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## URBAN AREA STORMWATER MONITORING PROGRAMME

For Thames Coromandel District Council

June 2022

## REPORT INFORMATION AND QUALITY CONTROL

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## 1 INTRODUCTION

Thames Coromandel District Council (TCDC) obtained comprehensive stormwater discharge consents (CSDCs) from Waikato Regional Council (WRC) in 2011 for eight urban areas within the Thames Coromandel District. This report describes the TCDC urban area stormwater receiving environment monitoring programme (monitoring programme), which was developed to meet the requirements of the CSDCs. The monitoring requirements of these consents are presented in detail in Section 2 of this report.

The WRC resource consent reference number and urban area that each consent relates to are listed in Table 1 and its general location is shown in Figure 1. The table also includes the estimated resident population for each of the urban areas based on Statistics New Zealand data<sup>1</sup> and the approximate stormwater catchment area.

Table 1: TCDC Urban Stormwater Area

CSDC – Resource Consent Reference	Urban Area	Approximate Stormwater Catchment Area (ha)	Estimated Resident Population
122521	Thames	1,052	7,470
105661	Pauanui	552	1,040
105663	Coromandel	532	1,790
105664	Tairua	435	1,500
105665	Whitianga	1,086	5,630
105666	Onemana	42	160
105667	Whangamata	833	4,180
105668	Thames Coast*	298**	1,500

\* Combined populations from Ngarimu Bay, Te Puru, Waiomu, Raumahunga, Tapu, and Te Mata.

\*\* Rough estimate of area calculated by 4Sight. Other catchment areas from TCDC GIS data.

The TCDC stormwater networks consist of approximately 278 km of stormwater pipes, approximately 3,900 manholes, four pump stations, stormwater inlet and outlet structures, and assorted minor drainage structures such as soakage pits, detention ponds, and stormwater treatment devices.

A stormwater monitoring programme was first developed by KTB Planning in 2013.<sup>2</sup> This monitoring programme was reviewed by 4Sight in 2022<sup>3</sup> in accordance with condition 4 of the CSDCs. As part of this review, several recommendations were made to update and improve the monitoring programme and are incorporated into the revised monitoring programme described in this report.

<sup>1</sup> Estimated resident population as at 30 June 2018. Retrieved on 23 March from <https://datafinder.stats.govt.nz/layer/105010-estimated-resident-population-at-30-june-2018-by-urban-rural/>

<sup>2</sup> KTB Planning, 2013. *Stormwater Monitoring Programme: Thames-Coromandel Urban Areas*. Prepared for Thames-Coromandel District Council. 13 pp.

<sup>3</sup> 4Sight, 2022. *Stormwater Monitoring Programme Review*. Prepared for Thames-Coromandel District Council. 16 pp.



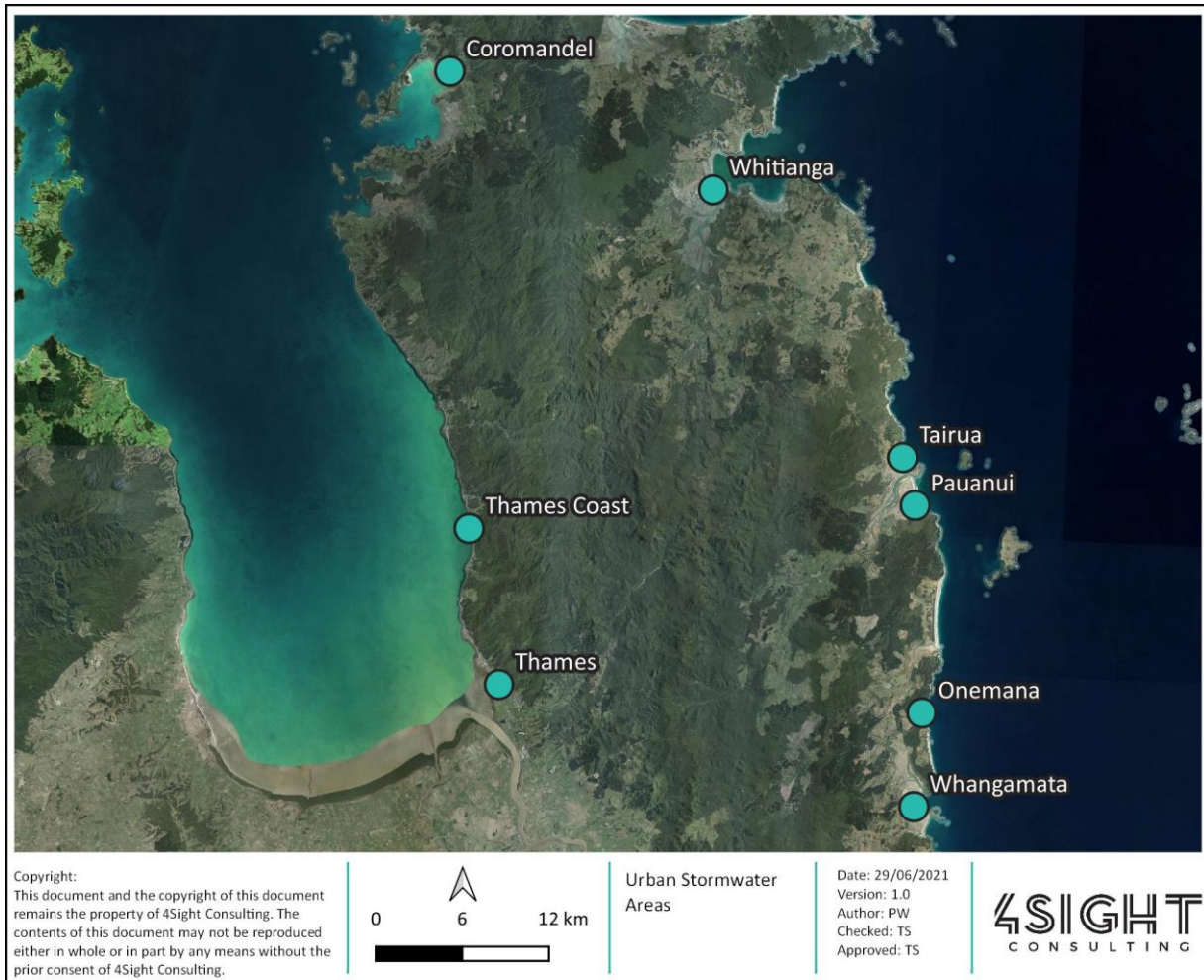


Figure 1: CSDC Urban Stormwater Locations.

## 1.1 Purpose

The purpose of this monitoring programme is to monitor the effects of stormwater discharging from the TCDC stormwater network urban areas on the receiving environment as required by Condition 4 of the CSDCs. The receiving environment monitoring follows established practice and seeks to understand the influence of typical urban contaminants (metals and hydrocarbons) entrained in stormwater runoff with the aim of identifying trends over the duration of the CSDCs. Ecological monitoring including visual assessment of fish populations and biological health are also useful tools to assist with understanding the overall health of the various receiving environments.

The purpose of this monitoring programme is not to detect unconsented/illicit discharges into the stormwater network (e.g., spills, wash/wastewater). However, if they were to occur, these may be detected by community complaints or TCDC surveillance. The corresponding response for non-routine discharges would be documented in accordance with the TCDC Stormwater Management Plan<sup>4</sup> (SMP).

The monitoring programme also provides a link to asset management and the physical operation of the stormwater network. This includes monitoring local outfall erosion; changes in fish passage associated with structures; flood hazard monitoring and response; stormwater management device operation and maintenance and street cleaning/sweeping. The operation of the stormwater network encompasses the best practicable option and monitoring of its components

<sup>4</sup> Gamble K, 2020. *Draft Stormwater Management Plan: Thames-Coromandel Urban Areas September 2020*. Thames-Coromandel District Council Draft Report.

provides information to support the implementation of the associated SMP. This includes the implementation of interventions in response to monitoring results.

This monitoring programme has been developed based on the recommendations of a review undertaken in accordance with Condition 4 of the CSDCs (4Sight 2022<sup>5</sup>).

## 1.2 Objectives

Condition 4 of the CSDC outlines the following objectives for the monitoring programme followed by more specific minimum requirements outlined in Table 2.

*The objectives of the Monitoring Programme are to:*

- *Investigate the actual and potential adverse effects of municipal stormwater diversion and discharge activities on the environment;*
- *Provide information to refine Best Practicable Option stormwater management measures that assist the Consent Holder in avoiding, remedying or mitigating actual and potential adverse effects on the environment;*
- *Assess the performance of utilised stormwater management devices to determine their overall effectiveness in managing and/or treating stormwater, and to guide the best practicable application of these devices in respective catchments;*
- *Provide guidance on the ongoing and necessary changes to the Stormwater Management Plan to address any shortcomings with the operational procedures, management initiatives and implementation measures adopted by the Stormwater Management Plan;*
- *Review the level of subdivision and development that is occurring in developing catchments, relative to the land use assumptions underlying the integrated catchment management approaches adopted by approved Catchment Management Plans;*
- *Determine overall compliance with the conditions of this consent.*

## 1.3 Monitoring findings

The objectives listed above outline how the findings from the monitoring programme are to be used by TCDC to improve stormwater network management and receiving environment outcomes.

Rather than implementing stormwater network interventions that may not directly respond to monitoring programme findings and trends, it is proposed that an adaptive management approach is adopted (see Figure 2). This will provide a pathway for TCDC to identify triggers and key steps for responding to monitoring findings. The benefit of adopting an adaptive management approach is that it provides flexibility for TCDC to best utilise monitoring data and to respond in line with best practicable option principles, while providing improved certainty for consent condition compliance over the lifetime of the consents. The adaptive management approach also allows TCDC to respond to monitoring trends and if necessary, tailor aspects of the monitoring programme accordingly.

This monitoring programme should be read and implemented in conjunction with the asset management processes and interventions outlined in the TCDC SMP.

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<sup>5</sup> 4Sight (2022) *Stormwater Monitoring Programme Review*. Client Draft Prepared for Thames Coromandel District Council. 16pp.

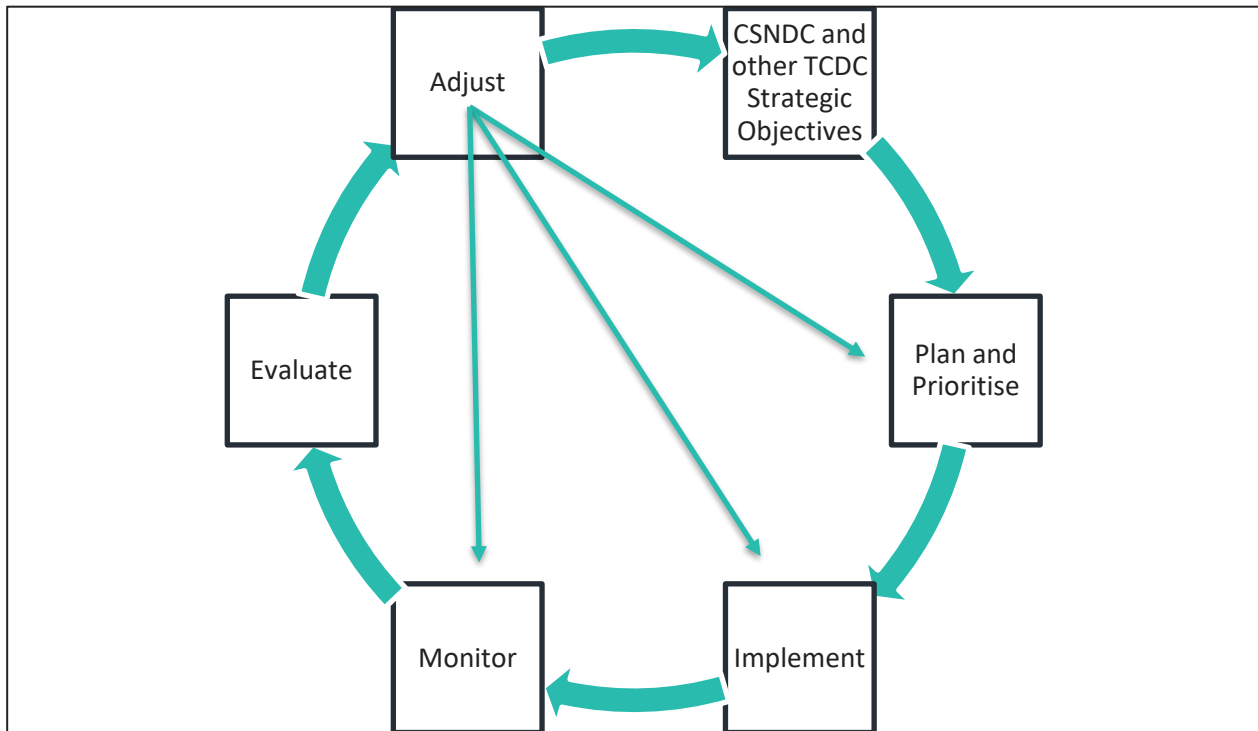


Figure 2: CSDC Adaptive Management Approach

## 1.4 Monitoring programme implementation

The receiving environment monitoring tasks required by Condition 4 are undertaken by Veolia Water as a contractor to the 3 Waters Business Unit. The remaining monitoring requirements listed in Condition 4 are collectively implemented (where applicable to the CSDCs) by Veolia Water (on behalf of the 3 Waters Business Unit) and Ventia (on behalf of the Roding Business Unit).

## 2 MONITORING REQUIREMENTS

Table 2 outlines the relevant consent requirements of the CSDCs for monitoring the effects of the stormwater discharges on aquatic ecosystems and associated stormwater network management. Reference is made to where in the monitoring programme each requirement is addressed.

Table 2: CDSC consent monitoring requirements to assess the effects of stormwater on aquatic ecosystems.

Condition 4 reference	Requirement	Monitoring Plan Section(s)
a	Monitoring to identify any adverse stormwater quantity and quality effects on aquatic ecosystems. This shall include stormwater receiving water body monitoring at targeted locations, and is likely to comprise one or more of the following activities:	Section 3.1
a i)	Visual assessments of general habitat quality and sensitivity to stormwater inputs.	
a ii)	Sediment quality sampling and analyses of key stormwater contaminants and sediment characteristics that aid data interpretation.	
a iii)	Biological sampling and analyses of macroinvertebrate communities and fish populations.	

Condition 4 reference	Requirement	Monitoring Plan Section(s)
b)	Monitoring to identify any visual signs of contaminants in stormwater (conspicuous oil or grease films, scums or foams, floatable suspended materials, conspicuous change in colour or visual clarity).	Section 3.2
c)	Monitoring to identify any adverse scour, erosion and sediment deposition on land, property and the beds of stormwater receiving water bodies.	
d)	Monitoring to identify any adverse flooding of land, property and stormwater receiving water bodies.	Section 3.3
e)	Monitoring to identify any stormwater management structures that are impeding the upstream and downstream movement of fish.	Section 3.4
f)	Monitoring to determine the performance of utilised stormwater management devices in managing and/or treating stormwater.	Section 3.5
g)	Monitoring to gauge the level of subdivision and development that is occurring in developing catchments, relative to the land use assumptions underlying the integrated catchment management approaches adopted by approved Catchment Management Plans.	Section 3.6
h)	Monitoring to ensure that all stormwater management devices are maintained in good working order and providing best practicable stormwater management and/or treatment efficiency at all times.	Section 3.5
i)	Monitoring to determine best practicable street and stormwater catchpit cleaning operations to minimise the volume of stormwater contaminants entering the stormwater network and discharging to the receiving environment.	Section 3.7

### 3 MONITORING PROGRAMME

#### 3.1 Receiving environment and ecological monitoring

Condition 4(a) (Table 2) sets out the requirements for receiving environment and ecological monitoring:

*Condition 4(a): Monitoring to identify any adverse stormwater quantity and quality effects on aquatic ecosystems. This shall include stormwater receiving water body monitoring at targeted locations, and is likely to comprise one or more of the following activities:*

- Visual assessments of general habitat quality and sensitivity to stormwater inputs.
- Sediment quality sampling and analyses of key stormwater contaminants and sediment characteristics that aid data interpretation.
- Biological sampling and analyses of macroinvertebrate communities and fish populations.

The monitoring programme has been designed to assess the effects of stormwater discharges on the receiving environment using three key indicators:

- to determine whether the habitat quality is appropriate for a given location and not being adversely affected by stormwater discharges;
- to assess whether there are acceptable concentrations of contaminants in the sediment; and
- to assess the abundance and diversity of benthic macroinvertebrate communities at appropriate locations as an integrated indicator of environmental health.

### 3.1.1 Monitoring sites

Site selection was informed by the catchment descriptions, 'high risk' outlets in the SMP, previous monitoring locations, inspection of many outlets during a site visit on 19–20 January 2022, and consideration of additional urban development as highlighted in the SMP since the 2013 Monitoring Programme was developed. Continuity of monitoring locations is important to track changes and trends over time in the receiving environment. Monitoring locations are summarised in a table in Appendix A with GPS coordinates and presented in maps in Appendix B.

Overall, it was considered that the urban growth that had occurred since the 2013 Monitoring Programme was developed was not substantial enough to warrant the movement or addition of monitoring sites. Further, it appeared that many of the additional areas directed their stormwater to the existing stormwater network. In general, continuity of existing sites was favoured and only two key changes were made regarding monitoring locations. These changes are the consolidation of four drain monitoring sites in Whangamatā to one estuary monitoring location and the removal of the control sites in Thames and Whangamatā. These changes are discussed further below. All other monitoring sites remain in the same locations.

Four monitoring sites in northwestern Whangamatā<sup>6</sup> have been consolidated into one location in the estuarine receiving environment and labelled Whangamatā@Moanaanuanu Estuary. The previous four locations were in small drains that were unlikely to have a diverse range of life but received stormwater from a number of commercial and industrial sites that were considered to be high risk. The SMP identifies the Moanaanuanu Estuary receiving environment to be relatively sheltered from wave and current action due to the causeway, which reduces the natural flushing and dispersal. The sediments are also fine, comprising coastal silts and muds, which are susceptible to contaminant accumulation. Consequently, it was considered appropriate to consolidate the previous four sites into one site in the estuary near the four drains as it is more representative of the broader receiving environment.

Control sites that were included in the previous monitoring programme have been omitted in this monitoring programme as it was considered that one control site in each of Thames and Whangamatā was not sufficient to provide meaningful reference conditions to most other monitoring sites. Further, the monitoring results to date did not indicate notably elevated levels of urban contaminants. In line with adaptive management principles, reinstating control sites may warrant further consideration if elevated contaminant levels are measured in future monitoring and there were questions around whether it was a result of stormwater discharges or other catchment-derived sources.

No monitoring has been conducted or is proposed in the Thames Coast or Onemana urban stormwater areas. This is considered appropriate due to the small catchment sizes, low populations, and the 'low risk' land use in these locations (e.g., no industrial activities).

### 3.1.2 Monitoring frequency

Previously, monitoring has been conducted 4-yearly during January or February. Visual inspections required by Condition 4(b) will also continue on a six-monthly basis (January and July) This frequency and timing is considered appropriate due to the general low risk of the stormwater discharges and because monitoring to date has not identified any notable issues. Monitoring should continue 4-yearly, with the next round of ecological monitoring being conducted in January/February 2023 (noting this is a 1-year delay). The most recent monitoring was scheduled for January 2022 but was postponed so that it could be conducted in accordance with this revised monitoring programme.

### 3.1.3 Sediment quality

Sediment quality is a key indicator of the long-term effect of stormwater on the receiving environment. Sediments accumulate contaminants over time and, therefore, can indicate chronic contamination that may otherwise be missed during event-based water sampling due to missing the contamination event or the contaminant concentrations in the discharge being too low for the laboratory to measure.

The recommended indicators of urban contamination are:

- Heavy metals (copper, lead, and zinc);

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<sup>6</sup> 10-Whangamata: Casement Rd drain Moana Anu Anu River; 11-Whangamata: Heatherington Rd – south of marina; 12 Whangamata: Aicken Rd; 13-Whangamata: Lindsay Road.



- Total organic carbon (TOC); and
- Polycyclic aromatic hydrocarbons (PAHs; from in the incomplete combustion of fossil fuels).

Samples shall be collected at each site as a composite sample comprising approximately 10 sub-samples from the area. Sediment should be placed into a laboratory-supplied container and transported to the laboratory for analysis as soon as practicable.

Sediment contaminant results should be assessed against the ANZG (2018) default guideline values (DGVs) for toxicants in sediment (Table 3).<sup>7</sup> The DGVs indicate the concentrations below which there is a low risk of unacceptable effects occurring. Further investigation may be warranted if a site exceeds a DGV or is on a trajectory to exceed a DGV over time.

Table 3: Default guideline values (DGVs) for toxicants in sediment relevant to this monitoring programme. ANZG (2018).

Contaminant	DGV
Copper (mg/kg dry weight)	65
Lead (mg/kg dry weight)	50
Zinc (mg/kg dry weight)	200
Polycyclic aromatic hydrocarbons (total PAH; µg/kg dry weight, normalised to 1% organic carbon)	10,000

### 3.1.4 Visual and biological assessments

Ecological monitoring to date (including to support the resource consent application) has relied on the visual assessment of three key biological indicators of ‘in-stream’ ecological health. These indicators are:

- Aquatic plant growth composition and percentage cover;
- Aquatic benthic macro-invertebrate diversity and distribution; and
- Identification of potential native freshwater fish habitat and potential barriers to fish.

Such an approach is qualitative (i.e., recording taxa presence and noting particularly abundant taxa) rather than a quantitative approach (identifying and counting all taxa in a specific sample size or area) which is the typical approach for regional council state of the environment monitoring. Additionally, the approach used to assess benthic macroinvertebrates was developed for freshwater habitats and the majority of sites included in the stormwater monitoring programme are estuarine. Although a qualitative approach is not as robust as a quantitative approach, the results to date from sediment analyses and macrofauna assessments do not suggest that the stormwater discharges are having unanticipated adverse effects that would warrant a much more resource intensive (both time and cost) monitoring approach. Accordingly, it is proposed that a qualitative assessment of macroinvertebrates continues in both fresh and marine receiving environments.

Similarly, the assessment of fish populations has been conducted during ecological surveys and relied on opportunistic sightings at the time of sampling. This was considered an appropriate approach in the 4Sight Stormwater Monitoring Programme Review (2022) and should continue.

Visual macroinvertebrate assessments should be conducted as follows in freshwater and estuarine sites:

#### Freshwater site

There is only one freshwater site in this monitoring programme, Whitianga@Moewai Road. Macroinvertebrate samples from this site should be collected in accordance with Waikato Regional Council’s Regional Ecological Monitoring of Streams – REMS.<sup>8</sup>

<sup>7</sup> <https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/sediment-quality-toxicants>

<sup>8</sup> Collier, K (2005) Review of Environment Waikato’s Regional Ecological Monitoring of Streams (REMS) Programme: Past Practices and Future Directions.

### Estuarine sites

A thorough search should be conducted for fauna species in the water, on the sediment surface, and under rocks and logs etc. The presence of taxa should be recorded along with noting particularly abundant taxa.

Monitoring results should be assessed against previous results to determine whether there are any notable changes including declines in ecosystem health or stepwise changes. Such changes may warrant further investigation and should be assessed in conjunction with sediment quality results as contaminants and sediment characteristics can be key explanatory variables.

## 3.2 Visual contaminant monitoring and erosion surveillance

Condition Requirements:

- *Condition 4(b): Monitoring to identify any visual signs of contaminants in stormwater (conspicuous oil or grease films, scums or foams, floatable suspended materials, conspicuous change in colour or visual clarity).*
- *Condition 4(c): Identify any adverse scour, erosion and sediment deposition on land, property and the beds of stormwater receiving water bodies*

Visual monitoring for the incidence of contaminants and evidence of erosion is carried out by TCDC contractors twice yearly and when the 4 yearly ecological assessment is carried out at the locations specified in Appendix A, Table 1.

Remaining outfalls throughout the district are programmed for inspection as listed in the monthly stormwater checklist form for the respective contractor along with inspection findings and any required remedial actions for work orders and requests for service.

Where non-routine contaminant discharges (pollution incidents) are evident during inspections, contractors and/or staff are referred to the Standard Operating Procedure for Non-Routine Contaminants Discharges detailed in the TCDC SMP and the associated notification and reporting requirements. TCDC staff and contractors also respond to non-routine contaminant discharges when notified by members of the public.

## 3.3 Flood hazard monitoring

Condition Requirement:

*Condition 4(d): Monitoring to identify any adverse flooding of land, property and stormwater receiving water bodies.*

As is detailed in the TCDC SMP document, flood hazard monitoring and response to flooding incidents is carried out by TCDC staff and contractors in accordance with TCDC Service Levels and Performance Measures for Stormwater which are:

- TCDCs stormwater services protect habitable areas from flooding (measured by flooding events and number of habitable floors affected)
- TCDC provides a responsive stormwater request service (measured by number of complaints and response time to complaints)
- TCDC minimises the environmental impact of protecting habitable areas from flooding (measured by number of operational resource consent conditions not complied with, number of abatement notices, number of infringement notices, number of enforcement orders, and number of successful prosecutions)

Contractors across all departments are responsible for attending requests for service. These are formally measured as part of TCDCs reporting with the following categories:

- Number of flooding events;
- For each flooding event the number of habitable floors affected (per 1,000 connected properties)
- The median response time to attend a flooding event, measured from the time TCDC receives notification to the time that service personnel reach the site; and
- Number of complaints received about the performance of the stormwater system (per 1,000 connected properties).

### 3.4 Fish passage

Condition Requirement:

*Condition 4(e): Monitoring to identify any stormwater management structures that are impeding the upstream and downstream movement of fish.*

Fish passage is reviewed as part of the ecological assessment undertaken in accordance with condition 4 (a)(i)-(iii) at the locations specified in Appendix A Table A1. Reporting to date concludes no stormwater management structures forming part of the TCDC stormwater network (with an upstream habitat) have currently been identified as a priority in terms of mitigating the effects of structures on fish movement.

New assets and stormwater network and fish passage performance is reviewed as part of assessing new developments proposed to be adopted under the CSDCs as stipulated in Appendix C of the TCDC SMP – Administrative process for incorporating new municipal stormwater diversion and discharge activities into the CSDCs.

### 3.5 Stormwater management device performance and maintenance

Condition Requirements:

- *Condition 4(f): Monitoring to determine the performance of utilised stormwater management devices in managing and/or treating stormwater.*
- *Condition 4(h): Monitoring to ensure that all stormwater management devices are maintained in good working order, and providing best practicable stormwater management and/or treatment efficiency at all times.*

Condition 4 (f) and (h) relate to monitoring the performance of stormwater management devices and the maintenance of such devices. A list of the stormwater management device type and locations are listed in Appendix E of the SMP document along with the associated contractual maintenance responsibilities being fulfilled by the 3 Waters (Veolia) and Roding (Ventia) Business Unit contractors. The stormwater treatment devices are predominantly rain gardens, located in the Whitianga urban area, a selection of detention ponds along with several proprietary treatment devices such as Hynds First Defence (gross pollutants) and Hynds Upflo Filters. Given the number of raingardens in the Whitianga area, maintenance practices are specifically detailed in the TCDC SMP document for implementation by Ventia.

Direct monitoring of the performance of stormwater management/treatment devices as directed by condition 4(f) is, not proposed. Gathering a statistically reliable dataset to assess against relevant stormwater treatment guidelines or standards, for example, would have high cost and logistical requirements that are unlikely to be commensurate with the potential level of effect. Devices such as detention ponds generally operate by maintaining an operating volume that is discharged via specifically designed outlet structures where efficiency can be influenced by matters such as sediment accumulation and inlet/outlet blockage as well as contributing catchment assumptions. It may be anticipated that a stormwater management/treatment device is performing satisfactorily as long as an appropriate maintenance regime is maintained.

Further, by conducting appropriate monitoring in the receiving environment as required by Condition 4(a), the performance of the stormwater management/treatment devices can be inferred. For example, if the receiving environment is not increasing in stormwater-derived contaminants, ecological communities are similar to areas that are not affected by stormwater, there is no substantial scouring near the discharge location, and no flooding is occurring, it can be inferred that the stormwater devices are performing satisfactorily.

### 3.6 Development monitoring

Condition Requirement:

*Condition 4(g): Monitoring to gauge the level of subdivision and development that is occurring in developing catchments, relative to the land use assumptions underlying the integrated catchment management approaches adopted by approved Catchment Management Plans.*

Appendix C of the SMP outlines the administrative process for adopting new stormwater networks into the CSDC. Compliance with Appendix C infers the new network is consistent with the receiving environment outcomes of the



CSDC including water quality treatment, flood hazard management and local erosion. In terms of reporting, new stormwater networks are also documented in the TCDC Annual Report required by Condition 6 of the CSDC.

### 3.7 Road runoff contaminant management

Condition Requirement:

*Monitoring to determine best practicable street and stormwater catchpit cleaning operations to minimise the volume of stormwater contaminants entering the stormwater network and discharging to the receiving environment.*

Street and catch pit cleaning frequencies are detailed in the SMP document under the responsibility of the roading maintenance contractor Ventia. This includes inspecting all stormwater structures (and cleaning if required) every six months. Inspection and cleaning frequency for urban streets and CBD streets (more frequent) is also outlined which includes removal of detritus and litter (gross pollutants). As is discussed in Section 3.5 above, if stormwater runoff derived receiving environment effects are not evident in the monitoring results then can be inferred the stormwater network operation and maintenance interventions (including street and catchpit cleaning) are at a satisfactory frequency

### 3.8 Adaptative monitoring

The monitoring approach may be adapted over time based on the results from the current monitoring programme, community complaints, or additional information. Adaptations to the monitoring programme could include the addition or removal of monitoring locations, monitoring frequency and parameters, or a one-off investigation.

The monitoring programme discussed above was designed to assess the effects of typical/anticipated stormwater discharges. At times, events may occur such as an unconsented discharge into the stormwater system that warrant additional investigation. These would likely be identified during regular inspection of the stormwater infrastructure or by complaints.

Possible investigation approaches could include one or more of the following:

- Visual assessments to determine the potential cause of the issue;
- Sampling of the stormwater discharge during a discharge event;
- Assessment of stormwater management device performance;
- Additional sediment quality sampling of the nearby receiving environment (possibly including reference sites). A broader (or more targeted) suite of contaminants to be analysed by the laboratory could also be considered;
- Quantitative assessments of benthic macroinvertebrates to assess ecological health.

### 3.9 Monitoring programme review

In accordance with Condition 4 of the CSDC, this monitoring programme shall be reviewed by the 31<sup>st</sup> March of every third year and shall be submitted to the WRC for technical certification.

## 4 MONITORING SUMMARY

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### 4.1 Data analysis and reporting

Table 4 summarises the monitoring components required by Condition 4 and outlines the reporting type and frequency, along with a precis of the actions that are available to TCDC in response to monitoring information.

Table 4 Monitoring Method Summary

Condition Number	Requirement	Monitoring Type	Monitoring Location	Monitoring Frequency	Action By Whom	Analysis Standard/Method	Reporting Type/Frequency	Further Monitoring Action
4(a)	<ul style="list-style-type: none"> <li>Visual assessments of general habitat quality and sensitivity to stormwater inputs.</li> <li>Sediment quality sampling and analyses of key stormwater contaminants and sediment characteristics that aid data interpretation.</li> <li>Biological sampling and analyses of macroinvertebrate communities and fish populations.</li> </ul>	Receiving Environment: <ul style="list-style-type: none"> <li>Visual assessments of general habitat quality</li> <li>Sediment quality (Cu, Pb, Zn, TOC, PAH)</li> <li>Biological assessments.</li> </ul>	<ul style="list-style-type: none"> <li>Refer Appendix A</li> </ul>	<ul style="list-style-type: none"> <li>4-yearly (ideally in January/February).</li> </ul>	<ul style="list-style-type: none"> <li>A suitably qualified ecologist</li> </ul>	<ul style="list-style-type: none"> <li>Sediment quality composite sample comprising approximately 10 sub-samples from the area to be collected at each site. Sediment should be placed into a laboratory-supplied container and transported to the laboratory for analysis as soon as practicable.</li> <li>Sediment quality results assessed against ANZG (2018) default guideline values (DGVs) for toxicants in sediments.</li> <li>Biological assessments compared against previous years' results and expert judgement.</li> <li>Visual observation of habitat quality based on expert judgement</li> </ul>	<ul style="list-style-type: none"> <li>Reporting to coincide with the ecological monitoring report prepared every four years following the monitoring occasion, and documentation of observations in the Annual Report required by Condition 6.</li> </ul>	<ul style="list-style-type: none"> <li>Exceedance of ANZG (2018) DGVs, trajectory towards an exceedance of a DGV, or notable decline or stepwise change in ecological health as indicated by visual assessments may warrant further investigation.</li> </ul>
4(b)	<ul style="list-style-type: none"> <li>Monitoring to identify any visual signs of contaminants in stormwater (conspicuous oil or grease films, scums or foams, floatable suspended materials, conspicuous change in colour or visual clarity).</li> </ul>	<ul style="list-style-type: none"> <li>Visual water quality observations.</li> </ul>	<ul style="list-style-type: none"> <li>Refer Appendix A for site locations monitored under 4(a)</li> <li>District wide during programmed observation of the stormwater network and receiving environments</li> </ul>	<ul style="list-style-type: none"> <li>For Appendix A site locations; twice yearly and coinciding with the 4-yearly monitoring required by Condition 4(a).</li> <li>For the remaining network, during programmed observation of the network and receiving environments by TCDC contactors and staff.</li> </ul>	<ul style="list-style-type: none"> <li>Contractors and TCDC staff</li> </ul>	<ul style="list-style-type: none"> <li>Visual assessment.</li> <li>Using the condition 4(b) text as a term of reference, i.e. observation of conspicuous oil or grease films, scums or foams, floatable suspended materials, conspicuous change in colour or visual clarity.</li> </ul>	<ul style="list-style-type: none"> <li>Reporting to coincide with the ecological monitoring report prepared every four years following the monitoring occasion, and documentation of observations in the Annual Report required by Condition 6.</li> </ul>	<ul style="list-style-type: none"> <li>Documentation of repeat observations/trends and implementation of the Standard Operating Procedure for Non-Routine Contaminants Discharges if required.</li> </ul>
4(c)	<ul style="list-style-type: none"> <li>Monitoring to identify any adverse scour, erosion and sediment deposition on land, property and the beds of stormwater receiving water bodies.</li> </ul>	Erosion: <ul style="list-style-type: none"> <li>Visual observation.</li> </ul>	<ul style="list-style-type: none"> <li>Refer Appendix A for site locations monitored under 4(a)</li> <li>District wide during programmed</li> </ul>	<ul style="list-style-type: none"> <li>For Appendix A site locations; twice yearly and coinciding with the 4-yearly monitoring required by Condition 4(a).</li> <li>For the remaining network, during programmed</li> </ul>	<ul style="list-style-type: none"> <li>Contractors, ecology consultants and TCDC staff</li> </ul>	<ul style="list-style-type: none"> <li>Visual observation and assessment of erosion trend (i.e. stable or eroding).</li> </ul>	<ul style="list-style-type: none"> <li>Reporting to coincide with the ecological monitoring report prepared every four years following the monitoring occasion, and documentation of observations in the Annual Report required by Condition 6.</li> </ul>	<ul style="list-style-type: none"> <li>Remedial works for local outfall erosion.</li> <li>Investigation of channel erosion and implementation of intervention(s) via the SMP and adaptive management approach.</li> </ul>

Condition Number	Requirement	Monitoring Type	Monitoring Location	Monitoring Frequency	Action By Whom	Analysis Standard/Method	Reporting Type/Frequency	Further Monitoring Action
			observation of the stormwater network and receiving environments	observation of the network and receiving environments by TCDC contactors and staff.				
4(d)	<ul style="list-style-type: none"> <li>Monitoring to identify any adverse flooding of land, property and stormwater receiving water bodies.</li> </ul>	Flood monitoring: <ul style="list-style-type: none"> <li>Monitoring of flooding hotspots in the district and use of rainfall forecasting tools.</li> <li>Prediction of significant weather events.</li> </ul>	<ul style="list-style-type: none"> <li>District wide</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing with response to flood events and remedial works as required.</li> </ul>	<ul style="list-style-type: none"> <li>Contractors and TCDC staff</li> </ul>	<ul style="list-style-type: none"> <li>Measurement against SMP flood hazard management outcomes and request for service metrics.</li> </ul>	<ul style="list-style-type: none"> <li>Reporting of flood incidents attended in the Annual Report required by Condition 6.</li> </ul>	<ul style="list-style-type: none"> <li>Network operation and maintenance, maintenance of inlet and outlet structures to clear debris, channel clearing works.</li> <li>Investigation and implementation of SMP flood hazard related outcomes using adaptive management approach.</li> </ul>
4(e)	<ul style="list-style-type: none"> <li>Monitoring to identify any stormwater management structures that are impeding the upstream and downstream movement of fish.</li> </ul>	Visual: <ul style="list-style-type: none"> <li>Observation change in fish passage capability (e.g. structures becoming perched).</li> </ul>	<ul style="list-style-type: none"> <li>Refer Appendix A for site locations monitored under 4(a)</li> </ul>	<ul style="list-style-type: none"> <li>Coinciding with the 4-yearly monitoring required by Condition 4(a).</li> </ul>	<ul style="list-style-type: none"> <li>A suitably qualified ecologist</li> </ul>	<ul style="list-style-type: none"> <li>Observe change in fish passage capability</li> </ul>	<ul style="list-style-type: none"> <li>Reporting to coincide with the ecological monitoring report prepared every four years following the monitoring occasion, and documentation of observations in the Annual Report required by Condition 6.</li> </ul>	<ul style="list-style-type: none"> <li>Remedial works for perched structures.</li> </ul>
4(f)	<ul style="list-style-type: none"> <li>Monitoring to determine the performance of utilised stormwater management devices in managing and/or treating stormwater.</li> </ul>	Stormwater management device performance.	<ul style="list-style-type: none"> <li>District wide</li> </ul>	<ul style="list-style-type: none"> <li>Implemented via the operation and maintenance protocols stipulated in the SMP and the programmed maintenance by TCDC contractors.</li> </ul>	<ul style="list-style-type: none"> <li>Contractors and TCDC staff</li> </ul>	<ul style="list-style-type: none"> <li>In accordance with SOPs for maintenance activities, device specific operation and maintenance plans and manufacturer guidance where applicable.</li> </ul>	<ul style="list-style-type: none"> <li>Summary of operation and maintenance activity reported via the annual report required by Condition 6.</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing operation and maintenance and improvement via adaptive management approach.</li> <li>Adaptive monitoring of specific parts of the network (e.g. stormwater treatment devices) where required as detailed in Section 3.8.</li> </ul>
4(g)	<ul style="list-style-type: none"> <li>Monitoring to gauge the level of subdivision and development that is occurring in developing catchments, relative to the land use assumptions underlying the integrated catchment management approaches adopted</li> </ul>	New development: <ul style="list-style-type: none"> <li>Using Appendix C of the SMP, assessment of new stormwater networks to meet the applicable outcomes of the CSDC.</li> </ul>	<ul style="list-style-type: none"> <li>District wide</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing as directed by new development seeking authorisation under the CSDC.</li> </ul>	<ul style="list-style-type: none"> <li>TCDC staff</li> </ul>	<ul style="list-style-type: none"> <li>Code of Practice – Stormwater and Land Drainage</li> <li>Compliance with relevant resource consent conditions</li> <li>Adoption of new stormwater networks in accordance with the SMP Administrative Process.</li> <li>Development in accordance with the relevant CMP (where applicable).</li> </ul>	<ul style="list-style-type: none"> <li>Summary of new network reported in the Annual Report required by Condition 6.</li> </ul>	<ul style="list-style-type: none"> <li>Adoption of the stormwater network and implementation of operation and maintenance protocols in accordance with the SMP.</li> </ul>

Condition Number	Requirement	Monitoring Type	Monitoring Location	Monitoring Frequency	Action By Whom	Analysis Standard/Method	Reporting Type/Frequency	Further Monitoring Action
	by approved Catchment Management Plans.							
4(h)	<ul style="list-style-type: none"> <li>Monitoring to ensure that all stormwater management devices are maintained in good working order, and providing best practicable stormwater management and/or treatment efficiency at all times.</li> </ul>	Network performance operation and maintenance.	<ul style="list-style-type: none"> <li>District wide</li> </ul>	<ul style="list-style-type: none"> <li>As per the operation and maintenance frequencies stipulated in the SMP and the programmed maintenance by TCDC contractors.</li> </ul>	<ul style="list-style-type: none"> <li>Contractors and TCDC staff</li> </ul>	<ul style="list-style-type: none"> <li>In accordance with SOPs for maintenance activities, device specific operation and maintenance plans and manufacturer guidance where applicable.</li> </ul>	<ul style="list-style-type: none"> <li>Reporting on levels of service</li> <li>Summary of operation and maintenance activity reported via the annual report required by Condition 6.</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing operation and maintenance and improvement via adaptive management approach.</li> </ul>
4(i)	<ul style="list-style-type: none"> <li>Monitoring to determine best practicable street and stormwater catchpit cleaning operations to minimise the volume of stormwater contaminants entering the stormwater network and discharging to the receiving environment.</li> </ul>	Street and catchpit cleaning: <ul style="list-style-type: none"> <li>Visual monitoring for prevalence of litter and detritus (e.g. in CBD areas)</li> </ul>	<ul style="list-style-type: none"> <li>Applicable street cleaning locations and district wide catchpit cleaning</li> </ul>	<ul style="list-style-type: none"> <li>As per the relevant street cleaning contract documents</li> </ul>	<ul style="list-style-type: none"> <li>Contractors and TCDC staff</li> </ul>	<ul style="list-style-type: none"> <li>Captured by receiving environment monitoring required by Condition 4(a) to understand changes in receiving environment (e.g. from road runoff), particularly from CBD and areas of higher traffic volumes in the district.</li> </ul>	<ul style="list-style-type: none"> <li>Summary of operation and maintenance activity reported via the annual report required by Condition 6.</li> </ul>	<ul style="list-style-type: none"> <li>Increased frequency of street and catchpit cleaning in accordance with adaptive management approach.</li> </ul>

**Appendix A:**

**Stormwater Monitoring Locations**

Table A1: Summary of stormwater monitoring locations including site name, description and coordinates (NZTM).

Site no.	Name	Receiving Environment Type	Description	Easting	Northing
1	Thames@ Thames Marina	Marine	Within the Thames Marina near the mouth of the Kauaeranga River. Depositional area susceptible to contaminant accumulation. Catchment contains a number of commercial and industrial activities.	1826043	5885823
2	Thames@Sealey St	Marine	South of the Goldfields shopping centre. Low flow depositional area susceptible to contaminant accumulation. Catchment mix of commercial activities. Stormwater drains into a narrow channel before discharging to the Firth of Thames.	1825663	5886572
3	Thames@Burke St	Marine	Large outlets discharging to low flow stream and then to the Firth of Thames. Depositional area susceptible to contaminant accumulation	1825029	5887635
4	Coromandel@ Whangarahi Stream	Marine	Catchment contains most of CBD including a service station and automotive repair workshops. Discharges into muddy stream (susceptible to contaminant accumulation).	1822723	5928734
5	Whangamata@ Kotuku St	Marine	In the vicinity of 2 large outlets into the Otahu River Estuary. Representative of typical residential environment.	1854854	5876250
6	Whangamata@ Moanaanuau Estuary	Marine	In the vicinity of a number of discharges including industrial activities. Muddy estuary susceptible to contaminant accumulation and has reduced flushing and dispersion due to nearby causeway.	1854206	5879016
7	Tairua@Marquet Place	Marine	Within the upper arm of Tairua Harbour near Pepe Stream. More enclosed than the rest of Tairua Harbour. Stormwater catchment includes large proportion of CBD.	1853338	5901182

Site no.	Name	Receiving Environment Type	Description	Easting	Northing
8	Pauanui@ Sheppard Ave	Marine	Near large, 'high risk' outlet including service station. Discharges to Tairua Harbour.	1854018	5899380
9	Whitianga@ Marina Hardstand	Marine	Discharges into marina. Catchment contains CBD including service stations and automotive repair workshops.	1841282	5919725
10	Whitianga@ Moewai Road	Freshwater	Discharge to freshwater. Catchment includes commercial and industrial activities.	1838259	5920606

**Appendix B:**

**Stormwater Catchment and Monitoring Location Maps**





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**Stormwater Receiving Environment Monitoring - Coromandel**

- ▭ Stormwater Catchment Boundary
- Stormwater Lines
- Monitoring Location

Client: TCDC  
 Project: Stormwater Review  
 Date: 25/03/2022  
 Version: 1.0  
 Author: PW  
 Approved: TS



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**Stormwater Recieving Environment Monitoring - Pauanui**

- ▭ Stormwater Catchment Boundary
- Stormwater Lines
- Monitoring Location

Client: TCDC  
 Project: Stormwater Review  
 Date: 25/03/2022  
 Version: 1.0  
 Author: PW  
 Approved: TS



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**Stormwater Recieving Environment Monitoring - Tairua**

- ▭ Stormwater Catchment Boundary
- Stormwater Lines
- Monitoring Location

Client: TCDC  
 Project: Stormwater Review  
 Date: 25/03/2022  
 Version: 1.0  
 Author: PW  
 Approved: TS



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**Stormwater Recieving Environment Monitoring - Thames Kopu**

- Stormwater Catchment Boundary
- Monitoring Location

Client: TCDC  
 Project: Stormwater Review  
 Date: 25/03/2022  
 Version: 1.0  
 Author: PW  
 Approved: TS



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**Stormwater Recieving Environment Monitoring - Whangamata**

- ▭ Stormwater Catchment Boundary
- Stormwater Lines
- Monitoring Location

Client: TCDC  
 Project: Stormwater Review  
 Date: 25/03/2022  
 Version: 1.0  
 Author: PW  
 Approved: TS



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**Stormwater Recieving Environment Monitoring - Whitianga**

- ▭ Stormwater Catchment Boundary
- Stormwater Lines
- Monitoring Location

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