EMERGING CONTAMINANTS – CURRENT STATUS IN NEW ZEALAND

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ABSTRACT (500 WORDS MAXIMUM)

This paper provides insight into the status of monitoring of emerging contaminants (EC) in New Zealand. The Parliamentary Commissioner for the Environment (PCE) is currently undertaking a much larger study into the current status of chemical contaminants (CC) monitoring across New Zealand with the outcomes expected to be published in 2022.

The investigation was conducted by Jacobs, with input from Cawthron and Streamlined Environmental Ltd. This paper provides an overview on how information on ECs is gathered by councils through resource consents and SoE monitoring and included data from active land-fill leachate, municipal wastewater, and stormwater discharge consents. key finding has been that there is a considerable amount of information on ECs contained in the 'grey-literature' area, meaning that it is not readily discoverable. For example, data held in technical assessments supporting consent applications, but not part of consent conditions.

The paper includes three case study examples of monitoring programmes undertaken by councils in New Zealand:

- Case study One: Auckland Council Regional Sediment Contaminant Monitoring Programme (RSCMP)
- Case Study Two: Tauranga City Council, Bay of Plenty Regional Council
- Case Study Three: Wellington City Council, Owhiro Bay catchment water quality issues

KEYWORDS

Emerging Contaminants, Chemical Contaminants, EC, CC, contaminant monitoring, Te Mana o te Wai

PRESENTER PROFILE

Dr Becky Macdonald is a chartered chemical engineer and Jacobs Principal Wastewater Engineer in New Zealand. She has worked on many wastewater treatment plant projects across the Aotearoa, from Taipa in the far north to Invercargill in the deep south. She believes that emerging contaminants are one of the trickiest hurdles the Water Industry will have to overcome.

Dr Claire Conwell an Associate Environmental Consultant with Jacobs, specializing in water quality, ecotoxicity, and environmental impact assessments. Claire brings a wealth of experience, including aquatic toxicology, understanding the fate of contaminants in the environment, and emerging contaminants.

1 INTRODUCTION

1.1 OVERVIEW

Emerging contaminants (ECs) are a diverse group of chemicals or microorganisms that are not normally monitored or have only recently been monitored for [1]. The commonly adopted definition was developed by the US Geological Survey[2]:

> *"Any synthetic or naturally occurring chemical or microorganism that is not commonly monitored in the environment but has the potential to enter the environment and cause known or suspected adverse ecological and/or human health effects"*

Some ECs are not new and may have been discharging into the environment for a long time, but not monitored. In some cases the adverse effects were not anticipated, in other cases, detection methods were not available to identify the specific compounds. Some ECs are new, recently developed compounds for modern products and applications, and some are the byproducts or other chemical released into the environment, which then go on to react or change into other compounds with more harmful effects.

1.2 NEW ZEALAND CONTEXT

Chemical contaminants (CC)are being monitored within Aotearoa New Zealand's aquatic environment including estuarine and freshwater ecosystems. This monitoring has largely focussed on traditional suites of trace metals, hydrocarbons, legacy pesticides and nutrients, for which there are extensive guidelines and management practices prescribed.

Non-routine ECs are being increasingly being monitored including industrial, commercial, agricultural and domestic situations. A 2019 Parliamentary Commissioner for the Environment (PCE) report [3] noted that some of the standard receiving environment guidelines provides some structure for monitoring programmes of CCs[4]. However, this report identified a knowledge gap with respect to emerging contaminants. Much of the EC data is collected in discrete studies, focusing on either a narrow snapshot of compounds, or a small geographical area.

A conclusion from in the 2019 PCE report was that the process of EC data collection and management of ECs is inconsistent across regions in New Zealand. The outcomes is inconsistent reporting, and the inability for knowledge gaps to be readily identified. Information about specific ECs found in leachates, stormwater, wastewater (grey and black water discharges) is limited, analytical protocols, and assessment methods (i.e. trigger values) are different across discharge activities. The information that is collected on ECs is not currently collated in a single, consistent national database. These factors

ultimately limit the ability to assess if potential impacts of ECs entering the receiving environment are comparable across regions.

For consent-based or location specific monitoring, the variation between regions is difficult to assess. The level of expertise and skills to develop monitoring programmes that assess these risks through an evidence-based approach varies across the country. The consequence of these factors is that it is not currently possible to consistently assess the potential risk of relevant ECs to New Zealand's environment.

This paper outlines monitoring programs that currently exist in New Zealand where information on ECs is gathered. Several specific case studies are presented that show how EC's are currently being monitored in these local areas and describes how this data is being used. The paper discusses opportunities for how data can be gathered and monitored in the future, including the development of a tool for gathering data.

2 NATIONAL GUIDELINES FOR EC MONITORING

The guidance for monitoring of EC's in New Zealand is limited and spread across a several different guidelines. These guidelines themselves are limited to target specific activities, or environments. The various guidelines are non-statutory, meaning that there is no legal obligation for these to be implemented on their own. Four of the mostly commonly used key guideline documents include:

- Landfill Guidelines, documenting suggested monitoring suites for active landfills[5]
- The ecologically focused Australian and New Zealand Guidelines for Fresh and Marine Water Quality Guidelines (ANZG 2018)[6]
- New Zealand Municipal Wastewater Monitoring Guidelines (NAMWWMG) (2002)[7]
- Guidelines for the Safe Application of Biosolids to Land (Biosolids Guidelines) (2003)[8]

Due to the rapidly changing and evolving nature of ECs, some of this guidance was published nearly 20 years ago and is considered out of date. Whilst these documents provide some general guidance, they cannot be considered up to date best practice. A new draft of the Biosolids Guidelines was originally shared for comment in 2017, but has yet to be finalised. The various guidelines provide some structure for EC monitoring, and to some degree can assist in providing consistency across NZ.

New Zealand is going through a fundamental step change in the way we view and value water. As this evolves it will provide a foundation for EC monitoring and management within the water context.

- The National Policy Statement for Freshwater Management (NPS-FM) [9] sets out mandated objectives and policies that apply across all freshwater in NZ, specifying a hierarchy of rights of protection under Te Mana o te Wai.
- National Environment Standards for Freshwater (NES-FW)[10], specifying requirements for carrying out certain activities that pose risks to freshwater and freshwater ecosystem
- New Zealand Coastal Policy Statement (NZCPS)[11], specifying policies that address the requirements for councils to regulate stormwater, wastewater and toxicant discharges to the coastal receiving environment which includes some ECs

- The Guidelines for Drinking Water Quality Management for New Zealand (2019)[12], specifying maximum allowable values (MAV) of toxicants in potable water, which includes some ECs

A great deal of research has been carried out across the world[i] into EC's and considerable guidance is available internationally. Examples of commonly applied international guidelines include those derived from the United States Environmental Protection Agency (EPA), European Union (EU), and various Australian based guidelines.

2.1 NEW ZEALAND BIOSOLIDS GUIDELINES EXAMPLE

Biosolids are sewage sludges or sewage sludges mixed with other materials that have been treated and stabilised to the extent that they are able to be safely and beneficially applied to land. There are two grades in the Biosolids Guidelines[13], the first letter denotes the stabilisation grade of the biosolids (Grade A or B) and the second letter denotes the contamination levels of heavy metals and pesticides in the biosolids (Grade a or b).

- Grade A stabilisation requires a quality assurance program to be in place in addition to a robust pathogen reduction process (e.g. thermal treatment, lime stabilisation and composting). Grade B stabilisation requires the biosolids to be processed via an acceptable vector attraction reduction (VAR) method.
- Biosolids that satisfy the contaminant Grade "a" are expected to have very low concentrations in CCs and ECs. Refer to the Biosolids guidelines for details on the derivations and the limits of the stabilisation and contamination grades.

Biosolids are known to have significant fertilising and soil-conditioning properties as a result of the nutrients and organic materials they contain – thus the Guidelines set out in 2003 (revised as a draft in 2017) sets out a pathway for the beneficial re-use of this as a resource to enhance soil condition and provide an alternative to disposal to landfill. However, in addition to natural nutrients, biosolids may also contain various CCs, including the potential for a wide range of EC's. They therefore require appropriate management to minimise the risk to public health and the contamination of the receiving environment (i.e. land, surface and groundwater and the coastal marine area).

New Zealand produces an estimated 300,000 tonnes of municipal biosolids from the 320 WWTP each year. Of this, approximately 32% is disposed of to landfill/onsite storage (Table 15) and 45% goes to quarry rehabilitation[14]. Therefore, for the majority of NZ biosolids the potential effects of both landfilling and rehabilitation activities will be governed by consents held for those activities rather than under consents specific to the disposal of biosolids to land. For example, the composition of biosolids going to landfills will be managed through the Waste Acceptance Criteria set by the individual landfill consent or management plan. Then the effects of the biosolids disposal would be on resulting leachate quality that would be managed by consents authorising the discharge of the landfill leachate.

The 2017 draft Biosolids Guidelines provides some, limited guidance for management of EC's within the context of biosolids, with four specific groups of EC's listed.

- Nonyl phenol and ethoxylates (NP/NPE)
- Phthalates (DEHP)
- Linear alkylbenezene sulphonates (LAS)
- Musks – Tonalide and Galaxolid

This draft also includes a recommendation that the list of EC's be reviewed five yearly intervals.

Vermicomposting in the Waikato Region has been operating under several resource consents (since approximately 2012) to include the use of biosolid in the consented waste stream accepted on site for the purpose of mixing with other organic waste streams, via a vermicomposting (worm-based composting) process. Up to 28,000 tonnes of municipal biosolids is consented to be processed at the vermicomposting facility each year. Results of leachate characterization (as required in the consent) indicate that the Class B leachability limits are generally complied with. Soil testing conducted in 2019 indicated that soil quality underneath the vermicomposting windrows (piles) were not impacted by CCs including ECs

In the Auckland Region, the Mangere WWTP, servicing a population of 1.1 million people, produces around 43 % of the total biosolid volume in New Zealand. This volume of biosolids is currently managed under the Puketutu Island Rehabilitation Management Plan (PIRMP, as part of the managed fill consent). Biosolids from the Mangere WWTP undergo dewatering and drying, and are disposed of to the Puketutu Island site, for the dual purpose of rehabilitation of the area previously use as a quarry, and to provide for a means of disposal of the biosolids volume. Receiving environment consent monitoring imposed on the site requires routine groundwater monitoring of various metals CCs (zinc, cobalt, copper, nickel, arsenic, chromium, iron, lead, manganese, mercury, and tin), but not EC's. A baseline assessment conducted in 2014 was required to establish and trigger of target values the CCs to be incorporated into the PIRMP. An 'alert level' of three standard deviations above the mean, and a response level at four standard deviations above the mean of baseline sampling results.

Results from the 2020 Annual Monitoring report indicate occasional exceedances of metals. The report indicates monitoring will continue at 2-weekly intervals, and that exceedances were not considered to be indicative of a liner breach (i.e. indicating discharge of leachate to groundwater).

3 EC MANAGEMENT IN NEW ZEALAND

3.1 RESOURCE CONSENTS

The Resource Management Act1991 (RMA) is the current legislation in New Zealand that manages discharges to the environment through resource consents (permits). The resource consents provide a mechanism for monitoring various CCs through specific resource consent permits for individual activities. This includes the discharge of ECs. The EC information gathered as a result of resrouce consent monitoring is focused on the requirements of the that specific activity and location.

Regional specific issues are identified through the RMA planning framework and therefore the requirement for resource consents follow on from these regional specific issues. This can result in differences between regions regarding the approach to common activities with the outcomes that monitoring of ECs may also differ between regions.

Each resource consent application assesses the matters of relevance to that activity and location – the resource consent application will include an Assessment of Effects on the Environment (AEE) that is in accordance with the scale and nature of the potential effects to the specific receiving environment. Hence, consideration is made of the nature of the discharge, the treatment being provided and the type and quality of receiving environments, among other matters. This means that the ECs monitored for are inherently linked to the original resource consent application as is the interpretation of the information gathered.

Given that monitoring is required for specific reasons, each resource consent application is decided on its own merits in relation to the location, environment and opinions of

submitters (among other matters). Thus, the monitoring requirements are usually specific and tailored to the consented activity and the reasons for that monitoring.

In a national context, there are differences between the ECs monitored for each consent, variations in test methods and difference in interpretation. This makes consistent and reliable comparison difficult, if not impossible.

3.2 STATE OF THE ENVIRONMENT MONITORING PROGRAMMES

RCs and UAs are mandated under Section 35 of the RMA (Section 35(1) and 35(2)) to gather information, monitor, and keep records about the state of the environment. This is commonly referred to as State of Environment (SoE) monitoring. Furthermore, the RMA specifies that information must be compiled and reviewed at least every 5 years (s35(2A)) – this is commonly referred to as 'Trend' analysis. This monitoring can include some specific ECs.

Differences in the SoE monitoring occurs across the different regions of NZ due to:

- Monitoring is generally in accordance with the requirement of specific regional plans – given each regional plan differs, and catchment specific requirements differ, then in turn SoE monitoring programmes are different between councils in terms of network design
- Network and monitoring design is generally undertaken on a representative area for major land-use and catchment types – and undertaken on a representative catchment basis, rather than specifically directed at point source or activity based discharge effects monitoring

Similar to resrouce consents, in a national context, the regional differences between the ECs targeted under SOE monitoring means that consistent and reliable comparison not possible. However, regional councils are currently looking to create greater consistency under the SoE programme, via the data reporting systems implemented by Land Air Water, Aotearoa (LAWA), and mandated by the sectors Resource Managers Group (and then by the Regional Councils' Special Interest Groups).

3.3 OTHER EC MONITORING IN NEW ZEALAND

A number of other mechanisms existing in New Zealand that directly or indirectly support councils to further develop knowledge about CCs. These include individual council focused initiatives facilitated through the Resource Managers' Group, various central government funded programmes and a number of research investigations. These provide opportunity to gather information on ECs.

3.3.1 LOCAL COUNCIL INITIATIVES

Council Special Interest Groups (SIGs) have provided funding for championing Ministry of Business, Innovation, and Employment (MBIE) Envirolink advice programmes and the development of monitoring tools [15]. Some examples of what has been produced out of these tools include the Estuarine Trophic Index (ETI) Tool, Urban Water Quality Tool, Eco-Sediment Guideline Value Tool, Review of EOCs in New Zealand.

The Land, Air, Water Aotearoa (LAWA) module development is a coordinated data reporting system, funded by MBIE and Ministry for the Environment (MfE), supported by various councils, for the purpose of collating and reporting SoE data[16]. The domains for groundwater and river water quality are publicly available, but data currently reported does not currently include the full suite of ECs analysed by each council. The domain for coastal/estuarine quality is currently under development.

National Environment Monitoring Standards (NEMS) provide a series of standardised sampling methodologies across a series of environmental monitoring disciplines [17]. It is designed by technical expert working parties in collaboration with regional council experts, for the purpose of setting out protocols for best practice for field sampling (including ECs) and management of the information generated.

3.3.2 RESEARCH COLLABORATIONS

Cawthron are leading an MBIE funded five year Emerging Contaminants programme. This comprehensive research programme is investigating the risks of EOCs to New Zealand aquatic biota [18].

Another programme, lead by the Institute of Environmental Science and Research (ESR) is the Aotearoa Impacts & Mitigation of Microplastics (AIM2) MBIE programme[19]. This five year research programme, funded by MBIE, is investigating the risks of microplastics to New Zealand's ecosystems, animals and people.

3.3.3 NATIONAL MONITORING PROGRAMMES

National Groundwater Pesticides Programme is undertaken on a four-yearly basis in collaboration with regional councils[20]. IN 2018 this programme included a comprehensive analysis of ECs.

3.3.4 NATIONAL REPORTING AND REVIEWS

MfE's Urban Water Quality State and Trends report provides a detailed assessment of the state and trend of water quality in urban streams for several sites across New Zealand[21]. This reporting programme provides long term records for key metal CC, but not ECs.

The Environmental Reporting Act review by the PCE is focused on the Act[22]. However, key themes relevant have emerged regarding in the report, specifically regarding the differences in how monitoring data is collated and reported across New Zealand.

3.3.5 CENTRAL GOVERNMENT POLICY REFORMS

The reform of the water sector in New Zealand by central government will provide the foundation for how water is managed into the future. This will, in time, include the monitoring, analysis, collation and distribution of information on ECs that is consistent.

Three Waters Review by the Department of Internal Affairs (DIA) provides a comprehensive assessment of the status of Three Waters (drinking water, wastewater, stormwater). It provides detailed information on the service provision and asset management by councils across New Zealand [23].

Establishment of a new Water Services Regulator, Taumata Arowai[24], and the Water Services Regulator Act[2526] underpin the management of New Zealand's water into the future. Once fully functional, the Taumata Arowai will oversee, from a national perspective, the environmental performance of wastewater and storm water networks across New Zealand (as well as drinking water). The management of ECs in water will be one of the key challenges to be managed.

4 MONITORING CASE STUDIES

4.1 CASE STUDY 1: AUCKLAND COUNCIL REGIONAL SEDIMENT CONTAMINANT MONITORING PROGRAMME (RSCMP)

The Auckland Council, through its Healthy Waters Department, manages the public stormwater network across the Auckland region. This network is extensive, comprising more than 6,000 kilometres of pipelines, several thousand outfalls and more than 900 stormwater treatment facilities. The network discharges to streams; coastal environments, including harbours, estuaries and open coastal water; and shallow groundwater systems in some parts of the region. A Network Discharge Consent (NDC) global Stormwater Consent was issued in 2018 to authorise the discharge of stormwater across the public stormwater network to the receiving environment. Condition 37 of the consent requires an 'Auckland Stormwater NDC Monitoring Strategy' to be set out, that incorporates relevant aspects of the long term SoE monitoring programmes: stream water quality; stream ecology; groundwater quality; marine benthic contaminants; and marine ecology.

In terms of marine sediment quality monitoring, Auckland Council's "Regional Sediment Contaminant Monitoring Programme" (RSCMP) conducts regular marine sediment contaminant monitoring across the region's harbours and estuaries. Data from over 130 sites has been collected to date. A sub-set of RSCMP monitoring sites, usually about 20–30 sites, are sampled each year.

The RSCMP is undertaken across three programmes:

- The State of the Environment (SoE) marine sediment monitoring programme, covering 27 sites, monitored approximately every two years since 1998. This programme aims to provide long-term information on contaminant status and trends across the region.
- The Regional Discharges Project (RDP), which monitored an additional 51 sites, at two to five yearly intervals. Monitoring in the RDP began in 2002, and was administered by the ARC on behalf of the region's Territorial Local Authorities (TLAs). This programme was aimed primarily at monitoring the effects of stormwater discharges, as part of the TLA stormwater network discharge consenting programme.
- The Upper Waitemata Harbour (UWH) benthic ecology programme, which has monitored 13 Upper Waitemata Harbour sites since 2005. This programme provides information on the effects of urban development on the Upper Waitemata Harbour.

Various CC are routinely analysed in the RSCMP. Persistent organic pollutants (POPs) such as polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCP), and polychlorinated biphenyls (PCB) have also been analysed at times in the past. These contaminants are now scheduled to be analysed much less frequently than for metals and at only selected "at risk" sites, for example estuaries at the bottom of established industrial catchments with a history of contamination, or coastal sites at the bottom of catchments undergoing land-use change associated with urbanisation and industrial growth.

ECs are not yet routinely analysed in the RSCMP. A scoping study commissioned by AC of sediments from 13 estuarine locations around Auckland was undertaken in 2008, with samples analysed for 34 emerging contaminants that could be analysed by commercial laboratories at the time. Subsequently, a range of common pharmaceuticals was also analysed on these samples[27].

Analysis of ECs at six RSCMP sites was undertaken in conjunction with the 2017 RSCMP sampling round. Additional sites are to be assessed by AC under the RSCMP in future to build up a more comprehensive picture of EC distribution.

A comprehensive quality assurance (QA) system is conducted to check that the RSCMP data are "fit for purpose" – i.e. suitable for reliably assessing status and temporal trends. The QA system has evolved over time since the SoE programme first began in 1998. Single Site Reports (SSRs), which summarise sediment contaminant status and trends at each site, are updated annually and reported on the Knowledge Auckland website[28].

The long term data records of key stormwater contaminants incldueing PAHs enable annual trend detection analyses to be updated with data relevant to the subset of catchment sites sampled: this serves as a key use of the data for a multiple range of uses, including State of the Environment (SoE) reporting; stormwater quality management; resource consenting; policy development, and public education.

4.2 CASE STUDY 2: TAURANGA CITY COUNCIL, BAY OF PLENTY REGIONAL COUNCIL AND EC_S

Tauranga City Council (TCC) holds three global stormwater consents: Tauranga City Comprehensive Stormwater Consent (CSC number 66823), Papamoa Comprehensive Stormwater Consent (CSC number 63636), and Maranui/Mangatawa Stormwater Consent (CSC number 65714). These consents set out the requirements for monitoring and reporting on stormwater discharge quality across the Central Tauranga to Papamoa Beach districts – and include residential, commercial, industrial and the Port catchments. The consents also set threshold values for discharges and set out what actions are required if results repeatedly exceed these.

TCC is required to prepare a five-yearly monitoring report in accordance with condition 9.9 of the TCC CSC (CSC Number 66823). This condition requires an integrated assessment of the past five years of consent monitoring data relevant to the consent conditions. The most recent integrated report was set out in 2018, covering the 2013-2017 reporting period, and also included the outcomes of both the Papamoa and Maranui/Mangatawa CSC – encompassing 51 stormwater monitoring sites across 28 sub-catchments.

Funding for comprehensive/global consents and SoE monitoring typically requires budgeting to be forecast and submitted to the local Long-Term Plan (three yearly) process. Under the most recent five yearly report cycle for the TCC CSC, in addition to the consent monitoring data, TCC also commissioned the integration of the relevant SoE catchment monitoring records for the same reporting period for the assessment of each sub-catchment against the relevant consent requirements. This was undertaken to determine the cost of anticipated future works to mitigate stormwater effects and undertake waterway enhancements.

As part of the comprehensive review, a substantial revision of the monitoring plan was also undertaken in response to the data analysis and need to increase spatial coverage of discharge point monitoring. Whilst a comprehensive review of the impacts and priorities across the affected, sub-catchment key recommendations were focused on traditional stormwater CC's (copper and zinc) given that these formed the main component of trigger level exceedance analyses. Recommendations from the 2018 reporting did not extend to the inclusion of any ECs or targeted investigations, but instead focused on recommendations to focus on reducing catchment loads (such as inclusion of stormwater treatment devices), and recognition of cultural values and ecological enhancements (such as revegetation/wetland enhancement programmes).

More recently, the BOPRC commissioned a survey of 16 coastal and freshwater receiving environment sites for the analyses of a suite of ECs (based on the Tier 1 suite set out by

the 2016 Envirolink report for Regional Council EC monitoring programmes, see Stewart et al. 2016). These results are pending publication by BOPRC, and will form part of a slowly growing picture about EC monitoring by the regional sector across key receiving environments and the relationship of these data to key contaminant sources and potential risks of future sources associated with land use changes.

4.3 CASE STUDY 3: WELLINGTON CITY COUNCIL, OWHIRO BAY CATCHMENT WATER QUALITY ISSUES SAND EC_S

A comprehensive review of the issues in the Owhiro Stream Catchment was undertaken in 2017, following a record of historic consent discharges from the operational landfills in the catchment, strong community concerns regarding poor water quality, and the poor water quality issues apparent following the Kaikoura earthquake which caused localised land slumps and influenced leachate behavior. Other historical and more recent issues have been identified regarding the condition of the stormwater and wastewater pipe assets, and the presence of lateral connections from the wastewater to the stormwater infrastructure, meaning discharge of untreated wastewater to the stormwater network. On top of this, the presence of wastewater network overflows (constructed and unconstructed), and more recently the increasing sludge disposal generated by the Moa Pt WWTP to the Southern Landfill (which has recently reported a 400% increase in disposal[1]) in the catchment have all contributed to concerns about the management of CCs entering the receiving environment. A key concern is the potential for discharge of unknown EC's into the environment.

The Owhiro stream runs through the southern urban centre in Wellington, discharging to Owhiro Bay on the south coast, and into the Taputeranga Marine Reserve. It has two main tributaries, draining Kowhai Park Gully (where the T&T landfill is located) and Carey's Gully (where the Southern Landfill and the C&D landfill are located).

Current landfill related monitoring requires a combination of monthly to quarterly monitoring for nutrients, faecal contaminants and suspended sediment. Macroinvertebrate sampling is also required as part of consent monitoring. An artificial wetland is being constructed to treat the surface stormwater and leachate prior to discharge to the stream. Recent notifications regarding orange/rust coloured precipitate in section of the stream have prompted further analyses of water quality with regard to discharges from the landfill, including EC's.

In addition to landfill consent monitoring, Wellington Water's global stormwater consent (GSC) includes a series of sites primarily focused on monitoring for indicators of faecal contamination.

A key recommendation from the 2017 review included the reinstatement of the downstream Owhiro Stream SoE site and include a metal suite for analysis (previous monitoring under the regional SoE programme was discontinued as the impact of urbanisation on local streams was already represented in the SoE network). Current monitoring schedules have also included the lower reaches of the Owhiro Stream as a site in the current global stormwater consent (GSC, held by Wellington Water), and includes analyses for metal CC at the bottom of the catchment.

A key action initiated in response to the ongoing water quality issues, and mandated under the framework of the GSC, has focused on mitigation of human health impacts, rather than the management of CCs, as human health effects are considered to require the more immediate attention with respect to overall risk management.

[1] https://wellington.govt.nz/-/media/environment-and-sustainability/water/files/2020/mayoral-taskforce-briefing-18-03-2020.pdf?la=en&hash=11B317341847512D6DE13879984C416E32C12F83

Condition 13 of the GSC requires the implementation of a 'Human Health Mitigation Project' to address concerns of poor water quality and impacts on human health (i.e. with a focus on identification and reduction of wastewater network overflows that are entering into the stormwater network), and to establish this as 'template' / framework for other investigations that have been escalated in other sub-catchments being monitored under the GSC. The projects are implemented across the Wellington region, under the GSC, where the risk to human health has been assessed as unacceptable (under the internal framework developed by WWL), and requiring priority funding to repair infrastructure (as set out in the Long Term Plan funding cycles, administered by WWL on behalf of Wellington City Council) and communicate risks to the public.

Preliminary results of the HHMP framework for the Owhiro Bay catchment indicate that the faecal contaminant triggers to initiate a HHMP are being met, with full analysis pending in the 2021 annual report. A summary of the investigations presented to the Wellington City Mayoral Taskforce, initiated February 2020 in response to ongoing water quality concerns, indicated for Owhiro Bay, the recent identification and repair of five lateral cross connections in a single subdivision, concluding the potential for systematic plumbing issues for this subdivision. In terms of overall pipe condition, around 40% of the 53 km length of the wastewater pipes in the catchment overall are rated as 'very good' (no repair needed), but 22% are collectively rated as 'poor' to 'very poor' (repairs/replacements required).

A full review of the GSC is likely to be undertaken in 2024 to inform the requirements for long term monitoring options, as well as to contribute knowledge to the development of the second stage global stormwater consent which sets out the long term catchment priorities and strategic requirements to manage stormwater and wastewater network overflows entering the stormwater network across the Wellington Region. Under the GSC, wastewater overflow discharging into the stormwater network is defined as a stormwater contaminant and is no longer defined as wastewater.

Other linkages of these catchment investigation have been analysed and integrated at a high level as part of the series of technical investigations undertaken for the Wellington Whaitua (NPSFM implementation and limit setting process). In the context of 3 waters, summaries of the wastewater and stormwater assets in the Wellington region[2] indicate for wastewater assets – across the Wellington Whaitua region, WNOs in the Owhiro catchment represent 2% of the WNOs across the region (the highest being in central Wellington and Wainuiomata catchments which make up 87% of the WNOs across the Whaitua). In the 2018/19 monitoring period, these WNOs in the Owhiro catchment contributed 104 m^3 of untreated wastewater discharged to the receiving environment – the equivalent to just over 4% of the volume of an Olympic size swimming pool.

Recommendations from the Wellington Whaitua limit setting process are pending, and following consultation these will then be recommended for inclusion into the Wellington Region's Natural Resources Plan. These outcomes will likely include objectives for key stormwater CCs and potentially ECs, as well as acknowledgement and measures for the enhancement of water quality of the Taupeteranga Marine Reserve as a key receiving environment at the bottom of the Owhiro Stream Catchment.

[2] http://www.gwrc.govt.nz/assets/Whaitua-Te-Whanganui-a-Tara/TWT-WhaituaWellingtonHutt-ValleyandWainuiomataStormwaterandWastewaternetworkoverviewFINAL.pdf

5 KEY OUTCOMES

Generally, councils do not include EC's into routine SoE monitoring as SoE/other routine programmes are not generally tailored to provide information and understanding of specific ECs across the regions. Generally, SoE monitoring has been focused on understanding the broader regional scale issues rather than on specific EC's. Clear guidelines/limits to comparing any data with that relate to effects and inexpensive analysis methods that allow for routine monitoring was also identified as a requirement for incorporation on non-routine CC/EOCs. Some wider range of targeted/one-off investigations have been undertaken (or are planned) for specific EC's. These vary from region to region and are generally in response to local perceived issues and potential concerns (such as pesticides, PFAS etc.).

The key issues regarding EC management through regional plans and consenting processes include:

- Potential ECs that may be present in discharges are identified during the application and processing of resrouce consents and the requirement for on going consent monitoring is limited to these activity specific ECs.
- Specific consideration to ECs is being increasing incorporated into new generation regional plans newer consents having a requirement for monitoring a wider range of contaminants. Resource consents granted under older style regional plans have less of a focus on ECs. It will be many years before these older style consents expire and provision for EC's to be included.
- The approach to consenting has not largely changed whilst knowledge of what contaminants may be involved has changed. Under the RMA, activities still being assessed individual, based on an assessment of the scale and nature of potential effects.
- There are inherent differences in the approach used for the management of ECs in water, wastewater and stormwater. There are also differences in the approach used by individual councils which are largely depended on the size/scale of the council and/or activity. This results in information that is captured and tested using different methods, is inconsistent across geographies and cannot be readily compared.

There are a range of potential barriers to implementing best practice EC management across New Zealand, including:

- The knowledge and expertise of the potential effects of contaminants is limited to a few key people and organisations. Training and upskilling of the water industry on ECs is required to overcome this.
- There is a lack of nationally consistent guidelines or frameworks to facilitate management of ECs and the comparison of information across regions and between studies.
- There is little knowledge in New Zealand of practical treatment or mitigation technologies for ECs. Considerable research has been undertaken across the world, and leveraging international networks and expertise of global companies such as Jacobs, will provide a mechanism to overcome this challenge.
- Currently the costs of EC testing is high and restricts the commitment to regular comprehensive monitoring programmes, especially smaller councils. The development of standardised testing and agreement across the water sector on standard indicators EC's will go some way to making these costs manageable.

- Lack of knowledge and expertise on where (and whether) EC's are likely to be an issue. Again, Considerable research from world means that leveraging global specialists from companies such as Jacobs, will allow this knowledge to be shared.

ACKNOWLEDGEMENTS

Jacobs wish to acknowledge the Local Government sector's Resource Managers Group (RMG) for facilitating council contacts and dissemination of information regarding this survey.

Acknowledgement and appreciation is extended to the many council staff members for their time to collate and supply requested data, and for the extra time to discuss the survey.

Drs Louis Tremblay from Cawthron Institute and Mike Stewart from Streamlined Environmental Ltd whose roles as leading NZ researchers into ECs provided guidance on the overall direction and approach of the wider PCE project.

PCE of which the information reported here is a small part of a wider, national scale investigation of chemical contaminants.

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