Appendix H: Condition 59 - Response to Monitoring (2023)

Internal Document Review and Approval

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1. Executive Summary

Under the Comprehensive Stormwater Network Discharge Consent (CSNDC), Christchurch City Council (Council) is required to meet Receiving Environment Objectives and Attribute Target Levels (ATLs) in the receiving environment. Condition 59 of the consent subsequently requires that for sites where the ATLs have not been met, investigations shall be undertaken to determine whether this is due to stormwater discharges authorised under the consent. This report assesses compliance with the Total Suspended Solids, copper, lead, and zinc ATLs for surface water (waterways and coastal waters) building upon the investigations/monitoring in the 2020 and 2021 calendar years.

In the 2022 monitoring year, thirty-six of the 51 monitoring sites were identified as not meeting at least one of these ATLs. Three sites were triggered for investigation, due to each site not just exceeding guideline levels for the given parameter, but also because of an increasing trend in concentrations. These three sites are Curlett Stream at Motorway, Addington Brook, and Nottingham Stream at Candys Road. The 2020-2022 investigations did not provide sufficient evidence for remediation purposes, and so these sites remained to be the focus of further investigation for 2023. The Ōpāwaho-Heathcote River at Ferrymead Bridge was not triggered in 2023 for further investigation but has been included in this report as progress has been made in undertaking investigations. This report outlines results for 2023 and the next steps to determine whether these exceedances of ATLs are due to stormwater discharges authorised under this resource consent and proposed remediation with associated timelines.

Copper, zinc, and TSS (total suspended solids) issues at the four priority sites are most likely due in part to stormwater discharges authorised under the CSNDC. However,

there are also likely other illicit (e.g., dry-weather) discharges not authorised under the consent that may be impacting contaminant levels. To address the impacts from stormwater, a number of remediation actions are proposed. This includes gathering more data on where contaminants are coming from by continuing targeted wet weather monitoring within the Curlett Stream catchment, and adding additional wet weather monitoring in the lower Ōpāwaho-Heathcote River and Nottingham Stream. Dry weather monitoring is also proposed within Curlett Stream and Addington Brook to identify non-stormwater illicit discharges. AECOM provided an assessment of high-risk sites to help develop the wet weather and dry weather monitoring plans for the Ōpāwaho-Heathcote River and Nottingham Stream. These monitoring plans have now been finalised and monitoring will commence this calendar year.

The targeted monitoring will enable Council to capture the stormwater with the highest contaminant load before discharge to the waterways and prevent illicit discharges. There is funding within the Capital Programme for treatment of Addington Brook and Nottingham Stream. These remediation options will be supplemented by existing work programmes under the CSNDC, such as Industrial Site Audits and other source control programmes, as well as Environment Canterbury programmes.

Council considers work under this condition to be a long-term project. Each annual report will consider whether sites are regularly being prioritised for investigation, and the project as a whole will be iterative and adaptive, building on lessons learned in previous years.

2. Introduction

As part of Christchurch City Council's (Council) Comprehensive Stormwater Network Discharge Consent (CSNDC), Council is required to meet Receiving Environment Objectives and Attribute Target Levels (ATLs) in the receiving environment. Condition -59 of the consent requires that for sites where the ATLs have not been met, investigations shall be undertaken to determine whether this is due to stormwater discharges authorised under the CSNDC.

Compliance with the Total Suspended Solids, copper, lead, and zinc ATLs for surface water (waterways and coastal waters) for the 2022 calendar year (January – December) were assessed in the 2023 annual surface water quality monitoring report (Margetts & Poudyal, 2023). In 2023, thirty-six of the 50 monitoring sites were identified as not meeting at least one of the ATLs. Sites that exceeded the guideline level for the given parameter and recorded an increasing trend triggered further investigation. In 2023, there were three sites that triggered further investigation; Curletts at Motorway, Addington Brook and Nottingham at Candys Rd. Sites from 2023 and compliance with the ATLs are outlined in Table 1. All three sites have been prioritised for the past three years. Heathcote at Ferrymead Bridge was triggered in 2021 and 2022, but not in 2023, however, after discussions with Environment Canterbury this site has been included in this report.

To address part (c) of Condition 59, this report provides for these ~~five~~ four priority sites (1) an evaluation of whether these exceedance of ATLs are due to stormwater discharges authorised under this resource consent, and if so, (2) proposed remediation, and (3) associated timelines. This is the second report in accordance with Condition 59, and builds upon previous data.

Table 1. *Five priority sites not meeting Attribute Target Levels (ATLs) for Total Suspended Solids (TSS), copper, and zinc, and which ATLs were exceeded. Note: there were no exceedances for lead.*

Site	ATL Exceeded
Ōpāwaho-Heathcote River at Ferry Road Bridge (HEATH01)	Dissolved copper: limit exceeded Dissolved zinc: limit exceeded
Curlett Stream at Motorway (HEATH14)	Dissolved copper: limit exceeded and statistically significant increase Dissolved zinc: limit exceeded and statistically significant increase TSS: statistically significant increase
Addington Brook (AVON09)	Dissolved copper: limit exceeded Dissolved zinc: limit exceeded and statistically significant increase
Nottingham Stream at Candys Road (HALS03)	Dissolved zinc: limit exceeded and statistically significant increase

3. Site Descriptions & Contaminant Inputs

3.1. Ōpāwaho-Heathcote River at Ferrymead Bridge

The Ōpāwaho-Heathcote River at Ferrymead Bridge site is a tidally influenced site located at the mouth of the Ōpāwaho-Heathcote River, at the Ihutai-Avon-Heathcote Estuary. Although Ōpāwaho-Heathcote River at Ferrymead Bridge recorded exceedances in guideline levels for copper and zinc in 2022 (Margetts & Poudyal, 2023), a statistical increase in zinc concentrations was recorded in previous years (a 10% increase in both the 2020 and 2021 monitoring years; Margetts & Marshall, 2021; Margetts & Poudyal, 2022) and investigations have begun. A wet and dry weather monitoring plan has been developed by Pattle Delamore Partners (PDP) which can be viewed in Appendix L of the 2024 Annual Report.

The increasing trend in zinc can likely be attributed to cumulative inputs down the catchment which culminate at this site or sources of zinc located between the Tunnel Road and Ferrymead Bridge site that discharge into the Ōpāwaho-Heathcote River. Other potential sources of contaminants include dredging of the upstream river, estuary contaminants entering at high tide and leachable heavy metals within the streambed. Dredging has been ruled out as unlikely to be a source of the increasing zinc concentrations as the timings of past dredging (2018-2020) do not align with the recorded increase in zinc. Tidal impacts may be the source, however catchment contributions were estimated to be more likely (Margetts, et al., 2022). It is recommended to address these concerns by sampling estuary water at high and low tides. This will be undertaken and reported on in the 2025 Annual Report.

To understand whether exceedances of the ATLs are occurring in relation to stormwater or other discharges during dry weather, the results of the monitoring from 2021 and 2022 were plotted against rainfall and the required ATL (Figure 1). Of note, the highest zinc results during that time were all associated with rainfall. This suggests that exceedances are primarily associated with stormwater discharges, but that there may be other dry weather exceedances occurring.

It is proposed to first investigate inputs between Tunnel Road and Ferrymead Bridge to rule out nearby site influences. The monitoring plan developed by PDP included seven sites within this stretch of the Heathcote with differing levels of priority to take into account the practicability of monitoring sites (costs, resources etc). Monitoring will be undertaken and reported on in the 2025 Annual Report.

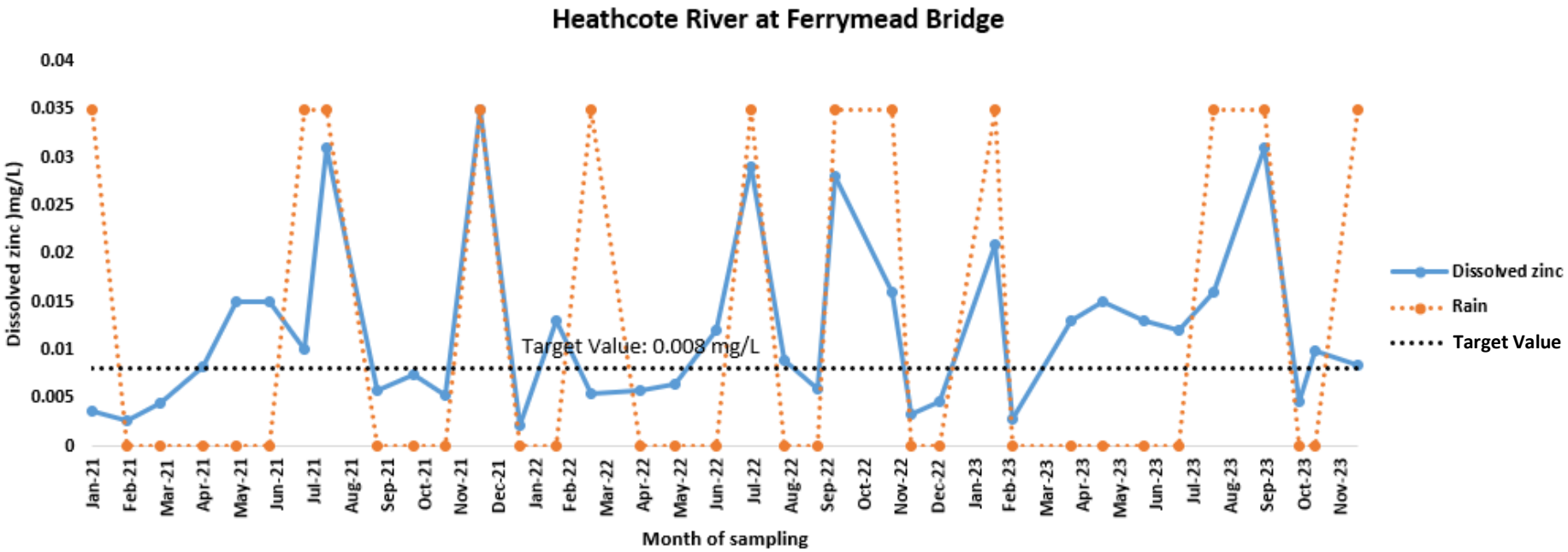

Figure 1: Rainfall versus dissolved zinc levels in surface water during monthly monitoring from January 2021 - December 2023. Note rainfall is in the graphs is considered as rain that has fallen either the previous day or at the sampling day.

3.2. Curlett Stream at Southern Motorway

The Curlett Stream at Southern Motorway site is located at the inlet to the recently constructed Curlett stormwater facility, immediately downstream of the motorway. The site at this location consists of a large pond. Land uses upstream of this site are predominantly commercial and industrial. The monthly monitoring results for copper, zinc, and TSS at this site for the 2021-2023 monitoring years show that copper and zinc generally always exceeded their respective ATL (Figure 2). In addition, a number of the copper and zinc samples exceeded the ATLs when no rainfall occurred, indicating that dry weather discharges are a significant source of metals. The largest concentrations were generally recorded during rainfall, indicating stormwater is also a major contributor of copper and zinc to the stream.

Detailed wet weather monitoring has previously been undertaken in the catchment as part of the Targeted Wet Weather Monitoring Programme (TWWMP) under Schedule 3(k) of the CSNDC (Borne & Gadd, 2022). This monitoring indicated high concentrations of contamination during both dry and wet weather. Overall, the monitoring identified additional wet weather monitoring is required to address the objectives of the project and to determine how corrective action/remediation will be carried out to address Condition 59. The report included a number of recommendations for the next stage of monitoring, and we have now finalised a monitoring plan for the next stage which can be viewed in Appendix M of the Annual Report. The monitoring plan objectives are:

- To identify sub-catchments contributing the most to stormwater contaminant load exports to Curlett Stream, in accordance with Condition 59 of the CSNDC and the recommendations in the 'Condition 59 responses to monitoring report 2022 - surface water',
- To characterise the presence of dry weather discharges (i.e., not associated with stormwater) to Curlett Stream, and
- To identify the water quality at the outlet of the Curlett wetland facility.

The proposed methodology relies on widespread implementation of monitoring sites dedicated to dry and/or wet weather monitoring. Wet weather monitoring sites were recommended to comprise equipment that allows flow volume calculation and flow weighted composite samples to be collected during a storm event. The objective is to quantify the pollutant loads exported from six sub-catchments (covering most of the Curlett Stream catchment) to identify those contributing the most to the pollutants load export during wet weather, and to quantify pollutant loads exported to the Heathcote River after treatment by the Curlett wetland. As dry weather unconsented discharges are suspected in the catchment, it is recommended water level, temperature and conductivity, in addition to turbidity at selected or all sites, should be monitored. The objective is to collect continuous data in the stormwater network and in Curlett Stream during

dry weather to identify discharges, their flow regime (continuous flow vs pulse), and characteristics (e.g., duration, time of the day/week/year, frequency). This monitoring is proposed for 17 sites, covering most of the Curlett Stream catchment which will help narrow down the location of sources of unconsented dry weather discharges.

The Curlett stormwater facility consists of an online first flush basin and wetland which was completed in Curlett Stream in 2019. However, due to a structural failure, the basin has not been operational, and monitoring has been delayed until after these issues are fixed.

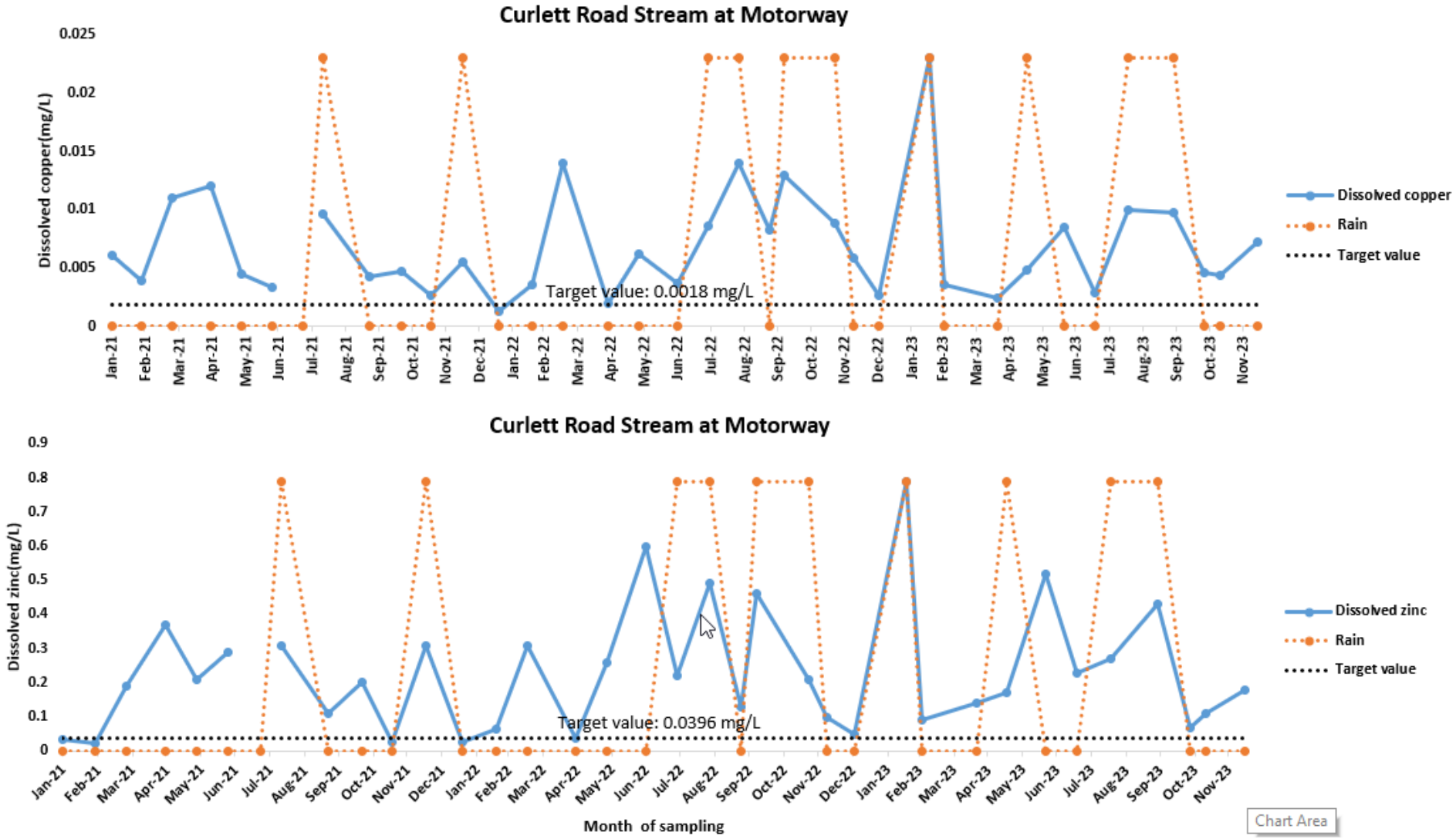

Figure 2: Rainfall versus dissolved copper (top graph) and dissolved zinc levels (bottom graph) in surface water during monthly monitoring from January 2021 - December 2023. Note rainfall is in the graphs is considered as rain that has fallen either the previous day or at the sampling day.

3.3. Addington Brook

The Addington Brook site is located at the bottom of the catchment within Hagley Park North, just upstream of its confluence with the Ōtākaro-Avon River. Land use of the upper catchment consists of commercial and industrial, and the lower catchment flows through both North and South Hagley Park. The Christchurch-Contaminant Load Model (C-CLM) predicts a moderate zinc load (645 kg/yr or 2.23 kg/ha/yr) and a moderate copper load (62 kg/yr or 0.21 kg/ha/yr) for this site.

Over half of the samples in 2021 exceeded the ATL for zinc, whereas less than half exceeded the ATL in 2022 and one site in 2023 (note this will be reported on in the 2025 Annual Report) (Figure 3). Only two zinc samples that exceeded the ATL were not associated with rainfall however, levels were elevated during dry weather. This indicates that there are both dry weather and stormwater sources of metals in this catchment.

PDP developed a dry weather monitoring plan for Addington Brook, this can be viewed in Appendix N of the Annual Report. In summary, this plan recommended seven sampling locations in the Addington catchment with differing levels of priority to make more feasible for monitoring. At each location, four weeks' worth of continuous dry weather sampling data was recommended to be collected using in-situ probes, at 5-minute intervals. PDP recommends probes to log conductivity, temperature, water level and turbidity. Four weeks were recommended with the intention of analysing and reporting on the data at the end of that time period. If there are no major trends, probes can be redeployed for a further month of continuous monitoring. If there are clear trends, monitoring locations and methodologies can be adjusted as required.

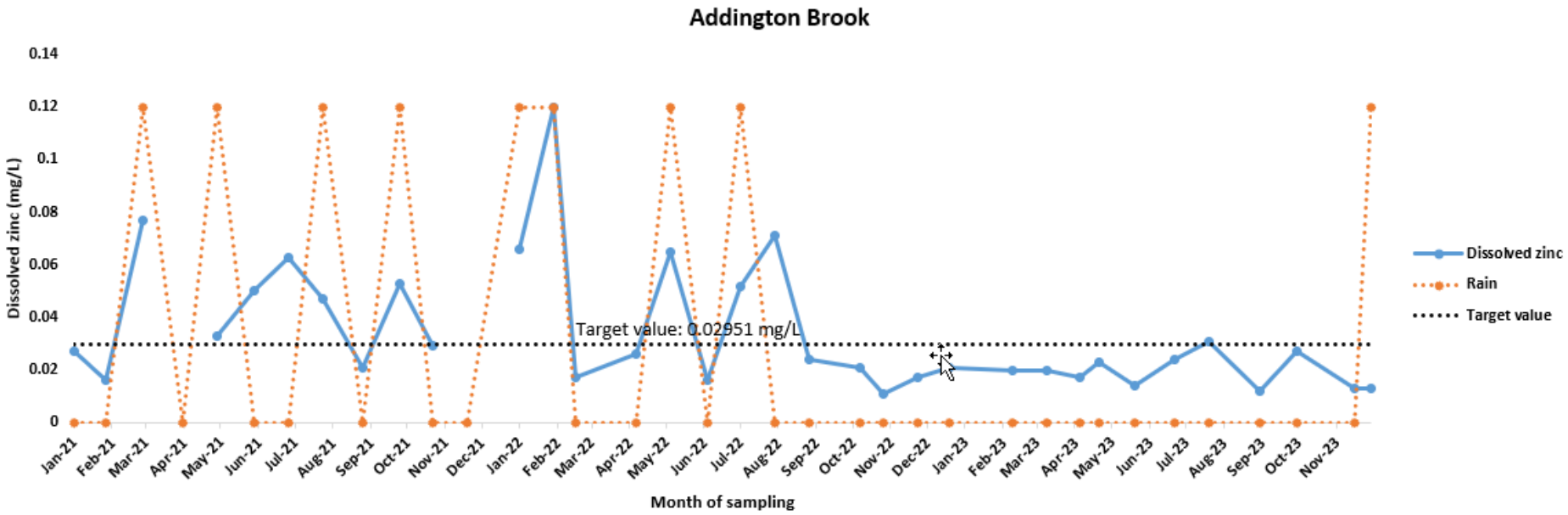

Figure 3: Rainfall versus dissolved zinc levels in surface water during monthly monitoring from January 2021 - December 2023. Note rainfall is in the graphs is considered as rain that has fallen either the previous day or at the sampling day.

3.4. Nottingham Stream at Candys Road

The Nottingham Stream at Candys Road site is located in the lower catchment of Nottingham Stream, in a predominantly rural area. The stream at this location is narrow and shallow, with incised banks. Land use in the Nottingham Stream catchment is predominantly residential, with some commercial. Small sections of Dunbars Road and Halswell Road lie in the catchment and discharge to the stream, with Dunbars road discharging to the stream via a treatment swale. The C-CLM predicts for this site a low zinc load (327 kg/yr or 1.79 kg/ha/yr) and a moderate copper load (27 kg/yr or 0.15 kg/ha/yr).

Approximately half of the zinc samples collected during the 2021 to 2023 monitoring years exceeded the ATL (Figure 4). Most exceedances were associated with rainfall in the 2022 monitoring year which indicates that exceedances at this site are mainly due to stormwater inputs.

A statistically significant increase in zinc of 5% has occurred since monitoring began at this site in 2011 (Margetts & Poudyal, 2023) (Figure 5). Larger peaks in concentrations have generally occurred in the last couple of years, coupled with higher baseline levels since 2016.

A targeted wet weather monitoring plan has been developed for the Nottingham Stream catchment and can be viewed in Appendix L of the Annual Report. This plan identified 11 monitoring sites of varying priority.

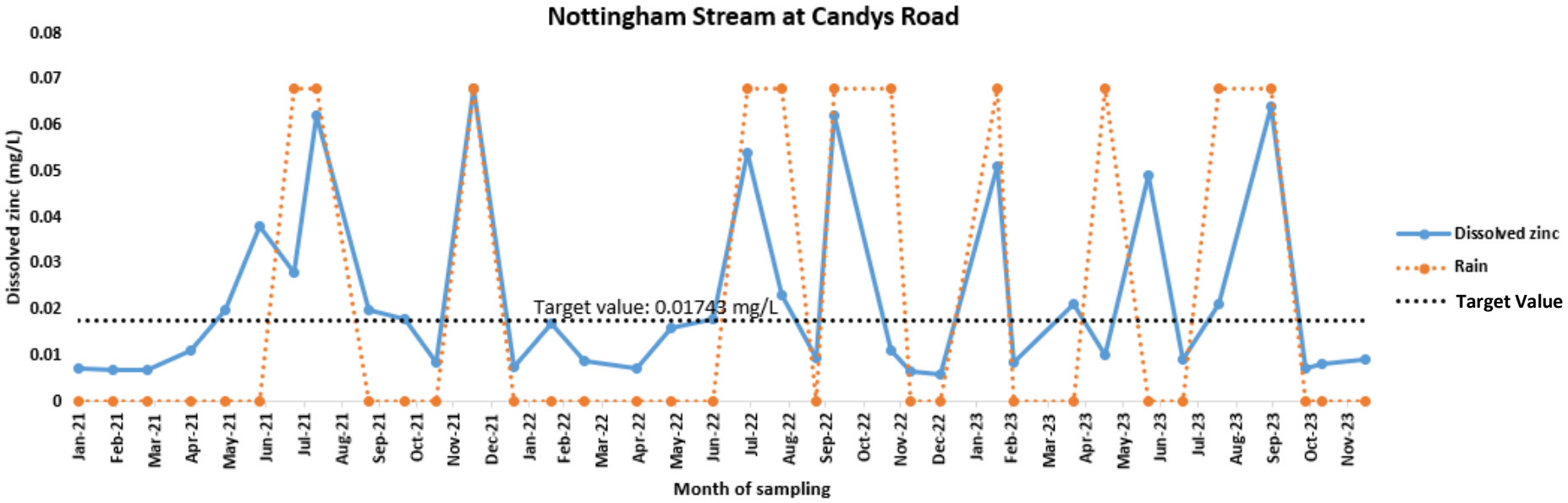

Figure 4: Rainfall versus dissolved zinc levels in surface water during monthly monitoring from January 2021 - December 2023. Note rainfall is in the graphs is considered as rain that has fallen either the previous day or at the sampling day.

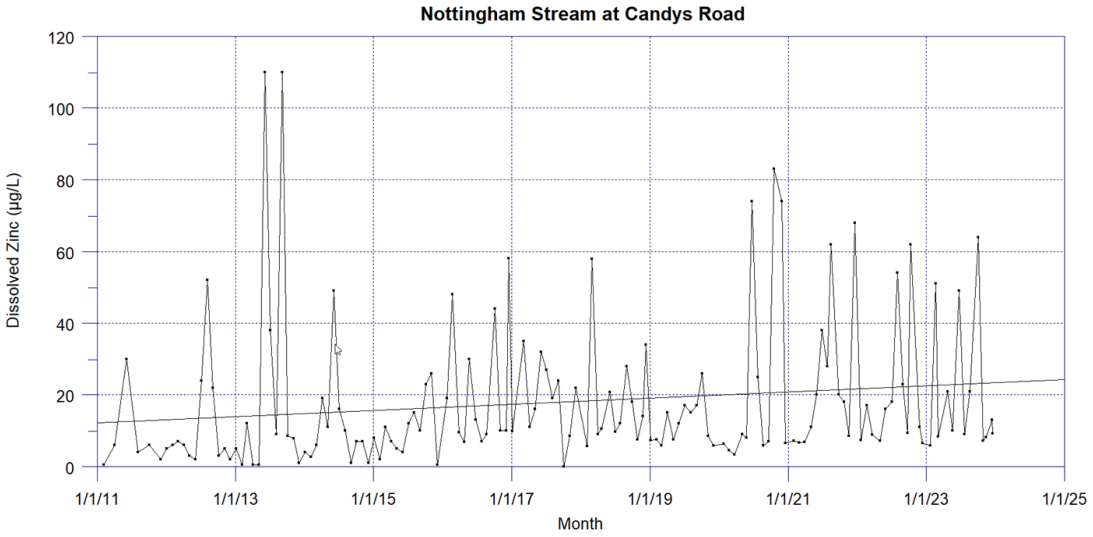

Figure 5: Dissolved zinc concentrations at the Nottingham Stream site for the January 2011 to December 2023 monitoring period. Squares indicate individual sampling events. An increasing trend of 5% was recorded over the sampling period.

4. Proposed Remediation & Timelines

4.1. High-Risk Sites Investigation

AECOM report (2023) on CSNDC Condition 59, Assessment of High-Risk Sites defined a high-risk site as: A site that has potential to discharge contaminants to stormwater at concentrations that could result in exceedance of the Attribute Target Levels (ATL). High-risk sites for the four priority catchments, which includes consideration of (1) HAIL sites, (2) CSNDC Schedule 1 sites1, and (3) other sites consented by ECan (i.e., not authorised under the CSNDC). high-risk sites discharging TSS (relevant to Curlett Stream only), copper, and zinc to the stormwater system and waterways within the four priority catchments. Factors considered whether sites are active or passive, activity type and how these relate to the ATLs exceeded, and risks in both wet weather (i.e., via stormwater) and dry weather not related to stormwater (e.g., washdown water and hazardous substances). For each catchment, the number of high risk sites are:

- Heathcote catchment – 8 sites.
- Curlett catchment – 25 sites.
- Addington catchment – 16 sites.
- Nottingham catchment – 1 site.

Of these sites, under the Industrial Site Audit Programme, Council have audited:

[1] These are generally high-risk sites for contamination generation that have been excluded from the CSNDC and require their own consent from ECan.

- Heathcote catchment – no sites.
- Curlett catchment – 15 sites.
- Addington catchment – no sites.
- Nottingham catchment – no sites.

AECOM's recommendations for further investigation:

- Passive inspection of the sites (i.e., completing observations from public areas) to note site layout, operations, type of ground cover, proximity to stormwater drains, etc.
- Spatial mapping of sites within each catchment to understand distribution and potential cumulative effects from grouping of sites.
- Identification of galvanised roofing on high-risk sites as an additional and potentially more likely source of zinc.

For 2023, Council were focused on controlling the source of TSS on construction sites. For 2024, we intend to shift the focus and as part of the Stormwater and Land Drainage Bylaw industrial rollout we can do more passive and targeted inspection of sites to capture a better understanding of how industry currently manage their stormwater.

4.2. Targeted Wet Weather Monitoring

4.2.1. Curlett Stream

The next stage of TWWMP in Curlett Stream is based on recommendations in Borne & Gadd (2022), Figure 6 shows the proposed sites to be monitored. Council plan to carry-out four more sampling events before revisiting whether sufficient information has been gathered to achieve the aim of identifying contaminant hotspots. Prioritising sites was discussed with Michele Stevenson (ECan) to ensure that the proposed monitoring programmes were in accordance with expectations. This work has been delayed due to resourcing and budget constraints and operational issues with the Curletts Basin. Based on this we were not able to fulfil this work in the 2023 monitoring year.

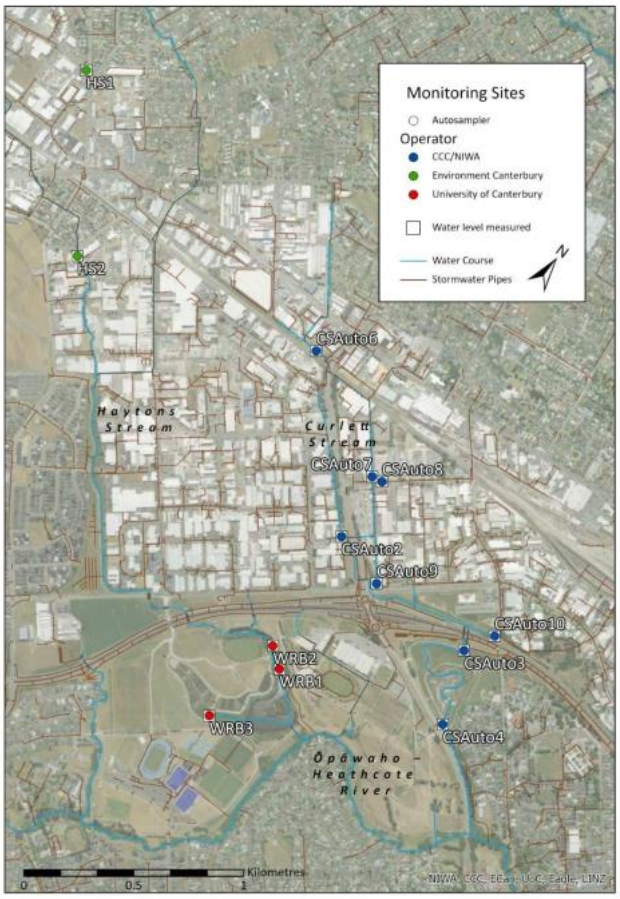

Figure 6. Proposed sites for Targeted Wet Weather Monitoring, Curlett Stream.

4.2.2. Nottingham Stream and Lower Ōpāwaho

Nottingham Stream will be added to the TWWMP, as well as the lower catchment of the Ōpāwaho Heathcote River, to investigate the issues at the Ferrymead Bridge site. The sampling plans for these two catchments have been informed by the results of the high-risk sites investigation project, with monitoring instigated as soon as practicable. Proposed sites for these catchments can be seen in Figure7 and Figure8.

Wet weather monitoring is not proposed for Addington Brook. There is already good baseline knowledge of this catchment through the ECan monitoring and they will continue to monitor and analyse this catchment in the coming years. Council will consider the results of this monitoring in future Condition 59 investigations where relevant.

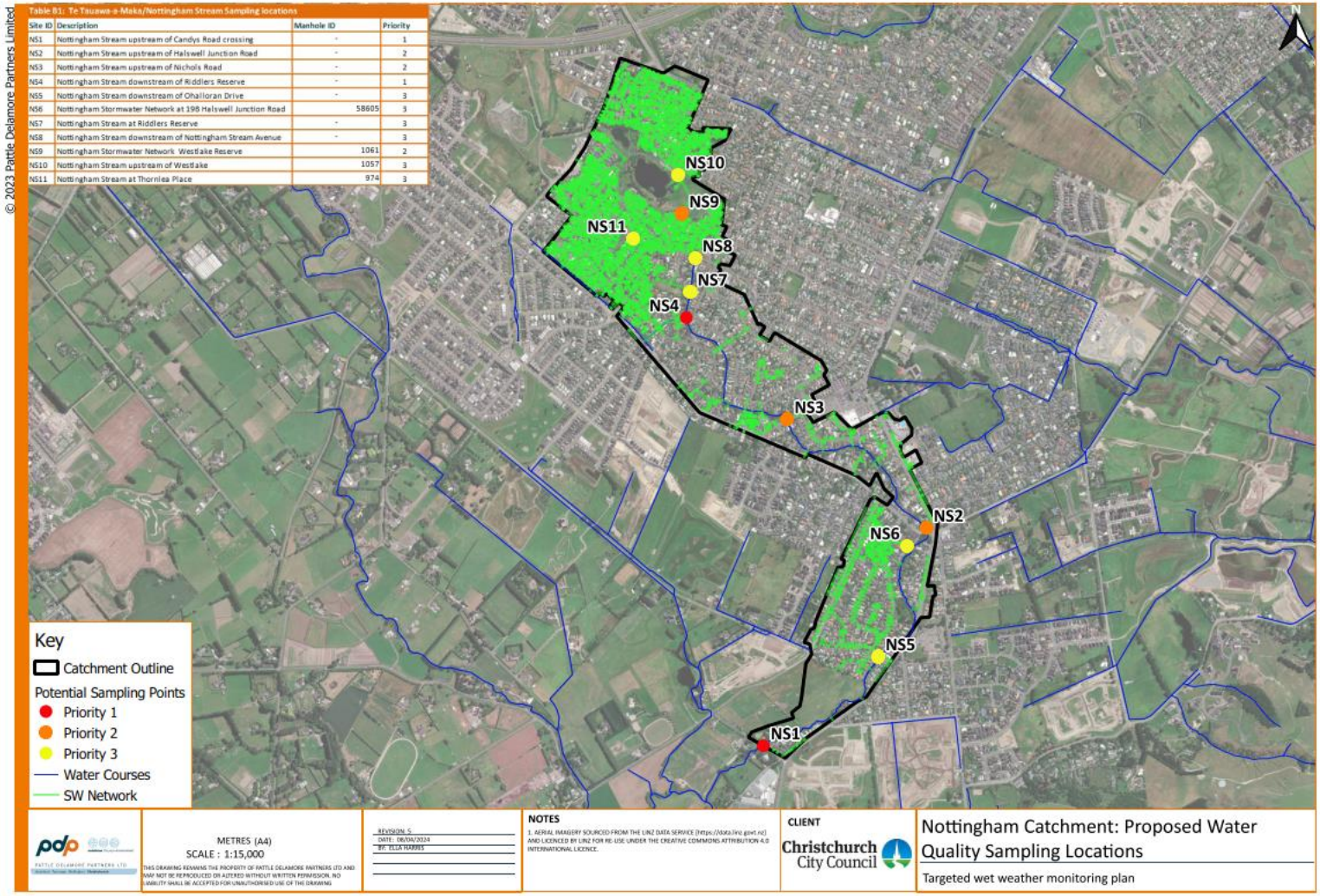

Figure 7. Proposed sites for Targeted Wet Weather Monitoring, Nottingham Stream

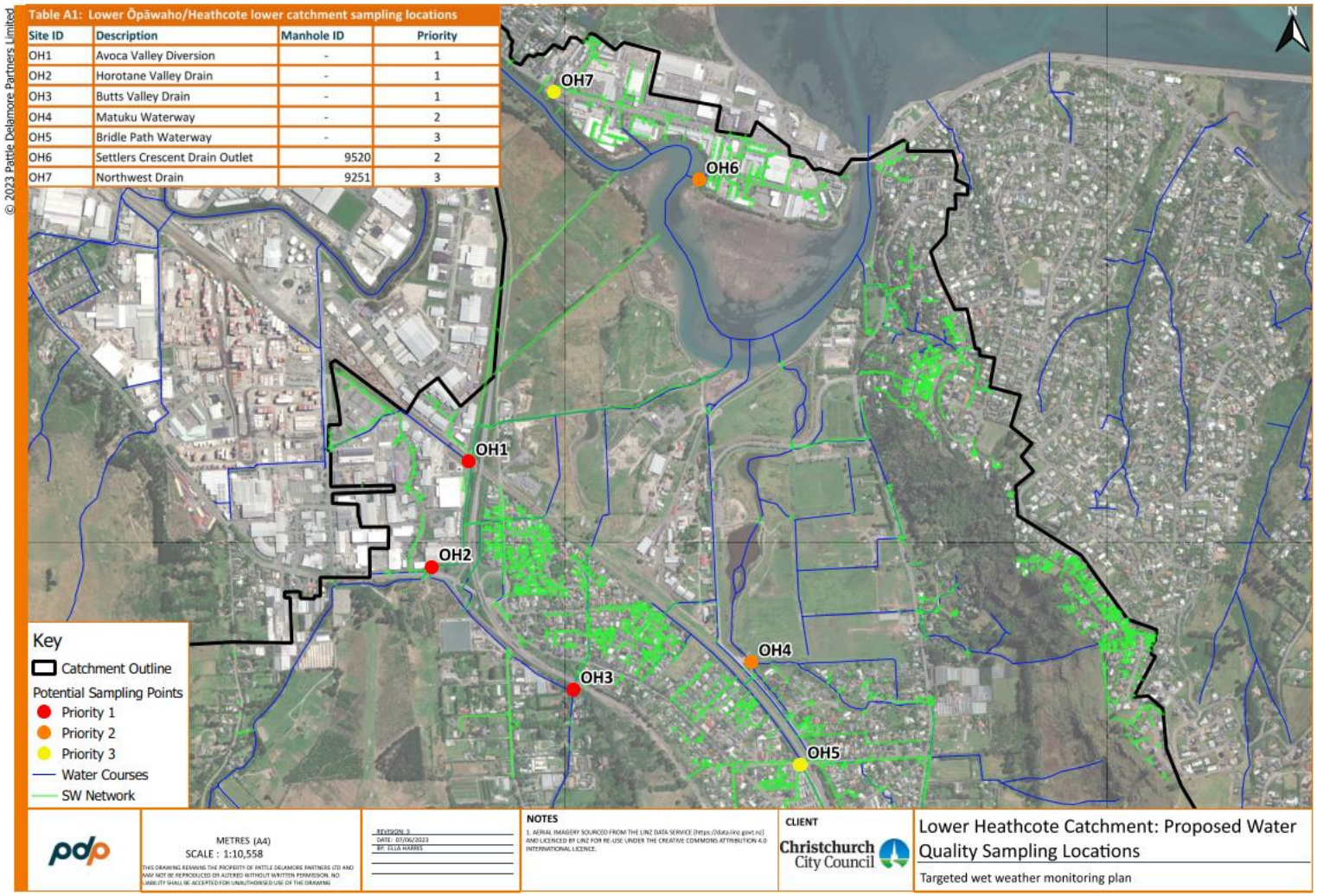

Figure 8. Proposed sites for Targeted Wet Weather Monitoring for Ōpāwaho, Lower Heathcote.

4.3. Dry Weather Discharge Investigations

The assessments in the previous Condition 59 report suggest that all sites to varying degrees are impacted by dry weather exceedances, not just stormwater. However, the results of monitoring from Curlett Stream, and Addington Brook to a lesser degree, suggest significant dry weather inputs of metals and TSS that need to be investigated in collaboration from ECan and stopped. Whilst dry weather exceedances are not covered by the CSNDC, understanding their occurrence will allow a better understanding of what is causing exceedances of ATLs and the relative role of stormwater inputs. Dry weather discharges may also indicate a likelihood of discharges also occurring during wet weather.

Once dry discharges have been identified, discussions between Council and ECan need to be undertaken as soon as possible around resourcing and the process of enforcement.

It is proposed to install monitoring devices in Curlett Stream and Addington Brook, and their associated pipe networks, to assess water level, turbidity/TSS, pH, and conductivity2. Figure 9 shows proposed Dry Weather Discharge monitoring sites.

4.4. Industrial Site Audits 2023 in Priority Catchments

- The Granite Benchtop Company 132 Wrights Road, Middleton, Christchurch 8024
  Glass, Clay, Cement, Concrete, and Gypsum Product Manufacturers
- Walker Powder Coatings 13 Kotzikas Place, Wigram, Christchurch 8042
  Primary and Fabricated Metal Product Manufacturers
- Mainstream Transport/BP Service Station 6 Jipcho Road, Wigram, Christchurch 8042
  Motor Vehicle and Equipment Associated Facilities
- Frews Contracting Limited 51 Chapmans Road, Hillsborough, Christchurch 8022
  Waste Transfer and Composting Facilities
- ARDEX New Zealand REAUDIT 32 Lane Street, Woolston, Christchurch 8023
  Chemical and Pharmaceutical Product Manufacturers
- Lyttelton Port Company 41 Chapmans Road, Hillsborough, Christchurch 8022
  Motor Vehicle and Equipment Associated Facilities
- Loman Auto Parts 5 Kennaway Road, Woolston, Christchurch 8023
  Automobile Salvage Yards

[2] As a proxy for metals, as the technology does not currently exist to measure metals robustly in real time

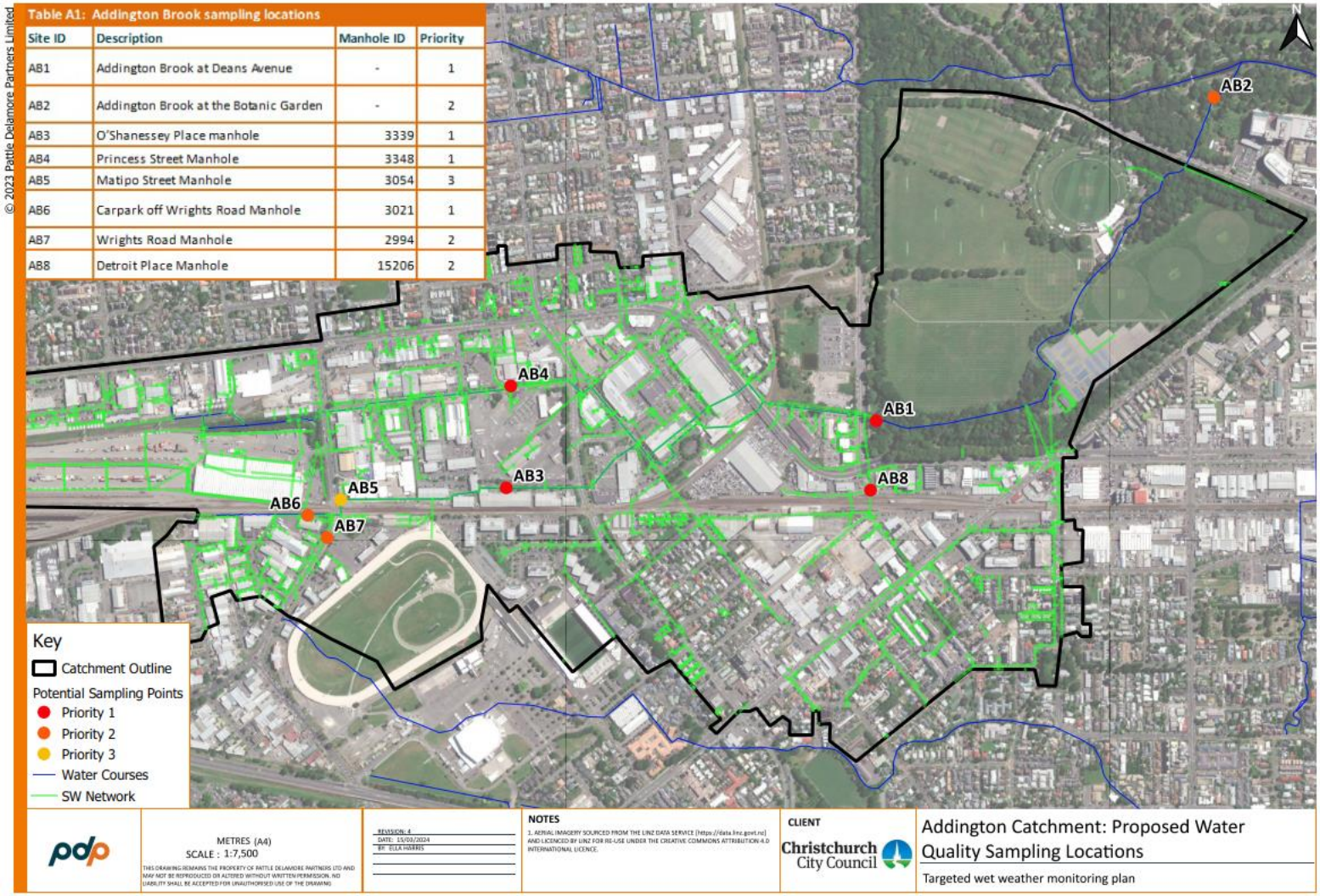

Figure 9. Proposed Sites for Dry Weather Discharges, Addington Brook.

4.5. Council Stormwater Treatment Facilities

4.5.1. Ōpāwaho-Heathcote River at Ferrymead Bridge

There are currently no plans to construct facilities in this catchment. This area is not a development growth area and mitigation options are limited by land availability. The proposed wet weather monitoring above may help inform future treatment options.

4.5.2. Curlett Stream at Southern Motorway

The Curlett first flush basin and wetland are still in the establishment phase and the plantings are not fully mature. Infill planting may be required in the future depending on plant growth over the next few seasons. There is currently an issue with sediment discharge from the wetland, and this is considered likely to be due to highly dispersive soils in the wetland base being disturbed due to wind or wildfowl action. This is likely to reduce over time as the system matures, due to plant growth and consolidation of site soils. Prior to flood events, detained first flush water may need to be released ahead of the main peak flow if it is considered that this will reduce downstream flooding. This decision will be made on a case-by-case basis and will likely be a rare event. Due to a structural failure, the Curletts stormwater storage basin has not been in operation for over a year but is undergoing repairs. Once, these repairs have been carried out and the plants are more established we will be able to do further effectiveness monitoring.

4.5.3. Addington Brook

Further CCC work in the catchment includes enhancement of lower Addington Brook and stormwater treatment in the upper catchment. A capital project to address stormwater treatment is underway for Addington Brook and Riccarton Main Drain (CMPS#41987). This project has a total budget of $25M to be spent across both catchments. The locations for stormwater treatment devices are 25 Lester Lane for Addington and within Hagley Park for Riccarton Main Drain (Figure 10). Concept design for the project has been completed by WSP and the detailed design of a Bioscape in both catchments is underway by AECOM. The detailed design will be presented in the 2025 Annual Report. The enhancement project has been completed and Figure 11 below shows before and after photos. It is intended to monitor these enhancement works this coming summer season to determine effectiveness for overall habitat improvement.

Figure 10: Locations and type of stormwater treatment devices being designed in Addington Brook and Riccarton Main Drain catchments.

Figure 11: Before (top) and after (bottom) photos of the Addington Brook naturalisation project. Photos: GSL Ltd

4.5.1. Nottingham Stream

The SMP for this catchment proposes a first flush basin, wetland and detention basin to provide stormwater treatment and flood mitigation for approximately 19 hectares of residential development. With an estimated cost of $3.5M, this is not currently funded within the 10-year horizon of the Long Term Plan; however, this facility may be delivered by the developer. Council is also investigating whether they could fund an extension to this facility to also treat up to 180 hectares of existing residential stormwater.

A stormwater treatment project is proposed for Nottingham Stream, with a focus on copper and zinc prior to discharge to the Huritini-Halswell River (CMPS#69267). This project has a total budget of $1.95M. This project is still in the concept phase. Targeted Wet Weather Monitoring will be able to be direct sub-catchments that could be treated.

4.6. Ongoing Improvement Programmes

The 2020 & 2021 report included detailed list of potential initiatives and work streams aimed at or can be aligned with improving stormwater across the City. Below is a snapshot of their current status:

- Council have begun the Stormwater and Land Drainage Bylaw industrial rollout. There is a new requirement for premises defined by the Register of Industrial and Trade Activities to obtain an Industrial Stormwater Discharge Licence (ISDL) (Clauses 27-35). This programme will allow Council to assess environmental risks and ensure compliance on industrial sites. Initial licence qualification is determined by activity type and scale. For applicable sites, the risk matrix works by crediting the site for mitigation measures. The risk score decreases when a site indicates various preventative infrastructure, processes and controls. A site's risk score determines the annual fee and auditing frequency.

- We continue to work with the trade waste team who have identified many sites where trade waste is entering the stormwater system instead of the wastewater network, meaning that contaminants ultimately end up in waterbodies. Going forward, the Trade Waste team within Council will assess the relevant high-risk sites for copper and zinc (e.g., metal finishers and motor vehicle workshops) in the four catchments to ensure that trade waste is not discharging to the stormwater system. This work may include collaboration with Industrial Site Audits and ISDL.

- Stormwater Management Plans (SMP) are to demonstrate how stormwater discharges will be progressively improved towards meeting the receiving environment objectives of the consent. Relevant tasks to target contaminants in these priority catchments include: creation of a long term zinc strategy, and looking at ways to prohibit the use of unprotected

architectural copper. Now that Council are close to completing SMPs, we can turn our focus to implementing some of these deliverables, Implementation Plan 2024 (draft).

- Community Waterways Partnership (CWP). The CWP is currently focussed on developing the programme at a high-level across the entire district. There may be scope in the future to target the programme to the four priority catchments in this report. As a start, the Avon-Ōtākaro Network, Ōpāwaho Heathcote River Network, and Avon-Heathcote Estuary Ihutai Trust are actively engaged in catchment wide advocacy, with key messaging around stormwater and connecting people with their waterways. In the Huritini – Halswell River catchment, the CWP is working with schools and a community group to encourage community connection with waterways.

4.7. Other Contributing CSNDC Programmes

There are a number of other work programmes within the CSNDC, which will also contribute to improving surface water quality across the district. These include the:

- Removal of contaminated sediment within stream channels under Schedule 3(g) and (h), which will remove legacy contaminants bound to sediment that may be impacting on surface water quality through resuspension. The feasibility study is now complete, unfortunately due to the complexity of this work a conclusion about the feasibility could not be drawn. NIWA recommended field trials and follow-up monitoring could provide Council greater understanding about feasibility across the City.
- Monitoring of treatment performance of stormwater treatment facilities under Schedule 3(i) and (j) to improve effectiveness; [Knights Stream and Prestons, Te Kuru and Richardson Tce]
- Source control measures under Schedule 4;
- Remedial Action Plan. Erosion and Sediment Control Plan for earthworks Sediment Discharge Management Plan under Condition 41-46 and Schedule 4(i), which aims to reduce the amount of sediment discharged to waterways during construction by the use and inspection of erosion and sediment control measures;
- As part of the recovery operations after the Port Hills Fire, in February 2024 projects were initiated focusing on erosion prevention and sediment capture in both Cashmere Valley and Hoon Hay Valley. In Cashmere Valley an existing sediment capture basin was extended to increase the capacity for capture of sediment. Pre-emptive removal of sediment also took place in the basin to maximise sediment capture. In Hoon Hay Valley the existing sediment basins were cleared, and gravel and mussel shell bunds added to

a portion of the channel to increase sediment capture. These will be monitored through the winter to test the effectiveness of these; and

- At the Wigram East Retention Basin, Council is trialling the installation of a mussel shell filtration bund to increase metal removal from stormwater. This will be installed at the end of the treatment wetland as a polishing filter. Mussel shell filters have been successfully used in treating acid mine drainage on the West Coast, and are also the key ingredient in the 'Storminator' treatment system for zinc removal developed by the University of Canterbury. We think that these could be used to retrofit in older SW facilities, or ones that aren't achieving their designed metal removal efficiency targets.

5. Conclusions

This report has continued to build upon the initial investigations into the source of copper, zinc, and TSS issues at the four priority sites for investigation (Ōpāwaho-Heathcote River at Ferry Road Bridge, Curlett Stream at Motorway, Addington Brook, and Nottingham Stream at Candys Road). We do not have sufficient evidence to negate the impact of stormwater discharges authorised under the CSNDC.

To address these impacts from stormwater, a number of remediation actions are proposed. This includes gathering more data on where contaminants are coming from by continuing targeted wet weather monitoring within the Curlett Stream catchment and adding additional wet weather monitoring in the lower Ōpāwaho-Heathcote River and Nottingham Stream. Dry weather monitoring is also proposed within Curlett Stream and Addington Brook to identify non-stormwater illicit discharges. To treat stormwater contaminants before discharge to the waterways, stormwater treatment facilities are planned in both Addington Brook and Nottingham Stream. Remediation will be supplemented by existing work programmes under the CSNDC, such as Industrial Site Audits and other source control programmes, as well as ECan programmes.