. Historical information shows that all direct overflows are of 'Low' volume and frequency except for WNO Sites 34 and 85 which are of 'Medium' volume and 'Medium' frequency. The overflow locations are spatially separated across several bays in the Pāuatahanui Inlet.

A summary of overflow characteristics is shown in Table 3-73.

Table 3-73: Summary of Overflow Characteristics, Duck - Pāuatahanui Inlet

Overflow ID	Direct/ Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
5	Direct	-	Low	-	Low	Operative	No data - assumed
46, 47, 48, 49, 62	Direct	-	Low	-	Low	Operative	WWL Records and Overflow Forms (2015-2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)
85	Direct	-	Medium	6	Medium	Operative	WWL Records and Overflow Forms (2015-2020), Stantec System

Overflow ID	Direct/ Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
							Performance Report (2018), WCS Engineering NIP (2019)
26, 41, 42, 43, 72	Indirect	-	Low	-	Low	Operative	No data
34	Indirect	763	Medium	4	Medium	Operative	WWL Records and Overflow Forms (2015-2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)

3.11.2 Potential Public Health Effects

'Medium' volume discharge to estuaries with 'Class 1' recreational values are assessed as having a 'Moderate' potential effect on all recreational activities, as shown in Table 3-74.

The overall level for potential public effects is summarised in Table 3-75. The level of effect is defined as the combination of the likelihood of an event and the consequences of an event. In this case, the frequency of overflows events range from 'Low' to 'Medium' and the level public health effect is 'Moderate'.

Table 3-74: Magnitude of Public Health Effects from overflows from Duck catchment to Pāuatahanui Inlet

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**Effects Score of 3 (moderate),** because microbial pathogen indicator contact recreation guidelines may be exceeded.
Loss of suitability for collecting shellfish	**Effects Score of 3 (moderate),** because shellfish have the potential to filter pathogens and metals from water and sediments.
Loss of suitability for fishing	**Effects Score of 3 (moderate),** because microbial pathogen indicator contact recreation guidelines may be exceeded.
Loss of suitability for harvesting watercress	**Effects Score of 3 (moderate),** because watercress or seaweed can be a hydraulic trap for particulate contaminants.

Table 3-75: Overall Level of Public Health Effects in Duck - Pāuatahanui Inlet

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Potential level of Public Health Effect
5	Direct	Low	Low	Very Low
46, 47, 48, 49, 62	Direct	Low	Low	Very Low
85	Direct	Moderate	Medium	**Moderate**
45	Indirect	Low	Low	Very Low

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Potential level of Public Health Effect
26, 41, 42, 43, 72	Indirect	Low	Low	Very Low
34	Indirect	Moderate	Medium	**Moderate**

3.11.3 Potential Ecological Effects

'Medium' volume discharges to estuaries with a 'Class 1' recreational value are assessed as having 'predominantly moderate' potential effect on all ecological values, as shown in Table 3-76.

The level of ecological effects is summarised in Table 3-77. Level of effect is defined as the combination of the likelihood of an event and the consequences of an event. The level ecological effect for overflows from Duck Catchment to Pāuatahanui Inlet is 'Moderate'.

Table 3-76: Magnitude of Ecological Effects of Overflows to Duck - Pāuatahanui Inlet

Potential Effect	Magnitude of Ecological Effect
Change in physical habitat suitability	**Effects Score of 3 (moderate),** because there may be physical and chemical changes resulting from a medium volume wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Score of 3 (moderate),** because nutrient concentrations and toxicants may increase above background levels.
Change in community structure/loss of sensitive species	**Effects Score of 3 (moderate),** because changes in physico- chemical habitat suitability may affect sensitive species.
Behavioural changes in fin fish	**Effects Score of 3 (moderate),** because there may be changes in physico-chemical habitat suitability.
Increase in nuisance plants	**Effects Score of 3 (moderate),** because elevated nutrient concentrations may stimulate plant growth.
Reduced quantities of fin fish	**Effects Score of 3 (moderate),** because there may be changes in physico-chemical habitat suitability.
Reduced quantities of shellfish	**Effects Score of 3 (moderate),** because there may be changes in physico-chemical habitat suitability.
Growth of sewage fungus/Beggiatoa	**Effects Score of 2 (low),** because the lack of BOD enrichment provides little opportunity for the growth of these organisms.

Table 3-77: Overall Level of Ecological Effects in Duck - Pāuatahanui Inlet

Overflow ID	Direct/Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level of Ecological Effect
5	Direct	Low	Low	Very Low
46, 47, 48, 49, 62	Direct	Low	Low	Very Low
85	Direct	Moderate	Medium	**Moderate**
45	Indirect	Low	Low	Very Low
26, 41, 42, 43, 72	Indirect	Low	Low	Very Low
34	Indirect	Moderate	Medium	**Moderate**

3.11.4 Potential Cultural Effects

Pāuatahanui Inlet is assessed as having very Important cultural values (Class 1) as listed in Table 3-46.

Potential overflow discharges volumes range from 'Low' to 'Medium' and as such cultural effects are assessed as 'High'. The level of cultural effects is assessed as 'Moderate'.

3.11.5 Potential Aesthetic Effects

Pāuatahanui Inlet is assessed as having a 'High' aesthetic value. 'Low' to 'Medium' volume discharges to such an environment have a 'High' potential to affect these values. The level of aesthetic effect is assessed as being 'Moderate'.

3.11.6 Potential Cumulative Effects

For the Pāuatahanui Inlet receiving environment in the Duck catchment, cumulative effects are possible because:

- There are a moderate number of overflow points that could potentially discharge (7 direct and 7 indirect overflows) which may have a combined effect depending on the timing of wet weather events, spatial variation in rainfall during those events, and several other contributing factors such as wastewater network capacity and condition.
- All the indirect potential overflow points discharge into the inlet at the same location.

For a cumulative effect to rise, most of the potential overflows would need to occur at the same time, which is highly likely during extreme wet weather events. This would result in the total volume of wastewater overflows falling within the 'High' volume range and result in 'Very High' potential public health effects and 'Very High' ecological effects. Therefore, the cumulative effect of overflows is potentially greater than any individual overflow. The assessed potential level of effect for public health and ecological values is 'Very High'.

3.11.7 Summary

The potential magnitude and overall level of effect of wastewater overflows at Pāuatahanui Inlet in the Duck catchment is summarised in Table 3-78.

Table 3-78: Summary of potential effects for overflows from Duck catchment to Pāuatahanui Inlet

Value category	Potential magnitude of effect	Level of effect
Public health	Very High	Very High
Aquatic ecology	Very High	Very High
Cultural	High	**Moderate**
Aesthetic	High	**Moderate**

3.12 PORIRUA - PORIRUA STREAM

3.12.1 Description of the Receiving Environment

Porirua Stream is a 5th order watercourse with an estimated mean flow of 980 L/s and a mean annual low flow of 155 L/s (Figure 3-7). It is the largest stream flowing into the Onepoto Arm of Porirua Harbour. The Porirua Stream catchment lies to the south and west of Porirua Harbour. The drainage area extends from Glenside and the Takapu Valley, through Tawa and Porirua City to the western end of Porirua Harbour. It covers an area of nearly 3,200 ha of which 37% is comprised of impervious surfaces. There are seven main sub-catchments: Kenepuru, Linden, Takapu, Belmont, Churton Park, Tawa and Mitchell (the Kenepuru Stream sub-catchment is described in the previous section, Section 5.3). The catchment dominated by production pasture in its upper reaches and urban land covering its lower reaches, with areas of regenerating indigenous forest, scrub and exotic forest. The River Environment Classification (REC) is 'warm wet climate/low elevation/hard sedimentary and metamorphic geology/pastural, scrub and urban landcover'.

None of the sites achieve pNRP objective O18 for contact recreation, and all are placed in NPS-FM Attribute state "E" indicating a predicted average risk of infection of >7% for full contact recreation users.

summarises the results of Wellington Water *E. coli* monitoring in the Porirua Stream across seven locations (POFW1 – POFW7). These locations were monitored at varying frequencies and during different periods between 2017 and 2022.

None of the sites achieve pNRP objective O18 for contact recreation, and all are placed in NPS-FM Attribute state "E" indicating a predicted average risk of infection of >7% for full contact recreation users.

Table 3-79: Summary statistics and NPS-FM Attribute State for *E. coli* (WWL data 2020 – 2022)

Site name	N	Monitoring Period	% over 540 CFU/100 mL	% over 260 CFU/100 mL	Median CFU/100 mL	95th percentile CFU/100mL	NPS-FM Attribute State	pNRP O18 (95th %ile ≤540)
Porirua Stream d/s Wingfield Place (POFW1)	35	Feb 2020-June 2022	51	63	544	6,140	E	Not meeting
Belmont Stream at Seton Nossiter Park (POFW2)	29	Feb 2020-June 2022	24	28	104	2,480	E	Not meeting
Stebbings Stream at Glenside Road (POFW3)	35	Feb 2020-June 2022	43	71	452	6,040	E	Not meeting
Takapu Stream u/s Porirua Stream (POFW4)	31	Feb 2020-June 2022	29	74	400	3,000	E	Not meeting
Porirua Stream u/s Takapu Stream (POFW5)	33	Feb 2020-June 2022	36	91	458	5,900	E	Not meeting
Porirua Stream at Town Centre (POFW6)	31	Feb 2020-June 2022	61	77	676	8,200	E	Not meeting
Mitchell Stream at Kenepuru Drive (POFW7)	31	Feb 2020-June 2022	32	65	348	9,000	E	Not meeting

The ecological component of the RWQE program a includes monthly monitoring of periphyton cover and annual monitoring of macroinvertebrate communities at two sites in Porirua Stream. Periphyton weighted composite cover (WCC) results from monthly sampling over three years are summarised in Table 3-80. pNRP Objective O19 for periphyton cover is met at both sites.

Table 3-80: Periphyton Weighted Composite Cover (WCC) results for Porirua Stream 2018/19 to 2021/22

Site name	N samples	Max WCC (%cover)	n ≥ 40% cover	pNRP O19 (no more than 8% of samples ≥40% cover)
Glenside Cables	35	15.9	0	Meeting
Milk Depot	35	43.9	1	Meeting

Table 3-81 summarises RWQI macroinvertebrate community index scores from annual invertebrate surveys in the Porirua Stream over five summers from 2017/18 to 2021/22. The pNRP outcome is not met for MCI but not for QMCI.

Table 3-81: Macroinvertebrate community metrics for Porirua Stream (2017/18 to 2021/22)

Site name	substrate	River class	Significant river	N samples	Taxa richness	%EPT (3-yr median)	MCI (5-yr median)	QMCI (5-yr median)	pNRP O19 – MCI	pNRP O19 – QMCI	Meeting O19
Glenside cables	Hard	4	No	4	9	40.9	101	5.7	≥ 110	≥ 5.5	Not meeting
Milk Depot	Hard	4	No	5	8	34.8	91	4.0	≥ 110	≥ 5.5	Not meeting

Thirteen native fish species were recorded in the Porirua Stream between 2003 and 2019 (NZFFD 2021). Several of these species are classified as either at risk or threatened including longfin eel, giant kōkopu, kōaro, inanga and redfin bully (Dunn, et al., 2017). The calculated fish Index of Biotic Integrity (F-IBI) for Porirua Stream is 58 which gives an NPS Attribute State of A and meets PNRP object O19 for fish (refer to Appendix B for details).

Significant values associated with the Porirua Stream as scheduled in the pNRP are summarised in Table 3-82 and categorised for the wastewater network overflow assessment in Table 3-83.

Table 3-82: Environmental and cultural values identified for the Porirua Stream in Schedules of the pNRP

Schedule	Category	Significant Sites
B	Ngā Taonga Nui a Kiwa	Porirua Stream to Porirua Harbour
C	Sites with significant values for Ngāti Toa Rangātira	Porirua Stream mouth: wai māori, wai ora, kai awa, rongoā, kai ngahere, nohoanga. Takapūwāhia, Te Awarua-o-Porirua Harbour: papa kāinga, kāinga, pā, mahinga kai, taunga ika, wāhi tapu, urupā, Te Ara o Kupe, tohu whenua, wāhi whakarite, mahinga kai, kai moana, taunga

Schedule	Category	Significant Sites
		ika, mahinga mataitai, mara kai, māhi pārekareka
F1	Rivers and lakes with significant indigenous ecosystems	Porirua Stream has significant indigenous values including habitat for indigenous threatened or at-risk fish, and inanga spawning.

Table 3-83: Porirua Stream receiving environment characteristics

Receiving Environment Name	Recreation	Ecology	Cultural	Aesthetic
Porirua Stream	Class 1 (Known shellfish gather and/or known fishing site)	Class 1 (High value)	Class 1 (Very important)	Class 1 (High value)

3.12.2 Summary of Overflow Characteristics

There are 34 potential overflows to Porirua Stream, 23 of which are direct overflows and 11 of which are indirect overflows. All direct overflows are 'Low' volume discharges except for WNO Site 64 which has a 'High' volume discharge. This is a constructed overflow point at the City Centre Pump Station (PS20) and has historically been well known for its high frequency and high volume of overflows. The overflow locations are spread across the entire stream length.

Table 3-84: Porirua Stream summary of overflow characteristics

Overflow ID	Direct/ Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
12, 71, 384, 389, 390, 391, 392	Direct	-[11]	Low[12]	-[11]	Low[13]	Operative	No data
393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407	Direct	-	Low	-	Low	Operative	WWL Re cords and Overflow Forms (2015-2020)
64	Direct	1020 to 39154	High[14]	≤11	High[15]	Operative	WWL Records and Overflow Forms (2015-2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)
11, 14, 18, 19, 23, 25, 27, 28, 32, 35, 37	Indirect	-	Low	-	Low	Operative	No data

[11] Where neither modelled nor measured data is available, this usually indicates that there are no known overflows associated with the overflow point. In these cases, the volume and frequency range is deemed to be 'Low'.
[12] 'Low' annual overflow volume is defined as less than 600 m^3.
[13] 'Low' annual overflow frequency is defined as 2 or fewer overflows per year.
[14] 'High' annual overflow volume is defined as 6,000m^3 or greater.
[15] 'High' annual overflow frequency is defined as more than 10 overflows per year.

3.12.3 Potential Public Health Effects

Porirua Stream at the Kenepuru confluence is a popular area for whitebaiting. All direct overflows are ‘Low’ volume discharges except for WNO Site 64 which has a ‘High’ volume discharge. ‘High’ volume discharges to large waterways with ‘Class 1’ recreational values are assessed as having a ‘Very High’ potential effect (Effects score of 5), as shown in Table 3-85.

The level of potential public health effect for Porirua Stream is summarised in Table 3-86. The level of effect is defined as the combination of the likelihood of an event and the consequences of an event. In this catchment, the frequency of overflow events range from ‘Low’ to ‘High’ and the assessed level of public health effect at this location is ‘Very High’.

Table 3-85: Assessment of public health effects from overflows to Porirua Stream

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**Very high potential effect (Effects Score of 5)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for fishing	**Very high potential effect (Effects Score of 5)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for harvesting watercress	**Very high potential effect (Effects Score of 5)** because watercress can be a hydraulic trap for particulate contaminants

Table 3-86: Level of public health effects in Porirua Stream

Overflow ID	Direct/ Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Potential Level of Public Health Effect
12, 71, 384, 389, 390, 391, 392	Direct	Moderate	Low	Low
393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407	Direct	Moderate	Low	Low
64	Direct	**Very High**	High	**Very High**
11, 14, 18, 19, 23, 25, 27, 28, 32, 35, 37	Indirect	Moderate	Medium	Moderate

3.12.4 Potential Ecological Effects

Potential overflows to Porirua Stream range from ‘Low’ to ‘High’ volume discharges. ‘High’ volume discharges to large waterways with ‘Class 1’ recreational values are assessed as having a ‘Very High’ potential effect on all ecological values, as shown in Table 3-87.

The level of ecological effect at Porirua Stream is summarised in Table 3-88. Level of effect is defined as the combination of the likelihood of an event and the consequences of an event. The assessed level of ecological effects at Porirua Stream is ‘Very High’.

Table 3-87: Assessment of ecological effects of overflows to Porirua Stream

Potential Effect	Magnitude of Effect
Change in physical habitat suitability	**Effects Score of 5 (Very High)**, because of the extent of physical and chemical changes resulting from a wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Effects Score of 5 (Very High)**, because nutrient concentrations and toxicants are likely to increase above background levels (up to 10-fold for nutrients and 2-100-fold for toxicants.)
Change in community structure/loss of sensitive species	**Effects Score of 5 (Very High)** because changes in physico-chemical habitat are likely to affect sensitive species.
Behavioural changes in fin fish	**Effects Score of 3 (Moderate)**, because there may be changes in physico-chemical habitat suitability.
Increase in nuisance plants	**Effects Score of 2 (Low)**, because of the generally short residence time of elevated nutrient concentrations and other constraints on plant growth.
Reduced quantities of fin fish	**Effects Score of 5 (Very High)**, because changes in physico-chemical habitat suitability are likely.
Growth of sewage fungus/Beggiatoa	**Effects Score of 4 (High)**, because BOD enrichment is likely to stimulate the growth of these organisms.

Table 3-88: Overall level of ecological effect at Porirua Stream

Overflow ID	Direct/ Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level of ecological effect
12, 71, 384, 389, 390, 391, 392	Direct	High	Low	Moderate
393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407	Direct	High	Low	Moderate
64	Direct	**Very High**	High	**Very High**
11, 14, 18, 19, 23, 25, 27, 28, 32, 35, 37	Indirect	High	Low	Moderate

3.12.5 Potential Cultural Effects

Porirua Stream is assessed as having 'Very Important' cultural values (Class 1) as listed in Table 3-83. The overflow discharges are of 'Low' to 'High' volume; cultural effects are assessed as 'Very High'. Overflows range from 'Low' to 'High' frequency and as such, the level of cultural effects is assessed as 'High'.

3.12.6 Potential Aesthetic Effects

Porirua Stream is assessed as having a 'High' aesthetic value. 'High' volume discharges to such an environment have a 'High' potential to affect these values. The overall level of effect on aesthetic values is assessed as 'High'.

3.12.7 Potential of Cumulative Effects

For the Porirua Stream receiving environment, cumulative effects are likely to occur because there is a high number of overflow points that could potentially discharge into the receiving water (23 direct and 11 indirect overflows) which may have a combined effect depending on the timing of wet weather events, spatial variation in rainfall during those events, and several other contributing factors such as wastewater network capacity and condition.

For a spatially cumulative effect to arise, most of the direct and indirect discharges would need to occur at the same time. This would result in the total volume of wastewater overflows falling within the 'High' range and result in 'Very High' level public health effects, and 'Very High' level of ecological effects. As these potential direct discharges have already been assessed in Section 3.12.3 and 3.12.4 of the AEE as having 'Very High' risk of potential effects individually, the cumulative effect is not notably different.

3.12.8 Summary of Potential effects for Porirua Stream

The potential magnitude and overall level effect of wastewater overflows in Porirua Stream is summarised in Table 3-89.

Table 3-89: Summary of potential effects for Porirua Stream

Value category	Potential magnitude of effect	Level of effect
Public health	Very High	Very High
Aquatic ecology	Very High	Very High
Cultural	Very High	High
Aesthetic	Very High	High

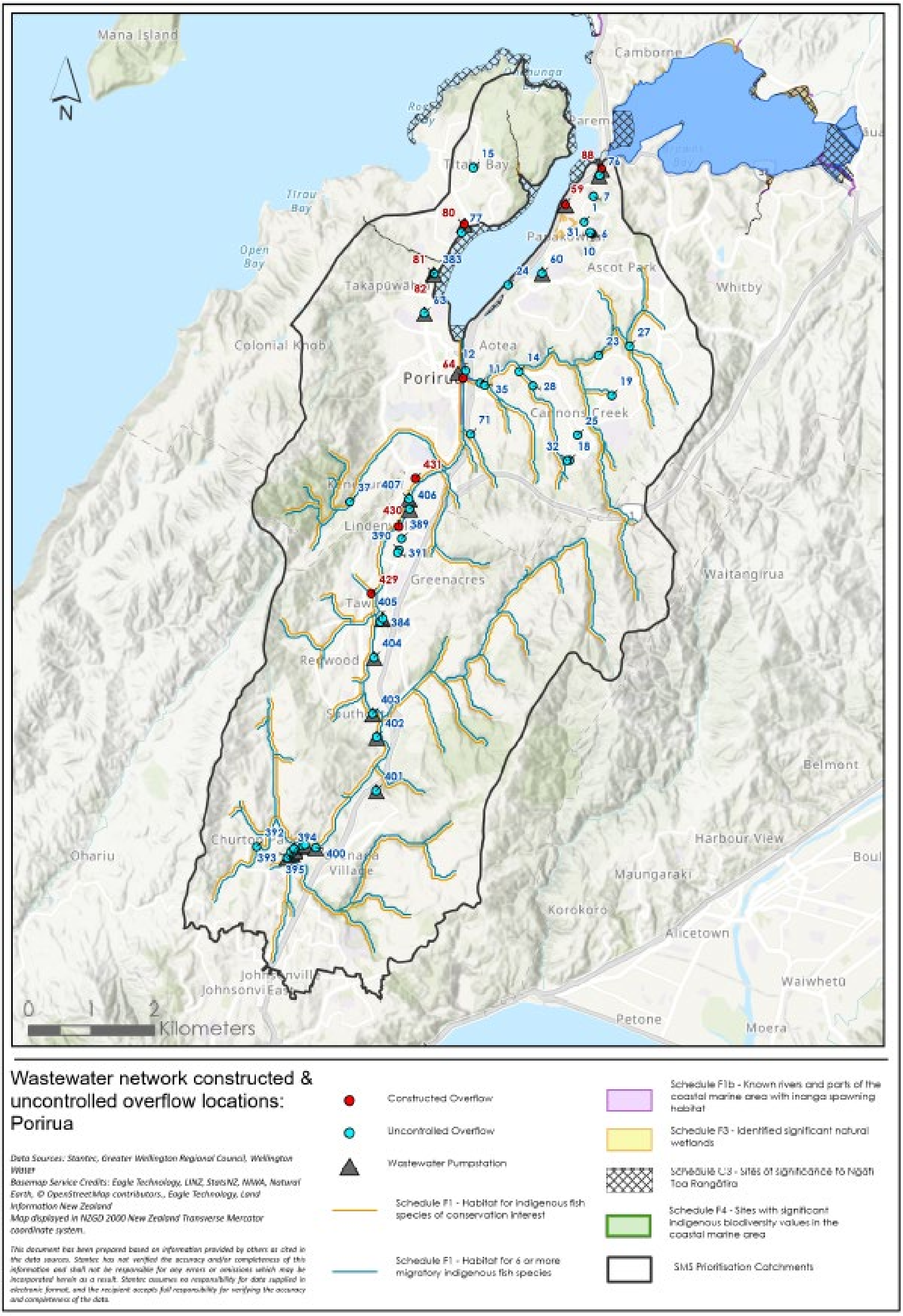

Figure 3-7: Wastewater network overflows to Porirua catchment

3.13 PORIRUA - KENEPURU STREAM

3.13.1 Description of the Receiving Environment

Kenepuru Stream is a 4th order watercourse which drains a catchment of approximately 1,300 ha including parts of Porirua East, Cannons Creek, Waitangrua and Ascot Park. It is the largest of the seven Porirua Stream sub-catchments, comprising 23% of the Porirua Stream catchment area (total catchment area 5,600 ha). Thirty five percent of the Kenepuru Stream sub-catchment is in urban land-use; the remainder of the catchment is mostly pasture, gorse and broom, with relatively small areas of regenerating indigenous broadleaved forest associated with the stream within Bothamley Park (Wildlands, 2012).

The stream has an estimated mean flow of 214 L/s and mean annual low flow of 29 L/s. The River Environment Classification (REC) is 'warm dry climate/low elevation/hard sedimentary geology/pastural, scrub and urban landcover'.

Table 3-90 summarises the results of monthly *E. coli* monitoring at two sites in the Kenepuru Stream from February 2020 to June 2022. The results indicate a high level of faecal contamination in Kenepuru Stream. Neither site achieves pNRP objective O18 for contact recreation and are placed in NPS-FM Attribute state "E" indicating a predicted average risk of infection of >7% for full contact recreation users.

Table 3-90: Summary statistics and NPS-FM Attribute State for *E. coli* in the Kenepuru Stream (WWL data, Feb 2020 to June 2022)

Site name	N samples	% exceeding 540 CFU/100mL	% exceeding 260 CFU/100mL	Median concentration CFU/100mL	95th percentile CFU/100mL	NPS-FM Attribute State	pNRP O18 (95th %ile ≤540)
Bothamley Park	33	76	85	1,090	14,740	E	Not meeting
Mepham Place	29	55	86	655	10,960	E	Not meeting

The NZFFD (2021) includes records for six species of indigenous fish in the Kenepuru Stream from surveys conducted between 2003 and 2019. These are longfin eel, shortfin eel, inanga, giant kokopu, banded kokopu and common bully. Several of these species are classified as either at risk or threatened including longfin eel, giant kokopu and inanga (Dunn, et al., 2017). The calculated fish Index of Biotic Integrity (F-IBI) for Kenepuru Stream is 40 which gives an NPS Attribute State of A and meets PNRP object O19 for fish.

Significant values associated with Kenepuru Stream as scheduled in the pNRP are summarised in Table 3-91 and categorised for the wastewater network overflow assessment in Table 3-92.

Table 3-91: Environmental and cultural values identified for Kenepuru Stream in Schedules of the pNRP

Schedule	Category	Significant sites
F1	Rivers and lakes with significant indigenous ecosystems	Kenepuru Stream has significant indigenous values including habitat for indigenous threatened or at-risk fish, migratory fish habitat, and inanga spawning habitat.
F1b	Inanga spawning habitat	The mouth of Kenepuru supports inanga spawning habitat.

Table 3-92: Summary of Kenepuru Stream and Cannons Creek receiving environment characteristics

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Kenepuru Stream	Medium waterway	Class 1 (Known fishing site)	Class 1 (High value)	Class 1 (Very important)	Class 1 (High value)

3.13.2 Summary of Overflow Characteristics

There are 10 direct potential overflows to Kenepuru Stream, all of which are 'Low' volume and 'Low' frequency discharges. Overflow characteristics are summarised in Table 3-93. The overflow locations are spread across the entire stream length.

Table 3-93: Summary of overflow characteristics in Kenepuru Stream

Overflow ID	Direct/ Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
11, 14, 18, 19, 23, 25, 27, 28, 32, 35	Direct	-[16]	Low[17]	-[16]	Low[18]	Operative	No record

3.13.3 Potential Public Health Effects

Kenepuru Stream is a known use area for fishing (whitebaiting, eeling, freshwater crayfish). 'Low' volume discharges to medium waterways with a 'Class 1' recreational value are assessed as having 'High' potential effect (Effects Score of 4) on all recreational activities as shown in Table 3-94. The level of public health effects in Kenepuru Stream is summarised in Table 3-95 and is assessed as 'Moderate'.

Table 3-94: Assessment of public health effects from overflows to Kenepuru Stream

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**High potential effect (Effects Score of 4)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for fishing	**High potential effect (Effects Score of 4)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for harvesting watercress	**High potential effect (Effects Score of 4)** because seaweed can be a hydraulic trap for particulate contaminants

[16] Where neither modelled nor measured data is available, this usually indicates that there are no known overflows associated with the overflow point. In these cases, the volume and frequency range is deemed to be 'Low'
[17] 'Low' annual overflow volume is defined as less than 600 m^3.
[18] 'Low' annual overflow frequency is defined as 2 or fewer overflows per year.

Table 3-95: Level public health effects at Kenepuru Stream

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Level of Public Health
11, 14, 18, 19, 23, 25, 27, 28, 32, 35	Direct	High	Low	Moderate

3.13.4 Potential Ecological Effects

Kenepuru Stream is assessed under the pNRP as having significant indigenous ecosystems and is an inanga spawning habitat. 'Low' volume discharges to medium waterways with 'Class 1' ecological values are assessed as having predominantly 'High' potential effects (Effects Score of 4) on ecological values, as shown in Table 3-96. The level of potential ecological effects in Kenepuru Stream is summarised in Table 3-97. The level of adverse effect is the combination of the likelihood of an event and the consequences of an event which, at this location, is assessed as 'Moderate'.

Table 3-96: Assessment of ecological effects of overflows to Kenepuru Stream

Potential Effect	Magnitude of Ecological Effect
Change in physical habitat suitability	**Effects Score of 4 (High),** because of the extent of physical and chemical changes resulting from a wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Effects Score of 4 (High),** because toxicant concentrations and toxicants may increase up to 20-fold above background levels.
Change in community structure/loss of sensitive species	**Effects Score of 4 (High),** because changes in physico- chemical habitat suitability are likely.
Behavioural changes in fin fish	**Effects Score of 3 (Moderate),** because there changes in physico-chemical habitat suitability are likely.
Increase in nuisance plants	**Effects Score of 2 (Low),** because of the generally short residence time of elevated nutrient concentrations and other constraints on plant growth
Reduced quantities of fin fish	**Effects Score of 4 (High),** because of there changes in physico-chemical habitat suitability are likely.
Growth of sewage fungus/Beggiatoa	**Effects Score of 3 (Moderate),** because BOD enrichment is likely to stimulate the growth of these organisms.

Table 3-97: Level of ecological effects at Kenepuru Stream

Overflow ID	Direct/ Indirect	Magnitude of Potential Ecological Effect	Overflow Frequency Range	Level of Ecological Effect
11, 14, 18, 19, 23, 25, 27, 28, 32, 35	Direct	**High**	Low	Moderate

3.13.5 Potential Cultural Effects

Kenepuru Stream is assessed as having 'Very Important' cultural values (Class 1) as listed in Table 3-92. The overflow discharges are 'Low' volume and as such, cultural effects are assessed as 'Moderate'. The overall level of cultural effects in Kenepuru Stream is assessed as 'Low'.

3.13.6 Potential Aesthetic Effects

Kenepuru Stream is assessed as having a 'High' aesthetic value. 'Low' volume discharges to such an environment have a 'High' potential to affect these values. The overflows are 'Low' frequency and therefore the overall level of aesthetic effect is 'Low'.

3.13.7 Potential of Cumulative Effects

Cumulative effects at Kenepuru Stream are considered to be possible because:

- There are 10 direct overflows that could potentially discharge into the stream. These may have a combined effect depending on the timing of wet weather events, spatial variation in rainfall during those events, and several other contributing factors such as wastewater network capacity and condition.

During peak wet weather flows in particular, the total volume of wastewater overflows would likely fall within the 'Medium' volume range and result in 'Very High' potential public health and 'High' ecological effects. As such, the level of cumulative of these discharges is assessed as 'High' for public health and 'Moderate' for level of ecological effects.

3.13.8 Summary

The potential magnitude and level of effects of wastewater overflows in Kenepuru Stream is summarised in Table 3-98.

Table 3-98: Summary of magnitude and level effects for overflows to Kenepuru Stream

Value category	Potential magnitude of effect	Level of effect
Public health	High	High
Aquatic ecology	High	Moderate
Cultural	Moderate	Low
Aesthetic	High	Low

3.14 PORIRUA - ONEPOTO FRINGE LAGOONS

3.14.1 Description of the Receiving Environment

The Onepoto Fringe lagoons including Aotea and Papakowhai lagoons were formed in the 1950s and 1960s when the main trunk railway line and State Highway 1 were realigned from the natural coastline to a more direct route on land reclaimed from the Onepoto Arm of Porirua Harbour (Figure 3-7). This development cut off a series of embayments from the harbour which were developed into artificial lagoons.

The largest of these, Aotea Lagoon, is now surrounded by a 7- hectare public park including a playground and miniature railway. It is popular for picnicking, walking and running. The lagoons have the character of duck ponds and are not suitable for full contact recreation activities (although swimming is prohibited in Aotea Lagoon, the lagoon is used for remote control boats).

Significant values associated with the lagoons as scheduled in the pNRP are summarised in Table 3-99 and categorised for the wastewater network overflow assessment in Table 3-100.

Table 3-99: Values identified for the Onepoto Fringe Lagoons in Schedules of the pNRP

Schedule	Category	Significant sites
C	Sites with significant for Ngati Toa Rangatira	Okowai (Papakowai) Lagoon

Table 3-100: Summary of Onepoto Fringe Lagoons receiving environment characteristics

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Onepoto Fringe Lagoons (Aotea Lagoon, Papakowhai Lagoon)	Basins/Lakes	Class 2 (Contact recreation may occur)	Class 2 (Some ecological value)	Class 1 (Very important)	Class 1 (High value)

3.14.2 Summary of Overflow Characteristics

There are 6 direct potential overflows to Onepoto Fringe Lagoons (1 to Aotea Lagoon and 5 to Papakowhai Lagoon), all of which are 'Low' volume and 'Low' frequency discharges. WNO site 60 is located at Aotea Lagoon while the remaining sites are clustered together at Papakowhai Lagoon.

Overflow characteristics are summarised in Table 3-101.

Table 3-101: Summary of overflow characteristics in Onepoto Fringe Lagoon

Overflow ID	Direct/ Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
1, 6, 10, 21, 31	Direct	-	Low[19]	-	Low[20]	Operative	No record
60	Direct	6	Low	0.4	Low	Modelled	WWL Records and Overflow Forms (2015-

[19] 'Low' annual overflow volume is defined as less than 600 m^3.
[20] 'Low' annual overflow frequency is defined as 2 or fewer overflows per year.

Overflow ID	Direct/ Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
							2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)

3.14.3 Potential Public Health Effects

Onepoto Fringe Lagoons do not appear to have any full contact recreation due to existing water quality issues (some of which are directly attributable to the presence of waterfowl). Aotea Lagoon is typically used for informal recreational activities such as strolling, walking, cycling, jogging, picnicking and children's play. Furthermore, the PCC Reserves Management Plan specifically precludes contact recreation in Aotea Lagoon, and signage is already present to restrict full contact activities such as swimming in the lagoon. 'Low' volume discharges to basins and lakes with a 'Class 2' recreational value are assessed as having 'Moderate' potential effect (Effects Score of 3) on all recreational activities as shown in Table 3-102. The level of effect for public health is summarised in Table 3-103 and is assessed as 'Low'.

Table 3-102: Assessment of public health effects from overflows to Onepoto Fringe Lagoons

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**Moderate potential effect (Effects Score of 3)** because microbial pathogen indicator contact recreation guidelines may be exceeded
Loss of suitability for fishing	**Moderate potential effect (Effects Score of 3)** because microbial pathogen indicator contact recreation guidelines may be exceeded
Loss of suitability for harvesting watercress	**Moderate potential effect (Effects Score of 3)** because seaweed can be a hydraulic trap for particulate contaminants

Table 3-103: Level of public health effects at Onepoto Fringe Lagoons

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Level of Public Health Effect
1, 6, 10, 21, 31	Direct	**Moderate**	Low	**Low**
60	Direct	**Moderate**	Low	**Low**

3.14.4 Potential Ecological Effects

All direct overflows to Onepoto Fringe Lagoons are 'Low' volume and 'Low' frequency discharges.

'Low' volume discharges to basins and lakes with 'Class 2' recreational values are assessed as having predominantly 'Moderate' effects on all ecological values, as shown in Table 3-104.

The level of ecological effects at beaches is summarised in Table 3-105. The overall level of effect is defined as the combination of the likelihood of an event and the consequences of an event. The assessed level of ecological effect at Onepoto Fringe Lagoons is 'Low'.

Table 3-104: Assessment of ecological effects of overflows to Onepoto Fringe Lagoons

Potential Effect	Magnitude of Ecological Effect
Change in physical habitat suitability	**Effects Score of 3 (Moderate),** because there may be physical and chemical changes resulting from a wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Effects Score of 3 (Moderate),** because nutrient and toxicant concentrations may increase above background levels.
Change in community structure/loss of sensitive species	**Effects Score of 3 (Moderate),** because changes in physico- chemical habitat suitability may affect sensitive species.
Behavioural changes in fin fish	**Effects Score of 3 (Moderate),** because there may be changes in physico-chemical habitat suitability.
Increase in nuisance plants	**Effects Score of 3 (Moderate),** because elevated nutrient concentrations may stimulate plant growth.
More frequent phytoplankton blooms in the water column	**Effects Score of 2 (Low),** because of the generally short residence time of elevated nutrient concentrations and low probability of elevated water temperature following an overflow event.
Reduced quantities of fin fish	**Effects Score of 3 (Moderate)**, because there may be changes in physico-chemical habitat suitability.
Growth of sewage fungus/Beggiatoa	**Effects Score of 3 (Moderate)**, because BOD enrichment may provide opportunity for the growth of these organisms.

Table 3-105: Level of ecological effects at Onepoto Fringe Lagoons

Overflow ID	Direct/Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level of Ecological Effect
1, 6, 10, 21, 31	Direct	**Moderate**	Low	**Low**
60	Direct	**Moderate**	Low	**Low**

3.14.5 Potential Cultural Effects

Onepoto Fringe Lagoons are assessed as having ‘Very Important’ cultural values (Class 1). ‘Low’ volume discharges to such an environment have a ‘Moderate’ potential effect on these values. Because all overflows occur at a ‘Low’ frequency the overall level of cultural effects is ‘Low’.

3.14.6 Potential Aesthetic Effects

Onepoto Fringe Lagoons are assessed as having ‘High’ aesthetic value due to their accessibility and proximity in public spaces. ‘Low’ volume discharges to such an environment has a ‘High’ potential effect on these values. As all overflows occur at a ‘Low’ frequency the overall level of aesthetic effects is assessed as ‘Low’.

3.14.7 Potential Cumulative Effects

Cumulative effects will be less than minor, if any, at Aotea Lagoon as there is 1 direct potential overflow. The lagoons are distinctly separate waterways and the low volume and frequency of discharges mean that pathogens would not normally persist in the receiving environment.

For the Papakowhai Lagoon receiving environment, cumulative effects may occur as there are 5 direct overflows to Papakowhai Lagoon. All overflows into Papakowhai Lagoon are of ‘Low’ volume and frequency. For a cumulative effect to arise, most of the direct and indirect discharges would need to occur at the same time, which is likely during peak wet weather flows. This could result in the total volume of wastewater overflows falling within the 'Medium' volume range and result in a 'High' potential public health effect and ecological effect. The cumulative level of effect of these discharges is assessed as 'Moderate' level of effect for both public health and ecological values.

3.14.8 Summary

The potential magnitude and level of effects of wastewater overflows in Onepoto Fringe Lagoons is summarised in Table 3-106.

Table 3-106: Summary of potential effects for overflows from Porirua catchment to Onepoto Fringe Lagoons

Value category	Potential magnitude of effect	Level of effect
Public health	High	Moderate
Aquatic ecology	High	Moderate
Cultural	Moderate	Low
Aesthetic	High	Low

3.15 PORIRUA – KAHUTEA, HIKARITO AND MAHINAWA STREAMS

3.15.1 Description of the Receiving Environment

Kahutea Stream is a minor 1st order watercourse which drains a catchment of 1430 hectares including Onepoto Park and suburban northern Titahi Bay. The stream has an estimated mean flow of 28 L/s and mean annual low flow of 5 L/s (NZ River Maps (niwa.co.nz)).

Hikarito Stream is a minor 1st order watercourse which drains a catchment of 1430 hectares including Onepoto Park and suburban northern Titahi Bay (Figure 3-7). The stream has an estimated mean flow of 28 L/s and mean annual low flow of 5 L/s.

Mahinawa Stream (Takapuwahia) is a 2nd order watercourse which drains a catchment of approximately 253 hectares including Porirua Scenic Reserve and urban Takapuwahia (Figure 3-7). The stream has an estimated mean flow of 46 L/s and mean annual low flow of 6 L/s. Much of the middle and lower reaches of the stream is piped, resulting in significant habitat loss.

The River Environment Classification (REC) has categorised all of these watercourses as having 'warm dry climate/low elevation/hard sedimentary geology/urban landcover'.

Table 3-107 summarises the results of WWL monthly *E. coli* monitoring in Mahinawa Stream at the outlet to Porirua Harbour over the period from February 2020 to June 2022. The results indicate a high level of faecal contamination. The site does not achieve pNRP objective 18 for contact recreation and is placed in NPS-FM Attribute state "E" indicating a predicted average risk of infection of >7% for full contact recreation users.

Table 3-107: Summary statistics and NPS-FM Attribute State for E. coli (WWL data June 2020-Feb 20222

Site name	N samples	% exceedance over 540 CFU/100mL	% exceedance over 260 CFU/100mL	Median concentration CFU/100mL	95th percentile CFU/100mL	NPS-FM Attribute State	pNRP O18 (95th %ile ≤540)
Mahinawa Stream	**31**	**42**	**58**	**485**	**9,850**	E	Not achieved

Four species of indigenous fish were recorded in the Mahinawa Stream during a survey in 2009: longfin eel, inanga, banded kokopu, redfin bully (NZFFD 2021). With the exception of banded kokopu, all are classified as either at risk or threatened (Dunn, et al., 2017). The calculated fish Index of Biotic Integrity (F-IBI) for Mahinawa Stream is 36 which gives an NPS Attribute State of A but does not meet the more stringent pNRP objective O19 for fish.

Values associated with the Mahinawa and Hukarito Streams as scheduled in the pNRP are summarised in Table 3-108 and categorised for the wastewater network overflow assessment in Table 3-109.

Table 3-108: Values identified for Mahinawa and Hukarito Streams in Schedules of the pNRP

Schedule	Category	Significant sites/values
B	Ngā Taonga Nui a Kiwa – Ngāti Toa Rangatira	Takapūwāhia Stream: wāhi tapu, urupā, wāhi tūpuna, wāhi maumahara, kāinga, marae, wai ora, wai māori, marae, kai awa, nohoanga, taunga waka, rongoā, puna raranga, tohu whenua

Table 3-109: Summary of Mahinawa and Hukarito Streams receiving environment characteristics

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Mahinawa Streams	Small Waterway	Class 2 (Contact recreation may occur)	Class 2 (Some ecological value)	Class 1 (Very important)	Class 1 (High value)

3.15.2 Summary of Overflow Characteristics

There are 2 direct potential overflows to Hukarito Stream, all of which are 'Low' volume discharges. The frequency of discharges are all 'Low'.

Summary of overflow characteristics is detailed in Table 3-110.

Table 3-110: Summary of overflow characteristics in Mahinawa and Hukarito Streams

Overflow ID	Direct/Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
15	Direct	-[21]	Low[22]	-[21]	Low[23]	Operative	No data – assumed
63	Direct	-	Low	-	Low	Operative	WWL Records and Overflow Forms (2015-2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)

3.15.3 Potential Public Health Effects

All potential direct overflows are 'Low' volume discharges. 'Low' volume discharges to streams with 'Class 1' recreational values are assessed as having a 'High' effect on all recreational activities.

The level public health effect at Mahinawa and Hukarito Stream is summarised in Table 3-112. Level of effect is defined as the combination of the likelihood of an event and the consequences of an event. In this case the level of public health effects in Mahinawa and Hukarito Stream is 'Moderate'.

[21] Where neither modelled nor measured data is available, this usually indicates that there are no known overflows associated with the overflow point. In these cases, the volume and frequency range is deemed to be 'Low'.
[22] 'Low' annual overflow volume is defined as less than 600 m^3.
[23] 'Low' annual overflow frequency is defined as 2 or fewer overflows per year.

Table 3-111: Assessment of public health effects from overflows to Mahinawa and Hukarito Streams

Potential Effect	Magnitude of Potential Public Health Effect
Loss of suitability for contact or partial contact recreation (e.g. rowing)	**High potential effect (Effects Score of 4)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded (and there is known to be intensive recreational activity within range of overflows).
Loss of suitability for collecting shellfish	**High potential effect (Effects Score of 4)** because shellfish have the potential to filter pathogens and metals from water and sediments
Loss of suitability for fishing	**High potential effect (Effects Score of 4)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for harvesting watercress	**High potential effect (Effects Score of 4)** because watercress can be a hydraulic trap for particulate contaminants

Table 3-112: Level of public health effects at Mahinawa and Hukarito Streams

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Level of Public Health Effect
15	Direct	**High**	Low	Moderate
63	Direct	**High**	Low	Moderate

3.15.4 Potential Ecological Effects

All potential direct and indirect overflows are ‘Low’ volume discharges. ‘Low’ volume discharges to small waterways with ‘Class 2’ recreational values are assessed as having a ‘High’ effect on all ecological values, as shown in Table 3-113.

The overall level of ecological effects is summarised in Table 3-114. Level of effect defined as the combination of the likelihood of an event and the consequences of an event. The assessed level of ecological effect at Mahinawa Streams is ‘Moderate’.

Table 3-113: Assessment of ecological effects of overflows to Mahinawa and Hukarito Streams

Potential Effect	Magnitude of Ecological Effect
Change in physical habitat suitability	**Effects Score of 4 (High),** because of the extent of physical and chemical changes resulting from a wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Effects Score of 4 (High),** because toxicant concentrations and toxicants may increase up to 20-fold above background levels.
Change in community structure/loss of sensitive species	**Effects Score of 4 (High),** because changes in physico- chemical habitat suitability are likely.
Behavioural changes in fin fish	**Effects Score of 3 (Moderate),** because changes in physico-chemical habitat suitability are likely.
Increase in nuisance plants	**Effects Score of 2 (Low),** because of the generally short residence time of elevated nutrient concentrations and other constraints on plant growth
Reduced quantities of fin fish	**Effects Score of 4 (High),** because changes in physico-chemical habitat suitability are likely.

Potential Effect	Magnitude of Ecological Effect
Growth of sewage fungus/Beggiatoa	**Effects Score of 4 (High),** because BOD enrichment is likely to stimulate the growth of these organisms.

Table 3-114: Level of ecological effects at Mahinawa and Hukarito Streams

Overflow ID	Direct/Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level of Ecological Effect
15	Direct	**High**	Low	Moderate
63	Direct	**High**	Low	Moderate

3.15.5 Potential Cultural Effects

Mahinawa and Hurarito Streams are assessed as having 'Very Important' cultural values (Class 1) as listed in Table 3-109.

The overflow discharges are of 'Low' volume and cultural effects are assessed as 'Moderate'. Because the overflows occur from a 'Low' frequency, the level of cultural effects is assessed as 'Low'.

3.15.6 Potential Aesthetic Effects

Mahinawa and Hurarito Streams are assessed as having a 'High' aesthetic value. 'Low' volume discharges to such an environment have a 'High' potential to affect these values. However, because the overflows occur with 'Low' frequency, the level of effect assessed as 'Low'.

3.15.7 Potential of Cumulative Effects

The potential of cumulative effects in the Mahinawa/Hurarito receiving environment is very unlikely because:

- There are only 2 potential direct overflows which may have a combined effect depending on the timing of wet weather events, spatial variation in rainfall during those events, and several other contributing factors such as wastewater network capacity and condition.
- The points are spatially separated discharging into different streams.

Cumulative effects have not been considered for these receiving environments.

3.15.8 Summary

The potential magnitude and level of effect of wastewater overflows in Mahinawa Stream are summarised in Table 3-115.

Table 3-115: Summary of potential effects for Mahinawa and Hurarito Streams

Value category	Potential magnitude of effect	Level of effect
Public health	High	Moderate
Aquatic ecology	High	Moderate
Cultural	Moderate	Low
Aesthetic	High	Low

3.16 PORIRUA - ONEPOTO ARM

3.16.1 Description of the Receiving Environment

There are 45 potential overflows from the Porirua sub-catchment to the Onepoto Arm of Porirua Harbour (Figure 3-7). Te Awarua-o-Porirua Harbour has been described in Section 3-4.

Table 3-116 summarises the results of GWRC recreational water quality monitoring in the Onepoto arm over the five-year period between January 2018 and December 2022. The monitoring site, off Wi Neera Drive at the southern end of the harbour, has exhibited poor microbiological water quality and consistently fails to achieve pNRP objective O18 for enterococci, typically by a considerable margin. The monitoring site is less than 800m from the mouth of Porirua Stream and is undoubtably influenced by the Porirua Stream inflow to the harbour, which as described in the previous section is known to be significantly affected by faecal contamination during rainfall events.

Table 3-116: Summary statistics for enterococci at Onepoto Arm (GWRC data 2017 - 2022)

Site name	N samples	% over 140 CFU/100mL	% over 500 CFU/100mL	Median CFU/100mL	95th percentile CFU/100mL (3 years to December 2020, 2021 and 2022)			pNRP Objective O18 95th percentile
					2018-2020	2019-2021	2020-2022	
Porirua Harbour at Wi Neera	138	42	21	94	1720	4260	3255	≤500

Table 3-117 provides an assessment of against PNRP Objective O19. The available information suggests that PNRP Objective O19 is currently not met in respect of macroalgae, invertebrate or mahinga kai species.

Table 3-117: Assessment of the Onepoto Arm of Porirua Harbour against PNRP Objective O19

	Macroalgae	Invertebrates	Mahinga kai species	Fish
PNRP Objectives	The algae community is reflective of a good state of aquatic ecosystem health with a low frequency of nuisance blooms	Invertebrate communities are resilient, and their structure, composition and diversity are reflective of a good state of aquatic ecosystem health	Mahinga kai species, including taonga species, are present in quantities, sizes and of a quality that is appropriate for the area and reflective of a healthily functioning ecosystem. Huanga of mahinga kai as identified by mana whenua area achieved	Fish communities are resilient, and their structure, composition and diversity are reflective of a good state of aquatic ecosystem health
Assessment	Nutrient inputs to the Onepoto Arm are sufficient to sustain elevated growths of macro-algae in Porirua Harbour, sometimes to nuisance levels. Benthic invertebrate community health metric scores ranged from ‘moderately healthy’ to ‘poor health’ in 2020. The inlet supports cockle beds (Austrovenus stutchburyi), and resident populations of various marine fish although there is no recreational fishing due to poor water quality and contaminants in sea floor sediments. The available information suggests that PNRP Objective O19 is currently not met in respect of macroalgae, invertebrate or mahinga kai species.			

Whitireia Peninsula forms the western side of the entrance to Porirua Harbour. The Peninsula is recognised as a site with significant mana whenua values. It is an important archaeological site including a pā, terraces and middens which represent Māori occupation dating up until about the 1840s. Much of the area is now included in Whitireia Park and co-managed by GWRC and Ngāti Toa. A summary of values associated with the Onepoto Arm of Porirua Harbour as scheduled in The pNRP are summarised in Table 3-118 and categorised for the wastewater network overflow assessment in Table 3-119.

Table 3-118: Values of the west coast of Porirua scheduled in the Proposed Natural Resources Plan (pNRP)

Schedule	Category	Significant sites
B	Ngā Taonga Nui a Kiwa – Ngāti Toa Rangatira	Te Awarua-o-Porirua (Porirua Harbour including contributing streams) Ngā Mahi a ngā Tūpuna: At Porirua, Ngāti Toa settlements were located exclusively in the coastal area around the harbour and outer catchment. The natural flows and processes of the harbour are a defining feature of traditional life. Te Mahi Kai: The abundance of natural life historically supported by the harbour provided a wealth of kai moana. This is recorded in numerous historical accounts by Ngāti Toa and early foreign visitors. The streams that feed into the harbour also provided a plentiful supply of freshwater fish, forest foods and rongoā. Te Mana o te Tangata: The abundance of kai moana provided by the harbour is renowned by iwi Māori and recorded in legend. In addition to providing sustenance for Ngāti Toa and guests, kai moana gathered from the harbour was an important commodity for trade and gifts. There are numerous accounts and images to support this. Te Manawaroa o te Wai: Despite excessive land reclamations, modification, and environmental damage the harbour continues to support a variety of endemic wildlife; including endangered species. There is vast potential for environmental restoration and this is a primary objective for Ngāti Toa. The only remaining traditional settlements of Ngāti Toa in the Wellington region are located in the coastal area around the harbour at Takapūwāhia and Hongoeka. Environmental issues continue to have a direct and significant impact on successive generations. Te Mana o Te Wai: A defining feature of Ngāti Toa settlement in the Wellington area and integral to Ngāti Toa identity. Wāhi Mahara: Numerous sites in and around the harbour foreshore bear testament to not only the history of Ngāti Toa, but also the formative history of New Zealand.
C	Sites of significance to Ngāti Toa Rangatira	Whitireia: papa kāinga, kāinga, pā, mahinga kai, taunga ika, wāhi tapu, urupā, Te Ara o Kupe, tohu whenua, wāhi whakarite, mahinga kai, kai moana, mahinga mataitai, mara kai
F2c	Significant Habitats for indigenous birds in the coastal marine area	Onepoto Arm, Porirua Harbour: The Onepoto Arm is one of only a handful of relatively large estuaries in the Wellinigton region and is therefore a regionally important stop-off site for several migrant shorebird species such as SI pied oystercatcher and bar tailed godwit. At least nine threatened or 'at risk' species are known to be resident or regular visitors to this site: royal spoonbill, pied shag, black shag, SI pied oystercatcher, variable oystercatcher, bar tailed godwit, pied stilt, banded dotterel, red-billed gull and Caspian tern.

Table 3-119: Porirua Harbour at Onepoto Arm receiving environment characteristics

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Onepoto Arm	Harbour	Class 1 (Contact recreation occurs)	Class 1 (High ecological value)	Class 1 (Very important)	Class 1 (High value)

3.16.2 Summary of Overflow Characteristics

There are 45 potential overflows from the Porirua Catchment to the Onepoto Arm of Porirua Harbour, 12 of which are direct overflows and 33 are indirect overflows.

10 of the 12 direct overflows are 'Low' volume discharges and 2 of the direct overflows (WNO sites 88 and 90) are 'Medium' volume discharges. For frequency 11 of the 12 direct overflows are 'Low' frequency discharges and 1 of the direct overflows (WNO site 90) has 'Medium' frequency discharge.

All but 1 indirect overflow are 'Low' volume discharges with WNO site 64 having a 'High' volume discharge. Similarly, the frequency all but 1 (WNO site 64) indirect overflows are 'Low' frequency discharges. WNO site 64 is a 'High' frequency discharge.
The overflow locations are spatially separated across the Onepoto Arm.

Overflow characteristics are summarised in Table 3-120.

Table 3-120: Summary of overflow characteristics in Porirua Harbour at Onepoto Arm

Overflow ID	Direct/ Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
7, 24, 76, 77, 383	Direct	-	Low[24]	-	Low[25]	Operative	No record
59, 80, 81, 82	Direct	1 to 11	Low	≤1	Low	Operative	WWL Records and Overflow Forms (2015-2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)
88	Direct	-	Medium	1	Low	Operative	WWL Records and Overflow Forms (2015-2020)
90	Direct	-	Medium	-	Medium	Operative	WWL Records and Overflow

[24] 'Low' annual overflow volume is defined as less than 600 m^3.
[25] 'Low' annual overflow frequency is defined as 2 or fewer overflows per year.

Overflow ID	Direct/ Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
							Forms (2015-2020)
1, 6, 10, 12, 15, 21, 31, 71, 384, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 402, 403, 404, 405, 406, 407, 429, 430, 431	Indirect	-	Low	-	Low	Operative	No data - assumed
60, 63	Indirect	-	Low	≤2	Low	Operative	WWL Records and Overflow Forms (2015-2020)
64	Indirect	1020 to 39154	High	11	High	Operative	WWL Records and Overflow Forms (2015-2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)

3.16.3 Potential Public Health Effects

Porirua Harbour at Onepoto Arm is well known for contact recreation including waka ama, rowing, wind surfing, flat-water kayaking, kite surfing, small boat sailing and power boating. Direct and indirect overflow volumes range from ‘Low’ to ‘High’ and the assessed effect is ‘High’ (Effects Score of 4) on all recreational activities as shown in Table 3-121. The overall level of public health effect is summarised in Table 3-122. The assessed level of public health effect at this location is ‘Very High’.

Table 3-121: Assessment of public health effects from overflows to Porirua Harbour at Onepoto Arm

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**High potential effect (Effects Score of 4)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for collecting shellfish	**High potential effect (Effects Score of 4)** because shellfish have the potential to filter pathogens and metals from water and sediments
Loss of suitability for fishing	**High potential effect (Effects Score of 4)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for harvesting watercress	**High potential effect (Effects Score of 4)** because watercress can be a hydraulic trap for particulate contaminants

Table 3-122: Overall level of public health effect at Porirua Harbour Onepoto Arm

Overflow ID	Direct/ Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Level of Public Health Effect
7, 24, 76, 77, 383	Direct	Low	Low	Very Low
59, 80, 81, 82	Direct	Low	Low	Very Low
88	Direct	Moderate	Low	Low
90	Direct	Moderate	Medium	Moderate
1, 6, 10, 12, 15, 21, 31, 71, 384, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 402, 403, 404, 405, 406, 407, 429, 430, 431	Indirect	Low	Low	Very Low
60, 63	Indirect	Low	Low	Very Low
64	Indirect	**High**	High	**Very High**

3.16.4 Potential Ecological Effects

Direct and indirect overflow volumes range from ‘Low’ to ‘High’. The assessed potential effect on all ecological values ranges from ‘Low’ to ‘High’, as shown in Table 3-123. The Porirua Harbour provides a high level of dilution and flushing.

In situations where potential ecological effects range across more than one effects score, the overall level of effect is determined by the dominant effects score. In this case, the overall ecological effect is considered to be ‘High’.

The level of ecological effects at the Onepoto Arm is summarised in Table 3-124. The level of effect is defined as the combination of the likelihood of an event and the consequences of an event. In this case the level of effect is assessed as ‘Very High’.

Table 3-123: Assessment of ecological effects of overflows to Porirua Harbour at Onepoto Arm

Potential Effect	Magnitude of Ecological Effect
Change in physical habitat suitability	**Effects Score of 4 (High),** because of the extent of physical and chemical changes resulting from a wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Effects Score of 4 (High),** because toxicant concentrations and toxicants may increase up to 20-fold above background levels.
Change in community structure/loss of sensitive species	**Effects Score of 4 (High),** because changes in physico- chemical habitat suitability are likely.
Behavioural changes in fin fish	**Effects Score of 2 (Low),** because the limited extent of changes in physico-chemical habitat suitability is unlikely to generate behavioural changes.
Increase in nuisance plants	**Effects Score of 4 (High),** because of the generally short residence time of elevated nutrient concentrations and other constraints on plant growth
Reduced quantities of fin fish	**Effects Score of 4 (High),** because of there changes in physico-chemical habitat suitability are likely.

Potential Effect	Magnitude of Ecological Effect
Growth of sewage fungus/Beggiatoa	**Effects Score of 1 (Very Low),** because the lack of BOD enrichment provides little opportunity for the growth of these organisms.

Table 3-124: Level of ecological effects at Porirua Harbour at Onepoto Arm

Overflow ID	Direct/ Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level of Ecological Effect
7, 24, 76, 77, 383	Direct	Low	Low	Very Low
59, 80, 81, 82	Direct	Low	Low	Very Low
88	Direct	Moderate	Low	Low
90	Direct	Moderate	Medium	Moderate
1, 6, 10, 12, 15, 21, 31, 71, 384, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 402, 403, 404, 405, 406, 407, 429, 430, 431	Indirect	Low	Low	Very Low
60, 63	Indirect	Low	Low	Very Low
64	Indirect	**High**	High	**Very High**

3.16.5 Potential Cultural Effects

Porirua Harbour at Onepoto Arm is assessed as having 'Very Important' cultural values (Class 1). 'High' volume discharges to such an environment have a 'Very High' potential effect on these values. The level of cultural effect is assessed as 'High'.

3.16.6 Potential Aesthetic Effects

Porirua Harbour at Onepoto Arm is assessed as having 'High' aesthetic value due to popular recreational use. 'High' volume discharges to such an environment have a 'High' potential effect on these values. The level of aesthetic effect is assessed as being 'High'.

3.16.7 Potential Cumulative Effects

For Porirua Harbour at Onepoto Arm, cumulative effects are very likely because:

- There is a high number of potential overflows (45), 12 of which are direct overflows and 33 are indirect overflows. These potential overflows may have a combined effect depending on the timing of wet weather events, spatial variation in rainfall during those events, and several other contributing factors such as wastewater network capacity and condition.
- Although 10 of the 12 direct overflows are 'Low' volume discharges, 2 of the direct overflows are 'Medium' volume discharges.

For a spatially cumulative effect to arise, most of the direct and indirect discharges would need to occur at the same time, which is likely at times of peak wet weather flow. This would result in the total volume of wastewater overflows falling within the 'High' volume range and result in 'High' potential public health and ecological effects. The potential risk has already been assessed in Section 3.16.3 and 3.16.4 of the AEE as being 'Very High' and as such, the level cumulative effect is not notably different.

3.16.8 Summary

The potential magnitude and level of effects of wastewater overflows from the Porirua catchment to the Porirua Harbour at Onepoto Arm is summarised in Table 3-125.

Table 3-125: Summary of potential effects for overflows to the Onepoto Arm of Porirua Harbour

Value category	Potential magnitude of effect	Level of effect
Public health	High	Very High
Aquatic ecology	High	Very High
Cultural	Very High	High/significant
Aesthetic	High	High/significant

3.17 PORIRUA COAST - PUKERUA BAY

3.17.1 Description of the Receiving Environment

Pukerua Bay is a small sea-side community at the southern end of the Kāpiti Coast. It is the northernmost suburb of Porirua City, 12 km north of the Porirua City Centre on State Highway 1 (Figure 3-8). The majority of Pukerua Bay is situated in a saddle between hills, about 60-90m above sea level, offering sea views (and views of Kapiti Island in the north) from most houses. The coastal marine area is popular for swimming, sunbathing, snorkelling, boating, fish, walking and picnicking.

Table 3-126 summarises the results of WWL/PCC monthly water quality monitoring at a shoreline site in Pukerua Bay over the period from January 2018 to December 2022. The results indicate moderately low levels of faecal contamination at the site. The site has consistently achieved pNRP objective O18 for enterococci.

Table 3-126: Summary statistics for monthly enterococci at Pukerua Bay (WWL, March 2016- March 2021)

Site name	N samples	% over 140 CFU/100mL	% over 500 CFU/100mL	Median CFU/100mL	95th percentile CFU/100mL (3 years to March 2020, 2021 and 2022)			pNRPpNRP Objective O18 95th percentile
					2016-2019	2017-2020	2018-2021	
Pukerua Bay	112	4	0	4	64	155	162	≤500

Table 3-127 provides an assessment of the Pukerua Bay marine ecology against pNRP Objective O19.

Table 3-127: Assessment of Pukerua Bay marine ecology against pNRP Objective O19, Table 3.8

	Macroalgae	Invertebrates	Mahinga kai species	Fish
pNRP Objectives	The algae community is reflective of a good state of aquatic ecosystem health with a low frequency of nuisance blooms	Invertebrate communities are resilient, and their structure, composition and diversity are reflective of a good state of aquatic ecosystem health	Mahinga kai species, including taonga species, are present in quantities, sizes and of a quality that is appropriate for the area and reflective of a healthily functioning ecosystem. Huanga of mahinga kai as identified by mana whenua area achieved	Fish communities are resilient, and their structure, composition and diversity are reflective of a good state of aquatic ecosystem health
Assessment	We have not sighted an any ecological survey data for Pukerua Bay. However, based on the relatively low level of urban development in adjacent catchments, and the lack of other known stressors, it is anticipated that objective O19 would be achieved in coastal waters around Pukerua Bay.			

Values associated with the Pukerua Bay coastal marine area as scheduled in the pNRP are summarised in Table 3-128 and categorised for the wastewater network overflow assessment in Table 3-129.

Table 3-128: Environmental and cultural values identified for Pukerua Bay in Schedules of the pNRP

Schedule	Category	Significant sites
B	Ngā Taonga Nui a Kiwa – Ngāti Toa Rangatira	Raukawa Moana (Cook Strait)
C	Sites with significant mana whenua values - Ngāti Toa Rangatira	Wairaka Point: pā, wahi tapu, urupā, wahi whakarite, wahi maumahara, mara kai, mahinga kai, mahinga mataitai
F2	Indigenous bird habitat	Pukerua Bay foreshore from Brendan Beach to Wairaka Point
F5	Habitats with significant indigenous biodiversity values in the coastal marine area	Giant kelp, kelp beds, seagrass, subtidal rock reefs
J	Significant geological features in the coastal marine area.	Pukerua Bay coastline along scientific reserve including Wairaka Point / Te Ana a Hau: Extensive greywacke shore platforms, rock stacks; rare Torlesse Complex fossils (Torlessia mackayi Bather).

Table 3-129: Pukerua Bay receiving environment characteristics

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Pukerua Bay	Beach	Class 1 (Known site for contact recreation)	Class 1 (High value)	Class 1 (Very important)	Class 1 (High value)

3.17.2 Summary of Overflow Characteristics

There are 8 direct potential overflows to Pukerua, all of which are 'Low' volume and frequency discharges. A summary of overflow characteristics is detailed in Table 3-130.

Table 3-130: Summary of overflow characteristics in Pukerua Bay

Overflow ID	Direct/Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
65, 66, 67, 68, 69, 70, 73, 78	Direct	-	Low	≤1	Low	Operative	WWL Records and Overflow Forms (2015-2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)

3.17.3 Potential Public Health Effects

Pukerua Bay provides a narrow sandy beach featuring scattered rock outcrops and provides great opportunities for beachcombing and rock-pool exploration. The shallow incline makes it a safe spot for surfing and swimming and the area supports fishing and conservation work.

'Low' volume discharges to beaches with a 'Class 1' recreational value are assessed as having 'Moderate' potential effect (Effects Score of 3) on all recreational activities as shown in Table 3-131. The associated level of effect for public health is summarised in Table 3-132 and is assessed as 'Low'.

Table 3-131: Assessment of public health effects from overflows to Pukerua Bay

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**Moderate potential effect (Effects Score of 3)** because microbial pathogen indicator contact recreation guidelines may be exceeded
Loss of suitability for collecting shellfish	**Moderate potential effect (Effects Score of 3)** because shellfish have the potential to filter pathogens and metals from water and sediments.
Loss of suitability for fishing	**Moderate potential effect (Effects Score of 3)** because microbial pathogen indicator contact recreation guidelines may be exceeded
Loss of suitability for harvesting seaweed	**Moderate potential effect (Effects Score of 3)** because seaweed can be a hydraulic trap for particulate contaminants

Table 3-132: Level of public health effects at Pukerua Bay

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Level Public Health Effect
65, 66, 67, 68, 69, 70, 73, 78	Direct	**Moderate**	Low	Low

3.17.4 Potential Ecological Effects

All direct overflows to Pukerua Bay are 'Low' volume and frequency discharges.

'Low' volume discharges to beaches with 'Class 1' ecological values are assessed as having predominantly 'Low' effects on all ecological values, as shown in Table 3-133.

The level ecological effect at beaches is summarised in Table 3-134. The level of effect is defined as the combination of the likelihood of an event and the consequences of an event. The assessed level of ecological effect at Pukerua Bay is 'Very Low'.

Table 3-133: Assessment of ecological effects of overflows to Pukerua Bay

Potential Effect	Magnitude of Ecological Effect
Change in physical habitat suitability	**Effects Score of 2 (Low)**, because of the general lack of physical and chemical changes resulting from a low volume wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Effects Score of 2 (Low)**, because the dilution of overflows means that nutrient concentrations and toxicants are unlikely to increase above background levels.
Change in community structure/loss of sensitive species	**Effects Score of 2 (Low)**, because the limited extent of changes in physico-chemical habitat are unlikely to affect sensitive species.
Behavioural changes in fin fish	**Effects Score of 1 (Very Low)**, because the limited extent of changes in physico-chemical habitat suitability is unlikely to generate behavioural changes.
More frequent phytoplankton blooms in the water column	**Effects Score of 1 (Very Low)**, because the dilution of overflows means that nutrient concentrations and temperature are unlikely to increase above background levels.

Potential Effect	Magnitude of Ecological Effect
Reduced quantities of fin fish	**Effects Score of 2 (Low)**, because there of the lack of changes in physico-chemical habitat suitability.
Reduced quantities of shellfish	**Effects Score of 2 (Low)**, because of the lack of changes in physico-chemical habitat suitability.

Table 3-134: Level of ecological effects at Pukerua Bay

Overflow ID	Direct/Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level of ecological Effect
65, 66, 67, 68, 69, 70, 73, 78	Direct	**Low**	Low	Very Low

3.17.5 Potential Cultural Effects

Pukerua Bay is assessed as having 'Very Important' cultural values (Class 1). 'Low' volume discharges to such an environment have a 'Moderate' magnitude of potential effects on these values. However, as the frequency of the overflows is 'Low' the overall level of cultural effects from overflows to Pukerua Bay is assessed as 'Low'.

3.17.6 Potential Aesthetic Effects

Pukerua Bay is assessed as having 'High' aesthetic value due to popular recreational use. 'Low' volume discharges to such an environment have a 'High' potential effect on these values. However, as the frequency of the overflows is 'Low' the level of aesthetic effects is 'Low'.

3.17.7 Potential of Cumulative Effects

Cumulative effects at Pukerua Bay are unlikely because the 8 potential overflows to the coast are spatially separated and unlikely to all operate at the same time.

3.17.8 Summary

The potential magnitude and level effects of wastewater overflows in Pukerua Bay is summarised in Table 3-135.

Table 3-135: Summary of potential effects for overflows from the Porirua Coast catchment to Pukerua Bay

Value category	Potential magnitude of effect	Level of effect
Public health	Moderate	Low
Aquatic ecology	Low	Low
Cultural	Moderate	Low
Aesthetic	High	Low

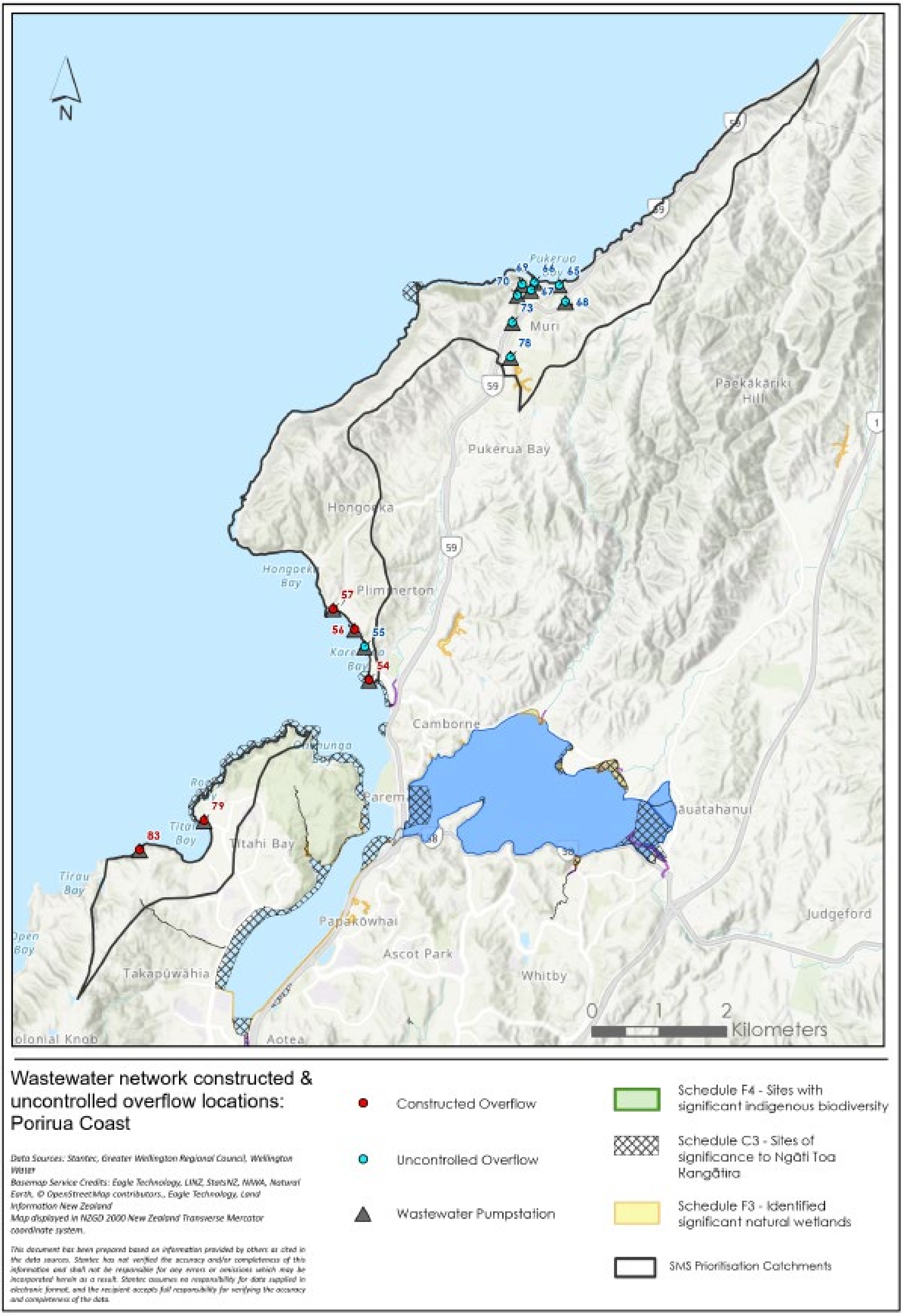

Figure 3-8: Wastewater network overflows to the Porirua Coast catchment

3.18 PORIRUA COAST – KAREHANA BAY

3.18.1 Description of the Receiving Environment

Karehana Bay is a sandy beach popular with swimmers, sunbathers and boating. Table 3-136 summarises the results of GWRC recreational water quality monitoring at these beaches over the five-year period to end of December 2022. Karehana Bay initially exhibited very good microbiological water quality but then failed to achieve the pNRP objective O18 for enterococci over in the 2021 and 2022 assessment period.

Table 3-136: Summary statistics for enterococci at Plimmerton Beach (GWRC data 2018- 2022)

Site name	N samples	% over 140 CFU/100mL	% over 500 CFU/100mL	Median CFU/100mL	95th percentile CFU/100mL (3 years to March 2020, 2021, and 2022)			pNRP Objective O18 95th percentile
					2018-2020	2019-2021	2020-2022	
Karehana Bay	113	7	5	<4	134	525	509	≤500

Table 3-137 provides an assessment of the Plimmerton coastal area against pNRP Objective O19.

Table 3-137: Assessment of Plimmerton Coastal waters against pNRP Objective O19

	Macroalgae	Invertebrates	Mahinga kai species	Fish
pNRP Objectives	The algae community is reflective of a good state of aquatic ecosystem health with a low frequency of nuisance blooms	Invertebrate communities are resilient, and their structure, composition and diversity are reflective of a good state of aquatic ecosystem health	Mahinga kai species, including taonga species, are present in quantities, sizes and of a quality that is appropriate for the area and reflective of a healthily functioning ecosystem. Huanga of mahinga kai as identified by mana whenua area achieved	Fish communities are resilient, and their structure, composition and diversity are reflective of a good state of aquatic ecosystem health
Assessment	We have not sighted an any ecological survey data for the Plimmerton coastal area. However, based on the relatively low level of urban development in the Plimmerton area, and the lack of other known stressors, it is anticipated that objective O19 would be achieved in coastal waters around from Plimmerton to Pukerua Bay.			

Significant values associated with beaches on the Porirua coast as scheduled in the pNRP are summarised in Table 3-138 and categorised for Step 1 of the wastewater network overflow assessment in Table 3-139.

Table 3-138: Environmental and cultural values identified for Plimmerton Beach in Schedules of the pNRP

Schedule	Category	Location/value
B	Ngā Taonga Nui a Kiwa	Porirua Harbour and Cook Strait
C	Sites with significant mana whenua values - Ngāti Toa Rangātira	Tawhiti Kuri: kai moana, pā, mahinga kai, tohu whenua (Taupō block) "Pou Herenga Kingitanga", wāhi maumahara. Taupō pā: pā (Taupō domestic & defensive), ara hikoi, wāhi tapu, tohu tūpuna, taunga waka, Te Ara o Te Rauparaha, tohu ahurea
F4	Indigenous biodiversity coastal	Taupō Estuary
F5	Habitats with significant indigenous biodiversity values in the coastal marine area	Giant kelp, kelp beds, seagrass, subtidal rock reefs

Table 3-139: Karehana Bay receiving environment characteristics

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Karehana Bay	Beaches	Class 1 (Known contact recreation site)	Class 1 (High value)	Class 1 (Very important)	Class 1 (High value)

3.18.2 Summary of Overflow Characteristics

There are three direct potential overflows to Karehana Bay, all of which are 'Low' volume and Low frequency discharges.

Table 3-140: Summary of overflow characteristics in Karehana Bay

Overflow ID	Direct/ Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
55, 56, 57	Direct	-	Low	≤2	Low	Operative	WWL Records and Overflow Forms (2015-2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)

3.18.3 Potential Public Health Effects

All direct overflows to Karehana Bay are 'Low' volume and frequency discharges (see previous section). 'Low' volume discharges to beaches with 'Class 1' recreational values are assessed as having a 'Moderate' potential effect on all recreational activities, as shown in Table 3-141.

The level public health effect is summarised in Table 3-142. The level of effect is defined as the combination of the likelihood of an event and the consequences of an event. The assessed level of public health effect Karehana Bay is 'Low'. Note, this result is not consistent with the bathing beach monitoring results summarised in Table 3-136 which indicates significant but intermittent faecal contamination.

Table 3-141: Assessment of public health effects of overflows to Karehana Bay

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**Moderate potential effect (Effects Score of 3)** because microbial pathogen indicator contact recreation guidelines may be exceeded
Loss of suitability for collecting shellfish	**Moderate potential effect (Effects Score of 3)** because shellfish have the potential to filter pathogens and metals from water and sediments
Loss of suitability for fishing	**Moderate potential effect (Effects Score of 3)** because microbial pathogen indicator contact recreation guidelines may be exceeded
Loss of suitability for harvesting seaweed	**Moderate potential effect (Effects Score of 3)** because seaweed can be a hydraulic trap for particulate contaminants

Table 3-142: Level of public health effects for Karehana Bay

Overflow ID	Direct/Indirect	Potential Magnitude of Public Health Effect	Overflow Frequency Range	Level of Public Health Effect
55, 56, 57	Direct	**Moderate**	Low	Low

3.18.4 Potential Ecological Effects

All direct overflows to Karehana Bay 'Low' volume and frequency discharges. Low volume discharges to beaches with 'Class 1' recreational values are assessed as having a 'Very Low' to 'Low' potential effect on all ecological values, as shown in Table 3-143. Beaches are likely to have high dilution rates and are generally able to absorb 'Low' volume overflows.

The level of ecological effects at beaches is summarised in Table 3-144. Level of effect is defined as the combination of the likelihood of an event and the consequences of an event. The assessed level of ecological effect at Karehana Bay is 'Very Low'.

Table 3-143: Assessment of ecological effects of overflows to Karehana Bay and Plimmerton Beach

Potential Effect	Magnitude of Ecological Effect
Change in physical habitat suitability	**Effects Score of 2 (Low),** because of the general lack of physical and chemical changes resulting from a Low volume wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Effects Score of 2 (Low),** because the dilution of overflows means that nutrient and toxicant concentrations are unlikely to increase above background levels.
Change in community structure/loss of sensitive species	**Effects Score of 2 (Low),** because the limited extent of changes in physico- chemical habitat suitability are unlikely to affect sensitive species.
Behavioural changes in fin fish	**Effects Score of 1 (Very Low),** because the limited extent of changes in physico-chemical habitat suitability is unlikely to generate behavioural changes.
Increase in nuisance plants	**Effects Score of 2 (Low),** because the dilution of overflows means that nutrient concentrations are unlikely to increase above background levels.

Potential Effect	Magnitude of Ecological Effect
More frequent phytoplankton blooms in the water column	**E Effects Score of 1 (Very Low),** because the dilution of overflows means that nutrient concentrations and temperature are unlikely to increase above background levels.
Reduced quantities of fin fish	**Effects Score of 2 (Low),** because of the lack of changes in physicochemical habitat suitability.
Reduced quantities of shellfish	**Effects Score of 2 (Low),** because of the lack of changes in physicochemical habitat suitability.
Growth of sewage fungus/Beggiatoa	**Effects Score of 1 (Very Low),** because the lack of BOD enrichment provides little opportunity for the growth of these organisms.

Table 3-144: Level of ecological effects at Karehana Bay

Overflow ID	Direct/Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level of Ecological Effect
55, 56, 57	Direct	**Low**	Low	Very Low

3.18.5 Potential Cultural Effects

Karehana Bay is assessed as having ‘Very Important’ cultural values (Class 1) as listed in Table 3-16. The overflow discharges are of ‘Low’ volume and potential cultural effects are assessed as ‘Moderate’. Because the overflows occur at a ‘Low’ frequency, the level of cultural effects is assessed as ‘Low’.

3.18.6 Potential Aesthetic Effects

The Karehana Bay is assessed as having a ‘High’ aesthetic value. Low volume discharges to such an environment have a ‘High’ potential to affect these values. As the overflows occur with ‘Low’ frequency, the risk is assessed as being ‘Low’.

3.18.7 Potential Cumulative Effects

Cumulative effects Karehana Bay are unlikely because:

- There are a relatively low number of overflows that could potentially impact water quality at Karehana Bay.
- All overflows are ‘Low’ volume.

Cumulative effects have not been considered for this receiving environment.

3.18.8 Summary

The potential magnitude and level of effect of wastewater overflows in Karehana is summarised in Table 3-145.

Table 3-145: Summary of potential effects for overflows from the Porirua Coast catchment to Karehana Bay

Value category	Potential magnitude of effect	Level of effect
Public health	Moderate	Low
Aquatic ecology	Low	Very Low
Cultural	Moderate	Low
Aesthetic	High	Low

3.19 PORIRUA COAST - TITAHI BAY

3.19.1 Description of the Receiving Environment

Stevens & Robertson (2006) described the coastal habitat of Titahi Bay as a relatively sheltered, crescent shaped beach consisting mainly of sand but with cobbles at its midpoint and rock headland at either end. The margins of the beach include relatively steep dunes with marram grass and flax and there is an artificial seawall at the southern end.

Titahi Bay is a very popular beach for swimming, snorkelling, windsurfing, surfing, fishing, walking and picnicking. Surf lifeguards patrol the beach during the summer months.

Table 3-146 Summary statistics for enterococci at Titahi Bay (GWRC data January 2018- December 2022)

Site name	N samples	% > 140 CFU/100mL	% > 500 CFU/100mL	Median CFU/100mL	95th percentile CFU/100mL (3 years to December 2020, 2021, and 2022)			pNRP Objective O18 95th percentile
					2018-2020	2019-2021	2020-2022	
Titahi Bay @ Bay Drive	110	16	3	30	360	347	351	≤500
Titahi Bay @ Toms Road	181	10	3	12	251	290	175	
Titahi Bay @ South Access Rd	145	18	5	20	485	439	465	

Marine ecology off the Porirua Coast to the south of Titahi Bay has been described by Morrisey, et al. (2019) as part of the investigations into the effects of the Porirua Wastewater Treatment Plant discharge to coastal was near Rukutane Point. The findings of that study, as summarised indicate that macroalgae and invertebrate objectives of PNRP O19 are achieved, but there is not sufficient information to determine the current state of mahinga kai species or the coastal fish population.

Table 3-147: Assessment of Porirua Coast marine ecology against PNRP Objective O19

	Macroalgae	Invertebrates	Mahinga kai Species	Fish
PNRP Objectives	The algae community is reflective of a good state of aquatic ecosystem health with a low frequency of nuisance blooms	Invertebrate communities are resilient, and their structure, composition and diversity are reflective of a good state of aquatic ecosystem health	Mahinga kai species, including taonga species, are present in quantities, sizes and of a quality that is appropriate for the area and reflective of a healthily functioning ecosystem. Huanga of mahinga kai as identified by mana whenua area achieved	Fish communities are resilient, and their structure, composition and diversity are reflective of a good state of aquatic ecosystem health

	Macroalgae	Invertebrates	Mahinga kai Species	Fish
Assessment	Intertidal and subtidal habitats have an abundant and diverse algae flora. There is no evidence of nuisance algae. Intertidal and subtidal habitats have an abundant and diverse invertebrate fauna (Morrisey, *et al.*, 2019)			

Values associated with Titahi Bay as scheduled in the pNRP are summarised in Table 3-148 and categorised for the wastewater network overflow assessment in Table 3-149.

Table 3-148: Environmental and cultural values identified for Titahi Bay in Schedules of the pNRP

Schedule	Category	Significant sites
B	Ngā Taonga Nui a Kiwa – Ngāti Toa Rangatira	Raukawa Moana (Cook Strait)
C	Sites with significant mana whenua values - Ngāti Toa Rangatira	Whitireia: papa kāinga, kāinga, pā, mahinga kai, taunga ika, wāhi tapu, urupā, Te Ara o Kupe, tohu whenua, wāhi whakarite, mahinga kai, kai moana, mahinga mataitai, mara kai
J	Significant geological features in the coastal marine area.	Tītahi Bay fossil forest: Titahi Bay foreshore and nearshore, Porirua. Tītahi Bay Pleistocene aged (last interglacial 120,000-80,000 yr) fossil forest. Tītahi Bay flysch sequence, southern side of Titahi Bay from end of boat sheds to point: Tītahi Bay Triassic interbedded greywacke and argillite Flysch sequence.

Table 3-149: Summary of Titahi Bay receiving environment characteristics

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Titahi Bay	Beach	Class 1 (Known contact recreation area)	Class 1 (High ecological value)	Class 1 (Very important)	Class 1 (High value)

3.19.2 Summary of Overflow Characteristics

There is one direct potential overflow which discharges into Titahi Bay. All potential overflows are 'Low' volume and frequency discharges.

Summary of overflow characteristics is detailed in Table 3-150.

Table 3-150: Summary of overflow characteristics in Titahi Bay

Overflow ID	Direct/Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
79	Direct	38	Low[26]	2	Low[27]	Modelled	WWL Records and Overflow Forms (2015-2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)

[26] 'Low' annual overflow volume is defined as less than 600 m^3.
[27] 'Low' annual overflow frequency is defined as 2 or fewer overflows per year.

3.19.3 Potential Public Health Effects

The wastewater modelling assessment indicates that all potential direct overflows are 'Low' volume discharges. 'Low' volume discharges to beaches with 'Class 1' recreational values are assessed as having a 'Moderate' effect on all recreational activities, as shown in Table 3-151.

The level of public health effects in Titahi Bay is summarised in Table 3-152. The level of effect is defined as the combination of the likelihood of an event and the consequences of an event. Based on the modelling assessment the level of public health is 'Low'.

Table 3-151: Assessment of public health effects from overflows to Titahi Bay

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**Moderate potential effect (Effects Score of 3)** because microbial pathogen indicator contact recreation guidelines may be exceeded
Loss of suitability for collecting shellfish	**Moderate potential effect (Effects Score of 3)** because shellfish have the potential to filter pathogens and metals from water and sediments.
Loss of suitability for fishing	**Moderate potential effect (Effects Score of 3)** because microbial pathogen indicator contact recreation guidelines may be exceeded
Loss of suitability for harvesting seaweed	**Moderate potential effect (Effects Score of 3)** because seaweed can be a hydraulic trap for particulate contaminants

Table 3-152: Level of public health effects at Titahi Bay

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Level of Public Health Effect
79	Direct	**Moderate**	Low	Low

3.19.4 Potential Ecological Effects

All potential direct and indirect overflows are 'Low' volume discharges. 'Low' volume discharges to beaches with 'Class 1' ecological values are assessed as having a 'Low' potential effect on all ecological values, as shown in Table 3-153.

The level ecological effect at Titahi Bay is summarised in Table 3-154. Level of effect is defined as the combination of the likelihood of an event and the consequences of an event which, in this case, is **'Very Low'**.

Table 3-153: Assessment of ecological effects of overflows to Titahi Bay

Potential Effect	Magnitude of Ecological Effect
Change in physical habitat suitability	**Effects Score of 2 (Low)**, because of the general lack of physical and chemical changes resulting from a low volume wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Effects Score of 2 (Low)**, because the dilution of overflows means that nutrient concentrations and toxicants are unlikely to increase above background levels.
Change in community structure/loss of sensitive species	**Effects Score of 2 (Low)**, because the limited extent of changes in physico-chemical habitat are unlikely to affect sensitive species.

Potential Effect	Magnitude of Ecological Effect
Behavioural changes in fin fish	**Effects Score of 1 (Very Low)**, because the limited extent of changes in physico-chemical habitat suitability is unlikely to generate behavioural changes.
Reduced quantities of fin fish	**Effects Score of 2 (Low)**, because there of the lack of changes in physico-chemical habitat suitability.
Reduced quantities of shellfish	**Effects Score of 2 (Low)**, because of the lack of changes in physico-chemical habitat suitability.

Table 3-154: Level of ecological effects at Titahi Bay

Overflow ID	Direct/Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level of Ecological Effect
79	Direct	**Low**	Low	Very Low

3.19.5 Potential Cultural Effects

Titahi Bay is assessed as having 'Very Important' cultural values (Class 1) as listed in Table 3-149. All overflow discharges are of 'Low' volume and the magnitude of cultural effects are assessed as 'Moderate'. All overflows occur at a 'Low' frequency resulting in a low overall level of effect.

3.19.6 Potential Aesthetic Effects

Titahi Bay is assessed as having a 'High' aesthetic value. 'Low' volume discharges to such an environment have a 'High' potential to affect these values. All overflows occur with 'Low' frequency and as such the overall level of adverse effects is assessed as being 'Low'.

3.19.7 Potential of Cumulative Effects

For the Titahi Bay receiving environment, cumulative effects are considered unlikely as there is only one direct discharge to Titahi Bay. Furthermore, the potential overflow is of 'Low' volume and frequency.

3.19.8 Summary

The potential magnitude and level of effect of overflows to Titahi Bay are summarised in Table 3-155.

Table 3-155: Summary of potential effects for overflows to Titahi Bay

Value category	Potential magnitude of effect	Level of effect
Public health	Moderate	Low
Aquatic ecology	Low	Very Low
Cultural	Moderate	Low
Aesthetic	High	Low

3.20 PORIRUA COAST – ROCKY REEF

3.20.1 Description of the Receiving Environment

Porirua's open coast includes a large area of exposed, rocky shore and shallow subtidal reef habitat with high biodiversity of animals and plants. Morrisey, et al., (2019) found marine habitats in the area to be of Moderate to high ecological value, and generally in good condition, consistent with the non-intensive use of land in the contributing catchment. Morrisey, et al., (2019) provide the following description of nearshore rocky habitat between Rukutane Point (near the Porirua wastewater treatment plant outfall) and Round Point:

> *"Porirua's western coastline has Moderate exposure to winds, wave action and tidal currents which result in it being a dispersive rather than depositional environment. The area surrounding the existing outfall is predominantly bedrock with patches of pebbles and shelly sand, grading to sand-dominated habitat at a distance of 150m from shore. The rocky habitats have an abundant and diverse algal flora and associated invertebrate fauna.*
>
> *Encrusting coralline algae were present at most locations with up to 90% cover. Turfing corallines were consistently present at Round Point but more variable at the other two locations. Macroalgae cover at all locations was dominated by brown algae with a range of smaller green, red and brown taxa living among them. The introduced kelp Undaria pinnatifida, common and widespread in Porirua and Wellington Harbour, was only recorded at the shoreward end of the transect at Round Point. Giant kelp was not found within the study area.*
>
> *Encrusting invertebrates on subtidal hard substrate included several types of sponge, ascidian, bryozoans and anemones. Mobile invertebrates included various herbivorous snails and starfish. Kina were only recorded at Round Point, while a single large sea cucumber was recorded at the existing outfall location. The most conspicuous invertebrates were paua (Haliotis iris) which occurred at all three locations but were most abundant at the outfall location. Limited numbers of fish were recorded, but the surveys were not designed to assess fish populations."*

A submerged isthmus known as 'The Bridge' is located southwest of Titahi Bay. The Bridge is an area of shallow rock, covered in places by patches of small stones, which extends between the mainland and Mana Island. The Bridge is designated as an area of important conservation value in the Greater Wellington Regional Council's Regional Coastal Plan (RCP) for its marine flora and fauna of national significance and as a significant geological feature in the pNRP. The location of the former Korohiwa whaling station sits directly below the Porirua WWTP and adjoining the Bridge.

The stretch of rocky coast from Rukutane Point to the Titahi Bay beach is recognised as a regionally significant geological feature in the pNRP, containing interbedded greywacke and argillite Flysch sequence.

Whitireia Peninsula, north-west of Titahi Bay, forms the western side of the entrance to Porirua Harbour. The Peninsula in recognised as a site with significant mana whenua values. It is an important archaeological site including a pā, terraces and middens which represent Māori occupation dating up until about the 1840s. Much of the area is now included in Whitireia Park and co-managed by GWRC and Ngāti Toa.

Table 3-156 summarises the results of WWL/Porirua City Council (PCC) routine monthly water quality monitoring at shoreline sites along the Porirua coast over the period from Jan 2016 to Jan 2021. Microbiological water quality was very good to the south of Titahi Bay and in the vicinity of the Porirua WWTP outfall but was poorer at Titahi Bay and immediately north of the Bay. Nevertheless, all coastal sites consistently achieved the pNRP objective for enterococci.

Table 3-156: Summary statistics for monthly enterococci at Titahi Bay (WWL data March 2016- March 2021)

Site name	N samples	% >140 CFU/100 mL	% > 500 CFU/100 mL	Median CFU/100 mL	95th percentile CFU/100mL (3 years to March 2019, 2020 and 2021)			pNRP Objective O18 95th percentile
					2018-2020	2019-2021	2020-2021	
Te Korohiwa Rocks	36	0	0	<4	13	13	12	≤500
200m southwest of WWTP outfall	35	0	0	<4	28	26	40	
200m east of WWTP outfall	36	3	0	<4	17	16	35	
Titahi Bay (Toms Road)	36	3	3	8	172	188	200	
Mount Cooper	36	3	3	<4	303	428	36	
Control site (Whitireia)	34	0	0	<4	31	28	16	

An assessment of Porirua Coast rocky reef habitat against pNRP Objective O19 has been provided earlier in Section 3-18. The available information indicates that macroalgae and invertebrate objectives of PNRP O19 are achieved, but there is not sufficient information to determine the current state of mahinga kai species or the coastal fish population.

Values associated with the Porirua coastal marine area as scheduled in the pNRP are summarised in Table 3-157 and categorised for the wastewater network overflow assessment in Table 3-158.

Table 3-157: Environmental and cultural values identified for Porirua Coast in Schedules of the pNRP

Schedule	Category	Significant sites
B	Ngā Taonga Nui a Kiwa – Ngāti Toa Rangatira	Raukawa Moana (Cook Strait)
C	Sites with significant mana whenua values - Ngāti Toa Rangatira	Whitireia: papa kāinga, kāinga, pā, mahinga kai, taunga ika, wāhi tapu, urupā, Te Ara o Kupe, tohu whenua, wāhi whakarite, mahinga kai, kai moana, mahinga mataitai, mara kai.
F5	Habitats with significant indigenous biodiversity values in the coastal marine area	Giant kelp, kelp beds, seagrass, subtidal rock reefs
J	Significant geological features in the coastal marine area.	Tītahi Bay fossil forest: Titahi Bay foreshore and nearshore, Porirua. Tītahi Bay Pleistocene aged (last interglacial 120,000-80,000 yr) fossil forest. Tītahi Bay flysch sequence, southern side of Titahi Bay from end of boat sheds to point: Tītahi Bay Triassic interbedded greywacke and argillite Flysch sequence.

Table 3-158: Summary of Porirua Rocky Coast receiving environment characteristics

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Porirua Rocky Coast	Beach	Class 1 (Known contact recreation area)	Class 2 (Some ecological value)	Class 1 (Very important)	Class 1 (High value)

3.20.2 Summary of Overflow Characteristics

There are 17 potential wastewater network overflows to Porirua Coast rock reef habitat, one of which is a direct overflow and 16 are indirect.

Summary of overflow characteristics is detailed in Table 3-159.

Table 3-159: Summary of overflow characteristics in Porirua Rocky Coast

Overflow ID	Direct/ Indirect	Volume (m^3)		Frequency (per year)		Status	Data Source
		(m^3)	Range	no.	Range		
83	Direct	3,835	Medium[28]	7	Medium[29]	Modelled	WWL Records and Overflow Forms (2015-2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)
54, 55, 56, 57, 61, 65, 66, 67, 68, 69, 70, 73, 78, 79, 91, 92	Indirect	-	Low	≤2	Low	Operative	WWL Records and Overflow Forms (2015-2020), Stantec System Performance Report (2018), WCS Engineering NIP (2019)

3.20.3 Potential Public Health Effects

All potential direct overflows are ‘Low’ volume discharges except for WNO Site 83. ‘Medium’ volume discharges to beaches with ‘Class 1’ recreational values are assessed as having a ‘High’ effect on all recreational activities, as shown in Table 3-160.

The level of public health effects at Porirua Rocky Coast is summarised in Table 3-161. Level of effect is defined as the combination of the likelihood of an event and the consequences of an event. The level of public health effect at Porirua Rocky Coast is ‘High’.

[28] ‘Medium’ annual overflow volume is defined as between 600 m^3 and 6,000m^3.
[29] ‘Medium’ annual overflow frequency is defined as between 3 and 9 overflows per year.

Table 3-160: Assessment of public health effects from overflows to Porirua Rocky Coast

Potential Effect	Magnitude of Public Health Effect
Loss of suitability for contact or partial contact recreation	**High potential effect (Effects Score of 4)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for collecting shellfish	**High potential effect (Effects Score of 4)** because shellfish have the potential to filter pathogens and metals from water and sediments
Loss of suitability for fishing	**High potential effect (Effects Score of 4)** because microbial pathogen indicator contact recreation guidelines may be significantly exceeded
Loss of suitability for harvesting watercress	**High potential effect (Effects Score of 4)** because watercress can be a hydraulic trap for particulate contaminants

Table 3-161: Level of public health effects at Porirua Rocky Coast

Overflow ID	Direct/Indirect	Magnitude of Potential Public Health Effect	Overflow Frequency Range	Level of Public Health Effect
83	Direct	**High**	Medium	**High**
54, 55, 56, 57, 61, 65, 66, 67, 68, 69, 70, 73, 78, 79, 91, 92	Indirect	Moderate	Low	Low

3.20.4 Potential Ecological Effects

'Medium' volume discharges to beaches with 'Class 1' ecological values are assessed as having a 'Moderate' magnitude of effect as shown in Table 3-162. The level of ecological effects at Porirua Rocky Coast is summarised in Table 3-163. Level of effect is defined as the combination of the likelihood of an event and the consequences of an event. The assessed level of public health effect at Porirua Rocky Coast is 'Moderate'.

Table 3-162: Assessment of ecological effects of overflows to Porirua Rocky Coast

Potential Effect	Magnitude of Ecological Effect
Change in physical habitat suitability	**Effects Score of 3 (Moderate),** because there may be physical and chemical changes resulting from a medium volume wastewater overflow.
Relatively frequent toxic concentrations of NH_4, sulphide, metals, nitrate	**Effects Score of 3 (Moderate),** because nutrient and toxicant concentrations may increase above background levels.
Change in community structure/loss of sensitive species	**Effects Score of 3 (Moderate),** because the changes in physico-chemical habitat suitability may affect sensitive species.
Behavioural changes in fin fish	**Effects Score of 1 (Very Low),** because the limited extent of changes in physico-chemical habitat suitability is unlikely to generate behavioural changes.
Reduced quantities of fin fish	**Effects Score of 3 (Moderate),** because there may be changes in physico-chemical habitat suitability.
Reduced quantities of shellfish	**Effects Score of 3 (Moderate),** because there may be changes in physico-chemical habitat suitability.

Table 3-163: Level of ecological effects at Porirua Rocky Coast

Overflow ID	Direct/Indirect	Potential Magnitude of Ecological Effect	Overflow Frequency Range	Level of Ecological Effect
83	Direct	**Moderate**	Medium	**Moderate**
54, 55, 57, 61, 65, 66, 67, 68, 69, 70, 73, 78, 79, 91, 92	Indirect	Low	Low	Very Low

3.20.5 Potential Cultural Effects

Porirua Rocky Coast is assessed as having 'Very Important' cultural values (Class 1) as listed in Table 3-158. Overflow discharges range from 'Low' to 'Medium' volume and as such cultural effects are assessed as 'High'. Because the overflows occur at a 'Low' to 'Medium' frequency, the level of cultural effects is assessed as 'Moderate'.

3.20.6 Potential Aesthetic Effects

Porirua Rocky Coast is assessed as having a 'High' aesthetic value. 'Medium' volume discharges to such an environment have a 'High' potential to affect these values. Overflows range from a 'Low' to 'Medium' frequency and as such the overall level of effects is assessed as being 'Moderate'.

3.20.7 Potential of Cumulative Effects

Cumulative effects at Porirua Rocky Coast are possible because:

- There are 17 potential overflows to Porirua Coast, one of which is a direct overflow and 16 are indirect overflows. These potential overflows may have a combined effect based on the timing of wet weather events.
- The direct overflow has a 'Medium' overflow volume.

For cumulative effects to arise, most of the direct and indirect overflows would need to occur at the same time, which is likely at times of peak wet weather flows. This would mean that the total volume of wastewater overflows will fall within the 'High' volume range and result in 'High' potential effects for public and ecological values. The level of both recreational and ecological effects is assessed as 'High'.

3.20.8 Summary

The potential adverse effects of wastewater overflows are summarised in Table 3-164.

Table 3-164: Summary of potential effects for Porirua Rocky Coast

Value category	Potential magnitude of effect	Level of effect
Public health	High	**High**
Aquatic ecology	High	**Moderate**
Cultural	High	**Moderate**
Aesthetic	High	**Moderate**

3.21 PORIRUA COAST - TITAHI BAY STREAMS

3.21.1 Description of the Receiving Environment

Several low stream order, unnamed watercourses discharge into Titahi Bay, including watercourses running adjacent to South Beach Access Road, Toms Road and Bay Drive. All three watercourses are best described as stream remnants, having been incorporated into the stormwater network, with very little stream habitat remaining. These are likely intermittent watercourses, with little or no surface flow during dry summer months. All three are categorised by the River Environment Classification (REC) as having 'warm dry climate/low elevation/hard sedimentary geology/urban landcover'.

The South Beach Access stream is a 1st order watercourse which is piped for almost its entire length through the stormwater network. It has an upstream catchment of approximately 36 hectares, an estimated mean flow of 6L/s and a mean annual low flow of <1L/s.

The Toms Road stream is a 1st order watercourse which is piped for almost its entire length through the stormwater network. It has an upstream catchment of approximately 30 hectares, an estimated mean flow of 6L/s and a mean annual low flow of <1L/s.

The Bay Drive stream is a 1st order watercourse which is piped for almost its entire length through the stormwater network. It has an upstream catchment of approximately 39 hectares, an estimated mean flow of 7L/s and a mean annual low flow of <1L/s.

Table 3-165 summarises the results of WWL monthly *E. coli* monitoring of the South Beach Access Road Stream at its outlet to Titahi Bay over the period from February 2020 to June 2022. Microbiological contamination of the stormwater discharge is extremely high. The site is placed in NPS-FM Attribute state "E" indicating a predicted risk average risk of infection of >7% for full contact recreation users.

Table 3-165: Summary statistics and NPS-FM Attribute State for E. coli (WWL data Feb 2020 –June 2022)

Site name	N samples	% exceedance over 540 CFU/100mL	% exceedance over 260 CFU/100mL	Median concentration CFU/100mL	95th percentile CFU/100mL	NPS-FM Attribute State
South Beach Access Stream (POSW4)	**35**	**94**	**97**	**11,200**	**41,440**	E

The pNRP does not list any values for the stream discharging to Titahi Bay. The stream values have been classified solely based on available information from other sources (such as the REC and known characteristics from WWL and anecdotal observations) to produce the wastewater network overflow assessment in Table 3-166.

Table 3-166: Summary of Titahi Bay Streams receiving environment characteristics

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Titahi Bay Streams	Small Waterway	Class 2 (Contact recreation may occur)	Class 2 (Some ecological value)	Class 2 (Important)	Class 1 (High value)

3.21.2 Summary of Overflow Characteristics

There are no confirmed wet weather WNO overflows to Titahi Bay Streams. It is noted however that very high *E. coli* concentrations have consistently been recorded in the South Access Road Stream indicating a significant wastewater network fault or faults in the area, with severe faecal contamination indicated in both dry and wet weather conditions.

3.22 GENERIC ASSESSMENT AGAINST PNRP POLICY P93 CRITERIA

A generic assessment of WNO discharges against pNRP Policy P93 water quality guidelines is provided in Table 3-167 below. The assessment is made by reference to WNO characteristics summarised in Appendix A and nine representative discharge scenarios summarised in Appendix C (low, medium, and high-volume discharges to small, medium, and large waterways). Smaller waterways are more susceptible to adverse impacts from WNO discharges because they provide less dilution for a given discharge volume. In the Porirua wastewater network Porirua Stream currently stand out as watercourses most likely not to meet P93 guidelines from time to time.

Table 3-167: Assessment of WNO Discharges against pNRP Policy P93 Water Quality Criteria.

P93: Quality of existing wastewater discharges to rivers. The quality of existing wastewater discharges to rivers shall be assessed in relation to the following water quality guidelines in the receiving water after reasonable mixing:	Assessment of WNO discharges against P93
a) When measured below the discharge point compared to above the discharge point: *i) A decrease in the QMCI of no more that 20%, and* *ii) A decrease in water clarity of no more than:* *1) 20% in River class 1 and in any river identified as having a high macroinvertebrate community health in Schedule F1, or* *2) 30% in any river, and* *iii) A change in temperature of no more than:* *1) 2° C in any river identified as having high macroinvertebrate health in Schedule F1, or* *2) 3° C in any other river, and*	(a)(i) Mechanisms by which WNO discharges might cause a decrease in QMCI scores include nutrient enrichment, dissolved oxygen depletion, and toxicity due to elevated ammonia or nitrate. While nutrient enrichment and oxygen depletion are unlikely in the context of an intermittent short duration WNO discharge occurring during a rainfall event, ammonia/nitrate toxicity is a possible outcome, particularly in the case of frequent medium to high volume discharges to a small or medium sized watercourse. In this context high volume, high frequency WNO discharges to a medium sized waterway, such as Porirua Stream would likely contribute to poor macroinvertebrate community health. (a)(ii) WNO discharges contain elevated levels of suspended solids. High-volume discharges have the potential to reduce water clarity in medium waterways by more than 30% for the duration of the discharge. WNO 64 to Porirua Stream would very likely not achieve the water clarity guideline from time to time. (a)(iii) WNO discharges consist partly or mostly of stormwater inflows to the wastewater network and are normally at, or close to, the ambient temperature of receiving waters. The risk of WNO discharges causing more than a 3° C temperature change is low.
b) Consider the extent to which the discharge causes the following to be exceeded: *i) The 7-day mean minimum dissolved oxygen concentration of more than 5 mg/L, and* *ii) The daily minimum dissolved oxygen concentration of no lower than 4 mg/L, and* *iii) Soluble carbonaceous biochemical oxygen demand (BOD_5) of no more than*	(b)(i) and (b)(ii) Oxygen Depletion is unlikely in the context of an intermittent short duration WNO discharge occurring during a rainfall event. (b)(iii) A WNO discharge to a small or medium sized watercourse has the potential to cause a soluble carbonaceous BOD_5 concentration greater than 2mg/L in receiving waters at flows less than flood flows, but such events are intermittent and of short duration. (b)(iv) A WNO discharge to a small or medium sized watercourse has the potential to cause a POM

P93: Quality of existing wastewater discharges to rivers. The quality of existing wastewater discharges to rivers shall be assessed in relation to the following water quality guidelines in the receiving water after reasonable mixing:	**Assessment of WNO discharges against P93**
2 mg/L at flows less than flood flows, and *iv) Particulate organic matter (POM) of no more than 5 mg/L at flows less than median, and* *v) Nitrate toxicity of no more than:* *1) 1mg/L (annual median) and 1.5mg/L (annual 95th percentile from monthly samples in outstanding water bodies (Schedule A1), River class 1 and any river identified as having high macroinvertebrate community health in Schedule F1, or* *2) 2.4mg/L (annual median) and 3.5mg/L (annual 95th percentile from monthly samples) in any other river, and* *vi) Ammonia toxicity (at pH 8 and 20° C) or no more than:* *1) 0.03mg/L (annual median) and 0.05mg/L (annual maximum from monthly samples) in outstanding water bodies (Schedule A1), River class 1 and any river identified as having high macroinvertebrate community health in Schedule F1, or* *2) 0.24mg/L (annual median) and 0.4mg/L (annual 95th percentile from monthly samples) in any other river*	concentration greater than 5 mg/L in receiving waters, but stream flows are unlikely to be less than median at such times. (b)(v) A high frequency of WNO discharges (>10 per year) to a small or medium sized watercourse has the potential to cause an exceedance of the annual median and/or 95th percentile nitrate-N values, based on monthly sampling. WNO 64 to Porirua Stream currently occurs at a high frequency and could potentially cause non-compliance with (b)(v) criteria, depending on how many monthly sampling occasions coincide the WNO discharge events. (b)(vi) A high frequency of WNO discharges to a small or medium sized watercourse has the potential to cause an exceedance of the annual median and/or 95th percentile ammonia values, based on monthly sampling. Conversely, a low frequency of discharge (<2 per year) is unlikely to cause non-compliance.

Notes:

1. Collins Stream, a tributary of the Mangaroa River, is the only Class 1 river that is potentially affected by an overflow from the Hutt/Wainuiomata wastewater network.

2. No rivers with high macroinvertebrate community health are potentially affected by an overflow from the Hutt/Wainuiomata wastewater networks

4.0 RANKING AND SYNTHESIS

4.1 SITE RANKINGS

Previous sections have described WNO receiving environment values (recreational, ecological, cultural, and aesthetic values), and scored from 1 (very low) to 5 (very high) the potential magnitude and overall level of adverse effects of WNO's on those values.

Table 4-1, below, ranks the WNO sites by their potential to cause adverse effects within the receiving environment. A single ranking score is achieved by combining scores for the four receiving environment value to give the following 'level of effect' rankings: Very Low (4-7), Low (8-10), Moderate (11-13), High (14-16) and Very High (17-20). A complete list of all COPs is provided in Appendix A.

Of the 120 WNOs, 113 were assessed as a having a very low or low level of adverse effect. The remaining 7 were assessed as having a moderate, high or very high level of adverse effect and should therefore be considered for a management response. The receiving environments for these WNOs are Porirua Stream, Duck Creek, Pāuatahanui Stream, Porirua Coast at Rukutane Point, Browns Bay Stream, Bradeys Bay in Pāuatahanui Inlet and the Onepoto Arm. Further details are provided below.

Table 4-1: WNO points assessed as having 'Very High', 'High' or 'Moderate' level of adverse effects

WNO number	Sub-catchment	Pump Station	Assessed Volume Range	Assessed Frequency Range	Direct Receiving Environment	Public Health effects	Ecological Effects	Cultural Effects	Aesthetic Effects	Overall Effects Score	Level of adverse effect
64	Porirua	PS20	High	High	Porirua Stream	5	5	4	4	18	Very High
34	Duck	PS01	Medium	Medium	Duck Creek	5	4	3	3	15	High
84	Pāuatahanui	PS38	Medium	Medium	Pāuatahanui Stream	5	4	3	3	15	High
83	Porirua Coast	PS35	Medium	Medium	Titahi Bay	4	3	3	3	13	Moderate
85	Duck	PS39	Medium	Medium	Bradeys Bay	3	3	3	3	12	Moderate
90	Porirua	PS6A	Medium	Medium	Onepoto Arm	3	3	3	3	12	Moderate
45	Duck	PS02	Low	Low	Browns Bay Stream	4	3	2	2	11	Moderate

It's important to note that a high ranking in this table does not mean that the overflow will be one of the first ones to be resolved under this application. As set out in section 4 of Part 1 of this application, Wellington Water is proposing to apply a sub-catchment approach to reducing overflows.

4.2 SYNTHESIS

4.2.1 Taupō

The Taupō sub-catchment includes 6 WNO sites which discharge directly to Taupō Stream. These are low volume and low frequency discharges to a moderate sized watercourse which, individually, are assessed as having a moderate level of adverse effect. There is, however, a reasonable likelihood of these discharges operating together in response to a larger rainfall event, which cumulatively is assessed as having a high level of adverse effect on the stream. The likely level of downstream impact on the coastal water quality at Plimmerton Beach is low.

4.2.2 Kakaho

The Kakaho sub-catchment includes 5 WNO sites which discharge directly to Pāuatahanui Inlet. There are no WNO discharges to Kakaho Stream. All discharges from Kakaho sub-catchment to Pāuatahanui Inlet are low volume and either low or moderate frequency discharges which, individually, are assessed as having a low level of adverse effect. These WNO discharge locations are spatially well separated, with little likelihood of the cumulative effect being greater than individual effects.

4.2.3 Pāuatahanui

The Pāuatahanui sub-catchment includes 23 WNO sites which discharge directly to Pāuatahanui Stream. These are low volume and low frequency discharges, except for WNO 84 which discharges to the tidal reach of Pāuatahanui Stream and is associated with pump station (PS38) on Joseph Banks Drive in Whitby. Based on historical records, PS38 overflows on average three times per year with an average duration of 28 hours per year. The level of adverse effect in Pāuatahanui Stream, including cumulative effects, is potentially high, especially in respect of public health and aquatic ecology.

One of the WNO sites (WNO 74) discharges directly to Pāuatahanui Inlet and is assessed as potentially having a high level of adverse effect, predominantly in respect of public health and aquatic ecology.

Network improvements already planned in the Pāuatahanui sub-catchment include gravity sewer upgrades and pump station upgrades (WCS, 2019).

4.2.4 Duck

The Duck sub-catchment includes 6 WNO sites discharging to Duck Creek, one to Browns Bay Stream and 7 discharging directly to Pāuatahanui Inlet. The most significant discharge to Duck Creek is WNO site 34 associated with pump station PS01. Historic overflow records show it operates approximately 5 times each year with an average duration of 36 hours per year. The discharge volume is typically in the range 600m^3 to 6000m^3. PS01 is located at the intersection of Mooring Close and Tradewinds Drive, approximately 20m from Duck Creek. The level of adverse effect in Duck Creek, including cumulative effects, is assessed as high, especially in respect of public health and aquatic ecology.

The single WNO discharge to Browns Bay Stream is WNO site 45, associated with pump station PS02. Historic monitoring indicates that since 2017 it has operated less than twice each year but for an average duration of 37 hours per year. It is assessed as having a ‘Moderate’ level of adverse effect on Browns Bay Stream. Water quality monitoring indicates a very high level of faecal contamination in the Browns Bay Stream and a moderate level of contamination in Browns Bay which suggest other sources in addition to a low frequency wet weather discharge. Wellington Water initiated a Human Health Mitigation Project for Browns Bay Stream in March 2021 which was reported in the Global Stormwater Consent Annual (Wellington Water Ltd, 2022). That report notes that an investigation of the private lateral network is required to locate faults.

The most significant of the discharges from the Duck sub-catchment directly to Pāuatahanui Inlet is WNO site 85 associated with pump station PS39 located on SH58 at Paremata Road, Bradeys Bay. Based on historical records, PS39 overflows on average six times per year with an average duration of 47 hours per year. Water quality has not been monitored at Bradeys Bay to date. Monitoring conducted at nearby Browns Bay indicates a moderate level of faecal contamination at that location, but those results are most likely driven by overflows to Browns Bay Stream. These discharges directly to Pāuatahanui Inlet, including cumulative effects, are assessed as potentially causing a high level of adverse effect, primarily in respect of public health and aquatic ecology.

Network improvements already planned in the Duck sub-catchment include gravity sewer upgrades, pump station upgrades, and Whitby storage (WCS, 2019). The proposed storage at Whitby is designed to store wastewater at times of peak wet weather flow, then gradually release it at levels the network can carry to the treatment plant, thereby reducing the frequency of wet weather overflows.

4.2.1 Porirua

The Porirua sub-catchment includes 27 WNOs to Porirua Stream, 10 WNOs to Kenepuru Stream, 2 WNOs to Onepoto minor streams, 6 WNOs to Onepoto Fringe Lagoons, and 11 WNOs direct to the Onepoto Arm of Porirua Harbour.

The most significant of these is WNO site 64 which discharges to Porirua Stream. It is associated with pump station PS20 which operates at a 'High' volume and 'High' frequency. Based on historical overflow records it operates on average 11 times a year at an average annual volume of approximately 39,000m^3. WNO 64 is ranked as having the highest potential level of adverse effect of any site in the Porirua wastewater network. It has a very high level of adverse effect on Porirua Stream and can cause a significant downstream impact water quality of Onepoto Arm of Porirua Harbour.

All 10 WNO's to Kenepuru Stream are low volume and low frequency, however the overall level of cumulative effects is assessed as moderate. Wellington Water conducted sanitary surveys in February 2021 in response to elevated faecal indicator bacteria concentrations at Bothamley Park, which was subsequently elevated to a Human Health Mitigation Project (Wellington Water Ltd, 2022). Wellington Water has developed a Wastewater Network Plan for the Eastern Porirua catchment as part the Kāinga Ora redevelopment of its housing stock in Eastern Porirua.

Of the 17 WNO's to the Onepoto Arm of Porirua harbour, the most significant is WNO site 90, associated with pump station (PS6A) situated on Station Road. WNO 90 operates at a 'Medium' frequency and 'Medium' volume. Based on historical records, PS38 overflows on average five times per year with an average duration of 25 hours per year. It is noted also that Wellington Water has commenced Human Health Mitigation Projects in relation to the Semple Street Culvert, and an unnamed stream at Onepoto Park (Wellington Water Ltd, 2022).

Network improvements planned or underway for the Porirua sub-catchment include (WCS, 2019):

- I&I reduction in Ascot Park, Cannons Creek, Ranui Upper, and Waitangirua.
- City wide gravity sewer upgrades, pressure main upgrades, and pump station upgrades

- Upsizing 400m of the Kenepuru Stream gravity sewer, and 130m of the incoming sewer to PS20.
- Provision of new City Centre storage and upsizing 2.6km of its connecting gravity sewer to the north. Wellington Water, PCC, mana whenua and the community have been concerned about the PS20 overflow for several years and in 2021 Wellington Water commenced the Porirua Central Wastewater Storage Tank Project. The Central Storage Tank is expected to be constructed during 2023. The tank will store up to 7,000m^3 of wastewater at times of peak wet weather flow, then gradually release it at levels the network can carry to the treatment plant. This tank, on its own, will not stop overflows to Porirua Stream but it is an important part of the solution.

4.2.2 Porirua Coast

The Porirua Coast sub-catchment includes 8 WNO sites discharging to Pukerua Bay, one to Titahi Bay and one to rocky reef habitat at Rukutane Point. All discharges to Pukerua Bay and Titahi Bay are low volume and low frequency; the level of adverse effect, including cumulative effects, is assessed as low.

The single discharge to Rukutane Point is WNO site 83 is associated with pump station (PS35). The discharge is to coastal waters via the short outfall which also carries the main discharge of treated wastewater from the Porirua WWTP. The wastewater network model indicates that WNO Site 83 operates at a ‘Medium’ volume and frequency. Based on historical records, PS35 overflows on average five times per year with an average duration of 58 hours per year.

It is noted also that Wellington Water commenced a Human Health Mitigation Project at Titahi Bay during 2021 in response to elevated faecal indicator bacteria in stormwater outlets to the beach (Wellington Water Ltd, 2022).

Network improvements already planned or underway for Porirua Coast include (WCS, 2019):

- Gravity sewer upgrades, pressure main upgrades, and pump station upgrades in Titahi Bay.
- Gravity sewer upgrades and Paramata storage.
- Gravity sewer upgrades and North Plimmerton Storage, and
- Pump station upgrades in Titahi Bay, Plimmerton, and Pukerua Bay.

5.0 CONCLUSIONS

This AEE Part 2 Report has been prepared to support the Wellington Water application to consent overflows from the wastewater network in the Porirua WWTP catchment. It should be read in conjunction with the AEE Part 1 Report which sets out the framework to manage the process of applying and implementing the global resource consents required for network discharges.

The assessment of wastewater overflows from the Porirua WWTP network identified one WNO which has the potential to cause a Very High (unacceptable) level of adverse effect in the receiving environment, two WNO's with the potential to cause a High (significant) level of adverse effect and a further four overflow points likely to cause a Moderate (more than minor) level of adverse effect. These WNO's are spread across the Porirua, Porirua Coast, Duck, and Pāuatahanui catchments.

The application proposes to resolve these adverse effects through the Wastewater Network Overflow Strategic Reduction Plan (Strategic Reduction Plan) and the Wastewater Network Overflow Sub-catchment Reduction Plans (Sub-catchment Reduction Plans), as detailed in Sections 4 and 5 of the Part 1 Report. The Collaborative Committee is a key component for managing the wastewater network overflows through the catchment wide consents. It fulfils the following three important functions:

1. Sets containment standards for wet weather overflows, and documents the process followed in setting the containment standards.
2. Recommends for consideration in the LTP process a wastewater network overflow reduction programme and priorities to progressively achieve the overflow objectives and containment standards over the term of the consent.
3. Reports on the progress towards achieving the overflow objectives and containment standards, particularly the effectiveness of the network improvement works in reducing the frequency of wet weather overflows.

The purpose of the Strategic and Sub-catchment Reduction Plans is to develop, implement and monitor mechanisms that will ensure the wastewater network overflow objectives and the containment standards are achieved over the term of the consent (35 years). The methodology for setting the containment standards is described in Section 4 of the Part 1 Report and set out in the consent conditions.

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Appendix A Summary of WNOs, Receiving Water Values, and Level of Adverse Effects

WNO number	ASSET ID	Overflow Type	Pump Station	Longitude	Latitude	Catchment	Direct Receiving Environment	Receiving Environment Type	Assessed Volume Range	Assessed Frequency Range	Level of Public Health Effect	Level of Public Health Effect	Level of Ecological Effect t	Level of Ecological Effect	Level of Cultural Effect	Level of Cultural effect	Level Aesthetic Effect	Level of Aesthetic Effect	Overall Effect Score	Level of Adverse Effect
64	PCC_WW010935	1	PS20	174.8433	-41.1359	Porirua	Porirua Stream	Medium Waterway	High	High	Very High	5	Very High	5	High	4	High	4	18	Very High
34	PCC_WW010761	1	PS01	174.8982	-41.1089	Duck	Duck Creek	Medium Waterway	Medium	Medium	Very High	5	High	4	Moderate	3	Moderate	3	15	High
84	PCC_WWPS238	1	PS38	174.914	-41.1083	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Medium	Medium	Very High	5	High	4	Moderate	3	Moderate	3	15	High
83	PCC_WW011292	1	PS35	174.8233	-41.1063	Porirua	Porirua Coast	Beach	Medium	Medium	High	4	Moderate	3	Moderate	3	Moderate	3	13	Moderate
85	PCC_WWPS239	1	PS39	174.8926	-41.1058	Duck	Bradeys Bay	Estuaries	Medium	Medium	Moderate	3	Moderate	3	Moderate	3	Moderate	3	12	Moderate
90	PCC_SW007117	1	PS6A	174.8683	-41.1064	Porirua	Onepoto Arm	Estuaries	Medium	Medium	Moderate	3	Moderate	3	Moderate	3	Moderate	3	12	Moderate
45	PCC_WW004735	1	PS02	174.8812	-41.1061	Duck	Browns Bay Stream	Small Waterway	Low	Low	High	4	Moderate	3	Low	2	Low	2	11	Moderate
50	PCC-WWPS207	1	PS07	174.8703	-41.1016	Kakaho	Dolly Varden Beach	Beach	Low	Medium	Moderate	3	Low	2	Moderate	3	Moderate	3	11	Moderate
8	PCC_WW002009	3		174.9128	-41.1093	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
11	PCC_WW006758	3		174.8466	-41.1366	Porirua	Kenepuru Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
12	PCC_WW007768	3		174.8438	-41.1348	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
14	PCC_WW006810	3		174.8539	-41.1348	Porirua	Kenepuru Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
15	PCC_WW005844	3		174.8444	-41.1057	Porirua	Kahutea Stream	Small Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
18	PCC_WW000148	3		174.8639	-41.1474	Porirua	Kenepuru Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
19	PCC_WW000559	3		174.8717	-41.1379	Porirua	Kenepuru Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
23	PCC_WW000528	3		174.869	-41.1323	Porirua	Kenepuru Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
25	PCC_WW000309	3		174.8653	-41.1437	Porirua	Kenepuru Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
26	PCC_WW009978	3		174.9	-41.1083	Duck	Duck Creek	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
27	PCC_WW007630	3		174.8749	-41.1308	Porirua	Kenepuru Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
28	PCC_WW000209	3		174.8567	-41.1368	Porirua	Kenepuru Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
32	PCC_WW000147	3		174.8634	-41.1474	Porirua	Kenepuru Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
35	PCC_WW007205	3		174.8475	-41.1369	Porirua	Kenepuru Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
41	PCC_WW009996	3		174.895	-41.1141	Duck	Duck Creek	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
42	PCC_WW007414	3		174.899	-41.1089	Duck	Duck Creek	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
43	PCC_WW009980	3		174.8989	-41.1091	Duck	Duck Creek	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
53	PCC_WW005479	1	PS09	174.8677	-41.0864	Taupo	Taupo Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
58	PCC-WWPS213	1	PS13	174.8693	-41.0831	Taupo	Taupo Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
63	PCC-WWPS219	1	PS19	174.8357	-41.1267	Porirua	Mahinawa Stream	Small Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
86	PCC_WW008276	1	PS40	174.8709	-41.0784	Taupo	Taupo Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
87	PCC-WWPS241	1	PS41	174.8705	-41.0769	Taupo	Taupo Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
89	PCC_WWPS249	1	PS49	174.8701	-41.0857	Taupo	Taupo Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
71	PCC_WW007170	3		174.845	-41.1439	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
72	PCC_WW006213	3		174.8991	-41.1097	Duck	Duck Creek	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
75	PCC_WW007374	3		174.8695	-41.0969	Kakaho	Pāuatahanui Inlet Arm	Estuaries	Low	Medium	Low	2	Low	2	Moderate	3	Moderate	3	10	Low
384	WW39785	3		1753390	5440629	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
389	WW33347	3		1753731	5441958	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
390	WW333252	3		1753694	5441778	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low

WNO number	ASSET ID	Overflow Type	Pump Station	Longitude	Latitude	Catchment	Direct Receiving Environment	Receiving Environment Type	Assessed Volume Range	Assessed Frequency Range	Level of Public Health Effect	Level of Public Health Effect	Level of Ecological Effect t	Level of Ecological Effect	Level of Cultural Effect	Level of Cultural effect	Level Aesthetic Effect	Level of Aesthetic Effect	Overall Effect Score	Level of Adverse Effect
391	WW333252	3		1753671	5441735	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
392	WW36316	3		1751418	5437042	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
393	WCC-WWPS051	1	PS51	1751906	5436871	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
394	WCC-WWPS052	1	PS52	1751982	5436934	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
395	WCC-WWPS053	1	PS53	1751966	5436957	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
396	WCC-WWPS055	1	PS55	1752021	5436981	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
397	WCC-WWPS054	1	PS54	1752017	5437011	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
398	WCC-WWPS056	1	PS56	1752146	5437054	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
399	WCC-WWPS057	1	PS57	1752190	5437070	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
400	WCC-WWPS058	1	PS58	1752360	5437027	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
401	WCC-WWPS050	1	PS50	1753327	5437934	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
402	WCC-WWPS061	1	PS61	1753335	5438789	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
403	WCC-WWPS062	1	PS62	1753269	5439167	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
404	WCC-WWPS063	1	PS63	1753292	5440063	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
405	WCC-WWPS064	1	PS64	1753430	5440685	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
406	WCC-WWPS065	1	PS65	1753856	5442431	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
407	WCC-WWPS066	1	PS66	1753848	5442589	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
408	PAEK002PSS	1	PAEK002PSS	1760963	5447677	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
409	PAEK006PSS	1	PAEK006PSS	1760975	5447747	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
410	PAEK009PSS	1	PAEK009PSS	1760917	5447780	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
411	PAEK010PSS	1	PAEK010PSS	1760982	5447794	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
412	PAEK017PSS	1	PAEK017PSS	1760902	5447834	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
413	PAEK012APSS	1	PAEK012APSS	1760956	5447843	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
414	PAEK019PSS	1	PAEK019PSS	1760887	5447858	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
415	PAEK021PSS	1	PAEK021PSS	1760897	5447907	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
416	PAEK023PSS	1	PAEK023PSS	1760913	5447945	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
417	PAEK025PSS	1	PAEK025PSS	1760928	5447959	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
418	PAEK027PSS	1	PAEK027PSS	1760962	5447961	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
419	PAEK029PSS	1	PAEK029PSS	1760951	5447987	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
420	PAEK031PSS	1	PAEK031PSS	1760978	5448000	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
421	PAEK033PSS	1	PAEK033PSS	1760992	5448000	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
422	PAEK034PSS	1	PAEK034PSS	1761036	5447964	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
423	PAEK036APSS	1	PAEK036APSS	1761084	5447923	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
424	PAEK037PSS	1	PAEK037PSS	1761005	5448018	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
425	PAEK038PSS	1	PAEK038PSS	1761066	5448026	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
426	PAEK039PSS	1	PAEK039PSS	1760992	5448055	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
427	PAEK037APSS	1	PAEK037APSS	1760942	5448066	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
428	PAEK039APSS	1	PAEK039APSS	1761034	5448093	Pāuatahanui	Pāuatahanui Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
429	WW33116	1	WW33116	1753245	5441082	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low

WNO number	ASSET ID	Overflow Type	Pump Station	Longitude	Latitude	Catchment	Direct Receiving Environment	Receiving Environment Type	Assessed Volume Range	Assessed Frequency Range	Level of Public Health Effect	Level of Public Health Effect	Level of Ecological Effect t	Level of Ecological Effect	Level of Cultural Effect	Level of Cultural effect	Level Aesthetic Effect	Level of Aesthetic Effect	Overall Effect Score	Level of Adverse Effect
430	WW018627	1	WW018627	1753685	5442151	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
431	WW000020	1	WW000020	1753952	5442919	Porirua	Porirua Stream	Medium Waterway	Low	Low	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
37	PCC_WW007950	3		174.8223	-41.154	Porirua	Mitchell Stream	Medium Waterway	Low	Low	Low	2	Moderate	3	Low	2	Low	2	9	Low
88	PCC_WW009017	1	PS6B	174.8688	-41.1055	Porirua	Onepoto Arm	Estuaries	Medium	Low	Low	2	Low	2	Low	2	Low	2	8	Low
1	PCC_WW004962	3		174.8657	-41.1132	Porirua	Papakowhai Lagoon	Basin/Lakes	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
6	PCC_WW008240	3		174.8671	-41.1148	Porirua	Papakowhai Lagoon	Basin/Lakes	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
10	PCC_WW008239	3		174.8673	-41.1148	Porirua	Papakowhai Lagoon	Basin/Lakes	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
21	PCC_WW008240	3		174.867	-41.1147	Porirua	Papakowhai Lagoon	Basin/Lakes	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
31	PCC_WW008238	3		174.8669	-41.1146	Porirua	Papakowhai Lagoon	Basin/Lakes	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
52	PCC_SW015097	1	PS08	174.8691	-41.0942	Kakaho	Ngati Toa Domain Beach	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
54	PCC_WW011266	1	PS10	174.8633	-41.0829	Taupo	Plimmerton Beach	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
55	PCC-WWPS250	1	PS50/PS10A	174.8624	-41.0785	Porirua Coast	Karehana Bay	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
56	PCC-WWPS211	1	PS11	174.8605	-41.0762	Porirua Coast	Karehana Bay	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
57	PCC-WWPS212	1	PS12	174.8567	-41.0735	Porirua Coast	Karehana Bay	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
60	PCC_WW004245	1	PS16	174.8579	-41.1206	Porirua	Aotea Lagoon	Basin/Lakes	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
61	PCC-WWPS217	1	PS17	174.8681	-41.0978	Kakaho	Ngati Toa Domain Beach	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
65	PCC-WWPS221	1	PS21	174.8954	-41.0295	Porirua Coast	Pukerua Bay	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
66	PCC-WWPS222	1	PS22	174.8911	-41.0292	Porirua Coast	Pukerua Bay	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
67	PCC-WWPS223	1	PS23	174.8904	-41.0303	Porirua Coast	Pukerua Bay	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
68	PCC_WW003865	1	PS24	174.8966	-41.0318	Porirua Coast	Pukerua Bay	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
69	PCC-WWPS227	1	PS27	1758789	5456245	Porirua Coast	Pukerua Bay	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
70	PCC_WW002721	1	PS28	174.8881	-41.0311	Porirua Coast	Pukerua Bay	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
73	PCC-WWPS229	1	PS29	174.8873	-41.0347	Porirua Coast	Pukerua Bay	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
78	PCC-WWPS230	1	PS30	174.8871	-41.0393	Porirua Coast	Pukerua Bay	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
79	PCC_WW004144	1	PS31	174.8346	-41.1022	Porirua Coast	Titahi Bay	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
91	PCC-WWPS247	1	PS8A	174.8671	-41.0888	Taupo	Plimmerton Beach	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
92	PCC-WWPS248	1	PS9A	174.8673	-41.0825	Taupo	Plimmerton Beach	Beach	Low	Low	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
5	PCC_WW004353	2		174.8795	-41.104	Duck	Browns Bay	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
7	PCC_WW006032	1		174.8674	-41.1095	Porirua	Onepoto Arm	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
24	S20N0219	1		174.8515	-41.1224	Porirua	Onepoto Arm	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
33	PCC_WW002522	1		174.8698	-41.0982	Kakaho	Pāuatahanui Inlet Arm	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
76	PCC_WW006073	2		174.8684	-41.1064	Porirua	Onepoto Arm	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
77	PCC_WW003706	2		174.8425	-41.115	Porirua	Onepoto Arm	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
46	PCC_WW004351	1	PS03	174.8796	-41.1038	Duck	Browns Bay	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
47	PCC_WW009164	1	PS04	174.8785	-41.1007	Duck	Pāuatahanui Inlet Arm	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
48	PCC_WW004517	1	PS05	174.8735	-41.1047	Duck	Ivey Bay	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
49	PCC-WWPS242	1	PS05A	174.8744	-41.1043	Duck	Ivey Bay	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
51	PCC-WWPS245	1	PS07A	174.8815	-41.0896	Kakaho	Pāuatahanui Inlet Arm	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
59	PCC_WW004970	1	PS15	174.8621	-41.1107	Porirua	Onepoto Arm	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low

WNO number	ASSET ID	Overflow Type	Pump Station	Longitude	Latitude	Catchment	Direct Receiving Environment	Receiving Environment Type	Assessed Volume Range	Assessed Frequency Range	Level of Public Health Effect	Level of Public Health Effect	Level of Ecological Effect t	Level of Ecological Effect	Level of Cultural Effect	Level of Cultural effect	Level Aesthetic Effect	Level of Aesthetic Effect	Overall Effect Score	Level of Adverse Effect
62	PCC-WWPS218	1	PS18	174.8763	-41.1022	Duck	Ivey Bay	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
74	PCC_WW010522	1	PS37	174.9048	-41.1054	Pāuatahanui		Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
80	PCC_WW007489	1	PS32	174.843	-41.1138	Porirua	Onepoto Arm	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
81	PCC-WWPS233	1	PS33	174.8373	-41.121	Porirua	Onepoto Arm	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
82	PCC_SW003885	1	PS34	174.8375	-41.121	Porirua	Onepoto Arm	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
383		3		1754254	5446180	Porirua	Onepoto Arm	Estuaries	Low	Low	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low

Appendix B Fish Species Record

Appendix B Fish Species Record

Table B1: Fish Species Records from the New Zealand Freshwater Fish Database 2012 to 2022 (and Stantec, 2022)).

Catchment	Banded kokopu	Bluegill bully	Common bully	Common smelt	Crans bully	Dwarf galaxias	Estuarine triple	Giant bully	Giant kokopu	Grey mullet	inanga	koaro	lamprey	Longfin eel	Shortfin eel	Redfin bully	Shortjaw kokopu	Upland bully	Yelloweye mullet	Brown trout	Perch	N species
1. Karori Stream	✓										✓	✓		✓	✓			✓		✓		7
2. Owhiro Stream	✓													✓	✓	✓						4
3. Island/ Houghton																						NR
4. Lyall Bay																						NR
5. East Coast																						NR
6. Evans Bay																						NR
7. Lambton	✓																					1
8. Kaiwharawhara Str	✓	✓						✓	✓			✓		✓	✓	✓	✓			✓	✓	11
9. North harbour Tyers	✓											✓		✓	✓							4
10. Korokoro Stream	✓	✓	✓	✓					✓		✓	✓		✓	✓	✓				✓		11
11. Speedy's Stream																						NR
12. Waiwhetu Stream	✓			✓			✓				✓				✓				✓			6
13. Stokes Valley Str	✓								✓					✓	✓	✓						5
14. Hulls Creek	✓		✓	✓					✓		✓			✓		✓						7
15. Lower Hutt South	✓	✓	✓					✓						✓						✓		6
16. Lower Hutt North		✓						✓						✓	✓	✓				✓		5
17. Upper Hutt South		✓										✓		✓	✓	✓				✓		6
18. Upper Hutt North		✓										✓		✓		✓				✓		5
19. Hutt Whakatiki												✓		✓		✓				✓		4
20. Hutt Akatarawa		✓										✓		✓		✓				✓		5
21. Hutt Headwater		✓		✓	✓	✓						✓		✓	✓	✓				✓		9
22. Hutt Pakuratahi					✓	✓						✓		✓		✓				✓		6
23. Hutt Mangaroa					✓									✓		✓				✓		4
24. Eastbourne	✓		✓						✓					✓	✓					✓		6
25. Black Creek																						3
26. Wainuiomata-iti																						2
27. Wainuiomata		✓	✓			✓			✓			✓	✓	✓		✓				✓		9
28.Wainuiomata Morton						✓								✓						✓		3
29. Taupo	✓							✓			✓	✓		✓	✓	✓						7
30. Kakaho																						NR
31. Horokiri	✓		✓	✓			✓	✓			✓	✓	✓	✓	✓				✓	✓		12
32. Pāuatahanui Stm	✓		✓							✓				✓	✓					✓		6
33. Duck	✓		✓	✓					✓		✓	✓	✓	✓	✓	✓						10
34. Porirua Stream			✓	✓					✓		✓	✓		✓	✓	✓				✓		9
35. Porirua coast																						NR

Table B2: NZFFD Record Comparison against Fish-IBI Objective (2000-2022)

Catchment	% Impervious surface	Number of records	Distance from the sea (km)	Altitude (m)	Number of Native fish species	Number of Exotic fish species	Number large invertebrate species	Fish IBI	NPS-FM attribute state	PNRP O19 Objective for F-IBI	Meeting PNRP O19
1. Karori Stream	5%	5	6	100	6	1	1	56	A	≥38	meeting
2. Owhiro Stream	6%	3	2	60	4	0	0	38	A	≥38	meeting
3. Island/ Houghton	17%	0									NR
4. Lyall Bay	34%	0									NR
5. East Coast	20%	0									NR
6. Evans Bay	25%	0									NR
7. Lambton	26%	1	1.8	65	1	0	1	20	C	≥38	Not meeting
8. Kaiwharawhara Str	10%	13	1.5	25	9	2	1	60	A	≥38	meeting
9. Tyers (Waitohu)	15%	3	1.5	80	4	0	1	42	A	≥38	meeting
10. Korokoro Stream	3%	3	1.5	5	10	1	1	60	A	≥38	meeting
11. Speedy's Stream	6%	0									NR
12. Waiwhetu Stream	53%	3	2	10	6	0	0	34	A	≥38	Not meeting
13. Stokes Valley Str	27%	2	16	80	4	0	1	46	A	≥38	meeting
14. Hulls Creek	21%	8	15	35	6	0	1	52	A	≥38	meeting
15. Lower Hutt South	59%	3	4	20	6	1	0	46	A	≥38	meeting
16. Lower Hutt North	27%	2	15	40	5	1	0	44	A	≥38	meeting
17. Upper Hutt South	20%	2	76	27	2	0	0	44	A	≥38	meeting
18. Upper Hutt North	32%	3	40	180	4	1	0	40	A	≥38	meeting
19. Hutt Whakatiki	<1%	1	26	210	3	1	1	48	A	≥48	meeting
20. Hutt Akatarawa	<1%	3	40	200	4	1	1	50	A	≥48	meeting
21. Hutt Headwater	<1%	3	43	200	3	1	0	56	A	≥48	meeting
22. Hutt Pakuratahi	<1%	4	53	250	5	1	1	52	A	≥48	meeting
23. Hutt Mangaroa	1%	3	40	150	3	1	1	46	A	≥48	Not meeting
24. Eastbourne	11%	3	0.5	40	1	0	0	18	C	≥38	Not meeting
25. Black Creek	27%	0									NR
26. Wainuiomata-iti	<1%	0									NR
27. Wainuiomata	1%	6	20	100	9	1	1	56	A	≥38	meeting
28. Wainuiomata Mor.	<1%	2	30	130	2	1	1	38	A	≥38	meeting
29. Taupo Stream	9%	18	2	10	9	1	1	52	A	≥38	meeting
30. Kakaho Stream	3%	0									NR
31. Horokiri Stream	2%	8	10	50	11	0	1	60	A	≥38	meeting
32. Pāuatahanui Stm	4%	3	5	60	5	1	0	42	A	≥38	meeting
33. Duck Creek	15%	26	5	15	13	1	1	60	A	≥38	meeting
34. Porirua Stream	19%	7	5	50	8	1	1	58	A	≥38	meeting
35. Porirua coast	10%	0									NR

Appendix C WASTEWATER AND CALCULATED RECEIVING WATER QUALITY

Wastewater Constituents	Discharge characteristics					Discharge quality			We weather stream flow			Stream water quality					
	Overflow	Volume	Duration	Duration	Discharge	Conc.	load	mass load	Small	Medium	Large	Background wet weather	Small waterway	Medium waterway	Large water way	Freshwater Guideline concentration	
	Type	m^3	hours	seconds	m^3/s	g/m^3	g/sec	kg	m^3/s	m^3s	m^3/s	g/m^3	g/m^3	g/m^3	g/m^3	g/m^3	Source
TSS	Low	100	1	3600	0.08	300	24	159	0.5	5	50	100	128	103	100	1000	Derived from NIWA DSS https://niwa.co.nz/our-
	Med	3000	6	21600	0.14	300	41.7	1593	0.5	5	50	100	143	105	101		
	High	10000	16	57600	0.17	300	52.1	4248	0.5	5	50	140	181	145	141		
scBOD5	Low	100	1	3600	0.03	220	6.1	165	0.5	5	50	1	13	2	1.1	2	MfE (1992)
	Med	3000	6	21600	0.14	220	30.6	1650	0.5	5	50	1	49	7	1.6		
	High	10000	16	57600	0.17	220	38.2	4400	0.5	5	50	1	57	8	1.8		
NH4-N	Low	100	1	3600	0.03	26	0.7	14	0.5	5	50	0.1	1.5	0.2	0.1	0.4	NPS-FM (202
	Med	3000	6	21600	0.14	26	3.6	141	0.5	5	50	0.1	5.7	0.8	0.2		
	High	10000	16	57600	0.17	26	4.5	376	0.5	5	50	0.1	6.8	1.0	0.2		
TN	Low	100	1	3600	0.03	40	1.1	23	0.5	5	50	2	4.0	2.2	2.0	3.5	NPS-FM (202
	Med	3000	6	21600	0.14	40	5.6	234	0.5	5	50	2	10.3	3.0	2.1		
	High	10000	16	57600	0.17	40	6.9	624	0.5	5	50	2	11.8	3.3	2.1		
TP	Low	100	1	3600	0.03	5.1	0.1	2.4	0.5	5	50	0.1	0.4	0.1	0.1	NA	
	Med	3000	6	21600	0.14	5.1	0.7	24	0.5	5	50	0.1	1.2	0.2	0.1		
	High	10000	16	57600	0.17	5.1	0.9	63	0.5	5	50	0.1	1.4	0.3	0.1		
Cu	Low	100	1	3600	0.03	0.096	0.0	0	0.5	5	50	0.002	0.007	0.003	0.002	0.0025	ANZG (2018)
	Med	3000	6	21600	0.14	0.096	0.0	0	0.5	5	50	0.002	0.022	0.005	0.002		
	High	10000	16	57600	0.17	0.096	0.0	1	0.5	5	50	0.002	0.026	0.005	0.002		
Zn	Low	100	1	3600	0.03	0.31	0.0	0.1	0.5	5	50	0.015	0.031	0.017	0.015	0.031	ANZG (2018)
	Med	3000	6	21600	0.14	0.31	0.0	1	0.5	5	50	0.015	0.079	0.023	0.016		
	High	10000	16	57600	0.17	0.31	0.1	2	0.5	5	50	0.015	0.091	0.025	0.016		
Norovirus	Low	200	1	3600	0.06	1.00E+09	6.E+07	3.00E+08	0.5	5	50	0	100000000	10989011	1109878	NA	
(n/m^3)	Med	3000	6	21600	0.14	1.00E+09	1.E+08	3.00E+09	0.5	5	50	0	217391304	27027027	2770083		
	High	10000	16	57600	0.17	1.00E+09	2.E+08	8.00E+09	0.5	5	50	0	257731959	33557047	3460208		
E. coli	Low	100	1	3600	0.03	4.00E+06	1.E+05	1.20E+06	0.5	5	50	130	210649	22229	2351	1200	NPS-FM (202
	Med	3000	6	21600	0.14	4.00E+06	6.E+05	1.20E+06	0.5	5	50	130	869667	108235	11210		
	High	10000	16	57600	0.17	4.00E+06	7.E+05	1.20E+06	0.5	5	50	130	1031024	134354	13970		

Appendix D Modelled WNOs (Type 5) Prioritised by Level of Potential Adverse Effect

WNO number	ASSET ID	POINT X	POINT Y	Modelled Volume (m3/s)	Assessed Volume Range	Modelled Frequency (spills/yr)	Assessed Frequency Range	Direct Receiving Environment	RE Type	RE Potential Public Health Risk	RE Potential Public Health Risk	RE Ecological Risk	RE Ecological Risk	RE Cultural Risk	RE Cultural Risk	RE Aesthetic Risk	RE Aesthetic Risk	Overall Risk Score	Level of adverse effect
267	PCC_WW004020	1753925.1	5447618.4	3	Low	0.5	Medium	Unnamed stream at Arnold Park	Small Waterway	High	4	High	4	High	4	High	4	16	High
268	PCC_WW004026	1753873.4	5447545.4	51	Low	0.5	Medium	Unnamed stream at Arnold Park	Small Waterway	High	4	High	4	High	4	High	4	16	High
269	PCC_WW004050	1753811	5447413.8	6	Low	0.5	Medium	Unnamed stream at Arnold Park	Small Waterway	High	4	High	4	High	4	High	4	16	High
38	PCC_WW000035	174.85554	-41.13439	1702	Medium	4	Medium	Kenepuru Stream	Medium Waterway	Very High	5	High	4	Moderate	3	Moderate	3	15	High
4	PCC_WW001306	174.88036	-41.1319	3	Low	4	Medium	Kenepuru Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
9	PCC_WW000054	174.86158	-41.13360	91	Low	4	Medium	Kenepuru Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
13	PCC_WW010097	174.85136	-41.13952	35	Low	4	Medium	Kenepuru Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
17	PCC_WW000027	174.85904	-41.13300	26	Low	4	Medium	Kenepuru Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
30	PCC_WW007020	174.84959	-41.13895	41	Low	4	Medium	Kenepuru Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
36	PCC_WW006638	174.87462	-41.13066	1	Low	4	Medium	Kenepuru Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
39	PCC_WW002001	174.91191	-41.10971	7	Low	4	Medium	Pāuatahanui Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
153	PCC_WW000028	1755984.6	5444709.6	11	Low	4	Medium	Kenepuru Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
154	PCC_WW000033	1755829.9	5444647.4	230	Low	4	Medium	Kenepuru Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
196	PCC_WW001160	1757596.4	5445664.1	8	Low	4	Medium	Kenepuru Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
197	PCC_WW001187	1757638.2	5446031.4	16	Low	4	Medium	Kenepuru Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
199	PCC_WW001199	1757658.4	5444914.3	2	Low	4	Medium	Kenepuru Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
214	PCC_WW006648	1757126.9	5445221	56	Low	4	Medium	Kenepuru Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
215	PCC_WW006682	1756501.7	5444673.3	14	Low	4	Medium	Kenepuru Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
216	PCC_WW006725	1756047	5444872.8	45	Low	4	Medium	Kenepuru Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
217	PCC_WW006726	1756076.3	5444911.2	117	Low	4	Medium	Kenepuru Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
229	PCC_WW008642	1757761.8	5445804.3	36	Low	4	Medium	Kenepuru Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
237	PCC_WW002008	1760582.2	5447344.7	22	Low	4	Medium	Pāuatahanui Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
261	PCC_WW003803	1754742.9	5447680.4	98	Low	4	Medium	Kahutea Stream	Small Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
289	WCC_WW015809	1751862	5436016.7	9	Low	4	Medium	Porirua Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
300	WCC_WW018364	1753452.6	5440947	71	Low	4	Medium	Porirua Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
302	WCC_WW018663	1753570.6	5442239	26	Low	4	Medium	Porirua Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
328	WCC_WW032794	1753424.2	5440603.5	71	Low	4	Medium	Porirua Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
334	WCC_WW033048	1753309.2	5440196.3	10	Low	4	Medium	Porirua Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
365	PCC_WW005700	1757065	5450192.1	10	Low	4	Medium	Taupo Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
385	WW18364	1753453	5440947	71	Low	4	Medium	Porirua Stream	Medium Waterway	High	4	High	4	Moderate	3	Moderate	3	14	High
137	PCC_WW006542	1758010.1	5447362	15	Low	0.5	Low	Browns Bay Stream	Small Waterway	High	4	High	4	Low	2	Low	2	12	Moderate
138	PCC_WW006543	1758016.3	5447334.6	59	Low	0.5	Low	Browns Bay Stream	Small Waterway	High	4	High	4	Low	2	Low	2	12	Moderate
139	PCC_WW006548	1758019.9	5447291.5	8	Low	0.5	Low	Browns Bay Stream	Small Waterway	High	4	High	4	Low	2	Low	2	12	Moderate
140	PCC_WW006549	1758021	5447253.9	1	Low	0.5	Low	Browns Bay Stream	Small Waterway	High	4	High	4	Low	2	Low	2	12	Moderate
151	PCC_WW010852	1756005.8	5446636.9	4029	Medium	4	Medium	Onepoto Arm	Estuaries	Moderate	3	Moderate	3	Moderate	3	Moderate	3	12	Moderate
370	PCC_WW002424	1758651	5455683.9	393	Low	4	Medium	Pukerua Bay	Beach	Moderate	3	Low	2	Moderate	3	Moderate	3	11	Moderate
372	PCC_WW002426	1758760.6	5455726	38	Low	4	Medium	Pukerua Bay	Beach	Moderate	3	Low	2	Moderate	3	Moderate	3	11	Moderate

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377	PCC_WW003195	1758719.7	5455683.2	25	Low	4	Medium	Pukerua Bay	Beach	Moderate	3	Low	2	Moderate	3	Moderate	3	11	Moderate
2	PCC_WW006163	174.91047	-41.11122	20	Low	2	Low	Pāuatahanui Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
3	PCC_WW010097	174.85136	-41.13953	1	Low	2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
16	PCC_WW006138	174.911	-41.11107	7	Low	0.5	Low	Pāuatahanui Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
20	PCC_WW001317	174.88078	-41.13450	4	Low	2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
29	PCC_WW006650	174.87178	-41.12786	39	Low	2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
40	PCC_WW008360	174.90759	-41.11393	2	Low	1	Low	Pāuatahanui Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
97	PCC_WW002859	1753802.3	5443099.1	14	Low	1	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
98	PCC_WW003053	1754081.7	5444940	42	Low	2	Low	Unnamed stream at Te Rauparaha Park	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
99	PCC_WW003061	1754033.1	5444850.2	5	Low	1	Low	Unnamed stream at Te Rauparaha Park	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
100	PCC_WW003062	1754060.4	5444837.5	5	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
101	PCC_WW003070	1753862.8	5444800	6	Low	1	Low	Unnamed stream at Te Rauparaha Park	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
102	PCC_WW003074	1753812.8	5444776.9	10	Low	1	Low	Unnamed stream at Te Rauparaha Park	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
103	PCC_WW003075	1753828.4	5444742.6	1	Low	2	Low	Unnamed stream at Te Rauparaha Park	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
104	PCC_WW003077	1753783.7	5444689.8	45	Low	0.5	Low	Unnamed stream at Te Rauparaha Park	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
105	PCC_WW003124	1753846.6	5445275.1	88	Low	0.5	Low	Mahinawa Stream	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
106	PCC_WW003125	1753830.5	5445241.3	2	Low	0.2	Low	Mahinawa Stream	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
107	PCC_WW003364	1753764.2	5445316.5	99	Low	0.5	Low	Mahinawa Stream	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
108	PCC_WW003433	1754073.3	5445766.4	11	Low	2	Low	Takapuwahia Stream	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
109	PCC_WW003470	1753626.6	5445774.3	6	Low	0.5	Low	Takapuwahia Stream	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
113	PCC_WW004375	1757896.3	5447978.1	70	Low	4	Medium	Browns Bay	Estuaries	Low	2	Low	2	Moderate	3	Moderate	3	10	Low
116	PCC_WW004516	1757347.5	5447912.2	3	Low	4	Medium	Ivey Bay	Estuaries	Low	2	Low	2	Moderate	3	Moderate	3	10	Low
143	PCC_WW007131	1754849.1	5443958.3	16	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
144	PCC_WW007155	1754817.9	5443796.3	1	Low	0.2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
145	PCC_WW007158	1754840.8	5443899.2	3	Low	2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
146	PCC_WW009010	1753980.4	5445835.5	2	Low	1	Low	Takapuwahia Stream	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
152	PCC_WW010854	1756081.4	5446658.2	3	Low	4	Medium	Onepoto Arm	Estuaries	Low	2	Low	2	Moderate	3	Moderate	3	10	Low
155	PCC_WW000046	1755663.8	5444531.8	10	Low	1	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
156	PCC_WW000079	1756238.2	5444479.4	9	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
157	PCC_WW000121	1756176.4	5443589.1	4	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
158	PCC_WW000124	1756156.1	5443704.1	1	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
159	PCC_WW000125	1756154.6	5443613.8	2	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
160	PCC_WW000126	1756162.6	5443556.6	4	Low	2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
161	PCC_WW000132	1756172.7	5443465.8	23	Low	1	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
162	PCC_WW000218	1755759.3	5444471.5	135	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
163	PCC_WW000250	1755985.4	5443813.5	23	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
164	PCC_WW000254	1755960.5	5443904.1	26	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
165	PCC_WW000394	1756162	5443816.8	8	Low	1	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low

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168	PCC_WW000507	1756904.5	5444708.5	8	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
169	PCC_WW000516	1756655.9	5444735.8	61	Low	2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
170	PCC_WW000519	1756613.4	5444795.8	10	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
171	PCC_WW000529	1756980.7	5444374.7	162	Low	1	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
172	PCC_WW000536	1756984.7	5444339.5	86	Low	1	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
173	PCC_WW000547	1757066.3	5444265.4	32	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
174	PCC_WW000564	1757302.8	5444180.4	9	Low	1	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
175	PCC_WW000565	1757319.3	5444192.8	7	Low	1	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
176	PCC_WW000583	1756940.5	5444460.5	1	Low	1	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
177	PCC_WW000584	1756958.5	5444418.8	2	Low	0.2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
178	PCC_WW000651	1757369.4	5444899.2	7	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
179	PCC_WW000663	1756631.7	5444479	13	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
180	PCC_WW000687	1756617.4	5444364.3	3	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
181	PCC_WW000743	1756227	5443219.7	8	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
182	PCC_WW000749	1756201.4	5443296.8	33	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
183	PCC_WW000907	1757186.7	5443920.3	4	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
184	PCC_WW000989	1757379.7	5446407.7	2	Low	0.2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
185	PCC_WW000994	1757388.2	5444828.4	2	Low	0.2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
186	PCC_WW001014	1757412.3	5446415.8	6	Low	0.2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
187	PCC_WW001020	1757420.2	5446337.2	31	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
188	PCC_WW001027	1757427.5	5446159.7	44	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
189	PCC_WW001038	1757443.4	5444775.5	1	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
190	PCC_WW001047	1757452	5446166.7	41	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
191	PCC_WW001074	1757486.6	5446365.5	3	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
192	PCC_WW001077	1757489	5444714.2	1	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
193	PCC_WW001081	1757491.9	5446454.4	3	Low	0.2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
194	PCC_WW001103	1757513.8	5445915.9	2	Low	0.2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
195	PCC_WW001106	1757520.9	5444455.1	3	Low	0.2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
198	PCC_WW001196	1757653.5	5446140.3	16	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
200	PCC_WW001212	1757671.5	5444365.8	2	Low	0.2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
201	PCC_WW001214	1757674.3	5445429.4	5	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
202	PCC_WW001218	1757680.3	5444317.7	1	Low	0.2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
203	PCC_WW001237	1757710.2	5445861.1	1	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
204	PCC_WW001241	1757719.2	5445862.6	1	Low	2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
205	PCC_WW001282	1757789.4	5444709	2	Low	0.2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
206	PCC_WW001292	1757798.3	5445441.4	27	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
207	PCC_WW001296	1757812.7	5445805	9	Low	2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
208	PCC_WW001307	1757833.5	5444935.3	1	Low	1	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
209	PCC_WW001315	1757846	5444993.9	5	Low	0.2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
210	PCC_WW001378	1757995	5444624.3	1	Low	0.2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
211	PCC_WW002770	1756259.7	5442984	1	Low	0.2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low

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212	PCC_WW006617	1757926.7	5445920	2	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
213	PCC_WW006618	1757893.9	5445888.8	21	Low	2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
218	PCC_WW006749	1755234.3	5444567	20	Low	2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
219	PCC_WW006809	1755637.3	5444563.8	70	Low	2	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
220	PCC_WW006922	1755504.7	5443745.9	17	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
221	PCC_WW006927	1755415.3	5443810.9	13	Low	1	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
222	PCC_WW006991	1755279	5443834.5	41	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
223	PCC_WW007017	1755280.6	5443982.8	8	Low	1	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
224	PCC_WW007019	1755210.1	5444125.8	7	Low	1	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
225	PCC_WW007715	1756230.5	5444373.8	50	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
226	PCC_WW007959	1756904.3	5445926.7	4	Low	1	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
227	PCC_WW008324	1756900.6	5445935.1	44	Low	1	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
228	PCC_WW008336	1756850.4	5446056.3	56	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
230	PCC_WW008877	1756106.7	5444925.6	7	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
231	PCC_WW009564	1757980.3	5446135.9	27	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
232	PCC_WW010096	1755575.6	5444011	2	Low	1	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
233	PCC_WW010098	1755410.2	5444086.6	22	Low	1	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
234	PCC_WW010099	1755509.2	5444041.3	5	Low	0.5	Low	Kenepuru Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
235	PCC_WW001700	1759239.6	5447393.8	1	Low	0.5	Low	Duck Creek	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
238	PCC_WW002010	1760653.1	5447372.1	1	Low	0.2	Low	Pāuatahanui Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
239	PCC_WW006137	1760456.8	5447191.8	37	Low	2	Low	Pāuatahanui Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
240	PCC_WW006217	1759544	5447477.3	45	Low	1	Low	Duck Creek	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
241	PCC_WW006218	1759561.3	5447470.3	64	Low	0.5	Low	Duck Creek	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
242	PCC_WW008053	1760206.1	5446966.2	3	Low	0.5	Low	Pāuatahanui Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
243	PCC_WW008389	1760186.4	5446658.1	1	Low	0.5	Low	Pāuatahanui Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
244	PCC_WW009404	1758473.2	5447055	4	Low	0.5	Low	Duck Creek	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
245	PCC_WW009541	1759083.9	5446705.6	38	Low	0.5	Low	Duck Creek	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
246	PCC_WW010000	1759048.1	5446838.2	25	Low	0.5	Low	Duck Creek	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
247	PCC_WW010003	1759151.4	5446575.7	1	Low	1	Low	Duck Creek	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
248	PCC_WW010004	1759172.2	5446496.3	3	Low	1	Low	Duck Creek	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
250	PCC_WW010121	1758868.1	5447040.6	87	Low	0.5	Low	Duck Creek	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
251	PCC_WW010125	1758914	5446984.6	3	Low	0.5	Low	Duck Creek	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
252	PCC_WW010172	1758734.8	5447306.9	19	Low	0.5	Low	Duck Creek	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
253	PCC_WW010444	1759242.2	5446285.3	8	Low	0.5	Low	Duck Creek	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
254	PCC_WW010454	1759304.6	5446239.2	19	Low	0.5	Low	Duck Creek	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
255	PCC_WW010646	1759386	5447278	45	Low	0.5	Low	Duck Creek	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
260	PCC_WW003801	1754817.1	5447699.5	2	Low	1	Low	Kahutea Stream	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
262	PCC_WW003804	1754838.5	5447881.8	1	Low	0.2	Low	Kahutea Stream	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
263	PCC_WW003806	1754852.3	5447798.1	3	Low	2	Low	Kahutea Stream	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
272	PCC_WW004203	1754322.9	5448373.1	79	Low	0.5	Low	Unnamed stream at Bay Drive/Richard Street	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low

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273	PCC_WW004209	1754355.7	5448435.7	12	Low	0.5	Low	Unnamed stream at Bay Drive/Richard Street	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
274	PCC_WW004213	1754408.3	5448536.3	1	Low	0.2	Low	Unnamed stream at Bay Drive/Richard Street	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
276	PCC_WW007475	1754924.4	5446999	14	Low	0.5	Low	Kahutea Stream	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
278	PCC_WW010586	1754838.9	5447717.8	26	Low	0.5	Low	Kahutea Stream	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
279	WCC_WW004995	1752440.9	5436027.4	1	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
280	WCC_WW004996	1752444.8	5436041.5	5	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
281	WCC_WW004997	1752473.8	5436011.1	54	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
282	WCC_WW010080	1751804.8	5436722.9	3	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
283	WCC_WW015780	1751950.9	5435329.6	51	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
284	WCC_WW015781	1751945.2	5435355.5	9	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
285	WCC_WW015787	1751943.5	5435438.4	5	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
286	WCC_WW015789	1751960.1	5435513.6	43	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
287	WCC_WW015805	1751851.2	5435958.5	1	Low	2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
288	WCC_WW015806	1751833.2	5435950	12	Low	1	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
290	WCC_WW016039	1752546.2	5435957.4	34	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
291	WCC_WW017170	1751898.3	5436576.9	55	Low	1	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
292	WCC_WW017215	1752444.5	5436051.2	2	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
293	WCC_WW017972	1752636.9	5440422.4	11	Low	1	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
294	WCC_WW017984	1752749.5	5440496	27	Low	2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
295	WCC_WW018186	1752450.8	5440045.2	6	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
296	WCC_WW018269	1752925.2	5440674	43	Low	1	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
297	WCC_WW018335	1753435.8	5440827.2	5	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
298	WCC_WW018360	1753542.5	5440917.6	5	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
299	WCC_WW018362	1753462.8	5440942.7	2	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
301	WCC_WW018583	1753722.5	5441924.9	56	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
303	WCC_WW018669	1753492	5442259.9	12	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
304	WCC_WW018671	1753415.8	5442211.8	3	Low	2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
305	WCC_WW018673	1753403.1	5442217.7	2	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
306	WCC_WW018906	1751927.5	5436947.5	66	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
307	WCC_WW019268	1753417.7	5440691.9	1	Low	0.2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
308	WCC_WW019657	1753626.4	5440217.2	5	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
309	WCC_WW019658	1753602.7	5440256.1	37	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
310	WCC_WW020362	1751860.7	5436608.4	126	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
311	WCC_WW020687	1753288.7	5435911.3	68	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
312	WCC_WW020691	1753374.8	5435886.4	67	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
313	WCC_WW020692	1753353.6	5435894.5	1	Low	0.2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
314	WCC_WW020769	1753475.7	5442072.3	1	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
315	WCC_WW020847	1751819.3	5435956.5	42	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
316	WCC_WW030228	1751394.4	5437163.8	3	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
317	WCC_WW030268	1751784.7	5436713.5	15	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low

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318	WCC_WW030292	1752170.7	5436401.5	33	Low	1	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
319	WCC_WW030315	1752321.8	5436303.1	12	Low	1	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
320	WCC_WW030923	1752529.7	5440079.3	37	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
321	WCC_WW032665	1752613.3	5440314.1	19	Low	1	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
322	WCC_WW032697	1753283.1	5439209.6	28	Low	2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
323	WCC_WW032698	1753271.2	5439194.2	2	Low	2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
324	WCC_WW032708	1752660.6	5440440.2	12	Low	2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
325	WCC_WW032722	1753025.6	5439981.3	8	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
326	WCC_WW032736	1753098.5	5439182.2	5	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
327	WCC_WW032770	1753202.5	5439151.5	9	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
329	WCC_WW032813	1753751.2	5440844.9	1	Low	0.2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
330	WCC_WW032863	1753367.4	5442234.2	11	Low	0.2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
331	WCC_WW032925	1752608.8	5440229.3	10	Low	1	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
332	WCC_WW032927	1752567.7	5440175.6	18	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
333	WCC_WW032929	1752413.4	5440206.7	97	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
335	WCC_WW033068	1753301.8	5440150.1	14	Low	2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
336	WCC_WW033107	1753467	5441072.7	1	Low	2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
337	WCC_WW033250	1753605.4	5441576.9	5	Low	2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
338	WCC_WW033252	1753696.6	5441732.9	23	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
339	WCC_WW033413	1753682.2	5442399.3	39	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
340	WCC_WW034477	1753658.7	5440212.3	1	Low	0.2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
341	WCC_WW034486	1753460.5	5440513.7	5	Low	2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
342	WCC_WW035317	1751848.3	5435941.6	5	Low	2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
343	WCC_WW041037	1753809.5	5443079.8	10	Low	1	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
344	PCC_WW005701	1757006.2	5450052.5	9	Low	2	Low	Taupo Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
352	PCC_WW005035	1756199	5451632.8	21	Low	0.5	Low	Karehana Stream	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
353	PCC_WW005039	1756179.8	5451557	7	Low	0.5	Low	Karehana Stream	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
354	PCC_WW005041	1756117.9	5451497	148	Low	0.5	Low	Karehana Stream	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
355	PCC_WW005056	1756172.5	5451660.5	120	Low	0.5	Low	Karehana Stream	Small Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
361	PCC_WW005487	1756917.9	5450122.1	4	Low	0.5	Low	Taupo Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
362	PCC_WW005494	1756975.4	5450130.5	15	Low	2	Low	Taupo Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
363	PCC_WW005500	1757090.4	5450179.4	14	Low	0.5	Low	Taupo Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
366	PCC_WW010801	1757075.9	5450033.6	3	Low	2	Low	Taupo Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
369	PCC_WW002508	1757125.1	5450038	18	Low	0.5	Low	Taupo Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
380	PCC_WW005096	1757144.8	5450802.9	1	Low	1	Low	Taupo Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
381	PCC_WW005099	1757121.1	5450764.6	9	Low	0.5	Low	Taupo Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
382	PCC_WW008277	1757186.9	5450855.4	44	Low	0.5	Low	Taupo Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
386	WW18362	1753463	5440943	2	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
387	WW18335	1753436	5440827	5	Low	0.5	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
388	WW33107	1753467	5441073	1	Low	2	Low	Porirua Stream	Medium Waterway	Moderate	3	Moderate	3	Low	2	Low	2	10	Low
94	PCC_WW002820	1753209.3	5443024.5	18	Low	0.5	Low	Mitchell Stream	Medium Waterway	Low	2	Moderate	3	Low	2	Low	2	9	Low

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95	PCC_WW002830	1753288.6	5443142.3	19	Low	0.5	Low	Mitchell Stream	Medium Waterway	Low	2	Moderate	3	Low	2	Low	2	9	Low
96	PCC_WW002843	1753517.6	5443514.1	40	Low	0.5	Low	Mitchell Stream	Medium Waterway	Low	2	Moderate	3	Low	2	Low	2	9	Low
148	PCC_WW009206	1753235.6	5443093.8	62	Low	0.5	Low	Mitchell Stream	Medium Waterway	Low	2	Moderate	3	Low	2	Low	2	9	Low
166	PCC_WW000463	1756715.7	5443957.5	79	Low	1	Low	Cannons Creek	Medium Waterway	Low	2	Moderate	3	Low	2	Low	2	9	Low
167	PCC_WW000476	1756665.2	5443925.5	47	Low	0.5	Low	Cannons Creek	Medium Waterway	Low	2	Moderate	3	Low	2	Low	2	9	Low
22	PCC_WW004963	174.86588	-41.113297	3	Low	0.5	Low	Papakowhai Lagoon	Basin/Lakes	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
111	PCC_WW004243	1755823.6	5446086.4	66	Low	0.5	Low	Aotea Lagoon	Basin/Lakes	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
120	PCC_WW004611	1756271	5446747.3	1	Low	0.5	Low	Papakowhai Lagoon	Basin/Lakes	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
121	PCC_WW004648	1756319	5446845.3	21	Low	2	Low	Papakowhai Lagoon	Basin/Lakes	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
122	PCC_WW004653	1756283.9	5446987.1	5	Low	2	Low	Papakowhai Lagoon	Basin/Lakes	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
123	PCC_WW004656	1756320.8	5446976.4	27	Low	0.5	Low	Papakowhai Lagoon	Basin/Lakes	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
124	PCC_WW004692	1756509.9	5446826	33	Low	0.5	Low	Papakowhai Lagoon	Basin/Lakes	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
125	PCC_WW004693	1756616.1	5446918.2	2	Low	0.2	Low	Papakowhai Lagoon	Basin/Lakes	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
127	PCC_WW004960	1756600.8	5447030.1	24	Low	0.5	Low	Papakowhai Lagoon	Basin/Lakes	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
128	PCC_WW004964	1756682.9	5446983.6	22	Low	0.5	Low	Papakowhai Lagoon	Basin/Lakes	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
129	PCC_WW004976	1756349.7	5447139.2	35	Low	0.5	Low	Papakowhai Lagoon	Basin/Lakes	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
133	PCC_WW006022	1756700.2	5446974.2	3	Low	0.2	Low	Papakowhai Lagoon	Basin/Lakes	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
141	PCC_WW006846	1755126.8	5445534.4	4	Low	0.2	Low	Okowai Lagoon	Basin/Lakes	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
264	PCC_WW003941	1754211.7	5447526.7	15	Low	1	Low	Titahi Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
265	PCC_WW003942	1754241.1	5447492.5	8	Low	1	Low	Titahi Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
270	PCC_WW004141	1754119.7	5448270.7	2	Low	0.5	Low	Titahi Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
271	PCC_WW004187	1754274	5448231	4	Low	0.5	Low	Titahi Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
277	PCC_WW007942	1753100.2	5447905.9	236	Low	2	Low	Porirua Coast	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
345	PCC_WW003867	1756199	5451299.5	2	Low	1	Low	Karehana Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
346	PCC_WW003868	1756230	5451246.1	4	Low	2	Low	Karehana Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
347	PCC_WW003872	1756421.5	5450991.3	1	Low	1	Low	Karehana Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
348	PCC_WW003873	1756462.1	5450940.5	20	Low	0.5	Low	Karehana Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
349	PCC_WW004275	1755711.5	5452193	36	Low	0.5	Low	Hongoeka Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
350	PCC_WW004278	1755631.7	5452187.6	3	Low	2	Low	Hongoeka Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
351	PCC_WW004279	1755631.7	5452169.5	7	Low	1	Low	Hongoeka Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
356	PCC_WW005130	1756665.6	5450693	6	Low	0.5	Low	Karehana Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
357	PCC_WW005134	1756726	5450584	21	Low	0.5	Low	Plimmerton Beach	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
360	PCC_WW005464	1756698.3	5450378.4	9	Low	0.5	Low	Plimmerton Beach	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
364	PCC_WW005697	1756483.4	5450892.2	15	Low	0.5	Low	Karehana Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
368	PCC_WW010769	1755784.8	5451708.6	21	Low	0.5	Low	Hongoeka Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
371	PCC_WW002425	1758634.9	5455717.7	16	Low	1	Low	Pukerua Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
373	PCC_WW002563	1758898.6	5456334.7	96	Low	0.5	Low	Pukerua Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
374	PCC_WW002686	1759436.8	5455999	4	Low	1	Low	Pukerua Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
375	PCC_WW002737	1758663.9	5455823.5	1	Low	0.5	Low	Pukerua Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
376	PCC_WW003189	1758632.1	5455730.9	12	Low	0.5	Low	Pukerua Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
378	PCC_WW003301	1758618.5	5455168	14	Low	2	Low	Pukerua Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low

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379	PCC_WW003302	1758632.6	5455157.6	2	Low	2	Low	Pukerua Bay	Beach	Low	2	Very Low	1	Low	2	Low	2	7	Very Low
44	PCC_WW005456	174.87496	-41.09224	5	Low	0.5	Low	Pāuatahanui Inlet Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
93	PCC_WW002528	1757595.9	5448317.6	11	Low	2	Low	Pāuatahanui Inlet Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
110	PCC_WW003566	1754094.2	5445902.4	15	Low	2	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
112	PCC_WW004350	1757825.5	5448093.8	20	Low	0.5	Low	Browns Bay	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
114	PCC_WW004478	1757449.8	5447964.8	4	Low	0.5	Low	Ivey Bay	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
115	PCC_WW004512	1757416.1	5447940.7	1	Low	1	Low	Ivey Bay	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
117	PCC_WW004607	1756152	5446656.9	1	Low	0.5	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
118	PCC_WW004608	1756176.4	5446704.5	44	Low	0.5	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
119	PCC_WW004610	1756219.2	5446737.2	3	Low	1	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
126	PCC_WW004756	1758465.1	5447817.2	64	Low	0.5	Low	Browns Bay	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
130	PCC_WW005215	1756785.6	5447550.6	1	Low	0.5	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
131	PCC_WW005222	1756641.3	5447623	27	Low	0.5	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
132	PCC_WW005228	1756822.1	5447628.3	1	Low	2	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
134	PCC_WW006045	1756765.9	5447611.3	3	Low	2	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
135	PCC_WW006068	1756940	5447706.3	1	Low	2	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
136	PCC_WW006069	1756936.3	5447674.4	4	Low	2	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
142	PCC_WW006865	1755343.2	5445917.1	15	Low	1	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
147	PCC_WW009081	1758394.4	5447791.4	2	Low	1	Low	Browns Bay	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
149	PCC_WW010850	1755728	5446330.8	1	Low	1	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
150	PCC_WW010851	1755734.8	5446338.7	8	Low	2	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
236	PCC_WW001722	1759679.3	5447666.8	3	Low	0.5	Low	Pāuatahanui Inlet Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
249	PCC_WW010039	1760285.2	5447850.4	35	Low	0.5	Low	Pāuatahanui Inlet Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
256	PCC_WW001609	1755048.6	5446980	68	Low	0.5	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
257	PCC_WW001611	1755066.9	5446993.7	1	Low	0.2	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
258	PCC_WW003647	1754119	5446583.9	10	Low	0.5	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
259	PCC_WW003654	1754025.4	5446694.7	3	Low	0.2	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
266	PCC_WW003965	1754279.4	5447103.1	51	Low	0.5	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
275	PCC_WW007472	1754776.9	5446977.7	42	Low	0.5	Low	Onepoto Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
358	PCC_WW005318	1756943.8	5448595.4	40	Low	0.5	Low	Pāuatahanui Inlet Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
359	PCC_WW005453	1757587.3	5449283.2	3	Low	2	Low	Pāuatahanui Inlet Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low
367	PCC_WW005719	1757759	5449280.5	9	Low	1	Low	Pāuatahanui Inlet Arm	Estuaries	Very Low	1	Very Low	1	Low	2	Low	2	6	Very Low