Appendix D (2 of 3)
Wellington
Catchment Characteristics
DRAFT

Whaitua te Whanganui-a-tara

Whaitua te Whanganui-a-Tara encompasses Upper Hutt, Hutt City and the majority of Wellington City.

Wellington Catchment

Wellington's stormwater network has developed in correspondence with the city's growth in population. Over its development natural water courses within the urban edge have become increasingly confined or piped to allow more intensive use of the land. There are nine sub-catchments in the Whanganui-a-Tara Wellington Harbour Catchment, four of which discharge out to the south coast and five that discharge to the Whanganui-a-Tara inner harbour, shown within Figure D 1 to Figure D 4.

While some urban streams remain, including the Kaiwharawhara that flows to the Whanganui-a-Tara inner harbour, Ōwhiro, and Karori streams that flow out to the South Coast and Cook Straight, most of Wellington's historical streams have been piped.

Wellington's stormwater network is made up of nearly 700 km of pipelines, 2.2 km of tunnels, over 15,000 inlets/outlets, 1 pump station and 2,700 associated fittings. These structures include kerbs, channels, and sumps.

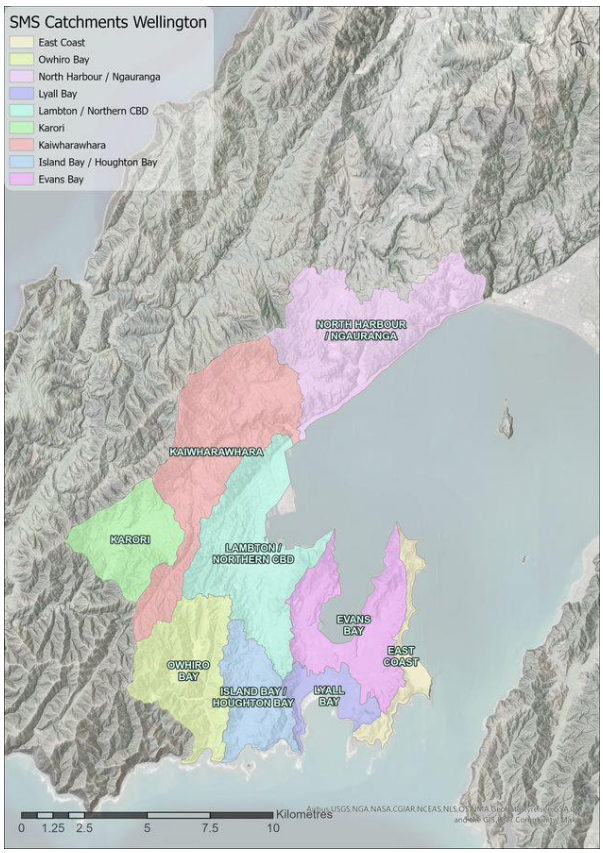


Figure D 1 Map showing the Wellington City catchments.

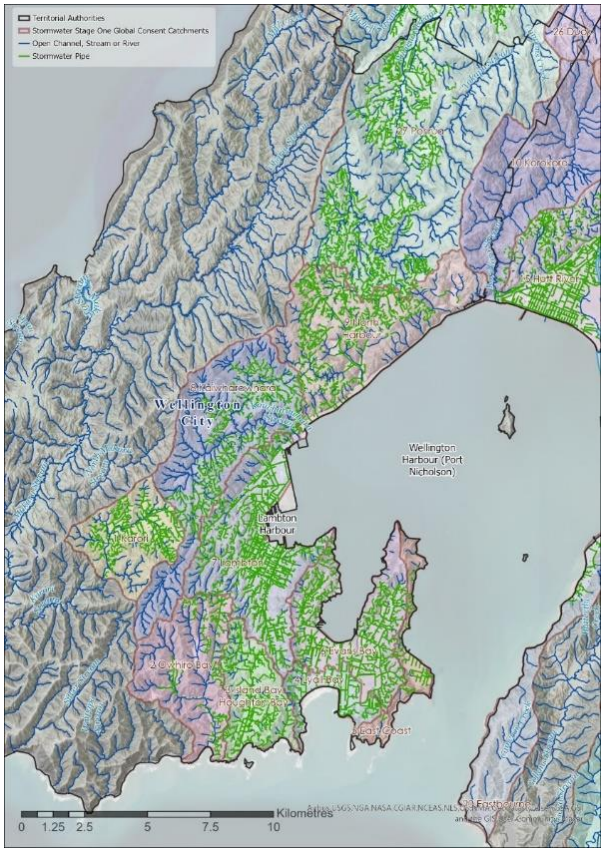


Figure D 2 Map showing the stormwater network in Wellington City.

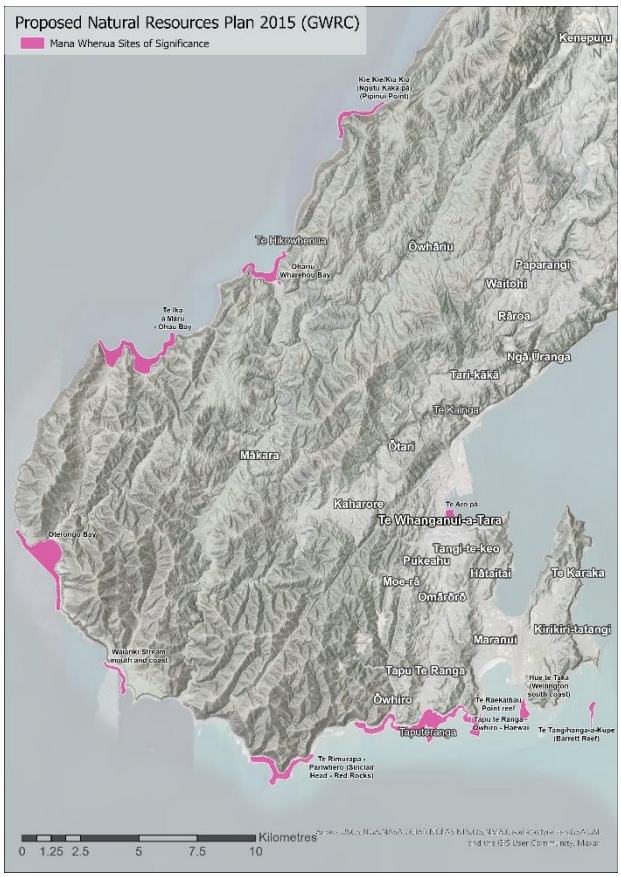


Figure D 3 Map showing the outstanding water bodies, Ngā Taonga Nui-a-Kīwa and aquatic sites with significant mana whenua values identified (Sch A-C of NRP).

Current State

Wellington City and its surrounds are mainly urban areas with some indigenous vegetation on the city fringes, town belt and in the headwaters of the streams. Most streams in the city have been heavily modified or piped, with only small (mainly headwater) reaches still open to daylight. If the current trend of reclamation and encroachment continues, we risk losing connection with these urban streams and the mauri they provide.

Under Schedule H2 of the NRP waterways that are prioritised for improvement of fresh and coastal water quality for contact recreation and mana whenua customary use include, Karori Stream, Island Bay at Derwent Street, Island Bay at Reef St Recreation Ground, Island Bay at Surf Club, Owhiro Bay, Wellington Harbour (Port Nicholson) at Harris Street, Wellington Harbour (Port Nicholson) at Hunter Street, and Wellington Harbour (Port Nicholson) at Tory Street

Monitoring results [1] from the Stage 1 Global Stormwater Discharge Consent shown in Figure D 4 indicate poor water quality regarding E. coli, copper, zinc and nutrients.

The open coastal waters are in a moderate state, although sediment inputs and faecal contamination after rainfall may continue to impact recreation the collection of mahinga kai at Ōwhiro Bay. The stretch of coastline which contains the Taputeranga Marine Reserve may also be affected by poorly understood freshwater impacts, including emerging contaminants[2].

[1] *Stormwater Monitoring Plan Annual Report 2020-2021*

[2] *as identified in the Whaitua Implementation Programme web document - https://www.gw.govt.nz/assets/Documents/2021/12/Te-Whaitua-te-Whanganui-a-Tara-Implementation-Programme_web.pdf*

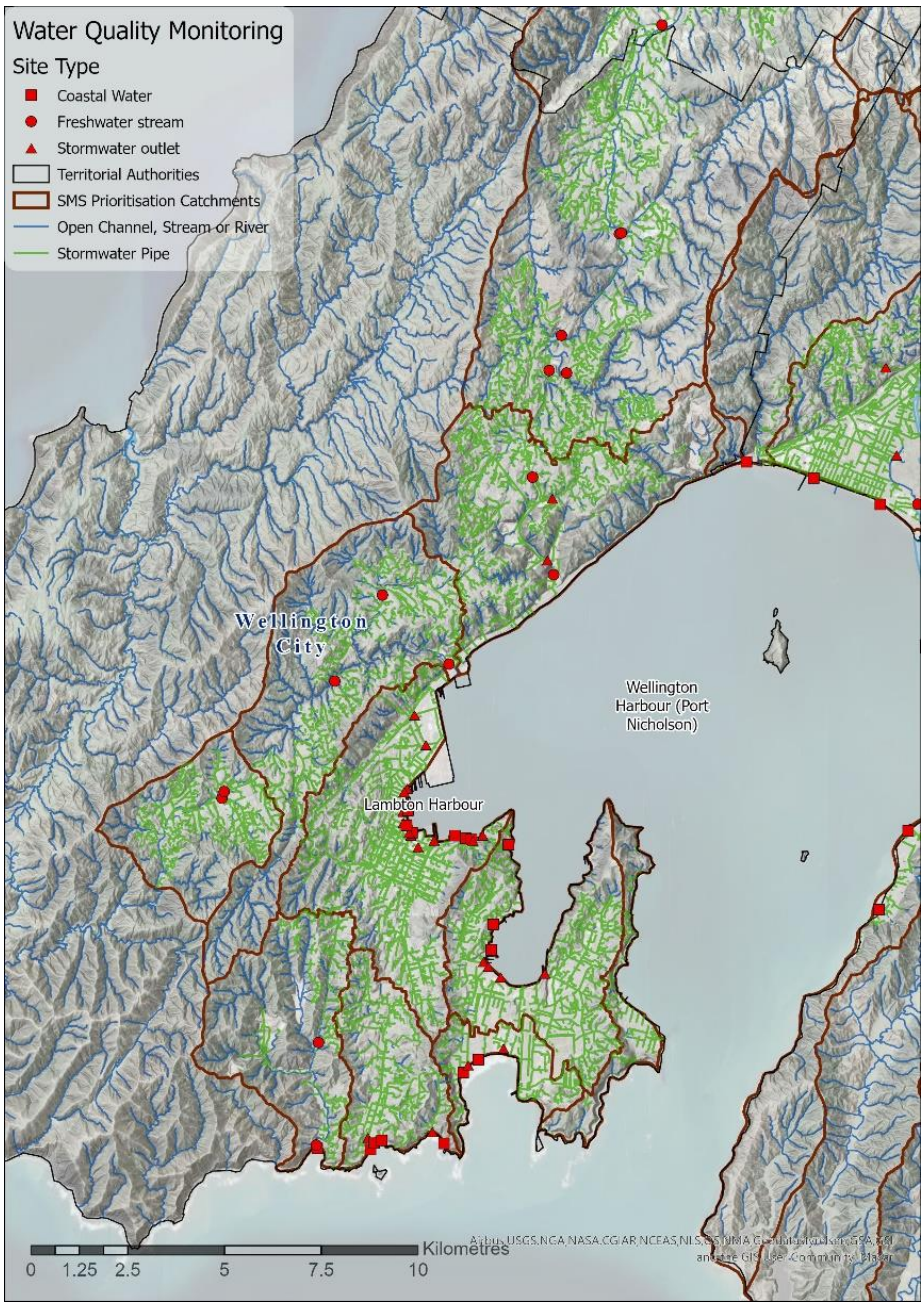


Figure D 4 Monitoring locations for the Stage 1 Global Stormwater Discharge Consent in the Wellington City catchments.

Table D 1 Overview of receiving environment water quality across the Wellington catchments, based on monitoring data collected for the Stage 1 Global Stormwater Monitoring consent (Stormwater Monitoring Plan Annual Report 2021-2022).

Water Quality parameter	Karori	Owhiro	Wellington south coast	Evans Bay	Lambton CBD	Kaiwhara-whara	Waitohu

E. coli (freshwater, NPS attribute state)	E	E	NM	NM	NM	E	E
E. coli (freshwater, NRP O18-95%ile <540)	Not met	Not met	NM	NM	NM	Not met	Not met
Enterococci (coastal water recreation, NRP 018-95%ile <540)	NM	Not met	Met	Met	Met (at Wairepo Lagoon and Oriental Bay Not met (Waterfront at Shed 6 and Taranaki Diving Platform)	NM	NM
Dissolved reactive phosphorus (NRP attribute state)	D	D	NM	NM	NM	C	NM
Nitrate-N (nutrient, ANZG 2018)	Not met	Not met	NM	NM	NM	Not met	NM
Nitrate-N (toxicity NPS attribute state)	B	B	NM	NM	NM	A	NM
Ammonia-N (toxicity NPS attribute state)	B	B	NM	NM	NM	B	NM
Dissolved copper (ANZG 2018)	Not met	Not met	NM	NM	NM	Not met	Not met
Dissolved zinc (ANZG 2018)	Not met	Met	NM	NM	NM	Not met	Not met

Note: The current state summary provided above is an indicative assessment based on the results of one or more individual sites reflecting the dominant condition of the waterbody. As instream conditions may differ between sites within a water body the reader is directed to the source document for site specific benchmarking against the NRP, NPS and ANZG. NM=Not measured.

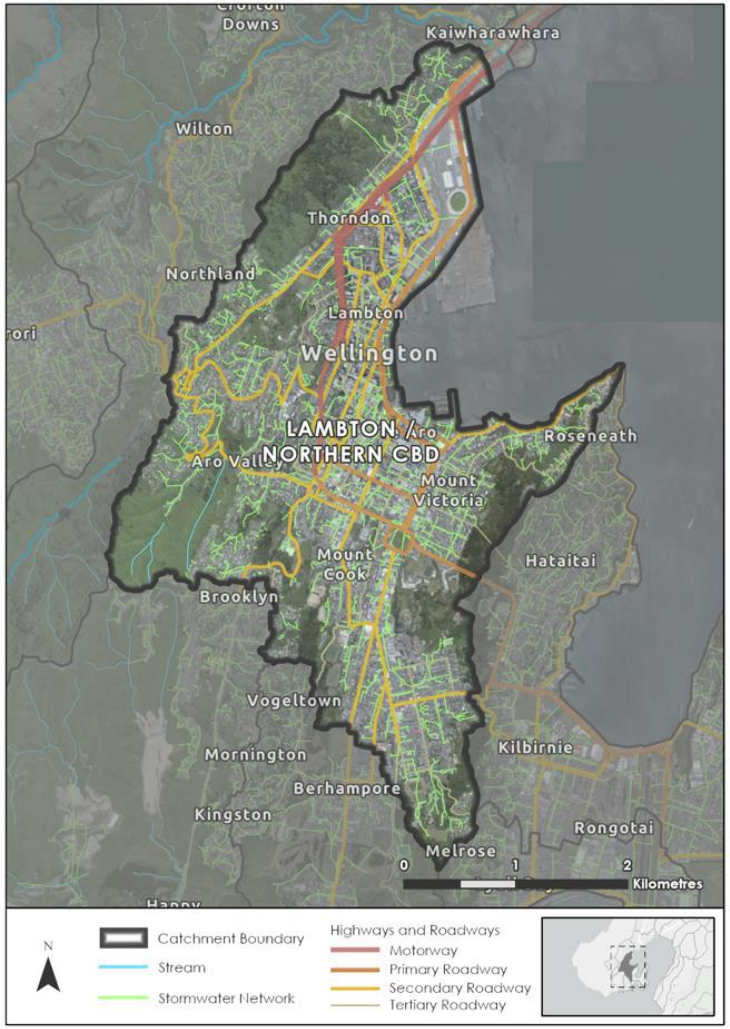
What is currently being done to support our journey to wai ora?

The case study of the Waitangi Park Wetland below is an early example of water sensitive design within the Wellington urban area. It is an internationally recognised response to urban stormwater management in Wellington City.

Case Study 4: Waitangi Park Wetland, Wellington City

One of Wellington City's largest urban stormwater catchments drains into the harbour through a culvert that runs through Waitangi Park. The 448 ha catchment, of which 262 ha is impervious, includes the suburbs of Mt Victoria, Newtown and Mt Cook. Flows within the Waitangi Park wetland are treated through filtration, absorption, and biological/chemical transformation, through a train of treatment devices including, treatment ponds and raingardens. Treated stormwater from the wetland is used to irrigate the park and the neighbouring grounds of Te Papa (National Museum of New Zealand).

Stormwater Catchment	Priority Ranking
Lambton	1 (highest)



Key Issues for Stormwater Management

In general, changes in stormwater related risk profile for this catchment are mainly associated with brownfield redevelopment opportunities focused activity on ages infrastructure, and closure/redevelopment of HAIL sites. The following outlines key issues for stormwater management related to this catchment:

- Significant port and railway areas, motorways, stadium, and commercial and industrial zones.
- Town belt is a large area of open space, densely forested in parts, balancing the high imperviousness of the Wellington CBD. Highly urbanised (modified); highest threat to stormwater quality compared to other catchments
- Te Whanganui-a-Tara (Wellington Harbour) is listed as Ngā Taonga Nui a Kiwa (wai tai) in Schedule B of the NRP; no sites of significance to mana whenua are listed in NRP Schedule C.

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment	
Open Space C:	19	**SLUR sites (%)[2]**	9.56
Inner Residential:	20	**Predominant HAIL activities**	• A17 (storage tanks or drums for fuel, chemicals, or liquid waste); F7 (service stations including retail or commercial refueling facilities) • G3 (landfill sites) • B3 (Electronics including the commercial manufacturing, reconditioning, or recycling of computers, televisions, and other electronic devices) • C1 (explosive or ordinance production, maintenance, dismantling, disposal, bulk storage, or re-packaging)
Central Area:	15		

Existing Monitoring

18 locations (12 stormwater discharges, 6 coastal sites)

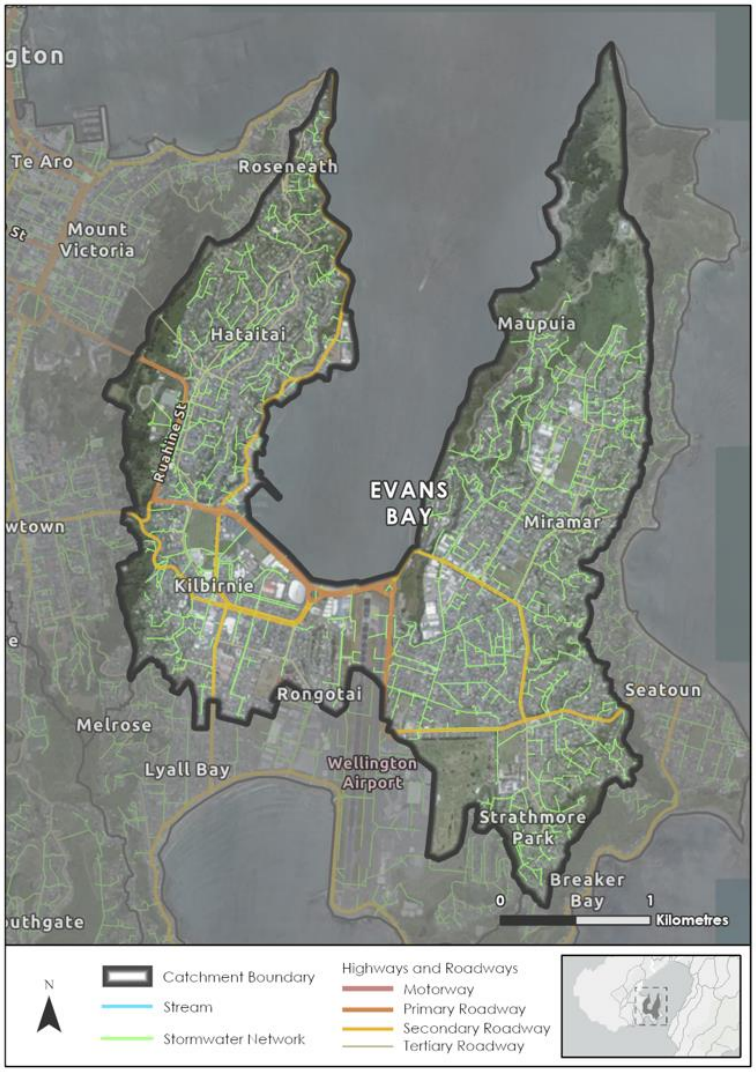
Preferred Management Approach

- Renewal of aging stormwater infrastructure (pipelines, pump stations) within 5-10 years
- Green roofs on 'flagship' and/or large new commercial buildings, precincts; controls on building materials within redevelopments (e.g., roofing materials which contribute less zinc)
- Retrofitting of proprietary devices in commercial and industrial areas
- Tree pits as part of streetscape upgrades
- Small-scale swales (e.g., in public reserve areas)
- Seek opportunities to add stormwater treatment to highly trafficked roads, options vary from changes in catchpit maintenance regime, catchpit insert devices and roadside treatment facilities.

This catchment has less opportunities for greenfield development as it is already heavily urbanised with dense commercial and residential development especially in the Wellington CBD. Therefore, the stormwater management approach is limited to retrofitting where possible (e.g., for brownfield re-development) and managing existing discharges e.g., via roads and large impervious areas. The latter can be achieved via a combination of engineered approaches (e.g., swales, tree pits as listed above) and non-engineering approaches as described in this SMS.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded

Stormwater Catchment	Priority Ranking
Evans Bay	2



Key Issues for Stormwater Management

- Secondary contact recreation may occur via wading in shallow waters near the marina, along with some passive recreation (e.g., walking along the foreshore).
- The northern shores of the Bay are occasionally affected by debris, including plastic litter, but this is likely to come from the marina; aesthetics are generally good at the Cobham culvert.
- Some scums/suspended matter, oil and grease, biological growth and die-off and discoloration are observed at the Hataitai and Kilbirnie outfalls, which are also closer to the marina.
- Te Whanganui-a-Tara (Wellington Harbour) is listed as Ngā Taonga Nui a Kiwa (wai tai) in Schedule B of the NRP.
- No sites of significance to mana whenua are listed in NRP Schedule C.

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Outer Residential:	48	**SLUR sites (%)**	4.46
Open Space B:	9	**Predominant HAIL activities**	• A17 (*storage tanks or drums for fuel, chemicals, or liquid waste)* • F7 (*service stations including retail or commercial refueling facilities*) • G3 (*landfill sites)*
Airport:	5		

Existing Monitoring

7 locations (3 stormwater discharges, 4 coastal sites)

Preferred Management Approach

- Renewal of aging stormwater infrastructure (pipelines, pump stations) within 5-10 years
- Storage and detention in new developments or re-developments , as multiple greenfield developments are planned or already underway in this catchment through to 2050 and beyond. Detention systems control peak flows and reduce runoff velocities which help contaminants to settle and be treated naturally prior to being discharged into the receiving environment.
- Bioretention, e.g., green roofs for flagship re-developments / medium to high density housing, big box retail etc

Greatest opportunity for improvements to stormwater quality in this catchment will come from controls implemented through greenfield developments, in alignment with WSD guidelines (as per this SMS) from the outset.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Island Bay & Houghton Bay	3

Key Issues for Stormwater Management

In general, changes in stormwater related risk profile for this catchment are mainly associated with brownfield redevelopment opportunities focused activity on ages infrastructure, and closure/redevelopment of HAIL sites. The following outlines key issues for stormwater management related to this catchment:

- Receiving environment is coastal
- Six closed landfills; located at Macalister Park, Martin Luckie Park, Tapu Te Ranga Marae, Southgate Reserve, Melrose Road/Albert Street and Wye Street. The closed Houghton Bay landfill (operational between 1951-1971) is a known source of leachate to Houghton Bay.
- Leachate migrates along the valley floor resulting in orange-coloured plumes in the bay.
- Cook Strait (Raukawa Moana) is identified as Ngā Taonga Nui a Kiwa (wai tai) in Schedule B of the NRP.
- Six sites of significance to mana whenua are listed in NRP Schedule C – Island Bay at Derwent Street, Reef Street and Surf Club (3 sites); Houghton Bay (1 site); Princess Bay (1 site)

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Outer residential:	43	**SLUR sites (%)[2]**	6.81
Open Space C:	20	**Predominant HAIL activities**	• G3 (*landfill sites)* • A17 *(storage tanks or drums for fuel, chemicals, or liquid waste)* • F7 (*service stations including retail or commercial refueling facilities*)
Open Space B:	9		

Existing Monitoring

6 locations (2 stormwater discharges, 4 coastal sites)

Preferred Management Approach

- Living Streams (for example, tributaries on flat land close to coast)
- Infiltration Basins (flat topography closer to coast)
- Storage and detention
- Bioretention

This catchment has larger areas of open space than other catchments in Wellington City, and flat topography especially down to the coast. This provides opportunity for the implementation of measures which require more space (e.g., bioretention) to treat stormwater before it reaches the coastal receiving environment.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Lyall Bay	4

Key Issues for Stormwater Management

- Receives surface runoff from the southern parts of Miramar Golf Course and Wellington Airport, and part of Moa Point Wastewater Treatment Plant
- Airport accounts for over 1/3 of total catchment area; degree of imperviousness is significantly high compared to other catchments.
- Receiving environment is coastal.
- Cook Strait (Raukawa Moana) is identified as Ngā Taonga Nui a Kiwa (wai tai) in Schedule B of the NRP.
- There are no sites of significance to mana whenua listed in Schedule C of the NRP for Lyall Bay.

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Outer residential:	36	SLUR sites (%)[2]	6.82
Airport	35	Predominant HAIL activities	• A17 *(storage tanks or drums for fuel, chemicals, or liquid waste* • D5 (*engineering workshops with metal fabrication)* • G3 (*landfill sites)*
Open Space B:	11		

Existing Monitoring

6 locations (2 stormwater discharges, 4 coastal sites)

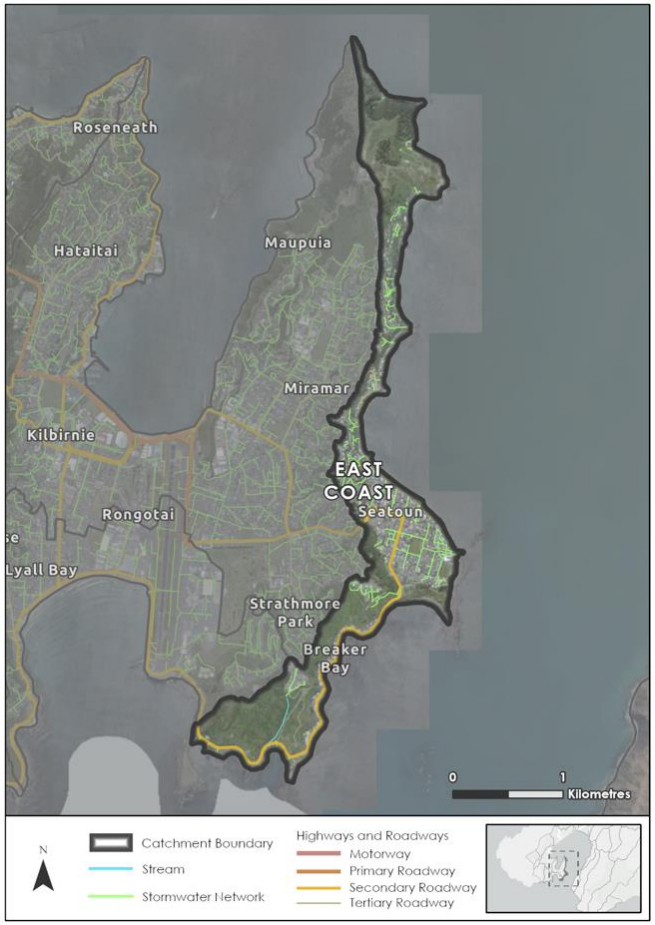
Preferred Management Approach

- Living Streams
- Infiltration Basins (flat topography closer to coast)
- Storage and detention
- Bioretention
- Use of proprietary devices to control private discharges (e.g., from airport)
- Non-engineering approaches (e.g., education programmes, awareness) for various dischargers in the catchment to improve stormwater management practices, especially for large impervious areas

Primary sources of contaminants are likely to be the airport and surrounding industrial areas; some of which are not directly within the control of WCC. Best opportunities for diffuse stormwater treatment will be via bioretention, storage and detention, in open space areas close to coast.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
East Coast	5



Key Issues for Stormwater Management

- Sub-catchments draining to the east coast are comparatively small due to steep topography and confined valleys.
- Discharges to the ocean are quickly dispersed into the Harbour due to currents coming along the exposed southern and eastern coasts of the peninsula.
- Te Whanganui-a-Tara (Wellington Harbour) is listed as Ngā Taonga Nui a Kiwa (wai tai) in Schedule B of the NRP.
- No sites of significance to mana whenua are listed in NRP Schedule C.

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Outer Residential:	36	**SLUR sites (%)[2]**	0.3
Open Space B:	34	**Predominant HAIL activities**	• A17 (*storage tanks or drums for fuel, chemicals, or liquid waste)* • G3 (*landfill sites)* • G6 (*waste recycling or waste or wastewater treatment)* • C1 *(explosive or ordinance production, maintenance, dismantling, disposal, bulk storage, or re-packaging)*
Conservation:	11		

Existing Monitoring

No established monitoring locations

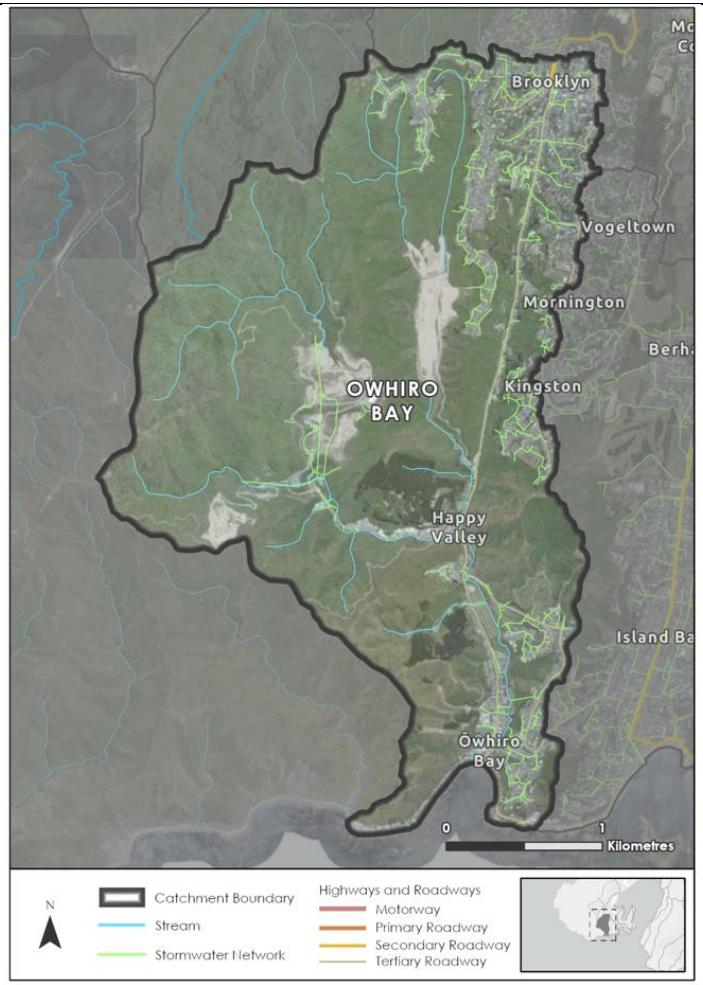
Preferred Management Approach

- Focus on maintaining and improving on existing ecological and cultural values
- Renewal of wastewater infrastructure (pipelines, pump stations) within 5-10 years
- Reduce degree of imperviousness through controls on new developments (e.g., permeable paving; proportion of property which is paved; swales; constructed wetlands) and by retrofitting in small areas (e.g., filter strips)
- Install GPTs at coastal discharge points

Future greenfield development will not be as prevalent in this catchment as in others across Wellington City; opportunities for improvement of stormwater quality are more likely within existing developed areas, and in the use of open space for approaches that require more space (e.g., Wetlands).

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Owhiro Bay	6



Key Issues for Stormwater Management

- Owhiro Stream which has three main tributaries draining Carey's Gully (occupied by Southern Landfill and C&D Landfill), Kowhai Park Gully (occupied by T&T Landfill) and urban Brooklyn (which is largely culverted).
- Industrial activity is clustered around Landfill Road while commercial properties are concentrated on Owhiro Road and Cleveland Road in Brooklyn.
- The urbanised areas of Brooklyn, Mornington and Kingston are a significant source of road and vehicle related pollution.
- One site of significance to mana whenua is listed in NRP Schedule C - Owhiro Bay

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Open Space B:	52	SLUR sites (%)[2]	5.08
Outer residential:	20	Predominant HAIL activities	• G3 (*landfill sites)* • A17 *(storage tanks or drums for fuel, chemicals, or liquid waste)*
Rural:	19		

Existing Monitoring

10 monitoring locations along Owhiro Stream

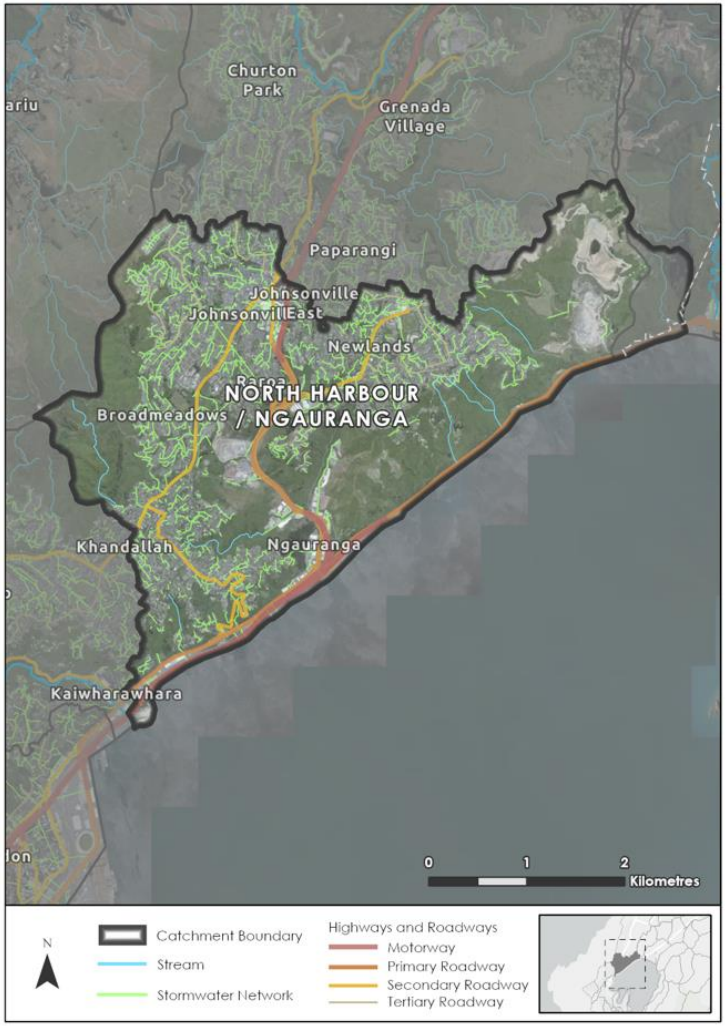
Preferred Management Approach

- Focus on maintaining and improving existing values
- Storage and detention in new residential and commercial developments (Owhiro Bay scored highly for predicted future growth in no. of households)
- Bioretention (due to available open space)
- Living Streams
- Daylighting

Greatest opportunities for improvements to stormwater quality in this catchment will come from controls implemented through greenfield developments from the outset, in alignment with WSD guidelines (as per the SMS), and in management of discharges from known SLUR sites (particularly closed and active landfills).

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded

Stormwater Catchment	Priority Ranking
Ngauranga	7



Key Issues for Stormwater Management

In general, changes in stormwater related risk profile for this catchment are mainly associated with brownfield redevelopment opportunities focused activity on ages infrastructure, and closure/redevelopment of HAIL sites. The following outlines key issues for stormwater management related to this catchment:

- Significant commercial and light industry zones in Johnsonville, Newlands and Ngauranga, including the Kiwi Point Quarry and Taylor Preston Abattoir.
- A landfill was previously operated at Raroa Park (1961 – 1971) but has since been closed.
- The catchment is bisected by the Wellington to Porirua motorway (State Highway 1).
- No sites of significance to mana whenua are listed in NRP Schedule C.

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Outer Residential:	33	SLUR sites (%)[2]	6.47
Rural:	17	Predominant HAIL activities	• B4 (*power stations, substations, or switchyards)* • F7 (*service stations including retail or commercial refueling facilities*) • G3 (*landfill sites)*
Open Space B:	14		

Existing Monitoring

Four locations (two on Waitohu Stream, two stormwater discharges)

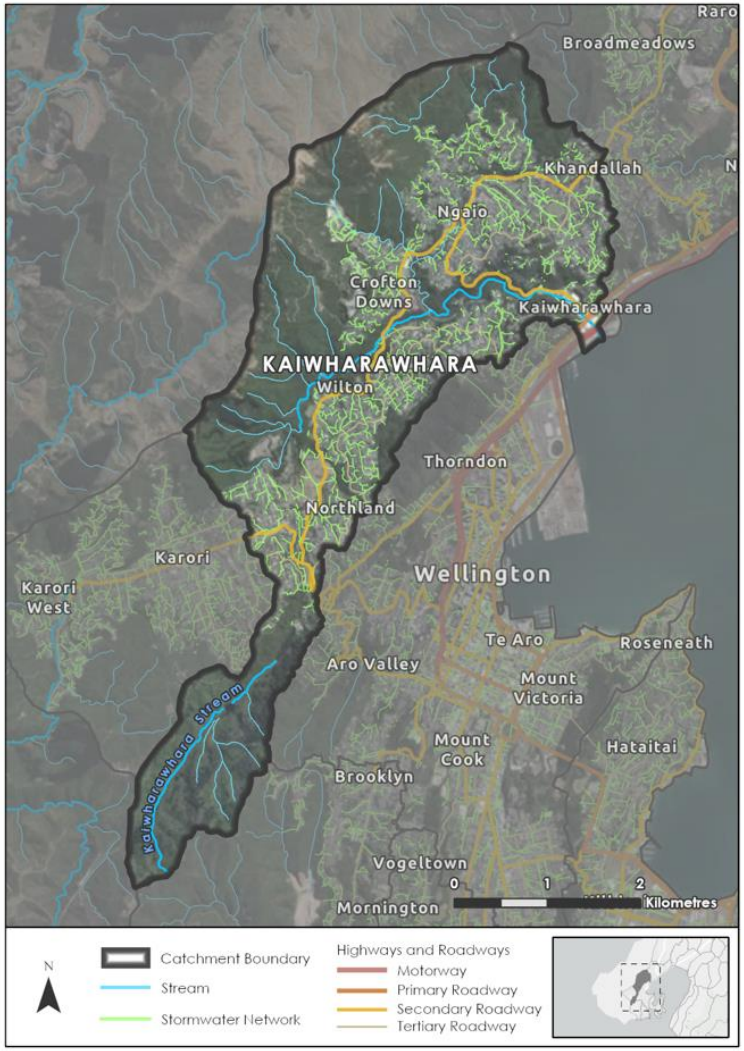
Preferred Management Approach

- Storage and detention in new residential and commercial developments
- Infiltration and soakage – industrial and commercial precincts (e.g., filter strips, permeable paving where space is restricted)
- Retro-fit proprietary devices when redeveloping, expanding, or upgrading existing industrial/commercial areas
- Seek opportunities to add stormwater treatment to highly trafficked roads, options vary from changes in catchpit maintenance regime, catchpit insert devices and roadside treatment facilities.

Brownfield redevelopment presents the best opportunity to manage stormwater quality and quantity in this catchment. The overall preferred management approach is to reduce impervious surfaces, encourage more stormwater discharges to ground through methods such as bioretention and install appropriate stormwater treatments where possible / practicable.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Kaiwharawhara	8



Key Issues for Stormwater Management

- Large areas of open space within the Karori Wildlife Sanctuary, to the west of Crofton Downs and west of Ngaio. Kaiwharawhara Stream passes through two water supply reservoirs and is then piped under closed landfills at Ian Galloway Park and Appleton Park; lead is a contaminant of concern (has been an issue in the past).
- Additional disused landfills at Anderson Park, Otari Plant Museum and Creswick Terrace Park.
- Kaiwharawhara Stream is identified in Schedule B (Ngā Taonga Nui-a-Kiwa) and Schedule F1b (inanga spawning habitat within CMA) of the NRP.
- No sites of significance to mana whenua are identified in NRP Schedule C.

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Outer Residential:	33	**SLUR sites (%)[2]**	5.65
Conservation:	32	**Predominant HAIL activities**	• A17 (*storage tanks or drums for fuel, chemicals, or liquid waste)* • F7 (*service stations including retail or commercial refueling facilities*) • F4 (*motor vehicle workshops*) • G6 (*waste recycling or waste or wastewater treatment)* • G3 (*landfill sites)*
Open Space B:	21		

Existing Monitoring

1 location on Kaiwharawhara Stream

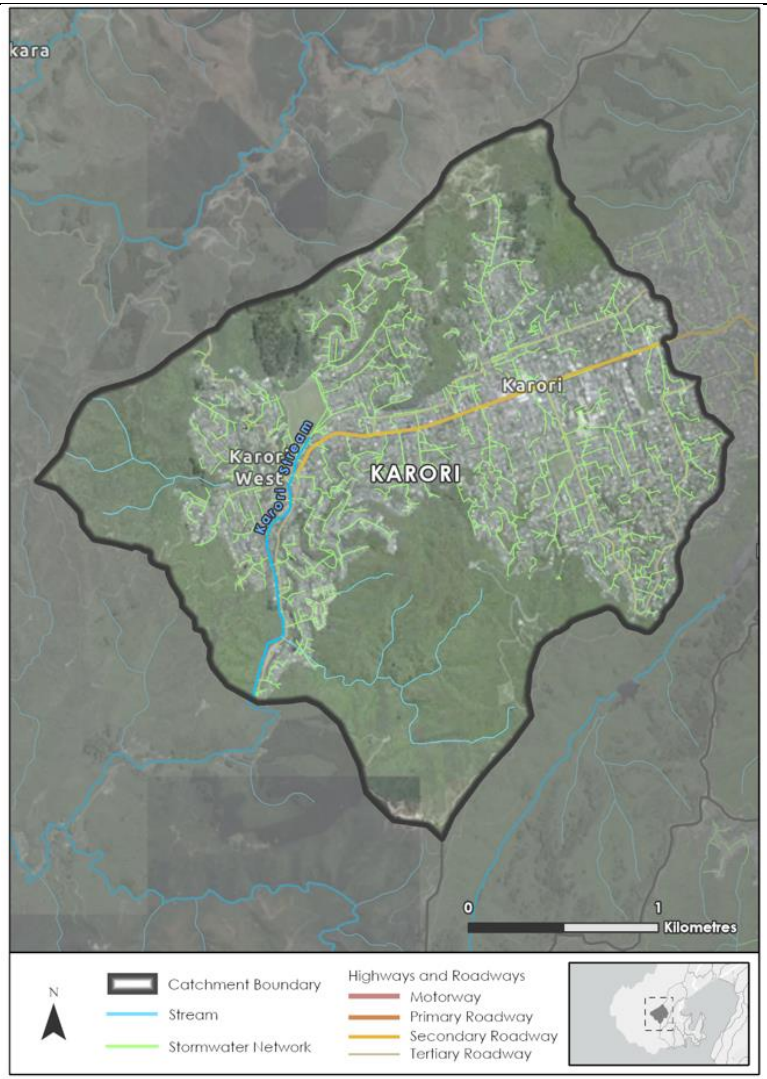
Preferred Management Approach

- Focus on maintaining and improving existing values
- Bioretention
- Living Streams
- Proprietary devices to filter and treat zinc, lead from roads and older housing stock
- Monitoring of closed landfills for leachate entering surface water and groundwater / migrating through soils

Brownfield redevelopment presents opportunities to better manage stormwater quality and quantity, with additional approaches involving community-led projects to build on existing high ecological and cultural value sites along Kaiwharawhara Stream (such as daylighting, planting, and further non-engineered approaches as described in the SMS).

1 Three highest land use proportions displayed as % of total area. 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Karori	9 (lowest)



Key Issues for Stormwater Management

- The urbanised area of Karori is predominantly residential, but with significant commercial and community infrastructure.
- Closed landfills are located at Futuna Retreat (Friend Street) and Ben Burn Park, but none are currently operating. The Western Wastewater Treatment Plant is located downstream of the urban area on South Karori Road. The treated wastewater is piped to Wellington's South coast near the Karori Stream mouth.
- Karori Stream is listed in NRP Schedule I (important trout fishery rivers and spawning waters); no sites listed in Schedule C of NRP (sites with significant mana whenua value).

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Outer Residential:	44	SLUR sites (%)[2]	0.08
Conservation:	34	Predominant HAIL activities	• F7 (*service stations including retail or commercial refueling facilities*) • F4 (*motor vehicle workshops*) • A17 (*storage tanks or drums for fuel, chemicals, or liquid waste)*
Open Space B:	9		

Existing Monitoring

1 monitoring location on Karori Stream at Makara Peak

Preferred Management Approach

- Focus on maintaining and improving existing values
- Renewal of wastewater infrastructure (pipelines, pump stations) within 5-10 years
- Living Streams
- Daylighting

Brownfield redevelopment and retrofitting of proprietary devices to control private discharges (such as those from service stations, workshops, and other light industrial activities) presents the best opportunity to manage stormwater quality and quantity in this catchment. The overall preferred management approach is to reduce impervious surfaces, encourage more stormwater discharges to ground through methods such as bioretention and install appropriate stormwater treatments where possible / practicable for activities known to contribute contaminants such as hydrocarbons and heavy metals.

1 Three highest land use proportions displayed as % of total area. 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.