Monday, 15 July 2024

Te Hui o Te Kaunihera ā-Rohe o Heretaunga
Hastings District Council
HDC : Tangata Whenua Wastewater Joint Committee Meeting

Kaupapataka

Attachments Under Separate Cover

Te Rā Hui: Meeting date:	**Monday, 15 July 2024**
Te Wā: Time:	**1.00pm**
Te Wāhi: Venue:	**Council Chamber** **Ground Floor** **Civic Administration Building** **Lyndon Road East** **Hastings**

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TE KAUNIHERA Ā-ROHE O HERETAUNGA

Hastings Wastewater Consent No. CD130214W Trends, Technology, Discharge, Environmental and Monitoring Review Report

July 2024 **Ref: 310003259**

PREPARED FOR:
Hastings District Council

PREPARED BY:
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Revision schedule

Rev No	Date	Description	Prepared by	Checked by	Reviewed by	Approved by
v1	17/02/2023	Initial outline draft	JG, AD	JB	-	
v2	06/04/2023	Initial outline draft for client review	AD	JG	JB	
v3	22/01/2024	Draft for internal detailed review	JG	-	-	
v4	31/01/2024	Draft for HDC and external (GEM) peer review	JG	JG	SB	ML
v5	06/05/2024	Draft for internal review, incorporating changes to address feedback from GEM peer review	JG	JG		
v6	13/05/2024	Final Draft for HDC and external peer review	JG	JG	JB	IR
v7	11/07/2024	Final Draft for HDC-TWWWJC	JG	JG	GR	IR

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Executive summary

A Review of the discharge consent for East Clive Wastewater Treatment Plant (the WWTP) has been completed by a team of technical specialists from Stantec on behalf of the Hastings District Council (HDC), to satisfy Condition 27 of the resource consent (AUTH-120712-01) held by HDC to discharge treated wastewater into Hawke Bay via an offshore outfall in East Clive, Hastings. Condition 27 requires a Trends, Technology, Discharge, Environmental and Monitoring Review Report (the 'Review Report') to be completed every nine years for the duration of the consent term.

The bulk of the Review Report content was developed between January 2023 and January 2024, with subsequent peer reviews and revisions undertaken to May 2024. The Review Report offers a very deep and broad insight into the operations of the Hastings Wastewater Scheme, taking a 'big picture' view to understand the changes that have occurred over the past nine years since the consent was issued in 2014, and the changes to be considered for the next review period (to 2032) and beyond. The resulting output was a lengthy and highly detailed analysis.

For reference, a conceptual diagram of the East Clive WWTP and its treatment processes is attached as Figure 1 below. The incoming wastewater (influent), the WWTP treatment processes, and the outgoing discharges of final combined treated wastewater via the offshore outfall are all discussed in detail in Section 1 of the Review Report.
The wastewater network comprises two systems which connect to the East Clive WWTP as two separate waste streams:

1. **Domestic and Non-separable Industrial wastewater system (DNSI)** – collects wastewater from residential and commercial properties, and some Permitted industrial / trade waste wastewater.
2. **Separable Industrial** / trade waste wastewater system – collects 'Controlled wastewater' from selected industrial sites.

The separate streams are treated separately at the East Clive WWTP site before being combined for discharge to the offshore outfall.

The key treatment units for the Domestic Non-Separable Industrial (DNSI) waste stream at the WWTP are the Biological Trickling Filters (BTFs). The combination of the BTFs and the Rakahore Channel was a first of its kind in Aotearoa New Zealand and internationally, and similar BTF plants are now at Napier, Gisborne and Greymouth. The WWTP has received national accolades and international attention for its innovative use of biological treatment and incorporation of cultural values into the design and operation.

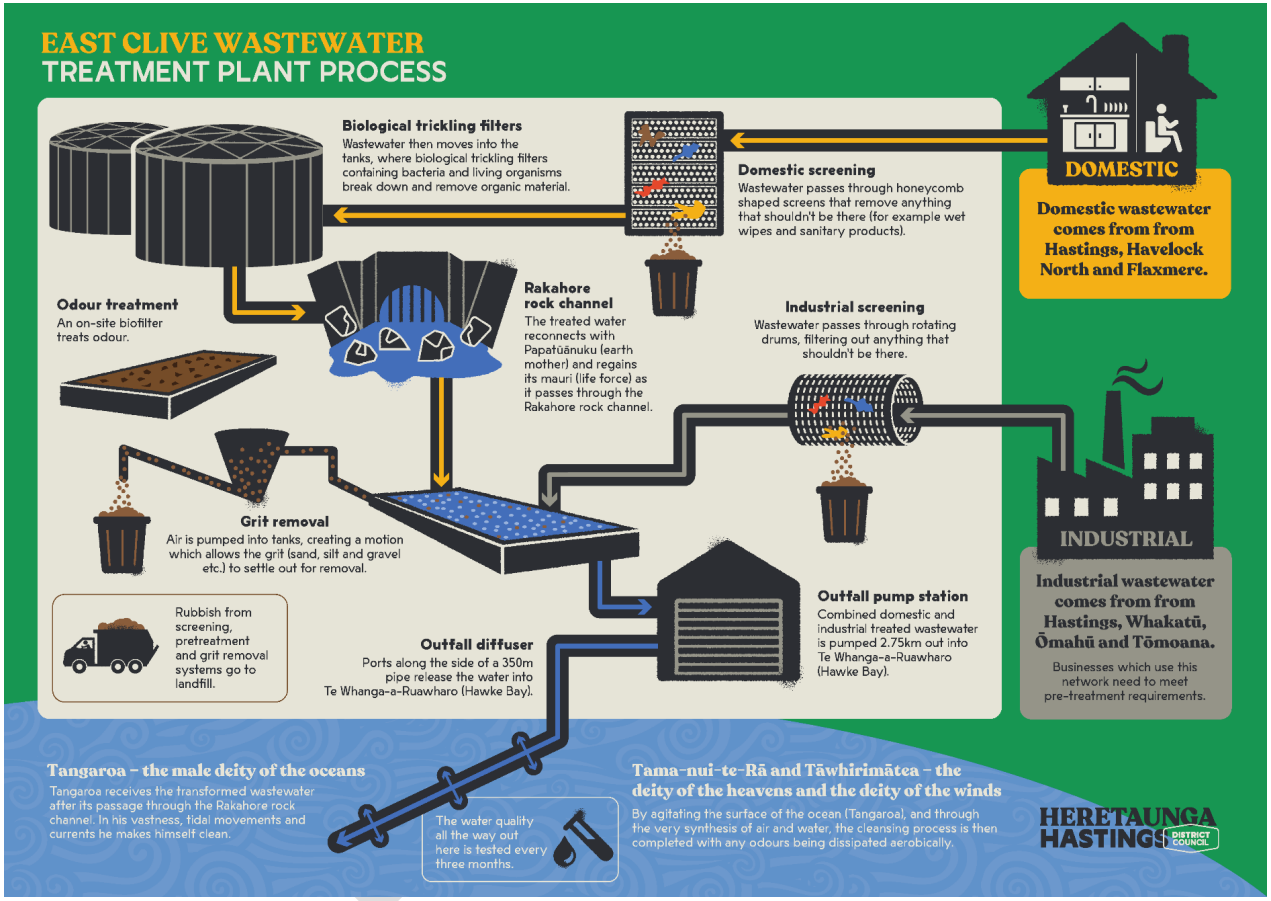


Figure 1 Conceptual diagram of the East Clive WWTP Treatment Process (Source: HDC 2023)

What is the purpose of the Review?

The Review is intended to meet the requirements of Condition 27 of the resource consent (AUTH-120712-01) to discharge treated wastewater into Hawke Bay via an offshore outfall at in East Clive. These requirements were included in the consent conditions as a result of extensive consultation in 2013 with Tangata Whenua and HDC representatives, technical experts and other stakeholders when the consent application was being prepared. This inaugural Review Report was completed by Stantec (consultants) on behalf of Hastings District Council (HDC), and also incorporates inputs from third parties including Te Taiwhenua o Heretaunga, the Cawthron Institute, and the National Institute of Water and Atmospheric Research (NIWA).

How was the Review scoped?

Scoping of the Review tasks contributing to the report began as early as August 2022 with subsequent consultation with the Hastings District Council and the HDC-Tangata Whenua Wastewater Joint Committee (HDC-TWWWJC), through October and November 2022. Table 1 provides an overview of the final scope and structure of the Review Report. The Report is structured to directly mirror the wording and order of consent conditions, to make it easier for Regional Council officers assessing the report for compliance and for general readers.

Table 1 Key components of the Review Report

Component	Consent condition(s) addressed	Report section(s)
Population and land use changes	27(a)	2.1
Wastewater flows and loads assessment	27(b)	2.2
Industrial / trade waste assessment	27(c)	2.3
Regulatory review	27(d)	2.4
Asset management	27(e)	2.5
Wastewater treatment technology and review of alternatives	27(f)	2.6
Recreational usage survey	27(g)	2.7
Assessment of options for treated wastewater disposal / discharge and beneficial reuses that may be appropriate to the Wastewater Scheme	27(h)	2.8
Effects Assessment	27(i)	2.9
Community engagement	27(j)	2.10
Consideration of the existing Project Objectives, opportunities for improvement and Best Practicable Option (BPO)	27	3

As described above, input was sought from the HDC-TWWWJC to identify any further matters to be included in the Review; this was in alignment with Condition 29(e) of the consent which allows for the HDC-TWWWJC to provide "*any further suggested input in respect to the scope of the review*". Numerous matters were identified; these are detailed in the Review Report (Section 1.4.2, with a guide to which specific sections deal with each issue provided in Section 5). Where possible the issues were integrated into the scope for the review and are addressed throughout the Review Report. The Review Report also analyses the existing consent conditions and recommends which of those conditions should be reviewed (to determine if a change is needed) or changed directly (if a change had already been identified). This is not required by Condition 27 but was seen as a highly valuable exercise by HDC.

What methods were used, and who was involved?

Condition 27 states the minimum requirements for the nine-yearly Review Report. The Review Report is structured to clearly reflect each of the sub-conditions of Condition 27, including additional sections to provide further commentary on matters outside the direct scope of Condition 27 (including those raised by the HDC-TWWWJC), or to provide useful context to the review. This approach is intended to assist officers from Hawke's Bay Regional Council in assessing the

adequacy of the report and level of compliance with the consent conditions, but also to make it easier to read for a general audience.

A draft of the Review Report was initially reviewed in detail by Good Earth Matters Consulting Limited (GEM) in February 2024 at the behest of HDC, providing an independent opinion on the scope, content and outcomes from the review. Overall, the initial review was positive and constructive, raising several matters for further discussion with HDC and Stantec. This led to subsequent updates to the Review Report content. GEM completed the final review of the Review Report in June 2024, and will be attending the presentation of the review findings to the HDC-TWWWJC in July 2024, prior to submission to HBRC as required by condition 29(f) of the consent.

Assessment of wastewater flows and contaminant loads

The Review Report (Section 2.2) assesses whether there have been any changes in the volume of wastewater received at the WWTP ('influent'), the volume of treated wastewater discharged via the offshore outfall ('Total Combined Discharge' or TCD) and the level and type of contaminants found in each. The TCD includes both wastewater from Separable Industrial and DNSI systems; Figure 1 shows these two separate waste streams and how they are treated.
Both the concentrations of contaminants (mass of contaminant per volume of wastewater) and the loads of contaminants (mass of contaminant generated over a specified time, such as per day) are considered. To achieve this, detailed calculations were based upon a large amount of data collected from the Hastings Wastewater Scheme since 2013. HDC collects data at a range of frequencies (from continuous, at 15-minute intervals, to quarterly or annual sampling); these are captured either by the WWTP's SCADA system (a real time, digital monitoring and operational control system) or in the Infrastructure Database (ID) which is managed on HDC's intranet.
The calculations for 2023 are compared to the equivalent calculations made to inform the consent application prepared in 2012/13, using the same methodology as was applied back then. The main components of the assessment are:

- The wastewater volumes and contaminant loads that were used in the 2013 AEE.
- The wastewater volumes and contaminant loads that were received at the East Clive WWTP between 1 January 2013 and 31 December 2022.
- The growth and serviced area projections which form the basis for the current (2022/23) calculations of predicted Domestic and Non-separable Industrial (DNSI) volumes and loads and for the Separate Industry Stream.
- The Projected Wastewater Volume, Flows and Loads for the remainder of the current discharge consent term, to 2049.

The assessment relied heavily on establishing the current population serviced by the Hastings Wastewater Scheme (as of 2023), and the projected population and industrial changes and trends for the remaining life of the consent, up to the year 2049. This was not straightforward; it required a review of several different sources and assumptions referenced or relied upon by different departments with HDC, depending on the purpose for which they were applied. The Review Report identifies a need for the processes to develop population and growth projections (including the preferred source data to be used) to be made consistent and simplified for future reviews. The assessment assumes an annual population growth rate of 0.7% to 2049. This was based on the projection made by Statistics NZ in 2018, for a medium growth scenario.

Assessment of industrial / trade waste discharges

The Review Report describes:

- The different types of industrial / trade waste discharges received at the East Clive WWTP, and how they might change into the future
- The history of the changes to HDC's Bylaw(s) since 2013, regarding management of trade waste
- The effectiveness of the current Consolidated Bylaw 2021 (Chapter 7 – Water Services) provisions in managing trade waste and complying with resource consents

- Trends and emerging issues with regards to the implementation of the Consolidated Bylaw, and compliance across industrial / trade waste premises as a whole (including those issues raised by the HDC-TWWWJC when agreeing on the scope of this review, such as consideration of mortuary waste)
- Any changes that would enable more effective management of industrial / trade waste discharges into the future (or for consideration in future consent reviews)
- Possible new legislative requirements as relevant to trade waste (identified in Condition 27(d) regulatory review) including possible implications and (any) management requirements for these.

These aspects were addressed using information gleaned from targeted discussions with key Council officers (including the current Trade Waste Officer; Wastewater Manager, and East Clive WWTP Engineer), discussions with the HDC and the HDC-TWWWJC, and a desktop review of relevant documents such as the Consolidated Bylaw 2021. The Review also involved detailed analysis of available monitoring data of the quality and quantity of individual discharges of Separable Industrial wastewater and Non-Separable Industrial wastewater to the Hastings Wastewater Scheme. Any identifying details for individual dischargers are anonymised.

Assessment of effects

The Review Report includes assessment against the following:

- Consent conditions (CD130214W)
- Where applicable, compliance to water quality guidelines relevant for the marine waters of Hawke Bay

The majority of the Review assesses against relevant consent conditions (CD130214W). However, some effects identified within the Assessment of Environmental Effects (AEE, 2013) were not carried through to be addressed directly by consent conditions. In those cases, results are compared to relevant guideline values in alignment with industry best practice. The assessment focuses on whether any changes could be detected or 'discerned' from the effects that were considered acceptable when the consent was granted in 2014.

The assessment of effects is primarily based on information obtained from the annual monitoring reports which commenced in 2013. It involves detailed analysis of data obtained throughout the entire nine-year period and therefore provides a more holistic and comprehensive review of compliance status than was given in the annual reports. Appendix E of the Review Report records compliance status for every consent condition, in each reporting year since 2013/14. Effects on cultural values need to be assessed in order to fully understand performance of the East Clive WWTP as the main driver for the DNSI treatment was to address cultural and spiritual issues. An assessment of the cultural impacts from the operations of the WWTP will be undertaken in a subsequent report and hence are excluded from the assessment. The preparation of a Cultural Impact Assessment (CIA) report is being supported by HDC, and it is expected that Tangata Whenua members of the HDC-TWWWJC will be closely involved. The Review Report (Section 2.9.1) outlines aspects that will potentially be considered by that assessment.

What were the Key Findings of the Review?

In general, the Review Report finds that the major components of the Wastewater Scheme (i.e. treatment method, performance, and management approach) are still adequate and appropriate in terms of meeting the Best Practicable Option (BPO) identified in the 2013 consent application and achieving effective treatment of wastewater according to the consent requirements. They are likely to remain as such for the next review period (to 2032), subject to the findings of the cultural assessment described above and the outcomes of various potential plan and policy changes currently being considered. The Review Report further details potential influencing factors for the BPO and the scope of future reviews. The East Clive WWTP has shown good performance and levels of compliance with the resource consent conditions since 2013, albeit with some challenges in specific years including following Cyclone Gabrielle in early 2023. Several opportunities for improvement are identified, and specific actions are proposed for HDC to incorporate into current and future work programmes.

Operations since 2014

While the overall treatment and discharge process and regular operations of the WWTP have remained fairly consistent since the current consent was granted in 2014, there have been some changes and upgrades in the past nine years. These are summarised using a timeline in Section 1.2.2 of the Review Report. In addition, the Review Report considers the implications of Cyclone Gabrielle in terms of water quality within Hawke Bay and effects on WWTP operations, as well as the potential risks and effects posed by changes to governance frameworks and regulations that control the way the Hastings Wastewater Scheme is managed.

Compliance with the resource consent

The overall level of compliance with the resource consent (CD130214W) has been consistently high since 2014, especially in relation to environmental effects. Non-compliances are typically minor and administrative in nature (such as submitting a report late). Common issues contributing to non-compliance include:

- Incorrect sampling procedures
- Incomplete records (such as logs, inspection sheets that were missing or could not be provided for review)
- Issues with the outfall diffusers and associated structures (such as blockages or damage following storms)
- Lateness in publishing annual reports on HDC's website

Non-compliances relating to environmental effects are discussed separately below and detailed in Section 2.9 of the Review Report.

Tangata whenua and community perspectives

The Review Report strongly emphasises the journey undertaken by HDC alongside Heretaunga Tangata Whenua to recognise and integrate Tangata Whenua values in the Hastings Wastewater Scheme. It details the values strongly held in relation to the whenua (land), awa (rivers) and moana (ocean) of the Heretaunga rohe (Hastings District), and the complex interactions between land and resource use activities such as wastewater collection, treatment and discharge into Hawke Bay.

The Review Report references factual resources that have already been publicly released with permission of Heretaunga Tangata Whenua as part of previous work undertaken in conjunction with the HDC-TWWWJC. Where assumptions are based on this information (regarding cultural concepts and values, such as the transformation of kūparu (human waste)), these are explicitly identified and referenced. Ideally, the Review Report would have been completed concurrently with a cultural assessment of the performance of the Hastings Wastewater Scheme. However, the timing for delivery of the Review Report (as determined by the consent conditions) did not allow for meaningful, longer-term engagement needed to complete a cultural assessment, and the right resources were also not available to do this within the consented timeframe. The main driver for completing this technical components of the Review Report separately from the cultural assessment was to maintain compliance with the consent, given these constraints. Several actions have been identified for HDC consider, to map out how and when the cultural assessment and additional engagement will occur and potential key outputs from those discussions.

HDC engaged with the public during 2023 to inform the Review Report, culminating in a formal consultation period between Monday 31 October and Friday 24 November 2023. The engagement approach was primarily focused on creating an opportunity for the public regarding how their wastewater is collected, treated and discharged. Engagement was undertaken in a variety of formats including printed materials; in-person drop-in sessions; the annual Open Day at the WWTP (18 November 2023); online feedback via HDC's website; a social media campaign, and radio and print advertising.

A recreational usage survey was completed during the summer of 2022/23 to meet the requirements of consent Condition 27(g). Methods used for the survey were the same as those previously used for a survey carried out between 2011 and 2013. The overall objective was to report on observational information of recreational users of the coastal environment

adjacent to East Clive WWTP and the offshore outfall. The survey involved observing recreational activities at four locations, and also asking members of the public to complete a short questionnaire. The locations were:

- Waitangi Estuary / Ngaruroro River
- Muddy Creek Estuary (East Clive)
- Tukituki River mouth and Estuary (Haumoana)
- Te Awanga (Domain)

Attempts were also made to gather perspectives from the commercial fisheries / aquaculture sector, however only one response was received. This was in part due to there being less than five known inshore commercial operators within the Hawke's Bay region. A letter was received from Health New Zealand | Te Whatu Ora in November 2023 regarding public health considerations associated with the discharge of treated wastewater into Hawke Bay.
The Review Report summarises the perspectives gleaned through these activities and concludes that the majority of responses were constructive and demonstrated that continued investment in wastewater treatment is valued and seen as a high priority by the public within Hastings District.

Management of the Hastings Wastewater Scheme

The Review Report contains substantial commentary about how the Hastings Wastewater Scheme is managed in accordance with local, regional and national regulations, policies and strategies. The Review considers past and potential future changes to the instruments listed in Table 2. It also considers changes to relevant environmental guidelines and standards, some of which were originally used to develop consent limits for contaminants of concern.

Table 2 Regulatory instruments, policies and strategies considered as part of the Review

District	Regional	National
• Hastings District Plan • HDC Consolidated Bylaw 2021 (Chapter 7 – Water Services)	• Hawke's Bay Regional Policy Statement (RPS) and Regional Resource Management Plan (RRMP) • Hawke's Bay Regional Coastal Environment Plan (RCEP) • HBRC Tukituki, Ahuriri, Ngaruroro and Karamu (TANK) Plan Change 9 • HBRC Kotahi Plan • Napier and Hastings Future Development Strategy (FDS; *in development*) • Heretaunga Plains Urban Development Strategy (HPUDS; 2010 and 2017)	• Resource Management Act 1991 (RMA) • Local Government Act 2002 (LGA) • Marine and Coastal Area (Takutai Moana) Act 2011 (MACA) • Water Services Act 2021 (WSA) • Local Government (Community Well-being) Amendment Act 2019 • New Zealand Coastal Policy Statement 2010 (NZCPS) • National Policy Statement for Urban Development 2020 (NPS-UD) • National Policy Statement for Highly Productive Land 2022 (NPS-HPL)

The Review Report also discusses specific plans and approaches developed by HDC and utilised to directly manage the Hastings Wastewater Scheme. It introduces the concept of a future strategic planning approach, which HDC sees value in applying to establish and provide a framework for decision-making and prioritising actions for the management of assets within the Hastings Wastewater Scheme including the WWTP. This approach is proposed to feature elements of Dynamic Adaptive Planning, which has been successfully implementing elsewhere in Aotearoa New Zealand including Auckland and the Greater Wellington region. HDC intends to continue further dialogue with the HDC-TWWWJC and other key stakeholders in alignment with condition 29 of the discharge consent and staying true to HDC's relationship with Tangata Whenua. Their direct input on the design of the future strategic approach and its implementation will be actively sought. This intention is reflected in the recommendations of the Review Report (Section 7 and summarised below).

The Review Report includes a detailed review of asset management and operational changes that have occurred at the East Clive WWTP and across the wider Hastings Wastewater Scheme since 2014, as follows:

- Evaluation of the implementation and effectiveness of key resources driving asset and operational management, including the Asset Management Plan (2021) AMP and the East Clive Wastewater Facility Manual (2008).
- Any significant changes in management and operation over the 9-year review period (summarised in Table 2-16 of the Review Report).
- Potential sustainability and efficiency actions to be implemented in future, including opportunities for increased energy efficiency, water conservation, and building redundancy into wastewater systems.
- Consideration of a carbon footprint assessment of the WWTP and the discharge.
- Assessment, as far as practicable, of the potential future impacts of climate change on the WWTP operations and discharges.
- Emerging issues for asset management.

The Review Report identifies nine recommendations for HDC to consider with regards to asset management, namely ensuring that key resources such as the Wastewater Facility Manual are updated to reflect modern practices and knowledge of the WWTP and its operations. Resources could also be updated to more directly address matters relating to sustainability; energy usage and efficiency; water conservation; reuse of treated wastewater, and the potential effects of climate changes.

Industrial / trade waste discharges to the Hastings Wastewater Scheme

Industrial wastewater (trade waste) discharges make up a significant portion of the total volume of wastewater collected within the Hastings District. The majority of these relate to the food and beverage production and other agricultural activities in the region, contributing to the wellbeing of the wider community particularly through the provision of employment. As introduced above, the discharges are categorised as either:

- **'Separable Industrial'** – discharges that are required to be pre-treated at each industrial site, and are then conveyed to the WWTP via a separate industrial / trade waste wastewater pipeline. These discharges are passed through a milliscreen (with 1 mm holes) at the WWTP to remove solids, and then combined with treated wastewater from the Domestic Non-Separable Industrial (DNSI) waste stream at the WWTP before the combined wastewater is discharged via the offshore outfall into Hawke Bay.
- **'Non-Separable Industrial'** – discharges that are discharged directly into the domestic wastewater system (also known as the DNSI system) and then conveyed to the WWTP. These discharges are treated through the Biological Trickling Filters (BTFs) and the Rakahore Channel with the rest of the domestic wastewater prior to being combined with treated separable industrial wastewater and discharged to Hawke Bay.

The Review Report describes how discharges of industrial / trade waste wastewater are managed in the Hastings Wastewater Scheme, in particular through mechanisms such as the HDC Consolidated Bylaw (2021; Chapter 7 – Water Services). The Bylaw provides a way for Council to control discharges that are considered to be of a higher risk to the Hastings Wastewater Scheme and to public health or the receiving environment. These are typically managed as 'Controlled' discharges that require approval for the level of pre-treatment and flow management required onsite before flow can be discharged to the DNSI or Separable Industrial systems. The DNSI predominantly receives 'Permitted' industrial / trade waste discharges that meet strict criteria outlined in Schedule B of the Bylaw (Chapter 7). The Review Report details how industrial / trade waste premises are required to monitor their discharges, and the procedures that are followed by HDC in the event of any non-compliance with approvals. Importantly, it also identifies past issues experienced in managing these discharges, and identifies opportunities for improvement. These have also been translated into recommendations in Section 7 of the Review Report (and summarised in Figure 3 below).

The Hastings Wastewater System currently receives discharges of 'Controlled' wastewater from 39 separate premises and around 300 'Permitted' discharges, covering a relatively wide range of industry types. The Separable Industrial stream is dominated by nine major dischargers:

- Fruit and vegetable processing (washing, canning, juicing) (5). *This group represents the majority of trade waste by flow and load ($cBOD_5$ and TSS) received at the WWTP.*

- Meat processing (abattoirs, rendering, preparation for export) (2)
- Tannery (1)
- Cold storage (1)

Together, these nine sources contribute up to 98% of all industrial / trade waste wastewater discharged to the network, by volume. The Review Report considers all of these industrial groups and the key constituents of the discharges they contribute to the Hastings Wastewater System. In particular, it found that loads of Chemical Oxygen Demand (COD) and sulphide have been reduced by over 60% since 2015. Loads of zinc and trivalent chromium have gradually decreased by up to 60% and 95% respectively. This is good news for both the WWTP and Hawke Bay, as these constituents can have a harmful effect on wastewater treatment infrastructure and the water and sediment quality in Hawke Bay if not carefully managed. The other constituents analysed have remained stable since 2014 or shown a slight reduction.

Volume and quality of wastewater received at the WWTP

Condition 24(d) of the discharge consent specifies a maximum annual average daily flow of 66,000 m^3/day as the trigger value for compliance. Based on total combined flow data at the outfall since 2014, this limit has not been exceeded. Figure 2 shows long term annualised average daily flow for the total combined discharge at the outfall as a black line, which has consistently remained below the trigger value (red line). It puts the flows seen since 2014 (under the current consent) in context against those for the preceding 10 years, where flows were more variable and therefore more difficult to manage. There is a significant increase in flows to the WWTP during peak food production season (roughly mid-February to end of April) each year, when the largest industrial / trade waste dischargers are contributing the highest volumes of wastewater.

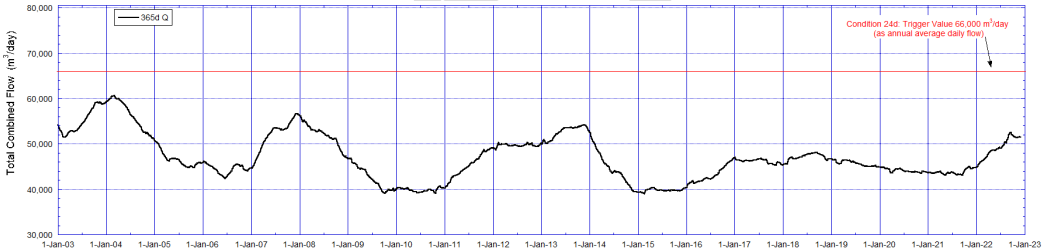


Figure 2 Moving 365-day Average Daily Flow (m^3/day) calculated from flow measurements captured between January 2003 and December 2022

Tables 3 and 4 below summarise the findings of the Review Report with regards to the current volumes and quality of wastewater treated at the East Clive WWTP, and projected future volumes and quality for the year 2049 (at the end of the current consent term). The parameters focused on in the assessment are defined as follows:

- **Average Daily Flow:** Cumulative total flow to the WWTP per year, divided by 365 days (because the WWTP is operated continuously).
- **5-day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$):** The amount of oxygen consumed by organisms in breaking down the organic matter in wastewater, over a five-day period.
- **Total Suspended Solids (TSS):** The mass of solid particles suspended in wastewater.

These are all key indicators (determined by standard tests) of how well the WWTP is coping with influent flows and treating the wastewater to the required standards. While there have been some increases in total combined flows and loads, these are well within the consented limits and the expected degree of change that was forecast back in 2013 (in projections that were made to inform the consent application).

Table 3 Looking back: Changes in wastewater flows and loads between 2013 and 2023

Parameter	Domestic and Non-Separable Industrial wastewater	Separable Industrial Wastewater	Total Combined Discharge
Annual Average Daily Flow	↑ <28% *	↓ <11%	↑ <10%
Average daily load of $cBOD_5$ in influent	↓ 4%	↓ <21%	Not analysed (lack of data)
Average daily load $cBOD_5$ in treated wastewater	↑ 14%	↓ <19%	↑ <16%
Average daily load of TSS in influent	↓ 4%	↓ <19%	Not analysed (lack of data)
Average daily load of TSS in treated wastewater	↑ 20%	↓ <16%	↑ 52%

*Note: *">" indicates "up to", accounting for statistical uncertainty in analysis*

Table 4 Moving forward: Projected wastewater flows and loads to 2049

Note: % are approximate

Parameter	Domestic and Non-Separable Industrial wastewater	Separable Industrial Wastewater	Total Combined Discharge
Annual Average Daily Flow	↑5%	➔ no change	↑ *(no % due to high uncertainty in data)*
Average daily load of $cBOD_5$ in influent	↑20%	➔ no change	
Average daily load $cBOD_5$ in treated wastewater			
Average daily load of TSS in influent			
Average daily load of TSS in treated wastewater			

The projections of wastewater flows and loads made in 2013 are compared with the revised projections developed as part of this Review, with the following observations:

- Projected wastewater flows for 2049 will slightly increase (by approximately 5%) for the DNSI stream, while the future projected flows for Separable Industrial stream will be slightly lower (decreasing by up to 17%) and Total Combined Discharge will remain similar to that originally projected in 2013.
- There is greater variation in the projected loads of $cBOD_5$ and TSS in influent and treated wastewater for 2049, when comparing the 2013 projections with the latest 2023 projections. $cBOD_5$ loads in the Separable Industrial stream are now projected to be up to 30% lower in 2049 than first projected in 2013, while $cBOD_5$ loads in the DNSI stream could be up to 20% greater than first predicted.
- The projected TSS load for Separable Industrial stream in 2049 is now predicted to be up to 80% less than that first projected in 2013. This difference is likely due to increased knowledge of industrial / trade waste management practices, and specifically changes in HDC's regulations and policies in relation to pre-treatment for the removal of TSS which includes sediment.
- Separate commentary for seasonal flows (for example, peak season average daily flow and off-season average daily flow) was not provided in 2013, so it is difficult to provide future predictions for these.
- The 'high uncertainty' referred to for the change in Total Combined Discharge is namely because it's very difficult to predict changes in the DNSI stream, given seasonal variations and population changes. A projection has been made but it should be considered as a rough indication only.

Wastewater treatment

Condition 27(f) of the resource consent requires the Review to consider changes in wastewater treatment technologies that may be relevant to the Hastings Wastewater Scheme. The effects assessment (summarised below) concludes that there have been "no discernible effects" (outside the consented mixing zones) from the discharges of treated, combined wastewater via the offshore outfall during the nine-year review period. As such, a full assessment of treatment technologies was not required. Instead, the Review Report revisits the treatment technologies identified in the 2013

consent application and assesses them against seven key factors to justify why a change in treatment is not considered necessary. These factors are:

- Scientific / environmental effects
- Māori cultural values (A complete assessment could not be made, pending further engagement between HDC, the HDC-TWWWJC and Tangata Whenua)
- Extent of Outfall Mixing Zones for different contaminants
- Beneficial reuse
- Sustainability
- Financial incentive
- Community and stakeholder viewpoints

The alternatives included a mixture of secondary and tertiary treatment options (combinations of BTFs and other filtration processes, clarification, sludge treatment and disposal, UV disinfection and beneficial reuse of treated wastewater). Three additional treatment technologies are identified (building on the 2013 assessment) as follows:

- Reuse of primary and sludge treatment biosolids
- Membrane filtration
- Install a third Biological Trickling Filter (BTF) tank

The first two options (along with the alternative options identified in the 2013 assessment) will not be implemented, but the third option (installing a third BTF tank) is being investigated further by HDC in terms of asset management and allowance for future growth i.e. planned resilience).

The assessment further notes that there is additional capacity in the BTFs to treat wastewater (if flows to the WWTP increase) and to continue to transform kūparu (the human waste component) to biomass into the future. The concept of transformation of kūparu was introduced above. The appropriate degree of transformation may be a consideration for the cultural impact assessment.

Options assessment and the Best Practicable Option (BPO)

The current Hastings Wastewater Scheme is assessed against the Project Vision and Objectives identified in the 2013 consent application, and the definition of a Best Practicable Option as defined in the RMA 1991. A key component feeding into this assessment is a secondary assessment of options for the "treated wastewater disposal / discharge and beneficial reuses that may be appropriate" (from Condition 27(h)). The latter involves reviewing options previously identified (for example, as part of the 2013 consent application) and introducing any new options that may now be relevant, such as sewer mining. The Review focuses on options for discharge of the two treated wastewater streams (DNSI and Separable Industrial), either jointly after being combined in the outfall pumping station, or separately. As stated above, the effects assessment presented in the Review Report concludes that there is no need, from an environmental impact perspective, to increase the level of treatment for the discharge via the offshore outfall. Therefore, the options assessment in this report was not highly detailed. Options in the following general categories are assessed:

- Land discharge / land application: Rapid Infiltration; Slow Rate Irrigation; Surface Flow Wetlands, and Overland Flow.
- Beneficial reuse of wastewater (from one or both of the DNSI and Separable Industrial waste streams): Sewer mining; options for industrial / trade waste dischargers to reuse separable industrial wastewater for non-potable uses, and reuse in the Hastings Wastewater System for non-potable water supply (for example, to combat water scarcity and recharge groundwater aquifers).

A key objective identified in 2013 was that "*the Scheme shall be the Best Practicable Option (BPO) (in terms of the RMA definition) for Hastings future wastewater management that is in keeping with sustainable management principles and*

practices". The Review Report identifies opportunities for improvement to the current BPO Scheme, and recommends future ways in which the Scheme could best fit a BPO solution. Key findings of the assessment include:

- Many of the Project Objectives are well aligned to the BPO interpretation, as set out in Section 3.2.3 of the Review Report.
- The current Hastings Wastewater Scheme still meets the 2013 Project Objectives well. The approvals and processes involved in achieving those Objectives also mean that the requirements of the Hawke's Bay RCEP regarding application of a BPO approach are met.
- A number of improvements that could be made to further enhance the BPO Scheme, mainly relating to the development and implementation of a strategic planning approach (which is detailed in Section 1.4.3 of the Review Report). There is scope for the project objectives and BPO criteria to be re-examined and, where appropriate, revised in the future either as part of the next nine-yearly review or at the behest of the HDC-TWWWJC. The strategic planning approach could be the mechanism by which this occurs.
- Several potential changes to the existing consent conditions could be adopted., The Review Report categorised these in terms of 'Defunct' conditions (those that are no longer relevant or applicable); conditions requiring further 'Review' with input from the HDC-TWWWJC, and conditions for which a change has already been recommended based on prior work or the Review Report findings. Further assessment of the changes requiring 'Review' is included as a recommendation in Section 7 of the Review Report.

Assessment of effects

The discharge via the offshore outfall has had **no discernible effects** outside the consented mixing zones since 2014, from those contaminants and parameters assessed. The majority of the effects assessed have a 'neutral' status, in that no adverse changes were obvious as evident from the consent monitoring records evaluated. This includes both temporal and spatial changes.

Table 5 Summary of assessment of effects of the discharge of treated wastewater into Hawke Bay from East Clive WWTP

Legend:

Compliance level	Assessed overall change
Full compliance over 9 years	↘ Improvement; positive effects
Mostly compliant, less than 5 non-compliances (e.g. exceedances of consented limits) over 9 years	➔ Neutral / no change
Non-compliant, multiple non-compliances over 9 years / historic issues	↗ Decline; adverse effects
N/A – No relevant consent condition to assess against	N/A – unable to assess long term change since 2014 (e.g. due to missing data)

Effects category	Compliance with relevant consent conditions	Assessed overall change	Comments / Relevant section(s) in Review Report
Water quality (physico-chemical)			
Suspended solids, colour and clarity	Some data gaps	➔	Table 2-26 Drone Surveys have been implemented to monitor visual effects (e.g. plumes) since early 2024.
Oil and grease		➔	Table 2-26 Assessment against Condition 7(c) limited due to occasional data gaps.
Ambient water temperature		➔	Table 2-26 Temperature generally between 10-22°C.
Dissolved oxygen		➔	Table 2-26 Dissolved oxygen levels typically greater than 80% saturation. Recommend a change to the wording of consent Condition 7(g) to clarify for future compliance assessments, as well as the introduction of Chlorophyll-α monitoring (top detect algal growth).
pH	Some data gaps	➔	Table 2-26 Difficulties in interpreting trends due to gaps in data records.
Nutrients (nitrogen and phosphorus, in their different forms)		➔	Section 2.9.3.3 Multiple exceedances of consented limits for total nitrogen, phosphorus, nitrate- and nitrite-nitrogen, and dissolved reactive phosphorus (DRP). However, there was no obvious difference between sites closest to the discharge and the sites farthest away (all locations had results that were similarly high). As described for cumulative effects below, this is likely indicative of other sources of nutrients in Hawke Bay.
Cumulative water quality effects on Hawke Bay	N/A	↗ (for the TANK coast)	Table 2-26 Difficult to separate out the direct effects of wastewater discharges via those from other sources (such as from rivers) using the available information. There are known issues with

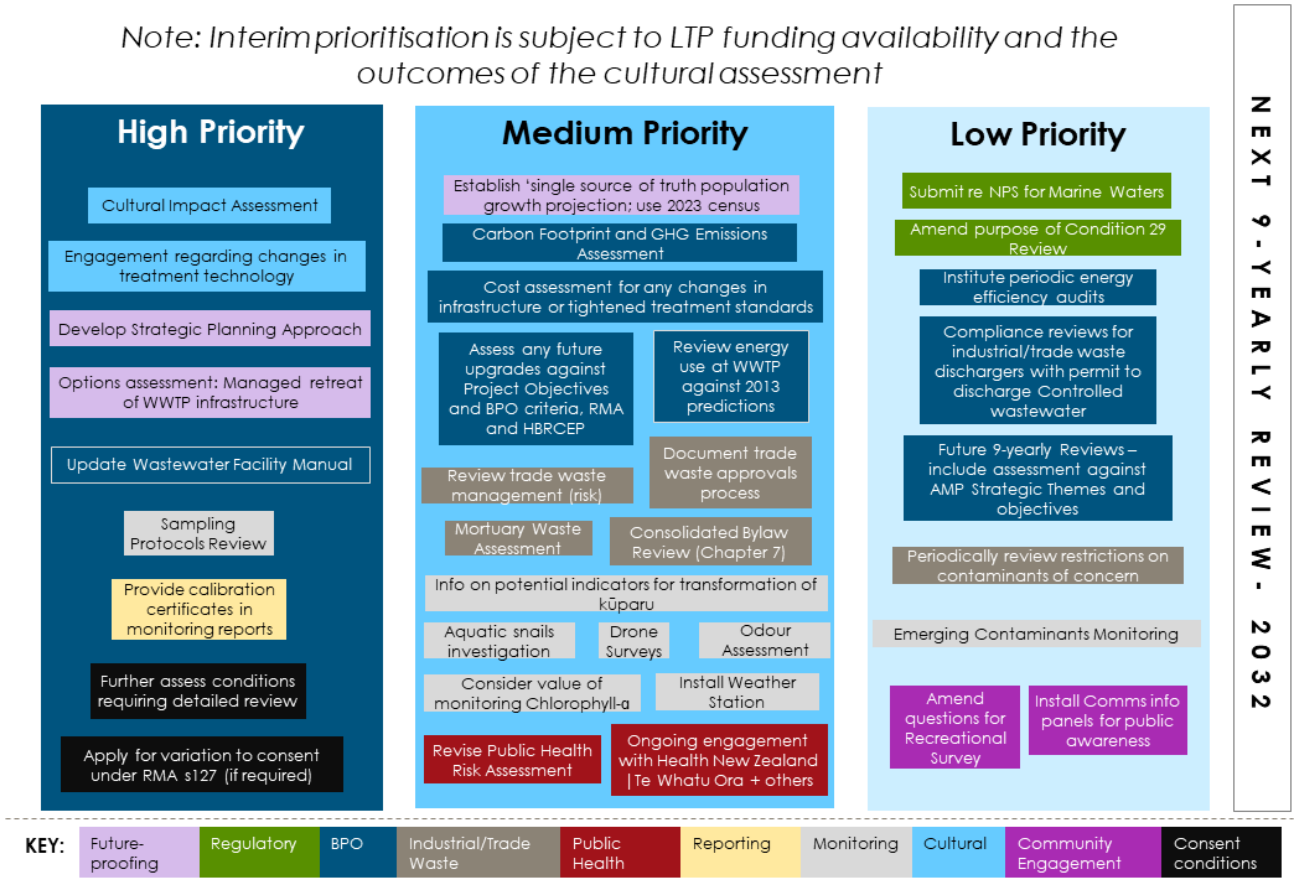
Effects category	Compliance with relevant consent conditions	Assessed overall change	Comments / Relevant section(s) in Review Report
			fine sediments, DRP and Dissolved Inorganic Nitrogen (DIN) along the coast where the Tūtaekurī, Ahuriri, Ngaruroro, and Karamū (TANK) rivers discharge.
Objectionable odour		→	Table 2-26 Inconsistent records for observations made close to the offshore outfall. Three complaints on record between 2014 – 2017.
Recreational values	N/A	↘	Table 2-26 Increased recreational usage in the area, particularly at Waitangi Estuary.
Public health			
Shellfish gathering	Some data gaps	→	Table 2-26 Nearest shellfish collection areas are over 6 km from the offshore outfall (Te Awanga, Clifton or Black Reef).
Contact recreation	Some data gaps	→	Table 2-26 Section 2.9.3.2 The few exceedances for faecal coliforms appear to be isolated events related to warmer, wetter summers rather than indicative of any long-term change. There is also likely to be an influence from other sources such as the Tukituki and Ngaruroro Rivers.
Aquatic ecology			
Chemical-specific toxicity to marine organisms		→	Table 2-26 No exceedances of guidelines for total ammoniacal-nitrogen toxicity.
Direct toxicity to marine organisms		→	Table 2-26 All Whole Effluent Toxicity (WET) testing since 2014 has yielded results that are compliant with Condition 15; to date, a Toxicity Identity Evaluation has not been required.
Benthic sediment (sediment on the sea floor)		→	Table 2-26 Mercury slightly elevated in sediment on three isolated occasions. No evidence of long term accumulation of contaminants in sediment.
Benthic ecology (organisms living on the sea floor)		→	Table 2-26 Benthic Survey completed 2023.
Bioaccumulation (the accumulation of contaminants within aquatic organisms and sediment over time)	N/A	N/A	Table 2-26 Not able to assess long term change due to lack of previous assessment.
Marine mammals	N/A	→	Table 2-26

Effects category	Compliance with relevant consent conditions	Assessed overall change	Comments / Relevant section(s) in Review Report
			No known observations on record.
Emerging contaminants	N/A	N/A	Section 2.9.3.4 No historic monitoring and no consent condition. A study (including testing) was initiated in 2023 and is ongoing.
Commercial aquaculture	N/A	➔	Section 2.10 Positive feedback from one commercial fishing organisation during public engagement.
Separation from other discharges / cumulative effects of discharges into Hawke Bay	N/A	➔	Table 2-26 No new discharges of wastewater consented since 2014. Dredging off-shore disposal also well away from the offshore outfall..

Recommendations and forward work programme

The Review Report identifies 35 actions for HDC to consider implementing , including recommendations to guide the scope of the next nine-yearly review. These are detailed in Table 7-1 of the Review Report and have been captured at a high level in Figure 3 below. The recommendations are intended as an indicative programme of work that HDC could undertake in the coming years before the next review in 2032. They have been assigned an interim high, medium or low priority with the view to developing a schedule for delivery , to be discussed with the HDC-TWWWJC after this Review Report is published.

Figure 3 Interim prioritisation of recommendations from the Review Report



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Abbreviations

Abbreviation	Full Name
ADF	Average Daily Flow
ADWF	Average Dry Weather Flow
AEE	Assessment of Effects on the Environment Report, submitted by HDC and MWH (now Stantec) in 2013 regarding the Hastings Wastewater Scheme.
AMP	Hastings District Council Wastewater Asset Management Plan 2021 (final draft)
ANZG	Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018)
BPO	Best Practicable Option (RMA Definition)
BRMP	Beneficial Reuse Management Plan
BTF	Biological Trickling Filter
$cBOD_5$	5-day Carbonaceous Biological Oxygen Demand
CCTV	Closed Circuit Television
cfu/100mL	Colony forming units per 100 millilitres
CHI	Cultural Health Index
CIA	Cultural Impact Assessment
CMA	Coastal Marine Area
m^3	Cubic metre
DIN	Dissolved Inorganic Nitrogen
DRP	Dissolved Reactive Phosphorus
COD	Chemical Oxygen Demand
DAF	Dissolved Air Flotation
DAPP	Dynamic Adaptive Pathway Planning
DMP	Discharge Management Plan
DNSI	Domestic and Non Separable Industrial Wastewater Stream
EBO	Emergency Beach Outfall (Contingency)
EC	Emerging contaminant
EC20	The effective concentration that causes the stated effect in 20% of the test organisms (refer to Section 2.9.2 – Whole Effluent Toxicity testing)
FINZ	Fisheries Inshore New Zealand
ESR	Institute of Environmental Science and Research
GEM	Good Earth Matters Consulting Limited

GHG	Greenhouse Gas
g/m³	Grams per cubic metre
FDS	Napier and Hastings Future Development Strategy
HBRC	Hawke's Bay Regional Council
HDC	Hastings District Council
HDC-TWWWJC	Hastings District Council – Tangata Whenua Joint Wastewater Committee
HDPE	High-Density Polyethylene
HPUDS	Heretaunga Plains Urban Development Strategy 2010 and 2017
IAF	Infrastructure Acceleration Fund
IANZ	International Accreditation New Zealand
IPCC	Intergovernmental Panel on Climate Change
ISQG	Interim Sediment Quality Guidelines
KPI	Key Performance Indicator
Kg/day	Kilograms per day
LC10	The lethal concentration that kills 10% of the test organisms (refer to Section 2.9.2 – Whole Effluent Toxicity testing)
LGA 2002	Local Government Act 2002
LoS	Level of Service
L/s	Litres per second
LTP 21	Long Term Plan 2021 – 2031 (for Hastings District Council)
MAC	Microbiological Assessment Category
MACA	Marine and Coastal Area (Takutai Moana) Act 2011
MAR	Managed Aquifer Recharge
MCF	Methane Correction Factor
MfE	Ministry for the Environment
MPI	Ministry for Primary Industries
MWH	Montgomery Watson Harza Consultants – now Stantec
N/A	Not applicable
NCC	Napier City Council
ND	No Date
NES	National Environmental Standard
NIWA	National Institute of Water and Atmospheric Research

NPS	National Policy Statement
NPS-HPL	National Policy Statement for Highly Productive Land 2022
NPS-UD	National Policy Statement for Urban Development 2020
NPV	Net Present Value
NTU	Nephalometric Turbidity Unit
NZCPS	New Zealand Coastal Policy Statement 2020
NZDS	New Zealand Diving and Salvage Limited
NZWERF	New Zealand Water Environment Research Foundation
OOS	Offshore Outfall Scheme
PE	Population Equivalent
PHRA	Public Health Risk Assessment
RMA	Resource Management Act 1991
RCEP	Hawke's Bay Regional Coastal Environment Plan
RPS	Regional Policy Statement
RRMP	Regional Resource Management Plan
SBR	Sequential Batch Reactor
SDG	Sustainable Development Goal
SIC	Sanitary Inspection Category
SLI	Slow Rate Irrigation
TANK	Tūtaekurī, Ahuriri, Ngaruroro, and Karamū (River catchments)
TCD	Total Combined Discharge
TEC	Threshold Effect Concentration
TSS	Total Suspended Solids
USGS	United States Geological Survey
UV	Ultraviolet
WET	Whole Effluent Toxicity
WFM	Wastewater Facility Manual (2008)
WWTP	Wastewater Treatment Plant (East Clive)

Glossary

Term	Definition
Atua	Ancestor with continuing influence / supernatural being / deity
kūparu	Human waste
Mana Moana	Authority over the seas and lakes.
Mana Whenua	The indigenous people (Māori) who have historic and territorial rights over the land – specifically within Heretaunga (Hastings), New Zealand.
mauri	The life principle, life force, vital essence, special nature, a material symbol of a life principle, source of emotions - the essential quality and vitality of a being or entity. Also used for a physical object, individual, ecosystem or social group in which this essence is located.
Papatūānuku	Atua; The land – the Earth Mother.
paruparu	(verb) to be dirty, discoloured, filthy; (noun) dirt, soil, mud, filth.
Tamanuiterā or Tamanui Te Rā	Atua; The personification of the Sun.
Tāne Mahuta	Atua; The God of the Forest.
Tangaroa	Atua; The God of the sea and progenitor of fish.
Tangata Whenua	The people of the land; that is the Māori iwi or hapu which have customary authority over a particular area.
Tāwhirimātea	Atua; The weather / the God of the weather.
Whiro	Atua; a personified form of “the wero, difficulties, evil and sickness”

1 Introduction

1.1 Purpose of this review

This Trends, Technology, Discharge, Environmental and Monitoring Review (herein referred to as the 'Review') has been undertaken to satisfy the requirements of the resource consent held by Hastings District Council (HDC), to discharge treated wastewater into Hawke Bay via an offshore outfall in East Clive. The Review was included in the consent conditions, with the required content of the Review stipulated by Condition 27 of the consent (CD130214W), as a result of extensive consultation in 2013 with Tangata Whenua and HDC representatives, technical experts and other stakeholders when the consent application was being processed.

This Review Report covers the nine-year period between 25 June 2014 and 24 June 2023. Some quantitative elements of the Review (e.g. wastewater flows and loads assessment, and analysis of receiving water quality results in Hawke Bay) are limited to the period between 25 June 2014 to 31 December 2022, due to the subsequent severe weather events in early 2023. The assessments contained in the Review Report were based upon information available and conditions encountered during this time period. For example, it should be noted that while the Review Report was being prepared, there was a change in national government in New Zealand (following the general election in October 2023). There were subsequently significant changes in national legislation and policies that were relevant to the Review. All efforts have been made to note where information was initially included, but may since have become obsolete.

The Review is required every nine years following commencement of the consent. It facilitates an adaptive management approach by scheduling an in-depth analysis of the consent; its implementation, and its effectiveness on a regular basis. This was considered necessary by the aforementioned parties, due to the 35-year consent term granted in 2014. In the assessment report issued by Hawke's Bay Regional Council (HBRC) in 2013 (notifying the decision to grant the consent) it was stated that *"the applicant wishes to continue providing the same level of treatment, in the same way at East Clive in the short term, and undertake a significant review, including public consultation and a review of the best practical [sic] option, every nine years. If, at that time, it is considered that additional treatment needs to be provided to ensure that the best practicable option is provided, then the applicant will do this…"*[1]

It further stated that "*a thorough review of the [WWTP] is required to be undertaken every 9 years for the duration of the consent. The actual and potential environmental effects of the discharge will be assessed at this time, as well as the results of a recreational usage survey, and public consultation (amongst other things) and recommendations made in the report, which could include the construction of additional treatment facilities if necessary to ensure that the water quality guidelines [stipulated in consent conditions] are achieved*." This was aligned with Guideline 6, Policy 16-1 of the Proposed Regional Coastal Environmental Plan (PRCEP; later operative from 8 November 2014) at the time. Policy 16-1 regulates discharges into the Coastal Marine Area (CMA) in the region, and Guideline 6 relates to HBRC's discretion to review the conditions of a consent to enable the maintenance of water quality standards.

The Review is also incorporated into Condition 29 of the resource consent, where HDC is required to seek suggested inputs from the HDC and Tangata Whenua Joint Wastewater Committee (the HDC-TWWWJC) with respect to the scope of the Review, as well as being required to review and advise HDC on the report before it is finalised and submitted to HBRC . The review of the scope is required to be undertaken no less than three months prior to commencing each Review. This process was completed between July 2022 and June 2023 for this Review Report; details regarding inputs from the HDC-TWWWJC to the scope of this Review Report are provided in Sections 1.4.2 and 5.

The findings of this Review Report are subject to the completion of a Cultural Impact Assessment, which is being supported by HDC and is expected to closely involved Tangata Whenua members of the HDC-TWWWJC.
The next nine-yearly Review is due in 2032.

[1] HBRC 2014 'Notification of Decision', letter to David James, Hastings District Council, 25 June 2014, p19.

1.2 Hastings District: Background and changes in context since issue of consent in 2014

This section provides an overview of the context in which the East Clive WWTP operates; how the wastewater treatment system is operated, and developments that have occurred since the long offshore outfall discharge consent was issued in 2014.

Firstly, HDC holds several resource consents in relation to the East Clive WWTP and associated assets. These are listed in Table 1-1 below.

Table 1-1: Hastings Wastewater Consents

Consent Number	HBRC AUTH Reference	Description	Decision Date	Expiry Date
CD130214W	AUTH-120712-01	To discharge final combined wastewater into Hawke Bay at East Clive via the long offshore outfall.	25 June 2014	31 May 2049
CD130271W	AUTH-120774-01	To discharge domestic sewage and industrial wastewater into Hawke Bay at East Clive via a short shoreline outfall (*contingency discharge)*	25 June 2014	31 May 2049
CD130272W	AUTH-120775-01	To discharge domestic sewage and industrial wastewater into Hawke Bay at East Clive via a beach overflow chamber *(contingency discharge)*	25 June 2014	31 May 2049
DP100435A	AUTH-119219-01	To discharge contaminants (namely odour) to air associated with the treatment of wastewater at the Hastings District Council Wastewater Facility	22 June 2012	31 May 2037
CL150176Oa	AUTH-121788-02	To occupy the coastal marine area with a 300 m replacement outfall diffuser	09 March 2017	31 May 2049
CL150177Ea	AUTH-121788-02	To demolish and remove a 300 m section of the existing outfall diffuser in the coastal marine area.	09 March 2017	31 May 2018
CL150178Ca	AUTH-121788-02	To erect a 300 m replacement outfall diffuser in the coastal marine area.	09 March 2017	31 May 2018
CL150305O	AUTH-121916-01	Clive WWTP (Coastal Protection)	11 November 2015	31 May 2049
WP050247Ta	AUTH-114866-03	Clive WWTP Bores (Abstraction)	01 December 2022	31 May 2025
CL050429C	AUTH-115086-01	Clive WWTP Buoys (Land use)	30 November 2005	31 May 2040

1.2.1 Overview of Hastings Wastewater Scheme

Wastewater is the term used for the combined flow of sewage from domestic and industrial / trade premises. Domestic sewage comprises liquid waste from toilets, baths, kitchens and commercial premises. Trade waste comprises liquid waste from industrial processing and manufacturing activities.

The Hastings Wastewater Scheme is made up of a network of pipes and pumps which collects the wastewater from Hastings, Havelock North, Flaxmere, Whakatū and Clive and conveys the wastewater to HDC's East Clive Wastewater Treatment Plant (WWTP). As with most wastewater systems, some rain and groundwater can enter the wastewater network and increase flows during wet weather.

The wastewater network comprises two separate systems; (1) domestic and non-separable industry wastewater system (DNSI) and (2) a separated industrial / trade waste wastewater system which enter the existing Hastings WWTP as two separate waste streams. The separate streams are treated separately at the East Clive WWTP site before being combined for discharge to the offshore outfall:

a) DNSI Stream
- The Wastewater Conveyance System to the East Clive WWTP;
- The tanker truck wastewater receiving facility;
- The treatment plant inlet fine (screening) with covers and air discharge fans and fan outlets;
- The Biological Trickling Filters (BTF); and
- The rock passage – Rakahore channel, formerly referred to as the Papatūānuku passage.

b) Separable Industrial Wastewater Stream
- Factory on-site treatment;
- Separate conveyance of the industrial / trade waste wastewater to the East Clive WWTP; and
- Milliscreening at the East Clive WWTP site.

c) Total Combined Discharge (TCD) following treatment at the East Clive WWTP site
- Grit removal;
- Outfall pumping station;
- Odour management biofilter;
- Planned maintenance and contingency short shoreline outfall and beach outfall structure;
- Offshore outfall; and
- Beach short outfall and chamber structure for contingency and emergency use.

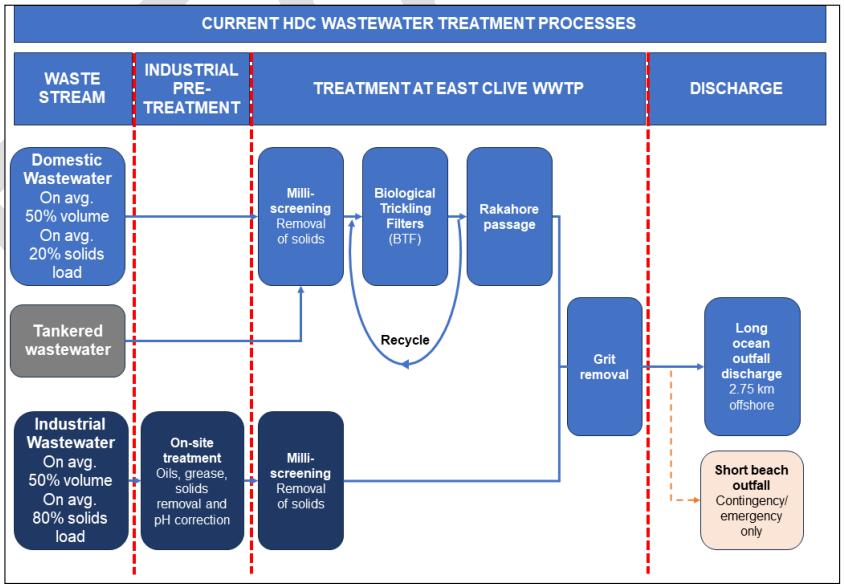


Figure 1-1: The two waste streams and treatment process general arrangement

The key WWTP structures and buildings are shown in Figure 1-2 which has been marked up to show the flow sequence of the two streams before they join for discharge at the offshore outfall.

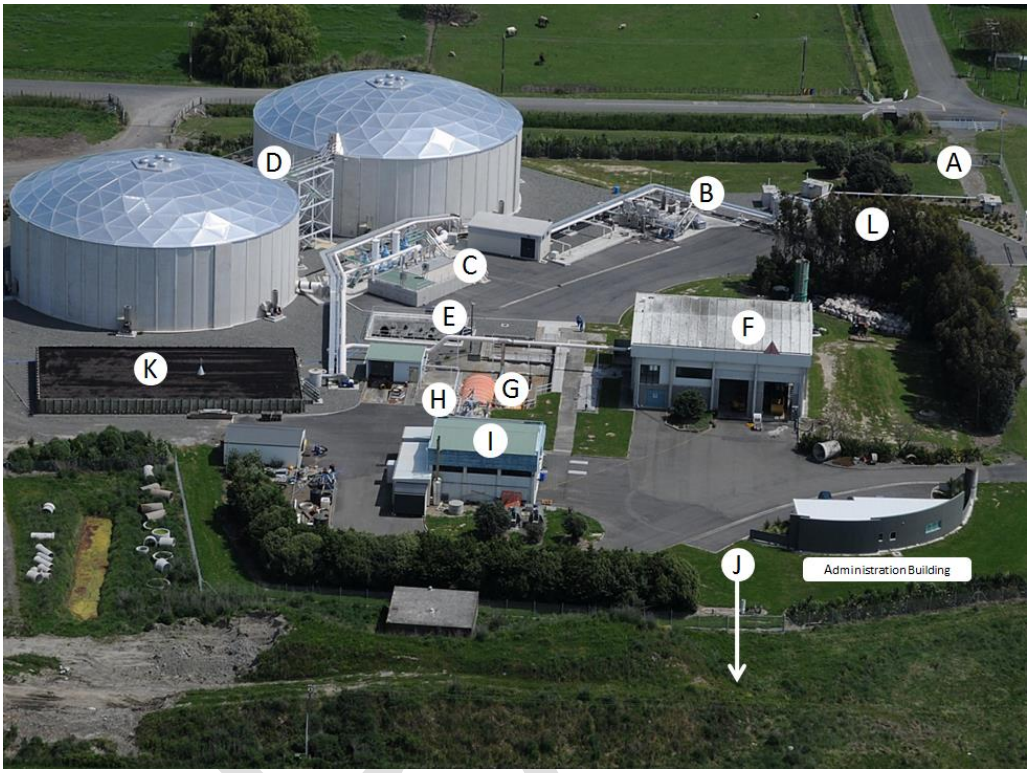


Figure 1-2: East Clive WWTP Site Layout showing the key Structures and Buildings within the site

A. Headworks and Domestic Septage Facility
This is where the DNSI wastewater stream enters the WWTP site. Tanker waste receiving facility is also located in this area to accept septic tank wastes (known as 'septage') and approved industrial liquid wastes.

B. Fine Screen
The DNSI wastewater passes through screens with 3mm diameter holes, this separates out the solids. The solids are then washed and collected for disposal at the Regional Landfill.

C. Biological Trickling Filter (BTF) Lift Pump Station
The screened DNSI wastewater is pumped via this pump station to the top of the BTF tanks. There is also another pump that recycles some of the treated wastewater, this helps ensure a constant flow of wastewater through the BTF's. It also ensures that the micro-organisms that live in the tanks have a constant source of food.

D. Biological Trickling Filter (BTF) Tanks
The two large BTF tanks contain plastic media on which the micro-organisms live. These micro-organisms process, biologically treat and transform the wastewater. The tanks are covered to prevent odorous emissions. Odorous air that is produced within the BTF's is drawn down through the biomass which treats the odour. The only residual odour is a slight musty smell. The air relief values have activated carbon filters to treat the odour. A further description of the BTF treatment process is included in Section 1.3.2 below.

E. Rakahore Channel

For Tangata Whenua it is important to seek to restore the *mauri* (life essence) of the transformed waste by the water passing through the rock channels (representing Papatūānuku, the earth mother deity). The Rakahore Channel is further discussed in Section 1.3.3.

F. Milliscreen Building and Industrial Septage Facility
The Separable Industrial wastewater (which does not include human wastes) is processed through the 1mm slot milliscreens which separate out the solids. These screenings are collected for disposal at the Regional Landfill.

G. Domestic and Industrial Flows Combine
Once the domestic flows have been treated in the BTF and passed through the rock passage and the industrial flows have passed through the milliscreens the flows combine at this point and then pass through the grit removal chamber.

H. Grit Removal Chamber
Any grit remaining in the treated wastewater is removed by passing through the grit removal chamber. The grit is collected for disposal at the Regional Landfill. Recently, aquatic snails have been found to inhabit the BTFs. Snails have been screened from the BTF discharge through grit removal, prior to discharge to the offshore outfall. Not much information is known about the snails (such as the source, extent of the population within the BTFs, and potential effects on the treatment process and/or receiving environment). Hence, HDC intends to complete a preliminary investigation to further understand the phenomenon (refer to Section 7).

I. Offshore Pump Station
Once the grit has been removed the TCD (treated wastewater) is then pumped through the offshore outfall.

J. Long Offshore Outfall
The TCD is discharged to sea via the 2,750 metre long offshore outfall pipeline. The discharge is through the ports on the last (offshore-most) 300 metre diffuser system.

K. Odour Treatment
Foul air is collected from all the above process units (except for units D, E, I and J) via ductwork and then processed through a soil / bark Biofilter bed that converts the odorous compounds in the airflow into non-odorous derivatives.

L. Tanker Septage Unit
This unit receives waste from septic tank cleaning trucks containing septage and Permitted and Controlled industrial liquid wastes.

Views of the BTFs prior to the installation of the covers are captured in the following images.

East Clive biological trickling filters (BTF) under construction

Top of BTF Tank Motorised Distributor Arms (prior to roof installation) onto Random Pack plastic media

View of plastic media (petal shape) piece showing a 1-2mm covering of biomass growth taken from the full scale BTF (approx. 6 million petals are in each BTF)

Stalked ciliate (microbe within biomass) viewed through a microscope

1.2.2 Timeline of key developments since 2014

While the overall treatment and discharge process and regular operations of the WWTP have remained fairly consistent since the current consent was granted in 2014, there have been some changes and upgrades in the past nine years. These are mapped out in the timeline below (Figure 1-3).

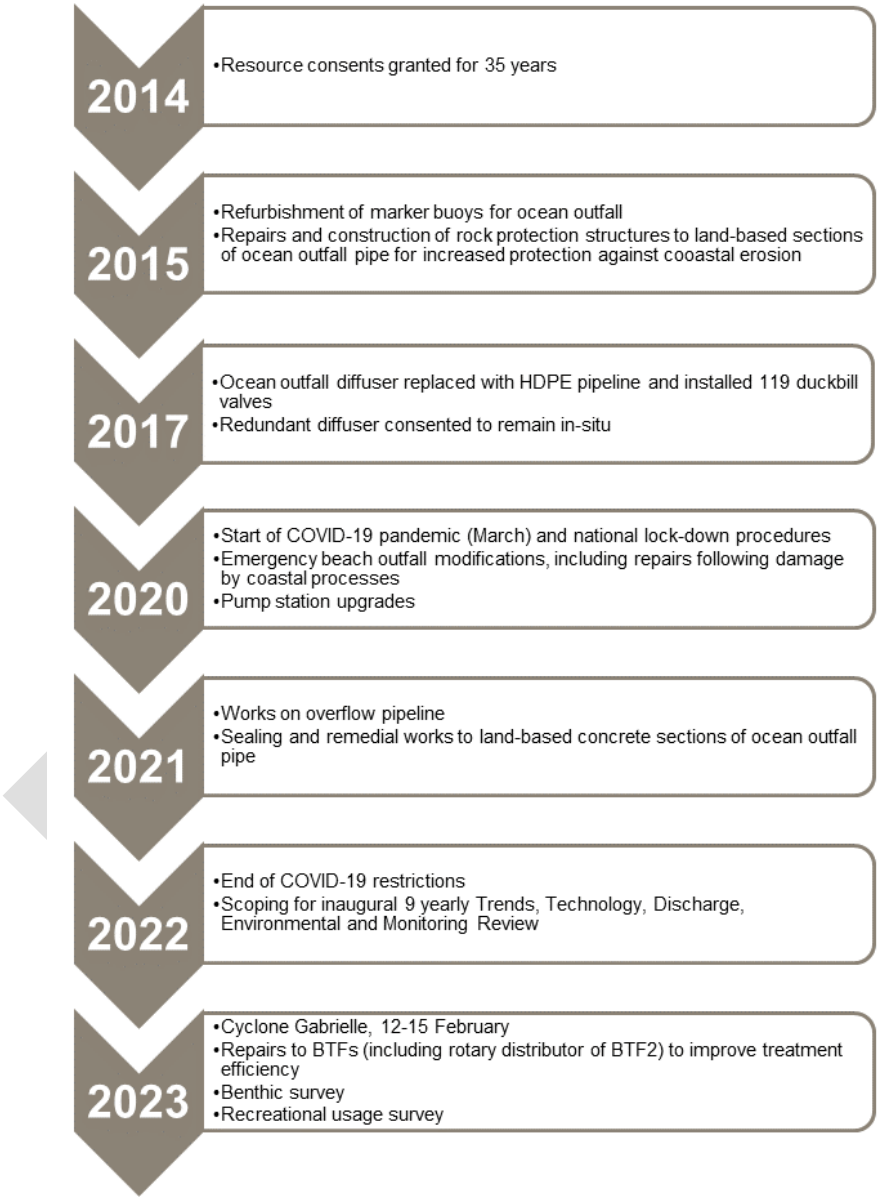


Figure 1-3: Timeline of key developments within the East Clive Wastewater Scheme, 2014 - 2023

1.2.3 Cyclone Gabrielle, February 2023

Aotearoa New Zealand, and particularly the Hawke's Bay region, was hit by Cyclone Gabrielle between 12-16 February 2023. This was a severe tropical cyclone which severely impacted the region with intense, prolonged rainfall, high winds and severe flooding. The impacts were intensified due to several weeks of wet weather preceding the cyclone (some of which were caused by Cyclone Hale in late January). Extensive flooding was seen within the Ngaruroro River catchment, which the East Clive WWTP is close to. The river breached stopbanks in several locations.

HDC worked in partnership with HBRC and other agencies to respond to the emergency situation in the region following Cyclone Gabrielle. Much of the response work is still ongoing, and will likely continue well into 2024. Due to the level of effort needed to coordinate and implement the response (led by the National Emergency Management Agency and HBRC), many of the key operational and management personnel who are usually responsible for the WWTP and/or wastewater network operations were diverted from their routine tasks (except for vital services). This resulted in some delays with regards to administrative processes and routine receiving environment monitoring (for example).

HDC commissioned a dive survey of the offshore outfall from East Clive WWTP on 15 March 2023 to determine the extent of any damage from Cyclone Gabrielle. This was completed by New Zealand Diving and Salvage Ltd (NZDS). A Closed-Circuit Television (CCTV) inspection of the Y-junction (Wye junction) on the outfall pipe was undertaken first, followed by the recovery and re-positioning of the inshore marker for the outfall. A submerged tree near the Y- junction was also removed.

The inclement weather during the first half of 2023 has meant that water quality within Hawke Bay (in the vicinity of the outfall, and in the wider Bay) and the quality of wastewater arriving at the WWTP has been highly variable. As such, monitoring data collected subsequent to the cyclone is not included in this Review Report; it will be analysed in the next nine-yearly Review. It is better practice to analyse that data within the context of a longer record (i.e. from the next year or two) during the next Review in 2032. In the meantime, annual reporting for the WWTP will highlight any more immediate issues or trends requiring action.

1.2.4 Changes in the regulatory and asset management landscape

Note: This section was prepared throughout 2023 and early 2024 during a period of significant change in the governance of New Zealand's water sector, and reflects the information available at that time.

New Zealand's water sector experienced a period of significant reform under the past Labour government (2017 – 2023). This followed previous changes to national policy (such as the introduction of the National Policy Statement for Freshwater Management in 2014 and subsequent amendments) and legislation (multiple amendments to the *Resource Management Act 1991*, the *Local Government Act 2002* and the *Health Act 1956*, and introduction of regulations under Section 360 of the RMA relating to water supply). A majority of the reforms in relation to three waters services were triggered on completion of the Government Inquiry into Havelock North Drinking Water in 2017 and the subsequent Three Waters Review (led by the then-Minister for Local Government).

An 'East Coast' regional model for a Council-Controlled Organisation has been championed by the five Hawke's Bay councils (HDC, Napier City Council, Central Hawkes Bay District Council, Wairoa District Council, and Hawke's Bay Regional Council) over the past few years. There is also the option of forming a single entity with Tairāwhiti (Gisborne District Council), while also maintaining equal representation for Māori.[2] The benefits of such a relationship for the delivery of three waters infrastructure services was very evident following Cyclone Gabrielle, where cross-jurisdictional collaboration was integral to the post-disaster response. This type of arrangement is being held up as a national example of what could be implemented around the country.

[2] Hawke's Bay 3 Waters 2023 'Positive Hawke's Bay reaction to Government Three Waters announcement', 14 April 2023, published online at https://www.hb3waters.nz/latest-news/article/37/positive-hawkes-bay-reaction-to-government-three-waters-announcement, accessed 3 November 2023.

It is possible that the governance framework and responsibilities for funding and management of the East Clive WWTP may be altered over the next nine years with new governments both national and local, and changes in public opinion, policies and technology. There is some concern for maintaining the current relationships and responsibilities shared by HDC and Tangata Whenua, namely through the vehicle of the HDC-TWWWJC, to weather such changes.

Reforms involving National Policy Statements and regulations, as well as governance frameworks, have the potential to impact the operation and performance of the East Clive WWTP in several ways such as:

- Changes to end-of-pipe wastewater quality and receiving water quality limits, which in turn may require upgrades to existing treatment process, or additional treatment technologies at significant cost
- Timing for decision-making (e.g. additional or different layers of bureaucracy may extend time taken to obtain approvals for expenditure, consenting, and other management actions)
- Decision-making powers afforded to HDC and Tangata Whenua (these may be enhanced or restricted)
- Degree to which the public are engaged on issues relating to the operation and performance of the WWTP and the offshore outfall.
- Other ways not yet identified.

1.3 Heretaunga Tangata Whenua Values

This section provides an overview of values held by Heretaunga Tangata Whenua in relation to the whenua (land), awa (rivers) and moana (ocean) of the Heretaunga rohe (Hastings District), and the complex interactions between land and resource use activities such as wastewater collection, treatment and discharge and the values which are so strongly held. The information presented here has come from factual resources already publicly released with permission of Heretaunga Tangata Whenua as part of previous work undertaken in conjunction with the HDC-TWWWJC. Where assumptions have been made on the basis of this information (regarding cultural concepts and values), these are explicitly identified and referenced.

Notably, this Review Report does not incorporate contemporary information provided by Tangata Whenua specifically for the purpose of this Review Report, as per the intention of consent condition 29. Ideally, the Review Report would have been completed concurrently with a cultural assessment of the performance of the Hastings Wastewater Scheme. However, the timing for delivery of the Review Report (as determined by the consent conditions) did not allow for the meaningful, longer term engagement needed to complete the cultural assessment, and the necessary resources were not available during 2023. The main driver for completing this technical components of the Review Report separately from the cultural assessment was to maintain compliance with the consent, given the constraints detailed above. Several actions have been identified for HDC to consider how and when the cultural assessment will happen. These actions are documented in Section 7 (Recommendations) below. The actions have been designed to facilitate wider discussions with a particular focus on answering questions raised through this review process such as:

- How do we assess the health of atua assisting in cultural cleansing process?
- How could the health of atua be measured?
- Do we need to do more to assist atua in the process?
- Is $cBOD_5$ loading still appropriate as an indicator for removal of kūparu?

1.3.1 The 'Remarkable Journey'

The 'Remarkable Journey' (Tomoana et al. 2006) is set out in Section 3.4 of the 2013 AEE and underpinned by Support Document 12 of the AEE. The following is an abridged summary of the process undertaken to recognise and integrate Tangata Whenua values in the Hastings Wastewater Scheme.

In achieving the sustainable management purpose of the Resource Management Act 1991, Section 6, clause (e) provides that "*The relationship of Māori and their culture and traditions with their ancestral lands, water [and] sites ..." shall be recognised and provided for as "matters of national importance.*" The customary beliefs and practices of

Tangata Whenua and their relationship with their land and the sea (Hawke Bay) are therefore matters of national importance.

These provisions lead the Tangata Whenua members of the HDC-TWWWJC to adopt a Māori world view of the entire system encompassing the treatment and discharge of the treated wastewater into the natural environment in their early deliberations. Refer Support Document 12 of the 2013 AEE.[3]

The Māori world view is where all things in the natural world are seen by Māori as the progeny of Papa and Rangi including humankind. People are thus seen as directly related and thus connected to all (living and non-living) things. This common bond places people firmly inside the natural environment; they do not exist outside it. If something is done to the natural environment (whether positive or negative) then it is done to oneself. The personification of the natural environment through various atua (spirits) reinforces this belief. For example, if a water body is polluted then not only is the water body polluted but it is an affront to the atua as well as oneself.

The total treatment process to address the Māori cultural concerns included a rock channel (now named the Rakahore Channel) which revives the mauri of the waste stream from the BTFs, and discharge to the ocean where further cleansing occurs through the action of the waves and currents as well as exposure to wind and the sun's rays. In accordance with the Māori world view, as upheld by Tangata Whenua with Mana Whenua and Mana Moana (at the time when the application for this consent was being considered) the deities of the Māori world view are applied to acknowledge the cultural expectation within Kaitiakitanga of environmental management.

- Tāne Mahuta to account for the bacterial activity of the biomass in the biological trickling filter that transforms the paruparu by the removal of the mauri of human waste
- Papatūānuku to account for the rock channel through which the filtered material is passed in order to revive the mauri and transform the natural elements of water
- Tangaroa to receive the transformed water and complete the cleansing process to a culturally acceptable standard, and
- Tamanui Te Rā of the heavens and the Sun, with Tāwhirimātea of the winds, to work with Tangaroa to complete the process.

This concept presented as below in Figure 1-4 in terms of the Māori view was represented in a brochure that was delivered by Hastings District Council to all properties served by the wastewater system at the time of consultation, leading to the 2013 AEE and consent applications.

The earlier 2002 Consent included the key condition of complete removal of kūparu (human waste). As time progressed from 2002 the project evolved such that there was acceptance of the BTF achieving transformation / bio-transformation through natural biological processes. Accordingly the consent condition was changed from the "complete removal of kūparu" to requiring the domestic and non-separable wastewater to be treated in the biological trickling filter, with an annual average daily loading of carbonaceous biochemical oxygen demand (5 day test) ($cBOD_5$) that shall not exceed 0.4kg per cubic meter of media, with the treatment plant managed in accordance with best wastewater engineering practice and industry standards.

This has resulted in the $cBOD_5$ loading on the BTF being considered the surrogate for the measure of biotransformation. Section 2.6.6 sets out the comparison of the consented $cBOD_5$ loading, the design and the operation, which shows that the actual loading is significantly below the consented loading (which implies that a greater degree of transformation may be being achieved than what was originally anticipated when setting the consent limits). The use of cBOD5 loading as an indicator for the degree of kūparu transformation being achieved, and the understanding of the concept of transformation, requires further consideration and discussion by the HDC-TWWWJC, particularly its Tangata Whenua representatives.

[3] Hastings District Council, MWH. (2013). Hastings Wastewater Resource Consent Project Assessment of Effects on the Environmental and Resource Consent Applications - Support Document 12. Report 1: Introduction to Cultural Issues In The AEE. Hastings District Council – Tangata Whenua Joint Committee Strategic Reports to TWWWJC Meeting.

HERETAUNGA TANGATA WHENUA VALUES

"Heretunga Hauku nui, Heretaunga Ararau, Heretaunga Haaro o te Kāhu, Heretaunga Takoto noa! Heretaunga of the life giving dew, of the hundred pathways, the vision of the far-sighted hawk, left to us the humble servants"

The current wastewater treatment process combines:

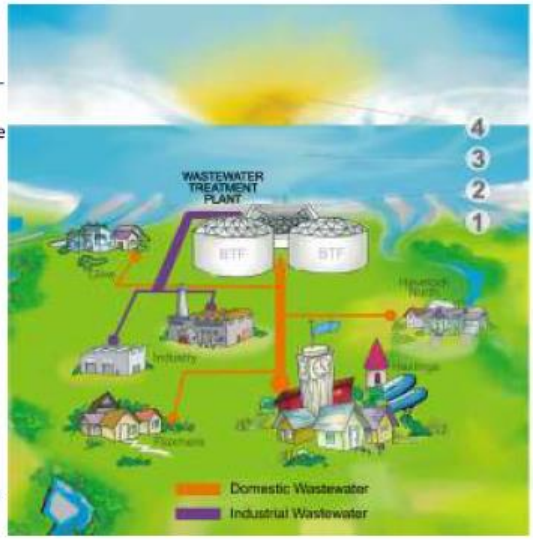
- innovative engineering infrastructure,
- applied science, and
- the customary practices and values of mana whenua.

The diagram below attempts to show the Maori dimension being expressed in an integrated form, against a backdrop of the current wastewater system.

1 Tane Mahuta - **The deity of the flora and fauna.**
Provides the bugs in the biomass in the biological trickling filter. Through the biomass, the kuparu is transformed by the removal of the *mauri* (life essence) of the human wastes.

2 Papatuanuku - **The earth element in the creation; the female element.**
The earth mother, receives the transformed waste and the contact with papatuanuku proceeds to re-establish the *mauri* (life essence) to the transformed waste.

3 Tangaroa- **The male deity of the oceans.**
Receives the transformed waste (after passage through Papatunuku), and in his vastness, tidal movements and currents he makes himself clean. Tangaroa has the natural capacity to cleanse himself.



4 Tamanui te Ra and Tawhirimatea - **The deity of the heavens and the deity of the winds**
By agitating the surface of the ocean (Tangaroa), and through the very synthesis of air and water, the cleansing process is completed with any odours being dissipated aerobically

- the discharge of wastewater from the WWTP into the sea, including specific cultural values that may be affected.
- To identify the potential effects (both favourable and adverse) on cultural values of the proposed activity.
- To identify appropriate measures to avoid, remedy or mitigate, where practical, any adverse effects of the proposed activity on cultural values.

Do you have any thoughts on this view?

WASTEWATER RESOURCE CONSENT

HASTINGS DISTRICT COUNCIL

Figure 1-4: The Māori view as represented in a brochure that was delivered by Hastings District Council to all properties served by the wastewater system at the time of consultation

1.3.2 Transformation of Kūparu

The following is a summary of how the Biological Trickling Filters (BTFs) became the accepted technology by the HDC-TWWWJC from a Māori cultural point of view for the transformation (treatment) of the domestic and non-separable (DNSI) wastewater. The journey taken to adopt this approach between the first consent in 2002[4] to the application for the current consent in 2013 was documented in the 2013 consent application[5].

The journey from a cultural perspective to arrive at the BTF system for the DNSI waste stream involved the following:

a) The initial consent[4] was framed in terms of removing a significant proportion of kūparu (the human waste component of wastewater) with treatment involving screening, natural settling and removal of solids in the DNSI wastewater stream.
b) Because the natural settling method of primary treatment produced sludge (faecal solids) that Tangata Whenua considered to be unacceptable from a transport and disposal viewpoint, secondary biological treatment was considered later in the consenting process (after the initial application has been lodged).
c) The HDC-TWWWJC had under the 2002 consent three years to further consider options including achieving "complete removal of kūparu" rather than "significant removal of kūparu".
d) After consideration of a number of options, the Biological Trickling Filter (BTF) process was decided on and a pilot/observation plant established at the East Clive WWTP site. From a Tangata Whenua perspective, the biological process using a low organic loading on a trickling filter was seen as a natural process where similar micro-organisms that break down waste in nature (as in early Māori settlements) were utilised in the BTF. Note – the term "biological" was added to the conventionally used term "Trickling Filter" to become Biological Trickling Filter (BTF). This was done to emphasise that the BTF is a biological system.
e) The BTF option with a low organic loading rate ($cBOD_5$) was further considered in terms of "transformation" rather than the removal of kūparu.
f) In confirmation of their support of the BTF concept, Tangata Whenua members of the HDC-TWWWJC highlighted the fact that kūparu is also contained in the liquid portion of the waste stream from conventional primary treatment (sedimentation or natural settling). By contrast, kūparu is significantly biologically transformed by the BTF option
g) To achieve the degree of "transformation" sought by the Tangata Whenua members of the HDC-TWWWJC, the approach taken was to set a resource consent condition on the organic loading by setting an upper limit for the BTF operation.

1.3.3 Rakahore Channel

In conjunction with the agreement to use the BTF process, it was determined by Tangata Whenua members of the HDC-TWWWJC that the total treatment process to address Māori cultural concerns would include a rock channel in order to revive the mauri of the waste stream from the BTF's by contact with Papatūānuku. This requirement is set out in Condition 5b of the current consent.

Rocks were specifically selected by local iwi and blessed for this purpose. The rock channel was previously called the Papatūānuku Channel but later changed to the Rakahore Channel as requested by Tangata Whenua members of the HDC-TWWWJC.

[4] Consent number CD99026Wd, Issued 1st April 2002.
[5] Consent number CD130214W, Issued 25th June 2014.

Figure 1-5: Rakahore channel, February 2024

1.4 Scope and Format of Review

The scope for this Review is prescribed by Condition 27 of the principal treated wastewater discharge resource consent (number CD130214W), as detailed in Section 1.1 above. This section explains the overall approach and methods used to complete the Review in accordance with consent requirements. The key components of the Review are set out in Table 1-2 below, with relevant consent conditions and references to the sections of this Review which provide detail to satisfy the consent requirements.

Table 1-2: Summary of Review Components

Task	Consent condition(s) met	Relevant section(s) of this Review Report
Stage 1 Scoping		
Meetings between HDC and Stantec to initiate review project	N/A	N/A
Present draft scope for review to HDC-TWWWJC	27(j)	1.4.2; 2.10
Finalise scope of review, incorporating HDC-TWWWJC feedback	27(j); and 29(e)	1.4.2; 2.10
Stage 2 Review Implementation		
Gap analysis of available information	N/A	N/A
Request for Information submitted to HDC	N/A	N/A
Data collation	N/A	N/A
Population and land use changes Comparisons of population and industrial changes and possible trends as compared to the Heretaunga Plains Urban Development Strategy (2010) (HPUDS), and then latest reports on the Hastings Urban Development Strategy and the Hastings Industrial Strategy.	27(a)	2.1

Task	Consent condition(s) met	Relevant section(s) of this Review Report
Wastewater flows and loads assessment Volumes, flows and loads profile and changes assessed against future projections and wastewater projections as set out in section 4.3 of the Hastings Wastewater Resource Consents Project: Assessment of Effects on the Environment and Resource Consent Applications copy dated June 2013.	27(b)	2.2
Trade Waste Profile Trade waste profiles, trends and any significant changes in the Consent Holder's trade waste management practices and the trade waste contaminant profile.	27(c)	2.3
Regulatory Review Any new changes to environmental guidelines and / or standards applicable to the discharge of treated wastewater into Hawkes Bay.	27(d)	2.4
Asset Management Changes in asset management and operational matters that may have relevance to the on-going operation and development of the Consent Holder's Wastewater Scheme from the perspective of the treated wastewater discharge, water conservation and efficient energy management.	27(e)	2.5
Wastewater treatment technology and review of alternatives Changes in wastewater treatment technologies that may be relevant to the Hastings Wastewater Scheme for either the domestic and non-separable waste stream and /or the Separable Industrial waste stream.	27(f)	2.6
Recreation Survey The results of a recreational usage survey undertaken during the nine year period, which is comparable to the survey undertaken between the summers of 2011 and 2013 and comparison of those results with previous surveys.	27(g)	2.7
Options Assessment Options for treated wastewater disposal / discharge and beneficial reuses that may be appropriate to the Hastings Wastewater Scheme.	27(h)	2.8
Effects Assessment Effects of the treated wastewater discharge into Hawke Bay as evident from the resource consent monitoring.	27(i)	2.9
Community Engagement Details of consultation undertaken with the community to ascertain their views of the effects of the current wastewater discharge.	27(j)	2.10
Objectives and Opportunities for Best Practicable Option (BPO) Consideration of this existing Resource Consents Project objectives, opportunities for improvement and Best Practicable Option (BPO) in terms of the interpretation of this term in the Resource Management Act 1991.	27	3
HDC-TWWWJC Review Advising the Consent Holder on the Condition 27 Trends, Technology, Discharge, Environmental and Monitoring Nine Yearly Review before it is finalised and submitted to the Regional Council (Manager Resource Use).	29(f)	6
Compile Review Report	27	N/A

Task	Consent condition(s) met	Relevant section(s) of this Review Report
Stage 3- Post-review		
Present review findings to, including findings from independent peer review	29(f)	6
Finalise draft report	N/A	N/A
Lodgement with HBRC	27	N/A
Publicise Review Report on HDC website	27	N/A

1.4.1 Overall approach

This Review was undertaken with inputs from and collaboration between the following parties:

- HDC Operational staff for the East Clive WWTP, including the WWTP Engineer, Wastewater Manager, and Trade Waste Officer among others;
- members of the HDC-TWWWJC, and
- suitably qualified and experienced technical personnel from Stantec (the authors / coordinators of this report) and Good Earth Matters (peer reviewers of this report).

The overall approach to the Review was to:

- Closely reflect the consent requirements, especially the components of Conditions 27 and 29 that specifically reference the Review
- Where possible, maximise the use of previous documentation (such as annual compliance reports and technical materials prepared for the 2013 application)
- Incorporate the additional matters raised for inclusion in the review by the HDC-TWWWJC (detailed in Section 1.4.2 and Section 5 below).
- Ensure that the review provides practical recommendations for implementation of the consent and improved operations moving forward, for the next nine years and beyond. Recommendations raised through this Review shall be collated and used to prepare a work plan (which will also tie into the 2024/25 LTP and other investment planning processes).

A number of reports were generated as part of the Review. Some documents from the 2013 consent application have also been referenced to convey changes that have occurred over the past nine years. The key findings are summarised throughout the report. Where appropriate (for example, if the work has not been previously published), the outputs have been attached as appendices to provide further detail. The key references include:

- Hastings Wastewater Resource Consent Project Assessment of Effects on the Environment and Resource Consent Applications (MWH and HDC, June 2013) and 12 supporting documents Including the following which are specifically relevant for this Review:
  - Alternatives Assessment Support Document 7 (MWH 2012) (and any new tables generated in order to assess options as part of this Review)
  - Support Document 12 (MWH 2012) Report 1 – Introduction to Cultural Issues in the AEE; HDC-TWWWJC Strategic Reports to HDC-TWWWJC Strategic Meetings.
- Details of the methods used to complete the recreation survey, and any associated records (e.g. transcripts, raw data)
- Calculations used to assess wastewater flows and loads (existing and future scenarios) – tables comparing 2013 AEE projections with updated projections to 2049
- Trade waste customer data (anonymised) – tabulated by industry group/discharge type
- Summary monitoring data (tabulated) used to inform effects assessment for Condition 27(j)
- Copies of minutes of HDC-TWWWJC meeting(s) where decisions were made/information presented regarding the scope of this review.

1.4.2 Inputs from the HDC-TWWWJC

This Review includes certain content which is not specifically prescribed by the consent. This is due to the provision for the "Review Report [to] address as a minimum, **but not be limited to**" the matters outlined in Condition 27. There is also provision for the HDC-TWWWJC to provide "any further suggested input in respect to the scope of the review" (Condition 29(e)). HDC first consulted with the HDC-TWWWJC to determine what these additional aspects of the Review should be during a committee meeting held on 17 August 2022.

Topics that were raised during this meeting for consideration in the Review included:

- Transformation and removal of kūparu through the BTF process; put a spotlight on aspiration for 'significant removal'. What are the measures of success?

- The role of kaitiaki and how the term has been incorrectly used in Condition 29 of the consent
- Implementation of cultural health monitoring
- Integrate a cultural review within this Review Report
- Consider what the approach to impementing the consent may be over the next nine-year period, rather than just "ticking the boxes" for this Review
- Investigate trends in the constituents of trade waste (e.g. heavy metals), and the possibility of utilising trade waste agreements to enable potential changes recommended in this Review to be implemented. Identify 'high risk' dischargers and describe how they are managed through the Consolidated Bylaw. Consider whether human waste could be present in industrial / trade waste discharges.
- Ensure that the Review reflects the same definition of "practicable" (for the Best Practicable Option) as in the resource consent

The initial consultation was followed up with a meeting on 12 September 2022 to confirm the feedback received and provide opportunity for any final inputs to be communicated. It was further decided that the 'cultural review' component of this Review should cover the following aspects:

- Reviewing and reflecting upon mātauranga Māori and its relevance for East Clive WWTP operations
- Incorporate the concept of *te Mana o te Wai*, and ensure that it is acknowledged and appropriately referenced throughout the Review report
- Acknowledge the cultural origins of aspects of the WWTP including the BTF and rakahore passage, as well as the role of Kaitiaki, with particular reference to how the term is incorrectly used in Condition 29 of the consent.
- Consider present, emerging or future practices as part of the Best Practicable Option assessment.
- Provide an overview of the 'past and present' context of the consent.
- Identify opportunities for future mahi (work) and ongoing involvement and buy-in of the HDC-TWWWJC.
- Consider cultural indicators currently used (and that could be used) in monitoring of the discharge.
- Discuss how the WWTP and associated discharges may have affected Cultural Health Index (CHI) indicators over the past nine years, and how monitoring could be improved to include these indicators to a greater degree in the present and future.
- Review the Annual Compliance Report(s) for the WWTP and highlight issues with particular contaminants, if any.
- Consider mortuary waste as a trade waste constituent and how to process it appropriately.
- Communicate the pros and cons of new treatment technologies available, and opportunities for improvement (as part of the options assessment component of the Review).

Where relevant, these aspects have been incorporated into sections of the Review which address a specific requirement of the consent (for example, additional matters relating to trade waste were incorporated into Section 2.3, which primarily addresses the requirements of Condition 27(c)). Section 5 summarises how these aspects have been addressed (or are to be further addressed as detailed in the recommendations from this Review Report) and provides references for the relevant sections of this Review Report where the matters are discussed.

1.4.3 Strategic Planning

During the HDC-TWWWJC meetings detailed above, HDC proposed that a Dynamic Adaptive Pathway Planning (DAPP) approach to strategic planning would be beneficial if implemented for the East Clive WWTP, its discharge and the operation of the wider wastewater network. The HDC-TWWWJC was generally receptive to this approach and it is likely that it will be used for future planning particularly with regards to climate change and the impact it will have on current wastewater treatment.

The strategic planning approach involves detailed analysis of all aspects of a facility or service, such as the East Clive WWTP, and considers all possible present and future outcomes for its management. It provides a framework for decision-making, and prioritising actions for management. The approach allows for very complex situations, with high uncertainty, to be broken down into a more manageable framework. This process makes decision-making more achievable, and helps to avoid "paralysis by analysis" and avoided action due to perceived complexity. DAPP methods

take into consideration the fact that there can be many different paths to reach a desired outcome or achieve agreed objectives. In some cases, multiple pathways need to be implemented at once. It is helpful to break down the actions required to achieve this in a sequential and logical manner, to encourage transparency and give everyone involved more confidence in the decisions being made.

The DAPP method has been applied by water services providers elsewhere in Aotearoa New Zealand and is well-referenced in international environmental and water resources management literature. In Auckland, it has incorporated into water and wastewater infrastructure projects, and DAP plans have been developed for individual schemes servicing both inner urban areas and regional hubs such as Helensville and Wellsford (Maynard et al. 2020). Greater Wellington Regional Council used the approach to develop the Hutt River Flood Protection Strategy (Infometrics & PS Consulting, 2015 in Maynard et al. 2020).

The global wastewater network discharge consent held by Watercare (since 2014) relies strongly upon focused, progressive improvement of performance across the network and prioritisation based on agreed environmental and cultural parameters. This is manifested in a Wastewater Network Improvement Works Programme. The DAP plans for various schemes are useful for identifying inter-dependencies between works projects and milestones, as well as for identifying step-change effects for different options (when these are being considered as part of the BPO methodology adopted by Watercare and enshrined in the network consent). The DAP plans also categorise short term and long term actions and investment needs.

Strategic planning allows for decision-makers to document a strategic vision for the future management of their assets, which also allows for the inevitable changes that may occur over time as a result of external influences (such as population growth; climate change; natural disasters; changing economic conditions, legislation changes, etc.). These external influences can come from a wide variety of sources, and with varying degrees of influence on the asset; some factors have a greater influence on the way the asset or system is operated than others. This creates a lot of uncertainty.

The DAPP method helps to manage that uncertainty by putting in place a robust and well-thought-out plan for how to deal with different situations if they arise in future, while keeping overall objectives and aspirational goals in mind. It serves as a "framework to guide future actions" (Haasnoot et al. 2012, p485). A DAPP approach can feature aspects of more 'traditional' planning and strategic approaches, such as adaptive management and 'roadmapping', but adds a further dimension of flexibility and a more detailed understanding of obstacles and inter-dependencies to be considered.

A strategic planning approach using DAPP will typically identify the following:

- **Objectives** – overall outcomes that the plan is developed to specifically achieve over time. These can be a detailed breakdown of a wider strategy.
- **Actions** – steps / activities undertaken to achieve an objective.
- **Contingency actions** – Potential alternative actions that could be taken should a condition change due to a trigger.
- **Triggers** – changes in the system which can influence the actions and routes taken. These can be external (for example, a change in physical environmental condition, such as a wetter climate; or resource availability (e.g. water supply)) or internal (e.g. availability of Council funding for asset upgrades). A trigger requires a review of the situation, potential **actions**, and a decision on how to proceed (which **pathway** to follow).
- **Tipping points** – a condition or state where actions no longer meet the objectives identified for the plan. The system starts to operate in a different way. When a tipping point is reached, new or additional actions are required.
- **Thresholds** – a way of measuring outcomes, and deciding whether they are acceptable or not. Used to assess performance.
- **Routes (or Pathways)** – A sequence of actions completed over time, to achieve an agreed outcome. These can be identified as 'Potential' and/or 'Preferred'. Whether or not a pathway is 'preferred' can change over time, depending on the conditions present.

Developing this type of approach typically involves the following steps (after Haasnoot et al. 2012), illustrated in Figure 1-6:

1. Describe the 'status quo' (present conditions, objectives and sources of uncertainty).

2. Problem definition – analyse potential vulnerabilities of the infrastructure, and opportunities for change or improvement. Identify possible future scenarios for the treatment and discharge system (including those reflecting climate change and/or sea level rise scenarios).
3. Identify actions that would need to be undertaken.
4. Detail potential pathways and map them visually.
5. Select any preferred pathway(s).
6. Determine contingency actions and triggers
7. Specify a DAPP approach
8. Implement the DAPP approach
9. Monitor performance; implement contingency actions where necessary. Learn from the process.
10. Continuously evaluate the 'status quo' and adapt the DAPP approach as needed.

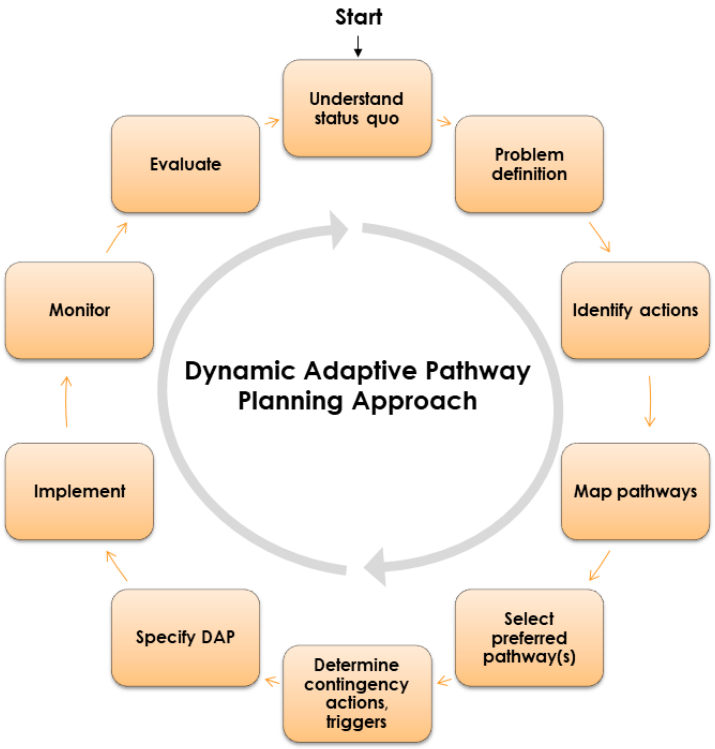


Figure 1-6: Steps towards implementing a DAPP approach

2 Condition 27 Review Items

This section has been structured to directly reflect not only the consent conditions (in the order in which they appear in the consent itself) but also the summary of contents originally presented in a scoping table dated 14 October 2022, which was provided for review by the HDC-TWWWJC. This is to show alignment between the content of this report, and the agreed scope (which was consequently approved by the HDC-TWWWJC).

This section covers all items under Condition 27, including the final paragraph of the condition regarding objectives and opportunities for BPO.

2.1 Condition 27(a): Population and Industrial Changes

(a) Comparisons of population and industrial changes and possible trends as compared to the Heretaunga Plains Urban Development Strategy (2010) (HPUDS), and then latest reports on the Hastings Urban Development Strategy and the Hastings Industrial Strategy.

This section sets out the projected population and industrial changes and trends for the remaining life of the consent, up to the year 2049, in response to Condition 27(a). It includes:

- Identification of relevant plans, strategies and datasets that have informed this Review of population and industrial changes in the Hastings District.
- Analysis of the change in population demographics between 2013 (when the application for this consent was developed) and 2023, including a summary of current population.
- Analysis of the change in land use activities between 2013 and 2023, with a focus on residential housing and industrial activities as they pertain to wastewater servicing demand.
- Predicted future population growth, with regards to the population serviced by the Hastings Wastewater Scheme.
- Commentary of possible/likely changes in industrial / trade waste production in the future.

2.1.1 Relevant documents

This section of the Review Report has relied upon the Final versions of reports and assessments at the time of preparation (June-July 2023). Documents relevant to the population and industrial changes in Hastings include the Hastings Industrial Strategy 2009, The Hastings District Council 2021 Wastewater Asset Management Plan, and the Hastings District Council Variations to District Plans, specifically Plan Change 5.

The initial consent application (2013) referred to the growth projections used in the Heretaunga Plains Urban Development Strategy (HPUDS) 2010, which covered the period of 2015 – 2045. The Housing and Urban Development (HUD) Strategy originally developed in 1993 was replaced/superseded by the HPUDS documents and is no longer referenced as a development strategy for the Hastings urban area. HPUDS was reviewed in 2016 to produce the updated 2017 strategy, which is the most up-to-date version as of 2023. It is unlikely that HPUDS will be subject to further review as the intention is for it to be replaced by the Future Development Strategy (FDS), which is being jointly developed by Napier City Council, HDC, HBRC and Tangata Whenua partners . The intention of the HPUDS is to assist Hastings District Council in planning for and managing growth on the Heretaunga Plains, while recognising the value of water and soil as a significant resource. The Heretaunga Plains is a 300km^2 sub-region in the east of the Hawke's Bay region, encompassing the towns and communities of Napier, Hastings, Flaxmere, Clive and Havelock North.

Reports and assessments regarding future planning and strategy relied upon by HDC include Essential Service Plans. Housing Assessment and the FDS mentioned above[6].

[6] The FDS is a requirement of the Government's National Policy Statement – Urban Development. The FDS will guide development across existing urban areas and areas close by across the two districts over the next 30 years. Refer to https://www.hastingsdc.govt.nz/hastingsnapierfuturedevelopment/ for more information.

As per the 2021 Wastewater Asset Management Plan (AMP), the urban area connected to the Hastings Wastewater Scheme is approximately 70% of the total population within the Hastings District.

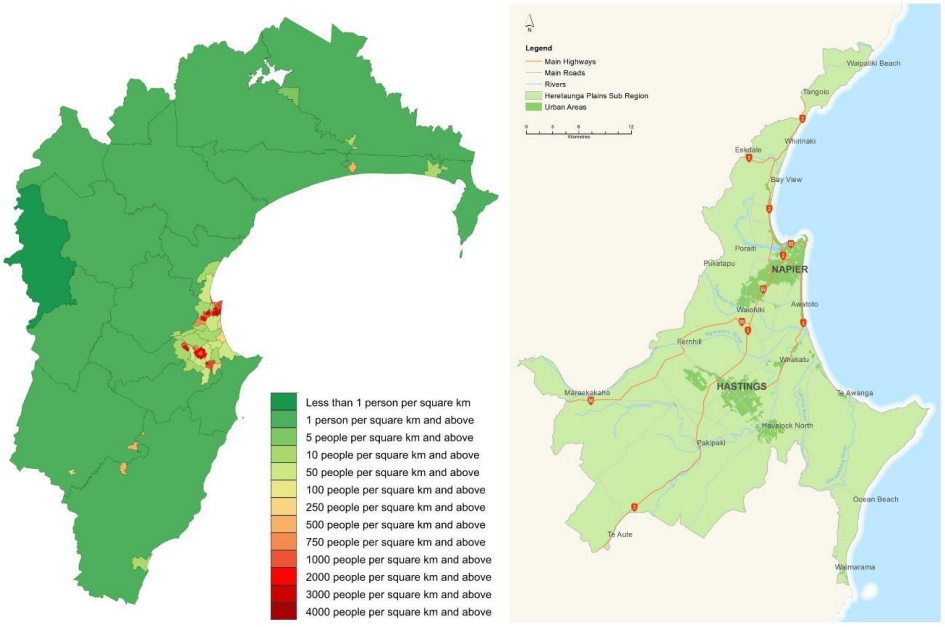


Figure 2-1: Left: Hawke's Bay Region showing population density (2006)[7], Right: The Heretaunga Plains (2017).

2.1.2 Future Growth

2.1.2.1 Heretaunga Plains Urban Development Strategy (2017)

The initial HPUDS 2010 was revised with an updated strategy in 2017 based on the 2013 census outputs. The strategy aims to quantify the level of growth and how that growth is to be managed over a 30 year period, commencing in 2015.

The review undertaken in 2016 found that the population growth within the Heretaunga Plains from 2010 – 2015 was 5,500 people, or an increase of 4.4% to a population of 131,400. This was higher than that projected in the 2010 strategy and was driven by both natural population increase and net migration gain. Household numbers increased from 2010 to 2016 by 6.3%, which is 3,063 houses. This exceeded the projections made in the 2010 strategy by 545 houses. The average number of people per household decreased from 2.6 in 2009 to 2.55 in 2016.

The projected total population increase for the Heretaunga Plains over the 30 year strategy period (to the year 2045) is an additional 16,425 people, which is a 12.5% increase from the 2013 population. Extrapolated out to the year 2050, to cover the life of the Wastewater Consent, that is a population of 150,900 people, an increase of 19,500 people from the 2013 population. The population age is expected to increase, with the age category 75+ being highlighted in the HPUDS as the usual starting age for entering aged care facilities and retirement villages.[8]

[7] https://commons.wikimedia.org/wiki/File:HawkesBayRegionPopulationDensity.png
[8] HDC, HBRC and NCC, 2017. Heretaunga Plains Urban Development Strategy.

The key growth projections and assumptions in the 2017 HPUDS, based on the 2013 Census, are summarised below[9]:

1. Adoption of a 'Halfway Medium to High' growth projection scenario (rather than the 'Medium' scenario adopted for 2010 HPUDS) is appropriate.
2. Projected total population growth for the Strategy area of 16,455 or 12.5% over 2015-2045.
3. Projected total additional dwellings across the Strategy area for the 2015-2045 study period is 10,610 dwellings (2010 HPUDS projections estimated a requirement for an additional 8,014 dwellings, based on a 'medium' growth projection scenario).
4. The average number of persons per household was estimated to be 2.55 in 2015 (as part of the 2016 HPUDS review) and is expected to fall to 2.38 in 2045.
5. The population of the region is ageing, with a moderate to significant increase in the 65+ population – expected to increase by 19,580 or 81% between 2015 and 2043. There is a significant shift in age-profile expected over the next 30 years, and even further beyond, which sees the 65+, 75+ and 90+ age groups increasing by 94%, 172% and 286% respectively.

Table 2-1: Summary of key population changes between HPUDS 2010, HPUDS 2017 and projections to 2045.

Item	HPUDS 2010	Difference	HPUDS 2017	Difference	Projection to 2045
Population	125,900	+ 4.4%	131,400	+ 12.5%	147,855
Households	48,392	+ 6.3%	51,455	+ 20.6%	62,065
Average population per household	2.6	- 1.9%	2.55	- 6.6%	2.38

2.1.2.2 2018 Census and future growth predictions

The latest projections from 2021 onwards for population growth to June 2048 are based around the 2018 census[10]. This identifies the Hastings District to have a medium increase of 19,100 people by 2048, which equates to an average annual increase of 0.7%.[11] The Hawke's Bay region has a projected medium increase of 29,600 people by 2048, equating to an average annual increase of 0.6% (slightly lower than projected for the Hastings District). The Hawke's Bay region saw a 10% increase in the population between 2013 and 2018, which was significantly higher than what was projected (represented as 'HBRC 2018 Census actual population' in Figure 2-2 below). This was attributed to the influence of steep property value increases elsewhere in New Zealand and the growth in the tourism space. The Hawke's Bay region, and thus the Hastings District, is highly accessible to the airport and the cities of Napier and Hastings, providing affordable living and employment options for New Zealanders.[12]

The projected total population of an additional 19,100 people by 2048 for Hastings District (see 'HDC 2018 Census Projected population' in Figure 2-2)is greater than the HPUDS area projection of an additional 16,455 people by 2045, however the 30 year growth rate is ~18% which is similar to the HPUDS 2017 projections. The increase in population for the Hastings district between the 2013 census and the 2018 census (as well as the 2015 estimate from HPUDS) is slightly higher than the average growth rate, identifying that a portion of the significant growth in the Hawke's Bay region has been felt in the Hastings District.

[9] HDC, HBRC and NCC, 2017. *Heretaunga Plains Urban Development Strategy*. Section 4.3.2: Updated Projections and Forecasts 2015 – 2045.
[10] The results of the latest census held on 7 March 2023, and subsequently delayed due to the impact of Cyclone Gabrielle will be taken into account in the next Review Report 2032.
[11] Stats NZ, 31 March 2021. *Subnational population projections: 2018(base)-2048.* Retrieved from: Subnational population projections: 2018(base)–2048 | Stats NZ
[12] Central Hawke's Bay District Council, 2019. https://www.chbdc.govt.nz/our-council/news/archive/article/584/census-data-tracks-central-hawkes-bay-population-growth-at-105

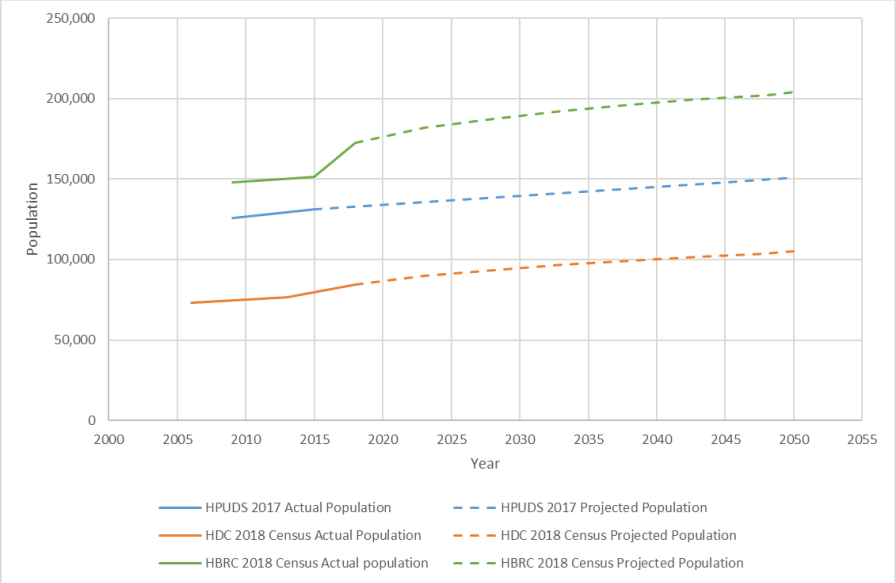


Figure 2-2: Population Growth Projections by data source for the Hawke's Bay and Heretaunga Plains Strategy Areas

2.1.2.3 Wastewater Scheme Connected Population

In the 2013 AEE it was identified that approximately 70% of the HDC population was connected to the Hastings Wastewater Scheme. The 2021 Wastewater Asset Management Plan (AMP) confirms that the scheme still supplies wastewater services to approximately 70% of the district's population[13]. The most recent number of connections to the network are as follows:

Table 2-2: Wastewater Connections, adapted from Table 9-7 of 2021 AMP.

Item	Domestic Reticulation	Industrial Reticulation	Total
No. of Connections	20,704	12	20,716

Based on the most recent census (2018) the estimated connected population to the Hastings Wastewater Scheme, using 70% of the Hastings population, is currently around 60,000 people. This is further supported by the estimated population of 62,118 serviced by East Clive WWTP, in Taumata Arowai's Public Register of Wastewater Networks.[14] Assuming the proportion of the population serviced remains the same for future projections, it would reach ~73,600 people by 2050.

[13] HDC, 2021. Wastewater Asset Management Plan, Section 3.3.2.
[14] Taumata Arowai 2024 'Public Register of Wastewater Networks', Network ID WWN-00174 (East Clive), accessed online 4 May 2024 at https://hinekorako.taumataarowai.govt.nz/publicregister/wastewater/

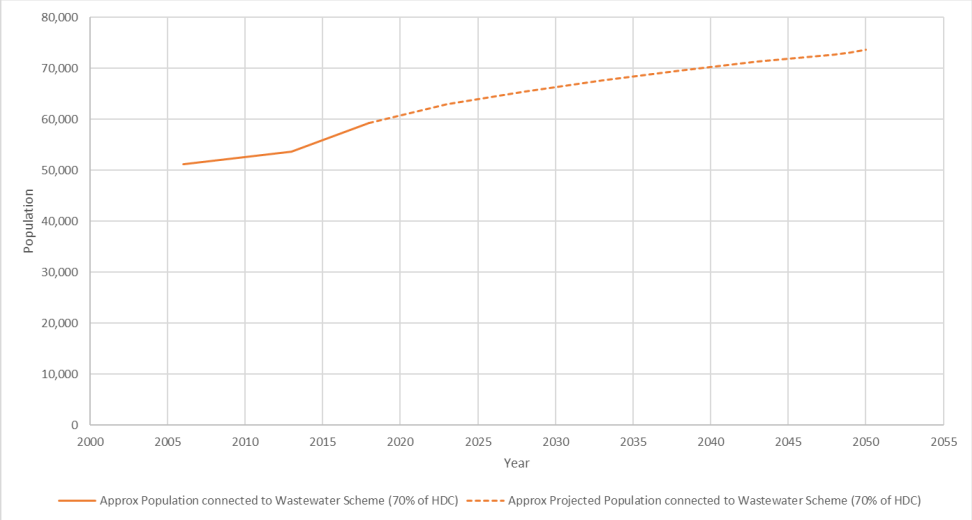


Figure 2-3: Estimated population serviced by the Hastings Wastewater Scheme.

2.1.3 Changes in type/extent of industrial and commercial land use

The trends in the Hawke's Bay population suggest that the retirement sector will be representing 30-40% of the new-build housing in the Heretaunga Plans sub-region between now and 2045. Half of these residential buildings are likely to be in the traditional format of retirement villages, coupled with medium density or high density dwellings. The average size of retirement villages within the strategy area is around 6.25ha, meaning the construction of new villages is likely to occur on greenfield sites. The likelihood of the future trend towards a larger population and an increase in the number of retirement villages and compact retirement houses, could require the need to allow higher densities in future housing zones.

The commercial and industrial growth identified in the HPUDS 2017 demand projections do not change from the 2009 forecast (HPUDS 2010) for commercial sector floor space, estimated to be 70 Ha. Total land development required for commercial growth is expected to be 110 Ha. Given the area, the assumption in the assessment was made that the existing commercial zoned land could retain and include this requirement through redevelopment and intensification. This would indicate the trade waste will not be from new areas but is expected to intensify initially. Matters relating to water conservation, noting that a large number of trade waste discharges source their water from private bores and thus Council have little control over their water use, are discussed below under condition 27e. An additional 225 hectares of industrial land is required by 2045. There is no additional industrial land zoned as the current zoning provides excess land for the requirement.

A key assumption in the 2017 Strategy Land Demand Projections is that the projected population growth will result in an increase in commercial demand, while it will not in itself generate demand for additional industrial land.[15] Thus, it is concluded that any changes in commercial land use will have no corresponding change in the quality and quantity characteristics of trade waste discharges to the HDC wastewater network.

The industrial / business greenfield growth areas in Hastings were identified as:
28. Irongate
29. Omahu

[15] Logan Stone, February 2016. *2016 – 2025 Land Demand Projection, Hastings District and Napier City.* Retrieved from Microsoft Word - 1602 4626 Land Demand (hpuds.co.nz)

30. Tomoana
31. Whakatu

The HPUDS economic growth and industrial demand assessment was based on primary production and associated operations of the pip fruit sector to drive the industrial growth from 2016 – 2019. The HDC implemented a Commercial Strategy[16] in 2003 to cover the next 20 years, which highlights that the allocation of commercial land is not necessary within the strategy period as projected growth be accommodated within the existing commercial environments.[17]

When comparing the 2013 AEE land use projections, based on the original HPUDS 2010 strategy, with the 2017 update of HPUDS based on the 2013 census, significant changes are identified. The future growth extract does not cover population, instead it identifies the assessment of HPUDS land use, which aligns with adopting a high growth projection strategy.

Table 2-3: Comparison between 2013 AEE and 2017 HPUDS proposed additional households.

	Proposed additional Households by 2045, by data source	
Type of development	2013 AEE[18] - projections from 2009 Industrial Strategy	2017 HPUDS – projections based on 2013 census data[19]
Greenfield	1,729	4,745
Intensification	2,084	4,995

Table 2-4: Comparison between 2013 AEE and 2017 HPUDS proposed industrial area growth.

	Proposed industrial area growth, by data source	
Type of development	2013 AEE[20] - from 2009 Industrial Strategy	2017 HPUDS – projections based on 2013 census data[21]
Total industrial (in 10 years)	48.4 ha	64 ha
Total industrial (beyond 2019)	84 ha	225 ha

Table 2-3 and Table 2-4 illustrate how overall, the estimated extent of future growth to 2045 has noticeably increased as a result of access to refined population estimates (from the 2013 census) and additional contemporary data that was not available to inform the 2013 AEE.

2.1.4 Potential Extent of Population Growth

The introduction of the additional greenfield development is due to the key elements of supporting compact design settlements. The Resource Management (Enabling Housing Supply and Other Matters Amendment Act) 2021 and the National Policy Statement for Urban Development (NPS-UD), 2020 requires Councils to remove barriers to development to allow growth in locations that have good access to existing services, public transport networks and infrastructure. The Hastings urban settlement is captured as a requirement of the NPS-UD. When Hastings and Napier are combined as one area it does meet the NPS-UD. Hastings growth does meet the requirement for NPS-UD for tier 2, but a plan

[16] HDC, 2003. Commercial Zone Review and Large Format Retailing Strategy 2003 – 2023.
[17] HDC, HBRC and NCC, 2017. *Heretaunga Plains Urban Development Strategy.* Section 2.3 Allocation of Business Land.
[18] MWH, HDC and Ipurangi Developments Ltd, 2013. Hastings Wastewater Resource Consents Project: Assessment of Effects on the Environment and Resource Consent Applications.
[19] HDC, HBRC and NCC, 2017. Heretaunga Plains Urban Development Strategy.
[20] MWH, HDC and Ipurangi Developments Ltd, 2013. Hastings Wastewater Resource Consents Project: Assessment of Effects on the Environment and Resource Consent Applications.
[21] HDC, HBRC and NCC, 2017. Heretaunga Plains Urban Development Strategy.

change is not required. Further discussion of the relevance of the NPS-UD for Hastings District is provided in Section 2.4.1.7 of this Review Report.

Hastings District Council "Right homes, right place – Plan Change 5" was notified on 29 October 2022. The summary of submissions and opportunity for further submission was from 25 March to 11 April 2023. Hearing of submissions took place in April 2024. The publicly notified plan change identifies key areas for medium and high density growth within the District, to promote intensification of residential living where in areas where services and amenities can cope with a denser population. The plan change allows for a more permissive approach to housing development through:

- Allowing houses up to three storeys high;
- That the number of houses on a site be determined through using rules to control the portion of a site that can be covered by buildings, the amount of grass and landscaping on a site and the space allocated for outdoor living rather than using a site size minimum;
- Turning the Medium Density Design Framework into an assessment tool to help ensure good design outcomes; and
- If all the rules are met, that medium density developments can proceed without affected persons' consent or neighbours approval.

The intention of the plan change is to allow for houses to be easier to build on properties and have more affordable housing options.

The planned built environment of the medium density housing zone enables a focus of compact residential living and improved health and wellbeing of the community. In doing so the permitted activity rules require no more than one principal residential unit per site. Where there are more principal dwellings per site the wastewater connection to the property is required to be assessed to ensure sufficient infrastructure capacity to service the development.

Comprehensive residential development, such as retirement homes, will be required to meet the performance standards for water, wastewater and stormwater through the proposed standard:

> *MRZ-S14 "Any application for comprehensive residential development shall include an infrastructure network assessment which has been certified by Council's Infrastructure Asset Management Team and which confirms that there is, or will be at the time of connection, sufficient infrastructure capacity to service the development."*

The provisions of Plan Change 5 enable medium housing development, and support future populations but still require wastewater infrastructure to have capacity for such growth.[22] Therefore, if population is anticipated to grow by 12.5%, wastewater capacity may also be required to grow.

2.2 Condition 27(b): Flows and Loads

> *(b) Volumes, flows and loads profile and changes assessed against future projections and wastewater projections as set out in section 4.3 of the Hastings Wastewater Resource Consents Project: Assessment of Effects on the Environment and Resource Consent Applications copy dated June 2013.*

This section sets out:

- the wastewater volumes and contaminant loads that were used in the 2013 AEE.
- the wastewater volumes and contaminant loads that have been received at the East Clive WWTP since 2013 and currently.
- the growth and serviced area projections which form the basis for the current calculations of predicted Domestic and Non-Separable Industrial (DNSI) volumes and loads and for the Separate Industry Stream.

[22] Hastings District Council, 2023. *Variations to District Plans*, retrieved from: District Plan Changes/Variations | Hastings District Council (hastingsdc.govt.nz)

- the Projected Wastewater Volume, Flows and Loads for the remainder of the current discharge consent term, to 2049.

2.2.1 Wastewater flows and loads estimates from 2013 AEE

Wastewater flows to the WWTP and discharged via the offshore outfall, and related contaminant loads within influent and treated wastewater, were last estimated as part of the AEE prepared to support the consent application in 2013.

The 2013 estimates and projections were prepared across five 'horizons' (2014, 2023, 2032, 2041 and 2049) given that the application at the time sought a 35 year consent term; the assessment assumed consent would be granted in 2014 (which was the case). These horizons also coincided with proposed nine-yearly consent reviews such as this one.

Key assumptions applied in 2013 to determine **baseline** flows and loads were as follows:

- The population serviced by the wastewater network was equivalent to 70% of the entire District population, reflecting the proportion of the urban area that was connected to the HDC network at the time.
- The "existing" flows and loads were calculated from 2011 quarterly monitoring data for the total combined discharge and DNSI, with the industrial / trade waste stream being the difference between the two. These served as a starting point for the projected scenarios.
- Key assumptions applied in 2013 to determine **future** (projected) flows and loads were as follows:
- Population growth rate of 0.4% per annum (projected for the entire Hastings District), reflecting the Statistics NZ model for medium growth at the time (based on 2011 census). This was also aligned with scenarios adopted in HPUDS (2010). [23]
- Forecasted DNSI wastewater flows and loads were based on a Population Equivalent (PE); this was calculated from projected $cBOD_5$ loads, assuming that 'one PE' was equal to 70 g $cBOD_5$/day , per capita and applying a unit daily flow factor of 300 g $cBOD_5/m^3$ of wastewater.
- The DNSI suspended solids load was determined from derived PE from the $cBOD_5$ load using a PE suspended solids load factor of 80 g/day per capita.
- Considered three DNSI scenarios for each horizon:
  - Low growth (annual growth rate of 0.2%)
  - Medium growth (annual growth rate of 0.4%)
  - High growth (annual growth rate of 0.9%)
- Two scenarios were considered for future Separable Industrial wastewater:
  1. **Constant growth:** Assumed that industrial / trade waste discharge volumes and loads would remain constant between each horizon, and would not increase above that of the baseline (2011/12).
  2. **HPUDS growth:** Assumed that industrial activities would experience the same annual rate of growth as projected for the population serviced by the wastewater network. I.e. Industrial /trade waste flows and loads would increase at the same projected rate as domestic wastewater flows and loads between the horizons.

The baseline average daily flow, and $cBOD_5$ and TSS loads estimated for 2011/12 have been included for comparison in this current review (see findings below), along with the previous projections generated in 2013. The 2013 assessment detailed in the consent application included projections for 2013, 2014/15, 2023, 2032, 2041 and 2049. However only the 2013 baseline, and the 2013 projections for 2023 and 2049, have been included for comparison with the results of this review.

[23] This assumed that the population increase would occur evenly across the District. Further details on the population estimates considered in 2013 and those which have informed this review can be found in Section 2.1 of this report.

2.2.2 Baseline wastewater flows and loads for this Review Report

This 9-yearly review largely follows the same methodology as was used in the 2013 AEE. However some of the assumptions needed to be revised to reflect updated data collected since 2013. These have been identified where relevant.

Baseline (2021/22) wastewater flows and loads have been analysed using monitoring data collected quarterly by HDC between 1 January 2021 and 31 December 2022. This data is routinely reported to HBRC each year through quarterly and annual reports as required by the consent. There is a significant increase in flows to the WWTP during peak food production season (roughly mid-February to end of April) each year, when the largest trade waste dischargers (food producers including canneries and other fruit and vegetable processors, as described further in Section 4.3 of this report) are contributing the highest volumes of industrial / trade wastewater. This period has a strong influence on the annual average flow, therefore it is necessary to present separate estimates of daily flow rates and volumes for the peak and off-peak seasons, alongside annual averages. The resolution of flow data is ideal for this type of comparison, however this is not the case for $cBOD_5$ and TSS loads, which are typically measured at quarterly intervals. Analysis for loads is therefore limited to average daily loads (calculated over an entire 12 month period only).

Flows for different wastewater streams are estimated as follows:

- **Separable Industrial discharges:** Measured via flow metering at sources
- **Domestic Non-Separable Industrial discharges (DNSI):** Estimated as the difference between Total Combined Discharge (TCD) and Separable Industrial discharge flows. The flows recorded on the DNSI influent pipeline to the WWTP are measured, but when compared with the other flow data (for example, the total combined discharge), the records are inconsistent and appear to have data quality issues. Hence, it was necessary to estimate DNSI flow rather than use actual measurements.
- **TCD**: Flow via the outfall (includes DNSI, domestic and Separable Industrial discharges)

It is important to note that wastewater flows and loads are monitored with different resolution at the different locations within East Clive WWTP. For example, volume and flows for the total combined discharge have generally been captured at five-minute intervals over the review period providing a robust, continuous record to inform this assessment. Whereas loads within influent to the plant and during the treatment process are recorded on a less frequent basis, estimated from a series of concentrations based on 24 hour composite sample over a 7-day period each quarter.

Table 2-5 summarises the existing flows and loads information for influent to the WWTP, and for treated wastewater after the BTF and immediately prior to discharge via the marine outfall.

It is important to note that Condition 24(d) of the discharge consent specifies an annual average daily flow of up to 66,000 m^3/day as the trigger value for compliance. Based on total combined flow data at the outfall since 2014, this limit has never been exceeded during the current consent term. Figure 2-5 below which shows long term annualised average daily flow for the total combined discharge at the outfall as a black line, which has consistently remained below the trigger value (green line).

The 2013 AEE assumed contaminant levels (in final treated wastewater discharged) based upon projected Average Daily Flows of 48,000 m^3/day for 2049 (NZ Stats) and 51,000 m^3/day for 2049 (HPUDS). Revised ADF baseflow for 2023 of45,000 m^3/day (±2,000 m^3/day) was used as a basis for updated projections to 2049 in this Review Report (detailed in Section 2.2.4 below).

Table 2-5: Comparison of estimated wastewater flows and loads in 2013, with 2023 baseline

	Contaminant	AEE (2013)						Actual 2023 Baseline		
		Baseline (2011/12)			Predicted 2023[a]					
		DNSI	SI	TCD	DNSI	SI	TCD	DNSI	SI	TCD
Wastewater Flows (000' m^3/day)										
Annual ADF[b]		22.5	20.2	42.7	23.6 23.6	21.6 22.6	45.2 46.2	27±2[c]	17±1	45±2
Peak season ADF (mid Feb-end Apr)		-	-	-	-	-	-	23±5	26±2	50±4

	Contaminant	AEE (2013)						Actual 2023 Baseline		
		Baseline (2011/12)			Predicted 2023[a]					
		DNSI	SI	TCD	DNSI	SI	TCD	DNSI	SI	TCD
Off-season ADF		-	-	-	-	-	-	28±2	15±1	44±2
Average daily load (000' kg/day)										
Influent to WWTP	$cBOD_5$	4.5	28.6	33.1	4.7	28.0 29.4	32.7 34.1	4.3	16.5±6	-
	TSS	5.1	18.9	24.0	5.4	20.7 21.7	26.1 27.1	4.9	10.4±5	-
Treated wastewater	$cBOD_5$	0.7	27.7	28.4	0.7	27.2 28.5	27.9 29.2	0.8	16.5±6	21±12
	TSS	2.0	18.4	20.4	2.1	20.0 27.6	22.1 29.7	2.4	10.4±5	18±13

NOTES:
[a] Two values are shown for 2023 predicted flows and loads from 2013 AEE. The top number in each row represents the 'Constant' population growth scenario, while the bottom number represents a projection using HPUDS population growth rates.
[b] ADF = average daily flow
[c] Value ± Value = average ± standard deviation.

On comparing the projections of wastewater flows and loads made in 2013 with the revised projections developed as part of this Review, the following observations were made:

- The actual 2023 baseline flows (based on Annual Average Daily Flow) were up to 23% higher than those predicted for 2023 (in 2013) for DNSI and TCD The greatest difference was observed for DNSI, where the actual ADF in 2023 was up to 5,400 m^3/day higher than that predicted in 2013.
- $cBOD_5$ loads in influent to the WWTP decreased by up to 23% for Separable Industrial, and decreased by 9% for the DNSI stream when comparing the actual 2023 estimates with those projected in 2013.
- $cBOD_5$ loads were also up to 23% lower in treated wastewater (2023 estimates) compared with the 2013 projections (with the difference being greatest for Separable Industrial compared to DNSI and TCD).
- TSS loads in treated wastewater were significantly lower in the Separable Industrial stream (a decrease of up to 44% when comparing the 2013 projection with actual 2023 estimates), however they were higher for DNSI and TCD with an increase of up to 14%.

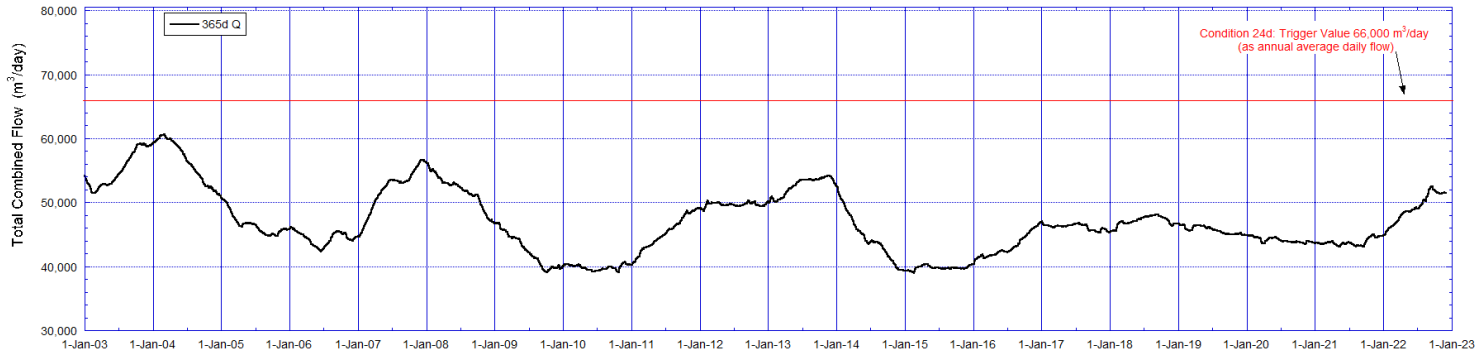


Figure 2-4: Moving 365-day Average Daily Flow (m3/day) calculated from flow measurements captured between January 2003 and June 2022

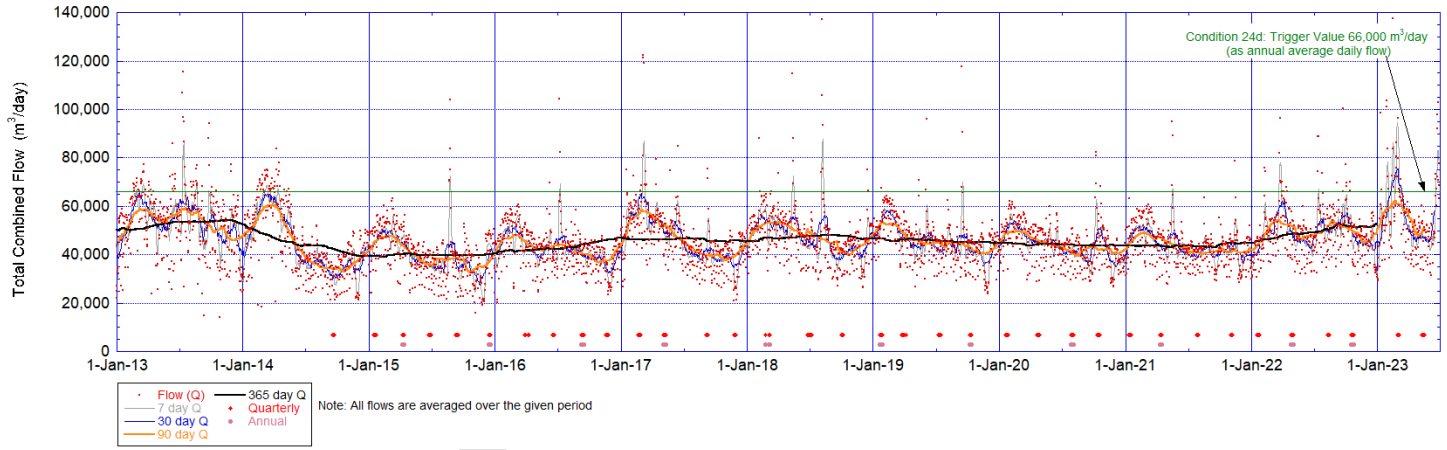


Figure 2-5: Total Combined Discharge measured over the Review Period (2013 - 2022)

2.2.3 Growth and serviced area assumptions (2023)

Further to (and based upon) the information contained in Section 2.1 above, this section identifies key assumptions regarding projected population growth and development within Hastings District.

In the process of developing this Review Report, it became clear that identifying a reliable estimate of future population growth rate was not straightforward. It required a review of several different sources and assumptions referenced or relied upon by different departments with HDC, depending on the purpose for which they were applied. This process should be made consistent and simplified for future reviews. As such, a recommendation has been made for HDC to undertake an evaluation of current growth projections utilised for asset management and planning purposes, and to identify a "single source of truth" to ensure a consistent approach for estimation of wastewater flows and loads in the future. This recommendation is included in Table 7-1 (Section 7 of this Review Report).

2.2.3.1 Domestic and Non-Separable Industry

The assumptions detailed here form the basis for calculations of projected flows and loads to 2049, particularly for the domestic component of the DNSI stream.

As for the 2013 assessment of flows and loads (presented in Section 4.3 of the AEE (MWH 2013)), estimates from the Statistics NZ medium growth scenario have been referenced to assign a rate of population growth per annum, however we have now used the rates from the 2018 census data for Hastings District. This rate is 0.7% per annum across the entire Hastings District; this has increased from the 0.4% per annum assumed in the 2013 AEE.

The original assessment noted that the urban area that is connected to the Hastings Wastewater Scheme serves approximately 70% of the population in the District. This estimate has continued to be applied in key decision-making documents such as the 2021 Asset Management Plan, therefore it has been adopted for this review. This assumes that the predicted increase in population occurs within the currently serviced area, or that the serviced area is extended to include newly developed areas.

2.2.3.2 Separable Industry

It is not possible to estimate the future volumes and contaminant loads for the industrial / trade waste stream with any certainty. Analysis of the available data has indicated that the industrial / trade waste stream has remained stable over the last 20 years. Hence, it has been assumed that the industrial / trade waste stream will remain fairly stable for the periods considered, albeit with seasonal fluctuations year-on-year.

Unlike the 2013 AEE projections (which also modelled the separable industry stream under an HPUDS population growth scenario), only this 'constant' growth scenario has been applied. This is due to the inherent difficulties in estimating how industrial / trade wastewater volumes and loads may change into the future. There are however a number of factors that could change this situation in the future, such as changes in water availability; water conservation and reuse; initiatives to target specific contaminants (including those of emerging / new concern), and new or changed trade activities and discharges. These are the types of factors that should be considered in a strategic approach to managing wastewater services (as described in Section 1.4.3 of this Review Report_.

2.2.4 Projected wastewater volume, flows and loads (2023)

2.2.4.1 Projected DNSI Stream

The projection of DNSI wastewater volume and contaminant loads into the future is based on the population equivalent (PE) forecasted for the Hastings Wastewater Scheme. The PE used in this assessment is based on a $cBOD_5$ equivalent, assuming one PE equals 70g of BOD per day, which is a typical per capita allowance. This was the PE applied in 2013.

Figure 2-6[24] demonstrates that the per capita $cBOD_5$ load has consistently remained between ~60-80 g/head/day since 2009; therefore the assumption of one PE = 70 g/head/day is still appropriate.

[24] Boxes in Figure 2-6 indicate data that are not reliable and are therefore considered to be outliers

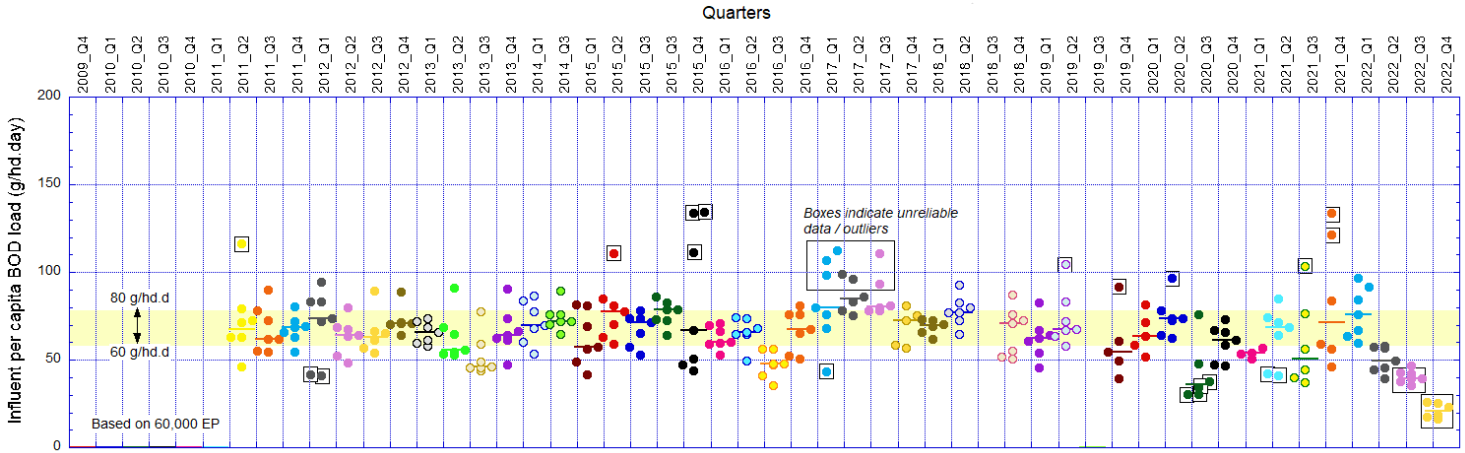


Figure 2-6: Per capita $cBOD_5$ loading rate, 2009 - 2023 (typical range highlighted in yellow; outliers indicated by boxes)

Figure 2-2 in Section 2.1 projects residential populations within the wider region versus those within the Hastings District for the 35 year consent duration from 2023 to 2049, and compares this with actual population (2006 – 2018). Three scenarios are presented, including:

- Low growth, based on an average growth rate of 0.1% per annum;
- Medium growth, based on the revised average growth rate of 0.6% per annum (from 2018 Census); and
- High growth, based on an average growth rate of 1.0% per annum.

All three growth rates are based on Statistics New Zealand predictions as of June 2023 as discussed in Section 2.1 above.

The DNSI (trade waste) wastewater flows and contaminant loads are expected to change in relation to the predicted population growth in the areas serviced by the Hastings Wastewater Scheme and any future areas that may be connected to it. The flows and loads projections for the 2049 population growth scenario are based on the following sources and actual data collected for over 10 years at the WWTP:

- The Statistics NZ projected annual average population growth rates as discussed in Section 2.1 and above;
- Per capita $cBOD_5$ load of 70g per person per day;
- $cBOD_5$ concentration of 180 g/m^3 (equates to a unit daily flow factor of approximately 400 litres per capita); and
- Per capita suspended solids load of 80g per person per day.

The 2013 AEE assumed a $cBOD_5$ concentration of 300 g/m^3 which equates to a unit flow factor of approximately 230 litres per capita per day. In contrast, the lower $cBOD_5$ concentration (180 g/m^3) and the higher unit flow factor that is now evident reflects the increased level of infiltration occurring in the system compared with conditions observed in 2013.

2.2.4.2 Projected Separable Industrial Stream

It is not possible to predict the Separable Industrial wastewater (trade waste) flows due to uncertainties as to future industrial / trade waste wastewater flows and loads. There are many factors that will affect the future volumes, discharge flow rates and contaminants that are discharged into HDC's Separable Industrial wastewater system. These factors include:

- The approach used to implement HDC's Trade Waste Strategy, once finalised (refer to Section 2.5).
- HDC's management of trade waste discharges through the administration of its Consolidated Bylaw (Water Services section) and issuing of individual industrial / trade waste discharge approvals for Controlled discharges;
- Further changes in water use and management driven by cleaner production principles and increased water conservation;
- Market demand which influences changes in production and the uptake of sustainable practices and resource recovery;
- The changing patterns of discharges from the existing industries;
- The possible closure of some trade waste discharge industries; and
- The likelihood of new discharges (including Controlled and permitted discharges)

As set out in Section 2.1 the economic development of Hastings District and the Hawke's Bay Region are important factors influencing the required capacity and capability of the Hastings Wastewater Scheme such that it can accept changes and particularly greater amounts of trade waste. This is predicated on the fundamental propositions that no undue and unexpected adverse effects will result outside of the designated mixing zones in the Hawke's Bay marine receiving environment, that the coastal discharge permit(s) are complied with, and that no odour problems result.

Historic separate industrial wastewater volumes have been estimated from industrial / trade waste records[25] collected by HDC since 2015 for the nine major industrial dischargers (representing approximately 95% of the total flows discharged by separate industry).

[25] The measured flow of the separable industry pipeline at the WWTP has been shown to be unreliable by direct comparison to the measured flows from the major industrial dischargers. The sum of separable industry flows (individually measured) is greater than the metered flow at East Clive WWTP. HDC is continually working to investigate the cause of the discrepancies and improve flow metering (for example, unreliable open channel flow meters; lack of maintenance and calibration) and has made allowances for this in

Contaminant loads have been derived from two sources:

1. Routine 7-day quarterly surveys of the Separable Industrial waste stream
2. Routine monitoring of individual trade waste premises (which is comparatively infrequent)

Details of these analyses can be found in Section 2.3 below. The projection of Separable Industrial flows and loads assumes that the current flows and loads will remain static until 2049 noting the significant seasonal variation in load.

2.2.4.3 Projected Total Combined Wastewater Flows and Loads

The total wastewater volumes and loads are made up of the contribution of the DNSI wastewater and Separable Industrial wastewater streams. The projection of average daily volumes and contaminant loads for 2049 are summarised in Table 2-6. The projected TCD flow for 2049 is within the variation of the current 2023 baseline flow; the same is evident for the treated wastewater loads. It is noted that some values are not included in Table 2-6, namely for seasonal flows. This is because it is not realistic to project future seasonal variations in flow (especially for DNSI) with any confidence.

Table 2-6: Projected Total Combined Wastewater Flows and Loads to 2049

	Contaminant	2023 Baseline			2049 Projection		
		DNSI	SI	TCD	DNSI	SI	TCD
Wastewater Flows (000' m^3/day)							
Annual ADF [a]		27±2 [b]	17±1	45±2	31.5	17±1	49±2
Peak season ADF (mid Feb-end Apr)		23±5	26±2	50±4	-	26±2	-
Off-season ADF		28±2	15±1	44±2	-	15±1	-
Average daily load (000' kg/day)							
Influent to WWTP	$cBOD_5$	4.3	16.5±6	-	5.2	16.5±6	-
	TSS	4.9	10.4±5	-	5.9	10.4±5	-
Treated wastewater	$cBOD_5$	0.8	16.5±6	21±12	1.0	16.5±6	21±12
	TSS	2.4	10.4±5	18±13	2.9	10.4±5	18±13

[a] ADF = average daily flow
[b] Value ± Value = average ± standard deviation.

2.2.5 Comparison with 2013 findings

In addition to the data provided in Table 2-5 and Table 2-6 above, a comparison has also been made between the projected flows and loads for 2049 originally made in 2013, and the equivalent projections derived in 2023 as part of this Review. The results of this assessment are shown in Table 2-7.

CAPEX/OPEX budget. For the purpose of this Review Report, the overall separable industry flow is assumed to be the sum of major industrial discharges.

Table 2-7: Comparison of projected wastewater flows and loads for 2049 (2013 and 2023)

	Contaminant	AEE 2049 Projection[a]			9-year review 2049 Projection		
		DNSI	SI	TCD	DNSI	SI	TCD
Wastewater Flows (000' m^3/day)							
Annual ADF[b]		26.2 26.2	21.6 25.1	47.8 51.2	31.5	17±1[c]	49±2
Average daily load (000' kg/day)							
Influent to WWTP	$cBOD_5$	5.2	28.0 32.6	33.2 37.8	5.2	16.5±6	-
	TSS	6.0	20.7 24.1	26.7 30.1	5.9	10.4±5	-
Treated wastewater	$cBOD_5$	0.8	27.2 31.6	28.0 32.4	1.0	16.5±6	21±12
	TSS	2.4	26.4 30.7	28.8 33.1	2.9	10.4±5	18±13

NOTE:
[a] Two values are shown for 2049 projected flows and loads from 2013 AEE. The top number in each row represents the 'Constant' population growth scenario, while the bottom number represents a projection using HPUDS population growth rates.
[b] ADF = average daily flow
[c] Value ± Value = average ± standard deviation.

On comparing the projections of wastewater flows and loads made in 2013 with the revised projections developed as part of this Review, the following observations were made:

- Projected wastewater flows for 2049 have slightly increased (by approximately 5%) for the DNSI stream, while the future projected flows for Separable Industrial stream will be slightly lower (decreasing by up to 17%) and Total Combined Discharge will remain similar to that originally projected in 2013.
-
- There is greater variation in the projected loads of $cBOD_5$ and TSS in influent and treated wastewater for 2049, when comparing the 2013 projections with the latest 2023 projections. $cBOD_5$ loads in the Separable Industrial stream are now projected to be up to 30% lower in 2049 than first projected in 2013, while $cBOD_5$ loads in the DNSI stream could be up to 20% greater than first predicted.
- The projected TSS load for Separable Industrial stream in 2049 is now predicted to be up to 80% less than that first projected in 2013. This difference is likely due to increased knowledge of industrial / trade waste management practices, and specifically changes in HDC's regulations and policies in relation to pre-treatment for the removal of TSS which includes sediment.
- The 2013 estimates and projections did not provide separate analyses and commentary for seasonal flows (for example, peak season ADF and off-season ADF).

2.3 Condition 27(c): Industrial / Trade Waste Profiles

(c) Trade waste profiles, trends and any significant changes in the Consent Holder's trade waste management practices and the trade waste contaminant profile.

This section of the Review Report seeks to:

- Describe the existing trade waste profile (different types of non-domestic discharges received at the East Clive WWTP) and analyse how this might change into the future
- Provide a history of the changes to HDC's Bylaw(s) since 2013, regarding management of trade waste
- Evaluate the effectiveness of the current Consolidated Bylaw 2021 (Chapter 7 – Water Services) provisions in managing trade waste and complying with resource consents
- Understand any significant trends or emerging issues with regards to the implementation of the Consolidated Bylaw, and compliance across trade waste premises as a whole (including those issues raised by the HDC-TWWWJC when agreeing on the scope of this review, such as consideration of mortuary waste)
- Identify any changes that would enable more effective management of trade waste discharges into the future (or for consideration in future consent reviews)
- Discuss possible new legislative requirements as relevant to trade waste (identified in Condition 27(d) regulatory review) including possible implications and (any) management requirements for these.
- Provide necessary information to inform the BPO assessment in Section 8 of this report.

These aspects have been addressed via targeted discussions with key Council officers (including the current Trade Waste Officer; Wastewater Manager, and East Clive WWTP Engineer), discussions with the HDC-TWWWJC and desktop review of relevant documents such as the Consolidated Bylaw 2021 and available monitoring data of the quality and quantity of individual trade waste sources and of the incoming and discharged wastewater at the WWTP. A summary of findings is provided in the following sub-sections.

The names of companies / trade premises have been anonymised throughout this commentary due to the commercially sensitive nature of some information pertaining to trade waste discharges, and to protect the privacy of trade waste consent holders. This follows the approach taken in the 2013 AEE and subsequent consent application.

2.3.1 Overview of Industrial / Trade Waste

This section provides further detail regarding the management, collection and treatment of trade waste within the wider Hastings wastewater system described above in Section 1.2.1.

2.3.1.1 Wastewater System

The Hastings District has a significant number of industrial / trade waste wastewater discharges. The majority of these relate to the food and beverage production and other agricultural activities in the region, contributing to the wellbeing of the wider community particularly through the provision of employment.

The industrial / trade waste system (which includes both Separable and Non-Separable Industrial discharges) currently serves 39 separate trade waste discharges, covering a relatively wide range of industry types, hence varied trade waste quality and quantity types. However, the trade waste stream is dominated by 9 major sources. Table 2-8 below identifies these industry groupings and provides key details such as type of industrial process and any key trends / issues identified since 2014.

Trade waste management approaches and pre-treatment needs for each discharge are identified through a trade waste management system, including approvals to discharge controlled wastewater issued under the Consolidated Bylaw 2021 (Water Services) and where appropriate, with discharge management plans. Appropriate pre-treatment is identified for each industry and implemented on a site-by-site basis.

Section 2.2.3 of this Report (above) details how the DNSI and Separable Industrial wastewater streams have been analysed, on the basis of seasonal data for discharge volume and key contaminants.

Most of the major industry discharges (Controlled, with approval from HDC as per the definition below) are to the Separable Industrial conveyance system to the East Clive WWTP site. The Separable Industrial discharges are milli-screened through 2.5 metre square mechanical screens fitted with 1 mm wedgewire. Each screen is designed to handle 700 L/sec flow. Typically, two screens will be in operation during high flow conditions. After screening, the discharges are combined with the treated Domestic and Non-Separable Industry (DNSI) wastewater stream from the WWTP. A few Controlled discharges, as well as 382 Permitted trade waste discharges[26], discharge into the DNSI system. Controlled discharges are those defined as follows within the HDC Consolidated Bylaw 2021 (Chapter 7 – Water Services):

> *"'Controlled Wastewater' means wastewater with the characteristics listed in Schedule B to [Chapter 7]. (Controlled Wastewater may only be discharged into the Network with an approval)."*

2.3.1.2 Separable Industrial wastewater

As mentioned above, industrial / trade wastewater discharges received at the WWTP via the Separable Industrial wastewater conveyance system are dominated by nine major sources. These include:

- Fruit and vegetable processing (washing, canning, juicing) (5). This group represents the majority of industrial / trade waste by flow and load ($cBOD_5$ and TSS) received at the WWTP
- Meat processing (abattoirs, rendering, preparation for export) (2)
- Tannery (1)
- Cold storage (1)

This analysis focuses on the characteristics of these nine discharges (referred to herein as "major industry") due to their proportional contribution to the combined wastewater flows received at the WWTP (together they contribute up to 98% of all industrial / trade waste wastewater discharged to the network, by volume). For example, Figure 2-7 below shows that these nine discharges (referred to collectively as 'major industry') contributed roughly 30% of total daily combined flows discharged from the WWTP to the offshore outfall between January 2016 and June 2023[27].

Average daily flow from major industry has varied between <2,000 m^3/day to around 38,000 m^3/day since 2016, with highest flows measured in 2021 and lowest flows occurring during 2016. These trends are illustrated by Figure 2-8 below, which compares average daily flow from major industries on each day of the year, between years.

[26] As per HDC's register, June 2023
[27] Flow data were not available prior to January 2016 (for total combined discharge)

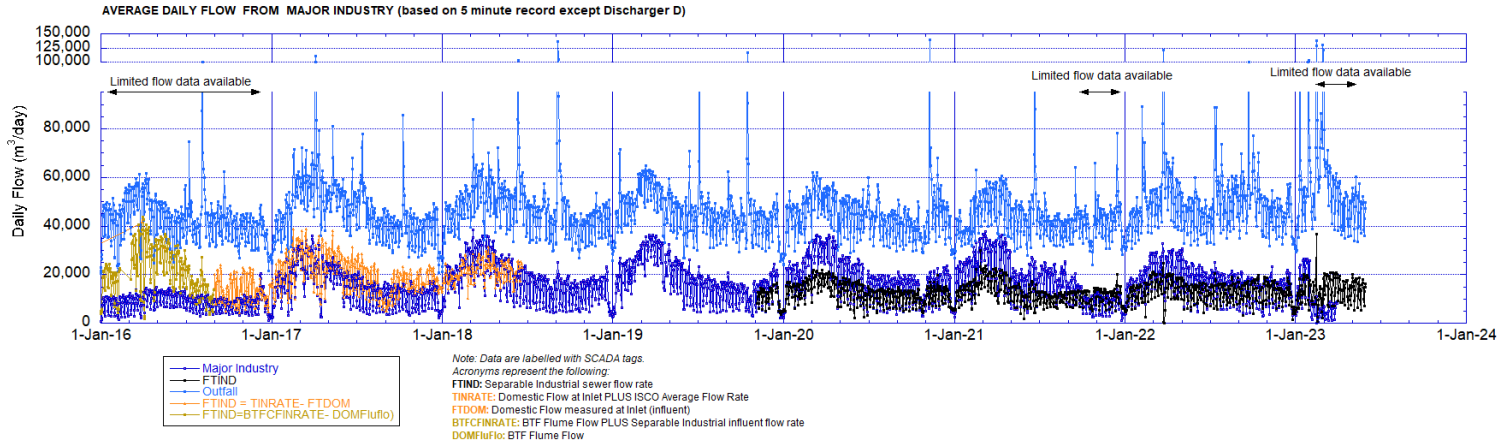


Figure 2-7: Average daily flow - major industries

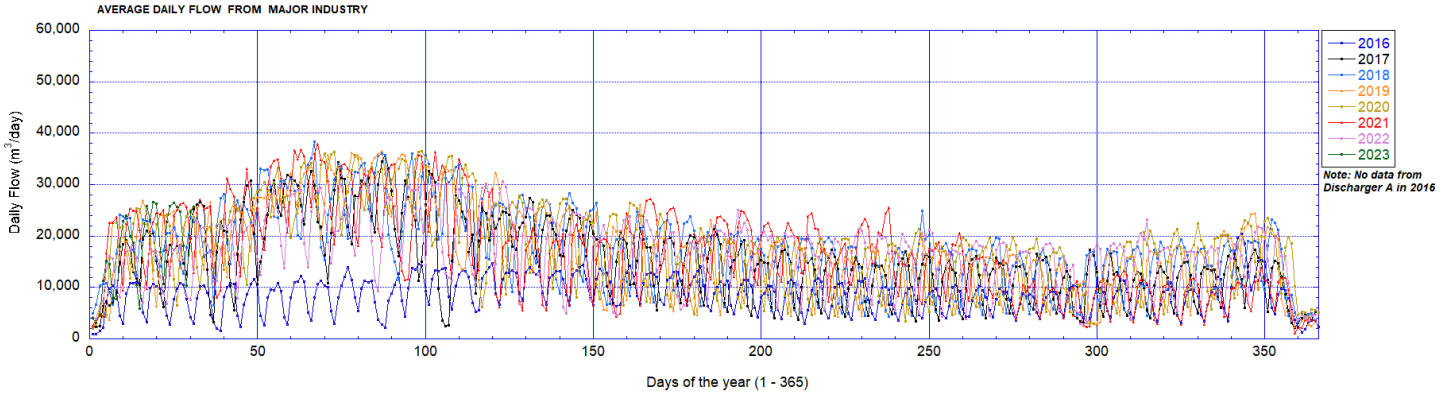


Figure 2-8: Average daily flow from major industries across 365 days of the year (year on year comparison)

2.3.1.3 Domestic and Non-Separable Industrial (DNSI) Wastewater

While DNSI wastewater discharges are not independently metered, it is possible to derive estimated flows and characteristics of these discharges by interrogating the total combined flows for the WWTP (TCD stream). The TCD stream is comprised of:

1. Domestic wastewater
2. Non-Separable Industrial wastewater (industrial / trade waste wastewater discharged into the domestic network and treated through the main WWTP)
3. Separable Industrial wastewater metered for major industrial / trade waste dischargers (discharged separately and subject to screening prior to discharge at the outfall, in the TCD stream)

The TCD and the Separable Industrial streams are measured, therefore the DNSI flows can be derived from the difference between the two. This output is illustrated in Figure 2-9 below, which shows that the average daily flow for DNSI (in red) has varied between approximately <18,000 m^3/day to 85,000 m^3/day since January 2017. In comparison, the average daily combined flow at the outfall varied between 25,000 to over 95,000 m^3/day.

In most years there is a 2-3 month long peak in TCD during February/March at the end of the summer season, where the highest flows are recorded from the major industries. During this peak, DNSI flows comprised approximately 60% of total flows, while in the off-peak periods this typically decreased to ~40%.

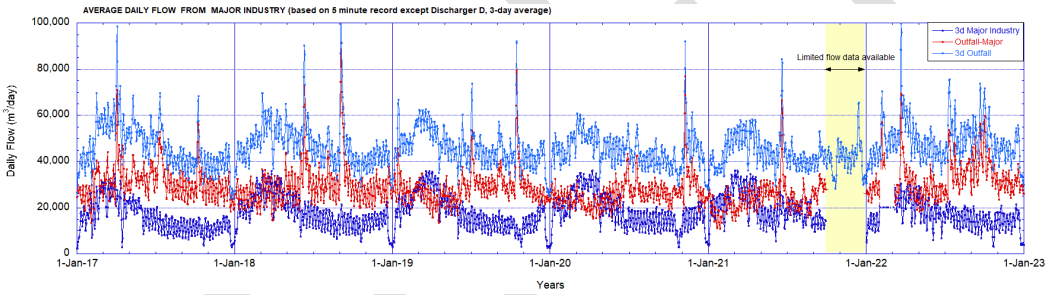


Figure 2-9: Average daily flow (m^3/day) from all wastewater streams (January 2017 - January 2023)

Permitted trade waste discharges make up the majority of those within the DNSI system, with a smaller proportion having Approval to Discharge Controlled Wastewater (Trade Waste) issued by HDC. The permitted discharges comply with all requirements of Schedule B of the Consolidated Bylaw 2021 and therefore do not require specific approval from HDC.

The DNSI wastewater influent is treated through the Biological Trickling Filters (BTFs), which were designed and installed primarily to remove the cultural offensiveness of the wastewater which is linked to the human waste component (kūparu – refer to Section 1.3.2 above).

Many of the trade waste permitted dischargers have some degree of preliminary on-site treatment (and/or primary treatment) such as grease traps, grease converters or oil and grit interceptors (usually proprietary devices).

2.3.2 Characteristics of Trade Waste in Hastings

2.3.2.1 Types of Trade Waste – Existing status with observed trends since 2014

Controlled Industrial / Trade Waste Groups

Table 2-8 below summarises the key characteristics observed within each of the major industry groups discharging to HDC's wastewater network. It also highlights any trends that are evident from the available data. Table 2-9 summarises the characteristics of non-major industry groups.

A further summary in relation to each key parameter monitored is provided below the tables. Appendix B to this report contains more detailed analyses, with historical flows and loads data plotted for different types of industrial / trade waste discharges (aggregated) and individual anonymised discharges (non-aggregated).

Table 2-8: Summary of Controlled wastewater approvals (Industrial / Trade Waste) – Major industries

Industry Group	Type of industrial processes	On site trade waste control and treatment facilities	Summary of flows between 2014 - 2023	Summary of discharge characteristics between 2014 – 2023 (based on $cBOD_5$ and TSS data only)	Trends and any key issues arising since 2014
Food processing - canneries	• Pet food manufacturing, casings processing, milk beverage bottling, fruit and vegetable freezing and canning.	• Screening sedimentation • Dissolved Air Flotation (DAF) • Flow meters.	This group has two major dischargers, with one having significantly higher and more variable flows than the other. Flows vary seasonally, typically lowest from June to November (averaging less than 10,000 m^3/day for the larger discharger, and less than 400 m^3/day for the smaller of the two). Flows are highest during the first half of the year (and particularly between March – May). A larger operation has experienced flows of up to 20,000 m^3/day during peak production however peaks of this magnitude have not occurred since the summer of 2020/21.	$cBOD_5$ loads are highly variable and are seasonally influenced, being at their peak during March/April in most years. TSS loads are also elevated during this period, but not to as great an extent. One of the two dischargers has significantly higher and more variable $cBOD_5$ and TSS loads than the other.	Canneries have not changed much. There have been some collective issues with solids and premises have been instructed to make improvements by the expiry of their current Approval (June 2024).

Industry Group	Type of industrial processes	On site trade waste control and treatment facilities	Summary of flows between 2014 - 2023	Summary of discharge characteristics between 2014 – 2023 (based on $cBOD_5$ and TSS data only)	Trends and any key issues arising since 2014
Fruit and vegetable processing and juicing	• Dicing fruit and vegetables • Producing apple and kiwifruit juice concentrate • Bottling fruit juices and milk beverages.	• Screening, sedimentation • pH adjustment • Flow meters	Varies throughout the year, influenced by growing seasons. Two major dischargers influence the trends for the entire group. One site has discharged as much as ~6,000 m^3/day during summer production (in Q4, 2016) but the two largest dischargers in this group typically collectively contribute flows of around 3,000 – 4,000 m^3/day during peak production, and up to ~1,600 m^3/day in off-peak periods.	$cBOD_5$ and TSS vary with seasonal flows (i.e. increased loads correlate with increased flows). However, the degree of variation has remained fairly consistent since 2016. There is no obvious improvement or worsening of discharge quality. $cBOD_5$ loads peaked as high as ~12,000 kg/day (on one occasion in 2016) but tended to be <5,000 kg/day for the majority of the sampling periods. One discharger has had TSS loads over twice as high as the other dischargers in this group (peaking between 4,000 – 5,000 kg/day on at least 4 occasions between 2016 and 2023).	Have progressively been improving pH adjustment and screening.

Industry Group	Type of industrial processes	On site trade waste control and treatment facilities	Summary of flows between 2014 - 2023	Summary of discharge characteristics between 2014 – 2023 (based on $cBOD_5$ and TSS data only)	Trends and any key issues arising since 2014
Meat works	• Livestock slaughter and further processing of meat (abattoir)	• Screening, sedimentation • Dissolved Air Flotation (DAF). • Flow meters.	Flows vary seasonally, typically lowest at end of winter (~August) then increasing to summer peak. The seasonal trend has remained fairly consistent since 2014 with up 4,000 m^3/day being discharged by the larger of two premises, and up to ~1,200 m^3/day for the smaller premises. Seasonal variations are more evident for the larger discharger of the two.	$cBOD_5$ and TSS loads have remained consistent since 2016 for the smaller discharger, while the larger discharger has seen more seasonal variability in both parameters, year on year TSS loads for the larger discharge peaked at ~6,000 kg/day on at least 3 occasions during late 2021/early 2022. These were the highest loads measured since 2016. $cBOD_5$ loads for the same discharger have consistently been at ~5,000 kg/day or less, with the exception of a sampling period in Q4 2022 where loads peaked at over 10,000 kg/day.	Seasonal variation has remained consistent year on year, with the exception of a small number of outlier events causing more elevated $cBOD_5$ and TSS loads than usual.
Cold storage	• Temperature controlled storage facility • Blast freezing • Picking and packing of fresh produce (mainly fruit and vegetables)	• Screening • Settling • Passive grease trap	Flows have gradually decreased from up to ~2,000 m^3/day in late 2016 – mid-2019, to below 1,000 m^3/day from July 2019 onwards. Flows are consistent year-round.	$cBOD_5$ loads were initially elevated (up to ~7,000 kg/day) between 2016 – mid-2019 but have since decreased to be consistently below 3,000 mg/day. A similar change is observable for TSS loads.	Overall improvement in $cBOD_5$ and TSS loads, and reduced flows.

Industry Group	Type of industrial processes	On site trade waste control and treatment facilities	Summary of flows between 2014 - 2023	Summary of discharge characteristics between 2014 – 2023 (based on $cBOD_5$ and TSS data only)	Trends and any key issues arising since 2014
Fellmongery/Tannery	• De-wooling / hairing, and pickling of skins • Wet blue tanning.	• Programmable Logic Controllers (PLC)-controlled processes. Standard Operating Procedures (SOPs) for staff. • Screening, sedimentation • Sulphide oxidation • Chromium recovery • Dissolved Air Flotation (DAF) • Flow meters.	Total daily flow has remained consistently below 3,000 m^3/day (predominantly between ~500 – 1,200 m^3/day). Flow varies seasonally, typically increasing during Q3 and Q4.	$cBOD_5$ loads have consistently remained below 5,000 kg/day since 2016. TSS has noticeably decreased since 2019, especially at the tannery.	Fellmongery has been separated from the industrial park discharge since 2019. Have been progressively improving pre-treatment processes and equipment. They are members of the NZ Leather Group and undergo regular auditing. Must comply with HDC approval process for discharges of controlled wastewater to pass audit.

Table 2-9: Other Controlled industrial / trade waste discharges (non-major industries)

Industry group	Typical activities	On-site pre-treatment	Constituents of interest (orange cell indicates relevance to industry group)					Other comments
			Organic strength	Solids	Metals	Oil & grease (including hydrocarbons)	pH (acidity or alkalinity)	
Chicken processing	• Breaking chicken carcasses into portions and packing for retail.	• Screening • Grease trap.						Has consistently had very low volume of discharge with low contaminant load.
Electro-plating plant	• Electro-plating of electrical components for use in switchboards/controls etc. • Washing off in-between process phases, where items are physically moved from one set of tanks into another (for rinsing).	• Containment • Sedimentation •						No significant change. Very infrequently exceed consented limit. When exceedances have occurred, they have been managed as per the applicable approval to discharge Controlled wastewater (detailed in Sections 2.3.3.2 and 2.3.4 below).

Industry group	Typical activities	On-site pre-treatment	Constituents of interest (orange cell indicates relevance to industry group)					Other comments
			Organic strength	Solids	Metals	Oil & grease (including hydrocarbons)	pH (acidity or alkalinity)	
Waste treatment plant (de-watering facility)	• De watering industrial sludge • Lime stabilization • Oily water separation and oil recovery.	• Screening • Lime dosing to settle solids from sludge • Lime stabilization of solids • Polymer dosing • Belt press • Screw press • Oil and grit interceptor • Oily water separation tanks.				(Heavier hydrocarbon fraction, similar to diesel)		This plant is currently implementing a significant upgrade which has been underway since 2021. Upgrades include: • Installed larger sumps (receiving sludge from trucks) • Additional tanks and belt press • Screens • Constructing a large container for sludge storage and settling (to increase process capacity, and to separate out sludges for better management)

Industry group	Typical activities	On-site pre-treatment	Constituents of interest (orange cell indicates relevance to industry group)					Other comments
			Organic strength	Solids	Metals	Oil & grease (including hydrocarbons)	pH (acidity or alkalinity)	
Woolscour	• Pre-scour treatment and sorting • Scour using detergents • Pressing and compaction • Drying • Packaging final products • Wool grease production (for commercial use)	• Screening • Sedimentation • Lanolin recovery • Flow meter				(e.g. Lanolin)		Have been instructed to reduce the solids loading in the discharge before the expiry of their current Approval (June 2024). TSS had increased because water usage was decreased (water efficiency measures introduced).
Commercial laundry	• Laundry for work clothing, uniforms, mats, towels and linen • Washing • Drying	• Screening sedimentation • Heat recovery •						No significant change.
Various operations with a truck wash effluent	• Livestock sale yard • Truck repair • Stock transport trucks and tanker operations.	• Screening • Sedimentation • Oil and grit interceptor.						No significant change.

Industry group	Typical activities	On-site pre-treatment	Constituents of interest (orange cell indicates relevance to industry group)					Other comments
			Organic strength	Solids	Metals	Oil & grease (including hydrocarbons)	pH (acidity or alkalinity)	
Wineries and wine bottling	• Crushing and pressing grapes/fruit • Fermentation • Clarifiers • Bottling	• Screening • Sedimentation • pH adjustment						No significant change. One of the discharges is into DNSI (however pH and $cBOD_5$ are well managed, TSS is low, because the premises has a Sequential Batch Reactor (SBR) on-site for pre-treatment).
Cardboard Manufacturing	• Paper pulp processing • Treatment (colouring, bleaching, glue application) • Cardboard cutting / final product assembly	Sedimentation			(Zn)			Some increase in $cBOD_5$ over the years. Solids concentration has not changed significantly. Production volume increased between 2015 – 2019 (previous approval).

2.3.2.2 Key Trade Waste Constituents

The following table summarises the key constituents in Separable Industrial wastewater discharges to the WWTP including any observed changes since 2014 based upon available data. This analysis generally considers mass loads of each constituent, with some commentary on measured concentrations where necessary to explain the observed patterns in further detail. The underlying data informing the analysis are contained within Appendix B to this Review Report.

The understanding of patterns in discharge quality is limited by the frequency of sampling (compared with flow monitoring, for which data are available in a very high resolution of five minute intervals since 201728). The majority of the dischargers only monitor the quality of their discharge quarterly, for a few days at a time. Therefore, analysis is limited to discrete periods rather than a continuous record. Table 2-10: Summary of total combined discharge quality (mass loads between 2014 – 2023)

Table 2-10 focuses mainly on constituents which are monitored at quarterly or greater frequency in accordance with Schedule 1 of the discharge resource consent (CD130214W).

Table 2-10: Summary of total combined discharge quality (mass loads between 2014 – 2023)

Constituent	Overall trend since 2014	Commentary
Flow	➔	Average Daily Flow has consistently remained below the Condition 24(d) trigger value of 66,000 m^3/day since 2014 (See Section 2.2.2 above for further detail). The ADF baseflow for 2023 was estimated to be 45,200 m^3/day in the 2013 AEE (Constant scenario) and up to 46,200 m^3/day with the population growth projected in HPUDS at the time. TCD has now been estimated at 45,200 m3/day (±2,000 m3/day) for 2023 based on actual data. However, estimated 2023 flows for SI are lower than those predicted in 2013, and estimated 2023 flows for DNSI are slightly higher than previously predicted. Overall, this demonstrates that the flows that are the basis for contaminant load estimates (in the consent conditions, and also in this Review) are generally appropriate. There may be some over-estimation of contaminant loads for SI, and under-estimation for DNSI.
$cBOD_5$	➔	There have been two occasions since 2014 where loads have exceeded the trigger level of 48,000 kg/day. On both occasions, it appears that the elevated load was influenced by a single major industry discharger.
COD	↘	Loads have generally declined from ~140,000 kg/day in 2015 to between ~50,000 kg/day and 100,000 kg/day prior to 2019, then predominantly below 50,000 kg/day thereafter.
TSS	➔	Loads have remained consistently between ~40,000 kg/day to 90,000 kg/day, with seasonal variations. There is room for improvement (to facilitate better outcomes for the receiving environment) especially for major dischargers where solids are a constituent of concern. More stringent limits could be placed on dischargers within individual approvals to discharge Controlled wastewater, thereby requiring more substantial on-site treatment. Additionally,

[28] 15 minute intervals prior to 2017

Constituent	Overall trend since 2014	Commentary
		the permitted level of TSS specified in Schedule B (Chapter 7 of the Consolidated Bylaw) could also be tightened.
Oil & Grease	➔	Has remained consistently below 10,000 kg/day since 2014, and below 8,000 kg/day since Q3 2018 with four exceptions (in Q1 2020 and three sampling periods with elevated loads during 2021).
Ammoniacal-nitrogen	➔	Consistently below 2,000 kg NH_4-N/day. Where higher load events have occurred (typically during Q1/Q2 sampling periods, which indicates seasonal influence), loads have not increased beyond 3,000 kg/day.
Dissolved reactive phosphorus	➔	Consistently below 200 kg P/day (samples analysed for DRP). Any exceedances of this load have typically occurring during summer periods.
Sulphide	↘	Overall reduction in load from over 1,000 kg/day in 2015, to less than 400/kg day since Q4 2017. It appears that sampling results were highly variable during earlier periods (~2014 – 2019)
Acid soluble metals		
Copper (Cu)	➔	Consistently between ~0.05 kg/day and 1 kg/day. There have been sporadic periods of elevated load (up to 3 kg/day, and on one occasion ~7 kg/day) with a frequency of roughly once per year.
Nickel (Ni)	➔	Ni has remained very consistent over the past 9 years. Loads have been maintained between 0.1 – 0.8 kg/day for the majority of sampling periods.
Zinc (Zn)	↘	Overall loads of Zn have gradually decreased from between 7-10 kg/day to consistently less than 4 kg/day since 2019.
Lead (Pb)	➔	Loads have consistently been maintained between ~0.03 and 0.2 kg/day.
Trivalent Chromium (Cr III)	↘	Cr (III) loads have gradually decreased overall, from a maximum of 20 kg/day in 2015 to less than 1 kg/day in Q2, 2022. Since Q1 2019 the majority of results have been below 10 kg/day. There was a decrease in Cr (III) concentrations in combined industrial / trade waste flows at the WWTP during the same period.

Key:
➔ Loads have remained consistent overall
↘ Loads have decreased (improvement)
↗ Loads have increased (decline)

2.3.3 Industrial / Trade Waste Management Approach

This section is further to Section 2.3.1. It provides a history of the changes to HDC's Bylaw(s) since 2013, regarding management of trade waste. It evaluates the effectiveness of the current Consolidated Bylaw 2021 (Chapter 7 – Water Services) provisions in managing trade waste and complying with resource consents, as well as additional mechanisms for the management of industrial / trade waste discharges.

2.3.3.1 Mechanisms for managing industrial / trade waste discharges

A wide range of factors need to be managed and monitored in relation to HDC's acceptance of industrial / trade wastes. Several mechanisms exist to achieve this, including:

- the Consolidated Bylaw 2021 (and approvals and agreements issued in accordance with Bylaw provisions) , this is further discussed later in this section;
- Council policies, and
- Management plans for individual discharges (as also stipulated in the Bylaw).

This is particularly the case in the Hastings situation, with the large number of dischargers and the high volume and contaminant amounts compared to domestic sewage as indicated above.

The key factors relevant to Hastings, and corresponding procedures and plans, are summarised in Table 2-11 below. This Review focuses primarily on the implementation of the Consolidated Bylaw 2021 and its relevance for industrial / trade waste discharges.

Table 2-11: Summary of policies, plans or procedures used to manage industrial / trade waste discharges in Hastings District

Factor requiring management	Relevant HDC policies, plans or procedures	Current version
Control of trade waste discharges, including approvals, fees/charges	Consolidated Bylaw – Chapter 7 Water Services	2021
Changes in demand for services (e.g. water use behaviours)	Cleaner Production principles integrated into trade waste management plans; industry-led	2014
Decision-making hierarchy; investment priorities, and allocation of funding for wastewater network repairs, upgrades, monitoring of discharges by HDC (operations and maintenance)	Asset Management Plan	2021
	Long Term Plan 2021-2031	2021
Trade waste and wastewater connections; on-site treatment or management of discharges (design and operations) for new developments	Engineering Code of Practice	2020
Treatment of industrial / trade waste discharges at East Clive WWTP	Wastewater Facility Manual	2018
	East Clive Long Outfall Discharge Resource Consent CD130214W	2014

2.3.3.2 Consolidated Bylaw 2021: Chapter 7 Water Services

The Consolidated Bylaw 2021 (the Bylaw) became operative on 30 July 2021. It includes a chapter dedicated to water services, including the control and management of industrial / trade waste discharges (Chapter 7). The Bylaw is a regulatory instrument which sets out HDC's rules and requirements (provisions) with regards to trade waste discharges into the public wastewater network. These provisions are made under Section 145 of the Local Government Act 2002 (LGA).

At the beginning of this review period (2014), trade waste discharges were managed under a Water Services Bylaw (operative 2009, the first HDC bylaw to regulate stormwater, wastewater and water supply services in an integrated manner). This was replaced by a Consolidated Bylaw in 2016. The Bylaw became subject to public consultation as part of the five-yearly Bylaw review required by Section 158 of the LGA, and a revised version (the current version) was made operative in 2021. There were very minimal changes to the 2021 Bylaw (with regards to trade waste services) compared with previous versions.

The integrated nature of the Bylaw and the gradual simplification of its requirements with regards to trade waste (as a result of the past two Bylaw reviews) has made implementation of the Bylaw more straightforward. Council staff find the current Bylaw much easier to interpret and enforce than previous versions, while still achieving similar outcomes (compared to past experiences). The current Bylaw does not feature any significant changes with regards to the process of applying for trade waste approvals. Customers can use a downloadable PDF form (available on HDC's website) and email this to the Trade Waste Officer. However, in most cases HDC's Trade Waste officer will have a conversation with potential applicants first, and assist them in completing the form. Some applicants may need assistance to complete the 'Discharge Management Plan' component of the application, which requires significant detail regarding their operations, and proposed monitoring and mitigation measures. In many cases, HDC has provided a template plan to guide the applicant in this process.

The Bylaw provides for the issuance of Warning Notices in the event that the conditions of a trade waste approval are breached. For example, where the required discharge characteristics (e.g., chemical constituents, or volume) are repeatedly not met, or a discharge has resulted in damage to Council's wastewater infrastructure or the natural environment. HDC considers these notices to be a very formal instrument, and typically will try to work proactively with a discharger to avoid the need to issue a notice. In general., HDC prefers to have a "no surprises" approach with dischargers, to maintain the relationships needed to implement the Bylaw and achieve positive outcomes. This has generally been effective, and Warning Notices are rarely required.

2.3.3.3 Industrial / Trade Waste Monitoring and Risk Based Approach

HDC requires those industrial / trade premises with Approval to Discharge to self-monitor their discharges (in terms of volume, and concentrations and mass loads of constituents) as well as submit to inspections by HDC officers when required. This monitoring is part of a wider risk-based approach to managing industrial / trade waste wastewater discharges.

Industrial / trade premises are categorised according to the risk they are perceived to present to the integrity of the wastewater network, the WWTP (and the effectiveness of the treatment process), HDC's ability to comply with the East Clive wastewater discharge consent, and health and safety aspects relating to the nature of the discharge (to both the public and workers). The categories are as follows[29]:

- **High Risk** – Discharges can have adverse effects on the sewer network (namely due to sulphide (H_2S)) and on the final discharge quality from the WWTP. The volume discharged, combined with characteristics of the discharge, can have a significant impact if on-site pre-treatment should fail.
- **Medium Risk** – Primary risk is related to the volume discharged. Many medium risk discharges also have comparatively low pH, so can accelerate the formation of H_2S in the sewer leading to corrosion issues. Solids and fat content may also affect the final discharge quality from the WWTP.
- **Low Risk** – All other discharges which have specific Approval to Discharge (i.e. Controlled discharges) that are not deemed Medium or High Risk. Have lower volume discharges, with widely available, proprietary and/or proven pre-treatment systems. Impact on sewer network and final discharge quality from the WWTP would be minor, even if pre-treatment systems fail.

HDC has two primary ways of monitoring Trade Waste discharges.

1. Industry self-monitoring

This consists of industries sampling their own discharge based on the condition in their Approval to Discharge. The results are emailed to HDC within ten days of the industry receiving them. The type and frequency of self-monitoring undertaken is described further in Table 2-12 below.
Industrial / trade waste dischargers supply a Discharge Management Plan (DMP) with their application for Approval to discharge into the Hastings Wastewater Scheme. The DMP gives an overview of the operation and the pre-treatment systems in place. It broadly describes how the industry will manage the industrial / trade waste discharge from the site.

[29] As per HDC SOP-F-MR-001-1 Standard Operating Procedure: Random checks of trade waste discharges from industry, Version 3, May 2022.

The DMP forms a part of the Approval. If there is any significant change in the operation, an updated DMP must be submitted.

2. HDC monitoring

HDC conducts random inspections of the discharges annually, with the number of inspections ranging between 300 - 500. The inspections consist of:

- All inspections (Average recorded (in ID) [30]inspections of trade premises per year = 313):
    - Visual assessment (Solids, O&G.) and does it look "normal" for the discharge.
    - pH check
- Inspections where sulphide is part of the discharge:
    - pH and sulphide are checked in influent to the plant (from the DNSI and Separable Industrial sewers) with lead acetate strips

In addition to the above, HDC's trade waste officer also visually checks influent to the WWTP (DNSI and Separable Industrial sewers) on most days, and a TSS meter was obtained in early 2024 as an additional method for checking influent quality. If the officer detects any anomalies, a sample of the influent is taken and sent to a laboratory.
If anomalies are found during inspections, or brought to the attention of Council officers, HDC responds as follows:

- **Minor issues:** Some solids present that should not get through the screens or pH slightly below 6.0.
    - Phone call to the industry contact explaining the issue and request remedial action.
- **Moderate issues:** Sulphide slightly elevated or solids look like they exceed limits, e.g. pH low (<5.5), some oil & grease visible.
    - Take a photograph of the test strips and/or the sample.
    - Phone call followed by email, including the photograph, explain the issue and request remedial action.
- **Significant issues**: Sulphide is high, pH very low (<5.0), large amount of solids or oil & grease.
    - Take a grab sample, send to lab for analysis.
    - Call industry contact, go on site to look at treatment system and discuss the issue.
    - If the issue is significant enough (or if it is repeated), issue a formal Warning Notice, which includes what action and by when it is required to be completed.
    - If the breach is believed to be due to inadequate pre-treatment, rather than a mechanical failure or a human error, the discharger must employ the services of a suitably qualified person to audit the operation and the pre-treatment and make recommendations about what needs to be done to bring the discharge back in compliance. A written report from the auditor must be supplied to HDC and must include the recommendations and proposed remedies and the timeframe to implement those remedies.
    - Should the Warning Notice not be complied with, the Consolidated Bylaw 2021 (Chapter 7: Water Services) has options that can be utilised. To date, any Warning Notices that have been issued have been complied with.

In all instances, if the industry is either reluctant to cooperate or simply fails to remedy the situation, then any action by HDC will be escalated proportionately to the problem.

2.3.3.4 Control of Trade Waste

On-site treatment of industrial / trade waste discharges is typically implemented to target the following outcomes, among others:

[30] Infrastructure Database (intranet-based data management system utilised by HDC)

- Protection of network (e.g. pre-treatment of high COD discharges, make sure pH stays high to compensate for fermentation in network)
- Reduction of sulphide and chromium (e.g. from tanneries)

It is HDC's preferred practice to only regulate and monitor what the industries are discharging into the Hastings Wastewater Scheme, not how they operate. Trade Waste Officers do not advise industrial / trade waste premises how to operate or pre-treat their effluent. HDC does not receive copies of audit reports completed by third party auditors by default. Due to the variability of the type of industries HDC deals with, it would take a considerable expertise to be able to make an informed decision about the suitability of the operation and pre-treatment of the industrial / trade waste discharges.

The table below provides an overview of the level and type of on-site treatment provided by industrial premises across the Hastings District.

Table 2-12: On-site treatment of industrial / trade waste wastewater across Hastings District

Industry type	Types of pre-treatment typically implemented on site	Self-monitoring
Engineering workshops	Physical separation from sewer and stormwater	Quarterly grab sampling
Dry cleaners	Heat exchanger, Screening, Settling	Bi-monthly grab sampling
Fresh produce – picking, packing Fruit and vegetable juices	Screening Settling Filtration pH adjustment (as needed) Oil and grit interceptor (as needed)	Grab sampling, variable frequencies depending on size of operation (as frequently as monthly during production periods, to six monthly)
Canneries	Screening Settling pH adjustment DAF	24 hour composite samples, quarterly and/or during processing season
Wineries (wine making)	Screening Settling SBR pH adjustment	Grab sampling, typically monthly and in alignment with vintages
Fellmongery / tannery	Screening Settling Screw press & belt press Chromium recovery Sulphide oxidation DAF	24 hour composite samples, quarterly
Meat works	Screening Settling DAF	24 hour composite samples, quarterly
Farm supplies / stockyards	Screening Settling	24 hour composite samples every 6 months

Industry type	Types of pre-treatment typically implemented on site	Self-monitoring
	Oil and grit interceptor (as needed, e.g. with truck wash)	
Woolscour	Lanolin recovery Settling	7 consecutive 24 hour composite samples when operating

2.3.3.5 Charging mechanism

The Consolidated Bylaw (2021) provides for HDC to charge industrial / trade premises for discharges to the Separable Industrial wastewater stream and for discharges to the DNSI stream. The schedule of charges is detailed in the Annual Plan[31], and is determined on a cost-causative basis (generally following the approach suggested in the NZ Standard Model Trade Waste Bylaw). A Standard Operating Procedure[32] is used to decide how the costs of receiving, treating and discharging trade waste will be apportioned amongst the dischargers. Two methods are applied:

1. Charges apportioned on the basis of peak flow – applied for industry connected to the Separable Industrial stream (screened at the WWTP)
2. Charges apportioned on the basis of household equivalence – used for industries connected to the DNSI stream with discharges treated through the BTF at the WWTP.

For the former, peak flow is calculated from the third highest peak in each year (1 April – 31 March). For the latter, household equivalent is determined on the basis of $cBOD_5$ load or flow volume (total flow over a 24 hour period), whichever is highest.

2.3.4 Past issues with Trade Waste Management

This section is based on discussions with HDC's officers and reports their concerns, rather than Stantec's assessment.

2.3.4.1 Issues and resolutions

To HDC's knowledge there have not been any issues with tankered waste being discharged into the DNSI or Separable Industrial streams without approval. Some illegal tipping did occur in the 2000s (likely prior to 2014) but that behaviour is now well under control thanks to good relationships since established between the dischargers concerned and HDC. The charges for receipt of tankered waste are low within the Hastings District (compared with elsewhere), which has incentivised responsible behaviours. HDC also employs a paperless (Barcoding) system to track tankered waste, which allows for responsive management. However, currently it is only possible for HDC to track the disposal end of the chain (not at-source). It is therefore challenging to manage or have influence over waste management/generation at sites located outside the district (where tankered waste is generated, then transported to a facility within Hastings District).

In discussions with HDC Officers, only two instances could be recalled where discharges had been found to have "Culturally Offensive Characteristics" (as defined in Clause 7.1.1 of the Bylaw). These instances included:

1. Discharge of mortuary waste (an ongoing issue which has historically been approached in coordination with mortuary operators, the HDC-TWWWJC and HDC. The previous (2016) Bylaw included a design diagram for a rock passage to 'treat' these discharges in a culturally appropriate manner at the source before discharge into the wastewater network, but implementation of this design at individual premises was not monitored. At a minimum, mortuary waste continues to be discharged via the domestic wastewater network (and is then treated via the WWTP and Rakahore Channel at East Clive prior to discharge via the offshore outfall). Refer to further discussion regarding this issue in Section 2.3.8 below.

[31] Published annually on the HDC website at https://www.hastingsdc.govt.nz/our-council/fees-and-costs/
[32] HDC SOP-F-MR-013-1 Standard Operating Procedure: Calculating the Annual Trade Waste Charges, Version 0.35, February 2023 (in progress).

2. A number of possible illegal connections, where human waste is being discharged via the separated trade waste network (or cross-connections in the domestic wastewater network). A faecal source investigation was initiated by HDC in early 2023 to attempt to detect the sources of these discharges. It is likely that these discharges have been ongoing for some time. As of the time of writing, the findings of the investigation had not yet been published.

No trade waste approvals were cancelled during the review period. One discharger was notified that action was required, and subsequently they improved their practice. At the time, HDC put in a lot of effort to work with the one discharger with poor performance. While it would not be practical or cost-efficient to replicate this level of effort for multiple dischargers (or repeatedly over time), at the time it was important to persevere to maintain an open line of communication and achieve a positive outcome. Maintaining constructive relationships is important for HDC especially given the relatively small community.

There was one event in the past where the discharge plume had visible colour changes (e.g. reddish brown) noticeable from a boat. The discharge was found to have originated from one of the major industry dischargers (food processing).

2.3.4.2 Effectiveness of existing Trade Waste management

There is currently a single Trade Waste Officer (one full-time equivalent (FTE)) in charge of monitoring compliance with trade waste approvals for the District. HDC has identified that staff resources are a limiting factor on the effective implementation of the Bylaw and other management approaches. It would be beneficial to have a greater number of appropriately skilled staff available to complete investigations into specific premises, identify key risks, and maintain all-important relationships with dischargers.

Council officers commented that it would be helpful if future revisions of the Bylaw could incorporate a right to refuse Trade Waste services, namely in that it would no longer be guaranteed that services (such as wastewater connections) will not be interrupted. This would provide greater freedom for HDC in shutting down particular assets for maintenance or to respond to emergency conditions. Instead of having this guarantee in the Bylaw, HDC would ideally integrate a clause relating to continuity of service into individual trade waste approvals if it was deemed legal and appropriate to do so. Provisions relating to reasons for refusal would need to be clearly set out by HDC in the Bylaw.

The application process for trade waste approvals is currently highly manual, relying on a small number of staff to process large amounts of information. The process does not include any automated / digital components to aid in data entry and consistent record keeping. As such, experiences may vary between applicants. HDC consider that it would be prudent to establish an online application form which can automate at least part of this process, and assist HDC in collecting more consistent information from applicants.

The decision-making process for trade waste approvals is also not well documented; the reasoning behind decisions is not always made clear or recorded for future reference. Currently, the process relies upon a single person. This presents operational risks. If a larger team is recruited to assist, it would be imperative to have a series of guidance resources to ensure that decision-making processes are fair, consistent, and well-documented.

Ideally an official, standardised process would be established for the consideration of applications (i.e. with clear, agreed criteria and a decision hierarchy/matrix) especially with regards to risk management. The 'buffer' being built into approvals (based on discharge characteristics, volumes etc) needs to be documented and well understood on a whole-of-network scale. HDC would also benefit from having a more standardised approach to building contingencies into discharge approvals, such as ensuring that compliance with approval conditions can still be achieved in the event of on-site system failures.

2.3.4.3 Mortuary waste

Further to the discussions in Section 2.3.4.1 above, discharges of wastewater from mortuaries (at the funeral home and hospitals) are currently Permitted by the Consolidated Bylaw 2021. They are discharged along with domestic wastewater from each facility into the domestic wastewater system and thereon treated at the East Clive WWTP.

Mortuary waste is typically wastewater produced as a result of embalming and other medical procedures, cleaning and disinfection. As such, wastewater from these facilities can contain chemicals such as bodily fluids, formaldehyde;

industrial-strength detergents, degreasers, disinfectants and surfactants; and may also possibly have variations in pH and temperature.

There is one funeral home and several mortuaries in Hastings. No autopsies are performed in the Hawke's Bay; where needed, bodies are sent out of the region to appropriate facilities where this service can be performed.

The New Zealand Funeral Director's Association and other industry groups governing mortuaries have their own standards and best practices for the management (and in some cases treatment) of discharges on-site, however HDC has not reviewed or investigated these practices.

Discussions were held with these premises in 2009 to understand the nature of the discharges and determine their level of risk to the sewer network and the WWTP. At that time, it was decided that the discharges met the criteria to be 'Permitted'.

Over many years, the cultural sensitivities relating to discharges of mortuary waste have been a subject of discussion between HDC and the mortuaries, as well as the HDC-TWWWJC . This has in part stemmed from discussions elsewhere in the NZ industry, such as in Gisborne. An 'acceptable solution' of providing a rock passage on-site to culturally treat mortuary discharges before they entered the domestic wastewater network was included in the Engineering Code of Practice for any new developments. This solution was arrived at in co-operation with the HDC-TWWWJC . However, this solution has not been put into practice to date.

Currently it is considered by HDC that the Rakahore Channel at the East Clive WWTP provides cultural treatment of the discharges including those from mortuaries. However, this is likely to be the subject of further consideration in years to come.

2.3.5 Input to Best Practicable Option

The following findings can be drawn from this review of the management, collection and treatment of trade waste within the Hastings Wastewater Scheme, in terms of whether or not the current practices represent the Best Practicable Option:

- Current level of pre-treatment required for industrial / trade waste discharges to both the DNSI and the Separable Industrial waste stream, as set out in individual trade waste agreements, is considered to be a cost efficient approach when compared with potential alternatives. It allows for the specific contaminant and flow profiles for different industries to be managed in a tailored manner on-site prior to discharge into Council networks, as opposed to the Hastings Wastewater Scheme needing to cover the whole range of necessary industrial / trade waste (pre)treatment. This is especially important during peak seasonal flows for major industry discharges such as those in the fruit and vegetable processing sector.
- Beneficial reuse of the Separable Industrial waste stream and industrial non-separable wastewater within the DNSI stream is currently very limited. There could be opportunities to reuse flows from particular dischargers (such as industries using water for cooling purposes) either at a discharger's own site or at nearby sites and therefore reduce overall flows and contaminant loads to the Hastings Wastewater Scheme.

These aspects have been considered in the assessment of the Best Practicable Option, detailed further in Section 3 of this Review report.

2.4 Condition 27(d): Changes to Environment Guideline and Standards

(d) *Any new changes to environmental guidelines and / or standards applicable to the discharge of treated wastewater into Hawke Bay.*

This section discusses all relevant changes to local, regional, national and/or international standards and guidelines where applicable to the discharge of treated wastewater into Hawke Bay. In particular, it notes:

- Significant and gazetted amendments to legislation that was existing in 2013, including regulations established under the Resource Management Act 1991 (such as National Environmental Standards);
- New legislation introduced since 2013 (and any subsequent, gazetted amendments to that legislation where relevant);
- Changes to National Policy Statements, and introduction of new NPS where relevant;
- Changes to the Hawke's Bay Regional Policy Statement and Regional Coastal Environment Plan, including any implications for the current resource consent conditions;
- Changes to the Hawke's Bay Regional Resource Management Plan (RRMP) and the introduction of the HBRC Kotahi Plan;
- Changes to the Hastings District Plan;
- Amendments to (and introduction of any new) guidelines and standards that apply at a national level, such as the Australia and New Zealand Guidelines for Fresh and Marine Water Quality (2018) and the NZ Municipal Wastewater Monitoring Guidelines (2002); and
- The potential impacts of proposed reforms relevant to the activity, further to that described in Section 1.2.4 above.

It is noted that this section was prepared throughout 2023 and early 2024 during a period of significant change in the governance of New Zealand's water sector and reflects the information available at that time.

2.4.1 National legislation and policies

Condition 27 currently does not specifically note that a 'purpose' of the review may be to deal with the introduction of new legislation, including Acts and national policy statements, national environmental standards or guidelines. In some cases a new Act or national policy statements provide a directive for change. A new purpose is recommended to be included in the consent condition to capture the introduction of new legislation that may have a bearing on the implementation of the discharge consent (refer to Sections 4 and 7 below for further details regarding this recommendation).

2.4.1.1 Resource Management Act 1991 (RMA)

The RMA statutory tests under Section 104, Section 105 and Section 107 largely remain unchanged. One minor exception in the context of wastewater management is that the consideration of greenhouse gases is no longer excluded from decision-making.

2.4.1.2 Local Government Act 2002 (LGA)

The LGA was utilised as the statutory instrument to establish and retain the HDC-TWWWJC as a governance committee. The HDC-TWWWJC is underpinned by the principles of the Treaty of Waitangi (Te Tiriti o Waitangi), especially those of partnership and consultation and recognising the role of Tangata Whenua as kaitiaki. This role has been the subject of discussion in recent years, including being raised by Tangata Whenua members of the HDC-TWWWJC, due to perceived inappropriate application of the word 'kaitiaki' as an individual. In 2019, it was proposed that the terminology used in Condition 29 of the consent be reviewed in conjunction with Tangata Whenua members of the HDC-TWWWJC and revised if necessary. This is reflected in Section 7 of this Review Report. The HDC-TWWWJC as set out under condition 29 is maintained under a 'Terms of Reference' which includes the Fields of Activity and Membership. The Fields of Activity mirrors the clauses under condition 29.

The streamline planning process established under the RMA could enable the wastewater discharge to be progressed for this significant infrastructure consent when it expires in 2049. The Natural and Built Environments Act[33] would need

[33] Repealed 22 December 2023 (after this section's content was written); the statement could apply to any new legislation related to resource and environmental management.

to provide for the streamline planning process, as currently provided for under the RMA if it is to remain a process in the new legislation, or its replacement.

2.4.1.3 Marine and Coastal Area (Takutai Moana) Act 2011 (MACA)

The Marine and Coastal Area (Takutai Moana) (MACA) Act 2011 came into force in March 2011.
The legislation provides for amongst other things, customary marine titles and protected customary rights. Any future resource consent will need to take into account the area of discharge in coastal waters and the occupancy of the pipeline on the seabed, if the area has a protected customary rights area over it and if the adverse effects are more than minor.

The customary marine title exists in a specific area of the common marine and coastal area if the applicant group holds the area in accordance with tikanga and has exclusive occupancy and use from 1840.

At the time of preparing this Review Report Heretaunga Tamatea (MAC-01-09-001) was the only applicant group with an application lodged with the Crown for recognition of customary interest that includes the area of the existing outfall pipeline and the area of discharge in Hawke Bay. The accompanying customary interest map was dated June 2015[34], with application details as follows:

Application Number:	MAC-01-09-001
Applicant Group:	Heretaunga Tamatea
Representative:	Heretaunga Tamatea Settlement Trust and He Toa Takitini

Accessed 15 May 2023: Te Arawhiti - Hawke's Bay

2.4.1.4 Water Services Act 2021

The Hastings WWTP is a wastewater network as defined within section 5 of the Water Services Act 2021[35]. When referring to the RMA under section 104, and the consideration of a resource consent application, at the time of the replacement consent, HBRC amongst other things:

- Must give effect to Te Mana o te Wai, to the extent that Te Mana o te Wai applies to the function, power, or duty under the Water Services Act
- must not grant a consent contrary to a wastewater environmental performance standard, as made under section 138 of the Water Services Act; and
- must include as a condition of granting the consent, requirements that are no less restrictive than is necessary to give effect to the wastewater environmental performance standard.

Currently, no such wastewater environmental performance standard has been established (as of January 2024).

Aquaculture Management Area

There are no marine aquaculture farms in the near vicinity of the offshore outfall pipeline. The nearest consented[36] marine aquaculture farm, granted under the Fisheries Act 1983, lies within the Hawke's Bay Regional Coastal Environment Plan (RCEP) scheduled aquaculture management area. The 2465 hectare area is located three nautical

[34] MAC-01-09-01.pdf (tearawhiti.govt.nz)
[35] Subject to repeals in 2024.
wastewater network means the infrastructure and processes that—
(a) are used to collect, store, transmit through reticulation, treat, or discharge wastewater; and
(b) are operated by, for, or on behalf of one of the following:
(i) a local authority, council-controlled organisation, or subsidiary of a council-controlled organisation:
(ii) a department:
(iii) the New Zealand Defence Force
[36] CL050542Qa obtained under section 67J of the Fisheries Act 1983.

miles offshore from Waipatiki Beach, Hawke Bay, and provides for green mussel (*Penus canaliculus*) marine farming. The consent expires in July 2032.

2.4.1.5 Local Government (Community Well-being) Amendment Act 2019

The 2019 amendment of the Local Government Act 2002 broadened the purpose of local government to include promoting the social, economic, environmental and cultural well-being of their communities, while taking a sustainable development approach. The previous clause of the Local Government Act section 10(1)(b) was:

(a) …
(b) to meet the current and future needs of communities for good-quality local infrastructure, local public services, and performance of regulatory functions in a way that is most cost-effective for households and businesses.

The amendment replaced section 10(1)(b) with the following:
(a) …
(b) to promote the social, economic, environmental, and cultural well-being of communities in the present and for the future.

2.4.1.6 New Zealand Coastal Policy Statement 2010

The mandatory New Zealand Coastal Policy Statement 2010 (NZCPS), revised from the previous 1994 version came into effect on 3 December 2010. There are no changes to the NZCPS post-2013 to present time, that would impact upon the main discharge activities originating from the WWTP.

2.4.1.7 National Policy Statement for Urban Development 2020

The Resource Management (Enabling Housing Supply and Other Matters Amendment Act) 2021 and the National Policy Statement for Urban Development (NPS-UD), 2020 requires Councils to remove barriers to development to allow growth in locations that have good access to existing services, public transport networks and infrastructure. It requires the assessment of development capacity with regards to 'infrastructure-ready' land, whereby in the short term, there is adequate existing development infrastructure; and in the medium term, there is adequate existing development infrastructure OR funding for this adequate infrastructure is identified in a long term plan. In the long term, development infrastructure to support development capacity is identified in an infrastructure strategy. As described in Section 2.4.2 and 2.4.3 below, both HBRC and HDC have mechanisms in place to incorporate this assessment and make allowances to ensure that 'infrastructure-ready' land is available now and in the future. In the context of the East Clive WWTP, this includes ensuring that land is available for expansion of the WWTP (to provide additional treatment capacity) and managing the risks of climate change, such as managed retreat.

As a Tier 2 authority, HDC notified Plan Change 5 to its District Plan in October 2022 to allow a more considered and permissive approach to Hastings, Flaxmere and Havelock North housing developments. This plan change provides the planning framework for medium density objectives, policies and district rules, including performance standards. Any new development would need to be appropriately serviced by wastewater infrastructure. This is coupled with the need for the efficient utilisation of existing infrastructure. As discussed below the aim is to have operative medium density provisions within the District Plan by the end of 2023. These changes could result in subsequent changes to wastewater flows and loads within the Hastings Wastewater Scheme (as discussed in Section 2.1.4 above).

2.4.1.8 National Policy Statement for Highly Productive Land 2022

The national policy statement came into force in October 2022. It provides policy direction to improve the way highly productive land is managed under the Resource Management Act 1991 (RMA). This is achieved through clear and consistent guidance to councils on how to map and zone highly productive land, and manage the subdivision, use and development of this non-renewable resource. The NPS HPL also includes pathways for consenting specified infrastructure. WWTPs would come under this category as they can be considered a 'lifeline utility' as per the definition of 'specified infrastructure' in the policy statement. This would be relevant for any future optioneering should a future decision indicate that the WWTP be relocated to a new site classified as highly productive land - Land Use Capability Class (LUC) 1, 2 or 3.

2.4.2 Regional Planning Instruments

At a statutory and regulatory level, the key planning instruments are the Hawke's Bay Regional Policy Statement (RPS), the Regional Resource Management Plan (RRMP), and the Regional Coastal Environment Plan (RCEP). The RMA provisions are encapsulated within these regulatory policy and plan documents.

When processing a resource consent application, HBRC must have regard to the RPS and the RCEP provisions as required by section 104 of the RMA.

2.4.2.1 Regional Policy Statement (RPS) and Regional Resource Management Plan (RRMP)

The Hawke's Bay Regional Policy Statement (RPS) is provided for within the Hawke's Bay Regional Resource Management Plan (RRMP). As noted within the purpose of the RRMP, the RPS recognises the regional significance of the coastal marine area and wider coastal environment of Hawke's Bay. There are no changes, amendments or variations, since the 2013 AEE was lodged, to the RPS that would materially impact the discharge of wastewater from the WWTP.
The key RPS policy themes noted in the 2013 AEE were:

- Water Quality (Objective 6)
- Investment and maintenance (Objective 9)
- On-going operation (Objective 32)
- Regionally significant infrastruture (Objective 33)
- Tangata Whenua (Objective 34)

The nature and intent of the RPS broadly covers resource management issues, regional objectives and policies for Hawke's Bay. A review of the RPS as currently applicable notes no significant changes to the regional objective and policy direction for resource management for the Hawke's Bay region, and in particular, in relation to the discharge of treated wastewater into Hawke Bay. However, for completeness, an overview of the RPS since 2013 has the following listed plan change and amendments:

- Plan Change 5 Land and freshwater management became operative in 2014
- Amendment 3 Insertion of policies as directed by National Policy Statement for Freshwater Management (NPS-FM) 2017
- Amendment 6 Insertion of objective and policies as directed by the National Policy Statement for Freshwater Management (NPS-FM) 2020 (and consolidation of similar in Chapter 5.1A) in 2020
- Amendment 7 Removing conflict and avoiding duplication with the Resource Management (National Environmental Standards for Freshwater) Regulations 2020 in 2020
- The plan change and amendments have no direct impact nor need for any consent condition amendments.

2.4.2.2 Regional Coastal Environment Plan

The Hawke's Bay Regional Coastal Environment Plan (RCEP) became operative on 8 November 2014. The decision version of the RCEP, issued in 19 July 2008 was used in the 2013 AEE. An amendment to remove the restricted coastal activity classification as directed by the NZCPS Policy 29 came into effect on 8 November 2014. This directed HBRC to remove the reference to the restricted coastal activity classification within the RCEP. This amendment has no material impact nor regulatory change upon the treatment plant and discharge, trade waste management or other key aspects of HDC's wastewater management in respect to the treated wastewater discharge into Hawke Bay.

The key RCEP objectives and policy themes reflected in the 2013 AEE were:

Relationship of Māori and the coast:

- Tangata Whenua (Policy 6)
- Water Quality (Objective 16-1)
- Mauri in CMA (Objective 16-2)

Discharge of contaminants into CMA:

- Contaminant discharge to CMA (Objective 16-3)
- Life-supporting capacity (Objective 16-4)
- CMA environmental guidelines (Policy 16-1)

The overarching regional objective and policy framework with respect to treated wastewater discharges into the coastal waters has not fundamentally altered under the RCEP. A review of the current RCEP notes no changes to the relevant objectives and policies applicable to the WWTP discharges to Hawke Bay.

The regional rule framework has remained unchanged since the preparation of AEE 2013, in particular with respect to the discharges into coastal waters.

A possible implication within the RCEP are objectives, policies and associated regulatory and non-regulatory mechanisms related to coastal hazards. In particular, Coastal hazards (Objective 15) and relevant Policy 15 (refer RCEP Part C). Under the RCEP - Part C, key objectives around coastal hazards has a possible policy implication to 'direct' or inform an approach for 'managed retreat' of the WWTP now and/or further into the future. A recommendation for addressing this matter has been included in the Future Proofing section of Table 7-1, Section 7 of this Review Report. The key objective states:

Objective 15.1 Risks posed by coastal hazards to people and property are avoided or mitigated.

Linked to climate change and its resultant effects, including sea level rise and more frequent and intense rainfall events, the risks posed by these activities may warrant possible new consent conditions in line with an adaptive management approach to provide for a co-ordinated relocation and/or removal of the WWTP. This is a long-term approach with a 50-100 year timeframe as discussed below. Policy 15 that sits under Objective 15 sets out a suite of environmental guidelines that would inform the need for managed retreat to be based on a strategic decision by HDC for the co-ordinated removal, relocation or even abandonment of the WWTP assets at risk of being impacted by coastal hazards.

Numerous factors such as extent, scale and timeframes would see the potential for managed retreat to include, for example:

a. micro-retreat, where the elevation of building floors is raised;
b. relocation within a property's boundaries;
c. relocation to another site;
d. large-scale relocation of settlements and associated infrastructure.

The HBRC environmental guidelines for coastal hazards provide issues and guidelines focusing on coastal erosion and inundation risk, and provide a range of responses to be adopted to implement managed retreat, while allowing for the extent, scale, timeframes, feasibility and practicality of each response, and include:

- regional and district rules that relate to managing existing uses, restricting new uses, and restricting construction of coastal protection structures;
- property title covenants;
- education and improved awareness of hazard and consequences;
- financial instruments, for example, property purchases, subsidies for relocation, taxation of risk, transferable development rights;
- removal, relocation and construction of infrastructure out of at risk areas;
- insurance incentives and disincentives.

Whilst being close to the shoreline, the location of the existing WWTP given its set back from the foreshore, the modified wetland in the foreground and the existing stopbank, means it does not currently experience any level of coastal erosion. Inundation risk along with the potential for sea level rise impacts and more frequent and intense rainfall events may see the incidences of inundation within the boundaries of the WWTP increase over the next 50 to 100 years. Aside from the need to operate the WWTP on back-up generators, no significant on site ponding nor inundation was experienced at the WWTP following Cyclone Gabrielle in February 2023.

The Clifton to Tangoio Coastal Hazards Strategy identifies that the East Clive preferred pathway, as shown in Figure 2-10, for the long-term (50 - 100 years) is a 'managed retreat', though this is coupled with gravel renourishment and control structures in the medium term (20 – 50 years).

Figure 2-10: Preferred medium and long-term pathway for coastal management at East Clive

Source: Assessment Panel Report FINAL 28.2.18.docx (hbcoast.co.nz)

2.4.2.3 Tukituki, Ahuriri, Ngaruroro and Karamu (TANK) Plan Change 9

The purpose of the TANK Plan change is to ensure integrated management of water quality and quantity in the Tūtaekurī, Ahuriri, Ngaruroro and Karamū (TANK) catchments. It is a complex and significant plan change covering interrelated management of surface and groundwater quality and quantity in the TANK catchments.

Some parts of TANK are under appeal to the Environment Court. The mediation process is also a mechanism aimed to resolve planning matters as efficiently and effectively as possible. Some TANK plan change regional rules are legally in effect, while other regional rules shall not take effect until HBRC make the plan operative following the resolution of all appeals.

As the TANK proposed plan change moves through the statutory plan hearing and potential Environment Court appeals stage, relevant policy and planning considerations, for example upon water conservation and land use behaviours, including any potential opportunities for innovative solutions such as sewer mining, could be addressed through the strategic planning approach described in this report, prior to or as part of the next 9-yearly Review. There could be additional opportunities for HDC and the HDC-TWWWJC to take a lead in promoting wastewater reuse for industrial users and link with drinking water strategic management and any community/industry water conservation engagement strategies.

As noted on the HBRC website, the Policy team at HBRC have transitioned back into Kotahi related policy and planning work (described in Section 2.4.2.4 below). The initial focus will be to update the Regional Policy Statement (RPS) and to address region wide issues as the first tranche of policy development. In the near future, the Kotahi Plan shall eventually

replace the current Regional Policy Statement, Resource Management Plan, and Coastal Environment Plan. HBRC acknowledge the massive impact post Cyclone Gabrielle has had on the region, and thus new issues within catchments and across the wider region have arisen that need to be addressed accordingly.

2.4.2.4 HBRC Kotahi Plan

In late 2021, HBRC proposed a new statutory policy and planning document, called Kotahi Plan. The single combined regional document, was to integrate the Regional Policy Statement, the Regional Resource Management Plan and the Regional Coastal Environment Plan. This regional document was to give effect to central government policies, planning and technical standards. The aim was to notify the regional document in 2024, with preceding work developing limits, targets and methods. The 'driver' behind the 2024 notification date is mandated by the National Policy Statement on Freshwater Management 2020, noting that the Regional Council must notify changes to policy statements and regional plans by 31 December 2024. However, due to the significant cyclonic event in February 2023, HBRC notified its partners and key stakeholders of the delay to the preparation of the Kotahi Plan[37]. HBRC further signalled in their Environmental Resilience Plan Cyclone Gabrielle – First Edition (April 2023) of their likely request to Government to provide flexibility with regards to legislation obligations and respective implementation timeframes under the NPS-FM and NES-F.

2.4.3 Hastings District Plan

The National Policy Statement on Urban Development 2020 (NPS-UD) aims to ensure that New Zealand's towns and cities are well-functioning and accessible urban environments that meet the changing and diverse needs of communities. In a local context, medium housing density Plan Change 5 has been included into the Hastings District Plan to ensure medium density buildings are provided for. The plan change provides a more permissive and considered approach for housing developments in Hastings, Flaxmere and Havelock North through enabling a greater height and density of development in urban areas where there is demand for housing and areas that are accessible by public transport or are within walking/cycling distance to services and facilities.

The extent of land use changes and population growth have been discussed earlier in Sections 2.1 and 2.2 of this Review Report.

2.4.4 Local Bylaws

HDC's former Trade Waste and Wastewater Bylaws are set out within HDC's amended Consolidated Bylaw 2021. This bylaw addresses amongst other things, water services which encompasses Trade Waste and Wastewater (Chapter 7). Of note under Schedule B of Chapter 7 is the need to ensure the wastewater characteristics do not *'impair wastewater treatment processes or compromises the treated wastewaters discharge Consent'* (refer pg 55) and *'any substance in concentrations which may cause Council to be in breach of any discharge consent for the Wastewater Network held by Council'* (refer pg 56). These characteristics are managed by the bylaw approval process granted by the Council that authorises contributors to the wastewater network and what conditions they need to comply with. The relevance of the Consolidated Bylaw to the Hastings Wastewater Scheme is discussed in detail in Section 2.3.3.1 of this Review Report.

2.4.5 Environmental standards and guidelines

The following guidelines were referenced in the 2013 AEE and as such required review to determine any subsequent (post-2013) changes that may have implications on the current consent conditions, the operation of the treatment plant and discharge, trade waste management or other key aspects of HDC's wastewater management in respect to the treated wastewater discharge into Hawke Bay.

[37] HBRC email dated 21 July 2023 (Jason Doyle HBRC Project Manager – Policy and Planning).

2.4.5.1 Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) 2018

Previously referenced as the ANZECC/ARMCANZ[38] 2000 Guidelines for Fresh and Marine Water Quality, these guidelines are a mainstay for the assessment of effects on the aquatic environments of New Zealand. From around 2016 onwards, a significant government- and industry-led consultative process was undertaken to review and (where necessary) revise the 2000 guideline values. A new version of the guidelines was published in 2018, and some updates to specific sections are still ongoing as of 2023.

Below is a summary of key changes to the guidelines which have occurred within the review period (namely associated with the new version published in 2018):

- Introduction of default guideline values for physico-chemical stressors in freshwater, categorised by the New Zealand River Environment Classification.
- Publication of technical briefs for selected toxicants (those with revised or new default guideline values within the 2018 publication (or later)) including:
  - Herbicides - Glyphosate in freshwater (2021); Metolachlor (2020); Picloram in freshwater (2023 – draft)
  - Sulfonylurea herbicides – Metsulfuron-methyl (2021)
  - Metals – boron (2021); copper in marine water (2023 - draft); zinc in marine water (2021)
  - Perfluorooctane sulfonate (PFOS) in freshwater (2023 – draft)

Addition of notes in relation to the New Zealand default guideline values for nitrate toxicity in freshwater. These were informed in part by studies undertaken by Hawke's Bay Regional Council in relation to the Regional Plan Change for the Tukituki River (2013). While the default guideline values for nitrate were not updated in 2018 (and therefore are still not directly applicable especially for native species such as inanga and mayflies in NZ rivers), these notes on the limitations of the values have been added. Additionally, the majority of sites needing to apply guideline values for nitrate in freshwater are now subject to the NOF attribute (from the NPS-FM 2020) for nitrate in freshwater, which as a regulatory limit has precedence over the ANZG 2018 guideline values. These limits are not applicable for the discharge into the marine environment from the East Clive WWTP, but are important to note for context.

The updated default guideline values for copper (draft as of 2023) and zinc (2021) in marine waters are of particular relevance for the East Clive WWTP due to its primary discharge being via an offshore outfall into Hawke Bay. The table below illustrates these changes, comparing the previous guideline which would have applied when the consent application was lodged in 2013, and the current values that apply. The table demonstrates that the newer values are significantly lower (more stringent) than those which applied when the consent was first granted.

The maximum concentration limits for copper and zinc in treated wastewater (from consent Condition 6) were delineated by multiplying the ANZECC (2000) Default Guideline Value (DGVs) for 95th percentile species protection in aquatic ecosystems (the values shaded grey in Table 2-13) by a dilution factor of 100. It is also noted that the consent limits are presented in g/m^3, while ANZG DGVs are in µg/L (1 g/m^3 = 1,000 µg/L). Therefore the consent limits for maximum concentration of acid soluble copper and zinc (respectively 0.13 and 1.5 g/m^3) translate to 130 and 1,500 µg/L. Dividing by 100 (dilution factor) leads back to the ANZECCC (2000) DGVs of 1.3 and 15 µg/L as per Table 2-13.

Using this same method, it is recommended that the consent limits for acid soluble copper and zinc should be updated to 0.04 g/m^3 and 0.8 g/m^3 respectively. This recommendation is included in Table 4-1 (Section 4 of this Review Report). Based on historic monitoring data analysed for the 9 year review period (presented in Section 2.2 and Appendix B), these new limits would have been met the majority of the time and therefore are achievable.

[38] Australia and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resources Management Council of Australia and New Zealand (ARMCANZ)

Table 2-13: Comparison of ANZG guideline values for total copper and zinc in marine water (2013 to 2023)

	Copper in marine water (µg/L)		Zinc in marine water (µg/L)	
Level of species protection (%)	Previous DGV (2000; applicable in 2013)	Current DGV (draft as of June 2023)[39]	Previous DGV (2000; applicable in 2013)	Current DGV (2021)
99	0.3	0.12	7	3.3
95	1.3	0.40	15	8.0
90	3.0	0.72	23	12
80	8.0	1.4	43	21

Note: The 2013 AEE applied the DGVs for 95% species protection for both total copper and zinc in marine water (chemical specific toxicity; Table 8-8, 2013 AEE); these values are shaded grey in the table above

2.4.5.2 Toxicant default guideline values for sediment quality

The ANZG 2018 (and prior to that, ANZECC/ARMCANZ 2000) also contain guidelines for sediment quality (toxicants in benthic sediment). The consent for discharges from the offshore outfall at East Clive refers to the "ANZECC 2000 (ISQG – Low) guidelines" (e.g. in Condition 19), which were the Interim Sediment Quality Guidelines adopted in 2000. These guidelines are no longer referred to as 'interim'. Instead, they are expressed as default guideline values (DGVs) and high guideline values (GV-High). The latter represents "the median value of the effects ranking" and should only be used "as an indicator of potential high-level toxicity problems, not as a guideline value to ensure protection of ecosystems" (ANZG 2019[40]). Key revisions were completed in 2011 and 2013, and the guidelines will continue to be reviewed as part of the wider programme of work undertaken by the ANZG working groups. Table 2-14 below lists those parameters for which one or both of the guideline values have changed since 2013. Guideline values for other parameters not included in this table have remained unchanged. Values which have decreased (i.e. become more stringent) since this consent was granted are highlighted in orange.

Table 2-14: Comparison of ANZG sediment quality guideline values (2013 to 2023)

Parameter	ANZECC/ARMCANZ 2000, as applicable in 2013		ANZG 2018 (currently applicable)	
	ISQG-Low	ISQG-High	DGV	GV-High
Silver (mg/kg dry weight)	1	3.7	1	4
Tributylin (tin; µg Sn / kg dry wt.)	5	70	9	70
*Total PAHs (µg/kg dry wt.)[41]	4,000	45,000	10,000	50,000
Total DDT (µg/kg dry wt.)	1.6	46	1.2	5

[39] Table 2 in ANZG 2023 *Toxicant default guideline values for aquatic ecosystem protection: Dissolved copper in marine water*, published May 2023, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Governments and Australian state and territory governments, Canberra, 50pp.
Note: as of time of writing, the draft guidelines for copper in marine water were subject to public consultation, which was due for completion (and a subsequent decision) in August 2023.

[40] ANZG 2019 'Toxicant default guideline values for sediment quality', Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Governments and Australian state and territory governments, Canberra, last updated 11 September 2019, available online at https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/sediment-quality-toxicants, accessed 15 June 2023.

[41] Polycyclic aromatic hydrocarbons

Parameter	ANZECC/ARMCANZ 2000, as applicable in 2013		ANZG 2018 (currently applicable)	
	ISQG-Low	ISQG-High	DGV	GV-High
p.p'-DDE (µg/kg dry wt.)	2.2	27	1.4	2.7
o,p'- + p,p'-DDD (µg/kg dry wt.)	2	20	3.5	9
Chlordane (µg/kg dry wt.)	0.5	6	4.5	9
Dieldrin (µg/kg dry wt.)	0.02	8	2.8	7
Endrin (µg/kg dry wt.)	0.02	8	2.7	60
Lindane (µg/kg dry wt.)	0.32	1	0.9	1.4
Total PCBs (µg/kg dry wt.)[42]	23	No value	23	280
TPHs (mg/kg dry wt.)[43]	No value		280	550

Note: *The ANZECC/ARMCANZ 2000 guidelines listed values for individual PAHs as well as values for the sum total PAHs. ANZG 2018 only lists values for total PAHs (on the website) but also refers to the older 2000 version. It is assumed therefore that the individual values for substances classified as being PAHs have remained the same (except for those included in the table above).

2.4.5.3 Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas (MfE, 2003)[44]

The 2003 microbiological water quality guidelines were first developed in 2002, subsequently updated in 2003, and have not been updated since 2013. They were developed to provide "a risk-based approach to monitoring water quality promoted by the World Health Organisation", following extensive consultation with regional and local authorities along with public health agencies between 1999 (when an initial version of the guidelines was released) and 2003. The guideline values presented in this document still serve as thresholds for recreational bathing water quality at beaches and rivers around New Zealand, although for freshwater environments the National Objectives Framework attributes (from the *National Policy Statement for Freshwater Management 2020*) typically take precedence.

These guidelines provide for the assessment of a water body within two categories: a Sanitary Inspection Category, and a Microbiological Assessment Category (MAC). When combined, the grades for each of the two categories combine to provide a "suitability for recreation grade". Most notably for water bodies receiving discharges of treated wastewater (such as Hawke Bay), the SIC provides a mechanism for identifying potential sources of faecal contamination, assessing how susceptible the water body might be to faecal contamination, and the risk of human health effects occurring.

2.4.5.4 New Zealand Municipal Wastewater Monitoring Guidelines (NZWERF & MfE, 2002)[45]

These guidelines were established in 2002 with funding from MfE's Sustainable Management Fund. They were intended to provide a consistent framework for councils and their stakeholders to develop "an appropriate environmental monitoring programme" for municipal WWTPs like the one at East Clive, and guide risk-based decision-making processes. Staff from Hastings District Council were involved in the Steering Group established to develop the guideline document. While the guidelines are still used as a general reference they have not been updated in the past 20 years, and therefore some elements may have been superseded through the advancement of other guidelines, policies and regulations.

[42] Polychlorinated biphenyls
[43] Total petroleum hydrocarbons
[44] MfE 2003 Microbiological water quality guidelines for marine and freshwater recreational areas, Ministry for the Environment, June 2002 (updated in June 2003), 159pp.
[45] NZWERF & MfE 2002 *New Zealand Municipal Wastewater Monitoring Guidelines*, New Zealand Water Environment Research foundation and Ministry for the Environment, Ray, D. ed., October 2002, 319pp.

2.5 HDC-TWWWJC Condition 27(e): Changes to Asset Management and Operational Matters

(e) *Changes in asset management and operational matters that may have relevance to the on-going operation and development of the Consent Holder's Wastewater Scheme from the perspective of the treated wastewater discharge, water conservation and efficient energy management.*

2.5.1 Approach

The review of asset management and operational changes that have occurred at the East Clive WWTP and the overall Hastings Wastewater Scheme since the issue of the consent has focused on:

- Evaluating the implementation and effectiveness of key resources driving asset and operational management, including the Asset Management Plan (2021) AMP and the East Clive Wastewater Facility Manual (2008).
- Identifying any significant changes in management and operation over the 9 year review period (summarised in Table 2-16 below)
- Identifying potential sustainability and efficiency actions to be implemented in future, including opportunities for increased energy efficiency, water conservation, and building redundancy into wastewater systems.
- Considering potential scope for undertaking a carbon footprint assessment of the WWTP and the discharge
- Assessing, as far as they can be at this stage, the potential future impacts of climate change both on the plant operations and from the plant discharges itself
- Identifying emerging issues with regards to asset management

The findings of the review are detailed in subsequent sections.

2.5.1 Hastings District Council's Asset Management Plan and Wastewater Facility Manual

The following management plans and procedures have been established by HDC since 2013 when the current consent No CD130272W was issued. They are critical to the successful operation of the plant and compliance with the resource consent conditions.

2.5.1.1 Asset Management Plan, February 2021

The Asset Management Plan (AMP) produced in February 2021 is extensive and adequately covers the many facets of asset management relating to HDC's wastewater assets, as well as supporting the investment plan outlined in the HDC Long Term Plan 2021-2031 (LTP 21). In terms of review condition 27e), a significant body of the information reflects new and changed approaches to asset management from those being followed in 2013 when the resource consents were granted.
The AMP sets out an overall wastewater objective for "the provision of wastewater services that safeguard public health and the environment".
The following are key wastewater matters that fed into LTP 21, all of which set the scene for the asset management approach, including:

- Renewals planning and implementation
- Direction for the initial nine yearly review of consent (this report)
- Network performance
- Trade waste capacity
- Network risk, resilience and climate change

- Growth projections through to year 2049, being the expiry of the existing discharge consent[46]
- Regulatory reforms in the water sector, in terms of emerging asset management issues
- Financial summary
- Level of service and performance
- Service Delivery
- Regulation and compliance

It is outside the Scope of this Review Report to address all of these matters in detail, although due to cross-over between the AMP and the requirements set out in consent condition 27e), a number are discussed at least at a high level.

2.5.1.2 HDC Three Waters Team Objectives

As set out in Section 2.12 titled "Our People, Processes and Systems", of the HDC 2021 Wastewater Asset Management Plan (AMP), HDC have determined that a robust enabling environment is required in order to ensure delivery of the desired wastewater activity outcomes. Key outputs from a recent review of the HDC Three Waters strategic themes and objectives are set out in Table 2-15 below, this being Table 2.8 of the AMP 2021.

Table 2-15: 3 Waters Strategic Themes Overview, from Table 2-8 of the HDC Wastewater AMP 2021.

Strategic Theme	Description
Think	• Develop 3Waters vision and strategic objectives
Plan	• Plan and establish a Team with the right capacity and capability comprising Council staff, contactors and consultants • Develop asset management strategies and work programmes to meet strategic objectives • Ensure asset management plans align with Council's Objectives, Long Term Plans and • Infrastructure Strategy
Do	• Maintain the operations and maintenance activities • Deliver the capital works programme identified in the LTP and annual plan • Support the implementation of key growth projects • Support the building and regulatory activities of Council
Review	• Ensure that quality and regulatory standards are achieved/ maintained and reported to our stakeholders • Ensure all resource consent requirements are met • Ensure that all compliance standards are met (drinking water standards, stormwater and wastewater quality and quantity requirements) • Ensure compliance with H&S requirements

Additionally, HDC's Three Waters Team identified six Objectives to go forward with. These are shown in Figure 2-11 below, this being Figure 2.6 of the AMP.

[46] The growth projections used to inform the 2021 LTP pre-dated the assessment detailed in Section 2.2 of this Review Report

Figure 2-11: 3 Waters Team Objectives, from Figure 2-6 of the HDC Wastewater AMP 2021.

These themes and objectives set ways going forward which directly tie with the requirements of the last part of Condition 27 in terms of considering opportunities for improvement and also establishing the BPO solution.
Additionally, the themes and objectives reflect the 2013 Project Objective and in a number of areas advance the thrust or direction of those former objectives. Such areas include:

- Ensuring compliance with Health and Safety requirements
- Support implementation of key growth project
- Ensuring resource consent requirements are met
- Capability and capacity improvement
- Key risk management (refer Section 2.5.8)

In going forward and setting the approach to progressively review the Hastings Wastewater Scheme, these AMP objectives should be built into the strategic planning approach (as detailed in Section 1.4.3).

2.5.1.3 Wastewater Facility Manual, January 2008

The Wastewater Facility Manual (WFM) produced by HDC in 2008 is another comprehensive report which details the maintenance requirements included in the current Underground Services Maintenance Contract for the East Clive WWTP (as at 2008). In terms of review condition 27e), the WFM has particular relevance in that it details the operational, management and environmental procedures for the facility. It overlaps with the AMP on the topics of level of service, performance, and service delivery.
There are also many environmental aspects covered in the WFM. The environmental policy for the plant commits to providing an environmentally responsible wastewater disposal site for the District that safely treats and disposes of all wastewater through the long offshore outfall located at East Clive. The WFM specifies that the methods used in treatment and disposal will result in no significant adverse effects in the marine environment after reasonable mixing following discharge through the multiport diffuser. The WFM states that the Facility (East Clive WWTP) must comply with legal requirements and seek to continually improve environmental performance.
The Wastewater Facility Manual's Environmental Policy and Objectives are;

- Communication
- Monitoring
- Continual improvement
- Legal compliance
- Codes of practice / guidelines / standards / resource consents
- Environmental performance
- Best Practicable Option (BPO)
- Risk reduction
- Environmentally acceptable disposal
- Pollution prevention

Cultural concerns (the obligations under the Treaty of Waitangi) are mentioned within the Environmental Objectives and Legislative Requirements Register of the WFM as an item of significance. The relevant cultural objective comes out of the Hawke's Bay Regional Policy Statement, and raises "The Māori Dimension" as follows;

- To have full regard to Māori values in promoting the sustainable management of natural and physical resources of the region,
- The recognition of the cultural and spiritual values of Māori by ensuring that the use, development and protection of the Region's natural and physical resources are undertaken in a manner that respects their relationship with the environment.

Other key procedural and management matters outlined within the WFM include;

- A system outline, including an environmental management system outline
- Outline of procedures, including for;
    - general site management,
    - corrective and preventative actions,
    - equipment operations,
    - maintenance, calibration, inspection and emergency procedures,

While the WFM is now 15 years old and has not changed since the 2013 consent application, it is generally still relevant to the operation and maintenance of the WWTP assets. It would be beneficial for Council to update the manual for present day relevance and to incorporate any matters raised in the AMP and this 9 yearly Review Report.

2.5.2 Significant Changes in Management and Operation

Ongoing attention is given to management and operational procedures of the WWTP and the wider Hastings Wastewater Scheme. The following Table 2-16 summarises the key matters addressed over the nine year review period namely through upgrades to assets. The installation of the new diffuser on the long ocean outfall was a major upgrade, completed in 2017 as included in the table and shown in photographs below.

Table 2-16 was completed in consultation with key HDC personnel and contractors involved in day-to-day operations. Many of the upgrades were completed in alignment with the LTP21 current at the time, with the intention of increasing plant and network capacity and reducing the likelihood and magnitude of wet weather overflows across the wastewater network. Several of the upgrades also built (or will build) increased resiliency into wastewater infrastructure, to prepare for future growth (and increased demand for services) and reduce the risk of and catastrophic failures.

Table 2-16: Condition 27e) Significant Changes in Management and Operational Matters: 2013-2022

Item	Action	When	Reason Why	Indicative Cost	Result/Outcome
Domestic Collection Network					
Eastern Interceptor	Project built under 2 phases. Warwick road (W) section constructed. Currently being built. Karamu – Victoria (KV) section currently under construction .	W- 2022 KV Feb 2023-Dec 2023 (anticipated)	The Akina neighbourhood capacity improvement – Growth, Park Road Master plan, pipe failure.	$6.2M construction cost	Increase in capacity repurposing old infrastructure.
Napier Rd Trunk Upgrade	Operational since construction. No further interventions required.	2015	Increasing capacity from Havelock North to the inland trunk mains. Frequent sewer main overflows during rainy periods.	More than $1M Less than $10M	Increase in capacity. Decrease in wet weather overflows
DNSI BTF Treatment Plant					
Domestic band screens upgrade	Replacement of existing band screens with modifications Band screen renewal	2023-2024 (not yet started)	Upgrade and replacement failing wastewater band screens	More than $1M Less than $2.5M	Asset Renewal Improve solids removal efficiency.
WWTP Electrical Supply Resilience (domestic and industrial)	Recent study review of the East Clive wastewater treatment plant to identify weaknesses in the available power supplies after the recent Cyclone Gabrielle.	Present (2023)	Resilience during power outages, Operator on site must manually slow down the large pumps to reduce the overall power demand.	More than $1M Less than $10M	Provide resilience to the existing power supply to improve both the resilience of the plant, and its ability to function well after a power outage

Item	Action	When	Reason Why	Indicative Cost	Result/Outcome
Separable Industrial Collection and Milli-screen System					
Infrastructure Acceleration Fund (IAF) projects Paharakeke trunk main & Waipatu trunk main	New capital wastewater trunk infrastructure including pumpstations. New capital drinking water trunk network extensions.	Staged programme indicative delivery from 2023 to 2025	Increase in capacity for growth. Decrease in wet weather overflows.	~$40M	Increase in capacity for growth. Decrease in wet weather overflows and flows in the network
Trunk sewer relining (industrial and domestic)	Multiple contracts Renewal of trunk due to hydrogen sulphide corrosion in concrete pipes Current 5-year term Contract ongoing – trunk renewals.	2009- present	Resilience, upgrade failing pipe.	More than $10M in construction cost over several years	Asset renewal
Offshore Outfall, Beach Overflow Chamber & Shoreline Outfall					
Emergency Beach Outfall (EBO) gates	Modifications of old historic beach outfall pipe to provide emergency beach outfall capacity to prevent gravel wash up and pipe blocking. Separate contracts for pipe cleaning and gate installations.	2014-2021 with main works carried out in 2020	Ensure pipe is operational. Stop gravel filling pipe.	More than $500k Less than $1M	Operational maintenance, prevention of gravel blockages in pipe

Item	Action	When	Reason Why	Indicative Cost	Result/Outcome
Rock Groyne	Provide protection to the beach section of the main outfall pipeline and allow for the Emergency Beach Overflow (EBO) – referred to as the Beach Overflow Chamber (CD130272W (AUTH-120775-01). Various repairs and improvements carried out. More work anticipated post cyclone (extent of the works to be confirmed)	2012-present	Provide protection to the beach section of the main outfall pipeline and allow for the EBO.	$1M – 2M construction cost	Resilient structure providing protection
Diffuser replacement (refer **Error! Reference source not found.** below for photographs)	Replacement of old diffuser with HDPE diffuser and duckbill discharge valves. Completed construction. Annual inspections	2016-2017	Renewal of aged asset. Improvement in ocean diffusion of all treated wastewater (domestic and non-separable industry combined with Separable Industrial stream prior to discharge) into marine receiving environment.	$2.5M construction cost	Resilient and functional diffuser
Diffuser leak repairs and inspections	Sealing and remedial work to leaking concrete pipe(wye) Annual inspections and repairs are carried out as and when necessary.	2021	Ensure integrity of the outfall/diffuser. Repair of leak at the wye junction of the pipeline.	$100K -$1M Over several years	Repaired leaks and removed concentrated un-diffused discharge.

Item	Action	When	Reason Why	Indicative Cost	Result/Outcome
Land based concrete outfall pipe	Repair on concrete line with an external carbon fibre wrap with concrete capping to protect pipe from internal corrosion.	2015	Repair to address corrosion on top of pipe	$500K construction cost	Avoiding leak and catastrophic failure on outfall pipeline.
Steel manifold replacement (upcoming project)	Replacing a corroded section of steel pipe and first concrete pipe string from the outfall pumping station. Asset renewal first 150m length pipeline.	Present	Replacing failing pipe. Resilience	Estimated to be more than $10M in construction costs	Renewal of asset.

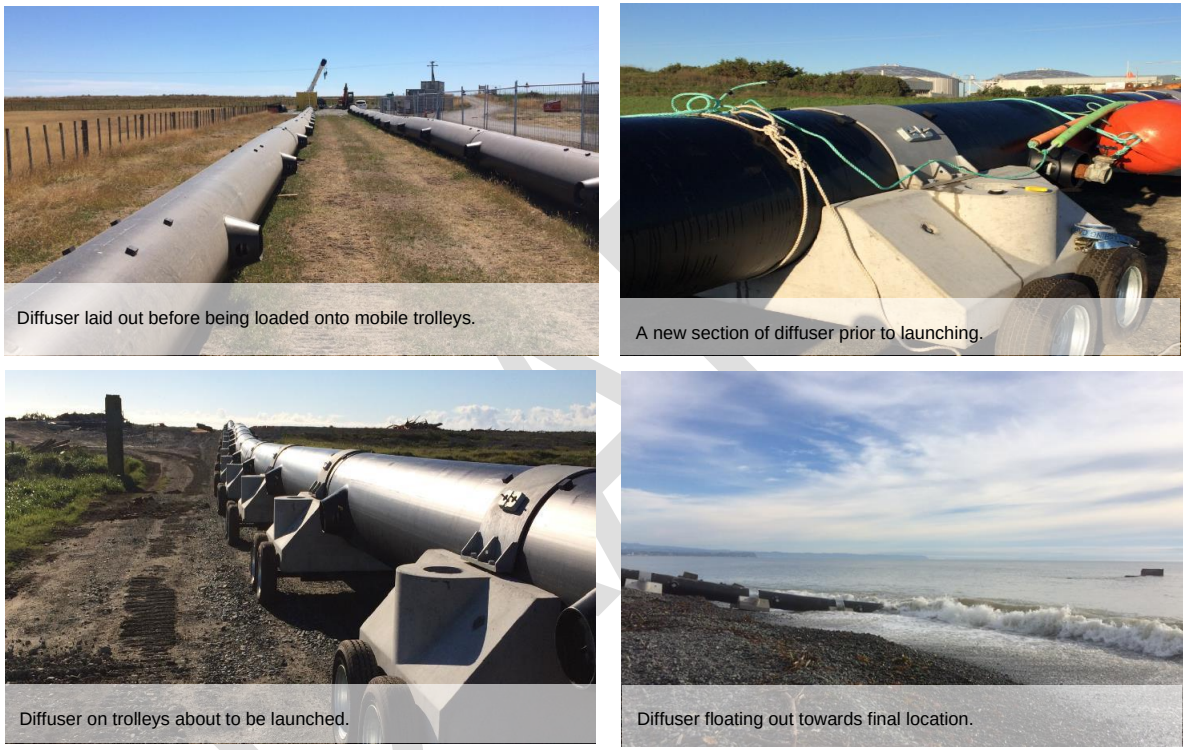


Figure 2-12: New diffuser for East Clive WWTP offshore outfall (2016 – 2017)

2.5.2.1 Future asset management procedures

In 2005 HDC undertook an initial "Assessment of Water and Sanitary Services" as required under the Local Government Act (LGA) 2002 to assess the adequacy for current and future demand of the services. The subsequent long term plans (LTPs) provide periodic updates on achievements made to date and any significant variations between the LTP and Water and Sanitary Services assessment. The future asset management projects included in the 2021 – 2031 LTP are as follows:

Table 2-17: Variations to Sanitary Services Assessment, from HDC Long Term Plan 2021 to 2031.

Projects for Review within 5 to 10 years			
Community	Service	Project	Progress to date
Haumoana Te Awanga	Wastewater	Community Treatment & Disposal Scheme.	Will not occur in 10 year period unless development, environmental or health issues become apparent and community support available.
Clifton	Wastewater	Community Treatment & Disposal Scheme.	No action – within Coastal Hazard Zone
Waimarama	Wastewater	Community Treatment & Disposal Scheme.	Nothing planned in current strategy. Outcomes of Community Plan will inform wastewater review.

The capital plan budget in the HDC Annual Plan 2022-2031 provides a high level summary of proposed works which are being carried forward from the current period to the 2023/24, 2024/25 and 2025/26 long term plans. These future adjustments include non-growth items such as WWTP works, inland trunk sewer renewal, general renewals and new works. The growth programme adjustments allocate budget for the residential growth areas, as well as the rollout of new wastewater rising mains and trunk mains.[47] Specific items relating to the East Clive WWTP include:

- Outfall Pump station Manifold upgrades (2021 – 23)
- Land based Section of Offshore Outfall (repairs/upgrades; 2021-23)
- Outfall By-pass structures (planned for 2029 and beyond)
- The next 9-yearly consent review (budgeted for 2029/30 and 2030/31)

2.5.3 Sustainability and Efficiency Actions Undertaken

Condition 27e) requires that the matters discussed in Section 2.5.2 above should also be assessed from a wastewater discharge, water conservation and efficient energy management viewpoint, along with any additional opportunities for improvement to operation of the wastewater system. These requirements bring in an overall sustainability and efficiency perspective, along with environmental wellbeing focus.

The foundation strategy for environmental wellbeing and objectives for the Hastings district is the Eco District Strategy, prepared by the Eco District Subcommittee in 2021. There are four pillars which collectively express the

[47] Hastings District Council, 2022. *Annual Plan 2022/23 Supporting Information.* Refer tables pg 15/16.

Councils commitment to all aspects of community wellbeing: economic, environmental, social and cultural, refer Figure 2-13.

VISION	Heretaunga whenua houkura, Heretaunga hapori ora - *Fertile land, prosperous people*			
COMMUNITY WELLBEING	Economic	Environmental	Social	Cultural
COMMUNITY OUTCOMES	Sufficient and supportive economy	Healthy environment and people	Safe and inclusive place	Vibrant place to live, play and visit
COUNCIL OBJECTIVES	We enable employment and growth Housing supply matches need The transport network links people, goods and opportunities	Water and land resources are used wisely Sustainable development is encouraged and carbon emissions are reduced The natural environment is enhanced and protected Council services are green and healthy	Our communities are safe and resilient Smart innovation connects citizens and services Our youth have positive pathways	There are great spaces for all people Civic pride, cultural diversity and relationships are strong
FOUNDATION STRATEGY	District Development Strategy	Eco District Strategy	Great Communities Strategy	

Figure 2-13: Hastings District Council Strategy Pillars

The sustainability and efficiency actions summarised in this section have been implemented at the East Clive WWTP since 2013, and contribute to the continuous improvement of the wastewater infrastructure and its operation.

Table 2-18 below includes sustainability and efficiency actions undertaken at the WWTP.

Table 2-18: Sustainability and Efficiency Actions undertaken at the East Clive WWTP 2013-2022

Item	Action	When	Reason Why	Indicative Cost	Result/Outcome
Replacement of outfall pumps	Completed pump testing of existing pumps and finalising report. Four suppliers identified – reviewing options for procurement	2022 - 2024	Three pumps are due for replacement to provide resilience, improve efficiency, and reduce costs	Less than $1M	Asset renewal, improved reliability, and efficiency. Reduced costs in running pumps
Energy efficiency at East Clive	Business as usual	-	-	-	Note that the BTF and overall plant is a low energy plant, compared for example to activated sludge type arrangement. Refer Section 2.5.6 below.

2.5.4 Water Conservation

Condition 27e) requires that changes in asset management and operations over the past nine years be considered with regards to water conservation.

The volume of wastewater received at the WWTP can be reduced by the implementation of water conservation measures in its catchment and by limiting the opportunities for stormwater to enter the wastewater network. It should be noted that these actions may not also reduce the constituent contaminant loads received by the WWTP.

Table 6.2 of the AMP (2021) sets out a number of Demand Management Methods for water which include Operation, Bylaw, Education and Embargo (preventing development) procedures.

While HDC does not have any direct water conservation measures in place to reduce wastewater volumes from domestic sources, it does promote water conservation for water supplies. This by itself results in a reduction of wastewater volumes, however does not reduce the contaminant load in wastewater. For example, mass contaminant load would remain unchanged, because the reduced volume of untreated wastewater would have a greater concentration of that contaminant. An example of how this translates to changes in plant configuration or operation is in the sizing of Biological Trickling Filters (BTF's). These are sized on a Biochemical Oxygen Demand ($cBOD_5$) mass loading rate, which means they are the same size even with a reduction in wastewater volume being treated, because the $cBOD_5$ load would remain the same.

Water conservation for Separable Industrial / trade waste wastewater discharges is advocated through HDC's Trade Waste Management system. Discharge volumes are limited in Trade Waste Approvals (issued in accordance with the Consolidated Bylaw 2021) and these can include the need for the discharging industry to include Trade Waste Management Plans. The latter includes a section for dischargers to detail their approach to conserving water and achieving cleaner production outcomes. A number of Separable Industrial / trade waste wastewater dischargers, particularly those with large volume discharges, source their process water from privately owned bores and accordingly any water supply demand management procedures HDC place on their public water supply do not apply.

Refer to Section 2.3 of this Review Report for further comment on Separable Industrial/ trade waste wastewater in terms of water demand management. Section 2.4.2 and 2.4.3 also provide commentary regarding regional and district plans of relevance (such as the Kotahi Plan and Proposed Plan Change 9 Tūtaekurī, Ahuriri, Ngaruroro and Karamū Catchments (PPC9) to the Hawke's Bay RRMP).

In terms of HDC further implementing its sustainability approach (refer Section 2.5.4 above) Council could implement additional water conservation matters that could result in reduced per person and/or per industry wastewater volume production. Water supply conservation matters that would have a direct influence on wastewater volume production could include:

- Universal water metering and charging, including for wastewater charges
- Water pressure management
- Financial incentives for water efficient plumbing
- Water use efficiency education

Such procedures have been considered in terms of the BPO assessment in this Review Report (refer to Section 2.8 and Section 3).

2.5.5 Emerging Asset Management Issues

In reviewing the changes to asset management since 2013 when the current discharge consent was issued it is prudent for Council to also identify likely future/emerging issues expected to arise, especially in the next nine then 18 years reviews (as per Condition 27e).

Accordingly, this section highlights in summary format what these are or could be going forward in terms of any changes to resource consent conditions and/or new procedures for asset management and allied procedures.

Council's Wastewater Asset Management Plan provides a useful start to such an assessment. Table 2.9 from that plan as included below (as Table 2-19) sets out the over-arching emerging issues.

Table 2-19: Wastewater Emerging Issues from HDC's Wastewater Asset Management Plan 2021

Emerging Issues	Comment
3 Waters Reform	• Monitoring and responding to the Government 3Waters Reform programme. Renamed 'Affordable Water Reforms" as announced and being progressively implemented by Central Government[48]
Increase compliance and quality standards	• Potential changes/increases in treated wastewater standards • Freshwater National Policy Statement (NPS) impacts on wastewater management and treatment
Environmental Impact	• Council has a long-term discharge consent (35 year, expires in 2049). • Conditions require discharge standards to be met and effects on the environment to be monitored in order to safeguard the environment. • There is no tolerance for wastewater overflows (both wet and dry)
Demographic Changes	• An aging population demographic profile may increase or change. This may alter where demand occurs and service affordability. This may also impact on network capacity. The hydraulic model currently under development will assist with planning for this
Growth and House Driver	• Population increases are exceeding current projections • Planning and responding to demand for a range of housing and industry types in the District • Investigation and planning for bulk services

Council's AMP (2021) also includes as Section 4.2.1 information on Government and Industry Direction Themes and as Section 4.2.2 the Three Waters Reform Programme.

In terms of updates on these above items, since they were identified and commented on in 2021, the following high level observations are made in terms of the national reforms currently proceeding – including reforms to water sector and resource management legislation and governance structures.

The reforms have been further advanced through detailed planning by the Department of Internal Affairs, individual councils and other organisations in terms of water sector reforms; and the Ministry of the Environment in terms of resource management and climate change reforms.

It is not possible to cover all facets of the impending reforms in this review, due to their dynamic and contemporary nature, however some of the expected key outcomes are highlighted below (from an asset management perspective as it relates to this review):

1. Asset management procedures are likely to become more consistent across the water sector entities and New Zealand as a whole.
2. Climate change adaptation actions be more coordinated, well developed and consistent.

[48] Major shakeup will see affordable water reforms led and delivered regionally | Beehive.govt.nz and Changes to water services reforms | Water Services Reform. Note: This is a direct quote from the 2021 AMP (and was correct at time of writing this report in mid-2023) but readers should note that there have been significant changes to water sector policies since the general election in October 2023.

3. Concepts of *Te Mana o te Wai* and *Te Mana o te Taiao* will underpin many of the activities and approaches associated with discharges of treated wastewater to both freshwater and marine environments, including groundwater.
4. A new national asset data registration system is expected to be administered by Taumata Arowai.
5. There will be a strategic and integrated approach to support achievement of targets for investment.
6. Potential changes to/more stringent treated wastewater standards for discharges to marine and freshwater receiving environments.
7. Greater recognition of the necessity to consider emerging organic contaminants and microplastics in wastewater discharges.
8. Increased emphasis on wastewater network raw sewage overflows, including consent requirements.
9. Additional National Policy Statements (NPSs) and/or regulations (as National Environment Standards (NESs)) relating to wastewater services.
10. Changes to Trade Waste Management Bylaws and procedures to achieve more standardised approaches across the entities and New Zealand wide.
11. Closer ties between urban development planning and infrastructure planning as per the NPS – Urban Development, and the proposed National Strategic Planning process.

It is envisaged that many, if not all, of these items can in one way or another be included in the ongoing next nine and then 18 year reviews. A number of them are therefore included to take forward into the BPO approach. This approach will be consistent with the DAPP approach as introduced in Section 1.4.3 of this Review Report.

2.5.6 Efficient Energy Management

Condition 27e) requires that changes in asset management and operations over the past nine years be considered with regards to energy efficiency of operations. This directly reflects Part 2 Section 7 (b)(a) of the RMA, which identifies *"the efficiency of the end use of energy"* as a matter to be considered. Furthermore Section 7.2.1 of HDC's AMP 2021 records that *"efficient use of energy with Council's 3 Water facilities"* is a past practice but no measure of this in terms of sustainability has been put in place. The AMP then highlights that future practices will put such procedures in place in terms of sustainability.

Regardless of the fact that no direct sustainable energy measuring practice is in place, both the domestic and non-Separable Industrial system (DNSI) and the industrial / trade waste treatment systems at the WWTP are considered to be low energy use/high energy efficient infrastructural systems.

The DNSI treatment system was a key consideration at the time of selecting the BTF. Section 4.5.7 of the 2013 AEE titled 'Energy Management' includes (as Figure 4.11) the following Figure 2-14, comparing the Biological Trickling Filter (BTF) treatment process with other treatment processes that were then considered as a solution for the treatment of Hastings wastewater.

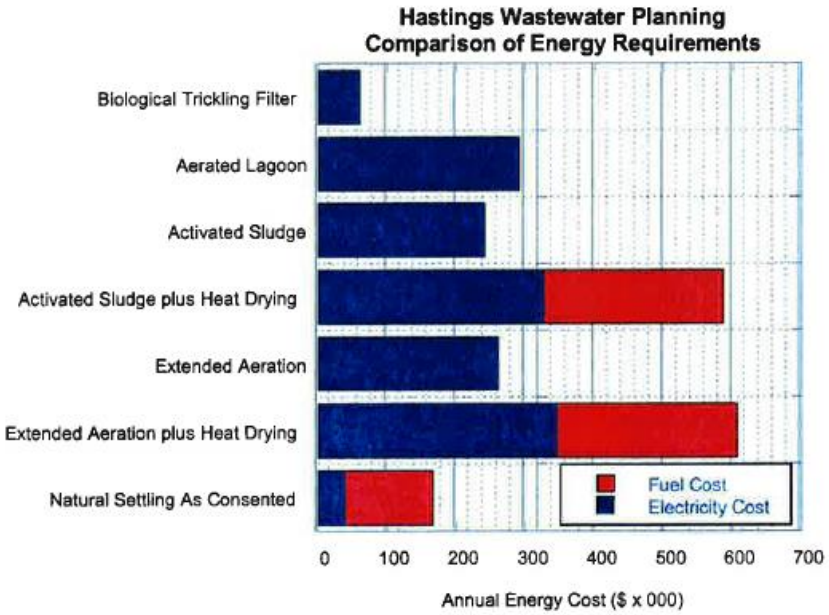


Figure 2-14: AEE Options, Comparison of Energy Usage

Figure 2-14 highlights that the BTF system is extremely energy efficient compared to other systems, especially other secondary (biological) treatment arrangements. This is largely because there are no sludges produced that need subsequent treatment and disposal.

The principal energy users in the BTF plant are the pumps to lift the treated wastewater to the BTF and the BTF induced air fan system.

Industrial / trade waste inflows are primarily treated at the source, as per the trade waste approval requirements, and then treated again at the East Clive WWTP by the rotating drum milli screens and screening dewatering screw conveyors. This equipment also uses comparatively low levels of energy.
Energy is also used to operate the offshore outfall pumping system, but energy consumption is low when compared with many other treated wastewater dischargers where treated wastewater has to be conveyed over a long distance and/or significant change in elevation to the discharge location or discharged via a land application system.
The East Clive WWTP outfall is a relatively short 2.7km length of pipeline, anchored to the ocean floor. These low energy use arrangements have a positive influence in mitigating the operating carbon footprint of the Hastings Wastewater Scheme, and are considered as set out in Section 2.5.6.1 below.
However, not withstanding these findings, it is suggested that an energy audit be undertaken within the next nine year review period to further assess improvements in energy efficiency over time. This would ideally be combined with a carbon footprint assessment (including estimation of greenhouse gas emissions from the entire wastewater system).

2.5.6.1 Carbon Footprint

Although review condition 27 does not specifically mention carbon footprint assessments, this is nowadays a very important current and future issue to consider as it ties into climate change potential impacts and creating a baseline assessment for improving the sustainability and efficiency of the plant. Furthermore it is noted that in 2013 when the current consent was put in place carbon footprints / carbon accounting were not common place as they are nowadays.

The current and national guideline for assessing the carbon footprint of a wastewater treatment system is the Water New Zealand Standard Method document "Carbon accounting guidelines for wastewater treatment: CH4 and N_2O", August 2021. The standard provides guidelines for accounting for methane (CH_4) and nitrous oxide (N_2O) emissions from municipal wastewater treatment, discharge, and sludge processing in New Zealand.

The objectives which form the basis of the Water NZ guideline are as follows[49]:

- To help wastewater treatment providers to prepare a greenhouse gas (GHG) inventory through the use of standardised approaches and principles;
- To provide guidance on the scope and boundaries to be considered for activities in the wastewater industry;
- To provide more detailed guidance on GHG accounting for treatment processes used widely in New Zealand;
- To consider the current state of knowledge for wastewater GHG emissions and applicability of the methodology updates published by the Intergovernmental Panel on Climate Change (IPCC, 2019); and
- To increase consistency and transparency in GHG accounting and reporting among wastewater treatment providers.

Carbon accounting has not yet been undertaken for the East Clive WWTP, however would be an appropriate tool for tracking aspects of the sustainability and efficiency of the plant moving forward. Given the plant was constructed in 2008-2009, a carbon footprint assessment would focus on the carbon associated with the operational aspects of the plant, rather than embodied carbon. The operational aspects include feed pumps, ventilation fans, distributor and minor electrical consumption of screens, ocean outfall pumps, and fans associated with odour control.

The reporting boundaries for direct and indirect green house gas (GHG) emissions are defined in the Water New Zealand Standard Method as per Figure 2-15. This methodology has a particular focus on the wastewater treatment emissions, and refers to other guidelines for calculation of sludge treatment and discharge emissions.

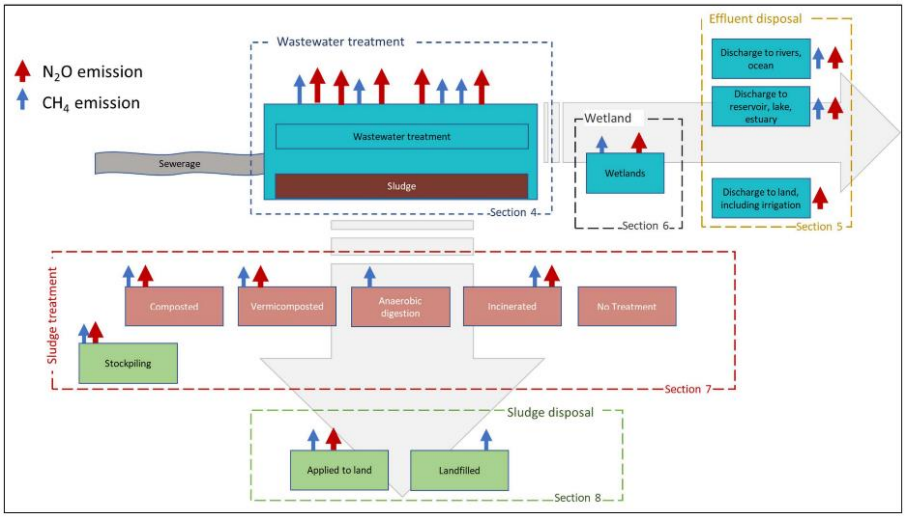


Figure 2-15: Sources of N_2O and CH_4 emissions from wastewater and sludge treatment and disposal. .[50]

[49] Water New Zealand, 2021. *Carbon Accounting Guidelines*.
[50] Water New Zealand, 2021. *Carbon Accounting Guidelines*, Figure 1. https://www.waternz.org.nz/Attachment?Action=Download&Attachment_id=4872

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Emissions associated with the treatment aspects of the WWTP are considered to be minimal due to, as listed above, the relatively few number of mechanical and electrical equipment items in comparison to a typical more mechanical, e.g. activated sludge, WWTP. In addition, the BTF treatment process is an aerobic process. The Water NZ standard recommends a single methane correction factor (MCF) of 0.03 for all aerobic wastewater treatment systems (including biological nutrient removal), compared to a MCF of 0.2 to 0.8 for anaerobic processes.[51]

As the BTF treatment process does not produce sludge for subsequent treatment and disposal or reuse, there will be no sludge processing or associated sludge / biosolids transport related emissions associated with the East Clive WWTP. It is noted however that washed screenings are transported to the regional landfill. This is however a relatively small amount.
The Water NZ standard provides an emission factor for both $cBOD_5$ and COD in treated wastewater discharging to a marine environment, to determine the total carbon associated with the offshore outfall.[52] Overall, it is expected the East Clive WWTP will have a low to very low operational Carbon Footprint.

There is scope to undertake a carbon footprint assessment for the East Clive WWTP moving forward. However, given the relatively bespoke nature of the HDC wastewater treatment process, a recommendation is for further research to be done by HDC into process-specific emission factors, and following that a carbon footprint assessment be undertaken within the next nine year review period. Carbon footprint assessments are becoming more commonplace in the industry and now guidance from Water NZ can direct the approach taken. In addition, with the introduction of Taumata Arowai it is expected that inclusion of carbon footprint data will be required in their upcoming new national surveys of wastewater systems.

2.5.6.2 Climate Change Potential Impacts and Adaption

The future promulgation of the Climate Change Adaptation Act will enact amongst other things, the managed retreat approach and the legal, technical and funding streams associated with implementing any agreed managed retreat.

While consent condition 27(e) does not specifically mention climate change this is a very important current and future issue to consider as the HDC-TWWWJC appropriately identified as part of their input to the scope of this review (2022).

The RMA provides for *"the effects of climate change"* (s7(i) - Other Matters) and this has recently been expanded to include not only the effects of **climate change on the activity** but also the effects **of the activity on climate change**.

These considerations are also relevant for greenhouse gas emissions and energy efficiency matters as discussed in Section 2.5.6. above.

The national Climate Change Risk Assessment completed in 2020 identified the “risk to wastewater and stormwater systems (and levels of service) due to extreme weather events and ongoing sea-level rise.” (Risk B1, Appendix 2 to National Adaptation Plan, 2022). It also found that this risk would have disproportionate impacts on Māori.

The National Adaptation Plan[53] (released in August 2022) details over 120 actions to be implemented across New Zealand in response to climate change, to address the risks identified in 2020. The objectives and actions

[51] Water New Zealand, 2021. *Carbon Accounting Guidelines,* Table 5.
https://www.waternz.org.nz/Attachment?Action=Download&Attachment_id=4872
[52] Water New Zealand, 2021. Carbon Accounting Guidelines, Table 12.
https://www.waternz.org.nz/Attachment?Action=Download&Attachment_id=4872
[53] MfE 2022 Urutau, ka taurikura: Kia tū pakari a Aotearoa i ngā huringa āhuarangi Adapt and thrive: Building a

identified in Chapter 8 of the National Adaptation Plan (Infrastructure) are particularly pertinent. These include those objectives shown in Table 2-20 below, all of which have relevance to HDCs wastewater system.

Table 2-20: Government objective to build resilient infrastructure (from Table 8 in MfE 2022)

Code	Objective	Explanation
INF1	Reduce the vulnerability of assets exposed to climate change	• Understand where infrastructure assets and their services are exposed and vulnerable to climate impacts. • Prioritise the risk management of assets so that services can continue if disruption occurs.
INF2	Ensure all new infrastructure is fit for a changing climate	• Consider long-term climate impacts when we design and invest in infrastructure, so the right infrastructure is in the right places. • Understand future adaptation options and finance them as part of the investment in new infrastructure to build capacity to adapt.
INF3	Use renewal programmes to improve adaptive capacity	• Consider long-term climate impacts when making decisions to maintain, upgrade, repair or replace existing infrastructure.

Benefits of achieving these objectives will include the development of more affordable and accessible infrastructure services, and creating opportunities to address existing inequities such as disproportionate impacts on Māori. The New Zealand Infrastructure Commission (Te Waihanga) will "convene a regular event for local government, central government and private sector asset owners to share information on the implementation of actions in the national adaptation plan and to support alignment across the sector. Initially, the focus may be on the scope and content of the actions on adaptation guidance that Te Waihanga has committed to in the national adaptation plan, but may also provide a forum for updates on other policy matters relevant to infrastructure asset owners."

The need to provide for legislative reforms will need to be taken into account when addressing approvals for the development of affordable and accessible infrastructure services.
Section 7.3 of HDC's Wastewater Asset Management Plan 2021 address climate change as set out in Table 2-21.

Table 2-21: Section 78.3 – Climate Change from the HDC Wastewater Asset Management Plan 2021

7.3 Climate Change
A key feature of climate projections within New Zealand is sea level rise impacts and the intensification and increase in frequency of severe rainfall events.
The latest climate change projections from the Intergovernmental Panel on Climate Change (IPCC) have been translated for New Zealand. From a planning perspective, the major changes are expected to be:

- *a change in frequency of extreme events –such as storm intensity, heavy rainfall, drought, wind extremes and thunderstorms rather than a change in average conditions locally*
- *higher temperatures - temperatures are likely to be 0.7˚C to 1.1˚C warmer by 2040 than in 1995, and 0.7˚C to 3.1˚C warmer by 2090*
- *rising sea levels - the IPCC forecasts just under a metre sea level rise by late this century*
- *a change in rainfall patterns*

Climate change is a major management issue facing all infrastructure providers and the built environment. Sea levels are predicted to change as a result of climate change. The Hastings District borders the Hawke Bay and critical treatment facilities are located in close proximity to the coastline.

climate-resilient New Zealand; Aotearoa New Zealand's First National Adaptation Plan, August 2022, Ministry for the Environment, Wellington.

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Initiatives to monitor changes in sea levels and storm impacts on these facilities will be undertaken. Future treatment options and locations will also be considered.

The East Clive WWTP is a critical treatment facility located close to the coast, where the coastline is at risk of coastal erosion and inundation in the future. Specific studies regarding these coastal hazards have been and continue to be carried out to feed into a coastal strategy. The report 'The Clifton to Tāngōio Coastal Strategy'[54] as introduced in Section 2.4.2 of this Review Report includes a comprehensive review of the long-term strategy to manage coastal hazards, and is to be reviewed every 10 years. The review would:

- Consider new data collected over the proceeding period (e.g. beach profiles, wave climate, sediment movement, etc.);
- Consider the efficacy of coastal hazard response actions implemented under the Strategy over the proceeding period;
- Consider any new information from the Intergovernmental Panel on Climate Change (IPCC) and other reputable sources regarding climate change and sea level rise projections;
- Consider any new studies or information regarding coastal erosion, coastal inundation or other hazards (for example the influence of sea level rise on groundwater levels in the Strategy area);
- Any other relevant information as may be identified.

By taking into account the points noted above, the review is then able to consider whether the actions identified by the strategy remain appropriate or should be amended in light of the new information. In terms of this Review Report this approach will be consistent with the DAPP approach as introduced in Section 1.4.3 of this Review Report.

HDC's current activities relating to climate change investigations and also natural hazards include the following:

- Close involvement in the Regional Clifton to Tāngōio Coast Hazard Strategy 2120
- Consideration in conjunction with ongoing outputs from the above Strategy development of the medium to long term future of the East Clive WWTP site and possible alternatives to that site
- Ongoing modelling of the wastewater collection network including the expected change in frequency of extreme wet weather and drought periods
- Developing initiatives to monitor changes in sea levels and storm impacts on critical coastal facilities.

Outputs and ongoing further Regional and District investigation on these key issues need to continue and be given high focus in the next and then subsequent nine year reviews. Such approaches should be included in the assessment of the BPO solutions and features associated with that (see Section 3 – BPO Assessment).

Additional to this will be key matters taken into the entity under the Affordable Water Reforms approach[55].

2.5.7 Redundancy

When providing input to the scope of this review (in 2022), the HDC-TWWWJC raised the issue of the need for national guidance in relation to building redundancy into wastewater systems. The National Policy Statement for Urban Development requires that local authorities "provide at least sufficient development capacity to meet

[54] HB Coast, 2023. *Clifton to Tangoio Coastal Hazard Strategy 2120*. Resource documents available here: https://www.hbcoast.co.nz/resources/

[55] As per the time of writing in mid-2023. However, it is noted that subsequent repeals of the Water Services Act provisions and other three waters legislation have occurred in 2024, including the introduction of the 'Local Water Done Well' policy by central government in February 2024.

expected demand … over the short term, medium term and long term"[56]. This requires a margin for development capacity of 20% for the short and medium term, and 15% for the long term. There is no other national direction on the degree of redundancy that should be built into a particular type of wastewater infrastructure.
There are however a range of generally accepted design and operation practices as to how much redundancy or spare backup capacity is provided for particular infrastructure components; such as pumping stations, treatment process units, mechanical and electrical components, UV disinfection systems, sludge handling systems, etc. Practices for establishing the degree of redundancy depend on a wide range of factors including for example:

- The importance of wastewater treatment units to reliably function in order to meet compliance consent conditions;
- The spare and/or future treatment capacity inherent in the treatment plant;
- The reliability of mechanical plant such as blowers and aerators needed to ensure efficient treatment operations;
- The life of equipment, especially mechanical items;
- The remaining life of structures etc, and where high risks are evident the need for greater spare capacity;
- The degree of modularisation at a treatment plant or with a major wastewater conveyance system, and
- The amount of storage and/or provision of standby power generation at pump stations.
- The acceptance or otherwise of network overflows and treated plant bypasses.

The degree of redundancy in relation to the East Clive WWTP infrastructure is considered to be generally acceptable; the current system has the ability to process the full flow through a single BTF and there are currently two BTFs.
In terms of resilience, the ability to buffer flow through emergency storage further to that provided by the sewer network may increase the resilience of the Plant and enable shut down of the WWTP to undertake critical repairs and reduce risk. Refer Section 2.5.9 for further discussion on resilience.
An additional BTF may be an advantage at times when, for example, the key rotating bearing mechanism needs replacement (as was recently the case in 2022/23). An extra BTF will only raise capacity at the plant such that the $cBOD_5$ annual loading rate, as set out in the consent, will not be exceeded, in the unlikely event that a substantially extended repair (in excess of 10 months) needs to take place. However, the current loading rate to the BTFs is low and during the 2022/23 event, the maintenance works did not result in the annual loading rate being exceeded. The establishment of a third BTF would reduce the load to each BTF further. This reduction in loading rate may result in operational issues, particularly in the management of the biofilm.

On the matter of an additional BTF, HDC are currently investigating the long term requirements of the East Clive WWTP and future climate resilience. Part of this investigation is understanding whether and when a third BTF would be required, and accordingly give clear direction on redundancy approaches for the next two nine year review periods.

In terms of Three Waters Reform, the matter of provision for redundancy in wastewater systems could potentially be an issue selected for further consultation by Taumata Arowai when considering the provision of design and operating guidelines and standards across the entire three waters sector in New Zealand.
Alternatively, the separate water entities across Aotearoa New Zealand could potentially address the issue across their respective geographic areas.

2.5.8 Risk, Resilience and Emergency Response

While Condition 27 does not specifically require this review to examine risks associated with continued operation of the East Clive WWTP, risk (along with resilience and emergency response) is a fundamental part of any wastewater management system.
The HDC-TWWWJC strongly advocated for matters of risk and resilience to be covered by this Review Report. Specific items raised by the HDC-TWWWJC when advising on the scope for this review (in 2022) included:

[56] New Zealand Government, May 2022. *National Policy Statement on Urban Development 2020*. Retrieved from: https://environment.govt.nz/assets/publications/National-Policy-Statement-Urban-Development-2020-11May2022-v2.pdf

- The need for strategic agility though the period of uncertainty with three waters reform, resource management reform and climate change matters
- The adoption of a strategic planning approach in terms of risk management and resilience (refer Section 1.4.3 of this Review Report)
- Identifying the primary risks to the major industrial / trade waste dischargers if standards etc change.
- Understanding the implication of changes such as the overarching adoption of Te Mana o Te Wai, as well as related procedural needs.

In addition to the above, several ongoing matters have previously been identified in Table 2.6 of HDC's Wastewater Asset Management Plan (AMP; 2021). For completeness this Table is reproduced below as Table 2-22.

Table 2-22: Key Matters Identified in HDC Wastewater Asset Management Plan 2020

Table Category	Description	Activity Impact	Mitigation	Risk Level
Legislative	• Major changes in legislation that impacts the role and function of local government	• Changes in activity requirements quality and or compliance standards. Increases in costs of compliance • Requirements to obtain new consents or review existing consents	• Regular review and assessment of legislation and regulations • Timely proactive responses to potential legislative changes • Review of wastewater processing technological advancements	High
Technical Level of Service (L o S) Change	• Major changes in levels of service and community preferences/demand	• Impact on costs to provide the services i.e. increases in LoS results in increases in costs to provide the activity and affects affordability	• Asset management strategies and service delivery models regularly reviewed • Changes in and service levels planned and budgeted for	Medium
Financial	• Major changes in the Council Revenue and funding policy • Major national / global economic impacts	• Impact on ability to funding the activity. This may affect both operational and capital development activities	• Regular review and assessment of the affordability of wastewater services i.e. right LoS to achieve key KPIs within allocated budgets	High
Environmental	• Adverse/Catastrophic natural events such as earthquake, Tsunami and flooding	• Major damage to infrastructure and services	• Consideration of infrastructure resilience factors in design standards and project planning • Lifelines planning	Low

Section 8 of the Wastewater AMP sets out a wide range of proven and effective procedures used to identify, investigate and mitigate the various risk categories, including reference to the11 different Operational Risk Plans that HDC has developed. HDC also has a Contingency Plan as well as Civil Defence and Emergency Management procedures which are applicable to the East Clive WWTP operations and the overall wastewater system.

It should be evident that HDC are well positioned in terms of risk identification and management, providing that all these procedures are well developed and effectively implementable. However, new challenges relating to the above-mentioned reforms and climate change adaption matters may open up new risks and associated new challenges. Where possible the adoption of a strategic planning approach as set out in Section 1.4.3 of this Review Report is likely to be an appropriate way forward.

2.5.9 Input to Best Practicable Option

Key elements from this asset management review that are directly relevant to the management and operation of the current and future Hastings Wastewater Scheme will feed into the best practicable option (BPO) assessment, and where possible should be addressed prior to the next 9 year review. The relevant items include:

- Adoption of a strategic planning approach; and
- Incorporation of the asset management plan 3 Waters strategic objectives into the strategic planning approach.
- Updating the wastewater facility manual (operations plan). This update should incorporate matters raised in the current AMP and discussed in this report for asset management and monitoring.
- Ensure an ongoing investigation into sustainable and efficient practices for the WWTP.
- Consider climate change and its impacts on the WWTP, particularly coastal erosion and sea level rise, which have the greatest relevance to the East Clive WWTP.
- Undertake regular monitoring of asset management procedures (as outlined in the AMP) against the consent requirements.
- Bring forward into the annual monitoring report a sustainability section, including water conservation matters.
- Going forward undertake an energy audit and operational carbon footprint as part of the ongoing nine yearly reviews.
- Practice proactive risk management including through the strategic planning approach (refer Section 1.4.3).

These items are included in the Recommendation set out in the Table 7.1 of this Review Report.

2.6 Condition 27(f): Changes to Wastewater Treatment Technologies

(f) *Changes in wastewater treatment technologies that may be relevant to the Hastings Wastewater Scheme for either the domestic and non-separable waste stream and / or the industrial waste stream.*

2.6.1 Approach

This section includes the following areas:

- Identify any effects in receiving marine environment that may be a key determinant for a change to or introduction of treatment requirements. This is covered in Section 2.9 which concludes there have been "no discernible effects" from the offshore outfall treated combined wastewater discharge during the nine-year review period.
- Separately address DNSI and Separable Industrial waste streams for other key determinants such as Māori cultural, social, economic and others. Section 2.6.4 sets out the seven key determinants that have been identified in terms of deciding on the need for additional treatment.
- Identify new technologies and assess the relevance of these for either waste streams against the determinants mentioned above.
- Introduce Circular Economy/Resource Reuse concepts and options and link to beneficial reuse in Section 2.8. This will bring in the link to sustainability relevant to comment on HDCs Eco District Strategy and Asset Management Plan (refer Section 2.5).
- Consider further treatment for the Separable Industrial waste stream, including to address requirements for the complete removal of kūpau (human waste).
- Identify (any) outputs of this assessment that should be included in the Best Practicable Option (BPO) considerations in Section 7 of this Review Report.

2.6.2 Previous Investigations and Documentation

Prior to obtaining the current consent, HDC considered a range of alternatives (options) to the Hastings Wastewater Scheme in place at the time (in 2013), including options which involved changes in treatment technology.

The Assessment of Alternatives in the 2013 consent application drew upon over 16 investigations prepared when the plant was first designed and commissioned in the 1990s, and subsequently between 2000-2005, to identify a wide range of treatment and disposal alternative for both the domestic and industrial / trade waste wastewater streams. That assessment detailed the treatment alternatives considered for each investigation and any recommendations made. These treatment alternatives, and any new technologies have been revisited for this review to extend the robust alternatives assessment process and keep consistency for stakeholders including the HDC-TWWWJC. Key factors assessed in 2013 (and also applied for this contemporary review) included:

- Whether or not there are (proven) actual or potential significant adverse effects of treated wastewater discharge after "reasonable mixing" in the Hawke Bay marine receiving environment
- Justification not only environmentally, but also economically socially and culturally (for any additional treatment alternatives)
- Satisfcation of Māori cultural concerns
- Application of technologies to target certain contaminants of concern
- Potential costs and economic benefits (e.g. financial incentives)

2.6.3 Review of Current Hastings Wastewater Scheme against Key Determinants for Change

The most important factors to consider when examining changes in treatment technology "that may be relevant" as per consent Condition 27f) can be grouped into seven 'key determinants'. These are detailed in Table 2-23 below which assesses the current findings of the review against these determinants, in order to justify why a full assessment of relevant treatment technologies is not required at the time of this review.

Table 2-23: Assessment of current treatment technology against key determinants for treatment technology alternatives

No.	Key Determinant	Assessment based on findings of this review report	Is a change in treatment technology required?
1	**Scientific Environmental Effects** Are there adverse environmental effects (i.e. effects that are discernible, or have a greater scale or magnitude such that they may be considered 'more than minor') outside of the consented mixing zone that could be addressed through further treatment and/or discharge volume reduction?	No discernible adverse environmental effect in Hawke Bay (see Section 2.9)	No
2	**Māori Cultural Values** Would a change result in avoided, remedied or mitigated effects on cultural values (if adverse cultural effects have been identified)? In this respect, input from the HDC-TWWWJC and the cultural review of this report (Section 5) are of fundamental importance.	To Be Determined: A complete assessment could not be made as outputs from engagement with Tangata Whenua (including Tangata Whenua representatives on the HDC-TWWWJC) were not available in time to be incorporated into this Review Report. A recommendation has been made in Section 7 for that engagement to be completed and this question revisited, especially with regards to transformation of kūparu (refer to Section 1.3.2).	
3	**Outfall Mixing Zone** Is the extent of the consented mixing zone (from the outfall diffuser) in Hawke Bay still appropriate and relevant?	Effects assessment (Section 2.9; Condition 27(i)) demonstrates that while some changes in select water quality parameters are noticeable within the 500m and 750m mixing zones, there has been no discernible effect beyond. Dilution as specified in the 2013 AEE has been maintained, if not improved, since 2014. Therefore, it is considered that the current mixing zones defined in the consent remain appropriate.	No

No.	Key Determinant	Assessment based on findings of this review report	Is a change in treatment technology required?
4	**Beneficial Reuse** Is beneficial reuse of treated and/or raw wastewater, and/or other WWTP by-products (as outlined in Section 2.6.9; and Section 2.8), to be carried out in terms of the Eco District Strategy?	The WWTP does not produce sludge, due to the BTF treatment process commissioned in 2013 and subsequently upgraded (refer to Section 1.2.2 and Section 2.5.2 for details on upgrades completed during this review period).	No
5	**Sustainability** Are there aspects of sustainability which need to be addressed (for example, to achieve further improvement of sustainable performance upon the status quo)? This takes into account a wide range of factors including efficient use of energy as per the RMA, carbon footprint of the Hastings Wastewater Scheme, and climate change adaptation.	No immediate need to improve energy efficiency has been identified, but there is always room for improvement. The options assessment contained in this review report (Section 2.8; Condition 27h)) provides further insight into possible options that could be considered, however these are not considered to be imperative at this time given the possible cost involved (see Determinant 6 below).	No, but if HDC and stakeholders were willing to accept costs, the options may be considered and possibly implemented prior to next 9-year review (2032). Such options would need to align with climate change and carbon footprint strategies of Central Government, HBRC and HDC. New, more robust, sustainability drivers may be put in place in time for new projects. This could bring in carbon footprint and energy efficiency appraisals.
6	**Financial Incentive** Is there a financial incentive to make a change? This brings in the definition of the BPO as per the RMA, which includes “the financial implications of an option compared with other options”.	Any treatment technology change would result in a substantial cost, which would need to be weighed other costs such as maintaining the current plant and making improvements in the wastewater network. Given this review has found that no discernible adverse effects have occurred in the receiving environment, and other indicators such as combined discharge flows via the outfall have remained stable (if not reduced) since 2014, there does not appear to be a strong imperative for large investment in technology change. The current solution is performing well.	No

No.	Key Determinant	Assessment based on findings of this review report	Is a change in treatment technology required?
7	**Community and Stakeholder Viewpoints** Would a change achieve greater alignment with community and stakeholder viewpoints and aspirations.? TWWWJC inputs are needed along with wider public engagement taking place in accordance with Sections 2.7 (Condition 27(g)) and 2.10 (Condition 27(j)).	Need to consider local context and the impact on ratepayers from a cost and affordability point of view. The community survey undertaken as part of engagement to inform this Review Report (refer to Section 2.10) sought people's opinions on the amount of money HDC invests into wastewater management. Over 65% of 52 respondents chose the response "plan improvements over time that ensure we are protecting the environment and public health at an affordable cost to the ratepayer."	From the community survey it appears ratepayers are open to bearing some of the cost provided that changes (e.g. in rates) are affordable. The response did not indicate that the public hold strong opinions for or against treatment changes or upgrades and the associated costs. However, the survey was limited in terms of sample size and the generic nature of questions asked. Further confirmation could be gained through wider engagement with a greater number of ratepayers regarding any specific proposals.

2.6.4 DNSI – Previous Investigations and Further Treatment Considerations

Table 2-24 sets up for comparison purposes the existing treatment (first row), then adds on options A – F from the 2013 AEE and further elaborated on in Support Document 7, along with three further treatment options that have subsequently been identified. The 2013 AEE tabulated what the quality of the treated wastewater would be for the options considered (options A to F are shown below in Table 2-24), along with indicative capital, operational and Net Present Value (NPV) costs estimated at that time.

These options have been assessed under the seven key determinants mentioned in Section 2.6.3.
With respect to beneficial reuse, other than the beneficial reuse of treated wastewater, the BTF plant would require extensive further infrastructure to enable beneficial reuse of other by-products and this would be outweighed by energy efficiency, overall sustainability and financial incentives which very much favour continued use of the BTFs.

In terms of community and stakeholder, and Māori cultural considerations, any requirements in respect of these parties would come through the HDC-TWWWJC and hence HDC itself.

Table 2-24: Treatment Alternatives that 'may be relevant' to the Hastings existing BTF DNSI WWTP

Alternatives (Options)	Principal "Add On" Treatment Units[2]	What would it achieve (technically)[3]	Determinants (Assessment Factors)						Relevance / Decision
			Adverse Environmental Effects in receiving Environment	Mixing Zone	Beneficial Reuse	Overall Sustainability	Financial Incentive		
Existing BTF – WWTP	None	Existing BTF – WWTP Included for Comparison with "Add On" Alternatives	No discernible effects	Current consented mixing zone still considered appropriate	Only treated wastewater available for reuse. None at present but could be used. Potentially would reduce abstraction from the aquifer with beneficial reuse or recycling of treated wastewater, replacing water supply.	Considered a sustainable solution now (low energy low carbon footprint)	Current system considered cost efficient	Existing BTF-WWTP previously accepted by HDC-TWWWJC and as part of 2023 community engagement, it was generally confirmed that it is also accepted by the wider public.	(HDC – TBC) Stay with current BTF plants as BPO; possibly add some enhancements/updates if identified as the BPO
A: UV Disinfection of BTF Treated Wastewater	UV Disinfection	To Disinfect Treated discharge of DNSI from Offshore Outfall Discharge	A current Ministry for Primary Industries (MPI) virus monitoring program is currently underway to determine if public health effects need addressing.		Could use raw or treated wastewater from either or both wastewater streams. Options removing sludge could have beneficial reuse of biosolids	All options expected to be less sustainable than the current arrangement providing prudent asset management applied. All have higher energy and carbon footprints.	Each option has increased costs even with any revenue from those with beneficial reuse incomes. Hence no financial incentives		Not to be implemented, but remains relevant to consider for medium to long term future options if found necessary, e.g. for human health risk mitigation. MPI is currently undertaking monitoring of norovirus at different sites in the bay, one site is near East Clive outfall. Results to be appraised (if) when available.
B: Clarification of BTF Treated Wastewater & Sludge	Clarifiers (Settling Tanks) & Sludge Treatment Disposal/Reuse	To remove Suspended Solids from Offshore Outfall discharge	No discernible effects						(HDC – TBC) Stay with current BTF plants as BPO; possibly add some enhancements/updates if identified as the BPO
C: Clarification & UV Disinfection of BTF Treated Wastewater & Sludge	Clarifiers & UV Disinfection & Sludge Treatment Disposal / Reuse	To achieve both Options A and B - Disinfection and Suspended Solid removal							
D: Filtration of BTF Treated Wastewater & Sludge	Filtration Unit & Sewage Treatment Disposal/Reuse	To remove Suspended Solids from Offshore Outfall Discharge							
E: Filtration & Disinfection of BTF Wastewater & Sludge	Filtration Unit, UV Disinfection & Sludge Treatment Disposal / Reuse	To achieve both Options C and D Disinfection and Suspended Solids							

Alternatives (Options)	Principal "Add On" Treatment Units[2]	What would it achieve (technically)[3]	Determinants (Assessment Factors)						Relevance / Decision
			Adverse Environmental Effects in receiving Environment	Mixing Zone	Beneficial Reuse	Overall Sustainability	Financial Incentive		
Primary and sludge treatment biosolids reuse	Primary clarifier, sludge/biosolids treatment, anaerobic digestion, nutrient (phosphorus removal)	To achieve a circular economy approach includes biogas generation for energy production							
Membrane filtration	Addition of membrane after BTF – ultrafiltration (0.04 micron membrane nominal pore size)	To produce extremely high quality WW, in effect zero suspended solids, low nutrients and relatively high degree of disinfection							
Install a third BTF Tank	Additional BTF tank	Redundancy (spare capacity) and potentially growth							Being investigated in terms of Asset Management and growth allowance. Refer Section 2.5.7 relating to resilience.

Notes for Table 2-24:

1. Refer to individual summary sheets in the 2013 AEE and Support Document 7 for further details of each option including schematic of treatment process, photographs of plants elsewhere, positive and negative effects summary and consultation responses.
2. Refer to decision diagram schematics –Figures 1, 2 and 3 of 2013 AEE Support Document 8 for Environmental Effects Driven Assessment Tool.

2.6.5 Comparison of DNSI and Separable Industrial loads

The treated wastewater profiles covered in Section 2.3 of this Review Report compare the mass loading of the DNSI waste stream with the Separable Industrial stream. The outcome of the comparison being that the domestic loads are small compared with the industrial / trade waste loads.
Therefore changing the treatment process of the DNSI wastewater will not have an appreciable impact on the combined discharge loads, provided that contaminants of concern continue to be managed under Schedule B to Chapter 7 – Water Services, Consolidated Bylaw 2021. Refer to Section 2.3 covering the industrial / trade waste flows and loads for further details.

2.6.6 Māori / Cultural Considerations

This section HDC-TWWWJC reviews the extent to which the current Hastings Wastewater Scheme resolves issues raised during the 2013 consenting process. However, further (future) discussion and direct engagement with Tangata Whenua on this issue is required in order to improve the understand of concepts such as transformation of kūparu and the work that is undertaken by atua in achieving this as well as the treatment solutions provided to assist them.

2.6.6.1 Transformation of Kūparu

The Biological Trickling Filters (BTFs) were accepted by the HDC-TWWWJC as an appropriate technology to aid in the transformation (treatment) of kūparu (human waste component of the wastewater) in the domestic and non-separable (DNSI) wastewater. Section 1.3.2 of this Review Report sets out the journey taken by the HDC-TWWWJC in this respect.

To achieve the degree of transformation sought by the Tangata Whenua members of the HDC-TWWWJC at the time of the consent application, the approach taken was to set a resource consent condition on limiting the organic loading on the BTF (Condition 5(b)). The limit was set at an annual average daily organic loading, in terms of the Biochemical Oxygen Demand ($cBOD_5$) loading to the BTF media, of 0.4 kg/m^3 based on a yearly average. The $cBOD_5$ loading is a surrogate to achieve the degree of transformation assessed as appropriate by the HDC-TWWWJC.

Figure 2-16 shows that the $cBOD_5$ consented limit on 0.4 kg BOD/m^3 day against the actual loading from 2014 to 2022, with each day of the seven days of calculated loads in each quarterly survey indicated by a single dot. This figure highlights the $cBOD_5$ loading for each individual day being well below the consented loading rate and hence the annual average will be also well below the consented limit. Figure 2-17 shows the last July 2021 – June 2022 (Annual Report) results in more detail for this period. It again highlights the $cBOD_5$ loading being well below the consented loading rate.

Figure 2-16 and Figure 2-17 highlight a high degree of compliance with the $cBOD_5$ loading on the BTFs in terms of the consent limits. Each of the data points in the two graphs represents a composite sample. Composite samples are when the data recorded over 24 hours and combined to represent the result for that 24 hour period, repeated for a seven day period.

With this result being achieved, the question in terms of condition 27(f) about the relevance of further treatment of DNSI waste stream can be answered by the $cBOD_5$ (organic) loading rate of the BTF's being well below the consented limit, therefore the expected degree of "transformation", as was considered appropriate at the time of the consent application, is currently as per originally agreed with the HDC-TWWWJC. Based solely on these results, it could be considered that further treatment for this issue is not required. There is additional capacity for transformation (if flows to the WWTP increase) as the BTFs are over-sized. However, the concept of transformation of kūparu is complex, and the assessment of whether or not the levels of performance achieved by the WWTP are meeting the required degree of transformation should be made by Tangata Whenua in consultation with the HDC-TWWWJC. A discussion is also required regarding the ongoing suitability of cBOD5 as an indicator of transformation, and whether alternative or additional indicators may be required. This has been

added as a specific action within the recommendations section of this Review Report (Section 7), to be incorporated into a future work programme prior to the next 9-yearly review.

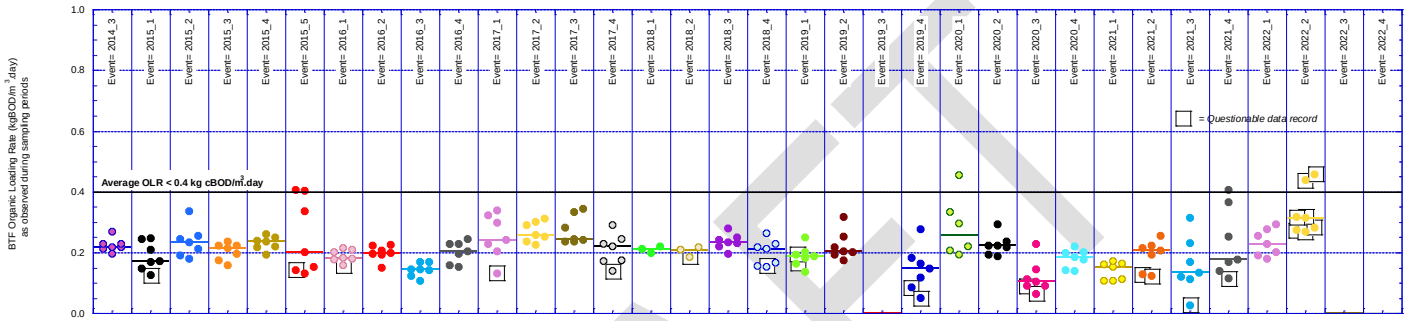

Figure 2-16: DNSI - BTF $cBOD_5$ (organic) Loading Rate since 2014 (note: boxes indicate data which are considered unreliable and/or outliers)

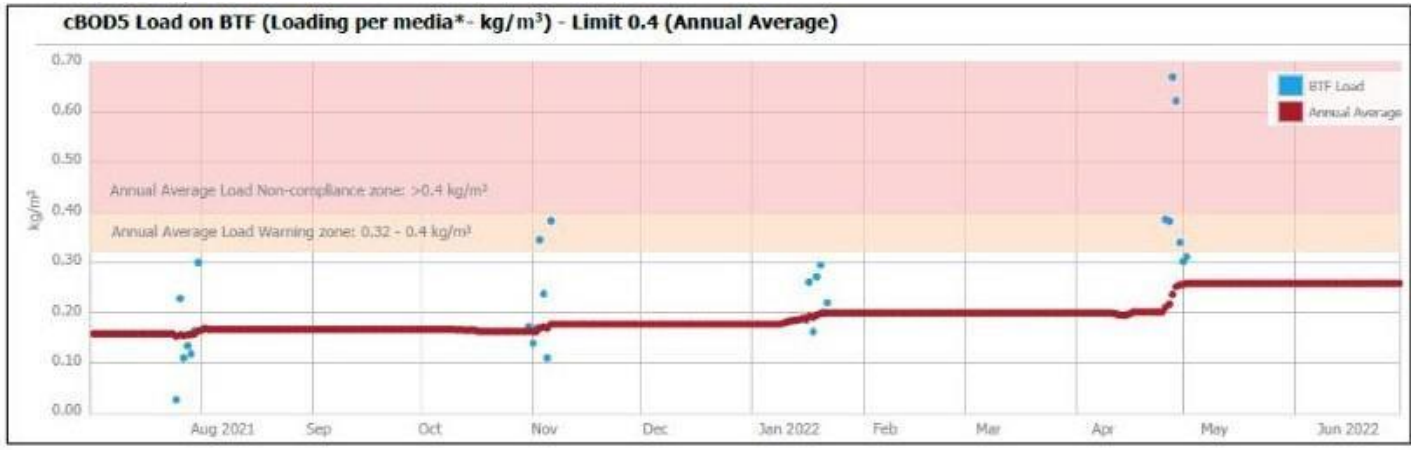

Figure 2-17: Annual Average $cBOD_5$ Load on BTF for the period July 2021 to July 2022

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2.6.6.2 Rakahore Channel

In conjunction with the agreement to use the BTF process, it was determined by Tangata Whenua members of the TWWWJC at the time of the consent application that the total treatment process to address Māori cultural concerns would include a rock channel in order to revive the mauri of the waste stream from the BTFs by contact with Papatūānuku. This requirement is set out in Condition 5b of the current consent, and more detail and photographs of the channel can be found in Section 1.3 of this Review Report.

2.6.6.3 Conclusion

The Māori World View (Te Ao Māori) as upheld by Tangata Whenua with Mana Whenua and Mana Moana is described in more detail in Section 1.3 of this review report. For the purpose of the consent (and as previously published), the Atua (deities) of Te Ao Māori are applied to acknowledge the cultural expectations as follows:

- Tāne Mahuta to account for the bacterial activity of the biomass in the biological trickling filters (BTFs) that transforms the paruparu by the removal of the mauri of human waste,
- Papatūānuku to account for the rock channel through which the filtered material is passed in order to revive the mauri and transform the natural element of water, as incorporated by the Rakahore Channel (refer Section 1.3 of this report)
- Tangaroa to receive the transformed water and complete the cleansing process to a culturally acceptable standard, and
- Tamanui Te Ra of the heavens and the Sun, with Tāwhirimātea of the winds, to work with Tangaroa to complete the process.

Section 1.4 includes a graphic representation of Te Ao Māori in the Heretaunga community as identified as part of consultation and engagement undertaken in 2013 (associated with the current consent).

2.6.7 Resource Recovery and Circular Economy

Both conditions 27 f) (considered in this section) relating to changes in wastewater technologies and 27 h) (refer to Section 2.8) covering options for beneficial reuse of treated wastewater encompass the relatively new concept of "Circular Economy" in terms of the overall approach to wastewater management. The concept of the circular economy and associated beneficial reuse of waste products was also identified by the HDC-TWWWJC as an additional matter to consider. This concept, including the 'Water Factory' concept for WWTPs, is detailed further in Section 2.8.7.

In the Hastings situation, the BTF process used for the DNSI stream does not lend itself to produce a number of these product lines, particularly sludges/biosolids, energy and nutrient recovery, as the infrastructure does not encompass sludge removal and subsequent treatment that could produce biogas (energy), nor does it produce sludges from which biosolids can be generated and nutrients recovered.

The treated wastewater does however provide opportunity for the Water Factory component. However Section 2.8.7 (covering condition 27h)), does consider options for the beneficial reuse of both the treated and untreated wastewater, thereby in part implementing aspects of a circular economy.

In terms of the Separable Industrial stream, options are available both at individual industry sites and/or on the total flow to implement treatment and other procedures that would encompass at least some components of a circular economy in terms of beneficial reuse of otherwise wasted products. Section 2.8 traverses a number of these possibilities. The question then again arises as to why such additional infrastructure would be implemented if the environment effects assessment of the treated wastewater discharge out the offshore outfall are acceptably low as is the case in terms of the present resource consent conditions and the compliance with tests (as detailed in Section 2.9 of this Review Report).

2.6.8 Separable Industry – Further Treatment Considerations

Section 2.3 covers consent condition 27 (c) relating to trade waste. This subsection should therefore be read in accord with Section 2.3, which describes in detail the approaches used by HDC to manage trade waste discharges within the Hastings Wastewater Scheme.

If further control of trade waste discharges is needed, and / or if treatment needed, to provide a higher quality standard of treated wastewater for identified "contaminants of concern", there are a number of different approaches available. These include:

a) Modifying parts of Chapter 7: Water Services of the HDC Consolidated Bylaw 2021
b) Applying more restrictive constraints and limitations on individual approvals to discharge Controlled wastewater.
c) Installing additional "on-site" treatment at those industries discharging contaminants of concern and/or needing limits on volume and/or mass loads, and/or installing satellite (pre)treatment sites at suitable locations servicing a group of industries in the same area.
   Note: HDC undertaking industry treatment at dedicated localised facilities and / or at East Clive WWTP site. This is not an approach that HDC have previously or are likely to agree to in the future particularly as on site (at industry) treatment is likely to be more appropriate and cost efficient for the specific industries. Section 6.5.3 of the 2013 AEE Support Document 7 covering Alternatives discusses various possibilities and factors against this approach
d) An individual industry ceasing the discharge of the "contaminant of concern".

The determination of whether further controls and/or treatment are needed on certain industrial / trade waste streams follows the seven key determinants as set out in Section 2.6.3 above. The first of these relates to whether industrial / trade wastes either as a single discharge, or a combination of discharges are causing significant adverse environmental effects in the marine receiving environment outside the outfall's consented mixing zone.

Assessment of this is informed by the effects assessment detailed in Section 2.9 of this Review Report, which confirms that there are considered to be "no discernible effects" outside the consented mixing zone. This assumes the mixing zone size is still appropriate.

However if reduction was necessary in any of the key contaminants, the mixing zone size, and/or the industrial / trade waste volume being discharged, any one or more of the above measures could be implemented by HDC as part of their trade waste management procedures. Foremost in these measures would be variation in the "controlled wastewater" parameters in Schedule B to Chapter 7 of the HDC Consolidated Bylaw 2021, and/or setting mass load and other limits in the Individual Controlled Wastewater Approvals.

Any lower/more stringent limits are likely in many cases to require a greater degree of on-site (pre)treatment at individual industrial / trade premises. Depending on the industry type, there are a range of proven treatment technologies that can be targeted to individual wastewater characteristics. Table 6.3 of the 2013 AEE lists four main Hastings Industry types, and technologies that will achieve both a moderate (indicative) and advanced level of treatment for a particular contaminant.

Section 2.3 covering trade wastes summarises trends and issues relating to each industry grouping of industrial / trade wastes. This information highlights that, in terms of avoiding significant adverse effects in the marine receiving waters outside the consented mixing zone, there are currently no major contaminant levels needing addressing. This is confirmed by the consent compliance in terms of the receiving environment monitoring.
Therefore, in terms of the effects assessment, it is not considered necessary at this stage to restrict and/or prohibit any existing trade wastes. However, ongoing monitoring and (any) changes in trade waste management should be matters built into individual approvals to discharge Controlled wastewater. Any strategic approach to managing the Hastings Wastewater Scheme (as per Section 1.4.3) should include a mechanism to periodically review the need to

restrict and/or prohibit certain contaminants of concern in industrial / trade waste discharges. This has been included as a recommendation in Section 7 of this Review Report.

There are however some industrial / trade waste matters that need some attention in terms of HDC's overall trade waste management which includes protection of HDC's wastewater infrastructure. Such matters are set out in Section 2.3 of this Review Report.

Other determinants for further controls on industrial / trade waste are, as highlighted above, the other five factors set out previously in Section 2.6.3, namely:

Determinant 3 Achieving beneficial reuse of raw or treated wastewater and treatment by products
Determinant 4 Energy efficiency, overall sustainability
Determinant 5 Financial incentives

Whether or not any of the previously listed determinants lead to individual industrial / trade premises undertaking additional activities to those required by HDC as part of their trade waste functions will depend on the individual industry As they implement the requirements of HDC's Consolidated Bylaw. Accordingly, it is outside the scope of this Review Report to evaluate such requirements.

In terms of Determinants 6 and 7, Community and Stakeholder, and Māori cultural considerations, any requirements in respect of these parties would come through the TWWWJC and hence HDC itself and be built into the trade waste Management requirements through the Consolidated Bylaw Chapter 7 Water Services included where appropriate individual industries "Controlled Wastewater Approvals".

Implementation of a strategic planning approach may include periodic review and adaptation of trade waste management matters.

2.7 Condition 27(g): Recreational Usage

(g) *The results of a recreational usage survey undertaken during the nine year period, which is comparable to the survey undertaken between the summers of 2011 and 2013 (See Advice Note 4), and comparison of those results with previous surveys.*

Recreational usage within Hawke Bay, in the vicinity of the WWTP and the offshore outfall, was previously surveyed between 2011 and 2013. The survey findings were used to inform an assessment of potential effects of the treated wastewater discharge on public health and recreational values, for the 2013 consent application. A comparative survey was completed in September 2023, and the findings are summarised in this section. A copy of the full report detailing the findings of the survey is attached as Appendix C to this Review Report.

Appendix C documents observation and questionnaire surveys of social and recreational activities conducted in the coastal environment and the potential impact the discharge of treated wastewater from the East Clive Wastewater Treatment Plant may have on these activities, for the periods 2011 to 2013 and 2021 to 2023. A single recorded comment during the 2011 to 2013 survey that was captured as noteworthy was," sewage pipes need to be further out into the sea."

The overall conclusion in comparing the 2011 to 2013 survey with the 2021 to 2023 survey findings was that the presence of the East Clive Wastewater Treatment Plant and the final combined treated wastewater discharge through the offshore outfall appeared to have no notable impact on the activities carried out by people's social and recreational activities nor those commercially fishing in Hawke Bay.

The information and analysis covers social and recreational activities along with commercial fishing information generally concluded that the social and recreational requirements are well met by the coastal environments at all locations.

2.7.1 Summary of the 2022/23 Recreational Survey

The overall objective of this comparative coastal social and recreational survey was to report on observational information of recreational users of the adjacent coastal environment. The data collection of recreational use observations was taken at the same four key locations and on comparative dates to the 2011-13 survey to ensure consistency and accuracy in the information gathered. The locations were:

1. Waitangi Estuary / Ngaruroro River
2. Muddy Creek Estuary (East Clive)
3. Tukituki River mouth and Estuary (Haumoana)
4. Te Awanga (Domain)

2.7.1.1 Methodology

The methodology involved two surveys to collect and record recreational activity information at each survey location and an additional questionnaire for commercial fishing to ensure the interests of the latter were considered in relation to the potential impact of the treated wastewater discharged from the offshore outfall on their activities. All surveys were carried out over the school holiday periods of December, January, and February 2011/12 (Summer), August 2012 (Winter) and January and February 2013 (Summer). These periods were selected to capture a cross section of recreationalists who may typically use these areas during summer and winter.

The original agreed methodology (from 2011) was repeated for both survey timeframes (2011 to 2012, and 2021 to 2023) to ensure consistent and reliable data. Importantly, it enabled all persons potentially affected by, or interested in, the ongoing WWTP to have an opportunity to become actively and effectively involved in assessing its ongoing operation.

Survey approaches included:

1. **Observational –** The main objective of the observational survey was to monitor the location, type and level of coastal recreational activities conducted by users within the Hawke's Bay coastal environment included in the survey area.

Observational approaches were used to monitor the location, type and level of coastal recreational activities conducted by users within the Hawke's Bay coastal environment included in the survey area, aided by a questionnaire.

2. **Questionnaire -** The main objective of the questionnaire was to find out what areas were used by people for recreational purposes, what activities occurred at these locations and what values people assigned to these areas.

- The questionnaire survey for the 2021 to 2023 survey period was limited to four days, compared to the 12 survey days in 2011 to 2013. This was due to two key factors:
  - The public health risk associated with COVID-19
  - The inclement weather conditions experienced throughout Hawke's Bay over the summers of 2021 to 2023.
- Where it was safe to do so, the questionnaire survey was conducted in person with respondents. A one-hour time limit was proposed and every person who walked past the designated survey location within that one hour 'window' were asked to complete the five-minute questionnaire.
- Surveys were typically conducted between the hours of 10.00am to 3.00pm. The days, dates and conditions encountered for each survey. Additional observation of the type and level of recreational activities conducted by users within Hawke Bay coastal environment, namely focused on primary (swimming and surfing) and secondary (boating) contact recreation.

3. Commercial fishing – The 2013 commercial fishing survey methodology involved a conversation with a Ministry of Primary Industries (MPI (Fisheries) Compliance and Response Officer, and local Hawke's Bay commercial fishing operators to obtain an understanding of commercial fishing in Hawke Bay and in relation to the long offshore outfall structures located in Hawke Bay. A similar approach was adopted for this 2023 comparative report, albeit that the survey was conducted with assistance from the Fisheries Inshore New Zealand (FINZ) Area 2 Committee Representative, Mr Rick Burch. The Area 2 Committee and its representative Mr Rick Burch was in direct contact with MPI, so it was agreed to rely upon within that relationship and close contact between FINZ and MPI to note comments, if any.

The conversations were followed up with a series of written questions and requests to the Compliance and Response Officer.

One key change from 2011-13 was the digitisation of the questionnaire and observation forms. Both were imported to ESRI ArcGIS (an online geospatial analysis platform), so that questions could be answered and input to a database in real time, and also geo-referenced on a map of the survey area.

2.7.1.2 Key findings

A total combined figure of the numbers of people observed and interviewed for the respective timeframes was 1,388 for 2011 to 2013 and 975 for the timeframe of 2021 to 2023. The Ngaruroro and Tukituki River locations and the Domain at Te Awanga attracted the most visitors.

In both survey periods, the majority of responders did not gather food (kai moana) from the survey sites. The exception was for the Waitangi Estuary and Ngaruroro River where a high number of responders noted that they gather kai moana at these locations.

Across all the locations, the predominant recreational activities undertaken included:

Passive:

- Sight-seeing (e.g., enjoying views)
- Bird watching
- Picnicking
- Sitting in cars
- Sitting on the beach
- Sunbathing

Active:

- Fishing (food gathering)
- Boating
- Walking / running
- Swimming
- Freedom camping
- Cycling
- Motorbiking
- Horse riding

Demographics

- The total of 202 people interviewed in 2011 to 2013; 53 people (25%) indicated they were residents of Clive (including East Clive), with 93 people (46%) stating they were residents of Napier or Hastings. The remaining 57 people (28%) stated they were day visitors or did not identify themselves as residents of Clive, Hastings or Napier. Of the people interviewed 197 people defined themselves as an individual, or member of a family group with the remaining five people associating themselves with a group or organisation.
- In 2021 to 2023, the total number of people interviewed was 75 of which 18 people (24%) indicated they were residents of Clive (including East Clive), with 25 people (33%) stating they were residents of Napier or Hastings. The remaining 32 people (43%) stated they were day visitors or did not identify themselves as residents of Clive, Hastings or Napier. Of the people interviewed 63 defined themselves as an individual, or member of a family group with the remaining six people associating themselves with a group or organisation.

Observational survey

- 1,186 people were observed over the survey periods of 2011 to 2013 compared to 990 in 2021 to 2023. This equates to a 17% reduction in people observed in the 2021 to 2023 period compared to those observed in the 2011 to 2013 survey period.
- Across both survey periods, the recreational activities carried out at all locations are typical passive and active recreational activities conducted in a coastal environment.

Questionnaire

- Over the survey period in 2011 to 2013 a total of 202 people were interviewed compared to 75 people interviewed in 2021 to 2023.
- In both survey periods, swimming as the primary contact recreation activity carried out at Te Awanga Beach was most prevalent.
- In both survey periods, the main improvements suggested by responders at the locality of the survey locations were more rubbish bins and rubbish clean ups, more toilets, and road and access upgrades. An increase in cycleway signage was noted in the survey responses in the 2021 to 2023 period.
- In 2011 to 2013, fishing was the dominant recreational activity at the four survey locations, followed by walking and running as the dominant land based recreational activity. In comparison, in 2021 to 2023 walking and running was the dominant recreational activity.

Commercial Fisheries[57]

The responses to the commercial fishing survey were very limited; a sole reply (from Starfish Fish Supplies) commented that “the discharge of wastewater to Hawke’s Bay has no detrimental impact on [their] fish supply”. Commercial fishing interests appear not to be significantly impacted on by the presence of the East Clive Wastewater Treatment Plant and associated discharge and occupation of the outfall structures in Hawke Bay.

2.7.2 Comparison between 2011-13 and 2021-23 findings

The overall objective of this comparative coastal social and recreational survey was to report on both observational information of recreational users of the adjacent coastal environment, and at the same locations interview recreational visitors during the survey period via face-to-face interviews.

In both survey periods, the main improvements suggested by responders at the locality of the survey locations were more rubbish bins and rubbish clean ups, more toilets, and road and access upgrades. An increase in cycleway signage was noted in the survey responses in the 2021 to 2023 period.

[57] While not specifically involving recreational activities, it was thought appropriate to include the findings regarding commercial activities here.

From 2017 onwards it became possible to view Ātea a Rangi at Waitangi Regional Park (at the mouth of Ngaruroro River near Awatoto), which attracted a new group of recreational users interested in viewing the celestial compass. The Ātea a Rangi was developed to continue fostering the art of Whakatere waka (traditional navigation) particularly for select groups chosen to sail and crew waka throughout Te Moana nui a Kiwa (the Pacific Ocean)[58]

The information and analysis generally concluded that the social and recreational requirements are well met by the coastal environments at Waitangi Estuary, Ngaruroro River, Muddy Creek Estuary, Tukituki Estuary and Te Awanga Domain.

The overall conclusion was that the presence of the East Clive Wastewater Treatment Plant and the final combined treated wastewater discharge through the offshore outfall appear to have no notable impact on the activities carried out by people's social and recreational activities nor those commercially fishing in Hawke Bay. Albeit, as noted earlier, one respondent's comment that was deemed noteworthy was that the sewage pipes need to be further out into the sea.

2.8 Condition 27(h): Options Assessment

(h) *Options for treated wastewater disposal / discharge and beneficial reuses that may be appropriate to the Wastewater Scheme.*

2.8.1 Approach

The approach to the assessment of options for the "treated wastewater disposal/discharge and beneficial reuses that may be appropriate" was to:

- Only focus on treated wastewater options as per condition 27 h). Note that beneficial reuse of other wastewater treatment by-products is covered in Section 2.6 (Condition 27f) of this report,
- Review earlier options assessments that may be appropriate and introduce new options that may be relevant such as, for example, sewer mining,
- Highlight the possibilities that the two separate networks and conveyance systems (DNSI and Separable Industrial) potentially offer. Comment on consenting and other approval matters associated with potentially appropriate options,
- Bring the above information together in tabular format (Table 2-25 below), covering both previously considered and further introduced options for wastewater discharge, and reuse of both treated and untreated wastewater,
- Identify any outputs of this assessment that should be included in the Best Practicable Option (BPO) considerations in Section 3 of this report.
- This review focuses on the options for discharge of the two treated wastewater streams (DNSI and Separable Industrial), either jointly after being combined in the outfall pumping station, or separately. Table 2-25 A number of these options require additional treatment to be feasible. In terms of additional treatment, Section 2.6 traverses the additional treatment process that could be added to the DNSI – BTF treatment process and cleaner industrial / trade waste wastewater production and treatment processes that could be added if deemed

[58] Ātea a Rangi Educational Trust 2024 'Ātea a Rangi – Star Compass', https://www.atea.nz/atea, accessed 11 January 2024.

appropriate. However as concluded in Section 2.9 (effects assessment), from a scientific/environmental perspective further treatment for the ocean discharge is not required.

2.8.2 Previous Investigations and Documentation

In 2012-2013 extensive investigations were undertaken into alternative treatment, discharge and beneficial reuse options. These included a range of treated wastewater discharge options, and beneficial reuse options in addition to the offshore marine discharge as then and currently practiced. Land discharge/land application was revisited along with consideration of beneficial reuse. These former options are all included in Table 2-25 to ensure they are not lost sight of and can periodically be revisited in terms of the strategic planning approach and future nine-yearly reviews.

The following sections provide a generalised summary of a number of option categories.

2.8.2.1 Land Discharge/Land Application

In the AEE, June 2013, the 1994-95 investigations were reviewed and indicative cost estimates updated to the then present day. These investigations included preparation of Technical Paper No. 7 titled "Land Disposal Technology and Impacts" 1994. This paper is included in Support Document 7 to the AEE June 2013. The following is a summary of key information presented in that paper.

Alternative land disposal and land application techniques investigated were:

- Rapid Infiltration – using infiltration beds on very permeable ground
- Slow Rate Irrigation (SRI) – spray irrigation or border dyke
- Surface Flow Wetlands (but still has discharge from wetlands)
- Overland Flow (but still has discharge from overland flow).

While surface flow, wetlands and overland flow do provide contact of the wastewater with land it needs to be appreciated that there is still a significant, if not at times total, treated wastewater discharge from these types of facilities.

The investigations highlighted that slow rate irrigation was then an appropriate approach to consider. This showed that for all flows, that is domestic and industrial / trade waste, a slow rate irrigation system for the then 2051 growth projections would require between 2,400ha flat land or 3,200ha hill country.

It is noted that 2,400ha would be very similar to the total area of the urban area of Hastings. The investigations as set out in Support Document 7 in the June 2013 AEE identify possible areas on the flats or hill country south west of Hastings.

The 1994 investigations highlighted some of the issues that would be associated with land disposal. These specifically dwelt on the importance of protecting the aquifers under the Heretaunga Plains.

Experience with land discharge/land application of treated wastewater, particularly domestic wastewater in New Zealand has highlighted many of the potential and actual significant adverse effects along with a number of advantages. Nitrogen contamination of groundwater is an issue currently receiving much attention. The protection of the Heretaunga Plains aquifers continues to be a major consideration and likely concern for land application in this area. The change in land use for food production to treated wastewater discharge is also problematic, particularly with regards to the NPS-HPL (refer to Section 2.4.1.8).

Table 2-25 further updates Land Disposal / Application Options from those previously considered and also introduced as part of this review.

2.8.2.2 Beneficial Reuse of Wastewater

As part of a more sustainable approach to wastewater management in the Hastings District, HDC as part of the 2012-13 Consent Application/AEE Project, identified that use of treated wastewater from either one or both of the wastewater streams for beneficial reuse is an approach it should promote.

Reuse of treated wastewater can involve industries either using their own wastewater, the treated wastewater from the DNSI system or the treated wastewater from the Separable Industrial system. However, many of the larger industries currently have their own water supply bores drawing from the aquifer. This later situation does not encourage the beneficial reuse of wastewater or provide a driver for HDC to impose it.

While it was not considered possible that either one or both of the wastewater streams could be beneficially reused in total all of the time, part of one or other of the streams might be used at times. For example the Separable Industrial stream has a high proportion of food processing waste and no domestic wastewater and could therefore be suitably used for irrigation of appropriate crops in the area. As indicated above however, due consideration would be needed for protection of the Heretaunga Plains aquifer, particularly from a nitrogen, phosphorus, pathogens and other specific contaminants point of view.

Re-use at industrial / trade waste premises of their own wastewater is another beneficial reuse option that is available. Some industry practice this for a proportion of their wastewater. The use of this approach is very much dependant on the industry type and the wastewater standards needed for re-use. It is noted that the Separable Industrial stream has been found to contain domestic wastewater, which is subject to ongoing investigation by HDC.

It is recorded that to date Hastings District Council (HDC) has not had any enquiries for reuse of treated wastewater, nor for the extraction of raw wastewater following the principles of sewer mining. Additionally HDC have not considered any reuse options themselves, but some such options for irrigation of parks, gardens etc that may be appropriate for the Hastings Wastewater Scheme.

Unless circumstances change and there are greater drivers for the options previously considered, there is probably no further benefit in reassessing these options in future nine yearly reviews. An exception to this could be if there are restrictions on the availability of water for water supply purposes, in the community and / or industry. Noting that many of the larger industry's have their own water supply extraction bores. Another change driver could be prolonged dry periods and subsequent lowering of water tables that may result from climate change.

2.8.3 System and Location Features

In considering options for treated wastewater discharge and beneficial reuse, key considerations relating to current infrastructure within the Hastings Wastewater Scheme include:

a) The split system encompassing the DNSI system and the Separable Industrial system, which are separated from each other. This allows options with the Separable Industrial stream that do not need to address human waste (providing human waste (domestic sewage) is all separated out).
b) The Separable Industrial system provides "sewer mining" options at any point along the conveyance line to the East Clive WWTP site. If sewer mining was to be used to a large extent, the seasonal variations in quantity and quality of the wastewater that would be extracted could lead to potential complexities In management of Separable Industrial wastewater received at the WWTP. Refer to Section 2.8.7 below for further discussion on sewer mining.
c) Sewer mining could also be undertaken on the DNSI system.
d) With treatment facilities at East Clive any reuse option back in urban or industrial areas of Hastings or even outside the Hastings District's boundary would require a DNSI system conveyance line(s) back to those areas from the East Clive WWTP site.

e) By contrast to b) above, land discharge in the coastal area and relatively close to the WWTP would only involve relatively short conveyance lines.

2.8.4 Hawke's Bay Regional Water Assessment Report

This June 2023 report from the Hawke's Bay Regional Council (HBRC)[59] includes a section on water reuse which covers the terms and concepts of water recycling, water recovery and wastewater reuse etc. For the large part, water reuse relates to reclaiming the 'water' in wastewater for reuse. The report discusses irrigation of treated wastewater and how new and emerging technology is such that it is possible to achieve potable reuse. The report also comments how centralised wastewater treatment plants are convenient locations to provide the additional treatment needed to return the water back to a state that is suitable for potable use. It also highlights that highly treated wastewater could also be integrated with Managed Aquifer Recharge (MAR). The latter approach is already being considered for the Heretaunga Plains Aquifer.

The report records that the benefits of water reuse include;

- Reduces the volume of wastewater discharged to water
- Treated wastewater is able to be used for activities that do not require a very high quality of water, such as irrigation and toilet flushing
- May offset the need for new supplies

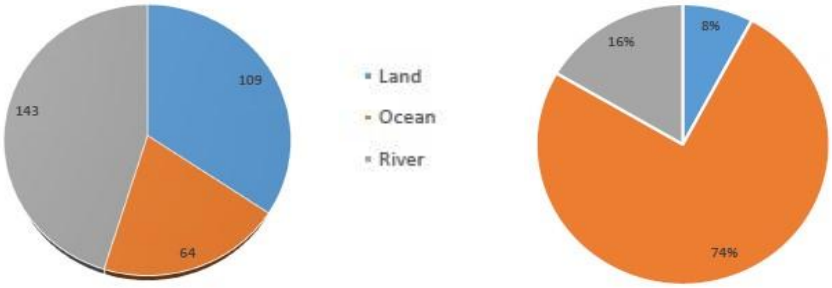
The overall conclusion of this Review Report is that while options for reuse remain available, there are not currently sufficiently strong drivers for large scale adoption. They should however in part be periodically addressed in terms of appropriateness and changing circumstances in the future. A related approach using recycling and land application and/or MAR is to raise the groundwater table to provide a barrier for seawater intrusion, should such a situation arise.

2.8.5 New Zealand Discharge/Disposal/Reuse Position

In considering options for treated wastewater it is useful to overview the current position in New Zealand in terms of treated wastewater receiving environments and see where the Hastings Wastewater Scheme fits with its offshore (2.75km) marine outfall. Figure 2-18 highlights that by population, 74% of the New Zealand population are served by municipal wastewater schemes discharging into the ocean/marine environment. There is industrial / trade waste on top of that, as is very much the case for Hastings with its large seasonal trade waste discharge volume. By contrast, the number of municipal treatment plants (WWTPs) is highest for discharge to inland rivers. This reflects the many mainly small and medium sized inland communities that discharge to inland surface waters.

In terms of the discharges to the marine environments, Figure 2-19 shows the number and location of the offshore marine outfalls, of which Hastings is one, and the other receiving environments for treated wastewater.

[59] Hawke's Bay Regional Council, June 2023. *Hawke's Bay Regional Water Assessment 2023.* Retrieved from Hawkes-Bay-Regional-Water-Assessment-report-28-June-2023.pdf (hbrc.govt.nz)



Number of WWTPs by discharge environment

WWTP serviced population by discharge environment

Figure 2-18: New Zealand Treated Wastewater Discharge Environment

Figure 2-19: New Zealand larger schemes and their discharge environments

2.8.6 Marine Outfalls – An International Perspective

According to a United Nations survey[60], half of the world's population lives within 60km of the sea, and three-quarters of all large cities are located on the coast.

Accordingly, marine outfalls are extensively used for the discharge of treated wastewater internationally. Outfalls however, do not work in isolation, but need to be seen in the context of the overall treatment system. Appropriate and sustainable systems require, as is the case in Hastings, integration of treatment and outfall location and operation. In the New Zealand context this is determined through the effects assessments undertaken as part of the RMA resource consenting process for discharges of the treated wastewater in the selected marine environments.

A paper was published in 2017 by members of the International Water Association's Specialist Marine Outfall Systems Committee traverses "Submarine Outfalls as part of the Solution to Achieve the United Nations SDGs" (Sustainable Development Goals). The paper traverses a range of the SDGs, predominantly SDG 6, Water and Sanitation[61]. It specifically includes:

- Universal and equitable access to safe and affordable drinking water for all;
- Access to adequate and equitable sanitation and hygiene for all;
- Protect and restore water-related ecosystems, including mountains, rivers, aquifers and lakes;
- Support and strengthen the participation of local communities in improving water and sanitation management;
- Climate change; and
- Oceans (conserve and sustainably use the oceans, seas and marine resources).

2.8.7 Resource Recovery and Circular Economy

Options for beneficial reuse of treated wastewater are encompassed in the relatively new concept of "Circular Economy" in terms of the overall approach to wastewater management. The concept of the circular economy and associated beneficial reuse of waste products was also identified by the HDC-TWWWJC as a matter to consider.

A definition of circular economy that encompasses wastewater management is a system or model that minimises waste and pollution, maximises resource efficiency and reuse, and design products and services to last longer or be recycled. It aims to create value and sustainability at different levels and to use renewable energy sources. In its widest sense it involves sharing, leasing, reaping, refurbishing and recovering materials and products as long as possible. It targets zero waste and emission throughout materials lifecycles and returns them to either an industrial process or the environment in a safe way.

This concept is further illustrated in Figure 2-20 as it relates to a Wastewater Treatment Plant. This shows the Product Factory approach highlighting waste streams that can be turned into product streams, namely:

- **Product Factory:** Products from sludges/biosolids/screenings/grit etc
- **Energy Factory:** Energy production from biogas
- **Nutrient Factory:** Nutrient recovery and
    - **Water Factory:** Treated wastewater for reuse

[60] UN Department of Economic and Social Affairs. (2021). "Protection of the Oceans, all Kinds of Sea, Including Enclosed & Semi-enclosed Seas, & Coastal Areas & the Protection, Rational Use & Development of their Living Resources". *Core Publications Agenda 21.*
[61] Roberts, P., Bradley, J., Morelissen, R., & Botelho, D. A. (2018). "Submarine outfalls as part of the solution to achieve SDGs." *Sustainable Development Goals.*

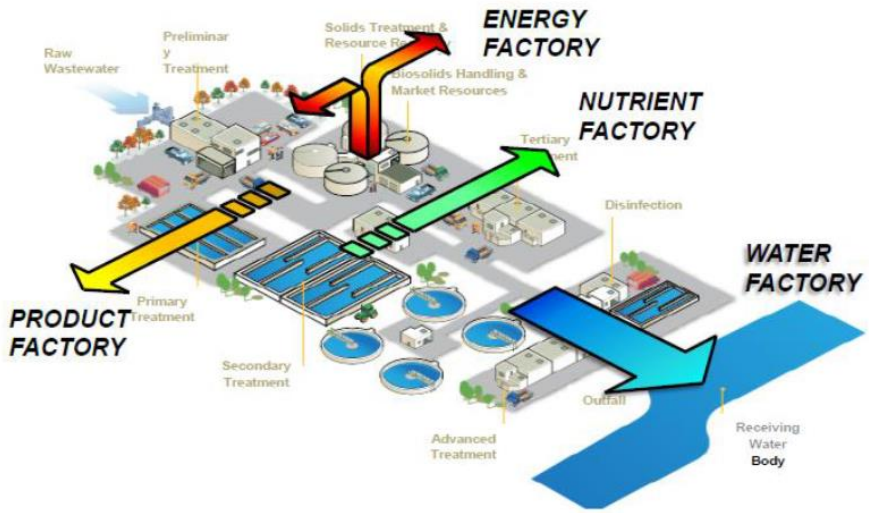


Figure 2-20: Wastewater Treatment - The Product Factory Circular Economy Model

In assessing how well the BTF plant meets a circular economy concept it must be appreciated that the BTF does not require sludge removal (unlike a traditional trickling filter plant) and provides infrastructure with a particularly effective and energy efficient arrangement. To produce sludges/biosolids, energy and extract nutrients would involve very substantial expenditure for additional infrastructure provision and operation. Additionally the carbon footprint of the removal of sludge along with handling of sludge and other by-products would be much more than the current low carbon footprint of the BTF plant for the DNSI stream

Accordingly it is not considered appropriate, at least at this time, to expand the current BTF plant to be able to produce other beneficial products, energy and nutrient sources. Beneficial reuse of the treated wastewater, or even untreated wastewater using sewer mining, remains a potentially viable and, when used appropriately, sustainable future option.

The above assessment is based on the conclusions in Section 2.9 – Condition 27i, that the adverse environmental effects of the Total Combined Discharge outside the allowed mixing zone in Hawke Bay are acceptably low as evidenced by the high degree of compliance with the effects based resource consent conditions.

In terms of the Separable Industrial stream, options are available both at individual industry / trade premises and/or on the total flow to implement treatment and other procedures that would encompass at least some components of a circular economy, in terms of beneficial reuse of otherwise wasted products.

2.8.8 Sewer Mining

While not currently used in New Zealand and not previously considered for Hastings, sewer mining could offer potentially viable and sustainable solutions for resource recovery in the Hastings system. This could be used with either or both of the DNSI and Separable Industrial systems. It is included as Option C4 in Table 2-25. Adoption of sewer mining would be heavily reliant on industry buy-in. Comparisons could be made between the pros and cons of the water supply bores and sewer mining for individual consumers. Council regulation through the Water Services

chapter of the Consolidated Bylaw and/or other measures could, if appropriately implemented, drive to some extent the use of sewer mining, if that is a direction HDC wishes to take in future.

Additionally, sewer mining would reduce water supply requirements and therefore would provide a means to assist in controlling the aquifers especially in locations where water tables are falling below desirable levels (i.e. creating a water scarcity situation).

Sewer mining is a process that sees untreated wastewater as a resource from which value can be extracted either as water or its constituents (like nutrients). It functions by tapping into the wastewater system before the wastewater treatment plant, and extracting raw wastewater, which is then treated as required and used as recycled water. Conceptually, sewer mining can be considered in three steps (as illustrated in Figure 2-21):

Step 1 Extraction of raw sewage from existing gravity or pressure sewer mains
Step 2 Treatment of raw sewage to produce recycled water, as required
Step 3 Return the treatment residuals back into the sewer.

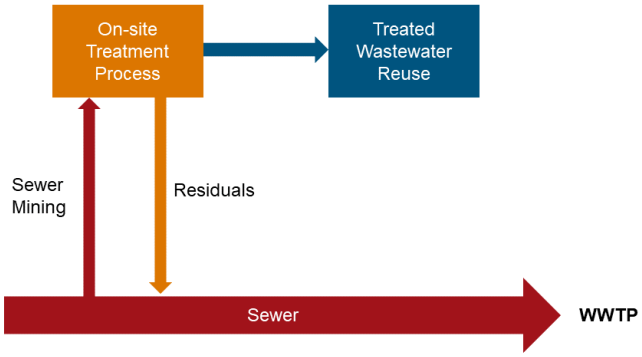


Figure 2-21: Sewer Mining

Sewer mining differs from centralised wastewater treatment and reuse schemes as it is usually treated at the point of demand and therefore avoids high reticulation costs normally associated with recycled water schemes. The quality of recycled water can be customized based on the requirement of the end user.

For example, in New South Wales (Australia), there are multiple sewer mining schemes in operation. The first of such schemes was the Pennant Hills Golf Club in south Sydney. The sewer mining scheme came about during the "Big Dry" of 2004, when reservoir levels around Sydney hit record lows. Sydney Water significantly tightened water-use restrictions to stretch the city's drinking water supply. In response to the tightening of supply, the golf course requested the permission to tap into the sewer line that ran through the golf course. The wastewater is then extracted and used to irrigate the 23-ha golf course on site.

Another example is the Sydney Olympic Park[62], this park is irrigated with a large-scale sewer mining system which reduces potable water use by 50% from what would be used to sustain green sites in the Sydney Olympic Park and Newington Estate.

A further example is Workplace 6 located on Sydney's Darling Island; the office building has an on-site sewer mining facility and produces up to 14 million litres of recycled water each year to flush toilets and irrigate two parks.

Similarly, the Melbourne City Council built the "Council House 2" which mines 100 m^3 of raw sewage from the nearby Little Collins Street sewer adjacent to the building. The mined sewage is added to the wastewater generated from the building and is treated on site. The treated wastewater and rainwater harvested supplies 100% of the building's needs for cooling water, toilet flushing and amenity plant watering.

[62] Sydney Water. (ND). "Sewer Mining. How to set up a sewer mining scheme." *Retrieved from:* https://www.sydneywater.com.au/content/dam/sydneywater/documents/guideline-sewer-mining-how-to-set-up-a-sewer-mining-scheme.pdf

2.8.9 Options and Assessment for treated and untreated wastewater

Table 2-25 includes options considered in 2013 when the Assessment of Environmental Effects and Consent applications were applied for, along with additional options further considered as part of this nine yearly review. This section incudes the liquid portion of wastewater only, both treated and raw for both the DNSI and Separable Industrial streams.

Table 2-25: Summary of Options for treated and untreated Wastewater for Hastings Wastewater Scheme

Type of Alternative Disposal/Discharge System	Summary Description of what a System Involves	"Appropriateness"[63] for the Current and Future Hastings Wastewater Scheme	Former Consideration for Hastings	New Zealand References and Reference Projects
A Land Application Disposal/Discharge				
A1 Slow rate irrigation including cut and carry/fibre/horticulture, re-vegetation – dry stock operations – full year application	• Appropriate treatment to land application requirements • Conveyance • Land application system • Land owner agreements needed if land is not owned by Council	• Yes • However, many factors to consider such as - large land area required which may mean multiple titles - high costs - groundwater protection - Planning requirements, consents and designation - Seepage and soil porosity decreasing over time - Ground and surface water contamination - Spray drift, if surface irrigation - Limitations on land use e.g. Dairy - Loss of productive soils and land for housing - Climate change - And others	• Yes, 1994-95 Investigations • Refer S6 AEE and Support Document No. 7 • Refer S2.8.2 above	• Taupo • Rolleston-Pines • Ashburton • Foxton Beach • Oxford • Te Anau • Mangawhai • Others

[63] Condition 27h uses the word 'appropriate'.

Type of Alternative Disposal/Discharge System	Summary Description of what a System Involves	"Appropriateness"[63] for the Current and Future Hastings Wastewater Scheme	Former Consideration for Hastings	New Zealand References and Reference Projects
A2 Combination land/water, compatible with the receiving environment conditions, application to land and water discharge options	• As for A1 at a lesser scale depending on the balance between land and water, e.g. time of the year and for how long which technique applies, or both at the same time • Receiving environment drivers, i.e. dry season to land, wet season to water.	• Yes – less land than A1 however other factors still apply	• Yes as per A1 but lesser land	• Masterton (Boarder Dyke) • Fielding • Palmerston (Otago) • Waihou • Palmerston North (proposed) • Others
A3 Combination, amenity, partial land based discharge on golf courses, playing fields, Council Reserves, racecourses, nurseries. Usually seasonal	• Appropriate wastewater treatment and application management • Conveyance to site(s) • Infrastructure at the application site	• Yes, but likely to require long conveyance lines • Yes for HDC's coastal planting programme if in reasonable proximity to the WWTP • However, the factors in A1 can apply to the land use component of the treated discharge. • Additional factors can also apply such as: - Ownership of the infrastructure (e.g. golf course) - Third party agreements / end product user - Compliance with consents - Other	• No, other than in very general terms in relation to sustainable procedures in HDC's Sustainability Strategy	• Omaha Golf Course (subsurface irrigation) • Omanu Golf Course Tauranga (surface irrigation) (but not used) • Nelson – proposed • Ruakaka – Rodger Hall Memorial Park – subsurface, consented but not installed • Kinlock subsurface irrigation • Coastal planting Seacliff (Otago) scheme

Type of Alternative Disposal/Discharge System	Summary Description of what a System Involves	"Appropriateness"[63] for the Current and Future Hastings Wastewater Scheme	Former Consideration for Hastings	New Zealand References and Reference Projects
A4 Forest Irrigation full time or as a "mix/match" (refer Alternative A2). Also possibilities for native (or natural) forest irrigation.	• As for A1 or A2 above with spray slow rate irrigation systems for trees	• Yes but depends on any forestry block(s) being established close enough to the WWTP or the Separable Industrial sewer line. The latter would be a Sewer Mining type arrangement. • However, management approaches need to address challenges with harvesting and ongoing operations of the system requiring a block rotational approach • Previously considered for Hastings, but not proceeded with as forest areas are inland and somewhat elevated. Remains future possibility but not one of any priority unless specialist forest type closer to the WWTP	• No – although may have been by inference in the 1994-95 investigations	• Rotorua further options being considered • Waihou (mix and match) • Levin • Waikouaiti • Whangamata • Nelson – Bell Island for biosolids • Other
A5 Natural wetland restoration	• Renovation/further development of natural wetlands	• Could be appropriate if natural wetlands are depleted and needing rejuvenation / renovation. • Natural wetlands would need to be within an economically feasible distance of the source of treated wastewater (DNSI and/or Separable Industrial), and other potential adverse effects would need to be at an acceptable level/scale.	• No	• Implemented in the Manawatu region for one small scheme.

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Type of Alternative Disposal/Discharge System	Summary Description of what a System Involves	"Appropriateness"[63] for the Current and Future Hastings Wastewater Scheme	Former Consideration for Hastings	New Zealand References and Reference Projects
A6 Managed Aquifer Recharge (MAR)	• Treatment to high degree to protect groundwater / Heretaunga Plains aquifer • Conveyance to aquifer bore injection area • Aquifer bore injection well system	• Unlikely to be relevant unless groundwater/ Heretaunga Plains aquifer needs to be supplemented • Such an option has been considered for a number of other schemes in New Zealand, none have proceeded other than at Russell, Bay of Islands. Issues have included aquifer contamination, Māori cultural concerns and social "faecal aversion" (yuck factor). These particularly apply when aquifers are used for potable water supply. • Could also be used to provide a barrier for seawater intrusion to protect (coastal) groundwater.	• No	• Investigations for Watercare's South West new scheme and Pukekohe, Nelson (Bell Island and Nelson work), Palmerston North's Best Practicable Option (BPO) investigations – none have been proceeded with as preferred option. • Others also considered
B Water Discharge				
B1 Offshore Outfall Discharge (the Status Quo for East Clive WWTP)	• Treatment • Combining DNSI and Industrial / Trade Waste streams • Discharge out 2.75km existing offshore outfall diffuser • Following community engagement completed to inform this Review Report (refer to Section 2.10),a respondent suggested that	• A key part of the current consented Hastings Wastewater Scheme • Extending the outfall pipeline further out into Hawke Bay is not considered necessary based on the findings of the environmental effects assessment (refer to Section 2.9) and the original investigations into the siting and configuration of the outfall. Such a procedure would be technically feasible but would likely involve considerable costs.	• Yes, Hastings outfall constructed in 1992 • The offshore (2.75km) outfall and diffuser are key parts of the current scheme • Diffuser replaced in 2016-2017	• There are approximately 18 offshore major marine outfalls in Aotearoa New Zealand, including: • Tauranga • Napier • Hastings (East Clive) • Christchurch • Wellington • Hutt Valley • Dunedin • Green Island

Type of Alternative Disposal/Discharge System	Summary Description of what a System Involves	"Appropriateness"[63] for the Current and Future Hastings Wastewater Scheme	Former Consideration for Hastings	New Zealand References and Reference Projects
	the offshore outfall could be further extended out into Hawke Bay.			• Auckland (Army Bay and Rosedale plants) • Gisborne • Nelson North and Bell Island • Timaru • New Plymouth • Wanganui and others.
B2 Sub-regional single Offshore Outfall Scheme (OOS) for Hawke Bay	• Marine discharge though shoreline or offshore outfall into open coastal waters serving more than one discharge/ authority	• With the separate Hastings and Napier outfalls in existence unlikely to be relevant, unless shorter Napier outfall needs extending. This was previously considered in the early 2000's. • The reorganization of water authorities could in time lead to further consideration of this option.	• Yes in the early 2000's a joint offshore outfall with Napier was considered using then existing Hastings outfall	• Refer Section 2.8.5 NZ Discharge Position • Offshore outfall for subregional schemes • Timaru inland towns and Timaru itself • Waimakariri Districts, Rangiora, Kaiapoi, Woodend etc schemes • Taranaki Schemes
B3 Shoreline Marine Discharges	• Hastings current shoreline outfall and beach chamber outfall	• Included and consented in Hastings Wastewater Scheme for "contingency purposes", and for true emergency purposes as defined in the RMA.	• Currently part of Hastings Wastewater Scheme and consented for contingency purposes	• Mangere (Watercare) • Hutt City • Invercargill • Porirua • Other smaller ones • Refer Section 2.8.4.
B4 Direct discharge to surface water – Rivers/streams	• Direct or diffuse discharge to surface water. In all cases Māori cultural / spiritual considerations and those of the community and stakeholders need to be thoroughly assessed. In	• Previously relevant as a "long list" option but not considered in any detail once the offshore outfall was in place in 1992	• No - not once offshore outfall in place 1992	• Palmerston North and Hamilton being New Zealand's two largest river discharges • Palmerston North planning "mix and match" – river and land. • Many other inland communities • Rock/land contact at Te Awamutu,

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Type of Alternative Disposal/Discharge System	Summary Description of what a System Involves	"Appropriateness"[63] for the Current and Future Hastings Wastewater Scheme	Former Consideration for Hastings	New Zealand References and Reference Projects
	some cases Māori cultural / spiritual considerations have led to the use of gabion baskets and rocks channels etc			Tokoroa, Te Puke
B5 Artificial Ponds/Lakes/Surface Flow (engineered or natural)/Wetlands before discharge to marine water	• Variety of arrangements • Each has direct discharge or infiltration discharge	• May or may not have "relevance" from Māori cultural/spiritual position. • May have "relevance" for wildlife, natural treatment purpose	• Not considered to any extent.	• Christchurch • Invercargill • Tauranga • Nelson • Whangarei (Main plant) • Other
C Beneficial reuse other than land based options to Options A above				
C1 Non-Potable Water Reuse (for toilets, garden watering, possibly washing machines	• Treatment to a reclaimed water reuse standard and reticulate to residential and business/industrial area as a third (purple) pipe system • Could be for the DNSI and/or the Separable Industrial System	• A further possibility but to date no traction in Aotearoa New Zealand for these. Maybe in the future this will happened. • Costs of separate reticulation network(s) likely to be a major barrier. • Illegal cross-connections to potable water supply could potentially be an issue as evidence from some other schemes.	• No	• One very small community in Aotearoa New Zealand, Golden Valley subdivision[64] • An increasing number of alternative assessments have considered, but no schemes have yet been proceeded with. • Schemes in Australia – at least one scheme (Pimpama Coomera) has been decommissioned, it is understood due to high costs and

[64] Ministry for the Environment, June 2003. MFE Sustainable Wastewater Management – A Handbook for Smaller Communities. Section 9.

Type of Alternative Disposal/Discharge System	Summary Description of what a System Involves	"Appropriateness"[63] for the Current and Future Hastings Wastewater Scheme	Former Consideration for Hastings	New Zealand References and Reference Projects
				cross connection concerns
C2 Potable Water Direct Reuse	• An Advanced Water Treatment Plant (after an enhanced Wastewater Treatment Plant) with direct discharge into Council's water supply network • Could be for the DNSI and/or the Industrial / Trade Waste System	• Considerations elsewhere in Aotearoa New Zealand are that this is unlikely to be accepted by society and Māori in the near or foreseeable future. However there is increasing interest in some areas, e.g. Watercare, after recent water shortage events. Needs a strong driver like water scarcity and/or strong sustainability drivers. • Costly (especially with regards to the separate network required), and for coastal or near coastal communities desalination is likely to be preferred based on current technology and costings. • Aotearoa New Zealand Health/potable Water Standards not yet in place to accept	• No	• No schemes in Aotearoa New Zealand • Has been considered in a number of Aotearoa New Zealand municipal wastewater recent alternatives assessments for wastewater schemes, but none proceeded with to date.
C3 Industrial - Reclaimed Water, Beneficial Reuse	• Reuse for Industry and related approaches • Could be from the Separable Industrial sewer line using sewer mining and /or the DNSI system. Māori cultural position would need consideration. • Additional/enhanced treatment after the BTF to achieve a reclaimed water source from the treated wastewater • Treatment of part or all of the	• Relevant for reclaimed water for industrial reuse. • Needs to be a driver(s) however for it to be relevant, e.g. costs, sustainability/circular economy driver, trade waste discharge limitations • Depending on industry type and the associated products / production, iwi cultural perspectives may guide approaches including the need, or not, for any cultural / spiritual treatment	• Yes for individual industrial on site • Not for additional treatment of the Separable Industrial stream other than milli-screening at the East Clive WWTP site.	• On site industrial treatment is practiced at many industrial / trade premises in Aotearoa New Zealand including those discharging to the Hastings Wastewater Scheme.

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Type of Alternative Disposal/Discharge System	Summary Description of what a System Involves	"Appropriateness"[63] for the Current and Future Hastings Wastewater Scheme	Former Consideration for Hastings	New Zealand References and Reference Projects
	Separable Industrial stream at the East Clive WWTP site. • Can be at individual industrial / trade waste sites using their own industrial wastewater. Would require on site treatment to degree needed for the type of beneficial reuse			
C4 Sewer Mining	• A process using untreated wastewater as a valuable resource using either are or both the DNSI and Separable Industrial streams	• Considered to be of relevance if there are strong drivers for this. Otherwise not relevant unless such an approach reduces any concerning/required adverse environmental effects from the marine discharge	• No other than where an individual industry may undertake on site treatment to provide reclaimed water for those industries own use	• None in Aotearoa New Zealand to Authors knowledge other than on-site industry schemes with own wastewater • Refer Section 2.8.8 above for details and examples including Sydney Water information
D "Mix and Match" Combination Options				
D "Mix and Match" Combination Options	• A mix of any of the above options for either the DNSI and/or the Separable Industrial streams	• As per above options which would be included in "mix and match" combination systems	• As per above options for those included in the "mix and match" combination systems	• As per above options included in "mix and match": combination unit

2.8.10 Consenting for Beneficial Reuse

Under current RMA processes, individual resource consents are typically required for application of treated wastewater to land on a case-by-case basis. In contrast to this, the 2018 consent application for the Rotorua Wastewater Treatment Plant proposed the issue of a wastewater discharge consent which included a set of conditions that covered any potential beneficial reuse of the treated wastewater onto or into land. The potential beneficial user of treated wastewater would then operate under the Council wastewater discharge consent provided that the consent conditions are met.

The consent would include a volunteered set of conditions and standards which avoid, remedy, or mitigate risks to the environment and to human health, including the development of a Beneficial Reuse Management Plan (BRMP) covering the treated wastewater onto or into land in circumstances consistent with the plan. The conditions in the plan would set out what would be appropriate and how it would be managed and monitored. This plan would include, amongst other requirements, suggested default buffer distances for a range of land uses and treated wastewater irrigation methods. While this consent application is not now proceeding it is expected this approach will be adopted in future consent applications.

Compared with applying for consents for each beneficial reuse location, the Rotorua Lakes Council's suggested approach allows for more flexibility in the reuse of treated wastewater as it would be covered in the WWTP consenting package and customers would not need their own consent.

If considered appropriate, HDC could explore options for a proactive beneficial reuse approach in terms of consent conditions, administration and management of the consent. Initial considerations would be an assessment of the drivers for this approach. That assessment, if suitably positive, would lead to the development of a consentable approach.. This would require consideration of types of beneficial re-use to be included in a BRMP and/or global consent, the required treated wastewater standards, the restrictions on the treated wastewater use, for land application buffer zones, local effects identification, monitoring requirements and periodic reporting to both HDC and HBRC.

An alternative approach that may be more appropriate would involve seeking an appropriate rule in the Regional Plan to allow for or better facilitate beneficial reuse.

2.8.11 Input to Best Practicable Option

The final part of Condition 27 includes for consideration of opportunities to improve the Best Practicable Option (BPO; following the RMA definition) in terms of how it was determined and defined in the 2013 AEE.
The outputs from this Section for the BPO (discussed in Section 3 below) are:

a) In terms of the DNSI waste stream the current treatment arrangement based on the BTFs and Rakahore (rock) channel are still considered to be the BPO, specifically for the aspects of:
- Minimising environmental effects
- Sensitivity of the receiving environment to adverse effects
- Financial implications compared with other options
- Current state of technology

b) In terms of the Separable Industrial stream, there are potentially some management and associated at-source treatment options that could result in enhancement of the existing BPO scheme. These could include:
   i. Additional on-site (at industrial / trade premises) attention to cleaner production and waste minimisation of some specific industries
   ii. Additional on-site treatment of discharges targeting contaminants of concern – for specific industrial / trade premises or for industrial groups..

For these options which involve on-site treatment, or less or no need for treatment, the focus can be managed through the implementation of Management Plans in individual Trade Waste Consent Agreements.

In terms of the RMA definition of the BPO, for the Separable Industrial stream, the present approach with the above improvements for some specific industries, if warranted necessary, is considered to be part of the BPO approach.

Detailed identification and investigation would be needed on which industries should be targeted for treatment, if any, in this respect.

A strategic planning approach could be used to address the above matters (refer Section 1.4.3), to further ensure the Hastings Wastewater Scheme is a BPO that meets the RMA definition of the BPO, and the project objectives. In terms of the Project Objectives set in 2013, the treatment approaches discussed in this section are considered to still adequately serve the overall Hastings Wastewater Scheme and associated RMA consenting. In particular the Technical Objectives thoroughly encompass the consideration of treatment options including specifically
"To promote outcomes that ensure sufficient flexibility to adapt new appropriate technology and more sustainable solutions in the future, including treated wastewater reuse where that provides more effective solutions"

2.9 Condition 27(i): Effects Assessment

(i) *Effects of the treated wastewater discharge into Hawke Bay as evident from the resource consent monitoring.*

This component of the nine-yearly review aims to assess the effects of the discharges under the current consent. In order to determine whether effects have occurred, the following have been considered:

1. Previous annual monitoring results and effects comments (from 1 July to 31 March 2023)
2. Identification of any significant and relevant new changes to environmental guidelines/standards
3. Summary of compliance with consent(s) as presented in accompanying annual reports since 2013/2014

2.9.1 Assessment approach

This review includes assessment against the following:

- Consent conditions (CD130214W)
- Where applicable, compliance to relevant water quality guidelines

The majority of this review has been assessed against relevant consent conditions (CD130214W). However, some effects identified within the AEE (2013) were not carried through to be addressed directly by consent conditions. In instances where this has occurred, results have been compared to relevant guideline values which are considered best practice for assessments of this type and include the following:

- ARMCANZ/ANZECC (2000) South-east Australia default trigger values for physical and chemical stressors
- ANZG default guideline values for toxicants (2018)
- Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas (2003)

The assessment undertaken in Table 2-26 relating to any water quality, sediment or physical parameter data is based on information obtained from the annual monitoring reports which commenced in 2013. The assessment also looked in detail at data obtained throughout the entire nine-year period and therefore a more holistic and comprehensive review of compliance status was able to be undertaken than was given in the annual reports.

Effects on cultural values have been excluded from the assessment below, as it was not appropriate to include this in Stantec's scope of work for the Review Report. An assessment of cultural impacts from the operation of the WWTP over the past nine years should (and will) be led and undertaken by Tangata Whenua. A Cultural Impact Assessment (CIA) report is being supported by HDC. From previous discussions with the HDC-TWWWJC regarding the review scope, it was determined that the following aspects could be considered by a cultural assessment:

- Direct effects on Tangata Whenua (including transformation of kūparu, discussed at a high level in Sections 1.3.2 and 2.66 of this Review Report; and mortuary waste, discussed in Section 2.6.6)
- Effects on mahinga kai (kaimoana) including availability, habitat, access for collection
- Cultural monitoring approaches
- Barriers to connection (to the HDC wastewater system) for Marae
- Opportunities for capacity building for Tangata Whenua (e.g. upskilling to complete monitoring activities)

- Continuation of the HDC-TWWWJC, and consideration of its responsibilities and functions particularly regarding representation of Tangata Whenua views, mātauranga and tikanga.

A compliance assessment summary table is provided in Appendix E of this report. This table presents a summary of compliance which was determined based on only the monitoring reports. This assessment was more targeted at determining any gaps in compliance within each of the individual reports rather than assessing the entire nine-years' worth of results data.

During the nine-year period, water quality sampling was not undertaken consistently across all parameters and therefore gaps in the dataset mean that compliance with certain conditions of consent particularly Conditions 7, 16 and 19 are unable to be fully complied with. Therefore, the assessment in Table 2-26 which refers to these particular conditions may state 'partial' compliance rather than 'full' compliance. As a result, the compliance status outlined in Table 2-26 may differ slightly to the compliance status outlined in Appendix E.

2.9.2 Effects summary

Table 2-26 summarises identified effects in relation to relevant consent conditions and / or guideline values. Table 2-26 also assesses any temporal or spatial changes that were observed throughout the nine-year period and whether any changes occurred which may have resulted in an increase of effects in the receiving environment.

The assessment focused on whether any changes could be detected or 'discerned' from the effects that were considered acceptable when the consent was granted in 2014. This was deemed an appropriate approach given that in general effects as a result of the discharges are not present or difficult to detect; there have not been any major issues that led to a significant effect of very high magnitude and consequence. An overall assessment of effects is given in Section 2.9.4 below.

Table 2-26: Assessment of the effects of the consented discharge of treated wastewater into Hawke Bay since 2014

Effects Status Key ('Assessed overall change'):

➔ Neutral / no change

↘ Improvement; positive effects

↗ Decline; adverse effects

Effects assessment category	Identified effect (sourced from original AEE (2013))	Relevant consent condition/s (2014)	Supporting evidence (data sourced from annual monitoring reports)	Compliance with relevant guidelines	Temporal or spatial changes observed	Compliance with relevant consent conditions	Assessed overall change	Additional comments / recommendations
Water quality (physico-chemical)[65] Suspended solids, colour and clarity	Relevant AEE (2013) Sections (S 8.3.1 and S 8.5.2) No production of conspicuous oil or grease films, scums or foams, or floatable or suspended material (beyond 750m from diffuser) No conspicuous change in colour or visual clarity beyond 750 m mixing zone (from the midpoint of the outfall diffuser)	7(a) 7(b) 14	Relevant parameters that provide an indication on visual clarity of the receiving waters include total suspended solids, turbidity and salinity. Over the nine-year review period, it appears that the variability in results is between sampling events, rather than consistent exceedances between sites or distances away from the discharge. There appears to be no consistent pattern of increased turbidity, suspended solids or reduced salinity that would indicate a plume effect is occurring as a result of the discharge.	Turbidity results from the nine-year period were compared to physico-chemical guidelines[66]. Results collected over the nine-period appear to be mostly compliant with the guideline values. However, it is important to note that gaps are present within the collected dataset. There are no relevant guidelines available for total suspended solids or salinity.	There appears to be no discernible spatial or temporal pattern evident based on the results data.	Based on data available at the time of assessment, it is considered that conditions 7(a), 7(b) have been partially complied with, whilst Condition 14[67] is considered to have been fully complied with as there was no discernible change observed over the nine-year period.	➔	Refer to Section 2.9.1 for further details on why full compliance is unable to be determined for Condition 7(a) and 7(b). These requirements have been drawn from s107 of the RMA (which prohibits these effects if consent is granted) and as such, partial compliance is not satisfactory. During the assessment, it was noted that the units for some of the turbidity results were recorded incorrectly as FNU (as opposed to the usual Nephalometric Turbidity Units / NTU). For the majority of the past nine years, monitoring for visual effects on water quality has been undertaken by personnel observing from a boat. During 2023, HDC implemented surveys via drone over the offshore outfall diffusers, particularly when maintenance activities are carried out. Refer to 'Recommendations' outlined in Section 7 below for further details.

[65] Minimum standards for water quality were based on the Regional Coastal Environmental Plan requirements for Class AE (HB) waters when the 2013 AEE was written
[66] ARMCANZ/ANZECC (2000) South-east Australia default trigger values for physical and chemical stressors.
[67] Refer to Section 2.2 [wastewater flows and loads]

Effects assessment category	Identified effect (sourced from original AEE (2013))	Relevant consent condition/s (2014)	Supporting evidence (data sourced from annual monitoring reports)	Compliance with relevant guidelines	Temporal or spatial changes observed	Compliance with relevant consent conditions	Assessed overall change	Additional comments / recommendations
Oil and grease[68]	Relevant AEE (2013) Sections (S 8.5.3) No production of conspicuous oil or grease films, scums or foams, or floatable or suspended material (beyond 500 m mixing zone) The average concentration of Total Oil and Grease in the final combined wastewater shall not exceed 200g/m^3 over any 24 hour period based on the sampling procedure set out in Conditions 13 and 14.	7(c) 8 13[67] 14[67]	There was no discernible spatial trend which would indicate the discharge results in films, foams or scums. Additionally, there were no exceedances of total oil and grease in the final combined wastewater output observed within the nine-year period.	There are no specific guidelines for oil and grease in the receiving environment.	There appears to be no discernible spatial or temporal pattern evident based data reviewed.	It is considered that condition 8 has been fully complied with as there were no exceedances observed within the nine-year period. Similarly, it is considered the monitoring requirements of conditions 13 and 14 have been fully complied with. Based on the data available at the time of assessment, it is considered that condition 7(c) has been partially complied with as there was no discernible change observed over the nine-year period (refer Section 1.3).	➔	Refer to Section 2.9.1 for further details on why full compliance is unable to be determined for Condition 7(c).
Ambient water temperature	Relevant AEE (2013) Sections (S 8.3.1 and S 8.5.8) Natural water temperature shall not change by more than 3°C after reasonable mixing (beyond 500 m mixing zone). This standard will be "comfortably complied with at all times". Note: AEE stated that coastal waters at Awatoto had natural temperature range of between 10 - 23°C.	7(f) 16	All data provided at the time of assessment was within the range of 10-22°C. Largest variation between sites during a given sampling event was 1.4°C for oceanic monitoring sites.	No guidelines relating to water temperature. However, results were assessed against criteria outlined in the AEE ('natural water temperature range of between 10 -23ºC).	There were no discernible temporal or spatial changes / patterns observed from the results collected.	It is considered that Condition 7(f) and 16 have been partially complied with (refer to 'additional comments' column for further details).	➔	Refer to Section 2.9.1 for further details on why full compliance cannot be achieved for Condition 7(f) and 16.

[68] Minimum standards for water quality were based on the Regional Coastal Environmental Plan requirements for Class AE (HB) waters when the 2013 AEE was written

Effects assessment category	Identified effect (sourced from original AEE (2013))	Relevant consent condition/s (2014)	Supporting evidence (data sourced from annual monitoring reports)	Compliance with relevant guidelines	Temporal or spatial changes observed	Compliance with relevant consent conditions	Assessed overall change	Additional comments / recommendations
Dissolved oxygen	Relevant AEE (2013) Sections (S 8.3.1 and S 8.5.9) DO will not be significantly depleted within the 500m mixing zone. Concentration of DO shall be more than 80% of the saturation concentration after reasonable mixing (i.e. beyond 500 m mixing zone).	7(g) 16	Throughout the nine-year period, monitoring of dissolved oxygen (% saturation) values appeared to be mostly more than 80% saturation. The majority of occasions where dissolved oxygen levels were elevated, it appeared to correlate with higher seawater temperatures. Higher temperatures as well as higher dissolved oxygen levels could be an indicator of an algal bloom. However, turbidity levels remained relatively stable despite higher oxygen and temperature levels, indicating that the reason for these elevated levels are unlikely to be attributed to an algal bloom. The higher temperature and dissolved oxygen levels could be attributed to a region wide affect, or faulty equipment (i.e. not calibrated correctly) could be the cause of the higher than anticipated levels (refer to Section 7 [recommendations]). Additionally, more useful indicator for algal growth is to monitor Chlorophyll-α concentrations. This parameter was not included as part of the monitoring suite (refer to Section 7).	There are no relevant guideline levels associated with dissolved oxygen (% saturation) levels.	High oxygen levels (% saturation) and temperature readings were observed across all sites, therefore no spatial pattern was evident.	Consent condition 7(g) states that *Dissolved oxygen concentration to be less than 80% of the saturation or concentration..'* It is considered that the wording *'to be less than 80%'* in this condition is an error. It is recommended by ANZECC (2000) guidelines[69] that dissolved oxygen levels should not be permitted to fall below 80%saturation. Given this, it is considered that Condition 7(g) has been partially complied with (refer to 'additional comments' column for further details). Based on the data available, it is considered that Condition 16 has been partially complied with (refer to 'additional comments' column for further details). Refer to Section 2.9.4 and Section 7 for further recommendations.	➔	Refer to Section 2.9.1 for further details on why full compliance cannot be achieved for Condition 16 and 7(g). It is recommended that the wording of Condition 7(g) is clarified. Refer to Sections 4 and 7.

[69] Australian and New Zealand Guidelines for Fresh and Marine Water Quality (volume 1), The Guidelines (Chapters 1-7), ANZECC (2000)

Effects assessment category	Identified effect (sourced from original AEE (2013))	Relevant consent condition/s (2014)	Supporting evidence (data sourced from annual monitoring reports)	Compliance with relevant guidelines	Temporal or spatial changes observed	Compliance with relevant consent conditions	Assessed overall change	Additional comments / recommendations
pH	Relevant AEE (2013) Sections (S 8.3.1) pH beyond mixing zone is within the range that occurs naturally in nearshore coastal waters. Any change in pH shall not have an adverse effect on aquatic life (after reasonable mixing).	7(e) 16	Over the nine-year period it appears that majority of the pH results collected were within the stipulated natural range[70]. Any exceedances of this natural pH range which occurred between sites appears to be restricted to specific sampling events. There does not appear to be any spatial trend in pH results in relation to the discharge.	The majority of pH results collected over the nine-year period were generally compliant the 'natural range'[71] as stipulated in the AEE (2013). However, large gaps of results data mean that an accurate assessment of compliance is unable to be undertaken at this stage.	There appears to be no discernible temporal or spatial pattern occurring based on the pH results data. Therefore, there is no indication from the results observed that there has been any effect on the receiving water quality as a result of the discharge.	It is considered Condition 7(e) is partially complied with. Full compliance cannot be determined at this time due to gaps in data collection across the nine-year period. It is considered that Condition 16 has been partially complied with. This was mainly due to the lack of consistent sampling occurring at each site.	→	During the assessment it appeared that the 2013/14 monitoring report contained different site ID's and therefore it was difficult to determine which data results corresponded to each site location. Additionally, it appeared that for some of the physical parameter monitoring occurred on different occasions to that of the water quality sampling, in some instances many weeks apart (for example 2018/19 monitoring report). Accordingly, recommendations are made in Section 7 of this report regarding improvements to monitoring, including record-keeping and creating a schedule for operational staff to follow to ensure that monitoring occurs at the correct frequency. Refer to Section 2.3.1 for further details on why full compliance cannot be achieved for Condition 7(e) and 16.

[70] 'Natural range' was defined by the AEE (2013) as the HBRC coastal water quality monitoring site at Awatoto
[71] There are no guideline values available for this parameter, instead results have been assessed against the parameters outlined in the original AEE (6.29 – 8.88 pH units).

Effects assessment category	Identified effect (sourced from original AEE (2013))	Relevant consent condition/s (2014)	Supporting evidence (data sourced from annual monitoring reports)	Compliance with relevant guidelines	Temporal or spatial changes observed	Compliance with relevant consent conditions	Assessed overall change	Additional comments / recommendations
Nutrients	No undesirable biological growths as a result of any discharge of a contaminant into the water after reasonable mixing (beyond 500 m mixing zone). The AEE (2013) predicted that under typical conditions, "the discharge is predicted to cause no measurable increase in DRP or DIN at the edge of the 500m mixing zone". "In the worst case, under exceptional conditions, the discharge is predicted to cause a significant increase in dissolved nutrient concentrations in the vicinity of the diffuser (within the mixing zone). However, such events would be localised and infrequent and are not expected to cause nutrient concentrations to increase beyond the background range recorded for the Awatoto coastal site (refer Table 7-2)." "The discharge is unlikely to lead to small scale localised [harmful algal] blooms" (p160).	7(h)	Relevant parameters that can affect and / or create undesirable biological growths include phosphorus and various nitrogen species. Over the nine-year period, there did not appear to be any discernible pattern to the nutrient concentrations that were related to a specific site and / or distance from the discharge. The variability in the results of total phosphorus, dissolved reactive phosphorus, total nitrogen and total ammoniacal-nitrogen was minimal. The majority of the results associated with each of these parameters consistently exceeded the relevant guideline values at each site / distance from the discharge. It is considered unlikely that the discharge is influencing the receiving water quality as there is no discernible difference in results between the sites closest to the discharge and the sites farthest away.	Nitrogen species (total nitrogen, total ammoniacal-nitrogen and nitrate + nitrite nitrogen) results were compared to relevant physico-chemical guidelines[66]. Total ammoniacal-nitrogen was also compared to toxicant guidelines[72]. Results collected over the nine-year period appear to contain many exceedances of these guideline values. Similarly, dissolved reactive phosphorus and total phosphorus were compared to relevant physico-chemical guidelines[66]. Results over the nine-year period indicate many exceedance instances.	There appears to be no discernible temporal or spatial pattern occurring based on the nutrient results. As mentioned previously, each parameter contains multiple exceedances of guideline values which do not appear to be related to a particular site and / or distance away from the discharge.	Although there were multiple exceedances for each parameter above the relevant guideline levels, it is still considered that Condition 7(h) has been fully complied with.	→	See further analysis in Section 2.9.3.3 below

[72] ANZG default guideline values for toxicants (2018)

Effects assessment category	Identified effect (sourced from original AEE (2013))	Relevant consent condition/s (2014)	Supporting evidence (data sourced from annual monitoring reports)	Compliance with relevant guidelines	Temporal or spatial changes observed	Compliance with relevant consent conditions	Assessed overall change	Additional comments / recommendations
Objectionable odour	Sometimes discernible “at the boil” but not objectionable, and this does not occur beyond 500 m mixing zone. No emission of objectionable odour beyond 500 m mixing zone Relevant AEE (2013) Sections: S 8.5.4	7(d)	Complaints logs kept by HBRC and HDC. Annual reports by HDC to HBRC. Observations are made regarding odour during each surface water sampling event completed by HDC personnel. Hydrogen Sulphide monitoring undertaken at a number of sites in the network during 2016, 2018, and 2019/20.	Two complaints were received by HBRC during the 2014/15 reporting period in relation to odour near the WWTP, but neither was confirmed as being generated by the plant. Both occurring during a prevailing north-easterly wind. On the second occasion HDC identified that some work had been carried out by contractors on the plant and the covers to the flow measurement chambers had not been refitted correctly. This may have caused the odour and was rectified immediately. 2015/16 - One odour complaint was received by HBRC but this was confirmed as not being generated by the plant (was suspected to be from Awatoto composting facility to the north, with a northerly wind). A further odour complaint was received in relation to relining works that occurred outside of the plant boundary and were not related to the plant’s air discharge consent. The odours were created by the forced ventilation of the sewers for Health and Safety of the contractors.	All complaints on record (reported annually) occurred prior to 2017. Since then, no complaints or records of objectionable odour have been reported. This is not enough evidence to suggest a worsening or improving state, but does indicate that there have not been any major issues with objectionable odour during the current review period.	HDC have stated that they were in full compliance with condition 7(d) for all of the annual periods since 2014. Many of the compliance reports from the review period state that odour is monitored at the outfall in conjunction with surface water sampling activities. However, it has been difficult to obtain these written observation records, so the claim cannot be independently verified.	➔	Recommend that field observations, include any notes relating to odour and a record that odour was checked for, are appended in writing to quarterly reports and filed in a location that is easy to access for future audits/reviews. It would be helpful to complete an odour removal assessment at the WWTP to determine whether the current odour treatment is effective and identify/justify any necessary improvements (for example, improvement actions such as connecting a blower exhaust and installing dual biofilters to allow for maintenance would be beneficial). Approximate wind direction should also be noted; it appears that when complaints were received, this typically occurred under prevailing north-easterly or northerly winds. A weather station should be installed to capture wind speed/direct continuously, to inform odour investigations following any complaints.

Effects assessment category	Identified effect (sourced from original AEE (2013))	Relevant consent condition/s (2014)	Supporting evidence (data sourced from annual monitoring reports)	Compliance with relevant guidelines	Temporal or spatial changes observed	Compliance with relevant consent conditions	Assessed overall change	Additional comments / recommendations
Contact recreation	Relevant AEE (2013) Sections (S 8.5.5 and S8.5.18) AEE stated: At Te Awanga: The bacterial content of the water must not exceed: i) 280 enterococci bacteria per 100ml in marine waters in a single sample or ii) 550 *E. coli* per 100ml of freshwater in a single sample "Hastings wastewater discharge through the long outfall will not influence the microbiological water quality of waters classified for contact recreation at Te Awanga" (p148) No significant adverse effect on waters classified for contact recreation at Te Awanga (Table 8-13)	16 27(g), Advice Note 4	There were minimal Enterococci[73,74] exceedances above the limit that was outlined in the AEE (2013) (280 Enterococci / 100 mL in a single sample) observed within the nine-year period. Isolated exceedances occurred at most sites (from 250 m to 2000 m away from the outfall). However, enterococci concentrations reduced with distance away from the outfall, with no exceedances above the relevant guideline values[75] observed at monitoring sites 2000 m away from the outfall. Therefore, the monitoring data indicates that the discharge is not influencing the microbiological water quality of waters classified for contact recreation at Te Awanga as this area is approximately 6 Kms south of the outfall. Although the AEE (2013) outlined that bacterial content must not exceed 550 *E.coli* / 100 mL, this is specific to freshwater environments and therefore was not considered relevant to the marine receiving environment which is subject to this assessment.	There were occasional, isolated exceedances of enterococci bacteria concentrations at some sites throughout the nine-year period. Therefore, it is considered that the majority of the results complied with the relevant guideline value[75].	Enterococci bacteria concentrations displayed a spatial pattern and appeared to be highest at sites closest to the outfall and decreased with distance away from the discharge. However, any exceedances appear to be isolated events rather than indicative of any long-term change.	Based on the data available at the time of undertaking the assessment, it is considered that Condition 27(g) has been fully complied with. It is considered that Condition 16 has been partially complied with (refer to 'Additional comments' column for further details).	→	During the assessment it appeared that the 2013/14 monitoring report contained different site ID's and therefore it was difficult to determine which data results corresponded to each site location. It is recommended that a review is undertaken to reconcile sampling locations including for the plant and receiving environment and the findings used to develop a monitoring schedule for operators (see Section 7). Additionally, refer to Section 2.3.1 for further details on why full compliance cannot be achieved for Condition 7(c).

[73] Enterococci samples were delivered to the laboratory outside of the 24 hr return period for sampling events which occurred on the 17/10/2022 and 26/10/2022, therefore results may be compromised. This may have occurred on multiple occasions, however individual laboratory reports were not able to be reviewed as part of this assessment.
[74] 2018/19 monitoring report stated *E.coli* was sampled on numerous occasions throughout that period. It is assumed that this is to be in error and as *E.coli* does not relate to contact recreation.
[75] Microbiological water quality guidelines for Marine and freshwater recreational areas (action / red mode); Ministry for the Environment, 2003

Effects assessment category	Identified effect (sourced from original AEE (2013))	Relevant consent condition/s (2014)	Supporting evidence (data sourced from annual monitoring reports)	Compliance with relevant guidelines	Temporal or spatial changes observed	Compliance with relevant consent conditions	Assessed overall change	Additional comments / recommendations
Shellfish gathering	Relevant AEE (2013) Sections (S 8.5.5). AEE: Mussel reef at Te Awanga (6km from diffuser): Median faecal coliform content of samples taken over a shellfish-gathering season shall not exceed 14 per 100ml, and no more than 10% of samples shall exceed 43 per 100ml (MfE & MoH 2003) "This assessment indicates that the Hastings wastewater discharge through the long outfall will not… influence the water quality at shellfish collection areas at Te Awanga, Clifton or Black Reef" (p148) No significant adverse effect on shellfish collection areas at Te Awanga, Clifton or Black Reef (Table 8-13) Mussel flesh testing was completed for the AEE.	22 16	As shown in Figure 2-22 in Section 2.9.3.2 below, faecal coliforms contained elevated counts near the outfall point (250N, 100N, 100S, 250S). This was noticeable for one sampling event in 2017 and one in 2020, but outside the mixing zone, counts are generally not elevated across quarters/years. There were elevated faecal coliform concentrations at the sites farthest away from the outfall (2000m north and 2000 m south), while concentrations around the outfall were low, indicating that the cause of these results is unlikely to be the discharge. Therefore, it is unlikely that the discharge is having any effect on the shellfish collection areas at Te Awanga, Clifton or Black Reef which are located >6Kms away as the faecal coliforms concentrations largely decrease with distance away from the outfall.	There were exceedances above the relevant guideline values[75] for most sites during the nine-year period.	A spatial pattern was evident as elevated faecal coliform counts were present during one sampling event during 2017 and 2020 near the outfall point. However, faecal coliform counts were generally not elevated within and / or outside the mixing zone across the remaining monitoring years.	It is considered that Condition 22 has been fully complied with. Based on the data available at the time of undertaking the assessment, it is considered that Condition 16 has been partially complied with (refer to 'Additional comments' column for further details).	→	Refer to Section 2.9.1 for further details on why full compliance cannot be achieved for Condition 16.
Recreational values	"The potential adverse effects on recreational activities will thus be avoided or mitigated by a combined approach utilising both a long offshore outfall and treatment of the domestic wastewater stream"	16	The recreational survey completed in 2023 (detailed in Section 2.7) confirmed that Ngaruroro River mouth, Tukituki River mouth and Te Awanga remain popular locations for recreational activities. In addition, the survey also identified Waitangi Estuary and Muddy Creek Estuary as popular locations, notably for gathering kaimoana. Refer to commentary regarding contact recreation and shellfish gathering above for public health related recreational impacts.	N/A	Waitangi Estuary has become more popular since 2014 with the construction of a public walkway/cycleway along the coast, and the establishment of Ātea a Rangi at the mouth of Ngaruroro River.	It is considered that Condition 16 has been fully complied with in regards to effects on recreational activities.	↘	2.
Aquatic ecology Chemical specific toxicity	Relevant AEE (2013) Sections (S8.5.12.2) Predicted dilution at 500m maintained at (1:11,368) or better. Receiving water toxicant concentrations will remain well below the ANZECC (2000) trigger values for "slightly-moderately disturbed systems"	15	Total ammoniacal-nitrogen results were compared to the relevant toxicity guidelines[72], which showed that over the nine-year period there were no exceedances above the guideline values recorded for any of the sites. This would indicate that the discharge is not increasing the overall toxicant effect for fauna residing in the receiving environment. All remaining water quality parameters measured do not contain toxicant guideline[72] values and therefore were not part of the above assessment.	Total ammoniacal-N results were compliant with the relevant guideline values[72] for the entire nine-year period. However, lack of consistency of sample collection throughout the nine-year period, means that there is the potential	There were no spatial or temporal patterns observed due to the parameter being consistently compliant with the relevant guideline values[72].	Yes	→	Nil

Effects assessment category	Identified effect (sourced from original AEE (2013))	Relevant consent condition/s (2014)	Supporting evidence (data sourced from annual monitoring reports)	Compliance with relevant guidelines	Temporal or spatial changes observed	Compliance with relevant consent conditions	Assessed overall change	Additional comments / recommendations
	except for sulphide, which may potentially exceed the guideline at dilutions <400-fold. Predicted receiving water concentration (typical) exceeded -> if worst concentration is exceeded, effect is more significant			for an exceedance to have occurred but is unable to be determined at this point.				
Direct toxicity	Relevant AEE (2013) Sections (S8.5.12.3) No statistically detectable [significant] difference in toxicity between a water sample taken from uncontaminated near shore water (from a location to be approved by Hawke's Bay Regional Council), and treated wastewater when diluted 200 times with that water (based on existing consent Condition 10 at the time)	15	Any statistically significant toxic effect as per Condition 15 of consent. Whole effluent toxicity (mussel embryo) testing (WET) has been completed quarterly since 2014, with sample analyses carried out by NIWA. The WET reports from NIWA are appended to each annual report. Monitoring events involve collecting samples of final combined wastewater prior to discharge over two consecutive days. The following species were then exposed to the samples in the laboratory, to ascertain the level of toxicity (if any): • For marine alga chronic toxicity – *Minutocellus polymorphus* (Alga) • For marine bivalve acute toxicity – *Macomona liliana* (Wedge shell; hanikura) • For marine bivalve acute toxicity – *Mytilus galloprovincialis* (Blue mussel; kuku / kutai) The adaptive management protocol detailed in Condition 15 (and associated Advice Notes) details a plan of action depending on the results found for each testing event. If it is necessary to complete a Toxicity Identification Evaluation (TIE) process based on the results and/or if it is found that the adaptive management protocol was not correctly followed, that constitutes non-compliance with Condition 15. For a TIE to be necessary (i.e. a statistically significant toxic effect), results must indicate: 1. One or more Threshold Effect Concentration (TEC) results ABOVE 1 in 200; AND More than 2 out of 3 TEC results ABOVE 1 in 200; AND EC20 or LC10[76] above 0.5%; **OR** 2. 2 out of 3 TEC results are ABOVE 1 in 200, AND Any species above 1 in 400 on 2 consecutive tests, AND EC20 or LC10 above 0.5%.	Given that all WET testing results have been compliant with Condition 15,they have therefore been compliant with all applicable guidelines.	Spatial changes not relevant as samples are taken from the WWTP prior to discharge. TEC of 1:200 was exceeded most often for blue mussel, followed by alga. TEC for alga was not exceeded until 2022/23 reporting year. Further data are needed to determine whether this is a temporal trend (i.e. if it continues on in 2023/34 and beyond). No samples exceeded the EC20 or LC10 so there has been no statistically significant effect detected on the occasions when samples were taken.	All WET testing since 2014 has yielded results that are compliant with Condition 15; to date, a TIE has not been required. The preliminary stages of the adaptive management protocol have been activated on occasion as follows: **Step 1:** Any TEC results > 1:200 – ***triggered for blue mussel*** on 7 occasions (2 in 2014/15; 2 in 20i5/16; 2 in 2017/18; 2 in 2018/19 and 1 in 2022/23). ***Triggered for alga*** on 3 occasions (in 2022/23). **Step 2:** 2 out of 3 TEC results >1:200 – ***triggered in 2022*** *(October – alga and blue mussel)* **Step 3:** TEC for any species above 1:400 on 2 consecutive tests – ***never triggered*** **Step 4:** EC20 or LC10 above 0.5% ***- never triggered***	➔	The relevance / effectiveness of WET testing is continually evaluated each year as part of the annual reporting process. There was an increase in exceedance of the TEC (1 in 200) for alga in 2022/23, but it is unknown if this is an ongoing trend, pending further testing in 2023/24.

[76] EC20 = the effective concentration that causes the stated effect in 20% of the test organisms; LC10 = the lethal concentration that kills 10% of the test organisms.

Sediment	Relevant AEE (2013) Sections (S8.2.12.4). No mercury accumulating in sediments near the offshore outfall. Samples are all compliant with ANZECC (2000) interim sediment quality – low guidelines. No impacts on benthic infauna around the outfall Any increased deposition of matter on the foreshore or seabed shall not have an adverse effect on aquatic life (after reasonable mixing[77]).	18 19	Sediment seabed grab samples were collected at least twice per year (summer and winter) throughout the nine-year period. During this time there were only three instances where mercury results exceeded the relevant guideline values[78]. However, from the results observed it can be concluded that mercury is not accumulating within the sediments as a result of the discharge at the outfall and therefore no increased effect on the receiving environment. Tin sediment sample results display variability spatially whereby exceedances above the relevant guideline values were most common at sites closest to the outfall (250m and 500 m sites). There were minimal exceedances above relevant guideline values that occurred at the sites farthest away (750 m) from the outfall. All other sediment samples (arsenic, cadmium, chromium, copper, lead, nickel and zinc) did not exceed the relevant guideline values[78] at any of the sampled sites. However, it is important to note that there are consistent gaps in data collected. Therefore, the above assessments were made based on data available. Refer to 'Additional comments' column. Percentage of mud (<63µm) in the 2023 survey[79] was high, representing more than 70% of the total weight at each site. Additionally, on the north and south transects mud content appeared to increase with distance from the outfall. It was concluded that the input of fine sediments from the catchments forming the Hawke's Bay is a known key stressor for the regional coastal ecosystem. Sampling locations positioned around the outfall are situated in front of the coastline delimited by the estuaries of surrounding large rivers. It was concluded that grain size distribution around the outfall was likely to be affected by neighbouring river systems during heavy rainfall events rather than the outfall effluent itself. Therefore, any impacts or changes to benthic biota are considered to be associated with natural seasonal events and cycles rather than related to the outfall effluent. There were difficulties in interpreting sediment quality data due to data labels that were unclear (for example, poor labelling of whether samples were analysed for dry matter, moisture content, or both).	Mercury in sediment results observed across the nine-year period generally (apart from three isolated occasions) complied with the relevant guideline value[78]. Concentrations within marine sediments were mostly compliant with the relevant guideline value[78], however there were more consistent exceedances compared to the Mercury sediment results. All other parameters analysed (arsenic, cadmium, chromium, copper, lead, nickel and zinc) were fully compliant with the guideline values[78] as there were no exceedances observed from the data available. However, refer to 'Additional comments' column for further commentary on compliance.	Two of the three exceedances for Mercury in sediment concentrations were observed at the '250 m North' site. However, these two exceedances occurred on different sampling occasions. Therefore, it does not appear that there are any significant spatial trends in terms of distribution of this particular contaminant. A spatial pattern was observed for tin results which showed the majority of exceedances occurred at sites closest to the outfall, with concentrations decreasing at sites farthest away from the discharge. Mud content appeared to increase with distance from the outfall along the north and south transect lines. However, the subtidal sediment over time was consistent with the general trend recorded by the State of the environment in Hawke Bay[79].	It is considered that Condition 18 has been fully complied with. Based on the data available at the time of assessment, it is considered that Condition 19 has been partially complied with (refer to 'additional comments' column for further details).	➔	Refer to Section 2.9.1 for further details on why full compliance cannot be achieved for Condition 19 at this stage.

Effects assessment category	Identified effect (sourced from original AEE (2013))	Relevant consent condition/s (2014)	Supporting evidence (data sourced from annual monitoring reports)	Compliance with relevant guidelines	Temporal or spatial changes observed	Compliance with relevant consent conditions	Assessed overall change	Additional comments / recommendations
Benthic ecology	Relevant AEE (2013) Sections (S8.2.12.5) Consistent composition of benthic fauna between samples within 500 m mixing zone and those outside. Benthic infauna community remains relatively abundant and diverse overall (some fluctuations in abundance, richness and diversity may have occurred). No discernible change in sediment texture which may then have influenced benthic community structure (p167).	18	The benthic survey report[79] indicated that despite a low relationship between contaminant levels and the distribution of biota communities, where more pollutant tolerant species were observed at sites with the highest levels of contamination (i.e. near the outfall and on the southern transect up to 250m), suggesting a link between that species and pollution levels may be present, however this was unable to be verified. Additionally, large differences in benthic assemblages and diversity indices were observed between the 2012 dataset and the 2023 dataset. The cause of these major differences observed were determined to likely be associated with methodology bias (different sampler), a change in sediment texture (higher mud content in 2023), a natural seasonal variation (autumn in 2012 versus summer in 2023) or a combination of all of these. Given the findings of the benthic survey report, it is considered that there has not been an overall increase in effect on the receiving environment in relation to benthic composition. As outlined in the report, changes within benthic community composition and sediment quality are more likely linked to undertaking the survey during different seasons, sampling methodology bias and / or natural variations in weather patterns (such as heavy rainfall events). With regards to sediment texture, refer to '*Sediment*' row above.	Sediment quality samples analysed for metals/metalloids showed only mercury values higher than the ANZG DGV guidelines at two sites. However, the concentrations were lower than the ANZG DGV-high guideline (ANZG 2018). There is no specific guideline for benthic ecology.	As outlined in previous column, spatial changes were observed with the distribution of the benthic community and the presence of more pollutant tolerant species being present closer to the outfall. However, factors such as natural seasonal variation (high rainfall events) and differences in the time of year sampling was undertaken, are likely to be the underlying reason for these spatial patterns.	Fully compliant with Condition 18.	➔	It is noted that the benthic survey report was in draft form when this Review Report was being compiled.

[77] Section 8.3.2 of the 2013 AEE infers that the mixing zone is at a distance of 750 m form the midpoint of the diffuser [on the ocean outfall] for colour and clarity, and at 500 m for other parameters. Class CR (HB) bacteriological standards apply only within CR classified coastal strips at Napier and Te Awanga, as per Figure 8-1.
[78] ANZECC (2000), ISQG - Low
[79] Environmental monitoring of Clive outfall: sediment quality and benthic biota survey (January, 2023), Bioresearches.

Effects assessment category	Identified effect (sourced from original AEE (2013))	Relevant consent condition/s (2014)	Supporting evidence (data sourced from annual monitoring reports)	Compliance with relevant guidelines	Temporal or spatial changes observed	Compliance with relevant consent conditions	Assessed overall change	Additional comments / recommendations
Bioaccumulation	Relevant AEE (2013) Sections (S8.5.12.6) No substantial concentrations of bio-accumulative substances (e.g. Cadmium, mercury, synthetic organics) in treated wastewater discharge No evidence of plume impacting on food gathering areas for higher order organisms such as flat fish No evidence of sediment accumulation near the outfall Trace element concentrations in flounder and mussels (transplanted in cages deployed around the mixing zone) caught around the outfall do not exceed the Food Standards Code (FSANZ 2010) maximum safe concentrations	19	The 2013/14 monitoring report (prepared while the consent was being processed) outlines that HDC have been deploying cultivated mussels at sites around the outfall. They were tested for bacterial content, heavy metals and organochlorine compounds. The bacteriological monitoring showed faecal coliforms and *E.coli* counts were higher in mussels located close to the outfall with reducing numbers further away from the outfall. Heavy metals (Zn, Cu, As, Hg, Cd, Cr, Ni, Pb and Sn) were tested for. Results showed Zinc, copper, arsenic, cadmium, nickel and lead all show no difference between sites. Mercury increases in distance away from the outfall. Chromium is higher closer to the outfall. This would be expected as the form of the Chromium normally found is tribasic which is insoluble. As the mussels are filter feeders they will filter out and retain the insoluble chromium. The levels found would depend on the time of sampling related to when the mussel last purged. The only commentary provided in the 2013/14 annual report with regards to organochlorine compounds was that there were 'few' and the 'levels are low'. Details similar to the above were not reported in subsequent years. With regards to sediment accumulation, refer to '*Sediment*' row above.	No guidelines available.	Not able to assess due to lack of previous analysis.	The current consent does not have a condition to specifically assess bioaccumulation.	N/A	Nil
Emerging contaminants	Relevant AEE (2013) Sections (S8.5.12.7) "The industrial wastewater stream is unlikely to carry human hormones at detectable levels and is not considered to affect the potential level of EDC's contained in the domestic wastewater. This would therefore have the effect of reducing hormone concentrations in the combined discharge." (p168) Levels of dilution stated in Table 8-12 for no effect from emerging contaminants are complied with.	N/A (no condition)	HDC has not undertaken this type of testing to date.	N/A	Not able to assess	N/A	N/A	Further details regarding HDC's intention to establish a routine monitoring programme for ECs and an overview of ECs in the context of wastewater treatment and discharges are provided in Section 2.9.3.4 of this Review Report. Section 7 contains a recommendation to scope and implement a monitoring programme in collaboration with the HDC-TWWWJC and accordingly including this in changed conditions. Refer Table 4-1 in Section 4.

Effects assessment category	Identified effect (sourced from original AEE (2013))	Relevant consent condition/s (2014)	Supporting evidence (data sourced from annual monitoring reports)	Compliance with relevant guidelines	Temporal or spatial changes observed	Compliance with relevant consent conditions	Assessed overall change	Additional comments / recommendations
Marine mammals	Risk of toxicity effects relating to the outfall discharge, on transient marine mammals (e.g. common dolphin, dusky dolphin) passing within range of the outfall, remains low. Relevant AEE (2013) Sections: S8.5.13	N/A	No marine mammal observations around the outfall have been noted.	N/A	No known observations on record	No monitoring required by consent	→	Nil
Commercial aquaculture	No commercial aquaculture ventures in operation in southern Hawke Bay (therefore no adverse effects). Relevant AEE (2013) Sections: S8.5.14	N/A	The recreational survey undertaken in 2023 (refer to Section 2.7) included attempts to contact commercial operators in Hawke Bay but the only respondent was a commercial fisher (not aquaculture).	N/A	No change.	N/A	→	Nil

Effects assessment category	Identified effect (sourced from original AEE (2013))	Relevant consent condition/s (2014)	Supporting evidence (data sourced from annual monitoring reports)	Compliance with relevant guidelines	Temporal or spatial changes observed	Compliance with relevant consent conditions	Assessed overall change	Additional comments / recommendations
Cumulative effects (including on water quality in Hawke Bay)	While the monitoring undertaken in southern Hawke Bay preparatory to [the 2013 consent application], and by HBRC from a regional perspective, show some effects on water quality (presumably from river events in the main), these are mostly localised and minor, or are generally associated with high rainfall events where stormwater runoff from the land carries contaminants into the Bay. There is no evidence of significant adverse effects on the water quality or aquatic ecology of the wider area and indeed the overall environmental state of Hawke Bay appears to be very good. One of the benefits of the long ocean outfall, in addition to wastewater treatment provided, is that not only does it ensure the discharge is well removed from sensitive recreational and commercial sites in Hawke Bay but it also removes it from the vicinity of other discharges and so minimises the risk that the combined effects of a these discharges might reach an unacceptable threshold level.	N/A	Regularly monitored by HBRC and the Hawke's Bay Marine and Coastal Group, with three-yearly State of the Environment reports. The latest report available was published in 2021 (2018 – 2021).80 It found that along the Hawke's Bay coast: • The Tukituki River provides 20% of Dissolved Inorganic Nitrogen (DIN) . Wastewater outfalls contribute 7% of DIN (including all outfalls along the coast, not just at East Clive). • River contribute up to 11.5% of the DRP load, while wastewater outfalls contribute 4.5%. DRP is highest in the Ahuriri and Waitangi estuaries. • Turbidity and suspended sediment levels in Hawke's Bay coastal waters are mostly similar to levels at other New Zealand coastal sites. However, the report did note that "*high levels of sediment delivery to the Ahuriri and Waitangi estuaries also appear to be altering the ecosystem*".[81] • The Ngarururoro River mouth had the highest recreational water quality ('swimmable' 98% of the time between 2017 – 2021). The report noted that "over the summer, Hawke's Bay often experiences tropical weather systems that bring periods of wet weather and elevated levels of bacteria in waterways". This is relevant to the discussion regarding faecal contamination provided in Section 2.9.3.2 of this report. There are two offshore outfalls that discharge directly to the coastal marine area in Hawke Bay (at Napier and East Clive), and seven additional consented discharges of treated wastewater to rivers or streams that ultimately discharge to Hawke's Bay.[82]	N/A	Levels of fine sediment and nutrients (particularly DIN and DRP) continue to increase within the coastal areas of Hawke Bay. Sedimentation is more of an issue at estuaries close to the East Clive WWTP offshore outfall (e.g. Waitangi estuary) than elsewhere in Hawke Bay. Wastewater discharges are noted to contribute to these issues, but the contribution is small compared with that from rivers and land.	N/A	↘ (for the TANK coast overall)	It is difficult to separate out the direct effects of wastewater discharges via those from other sources (such as stormwater) using the available information. However, according to the findings of the Hawke's Bay State of the Environment Report (2018 – 2021), the contribution of these discharges are minor in comparison with those from other sources across the wider catchment. The assessment has been made without direct input regarding cumulative effects from a cultural perspective. As such, the overall status may change depending on the findings of a Cultural Impact Assessment (as described in Section 2.9.1).
Separation from other discharges	Potential to exacerbate pressure on Hawke Bay receiving environment (cumulative effect)	N/A	Napier and PanPac discharges are located well north of the area of interest. No new discharges of wastewater consented since 2014. Dredging off-shore disposal also well outside area of concern.	N/A	No relevant changes.	Nil.	→	Nil

[80] Regional Marine and Coast (Section 14), Hawke's Bay State of the Environment 2018-2021, accessed online at https://www.hbrc.govt.nz/environment/state-of-the-environment/three-yearly-report/, 12 May 2024.
[81] Land and Water: Tūtaekurī, Ahuriri, Ngarururoro, and Karamū (TANK; Section 17), Hawke's Bay State of the Environment 2018-2021, p17
[82] Discharges at Otane, Waipawa, Porangahau, Takapau and Waipukurau (consents held by Central Hawke's Bay District Council) and at Tuai and Wairoa (consents held by Wairoa District Council). According to the Public Register of Wastewater Networks, Taumata Arowai, accessed 12 May 2024, https://www.taumataarowai.govt.nz/for-communities/public-registers/

2.9.3 Additional analyses

2.9.3.1 Dilution in the receiving environment

The Public Health Risk Assessment (PHRA) prepared in support of the 2013 consent application (Supporting Document 8) assumed that the discharge of treated wastewater into Hawke Bay would be diluted by a ratio of between 1:50 (treated wastewater to sea water) and 1:500.

This was based on underlying assumptions about the actual (baseline as of 2012) and predicted future (to 2030) flows from the WWTP as follows:

- Average Dry Weather Flows of up to 53,000 m^3/day by 2030 (total combined discharge), of which up to 22,000 m^3/day would be from DNSI, and up to 31,000 m^3/day would be from the Separable Industrial stream.
- Future flows predicted using Monte Carlo analysis (to model changes in flow through time to 2030)
- The WWTP would be operating 'normally' (e.g. no emergency discharges, or unusually high loads of contaminants in influent)
- Population growth of 5% compared with 2012 (to horizon of 2030)
- At the time the PHRA was conducted in 2012, the East Clive Outfall extended "some 2,750 metres offshore with 52 diffuser ports discharging in approximately 9m water depth (mean sea level)" (p11, Supporting Document 8 of the 2013 AEE). As previously mentioned in Section 1.2.2, significant upgrades were made to the outfall structures in 2017 including the installation of 119 duckbill valve diffuser ports, and an HDPE pipeline. During a routine inspection in November 2023, the end of the diffuser was noted as being 10.7 metres below mean sea level.

The PHRA assessed three scenarios as potential exposure pathways for pathogens from wastewater discharged into Hawke Bay from the offshore outfall:

- primary contact recreation at Tukituki (swimming) and Te Awanga (swimming and surfing)
- secondary contact recreation (boating) at Ngaruroro, Tukituki and Clifton
- consumption of uncooked shellfish gathered at Te Awanga, Clifton and Blackreef with 'low' ('normal') bioaccumulation and hyper bioaccumulation.

Given the above, it can be assumed that if the wastewater discharge flows have been maintained below the modelled levels in the PHRA, then the dilution envelope of 1:50 to 1:500 would also have been maintained, and the findings of the PHRA regarding potential risks to public health would not have changed as of 2023.

With this in mind, a comparison has been made between the current baseline (2023) flows with those estimated in 2012, and also with the projections for 2049. Detailed results of this comparison can be found in Section 2.2 above. It can be confirmed that:

- Baseline wastewater flows (average daily flow) in 2023 were well below the projected ADWF of 53,000 m^3/day for 2030 during normal operations.
- The relative contribution of DNSI and Separable Industrial flows did vary somewhat to the PHRA predictions, especially during peak periods (although this cannot be considered as reflective of 'normal operations').
- The Separable Industrial flows (2023 baseline) varied between 18,000 m^3/day and 28.000 m^3/day (the latter being during peak season). The maximum predicted flow for Separable Industrial stream to 2030 was 31,000 m^3/day. The updated projection to 2049 for Separable Industrial flows is up to 28,000 m^3/day during peak season (see Section 2.2.4 above for detail). The separable industry flow is projected to remain stable at current volumes as it is assumed that no significant growth will occur in industrial activities within Hastings District (as explained in Section 2.2.4.2 above).Therefore, Separable Industrial flows are expected to be consistent with the PHRA (2013).
- Based on the analysis presented in Section 2.1 of this Review Report, the population serviced by the wastewater network could increase by up to 12.5% by 2049. This is a greater population increase than envisaged when the PHRA was completed in 2012.

Table 2-5 (in Section 2.2.2) indicates that the actual 2023 flows for TCD are similar to that predicted for 2023 in the 2013 AEE. Therefore, the dilutions achieved would be similar to those stated in the 2013 PHRA. The proportion of DNSI flows

is greater for the actual 2023 baseline, which indicates a potentially higher risk of pathogens present in treated wastewater than previously predicted.

Given the potential for increased population growth beyond that which originally informed the PHRA, and the particular increase in volume of wastewater flows from the Separable Industrial stream, wastewater flows may increase to volumes beyond those predicted in 2012. However, the upgrades to the outfall (particularly the installation of duckbill valves in 2017) will have enhanced the dilution capacity. If the dilution threshold of 1:50 cannot be maintained, the risk to public health posed by the discharge may increase during the later years of the consent (beyond 2032). It would also become more difficult for the discharge to comply with Condition 4 ("achieve a minimum average dilution over the boil of not less than 100:1 on slack water"). It is therefore important to understand the level of risk given changes in influencing factors including population serviced, industrial / trade waste flows, and the outfall structure through which the discharge occurs.

While the potential effects on public health are currently within the range permitted under the existing consent, and are likely to remain so at least for the next review period, it is recommended that the PHRA is updated for the next nine-yearly review based on revised wastewater flow estimates (presented in Section 2.2) and taking into consideration the upgrades to the outfall since 2017. This would help to inform future decisions regarding the management of risks to public health. Recommended timing for this work is detailed in Section 7.

2.9.3.2 Faecal coliforms

A temporal pattern associated with the total faecal coliform results collected from seawater samples during discrete events on 14 February 2017 and 21 January 2020 became evident during this review. In these events, faecal coliform concentrations were highest near the outfall (site '100 S'), with a count of up to 2000 cfu/100mL.

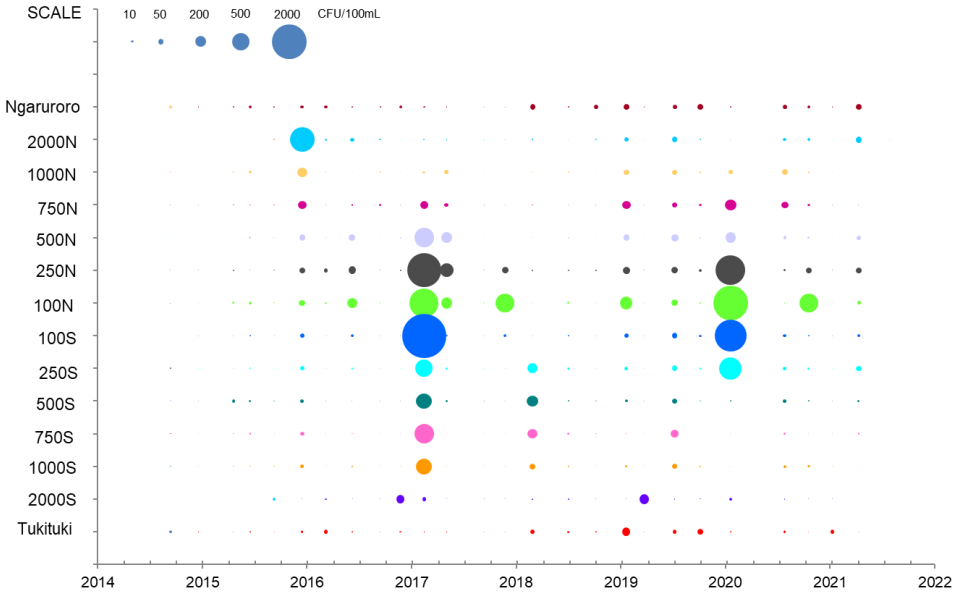

Figure 2-22 Faecal coliform results from 2014 – 2022 displaying temporal pattern

Several factors (either separately or cumulatively) could have influenced these results. However, given that both events coincided with rainfall it's most likely that faecal coliforms were elevated due to surface runoff from land draining to this area of Hawke Bay. This would have been coupled with particularly high loads of faecal coliforms as the rainfall occurred

after sustained dry periods. For example, the Hastings District received approximately 32 mm of rain[83] in the week leading up to sampling on 14 February 2017. This rain came after two very dry months, and therefore would have had a 'flushing' effect on overland flow paths, streams and rivers with contaminants built up due to prior low flow conditions. Similarly, 30 mm of rain fell in the week leading up to sampling on 21 January 2020, after a dry period of 18 days. Bacterial populations would also have been elevated on both these occasions due to higher ambient temperatures (and sea surface temperatures) experienced in the summer.

2.9.3.3 Nitrate- and nitrite-nitrogen

As discussed in Table 2-26 above, results for nitrate- and nitrite-nitrogen have been variable over the past nine years with a number of exceedances of the ARMCANZ 2000 default guideline value of 0.005 g/m^3 (for physico-chemical stress due to nutrients, based on the default trigger value for South-East Australian waters). Overall, the degree to which the guideline value is exceeded has not increased (I.e. the likelihood of physico-chemical stress on marine aquatic ecosystems occurring does not appear to have increased as a direct result of the discharges from the offshore outfall).

Figure 2-23 shows that the majority of exceedances occurred in isolated years, such as 2017-2018, 2020, and 2023, but overall there is no discernible increase over the nine-year review period. In select years where nitrate-N + nitrite-N concentrations were elevated, some sites had higher concentrations than others, but otherwise there was typically very little spatial variance. The most marked pattern was in 2017/18 with noticeably higher concentrations at Tukituki (likely due to external sources of nutrients from the Tukituki River catchment) and at the two sites close to the outfall (100N and 250N; 100 metres and 250 metres north of the outfall respectively).

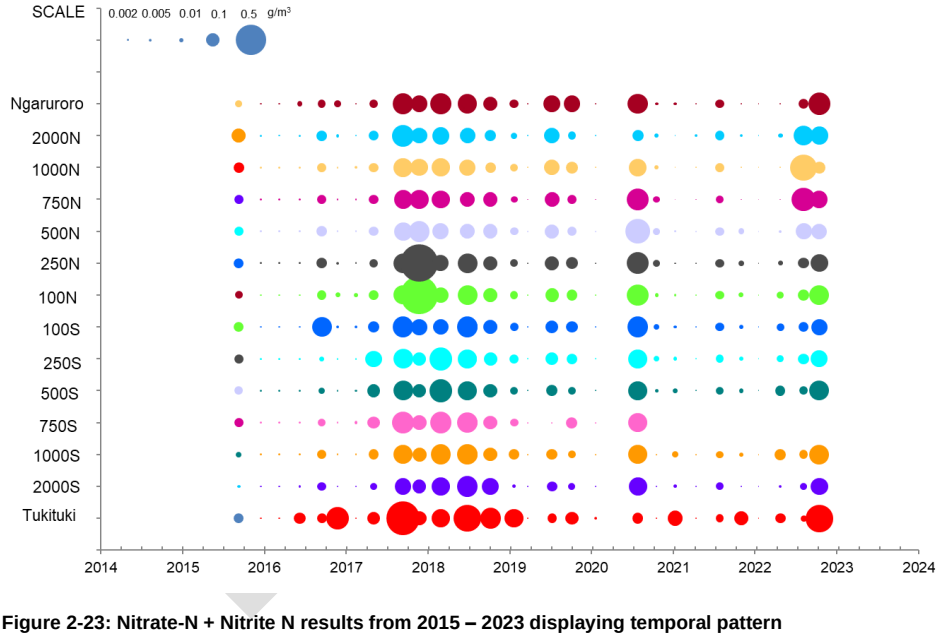

Figure 2-23: Nitrate-N + Nitrite N results from 2015 – 2023 displaying temporal pattern

[83] Based on total daily rainfall (mm) recorded at Hastings AWS (weather station), from NIWA CliFlo Database

2.9.3.4 Emerging Contaminants

The current resource consent does not include any requirement to understand the potential effects of emerging contaminants (EC's) on the receiving environment, the wastewater treatment process, or wider effects such as those relating to public health and cultural considerations. During the scoping phase of this nine-yearly Review, the topic of emerging contaminants was raised as being one of great interest to HDC. This is also aligned with moves within the wider wastewater sector in Aotearoa New Zealand to better understand the nature and distribution of emerging contaminants, their potential effects on WWTPs and network infrastructure, and how susceptible they are to removal from treated wastewater through treatment processes.

This section aims to provide a broad and high level understanding of these issues, as a first step towards the more in-depth investigations which are recommended in Section 7. A potential change to consent conditions is also raised in Section 4.

An initial round of monitoring for emerging contaminants in influent to the East Clive WWTP, treated wastewater (prior to discharge) and the marine receiving environment for the offshore outfall was commissioned by HDC in 2023. Laboratory analysis for the first round was completed by Northcott Research Consultants. Further rounds are required before any robust conclusions can be drawn (i.e. replication of monitoring to increase the statistical reliability of results). These further rounds are planned for 2024 and 2025, as indicated in Section 7. As such, commentary regarding results for the East Clive WWTP have not been included in this Review Report.

What are emerging contaminants (ECs)?

There are multiple definitions of emerging contaminants (ECs) or Emerging Organic Contaminants (EOCs) however a widely accepted definition from the United States Geological Survey (USGS) defines ECs as:

> *"…any synthetic or naturally occurring chemical or any microorganism that is not commonly monitored in the environment but has the potential to enter the environment and cause known or suspected adverse ecological and (or) human health effects. In some cases, environmental effect has likely occurred for a long time, but may not have been recognised until new detection methods were developed. In other cases, synthesis of new chemicals or changes in use and disposal of existing chemicals can create new sources of EOC's."* (USGS 2011, cited in Tremblay et al. 2011, p1)14.

ECs found in wastewater are typically active ingredients in multiple products and medications that are extensively used by humans. Others arise from industrial processes discharged into municipal wastewater schemes. There are a large number of known ECs (and potentially many more which have not yet been identified), which makes it difficult to identify and analyse all possible ECs existing in the environment. Analytical methods are also currently not available for some ECs or are still in their infancy (and therefore highly expensive and restricted to advanced research laboratories).

Plastics are ever-present in the environment and are another EC. Plastic waste can originate from different sources, and debris can be classified according to size into macroplastics, mesoplastics, microplastics, and nanoplastics. It is estimated microplastics make up approximately 92% of global plastic. Common sources include packaging, clothing and textiles, electronics, construction, and consumer electronics (Campos et al, 2023). Physical, chemical, and biological degradation and further physical abrasions result in these common products entering the system in smaller sizes (De Bhowmick et al, 2021).

How are ECs currently managed in Aotearoa New Zealand?

Physico-chemical contaminants are commonly monitored in New Zealand's aquatic environment, including freshwater and estuarine ecosystems, with the focus typically on well-established suites of trace metals, pesticides, and nutrients. There are extensive guidelines and management practices available for this type of monitoring. This means there is a national standard for chemical contaminant monitoring that can be followed so monitoring remains consistent across New Zealand.

Awareness of adverse effects from ECs has been increasing and they are being increasingly monitored in industrial, commercial, agricultural, and domestic settings. A 2019 Parliamentary Commissioner for the Environment (PCE) report identified a knowledge gap with respect to ECs as most EC data is collected in discrete studies, focusing on either a narrow snapshot of compounds, or a small geographical area.

The process of EC data collection and management of ECs is inconsistent across New Zealand. These inconsistencies mean there is no nationally recognised standard to develop EC monitoring plans from.

There are however, several guidelines that can be drawn from for guidance on monitoring and managing ECs in New Zealand. These include:

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

In addition, a report prepared by leading academics in 2017 advocated for councils to take a "tiered approach" to monitoring for ECs (Stewart et al. 2017). This includes:

- Tier 1: Identify key EC classes of concern through analysis of representative EC 'markers' at a large number of sites.
- Tier 2: Based on Tier 1 findings, refine EC classes and sites and undertake future monitoring only at those sites that are most highly impacted.
- Tier 3: Undertake further assessments of EC bioavailability and non-lethality effects for the refined EC's and sites only.

Currently, Cawthron Institute, Northcott Research Consultants, AsureQuality, and the Institute of Environmental Science and Research (ESR) are the major laboratories that analyse samples for ECs. They have developed robust and IANZ-certified techniques to test wastewater, leachate, and soil. Cawthron Institute, Northcott Research Consultants, ESR and Scion can also test for microplastics.

What ECs are typically found in domestic and industrial / trade waste wastewater?
Many ECs are used in a wide variety of products and applications including sunblock, household cleaning products, and personal medicines. The everyday use of such products means these ECs are ubiquitous contaminants. Examples of ECs commonly detected include pharmaceuticals; plasticisers; antimicrobials; corrosion inhibitors; flame retardants; surfactants; UV filters, steroid hormones; musk fragrances and perfluorinated alkyl substances (Stewart & Tremblay 2020).

These products enter wastewater through everyday activities such as laundry, bathing and toileting and treated wastewater is one of the major sources of ECs to the New Zealand environment. There are 9 classes of ECs commonly identified and found in wastewater in New Zealand. Each class has several different commonly associated compounds. These classes are:

- Alkyl phosphate flame retardants (11 compounds)
- Industrial alkylphenols (7 compounds)
- Insect repellents (3 compounds)
- Nitro- and polycyclic musk fragrances (11 compounds)
- Paraben preservatives (11 compounds)
- Pharmaceuticals (10 compounds)
- Phenolic antimicrobials (8 compounds)
- Phthalate esters and plasticisers (13 compounds)
- Steroid hormones (11 compounds)

Why is it important to understand and monitor ECs?
The presence of EC's in the environment has led to global concern due to the risk of adverse environmental and human health effects. There is a significant absence of data on the fate of ECs currently, but with increased awareness of the potential harm they cause, this is changing.

The environmental effects of ECs are important to consider as these chemicals can interact with other contaminants and environmental stressors. As a result, organisms (including humans) are exposed to complex mixtures of chemicals, often with increased potency, where the individual chemicals themselves may be present at concentrations too low to raise concern.

Some ECs are new, or recently developed compounds for modern products and applications, and some are the by-products of other chemicals released into the environment, which subsequently react or change into other compounds with more harmful effects. Rivers, coastal environments and soils act as a sink for these contaminants. The sink effect allows opportunity for bioaccumulation and biomagnification of some ECs by organisms.

Microplastics are common in wastewaters and land run-off, and enter aquatic environments, including freshwater and marine ecosystems. The constant fragmentation of plastics means that they are bioavailable to some of the smallest marine organisms, such as zooplankton, as well as megafauna such as marine mammals. Microplastics have been analysed in the following environments and substrates in New Zealand (De Bhowmick et al. 2021):

- Harbour / inlet / sheltered beach – sand, pebbles, fine to medium grain sediments.
- Exposed beaches – Coarse sand, pebbles and fine sediment
- Estuaries – medium and very fine sediment, rocks

In several New Zealand case studies described by De Bhowmick et al. (2021), microplastics were found to be most concentrated in locations near stormwater or wastewater outfalls, river mouths, industrial sites, recreational areas (such as public parks) and rocky beaches.

Microplastics are potentially harmful to wildlife and humans. Physical uptake can cause choking and blocked digestive tracts as biota mistake plastic particles for food due to their size and colour. Microplastics can also contain toxic substances such as flame retardants (a common EC). Microplastics therefore act as a vector for exposure to other ECs. The potential harmful effects of microplastics are understudied, making them a contaminant of emerging concern.

To what degree can WWTPs with treatment methods similar to those at East Clive remove ECs from influent?

Pending the results and further monitoring for ECs at East Clive WWTP, it is helpful to consider the research and experiences reported at Gisborne's WWTP which also has a BTF. The Wastewater Treatment Advisory Group for the Gisborne WWTP considered that reducing the amount of ECs in treated wastewater was "complementary to the principles of restoring the mauri" (Northcott 2017 in Shaw & Kanz 2017). A study commissioned by Gisborne District Council in 2017 found that the BTF "achieved greater than 95% reduction for most of the analysed [ECs]", and that most of the ECs monitored were reduced to 'acceptable levels' (Northcott, 2017).

2.9.4 Assessment of effects

Overall, it was found that the discharge via the offshore outfall has had **no discernible effects** since 2014 from those contaminants and parameters assessed. The majority of the effects assessed were determined to have a 'neutral' status, in that no positive or adverse changes were obvious as evident from the consent monitoring records evaluated. This includes both temporal and spatial changes.

2.10 Condition 27(j): Community Engagement

(j) *Details of consultation undertaken with the community to ascertain their views of the effects of the current wastewater discharge.*

This section summarises all community engagement activities undertaken in relation to this Review Report, and to satisfy the requirements of Condition 27(j). A detailed record of the activities (prepared by HDC's Marketing and Communications Team) is attached as Appendix D.

HDC undertook a public engagement exercise during 2023, culminating in a formal consultation period between Monday 31 October and Friday 24 November 2023. The engagement approach was primarily focused on creating an opportunity for the public regarding how their wastewater is collected, treated and discharged, with much of the material having a much longer life than just the consultation. Materials developed and released to the Hastings District community (and available to wider public) included:

- A printed flyer mailed out with HDC rates in October 2023 (and emailed to those ratepayers that receive rates via email)
- Updated information about the East Clive WWTP on HDC's website, including information about the role of the HDC-TWWWJC.
- 'Myvoicemychoice' page on HDC's website, with online forms to receive direct feedback about the WWTP and public perceptions about effects on the receiving environment from the discharge of treated wastewater into Hawke Bay.
- An infographic about the Hastings District wastewater system and animated explainer video on YouTube
- Two drop-in sessions at Waiaroha Water Discover Centre (Saturday 4 November (10am-12pm) and Sunday 12 November (10am-12pm)), advertised on local radio. Supported by information stands placed in Waiaroha, the HDC customer services area, the WWTP office (for the November 2023 open day) and at all three Hastings libraries.
- Radio advertising about the consultation on all NZME and MediaWorks stations from Sunday 30 October to Sunday 19 November
- The regular annual treatment plant open day was held on Saturday 18 November (within the consultation period). It usually runs from 10am-1pm. In 2023 it was extended from 10am-3pm and had a record number of 115 attendees.
- Print advertising
- Digital advertising on social media, provided by consultant FizzyPop.
- Formal media releases on the HDC website[84]
- HDC's Principal Advisor: Relationships, Responsiveness & Heritage assisted in disseminating targeted communications to various iwi/hapū groups across Hawke's Bay. The advisor also shared information via email and in person at a stormwater Resource Consent project group hui. Positive feedback was received on 'Te Whare o Whiro' – a proposed te reo Māori name for the treatment plant. This name reflects the functions of the WWTP and the Atua that are involved in the treatment process. The BTFs can be seen as representations of Whiro, a personified form of "the wero, difficulties, evil and sickness"[85], however this representation and interpretation of Whiro may vary between hapū and whānau. The possibility of gifting a reo Māori name to the WWTP has emerged organically through many years of discussions between Tangata Whenua and HDC, and the discussion is ongoing.

[84] - https://www.hastingsdc.govt.nz/our-council/news/article/2952/successful-wastewater-treatment-plant-open-day?t=featured&s=2
- https://www.hastingsdc.govt.nz/our-council/news/article/2932/feedback-wanted-on-wastewater-treatment-plant

[85] Kauwhata Reo 2024 'Explore Atua: Whiro', New Zealand Ministry of Education, accessed online at https://kauwhatareo.govt.nz/en/atua/show/10/, 12 May 2024.

Overall, 55 responses were received through HDC's website between (and inclusive of) 28 October 2023 and 28 November 2023. Of these responses:

- Two were received from business owners connected to the Separable Industrial system (and these respondees did not answer some of the subsequent questions as they were not always applicable)
- Eight responses were received from respondents residing outside of the Hawke's Bay region
- Four respondents identified themselves as being Tangata Whenua in Hastings
- "Treating wastewater to an even higher standard" was the most frequent response to the question "What do you think should be the highest priority for the wastewater treatment plant over the next nine years? (This is how often the Resource Consent for the facility is reviewed)" (35% of respondents). However, this question also elicited a wide range of "Other" responses from 25% of respondents.
- 40% (21) of respondents said that they would not be comfortable collecting kaimoana along the coastline or where our treated wastewater is discharged into the ocean. 31% of respondents indicated that they may collect kaimoana, but would need to understand more about the water quality.
- 38% of respondents indicated they would be happy to engage in recreational activities (swimming, boating etc.) along the coastline or where our treated wastewater is discharged into the ocean; 28% would not, and 28% said they would need to understand more about the water quality.

Additionally, Health New Zealand | Te Whatu Ora submitted a letter (dated 22 November 2023) in response to HDC's public call for submissions regarding the 'scheduled nine-year review for the East Clive wastewater treatment plant'. They provided detailed comments regarding the health and wellbeing considerations relevant to the review as follows:

Te Whatu Ora strongly suggests that the highest priority over the next nine years for wastewater treatment in the Hastings District is to implement a tertiary treatment process (such as tertiary disinfection for example) that reduces the pathogenic loading of discharge from the East Clive treatment plant.

This is important to reduce the discharge of pathogens that can be maintained in the sea environment and can result in human illness through collection and consumption of contaminated kaimoana (such as shellfish). Such processes have been successfully implemented in other parts of New Zealand.

Taking all practical steps to reduce the environmental and human health impact of waste water treatment discharges is of.paramount importance in the Hawke's Bay context, where gathering of kaimoana (including shellfish) remains a significant source of food and an important recreational activity that supports the health and wellbeing of our communities. We also acknowledge the importance of managing these resources in partnership with Tangata Whenua given the cultural significance of kaimoana as a traditional food source.

Testing requirements under consent conditions for the Hastings Wastewater Treatment Plant discharge, and discharge area, are only for faecal coliforms and Escherichia coli. Although these are recognised as indicator organisms, they have no correlation to other potential pathogens that may remain in the effluent/discharge.

Recent testing of five mussel beds in Hawke's Bay (24/10/2023) undertaken by the Napier City Council, has shown that all mussel samples contain Norovirus.

Te Whatu Ora Hawke's Bay has identified 13 institutional outbreaks during 2023 in our region confirmed as being Norovirus, with a further 17 outbreaks more than likely attributed to Norovirus. It is not suggested that the discharge from the treatment plants are the cause of these outbreaks. However, it is suggested that discharge not treated through a tertiary disinfection stage (such as tertiary UV disinfection for example) is one potential pathway by which shellfish beds can become contaminated with viruses of human health concern (such as Norovirus).

Given that this feedback was received during the public consultation period, it has been included in this Review Report. It is acknowledged that consent-based monitoring is reliant on faecal indicator organisms to detect potential pathogenic contamination in the receiving environment, and that this approach has its limitations. However, the comments regarding the pathogenic loading of the discharge from the East Clive WWTP and in particular the potential for norovirus to be

present do not align with the findings of the assessment of effects on public health presented in Section 2.9 of this Review Report. This includes a nine-year trend of low to moderate levels of faecal coliforms detected within 100 metres of the offshore outfall (further analysis is presented in Section 2.9.3.2).

The concerns raised in the letter from Health New Zealand | Te Whatu Ora further demonstrate the need to revise the PHRA prepared in 2012 on the basis of the updated wastewater flows and loads estimates presented in this Review Report. The revised PHRA can then be used to determine whether the level of risk to public health is likely to change prior to 2049, and if so, what actions must be taken to mitigate the risk to current levels (or lower). In addition, HDC intends to discuss decision-making processes regarding risks to public health with Health New Zealand | Te Whatu Ora in order to determine how the discharges and potential associated risks can be managed into the future. These recommendations have been included in Section 7 of this Review Report.

3 Best Practicable Option Assessment

Consideration of the existing Project objectives used in developing the existing Resource Consent there maybe opportunities for improvement of the Best Practicable Option (BPO) in terms of the interpretation of this term in the Resource Management Act 1991.

3.1 Overall approach

The approach for the Best Practicable Option (BPO) Assessment encompasses two assessments as follows:

- **BPO Interpretation:** The assessment of the current Hastings Wastewater Scheme, in terms of the components of the BPO as interpreted in the RMA and the Hawke's Bay Regional Coastal Environment Plan (RCEP). At the time of 2013 AEE, the current scheme was considered to be the BPO.
- **Project Objectives:** The assessment of the current Hastings Wastewater Scheme against the 2013 AEE project objectives, with the focus on assessing how well the scheme meets the project objectives, and the opportunities for improvement

3.2 BPO definitions

Multiple definitions of the term 'BPO' exist, including in national legislation; in regional planning documents, and at a project level. This section provides context regarding those definitions applying to the Hastings Wastewater Scheme, and describes how they were applied in the assessment completed for this Review.

3.2.1 RMA 1991

The definition of the Best Practicable Option (BPO) as per the RMA 1991 is:
***best practicable option**, in relation to a discharge of a contaminant or an emission of noise, means the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to—*
(a) the nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and
(b) the financial implications, and the effects on the environment, of that option when compared with other options; and
(c) the current state of technical knowledge and the likelihood that the option can be successfully applied.

The 2013 AEE and application documents for the then-new consents set out an extensive set of project vision and a clearly defined set of Project objectives as outlined in Section 7.2.3 below. A key overall objective is that *"The Scheme shall be the Best Practicable Option (BPO) (in terms of the RMA definition) for Hastings future wastewater management that is in keeping with sustainable management principles and practices*".

This Review used the following approach to assess the Hastings Wastewater Scheme against the BPO as defined in the RMA:

- Distil the definition of the RMA definition into its component parts,
- Assess the current Hastings Wastewater Scheme against the component parts of the RMA definition,
- Identify opportunities for improvement to the current BPO scheme in terms of enhancing it from a BPO perspective, and
- Recommend future approaches in terms of how the scheme would best fit a BPO solution.

This generally reflects the approach taken previously in 2013.

3.2.2 Hawke's Bay RCEP

The provisions of this plan under Chapter 16, Discharge of Contaminants into the Coastal Marine Area (CMA) set out a number of objectives and policies that incorporate a BPO approach. These are:

- Policy 16.1, Table 16.1 – Discharge of contaminants in CMA, Issue 3 Sewage discharges, item (i) "*the disposal of sewage directly into the coastal marine area is the best practicable option*"
- Chapter 29 – Administration Matters, item (a) "Requiring the holder of a discharge permit to adopt the best practicable option to remove or reduce any adverse effect on the environment"
- Policy 47A - Decision making criteria, Land-based disposal of contaminants, item (b) "any disposal of wastewater, solid waste or other waste products to a surface waterbody or coastal water occurs only when it is the best practicable option".

3.2.3 2013 Project Objectives

The project vision and project objectives identified in the 2013 AEE and set out in Table 3-3 below were developed after extensive consultation and deliberations by the HDC-TWWWJC prior to lodging the consent applications. Section 2.2 "Project Vision and Objectives" of the 2013 AEE set out the key considerations that fed into developing the vision and objectives, and then listed:

- the vision,
- the overall project objective,
- the purpose of local government
- the four wellbeing objectives
  - environmental
  - social
  - economic
  - Tangata Whenua (cultural)
- technical objectives

In determining the Project Vision and Objectives, a set of key considerations were first developed as set out in Section 2.2 of the 2013 AEE.

In summary these included:

- HDC's responsibilities under the purpose of the Local Government Act (LGA) 2002;
- HDC's need to work in partnership with the Community and Tangata Whenua;
- The proposed scheme and consents achieving high level of public health protection;
- The proposed scheme and consents represent a Best Practicable Option (BPO) approach according to the RMA definition;
- Achieving practical resource consent condition;
- Option selected is serviceable, easily operational and economically affordable; and
- Treated wastewater has no more than minor effects on the receiving marine environment.

3.3 Assessment of current Hastings Wastewater Scheme against BPO Definitions, Project Vision and Objectives

This assessment of the current Hastings Wastewater Scheme is first presented in two tables as follows:

- Table 3-1 assesses the scheme against the RMA definition of the BPO

- Table 3-2 assesses the scheme against the Hawke's Bay RCEP

Each of these tables summarises how the current scheme meets the individual BPO criteria, identifies opportunities for improvements and makes any recommendations for the future approach.
For the final aspect of the BPO assessment, Table 3-3 summarises how well (or otherwise) the 2013 Project Objectives are being met by the East Clive wastewater treatment and discharge system.

Table 3-1: Assessment of the current Hastings Wastewater Scheme against the RMA definition of the BPO

Evaluation Criteria from BPO definition	Current Hastings Wastewater Scheme Assessment against BPO	Opportunities for Improvement to the current BPO Scheme	Recommendation of Future Approach
Best Method "Best practicable option, in relation to a discharge of a contaminant or an emission of noise, means the best method for preventing or minimising the adverse effects on the environment having regard, among other things"	The 2013 AEE Section 4.8 and especially Component 6 Sustainable Management Approaches sets out how at the time of consenting the scheme in 2013 it was considered a BPO approach. The last nine years of scheme operation and further development has confirmed this although there has been limited progress in reuse of appropriately treated wastewater by industry and no advancement in other uses of treated domestic or industry wastewater (Section 2.8 Condition 27h covers this). This is still considered the BPO solution when all factors are taken into account.	In terms of other asset management advances (refer Section 2.5 Condition 27e) and with a low carbon footprint scheme these factors further add to the assessment of this currently being a BPO Solution. Notwithstanding the current scheme to still be considered a BPO, ongoing periodic review incorporating a strategic planning approach, will ensure any appropriate measures are undertaken in the future to ensure it continues to be a BPO.	Address appropriate matters in future 9 yearly reviews or separately undertake if circumstances require to ensure it continues to be BPO. This approach is to be inline with the strategic planning approach.
Receiving Environment Sensitivity "(a) the nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and"	As set out in the summary of the effects assessment section (Section 2.9 Condition 27*i*) no discernible effects have been found outside the consented mixing zone associated with the discharge via offshore outfall since 2014. Majority of effects assessed were determined to have 'neutral' status, in that no positive or adverse changes, including spatial and temporal changes, are obvious from the monitoring records.	The assessment of annual reports used in the overall effects assessment as part of this review has identified some areas for improvement, which are detailed in Section 2.9.6 and primarily relate to monitoring and reporting of results.	Review adoption of the recommendations.
Financial Implications & Effects on the Environment "(b) the financial implications, and the effects on the environment, of that	Financial Implications The BTF treatment arrangement for the DNSI treatment, while originally estimated to be similar in capital costs as the earlier consented natural settling (primary treatment), the savings in annual operating costs particularly in terms of energy costs and no sludge disposal/reuse costs, highlights the very favourable financial implications of this	Any future proposed upgrades to the BTF / DNSI system would result in a less affordable scheme for the community. Table 6-2 of the 2013 AEE sets out an indicative and comparative ratepayer cost per property for the six alternative treatment upgrades to the BTF system that were then considered. These costs when converted to	The nine year review and adoption of a strategic planning approach should periodically assess this matter.

Evaluation Criteria from BPO definition	Current Hastings Wastewater Scheme Assessment against BPO	Opportunities for Improvement to the current BPO Scheme	Recommendation of Future Approach
option when compared with other options; and"	option compared to others. This is particularly the case in comparison to a conventional secondary treatment activated sludge plant. Refer Section 2.5.6 and Condition 27e generally. The approach of HDC requiring industry to (pre)treat their waste streams to councils' requirements, as set out in the specific industry agreements, is considered to be a cost efficient approach for industry compared to the Hastings Wastewater Scheme undertaking the whole range of necessary industrial (pre)treatment. The split system arrangements, including treatment, conveyance and offshore ocean outfall, are considered to be low energy compared to most if not all other infrastructure arrangements achieving the same degree of treatment and similar position with regards to environmental effects.	present day would be a significant increase in property rates. More stringent requirements on (pre)treatment for discharges to the separable industry system would represent greater cost for industry. As highlighted in the effects assessment, such an approach does not appear necessary, although if individual contaminants need greater control, such measures should be put in place from an environmental effects point of view.	
Technical Knowledge "(c) *the current state of technical knowledge and the likelihood that the option can be successfully applied."*	The BTFs, installed in 2009, were still relatively new when the 2013 consents where issued. Following Hastings there is now the same/similar technology in Napier, Gisborne and Greymouth, and a plant in Spain that adopted the Hastings then proposed approach. If so it is considered well-proven, successful and most cost efficient. It is currently being considered as one of the two options for Hokitika. It has been subject to a number of technical papers and winner of industry awards so while previously it was considered a new and innovative approach, it is now considered to be well proven and very successfully applied.	There are a number of proven upgrades or enhancements that could be added to the BTF system, should in the future one or more of these be required. Refer Section 2.6 – 27f.	The nine year review and adoption of a strategic planning approach should periodically assess this matter.

Table 3-2: Assessment of the current Hastings Wastewater Scheme against the BPO as described in the Hawke's Bay RCEP

Evaluation Criteria from HBRCEP	Current Hastings Wastewater Scheme Assessment against HBRCEP	Opportunities for Improvement to the current BPO Scheme to meet HBRCEP	Recommendation of Future Approach
Policy 16.1, Table 16.1 – Discharge of contaminants to the CMA, Issue 3 Sewage discharges, item (i) "*the disposal of sewage directly into the coastal marine area is the best practicable option*"	Refer Table 3-1 above in respect to the current scheme well meeting all parts of the BPO definition as per the RMA. In terms of a full land application system this has been previously considered and not found appropriate. There remains however options for at least partial land application at certain times. Refer Section 2.8 – Condition 27h.	Notwithstanding that the current scheme is considered the BPO, there are opportunities to reduce the discharge to the CMA through the outfall as set out in Section 2.8 – Condition 27h.	The nine year review and adoption of the strategic planning approach should periodically assess this matter.
Chapter 29 – Administration Matters, item (a) *"Requiring the holder of a discharge permit to adopt the best practicable option to remove or reduce any adverse effect on the environment"*	Refer Table 3-1 above in respect to the Receiving Environment Sensitivity as part of the BPO definition.	Refer above in respect to the opportunities for improvement.	The nine year review and adoption of the strategic planning approach should periodically assess this matter.
Policy 47A - Decision making criteria, Land-based disposal, item (b) *"any disposal of wastewater, solid waste or other waste products to a surface waterbody or coastal water occurs only when it is the best practicable option"*	As set out in Table 3-1 and sections of this review report supporting the current scheme with discharge to coastal water being the BPO. However if a proportion, or even the total discharge was in the future to go to land, the policy would need reassessment.	Only relevant if there is a move away from the current discharge to coastal water being deemed to be the BPO.	The nine year review and adoption of the strategic planning approach should periodically assess this matter.

Table 3-3: Assessment of current Hastings Wastewater Scheme against project objectives as described in the 2013 AEE

Vision and Objectives	Overview Assessment (this review)	Future Opportunities to better meet the Project Objectives	Recommendation of Future Approach to meet project objectives
Project Vision: Ensuring Hastings Wastewater Scheme is compatible with and fosters Hastings District Council's Vision of "Great living for a sustainable future."			
1. Overall Project Objectives			
1.1 To work consultatively with local hapu and iwi, the community and key stakeholders to achieve a good understanding of this Project, so as to enable genuine and effective consultation.	Achieved through HDC-TWWWJC activities, WWTP open days, Condition 27(f) activities and other HDC actions, including school visits, annual WWTP open days, media comment and website inclusion of the Annual Reports.	The appropriateness and effectiveness of current activities needs to be confirmed through direct dialogue with Tangata Whenua representatives of the HDC-TWWWJC. Additional activities could be implemented if they are identified as being required.	As existing.
1.2 To work in partnership with the community and Tangata Whenua to obtain the necessary long term resource consents for the Hastings Wastewater Scheme. The Scheme shall encompass a high level of public health and environmental protection, and the treatment processes shall significantly remove the offensiveness of human waste.	In obtaining the 35 year (i.e. long term) consents in 2012-13, HDC worked closely with the community, industry and Tangata Whenua. The scheme then applied for consent which, as continues today, achieves a high degree of public health and environmental protection and the treatment processes are deemed to significantly remove the offensiveness of human waste. Refer Section 2.6.6, Section 2.7 and Section 5 of this review report.	Nine yearly reviews to address any matters.	Nine yearly reviews to address any matters that may need addressing.
1.3 The Scheme shall be the Best Practicable Option (BPO) (in terms of the RMA definition) for Hasting's future wastewater management that is in keeping with sustainable management principles and practices.	Refer Table 3-1, covering various parts of the RMA definition of the BPO.	Refer Table 3-1, covering various parts of the RMA definition of the BPO.	Refer Table 3-1, covering various parts of the RMA definition of the BPO.
1.4 The Scheme meets the current and future needs of the Hastings communities and businesses for good quality local	In overview the history of the last nine years and the current system well achieves this overall objective. In terms of cost effectiveness both domestic charges	The BTFs in the DNSI have significant spare capacity for the future needs of hastings community and business for some time yet,	Servicing increased community and business growth to be periodically

Vision and Objectives	Overview Assessment (this review)	Future Opportunities to better meet the Project Objectives	Recommendation of Future Approach to meet project objectives
infrastructure, local public services, the performance of regulatory functions that is most cost effective for households and businesses	to industry compare favourably in terms of the range of NZ local authority charges. Refer to Financial Implications in Table 3-1.	as is evidenced by the $cBOD_5$ loading consented limit verse the lower loading currently being applied. The hydraulics of both systems also provide some capacity for future growth. New offshore outfall pumps being considered will further improve the level of spare capacity for the future in terms of the offshore outfall discharge volumes.	reviewed (e.g. through nine-yearly reviews).
2. Purposes of local government – amended section 10, Local Government Act 2002			
2.1 The Council is required to give effect to the purpose of local government as prescribed by Section 10 of the Local Government Act 2002. The project will achieve that purpose.	Current scheme considered to meet these objectives.	Scheme considered to well meet the purposes of local government.	Ensure nine year periodic review checks the compliance with the Local Government Act and that measures are built into a strategic planning approach.
2.2 The project will meet the current and future needs of the Hastings urban residential and business communities for good quality local infrastructure and local public services in a manner that is most cost effective for households and businesses.	Refer item 1.4 above, and Financial Implications in Table 3-1.	Scheme considered to well meet the needs of urban residential and business communities.	Also ensure nine year periodic review checks the current and future wastewater needs of the urban and business communities, and that measures are built into a strategic planning approach.
2.3 The project will be “good quality” as the project’s infrastructure, services and performance are expected to be efficient	The BTF treatment system, being relatively new still, is by and large good quality and achieves the necessary level of service and performance.	Proactive asset management and appropriate operating techniques.	Proactive asset management and appropriate operating techniques.

Vision and Objectives	Overview Assessment (this review)	Future Opportunities to better meet the Project Objectives	Recommendation of Future Approach to meet project objectives
and effective and appropriate to present and anticipated future circumstances.	The conveyance pipelines to the East Clive WWTP are older than the BTF system and a combination of operating techniques and replacement through the asset management plan process are necessary to achieve a relatively good overall quality of this infrastructure.		
3. Well-being Objectives - Environmental			
3.1 To protect the natural environment and in particular the overall qualities of Hawke Bay and ensure these are not compromised.	Refer to section of Table 3-1 covering Receiving Environment Sensitivity.	Monitoring, reporting and consent conditions as per Receiving Environment Sensitivity sections of Table 3-1.	Monitoring, reporting and consent conditions as per Receiving Environment Sensitivity sections of Table 3-1.
3.2 To ensure a high level of compliance with recreational, ecological and water quality standards and guidelines, and Regional and District Planning requirements.	Section 2.7 Condition 27(g) covers the results of recreational usage survey. Section 2.9 Condition 27(i) covers the compliance with ecological and water quality and Regional and District planning requirements are on overall there is a high degree of compliance.	Monitoring, reporting and consent conditions as per Receiving Environment Sensitivity sections of Table 3-1.	Monitoring, reporting and consent conditions as per Receiving Environment Sensitivity sections of Table 3-1.
3.3 To promote the efficient use and development of natural and physical resources, and if appropriate the sustainable reuse of wastewater products.	The existing scheme is considered to well promote efficient use and development of natural and physical resources. Physical resources includes the existing infrastructure. There is a relatively little sustainable reuse of wastewater products and industry and none by HDC. Section 2.8 – 27(h) covers the background to this and future options available in some depth.	• Consider climate change and its impacts on the WWTP, particularly coastal erosion and sea level rise, which have the greatest relevance to the East Clive WWTP. • Undertake regular monitoring of asset management procedures (as outlined in the AMP) against the consent requirements.	Follow Councils asset management plan requirements and incorporate these opportunities into the strategic planning approach..

Vision and Objectives	Overview Assessment (this review)	Future Opportunities to better meet the Project Objectives	Recommendation of Future Approach to meet project objectives
		• Bring forward into the annual monitoring report a sustainability section, including water conservation matters. • Implement beneficial reuse of the waste streams for either one or both of the council schemes (i.e. DNSI or Separable Industrial system)	
3.4 To minimise energy use and the emission of greenhouse gases as far as is practicable.	The WWTP arrangements and conveyance and offshore outfall are considered to be low energy and low greenhouse gas emission schemes, compared to most if not all other local authority wastewater infrastructure arrangements achieving the same degree of treatment. The exception to this may be land application schemes discharging to native or exotic forests. Section 2.5 – 27(e) relating to Asset Management covers both these topics and includes reference to Section 4.5.7 of the 2013 AEE which shows the low energy use compared with other treatment processes in terms of energy usage.	• Ensure an ongoing investigation into sustainable and efficient practices for the scheme. • Going forward undertake an energy audit and operational carbon footprint as part of the ongoing nine yearly reviews. •	Include in the nine year periodic review energy assessments and green house gas emissions / carbon foot printing.
4. Well-being Objectives - Social			
4.1 To ensure that the Hastings Wastewater Scheme achieves the greatest practicable protection of public health.	Public health protection as afforded by the resource consent conditions is well achieved. Disinfection of the treatment domestic stream discharge, and/or the industrial / trade waste discharges could be achieved with proven UV technology if proven required. The annual monitoring and environment effects assessment does not indicate that this is required at this stage.	Additional industrial / trade waste wastewater (pre)treatment on-site, attention to cleaner production and waste minimisation of some specific industries may achieve greater protection of public health, although currently there is not considered to be any substantial issues in terms of public health protection.	Ensure that the annual monitoring sufficiently addresses any public health protection. Revisit in future nine yearly reviews and as recommended in Section 7 of this Review Report.

Vision and Objectives	Overview Assessment (this review)	Future Opportunities to better meet the Project Objectives	Recommendation of Future Approach to meet project objectives
	Refer Section 2.6 Condition 27(f) regarding UV disinfection treatment technology and Section 2.9 condition 27(i) relating to the effects assessment. The implementation of such UV disinfection technology or other treatment processes would substantially add to the WWTP capital and operating costs. This would probably result in the then expanded scheme not being considered a BPO solution (infrastructure-wise) if such infrastructure was not required.		
4.2 To provide a suitable wastewater system which will maximise the uptake of the services provided to the residential and business communities	The Hastings Wastewater Scheme, and both the DNSI and Separable Industrial systems have certain provisions for maximising the uptake of the services. Section 6 of the Councils Asset Management Plan covers "Future Growth and Demand". It sets out the factors that influence demand growth assumptions and growth trends. Sections 2.1 and 2.2 of this Review Report update such trends through to 2049, the expiry date of the current discharge consent. In terms of HDCs WWTP infrastructure for both the domestic and industrial / trade waste streams the use of modular approaches to the key treatment units well facilitates a cost affordable approach to growth over time.	Closer monitoring of growth versus growth projections in terms of the wastewater infrastructure capacity.	Include in nine year review and furthermore at times of council reassessing its growth projections and at the time of national census.
5. Well-being Objectives - Economic			
5.1 To provide an economically sustainable future Hastings Wastewater	Refer to Financial Implications in Table 3-1.	The current scheme is considered to meet this project objective well.	Refer to Financial Implications in Table 3-1.

Vision and Objectives	Overview Assessment (this review)	Future Opportunities to better meet the Project Objectives	Recommendation of Future Approach to meet project objectives
Scheme which will match the anticipated growth in the area, - i.e. affordable for both the existing and growth communities and businesses now and in the future.	The existing systems for both the DNSI and Separable Industrial streams is considered in both cases to be particularly affordable as compared to other options for both waste streams.		
5.2 To ensure the optimum economic use of the existing infrastructure including the Biological Trickling Filter Wastewater Treatment Plant.	It is considered that optimum economic use is made of infrastructure particularly the BTFs. This can be assessed in terms of the key design parameter for the BTF's namely the $cBOD_5$ loading represented as the kg/BOD m^3 median/day as an annual average. The consent limit is 0.4 the design limit was 0.3 and the last annual report (2021-22) yielded an actual figure of 0.019.This shows capacity is still available in the BTF system before expansion is needed from a capacity view point. Redundancy considerations currently being undertaken may well indicate alternative approaches (refer Section 2.5 Condition 27e).	Significant spare capacity available in the BTFs but awaiting redundancy considerations which are currently being carried out. See Section 2.5.7 on redundancy.	Practice proactive risk management, and considerations for redundancy, including through the strategic planning approach.
5.3 To promote outcomes that ensure sufficient flexibility to adopt appropriate technology and more sustainable solutions in the future, including treated wastewater reuse, where they provide more effective solutions.	In 2013 when applying for the necessary resource consents and defining the scheme then proposed as being the DNSI and Separable Industrial / trade waste solutions, extensive investigations were undertaken on alternative options focussing extensively on upgrades to the BTF and additional on site industrial (pre)treatment approaches.	Develop beneficial reuse concepts to be taken forward to meet the sustainability approach, and to be implemented when it is practical and economic to do so.	Such a future opportunities approach could be included in future HDC Policies and Plans such as the Asset Management Plan and the Eco District Strategy. This would be consistent with the strategic planning approach.
5.4 To apply appropriate technology that will protect public health and meet environmental standards and Tangata	This objective overlaps with a number of other objectives in terms of cost affordable technology at lowest costs while meeting public health,	Current scheme considered to meet this objective well.	Addressed in the nine yearly reviews and the

Vision and Objectives	Overview Assessment (this review)	Future Opportunities to better meet the Project Objectives	Recommendation of Future Approach to meet project objectives
Whenua and community aspirations while achieving lowest whole of life costs.	environmental, community and Tangata Whenua values. Overall it is considered the scheme meets these requirements well although it has not been tested out, if lesser treatment requirements having less costs would still meet the range of requirements as above, especially in terms of environmental effects, growth, provision of services and other factors.		strategic planning approach.
5.5 To meet all current and future requirements in a way that is most cost-effective for households and businesses.	Refer to Financial Implications in Table 3-1. This overlaps with the fourth Overall Project Objectives as set out above in terms of "being most cost effective". It also overlaps with the question of energy use, this being one of the sustainable ongoing operating costs. Taken in overall context and comparison with other approaches to both domestic and under trial wastewater treatment and discharge it is considered that the scheme does meet the cost effectiveness objectives well. Presently unknown future requirements need mechanism to ensure they are addressed at an appropriate time.	Develop a strategic planning approach incorporated into the nine yearly review, and where required one-off reviews as may be required. This for example could include changing legislation and environmental standards – Three Waters Management reform.	Develop proactive approach to future requirements that might arise and incorporate in the strategic planning approach.
6. Well-being Objectives – Tangata Whenua (Cultural)			
6.1 To recognise and provide for the rangatiratanga that Māori (local hapu and iwi) have as Tangata Whenua.	It is not appropriate for Stantec to undertake an assessment of this matter. It is anticipated that the forthcoming Cultural Impact Assessment and associated engagement with Tangata Whenua will consider how well this objective has been met by the Hastings Wastewater Scheme, and identify any opportunities for future improvement.		

Vision and Objectives	Overview Assessment (this review)	Future Opportunities to better meet the Project Objectives	Recommendation of Future Approach to meet project objectives
6.2 To ensure the HDC-TWWWJC undertakes its functions (as set out in condition No. 29 of the current consent) in a proactive and meaningful way. 6.3 To work in partnership with Tangata Whenua to share knowledge and achieve a good understanding of this Project, so as to enable genuine and effective consultation. 6.4 To carry out, where appropriate, activities and consultation in alignment with tikanga Māori.			
7. Technical Objectives			
7.1 Ensure that the Hastings Wastewater Scheme is readily serviceable, operational and economically affordable for the Hastings Community and its businesses.	Overall this is considered to be achieved. Refer to Section 2.5 Condition 27(e) in terms of proactive operational asset management matters and above objectives relating to affordability and cost effectiveness being achieved.	Update Wastewater Facility Manual reflecting current efficient operational matters that have been developed over the last nine years.	Update Wastewater Facility Manual and incorporate operational matters into the strategic planning approach..
7.2 To promote outcomes that ensure sufficient flexibility to adopt new appropriate technology and more sustainable solutions in the future, including treated wastewater reuse where that provides more effective solutions.	Section 2.5, Condition 27(e) outlines new and changed asset management procedures. Section 2.6, Condition 27(f) reviews additional technologies that could be applied. Section 2.8, Condition 27(h) traverses a wide range of treated wastewater disposal/discharge and beneficial reuse technologies that could be implemented if various factors so lead to this.	Consideration of the overview assessment matters, should there be opportunity to provide further flexibility, as per the objective.	Ensure covered by nine yearly reviews and the strategic planning approach.

Vision and Objectives	Overview Assessment (this review)	Future Opportunities to better meet the Project Objectives	Recommendation of Future Approach to meet project objectives
	For any such procedures included in the above references, to provide more effective solutions than currently, they would need to achieve • Reduction of (any) adverse environmental effects from the treated wastewater discharge into the marine environment • Provision of a more sustainable operating technique • Removal or at least mitigation of an activity that is causing the cultural/spiritual adverse effects on Tangata Whenua • A more affordable solution for the community and/or industrial / trade waste wastewater dischargers • New technology that is proven, appropriate and affordable to replace current technology • Other possible drivers		
7.3 To provide a Scheme that can be maintained and operated to best practice standards.	Ongoing operating experience and modifications some of which are aimed at more sustainable solutions are set out in Table 2-16 and Table 2-18. These relate to significant changes in management and operation and sustainability and efficiency actions. These highlight in a general way that best practice is considered to be typically achieved. This position is further emphasised by the wide range of management and operating maters in	Proactive operation and asset management consistent with developments in this general field.	Ensure included in the nine year reviews and the strategic planning approach.

Vision and Objectives	Overview Assessment (this review)	Future Opportunities to better meet the Project Objectives	Recommendation of Future Approach to meet project objectives
	HDC's extensive Wastewater Asset Management Plan dated February 2021.		
7.4 To ensure good-quality infrastructure that is efficient, effective and appropriate to present and anticipated future circumstances.	Refer above to Overall Objective and Technical Objective categories of this table.	Refer above to Overall Objective and Technical Objective categories of this table.	Refer above to Overall Objective and Technical Objective categories of this table.

3.4 BPO Assessment Outcome

The assessment undertaken in this section brings out the following matters that are of direct relevance in considering the current Hastings Wastewater Scheme in terms of meeting the 2013 project objectives and being a BPO solution:

- Overall, many of the objectives are still well aligned to the BPO interpretation. This is highlighted by the focus of a number of the objectives on the "best method for preventing or minimising adverse effects" on the environment. This is particularly so when the environment (as defined in the RMA) includes the social, cultural, economic and built environment as well as the natural marine and air environments to which treated wastewater and air discharge are made.
- The strong focus on technical matters on a number of the objectives ensuring proven, up to date, efficient and effective technologies are used. This aligns well with the current scheme being a BPO.
- A number of the objectives referencing economics, lowest whole of life costs, and cost effective for households and businesses, and therefore overall affordability.

From the above, it is concluded that the 2013 AEE Objectives are well met by the current scheme and approvals and processes associated with achieving them complements the assessment of the current scheme being the BPO scheme in terms of:

- The interpretation of the BPO as per the RMA
- The requirements of the Hawke's Bay RCEP relating to application of a BPO approach

It is noted that the above assessment and conclusions are based on all information reviewed, **excluding** a Cultural Impact Assessment that is still pending and will be completed after this Review Report is submitted to HBRC. Therefore, the findings presented here do not take into account whether cultural objectives were adequately met.

There are, notwithstanding the above assessment, a number of improvements that have been identified as per Table 3-1 through Table 3-3:

- Adopt a strategic planning approach which would also inform ongoing reviews of the scheme in accordance with the requirements of resource consent Condition 27 and the nine yearly reviews. This approach could include milestones and actions such as:
  - Undertaking at a relatively early date a carbon footprint and greenhouse gas emissions assessment, and comparing the findings with those for other WWTPs, statutory requirements and non-statutory guidelines.
  - Undertake periodic energy efficiency audits.
  - Assessing the financial implications of any significant additions in infrastructure requirements or more stringent standards for treated wastewater discharge – either for the DNSI and/or the industrial / trade waste dischargers using the separate industrial system.
  - Periodically reviewing the requirements for industrial / trade waste wastewater dischargers in terms of consent compliance and effects on the receiving environment.
  - Assessing any potential future upgrades for the Hastings Wastewater Scheme against the project objectives and the BPO criteria, in terms of the RMA and the Hawke's Bay RCEP. Any future changes or reforms to the RMA could have an impact on how this is undertaken, and will need to be considered in future 9-yearly reviews.
- Seek variations to the respective resource consent monitoring and reporting conditions as outlined in Table 4-1.

In terms of project objectives going forward, the six objectives of the Three Waters Strategic Themes overview could also be included in the future reviews of the Hastings Wastewater Scheme. Those objectives are detailed in Section 2.5.1.1 of this Review Report. Furthermore, the objectives could be reviewed (and revised where appropriate) in future at the discretion of the HDC-TWWWJC. Such a change could be undertaken in response to changes in legislative or policy requirements, or where it is determined that another assessment of the BPO is necessary (for example, if performance of the Hastings Wastewater System becomes unsatisfactory). There is also scope for the objectives and

BPO criteria to be re-examined and changed where necessary for the next 9-yearly Review (2032) based on the findings of the cultural assessment being completed in 2024.

The output of this section, as summarised above, forms the basis of the recommendations as set out in Section 7.

4 Resource Consent Conditions

This section provides an overview of the current status of the consent conditions from HDC's perspective, including whether any of the conditions have become redundant / defunct due to the age of the project and other changes in the past nine years. While a review of consent conditions is not explicitly required by Condition 27, it is nevertheless a useful exercise and the process of preparing this Review Report has allowed for a critical assessment of the 'status quo' and identification of opportunities for improvement.

HDC welcomes any opportunity to amend the consent where appropriate, if such amendments are agreeable to the HDC-TWWWJC and HBRC.

In order to inform further discussions regarding the consent conditions, and a potential future application to vary the consent under Section 127 of the RMA, a list of changes has been compiled for consideration. It is noted that HDC has been internally reviewing the appropriateness of the current consent conditions since 2018. A proposal to change selected conditions was discussed with HBRC in 2019 but never finalised. Some of the changes identified in that original assessment are now reflected here. Other changes or recommendations have been drawn from HDC and the author's collective experience in preparing annual compliance reports for the consent, and from operational history of the Hastings Wastewater Scheme. Any conditions not listed in Table 4-1 were deemed not to require further review or amendment.
Each condition listed in the table has been assigned a status, as follows:

- **'Defunct'** – The condition is no longer relevant or applicable.
- **'Review'** – A change in the condition is desired, but a decision needs to be made with the HDC-TWWWJC regarding whether the change is necessary and appropriate, and if so what the nature of the change should be. Requires further discussions and/or assessments to be undertaken to inform decision-making.
- **'Change recommended'** – A change has been definitively identified based on evidence presented in this Review Report or prior publications, and/or issues raised by the HDC-TWWWJC in the past (with consensus).

Table 4-1: Potential changes to the main discharge consent conditions (CD130214W), for consideration

Existing Condition No.	Sub-condition	Summary description	Status	Recommendations (if change required)	Reference within this Review Report (for justification, where relevant)
5	b (i-ii)	Required treatment methods and standards	Review	Consider when / under what conditions would the threshold of 0.4 kg $cBOD_5/m^3$ media be reached? Under what future growth scenarios could it be reached? (see above for condition 2)	Section 2.1.3 Section 2.2.4
6	-	Final combined treated wastewater quality limits	Change recommended	Update the maximum concentration (g/m^3) limit for acid soluble copper and zinc to 0.04 g/m^3 and 0.8 g/m^3 respectively. Update the corresponding maximum loading (kg/day) based upon 75%ile wastewater flow rate over the driest 12 month period within the past 9 years (to be determined by HDC with review by suitably qualified and experienced wastewater process engineer).	Section 2.4.5
7	a	Prohibiting effects outside the mixing zone	Review	Consider whether there are any implications associated with the wording of this conditions (i.e. 'or' versus 'and') in terms of compliance interpretation and enforcement. Identify any past issues of this nature.	From HDC 2019 proposal (not proceeded with)
	c		Review	Outfall flushing during annual diffuser inspection is when HDC is most at risk of non-compliance with this criteria. As previously suggested it would be good to require a drone/aerial footage inspection during the flushing to verify this.	From HDC 2019 proposal (not proceeded with)
	g		Change recommended	There is currently a typo in condition wording which causes confusion. Recommend updating to read that dissolved oxygen saturation should be **more than** 80%.	Section 2.9.6

Existing Condition No.	Sub-condition	Summary description	Status	Recommendations (if change required)	Reference within this Review Report (for justification, where relevant)
11	-	Maintenance and calibration of sampling equipment	Review	Suggest this says "calibration/verification" i.e. flowmeters are typically only verified not calibrated. Calibration requires significantly more effort and is not done across the industry. HDC's wastewater team will liaise with water supply team to keep up to date with their current workstream.	Section 2.9.6
12	-	Requirement to continuously monitor flows	Review	As for condition 11	Section 2.9.6
13	a (i-iii)	Flow proportional sampling during first 12 months of WWTP operation	Defunct	No longer relevant as only applied to first 12 months following commencement of consent (2014/15)	From HDC 2019 proposal (not proceeded with)
	b (i-iii)		Defunct		
	c		Defunct		
14	a (i-iii)	Flow proportional monitoring **after** the first 12 months of WWTP operation	Review	Sampling protocols and their appropriateness require further review	Section 2.2 Section 2.2
	b (i-iii)		Review		
	c		Review		
15	including advice note	Direct toxicity testing	Review	HDC would prefer to reduce the frequency of this testing; this has been mentioned previously in annual compliance reports however it has not been progressed. Any reduction in frequency of this sampling would rely heavily on sodium nitrate dosing at the WWTP, which has a positive impact on toxicity.	From HDC 2019 proposal (not proceeded with)
18	-	Routine receiving water quality monitoring	Review	Amend wording to make timing for completion of benthic survey report ahead of nine-yearly reviews clearer. E.g. "The 17th year benthic survey is to be submitted prior to DD/MM/YYY". Counting of years can be subjective depending on what is considered the starting point.	HDC (direct feedback)

Existing Condition No.	Sub-condition	Summary description	Status	Recommendations (if change required)	Reference within this Review Report (for justification, where relevant)
22	-	Signage	Review	Suggest that "at all times" is changed. Should be required to erect signs and check them regularly, but cannot be expected to have signs up at all times or know the status of the signs at all times.	Section 2.9.3
24	a	Annual reporting requirements	Review	Review to improve consistency in how annual reports are assessed for compliance, year on year and by different officers/authorities.	Section 2.9.3
25	-	Publication of annual reports on HDC website, and notification	Review	Review the appropriateness of the requirement to include notice regarding availability of the report in the next public newspaper, general ratepayers' notice and next ratepayer newsletter, particularly the frequency at which this needs to be done.	From HDC 2019 proposal (not proceeded with)
26	-	Public open day	Review	This condition is very specific about how the open day is advertised. Review with regards to alternative options / increasing flexibility for the medium through which the open day is communicated.	From HDC 2019 proposal (not proceeded with)
27	a	Requirements for the 9-yearly Trends, Technology, Discharge, Environmental and Monitoring Review Reports	Review	Add wording to match Condition 24 – e.g. "The report shall be submitted together with an independent peer review completed by a suitably qualified and experienced professional expert." Consider using calendar years/dates for report timing (see also for Condition 18).	HDC (direct feedback)
	d		Review	The current review conditions of the main consent do not specifically note a purpose of the review. A review may be required to deal with the introduction of new legislation, including Acts and national policy statements, national environmental standards or guidelines. In some cases the new Act or national policy statements provide a directive for change.	From HDC 2019 proposal (not proceeded with)

Existing Condition No.	Sub-condition	Summary description	Status	Recommendations (if change required)	Reference within this Review Report (for justification, where relevant)
29	a	Establishment, retention and functions of the HDC-TWWWJC	Change recommended	The issue has previously been raised by Tangata Whenua members of the HDC-TWWWJC regarding inappropriate use of the word “kaitiaki” in reference to a person/individual. Wording accordingly should be revised in consultation with the HDC-TWWWJC.	HDC (direct feedback)
30	b (i-iv)	Notification of unusual or extreme circumstances, or non-compliance, to HBRC	Change recommended	Propose changing to notification as soon as practically possible and not later than 24hrs after the event. Notification would ideally also be required to key stakeholders such as: • HDC • Tangata Whenua • Health New Zealand |Te Whatu Ora • Local fisheries in the wider vicinity to the offshore outfall or the two beach contingency discharge facilities	From HDC 2019 proposal (not proceeded with)
Advice Notes					
2	-	Condition 6 interpretation	Change recommended	Add clarification that both concentrations and loads are determined on basis of Acid Soluble Metals (or otherwise)	Section 2.9.3
3	-	Condition 18 interpretation (benthic survey)	Change recommended	District Health Board (DHB) now called 'Health New Zealand | Te Whatu Ora'	General

5 Conditions 29(e) and 29(f): Inputs from HDC-TWWWJC

As described at the beginning of this Review Report (Section 1.1), HDC is required to seek suggested inputs from the HDC-TWWWJC with respect to the scope of the Review under Condition 29 of the resource consent. This process was completed in late 2022/early 2023 for this Review. A number of additional scope items were identified and formally requested to be addressed by this Review Report; a final (revised) scope was subsequently issued to the HDC-TWWWJC and this scope was formally approved at the committee meeting held on 5 December 2022. The meeting minutes documenting this decision are attached as Appendix A.

The additional scope items raised by the HDC-TWWWJC are listed in Table 5-1 below along with references to supporting content, to demonstrate how each of the items have been addressed within this Review Report. Where the items have not been fully addressed (as it was not appropriate for Stantec to do so), it is understood that further work will be led by Tangata Whenua and supported by HDC as indicated in Section 7.

Table 5-1: Additional scope items addressed in this Review Report

Item requested by HDC-TWWWJC	Reference within this Review Report
Cultural	
• Acknowledge the cultural origin component to the consent, (refer to Consent Application "Assessment of Effects on the Environment" Document June 2013 - Support Document 12 as a starting point), and the Joint Committees' Kaitiaki role as set out under Condition 27.	Section 1.3
• Comment on the inclusion, of relevant monitoring cultural indicators that should be undertaken and implemented. Consider MfE Cultural Health Index (CHI) approach.	Not fully addressed – refer to Section 7
• Provide comment on the Ministry for the Environment (MfE) Cultural Health Index (CHI) Publication and how it may be used, where relevant and applicable as 'measured' against a holistic and Te Ao Māori 'lens'. For example, coastal protection, mussel monitoring and shellfish restoration.	Section 1.3
• Examine the Napier City Council implemented cultural monitoring programme for Awatoto treated wastewater discharge and provide comment on its potential to be adapted or modified for the Hastings WWTP and its discharge.	Section 1.3
• Linking to Condition 27(a) (population and land use changes), comment on the change to domestic living and with assistance and guidance from the HDC-TWWWJC seek their views on whether those changes are aligned to mātauranga Māori.	Section 2.1
• Incorporate 'Three Water' reform terminology along with other changes such as Te Mana o Te Wai, and acknowledge and appropriately reference these terms/concepts within the Review Report.	Section 1.3 Throughout report
• Nine Yearly Draft Review Report to be reviewed by Tangata Whenua members of the Joint Committee to ensure it reflects mātauranga Māori.	Section 4

Item requested by HDC-TWWWJC	Reference within this Review Report
Note: The HDC-TWWWJC have agreed for Good Earth Matters to conduct an independent review of this Review Report on their behalf (with HDC engaging Good Earth Matters directly), and report back to them. It is assumed that this item will form part of the commentary provided by Good Earth Matters in their review.	Section 6
Technical	
Provide comment on the key measure of success, consent initially for 'significant' removal of kūparu, changed to organic loading on the BTF process, that encompassed the removal of kūparu.	Section 1.3.1 and 1.3.2 (background) Section 2.6.6 (assessment)
Provide additional comment on the further refinement of this statement, 'significant removal of kūparu,' to be transformation of the human waste component to a point where it is culturally acceptable for discharge to the sea.	Section 2.6.6 Section 7 (recommendations)
Comment on what monitoring is undertaken on industrial sites discharging trade water to the separate trade waste system, to ensure that human waste is not present within trade waste.	Section 2.3.4.1 (commentary on past issues)
Comment of whether current treatment of trade waste is 'fit for purpose'? and how the treatment of trade waste aligns with cultural understanding and acceptance. Assistance will be needed from the HDC/TWWWJC on what will be determined as "fit for purpose".	Section 2.3.4 Sections 2.6.3 and 2.6.4 Section 2.6.8
Comment on trade waste constituents, with a particular focus on mortuary waste.	Section 2.3.4.3
Comment on the domestic waste stream and its treatment and how it is kept separate, as far as practicable, from trade waste.	Section 1.2.1 Section 2.6.3
Comment on whether new technology can improve treatment, and if 'yes' what needs to be improved, and why and the 'pro's and con's' of doing so.	Section 2.6
Assess and comment on climate change and sea level rise and their potential impacts upon the current Hastings Wastewater Scheme now and into the future through a strategic planning approach. Maximise use of existing reports/analysis where possible.	Section 1.4.3 (Strategic planning approach) Section 2.5.8
Comment on how far the assessment of options could be added and /or retrofitted to the Biological Trickling Filter (BTF), or what more could industry do. As a starting point refer to Support Documents No. 7 "Alternative Assessment" to the Assessment of Effects on the Environment" Document June 2013.	Section 2.8
Summarise past quarterly reports, as part of the review of the Annual Compliance Report, noting that they were considered to be informative and highlighted issues with contaminants. Provide comment of the need or otherwise to reinvigorate these reports.	Section 2.9 Appendix E
Procedures and Governance	
Setting up procedures for inclusions of additional and changed procedures and/or consent conditions, including any suggested new conditions, along with targets for Year 18 and Year 27 reviews	Section 4 (changes to consent conditions) Section 7 (recommendations)
Matters of Three Waters and Resource Management Reviews that may/are likely to require significant changes. Assess and comment on the need for strategic agility through this period of uncertainty, including but not limited to, Resource Management Reform, 'Three Water' Reform and climate change	Section 1.2.4

Item requested by HDC-TWWWJC	Reference within this Review Report
Note: The political climate and central government intentions for reforms have changed significantly under the new Coalition government (post-2023 election) since the HDC-TWWWJC were first engaged with regarding scope of this review in late 2022	
Comment on the trade waste agreements (trade waste approvals) with individual trade waster dischargers that expire shortly, in sync with this 9 Year Review, to enable changes required from the Review to be implemented.	Section 2.3.5
Comment on the strategic planning approach in similar resource consents elsewhere in Aotearoa New Zealand with 'trigger levels' initiating certain actions and responses.	Section 1.4.3
Comment on the 'high risk' trade waste dischargers potential to meet more stringent requirements under the HDC's Consolidated Bylaw, Chapter 7 and individual approvals.	Section 2.3.3
Assess and provide comment that 'monitoring starts from the point of discharge' thus the entire system i.e. the network.	Section 2.3.3 (trade waste monitoring)
Comment (if required) on the ongoing journey over the next 9 years , 18 years, and as noted above address, if relevant through a strategic planning approach	Section 1.4.3 (strategic planning approach to be developed) Section 7 (recommendations)
Assess and comment on the need for National guidance in relation to building redundancy and/or maintenance into wastewater systems and provide comment on how this Scheme will operate over the following 18 years, and further until the consent expires in 2049, and further in terms of infrastructure security.	Sections 2.5.7 and 2.5.8
Examine and comment on what was not included in the consent 9 years ago, because it was too difficult to deal with or not known/appreciated at the time and provide comment on what is now within this Review Report – with respect to meeting Project Objectives and the solution being a BPO.	Section 3
Comment on the work that may continue once this Review Report is lodged with HBRC in 2024, and how ongoing involvement may be provided within a 'road map' approach.	Section 7

6 Independent Peer Review of Draft Report

A draft of the Review Report was initially reviewed in detail by Good Earth Matters Consulting Limited (GEM) in February 2024 at the behest of HDC, with a view to providing an independent opinion on the scope, content and outcomes from the review and to communicate these findings to the HDC-TWWWJC. This was to enable the HDC-TWWWJC to advise HDC regarding the Review Report before it was finalised, in accordance with Condition 29(f) of the resource consent. Copies of the initial memorandum (20 February 2024) submitted by GEM following completion of the first review, and final comments provided in June 2024, are attached in Appendix F.

Overall, the initial review stated that the draft Review Report *"is a technically complete and detailed report that addressed all of the matters identified in the agreed scope and those required to be addressed via the review condition (Condition 27 of the resource consent)".* However, the reviewers did identify several matters for further discussion with HDC and Stantec as part of their constructive feedback. The comments were presented in two major categories: detailed edits/comments from the peer review team members on specific report sections, and overall findings (themes) identified. The latter included matters relating to:

- The limited timeframe available for HDC-TWWWJC review and feedback into the report (namely, the need for a longer Executive Summary or separate summary document to aid in communicating the findings to the HDC-TWWWJC and other readers)
- RMA and Water Services Reform (given that a new Coalition-led government had come into power while the Review Report was being drafted)
- Climate change and natural hazard risks
- Options not recommended due to lack of water conservation driver
- Alignment of growth projections considered in the Review Report with HDC's Future Development Strategy
- Measures for transformation of wastewater
- Emerging Contaminants (ECs)
- Feedback from Health New Zealand | Te Whatu Ora regarding treatment processes and public health risk matters (received in November 2023 and not fully accounted for in the initial draft)
- Consideration of the Best Practicable Option
- Recreational survey and opportunities for community education
- Pathway for the next 9-year review period

GEM identified two options for HDC to consider regarding the completion of the Review Report, given the matters raised in their review. These options accounted for the pressures faced in relation to meeting the approved deadline for submission of the report (with the extension to 31 March 2024 previously approved by HBRC) and the scope that had originally been agreed with the HDC-TWWWJC. The options were as follows:

1. *"Complete the report as a technical review report that will be used to inform the opportunity for feedback on cultural matters and the development of a pathway forward following submittal to HBRC. Submit the technical review report to HBRC for compliance purpose on or before 31 March 2024 as agreed. After submittal proceed with further engagement with the Joint Committee and development of the pathway forward for the next 9-year period.*
2. *Seek a further extension from HBRC to enable meaningful engagement with and feedback from the Joint Committee and develop indicative pathway approach for next 9-years prior to finalisation of the report."*

These options were discussed with HDC personnel and the Stantec technical team, and it was decided to:

- Address those matters raised by GEM which were within the scope originally agreed by the HDC-TWWWJC and could be practically achieved within a reasonable time and budget

- Catalogue any additional matters deemed appropriate for further consideration in the 'Recommendations' (Section 7) of the Review Report, with the intention that these matters will then be incorporated into a formal work programme by HDC following completion of the Review Report.
- Allow an opportunity for GEM to review the final report before it was presented to the HDC-TWWWJC, to confirm that all matters raised in their initial review had either been adequately addressed, or if not addressed, a reasonable explanation was provided.
- Request an appropriate extension from HBRC, to allow for engagement with the HDC-TWWWJC. The revised deadline of 27 June 2024 was subsequently approved by HBRC.

GEM completed a final review in June 2024, and will be attending the presentation of the review findings to the HDC-TWWWJC in July 2024.

7 Recommendations

Table 7-1 contains list of actions to implement as a result of this review, and recommendations to guide the scope of the next nine-yearly review. It is designed to inform a programme of work that HDC can undertake in the next few years before the next review. The timing for implementation of these actions, and their prioritisation, is subject to LTP funding availability and the outcomes of the cultural assessment.

Table 7-1 assigns an interim priority to each action, with each being of high, medium, and low priority.
High priority actions are those which HDC will endeavour to initiate first (from 2024 onwards), while medium to low priority actions would be targeted for completion prior to the next 9-yearly Review (in 2032).

Table 7-1:Recommendations from this review

Item No.	Review theme	Recommendations	Reference within this Report	Recommended timeframe for implementation (where appropriate)
1	Cultural considerations	A Cultural Impact Assessment (CIA) shall be completed by a provider nominated by the HDC-TWWWJC to assess the effects of the treated wastewater discharge into Hawke Bay from a Tangata Whenua perspective (pursuant to Condition 27(i) of the resource consent).	Section 1.3 Section 2.9 Section 5	High
2		HDC shall undertake further engagement with Tangata Whenua representatives on the HDC-TWWWJC (and a wider audience from local hapū and marae if appropriate) to consider whether a change in treatment technology shall result in avoided, remedied or mitigated effects on cultural values. This engagement should include discussions regarding transformation of kūparu and current methods for measuring the degree of transformation, as well as whether the introduction of a reo Māori name for the WWTP should be progresses (and if so, identify an appropriate process for this to occur). This further engagement will be dependent on prior completion of the CIA as a key resource to inform discussions.	Section 1.3 Table 2-23 (Section 2.6.3) Section 2.6.6	High
3	Regulatory changes	Amend the purpose of the review (stated in Condition 27) to capture the introduction of new legislation that may have a bearing on the implementation of the discharge consent.	Section 2.4.5	Low
4		If a national policy statement on marine waters is prepared for public consultation by the Government in future, this should be carefully considered and submitted upon by HDC and the HDC-TWWWJC when written submissions are called for.	Section 2.4.5	Low
5	Future-proofing	Establish a set of growth projections to inform current and future estimates of demand	Section 2.1 Section 2.2.3	Medium

Item No.	Review theme	Recommendations	Reference within this Report	Recommended timeframe for implementation (where appropriate)
		(wastewater flows and loads) that is consistent with Statistics NZ population estimates, and aligned with HDC strategies such as the FDS and HPUDS. These shall act as a "single source of truth" to avoid the complications that have been experienced in completing this current nine-yearly Review Report.		
6		Assess options for protection of the WWTP against climate change now and into the future, including potential approaches for 'managed retreat' of the infrastructure. The assessment should consider both climate change and natural hazard risks (e.g. seismic, flood) to the Hastings Wastewater Scheme infrastructure, including the WWTP and provide an assessment of the severity and potential likelihood and consequences of the risks identified.	Section 2.4.2 Section 2.5.6	High
7		Collaborate with the HDC-TWWWJC to identify an appropriate strategic planning approach for managing the Hastings Wastewater Scheme into the future, as detailed in Section 1.4.3 of this Review Report.	Section 1.4.3	High
8	Maintaining / achieving the BPO	Undertake a carbon footprint and greenhouse gas emissions assessment, and compare the findings with those for other WWTPs, statutory requirements and non-statutory guidelines. (Note: this could also inform and/or be a component of the strategic planning approach as described in Section 1.4.3 of this Review Report).	Section 2.5.6 Section 3.4	Medium
9		Institute periodic energy efficiency audits of the current Hastings Wastewater Scheme.	Section 3.4	Low
10		Assess the financial implications of any significant additions in infrastructure requirements or more stringent standards for treated wastewater discharge – either for the DNSI and/or the industrial / trade waste dischargers.	Section 3.4	Medium
11		Institute periodic reviews of compliance with approvals to discharge Controlled wastewater, for industrial / trade waste dischargers. Reviews should include assessment of effects on the marine receiving environment.	Section 3.4	Low
12		Assess any future upgrades to the existing Hastings Wastewater Scheme against the project objectives as set out in the 2013 AEE Documentation and the BPO criteria, in terms of the RMA and the Hawke's Bay RCEP.	Section 3.4	Medium

Item No.	Review theme	Recommendations	Reference within this Report	Recommended timeframe for implementation (where appropriate)
13		Include an assessment against the six objectives of the Three Waters Strategic Themes from HDC's current AMP in future 9-yearly reviews of the consent.	Section 3.4	Medium
14		Update the 2008 Wastewater Facility Manual for present day relevance and to incorporate any matters raised in the AMP and this Review Report. Seek input from the HDC-TWWWJC regarding cultural objectives specific to the East Clive WWTP. This input may need to be developed with the assistance of a third party to be engaged on behalf of (and with permission of) the HDC-TWWWJC.	Section 2.5.1	High
15		Review the actual energy use at the WWTP and compare with that predicted in the 2013 consent application. Confirm whether the assumption that the WWTP remains a 'low energy, low cost' plant is still accurate.	Section 2.5.6	Medium
16	Trade waste management	HDC undertake a review of the current trade waste management approach with a focus on risk management.	Section 2.3.4	Medium
17		Review existing documentation of the decision-making process for trade waste approvals, to ensure that a quick reference guide is readily available.	Section 2.3.4	Medium
18		In collaboration with the HDC-TWWWJC, prepare a scope and carry out a desktop assessment regarding mortuary waste, to provide information on (at minimum): • Mortuary service providers in the Hastings District • Constituents of concern • Estimated volume of wastewater requiring collection and treatment • Potential effects on the receiving environment and public health • Cultural considerations • Current practices across Aotearoa New Zealand (including direct communication with the New Zealand Funeral Director's Association), and any existing standards • Where gaps exist in the Aotearoa New Zealand context, consider international best practice. This desktop assessment shall then be used to inform further discussions regarding the	Section 2.3.4.3	Medium – to be addressed following the completion of the cultural assessment, with pathways identified to resolve issues relating to mortuary waste.

Item No.	Review theme	Recommendations	Reference within this Report	Recommended timeframe for implementation (where appropriate)
		management of mortuary waste in the Hastings Wastewater Scheme and determine whether it is necessary to change the status quo.		
19		Review Chapter 7: Water Services of the Consolidated Bylaw (2021) as required by Section 158 of the Local Government Act 2002. Consider whether provisions regarding "risk of refusal" should be included as part of any future revisions to the bylaw.	Section 2.3.3.2	Medium
20		As part of the strategic planning approach (detailed in Section 1.4.3 and in recommendations for future-proofing above), periodically review the need to restrict and/or prohibit certain contaminants of concern in industrial / trade waste discharges, and review the scope of Schedule B of the Consolidated Bylaw (Chapter 7).	Section 1.4.3 Section 2.6.8	Low
21	Monitoring	Prepare an informative resource outlining possible indicators (choose indicators for consideration in collaboration with Tangata Whenua members of HDC-TWWWJC) and provide detail regarding potential challenges, practicalities etc for their use. The purpose of this resource will be to inform decision-making by the HDC-TWWWJC. It will also support a wider discussion around the degree to which kūparu is transformed by the WWTP, and .whether any additional actions should be taken.	Section 2.6.6	Medium – to be informed by the cultural assessment
22		Undertake a preliminary investigation into the presence of aquatic snails in inflows to the WWTP, and within the BTFs. The investigation shall include identification of snail species present, assessment of potential effects on the treatment process and the marine receiving environment, and identification of further actions to resolve the issue as appropriate.	Section 1.2.1	Medium
23		Monitor visual effects from the discharge at the offshore outfall diffusers (for example, colour changes, scums, foams) using drone surveys. This could be undertaken in conjunction with routinemaintenance being performed on the offshore outfall structure and/or diffusers.	Section 2.9.2	Already implemented (2023), continue for 2024 onwards.
24		Design and implement an ongoing (regular) monitoring programme for ECs in the treated wastewater being discharged into Hawke Bay.	Section 2.9.3	Low
25		Use the findings of this review to develop a monitoring schedule and make this available to operational staff/monitoring contractors. Undertake	Section 2.9	High reflected in 2023/24 annual report)

Item No.	Review theme	Recommendations	Reference within this Report	Recommended timeframe for implementation (where appropriate)
		a site-wide review to reconcile sampling locations and Site ID / sampling nomenclature attributes including for the plant and receiving environment. Updated monitoring information should also include: • For monitoring of influent, treated wastewater and the receiving environment, ensure that each required parameter is sampled at each site at the appropriate time, as specified by the consent conditions. • Confirm units for each parameter are correct, and the correct laboratory and analysis methods are being applied (including detection limits). • Ensure that water samples intended for microbiological analyses are delivered to the laboratory within the standard 24 hour return period to ensure accurate results are recorded.		
26		Consider monitoring for chlorophyll-α concentrations in marine water for an accurate indicator of algal growth. Appropriate frequency would be at least once every 6 months (seasonal).	Section 2.9	Medium
27		Install a weather station to capture wind speed/direct continuously, to inform odour investigations following any reported complaints.	Section 2.9	Medium
28		Complete an odour assessment at the WWTP to determine whether the current odour treatment is effective and identify/justify any necessary improvements (for example, improvement actions such as connecting a blower exhaust and installing dual biofilters to allow for maintenance would be beneficial).	Section 2.9	Medium
29	Effects on public health	Revise the Public Health Risk Assessment (PHRA) prepared in 2012 on the basis of the updated wastewater flows and loads estimates presented in this Review Report. Based on an updated PHRA, determine whether the level of risk to public health is likely to change between 2032 and 2049, and if so, what actions must be taken to mitigate the risk to current levels (or lower).	Section 2.9.3.1 Section 2.10	Medium – noting that work is being done on this currently (as of late 2023)
30		Continue discussions with Health New Zealand | Te Whatu Ora and other relevant stakeholders about decision-making processes regarding risks to public health. Through these discussions, determine how the discharges and potential associated risks can be managed into the future.	Section 2.10	Medium – occur in conjunction with above recommendation for public health.

Item No.	Review theme	Recommendations	Reference within this Report	Recommended timeframe for implementation (where appropriate)
31	Community Engagement	Amend the survey questions applied in the 2023 recreational survey (refer to Section 2.7) for the next nine-yearly survey, to include questions that will help to determine: • Respondents' levels of awareness regarding the existence of the WWTP and/or offshore outfall in their local area. • Reasons why people have or have not gathered kai moana. • Continue including commercial fisheries / aquaculture as an interest group for future nine-yearly surveys.	Section 2.7 Section 6	Low
32		Consider opportunities to enhance the public's understanding of this critical infrastructure (the WWTP and wastewater system). An initial action should be to install information panels or similar communication tools along the shared pathway that runs adjacent to the WWTP.	Section 2.10 Section 6	Low
333	Reporting	Keep copies of calibration certificates for the instruments used in the field to take physical parameter measurements on file, and provide them in monitoring reports.	Section 2.9	High
34	Consent conditions	Assess any conditions identified in Table 4-1 as requiring review, and use the findings of the assessment to propose any additional changes required.	Section 4	High
35		Apply for variation to consent conditions as per Section 4 above (for those identified as 'change required' in Table 4-1) if a formal variation under s127 of the RMA is justified.	Section 4	High

8 Acknowledgements

A large number of people have contributed their knowledge and time to this Review Report since late 2022. The authors would like to acknowledge the following contributors with many thanks:

- The HDC – Tangata Whenua Wastewater Joint Committee
- Hawke's Bay Regional Council
- Members of the local community who have visited open days, and who provided submissions and other feedback via the public engagement process in Oct/Nov 2023.
- Numerous HDC staff but with particular thanks to David Mackenzie, Wakefield Harland-Baker, Armann Einarsson, Steve Cave and Craig Thiew as core contributors and reviewers, and to Emma Kay and the wider HDC engagement team for delivering community engagement activities throughout the process.
- Annette Sweeney and Grey Wilson at Good Earth Matters Consulting Ltd, for their independent reviews of this Report
- The Stantec team including Project Managers Melanie Lee, Ilze Rautenbach and Evelyn Gordon; Project Technical Leads Jessica Grinter and Grant Russell; Jim Bradley and Sue Bennett (internal peer reviewers), and numerous technical contributors including Peter Loughran, Ashleigh Denize, Finbar Macleod, Emma Gibbs, James Hopgood, Johanna McIntosh, and Stephanie Davis.

Mā tō rourou, mā taku rourou e ora ai te iwi
With your contribution and mine, the people will thrive and prosper

9 References

A: The Hastings Wastewater Project conference papers and articles:

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Appendices

Appendix A HDC-TWWWJC Meeting Minutes

Appendix B Historical industrial / trade waste discharge flows and loads data

Appendix C Recreational Survey Report (2023)

Appendix D Community Engagement Summary

Appendix E Compliance Summary

Appendix F Peer Review Memorandums (GEM, Feb 2024 and June 2024)

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Summary

Hastings Wastewater Consent No. AUTH-120712-01 Trends, Technology Discharge, Environmental and Monitoring Review

Revision Schedule

Revision No.	Date	Description	Prepared by	Quality Reviewer	Independent Reviewer	Project Manager Final Approval
V0	10/05/2024	Draft for internal review	Jessica Grinter	-	-	-
V1	14/05/2024	Draft for HDC and independent peer review	Jessica Grinter	Jim Bradley	Grant Russell	Ilze Rautenbach
V2	09/07/24	Draft for HDC-TWWWJC review	Jessica Grinter	-	Grant Russell	Ilze Rautenbach
V3	TBC	Final	Jessica Grinter	TBC	TBC	TBC

This document is intended as a summary to be read in conjunction with the full report entitled:

Hastings Wastewater Consent No. AUTH-120712-01 Trends, Technology Discharge, Environmental and Monitoring Review Report

July 2024

DOCUMENT: \\NZ4108-PPFSS01\SHARED_PROJECTS\310003259\2_TECHNICAL\REPORT\SUMMARY\EXECUTIVE SUMMARY_DFT_10-7-2024.DOCX (GJ)

1. Introduction

A Review of the discharge consent for East Clive Wastewater Treatment Plant (the WWTP) has been completed by a team of technical specialists from Stantec on behalf of the Hastings District Council (HDC), to satisfy Condition 27 of the resource consent (AUTH-120712-01) held by HDC to discharge treated wastewater into Hawke Bay via an offshore outfall in East Clive, Hastings. Condition 27 requires a Trends, Technology, Discharge, Environmental and Monitoring Review Report (the 'Review Report') to be completed every nine years for the duration of the consent term.

The bulk of the Review Report content was developed between January 2023 and January 2024, with subsequent peer reviews and revisions undertaken to May 2024. The Review Report offers a very deep and broad insight into the operations of the Hastings Wastewater Scheme, taking a 'big picture' view to understand the changes that have occurred over the past nine years since the consent was issued in 2014, and the changes to be considered for the next review period (to 2032) and beyond. The resulting output was a lengthy and highly detailed analysis. This summary was developed as a stand-alone, quick reference guide. It is intended for a general audience, and briefly introduces the methodology used to complete the Review as well as the key findings. References to specific sections in the Review Report are provided where it is anticipated that readers may want further details (for example, regarding the assumptions behind calculations).

For reference, a conceptual diagram of the East Clive WWTP and its treatment processes is attached as Figure 1 below. The incoming wastewater (influent), the WWTP treatment processes, and the outgoing discharges of final combined treated wastewater via the offshore outfall are all discussed in detail in Section 1 of the Review Report.

The wastewater network comprises two systems which connect to the East Clive WWTP as two separate waste streams:

1. **Domestic and Non-separable Industrial wastewater system (DNSI)** – collects wastewater from residential and commercial properties, and some Permitted industrial / trade waste wastewater.
2. **Separable Industrial** / trade waste wastewater system – collects 'Controlled wastewater' from selected industrial sites.

The separate streams are treated separately at the East Clive WWTP site before being combined for discharge to the offshore outfall.

The key treatment units for the Domestic Non-Separable Industrial (DNSI) waste stream at the WWTP are the Biological Trickling Filters (BTFs). The combination of the BTFs and the Rakahore Channel was a first of its kind in Aotearoa New Zealand and internationally, and similar BTF plants are now at Napier, Gisborne and Greymouth. The WWTP has received national accolades and international attention for its innovative use of biological treatment and incorporation of cultural values into the design and operation.

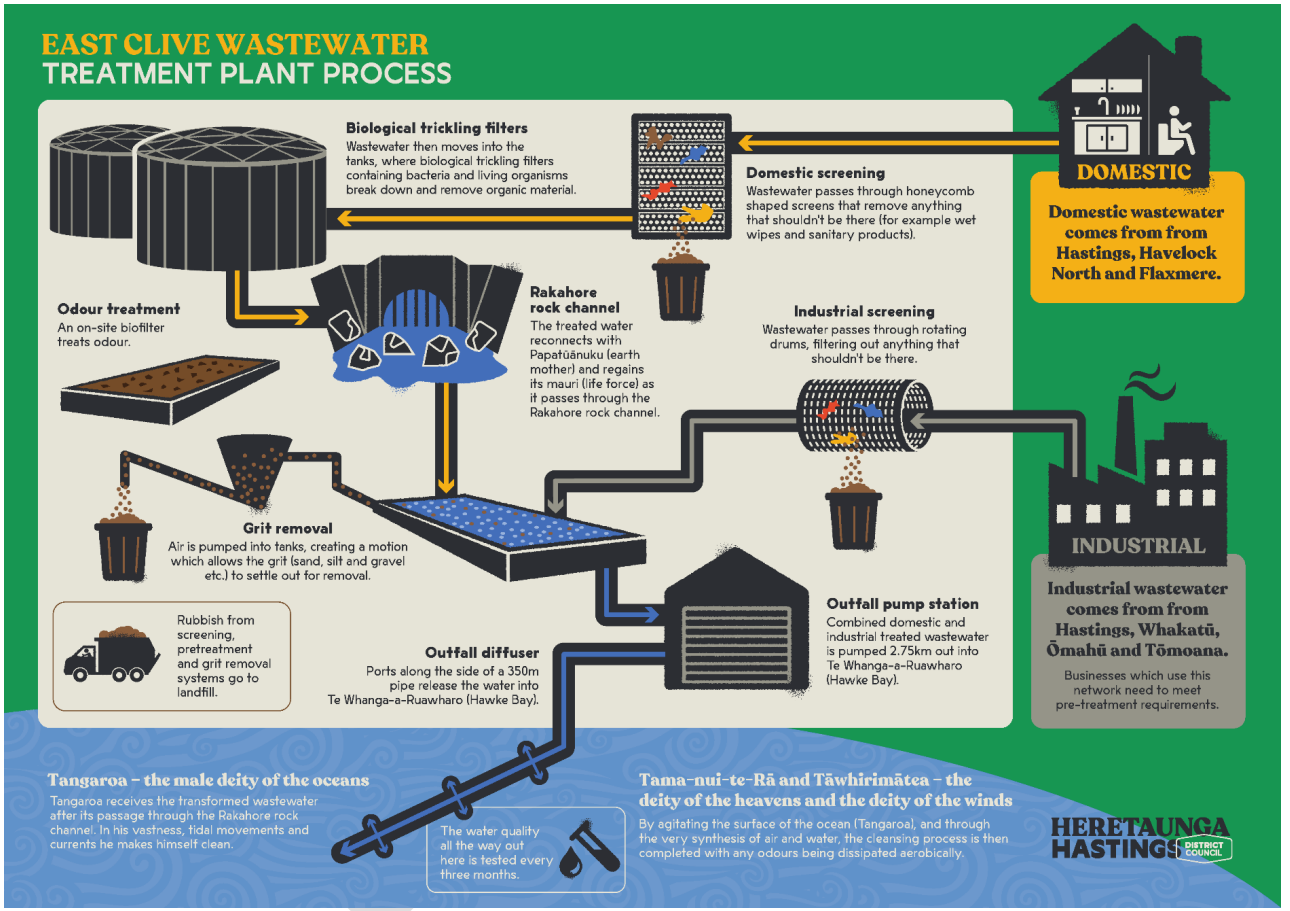

Figure 1 Conceptual diagram of the East Clive WWTP Treatment Process (Source: HDC 2023)

2. What is the purpose of the Review?

The Review is intended to meet the requirements of Condition 27 of the resource consent (AUTH-120712-01) to discharge treated wastewater into Hawke Bay via an offshore outfall at in East Clive. These requirements were included in the consent conditions as a result of extensive consultation in 2013 with Tangata Whenua and HDC representatives, technical experts and other stakeholders when the consent application was being prepared. This inaugural Review Report was completed by Stantec (consultants) on behalf of Hastings District Council (HDC), and also incorporates inputs from third parties including Te Taiwhenua o Heretaunga, the Cawthron Institute, and the National Institute of Water and Atmospheric Research (NIWA).

3. How was the Review scoped?

Scoping of the Review tasks contributing to the report began as early as August 2022 with subsequent consultation with the Hastings District Council and the HDC-Tangata Whenua Wastewater Joint Committee (HDC-TWWWJC), through October and November 2022. Table 1 provides an overview of the final scope and structure of the Review Report. The Report is structured to directly mirror the wording and order of consent conditions, to make it easier for Regional Council officers assessing the report for compliance and for general readers.

Table 1 Key components of the Review Report

Component	Consent condition(s) addressed	Report section(s)
Population and land use changes	27(a)	2.1
Wastewater flows and loads assessment	27(b)	2.2
Industrial / trade waste assessment	27(c)	2.3
Regulatory review	27(d)	2.4
Asset management	27(e)	2.5
Wastewater treatment technology and review of alternatives	27(f)	2.6
Recreational usage survey	27(g)	2.7
Assessment of options for treated wastewater disposal / discharge and beneficial reuses that may be appropriate to the Wastewater Scheme	27(h)	2.8
Effects Assessment	27(i)	2.9
Community engagement	27(j)	2.10
Consideration of the existing Project Objectives, opportunities for improvement and Best Practicable Option (BPO)	27	3

As described above, input was sought from the HDC-TWWWJC to identify any further matters to be included in the Review; this was in alignment with Condition 29(e) of the consent which allows for the HDC-TWWWJC to provide "*any further suggested input in respect to the scope of the review*". Numerous matters were identified; these are detailed in the Review Report (Section 1.4.2, with a guide to which specific sections deal with each issue provided in Section 5). Where possible the issues were integrated into the scope for the review and are addressed throughout the Review Report.

The Review Report also analyses the existing consent conditions and recommends which of those conditions should be reviewed (to determine if a change is needed) or changed directly (if a change had already been identified). This is not required by Condition 27 but was seen as a highly valuable exercise by HDC.

4. What methods were used, and who was involved?

Condition 27 states the minimum requirements for the nine-yearly Review Report. The Review Report is structured to clearly reflect each of the sub-conditions of Condition 27, including additional sections to provide further commentary on matters outside the direct scope of Condition 27 (including those raised by the HDC-TWWWJC), or to provide useful context to the review. This approach is intended to assist officers from Hawke's Bay Regional Council in assessing the adequacy of the report and level of compliance with the consent conditions, but also to make it easier to read for a general audience.

A draft of the Review Report was initially reviewed in detail by Good Earth Matters Consulting Limited (GEM) in February 2024 at the behest of HDC, providing an independent opinion on the scope, content and outcomes from the review. Overall, the initial review was positive and constructive, raising several matters for further discussion with HDC and Stantec. This led to subsequent updates to the Review Report content. GEM completed the final review of the Review Report in June 2024, and will be attending the presentation of the review findings to the HDC-TWWWJC in July 2024, prior to submission to HBRC as required by condition 29(f) of the consent.

4.1 Assessment of wastewater flows and contaminant loads

The Review Report (Section 2.2) assesses whether there have been any changes in the volume of wastewater received at the WWTP ('influent'), the volume of treated wastewater discharged via the offshore outfall ('Total Combined Discharge' or TCD) and the level and type of contaminants found in each. The TCD includes both wastewater from Separable Industrial and DNSI systems; Figure 1 shows these two separate waste streams and how they are treated.

Both the concentrations of contaminants (mass of contaminant per volume of wastewater) and the loads of contaminants (mass of contaminant generated over a specified time, such as per day) are considered. To achieve this, detailed calculations were based upon a large amount of data collected from the Hastings Wastewater Scheme since 2013. HDC collects data at a range of frequencies (from continuous, at 15-minute intervals, to quarterly or annual sampling); these are captured either by the WWTP's SCADA system (a real time, digital monitoring and operational control system) or in the Infrastructure Database (ID) which is managed on HDC's intranet.

The calculations for 2023 are compared to the equivalent calculations made to inform the consent application prepared in 2012/13, using the same methodology as was applied back then. The main components of the assessment are:

- The wastewater volumes and contaminant loads that were used in the 2013 AEE.
- The wastewater volumes and contaminant loads that were received at the East Clive WWTP between 1 January 2013 and 31 December 2022.
- The growth and serviced area projections which form the basis for the current (2022/23) calculations of predicted Domestic and Non-separable Industrial (DNSI) volumes and loads and for the Separate Industry Stream.
- The Projected Wastewater Volume, Flows and Loads for the remainder of the current discharge consent term, to 2049.

The assessment relied heavily on establishing the current population serviced by the Hastings Wastewater Scheme (as of 2023), and the projected population and industrial changes and trends for the remaining life of the consent, up to the year 2049. This was not straightforward; it required a review of several different sources and assumptions referenced or relied upon by different departments with HDC, depending on the purpose for which they were applied. The Review Report identifies a need for the processes to develop population and growth projections (including the preferred source data to be

used) to be made consistent and simplified for future reviews. The assessment assumes an annual population growth rate of 0.7% to 2049. This was based on the projection made by Statistics NZ in 2018, for a medium growth scenario.

4.2 Assessment of industrial / trade waste discharges

The Review Report describes:

- The different types of industrial / trade waste discharges received at the East Clive WWTP, and how they might change into the future
- The history of the changes to HDC's Bylaw(s) since 2013, regarding management of trade waste
- The effectiveness of the current Consolidated Bylaw 2021 (Chapter 7 – Water Services) provisions in managing trade waste and complying with resource consents
- Trends and emerging issues with regards to the implementation of the Consolidated Bylaw, and compliance across industrial / trade waste premises as a whole (including those issues raised by the HDC-TWWWJC when agreeing on the scope of this review, such as consideration of mortuary waste)
- Any changes that would enable more effective management of industrial / trade waste discharges into the future (or for consideration in future consent reviews)
- Possible new legislative requirements as relevant to trade waste (identified in Condition 27(d) regulatory review) including possible implications and (any) management requirements for these.

These aspects were addressed using information gleaned from targeted discussions with key Council officers (including the current Trade Waste Officer; Wastewater Manager, and East Clive WWTP Engineer), discussions with the HDC and the HDC-TWWWJC, and a desktop review of relevant documents such as the Consolidated Bylaw 2021. The Review also involved detailed analysis of available monitoring data of the quality and quantity of individual discharges of Separable Industrial wastewater and Non-Separable Industrial wastewater to the Hastings Wastewater Scheme. Any identifying details for individual dischargers are anonymised.

4.3 Assessment of effects

The Review Report includes assessment against the following:

- Consent conditions (CD130214W)
- Where applicable, compliance to water quality guidelines relevant for the marine waters of Hawke Bay

The majority of the Review assesses against relevant consent conditions (CD130214W). However, some effects identified within the Assessment of Environmental Effects (AEE, 2013) were not carried through to be addressed directly by consent conditions. In those cases, results are compared to relevant guideline values in alignment with industry best practice. The assessment focuses on whether any changes could be detected or 'discerned' from the effects that were considered acceptable when the consent was granted in 2014.

The assessment of effects is primarily based on information obtained from the annual monitoring reports which commenced in 2013. It involves detailed analysis of data obtained throughout the entire nine-year period and therefore provides a more holistic and comprehensive review of compliance status than was given in the annual reports. Appendix E of the Review Report records compliance status for every consent condition, in each reporting year since 2013/14.

Effects on cultural values need to be assessed in order to fully understand performance of the East Clive WWTP as the main driver for the DNSI treatment was to address cultural and spiritual issues. An assessment of the cultural impacts from the operations of the WWTP will be undertaken in a subsequent report and hence are excluded from the assessment. The preparation of a Cultural Impact Assessment (CIA) report is being supported by HDC, and it is expected that Tangata Whenua members of the HDC-TWWWJC will be closely involved. The Review Report (Section 2.9.1) outlines aspects that will potentially be considered by that assessment.

5. What were the Key Findings of the Review?

In general, the Review Report finds that the major components of the Wastewater Scheme (i.e. treatment method, performance, and management approach) are still adequate and appropriate in terms of meeting the Best Practicable Option (BPO) identified in the 2013 consent application and achieving effective treatment of wastewater according to the consent requirements. They are likely to remain as such for the next review period (to 2032), subject to the findings of the cultural assessment described in Section 4.3 above and the outcomes of various potential plan and policy changes currently being considered. The Review Report further details potential influencing factors for the BPO and the scope of future reviews. The East Clive WWTP has shown good performance and levels of compliance with the resource consent conditions since 2013, albeit with some challenges in specific years including following Cyclone Gabrielle in early 2023. Several opportunities for improvement are identified, and specific actions are proposed for HDC to incorporate into current and future work programmes.

5.1 Operations since 2014

While the overall treatment and discharge process and regular operations of the WWTP have remained fairly consistent since the current consent was granted in 2014, there have been some changes and upgrades in the past nine years. These are summarised in the timeline below (Figure 2). In addition, the Review Report considers the implications of Cyclone Gabrielle in terms of water quality within Hawke Bay and effects on WWTP operations, as well as the potential risks and effects posed by changes to governance frameworks and regulations that control the way the Hastings Wastewater Scheme is managed.

5.2 Compliance with the resource consent

The overall level of compliance with the resource consent (CD130214W) has been consistently high since 2014, especially in relation to environmental effects. Non-compliances are typically minor and administrative in nature (such as submitting a report late). Common issues contributing to non-compliance include:

- Incorrect sampling procedures
- Incomplete records (such as logs, inspection sheets that were missing or could not be provided for review)
- Issues with the outfall diffusers and associated structures (such as blockages or damage following storms)
- Lateness in publishing annual reports on HDC's website

Non-compliances relating to environmental effects are discussed separately below and detailed in Section 2.9 of the Review Report.

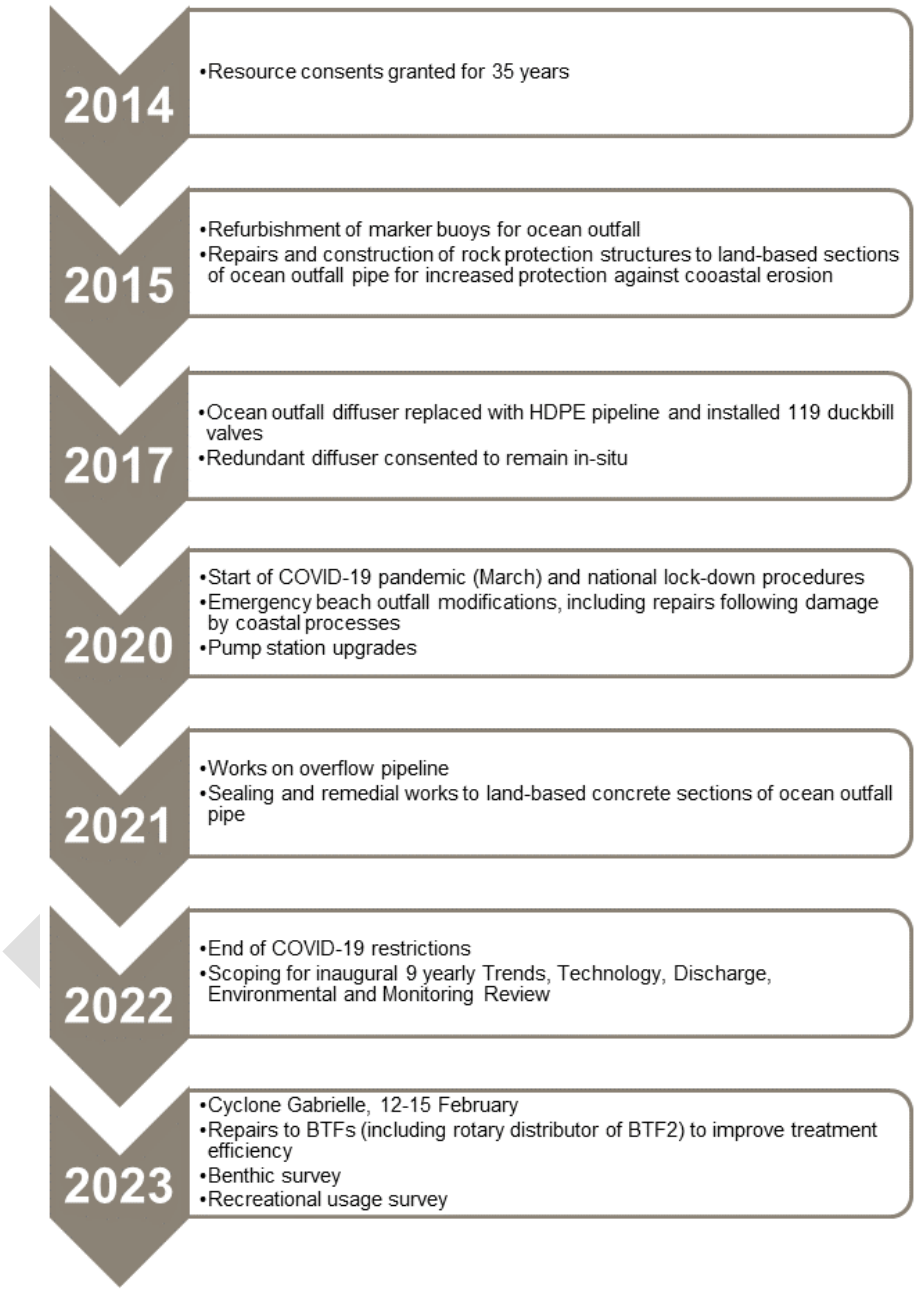

Figure 2 Timeline of key developments and events since 2014

5.3 Tangata whenua and community perspectives

The Review Report strongly emphasises the journey undertaken by HDC alongside Heretaunga Tangata Whenua to recognise and integrate Tangata Whenua values in the Hastings Wastewater Scheme. It details the values strongly held in relation to the whenua (land), awa (rivers) and moana (ocean) of the Heretaunga rohe (Hastings District), and the complex interactions between land and resource use activities such as wastewater collection, treatment and discharge into Hawke Bay.

The Review Report references factual resources that have already been publicly released with permission of Heretaunga Tangata Whenua as part of previous work undertaken in conjunction with the HDC-TWWWJC. Where assumptions are based on this information (regarding cultural concepts and values, such as the transformation of kūparu (human waste)), these are explicitly identified and referenced. Ideally, the Review Report would have been completed concurrently with a cultural assessment of the performance of the Hastings Wastewater Scheme. However, the timing for delivery of the Review Report (as determined by the consent conditions) did not allow for meaningful, longer-term engagement needed to complete a cultural assessment, and the right resources were also not available to do this within the consented timeframe. The main driver for completing this technical components of the Review Report separately from the cultural assessment was to maintain compliance with the consent, given these constraints. Several actions have been identified for HDC consider, to map out how and when the cultural assessment and additional engagement will occur and potential key outputs from those discussions.

HDC engaged with the public during 2023 to inform the Review Report, culminating in a formal consultation period between Monday 31 October and Friday 24 November 2023. The engagement approach was primarily focused on creating an opportunity for the public regarding how their wastewater is collected, treated and discharged. Engagement was undertaken in a variety of formats including printed materials; in-person drop-in sessions; the annual Open Day at the WWTP (18 November 2023); online feedback via HDC's website; a social media campaign, and radio and print advertising.

A recreational usage survey was completed during the summer of 2022/23 to meet the requirements of consent Condition 27(g). Methods used for the survey were the same as those previously used for a survey carried out between 2011 and 2013. The overall objective was to report on observational information of recreational users of the coastal environment adjacent to East Clive WWTP and the offshore outfall. The survey involved observing recreational activities at four locations, and also asking members of the public to complete a short questionnaire. The locations were:

- Waitangi Estuary / Ngaruroro River
- Muddy Creek Estuary (East Clive)
- Tukituki River mouth and Estuary (Haumoana)
- Te Awanga (Domain)

Attempts were also made to gather perspectives from the commercial fisheries / aquaculture sector, however only one response was received. This was in part due to there being less than five known inshore commercial operators within the Hawke's Bay region. A letter was received from Health New Zealand | Te Whatu Ora in November 2023 regarding public health considerations associated with the discharge of treated wastewater into Hawke Bay.

The Review Report summarises the perspectives gleaned through these activities and concludes that the majority of responses were constructive and demonstrated that continued investment in wastewater treatment is valued and seen as a high priority by the public within Hastings District.

5.4 Management of the Hastings Wastewater Scheme

The Review Report contains substantial commentary about how the Hastings Wastewater Scheme is managed in accordance with local, regional and national regulations, policies and strategies. The Review considers past and potential future changes to the instruments listed in Table 2. It also considers changes to relevant environmental guidelines and standards, some of which were originally used to develop consent limits for contaminants of concern.

Table 2 Regulatory instruments, policies and strategies considered as part of the Review

District	Regional	National
• Hastings District Plan • HDC Consolidated Bylaw 2021 (Chapter 7 – Water Services)	• Hawke's Bay Regional Policy Statement (RPS) and Regional Resource Management Plan (RRMP) • Hawke's Bay Regional Coastal Environment Plan (RCEP) • HBRC Tukituki, Ahuriri, Ngaruroro and Karamu (TANK) Plan Change 9 • HBRC Kotahi Plan • Napier and Hastings Future Development Strategy (FDS; *in development*) • Heretaunga Plains Urban Development Strategy (HPUDS; 2010 and 2017)	• Resource Management Act 1991 (RMA) • Local Government Act 2002 (LGA) • Marine and Coastal Area (Takutai Moana) Act 2011 (MACA) • Water Services Act 2021 (WSA) • Local Government (Community Well-being) Amendment Act 2019 • New Zealand Coastal Policy Statement 2010 (NZCPS) • National Policy Statement for Urban Development 2020 (NPS-UD) • National Policy Statement for Highly Productive Land 2022 (NPS-HPL)

The Review Report also discusses specific plans and approaches developed by HDC and utilised to directly manage the Hastings Wastewater Scheme. It introduces the concept of a future strategic planning approach, which HDC sees value in applying to establish and provide a framework for decision-making and prioritising actions for the management of assets within the Hastings Wastewater Scheme including the WWTP. This approach is proposed to feature elements of Dynamic Adaptive Planning, which has been successfully implementing elsewhere in Aotearoa New Zealand including Auckland and the Greater Wellington region. HDC intends to continue further dialogue with the HDC-TWWWJC and other key stakeholders in alignment with condition 29 of the discharge consent and staying true to HDC's relationship with Tangata Whenua. Their direct input on the design of the future strategic approach and its implementation will be actively sought. This intention is reflected in the recommendations of the Review Report (Section 7 and summarised in Section 4.10 below).

The Review Report includes a detailed review of asset management and operational changes that have occurred at the East Clive WWTP and across the wider Hastings Wastewater Scheme since 2014, as follows:

- Evaluation of the implementation and effectiveness of key resources driving asset and operational management, including the Asset Management Plan (2021) AMP and the East Clive Wastewater Facility Manual (2008).
- Any significant changes in management and operation over the 9-year review period (summarised in Table 2-16 of the Review Report).
- Potential sustainability and efficiency actions to be implemented in future, including opportunities for increased energy efficiency, water conservation, and building redundancy into wastewater systems.
- Consideration of a carbon footprint assessment of the WWTP and the discharge.
- Assessment, as far as practicable, of the potential future impacts of climate change on the WWTP operations and discharges.
- Emerging issues for asset management.

The Review Report identifies nine recommendations for HDC to consider with regards to asset management, namely ensuring that key resources such as the Wastewater Facility Manual are updated to reflect modern practices and knowledge of the WWTP and its operations. Resources could also be updated to more directly address matters relating to sustainability; energy usage and efficiency; water conservation; reuse of treated wastewater, and the potential effects of climate changes.

5.5 Industrial / trade waste discharges to the Hastings Wastewater Scheme

Industrial wastewater (trade waste) discharges make up a significant portion of the total volume of wastewater collected within the Hastings District. The majority of these relate to the food and beverage production and other agricultural activities in the region, contributing to the wellbeing of the wider community particularly through the provision of employment. As introduced above, the discharges are categorised as either:

- **'Separable Industrial'** – discharges that are required to be pre-treated at each industrial site, and are then conveyed to the WWTP via a separate industrial / trade waste wastewater pipeline. These discharges are passed through a milliscreen (with 1 mm holes) at the WWTP to remove solids, and then combined with treated wastewater from the Domestic Non-Separable Industrial (DNSI) waste stream at the WWTP before the combined wastewater is discharged via the offshore outfall into Hawke Bay.
- **'Non-Separable Industrial'** – discharges that are discharged directly into the domestic wastewater system (also known as the DNSI system) and then conveyed to the WWTP. These discharges are treated through the Biological Trickling Filters (BTFs) and the Rakahore Channel with the rest of the domestic wastewater prior to being combined with treated separable industrial wastewater and discharged to Hawke Bay.

The Review Report describes how discharges of industrial / trade waste wastewater are managed in the Hastings Wastewater Scheme, in particular through mechanisms such as the HDC Consolidated Bylaw (2021; Chapter 7 – Water Services). The Bylaw provides a way for Council to control discharges that are considered to be of a higher risk to the Hastings Wastewater Scheme and to public health or the receiving environment. These are typically managed as 'Controlled' discharges that require approval for the level of pre-treatment and flow management required onsite before flow can be discharged to the DNSI or Separable Industrial systems. The DNSI predominantly receives 'Permitted' industrial / trade waste discharges that meet strict criteria outlined in Schedule B of the Bylaw (Chapter 7). The Review Report details how industrial / trade waste premises are required to monitor their discharges, and the procedures that are followed by HDC in the event of any non-compliance with approvals. Importantly, it also identifies past issues experienced in managing these discharges, and identifies opportunities for improvement. These have also been translated into recommendations in Section 7 of the Review Report (and summarised in Figure 4 below).

The Hastings Wastewater System currently receives discharges of 'Controlled' wastewater from 39 separate premises and around 300 'Permitted' discharges, covering a relatively wide range of industry types. The Separable Industrial stream is dominated by nine major dischargers:

- Fruit and vegetable processing (washing, canning, juicing) (5). *This group represents the majority of trade waste by flow and load ($cBOD_5$ and TSS) received at the WWTP.*
- Meat processing (abattoirs, rendering, preparation for export) (2)
- Tannery (1)
- Cold storage (1)

Together, these nine sources contribute up to 98% of all industrial / trade waste wastewater discharged to the network, by volume. The Review Report considers all of these industrial groups and the key constituents of the discharges they contribute to the Hastings Wastewater System. In particular, it found that loads of Chemical Oxygen Demand (COD) and sulphide have been reduced by over 60% since 2015. Loads of zinc and trivalent chromium have gradually decreased by up to 60% and 95% respectively. This is good news for both the WWTP and Hawke Bay, as these constituents can have a harmful effect on wastewater treatment infrastructure and the water and sediment quality in Hawke Bay if not carefully managed. The other constituents analysed have remained stable since 2014 or shown a slight reduction.

5.6 Volume and quality of wastewater received at the WWTP

Condition 24(d) of the discharge consent specifies a maximum annual average daily flow of 66,000 m^3/day as the trigger value for compliance. Based on total combined flow data at the outfall since 2014, this limit has not been exceeded. Figure 3 shows long term annualised average daily flow for the total combined discharge at the outfall as a black line, which has consistently remained below the trigger value (red line). It puts the flows seen since 2014 (under the current consent) in context against those for the preceding 10 years, where flows were more variable and therefore more difficult to manage.

There is a significant increase in flows to the WWTP during peak food production season (roughly mid-February to end of April) each year, when the largest industrial / trade waste dischargers are contributing the highest volumes of wastewater.

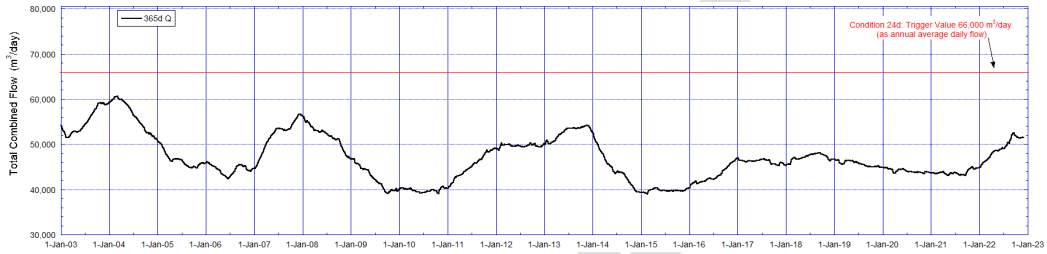

Figure 3 Moving 365-day Average Daily Flow (m^3/day) calculated from flow measurements captured between January 2003 and December 2022

Tables 3 and 4 below summarise the findings of the Review Report with regards to the current volumes and quality of wastewater treated at the East Clive WWTP, and projected future volumes and quality for the year 2049 (at the end of the current consent term). The parameters focused on in the assessment are defined as follows:

- **Average Daily Flow:** Cumulative total flow to the WWTP per year, divided by 365 days (because the WWTP is operated continuously).
- **5-day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$):** The amount of oxygen consumed by organisms in breaking down the organic matter in wastewater, over a five-day period.
- **Total Suspended Solids (TSS):** The mass of solid particles suspended in wastewater.

These are all key indicators (determined by standard tests) of how well the WWTP is coping with influent flows and treating the wastewater to the required standards. While there have been some increases in total combined flows and loads, these are well within the consented limits and the expected degree of change that was forecast back in 2013 (in projections that were made to inform the consent application).

Table 3 Looking back: Changes in wastewater flows and loads between 2013 and 2023

Parameter	Domestic and Non-Separable Industrial wastewater	Separable Industrial Wastewater	Total Combined Discharge
Annual Average Daily Flow	↑ <28% *	↓ <11%	↑ <10%
Average daily load of $cBOD_5$ in influent	↓ 4%	↓ <21%	Not analysed (lack of data)

Parameter	Domestic and Non-Separable Industrial wastewater	Separable Industrial Wastewater	Total Combined Discharge
Average daily load $cBOD_5$ in treated wastewater	↑ 14%	↓ <19%	↑ <16%
Average daily load of TSS in influent	↓ 4%	↓ <19%	Not analysed (lack of data)
Average daily load of TSS in treated wastewater	↑ 20%	↓ <16%	↑ 52%

*Note: *“>” indicates “up to”, accounting for statistical uncertainty in analysis*

Table 4 Moving forward: Projected wastewater flows and loads to 2049

Note: % are approximate

Parameter	Domestic and Non-Separable Industrial wastewater	Separable Industrial Wastewater	Total Combined Discharge
Annual Average Daily Flow	↑5%	→ no change	↑
Average daily load of $cBOD_5$ in influent	↑20%	→ no change	*(no % due to high uncertainty in data)*
Average daily load $cBOD_5$ in treated wastewater			
Average daily load of TSS in influent			
Average daily load of TSS in treated wastewater			

The projections of wastewater flows and loads made in 2013 are compared with the revised projections developed as part of this Review, with the following observations:

- Projected wastewater flows for 2049 will slightly increase (by approximately 5%) for the DNSI stream, while the future projected flows for Separable Industrial stream will be slightly lower (decreasing by up to 17%) and Total Combined Discharge will remain similar to that originally projected in 2013.
- There is greater variation in the projected loads of $cBOD_5$ and TSS in influent and treated wastewater for 2049, when comparing the 2013 projections with the latest 2023 projections. $cBOD_5$ loads in the Separable Industrial stream are now projected to be up to 30% lower in 2049 than first projected in 2013, while $cBOD_5$ loads in the DNSI stream could be up to 20% greater than first predicted.
- The projected TSS load for Separable Industrial stream in 2049 is now predicted to be up to 80% less than that first projected in 2013. This difference is likely due to increased knowledge of industrial / trade waste management practices, and specifically changes in HDC’s regulations and policies in relation to pre-treatment for the removal of TSS which includes sediment.
- Separate commentary for seasonal flows (for example, peak season average daily flow and off-season average daily flow) was not provided in 2013, so it is difficult to provide future predictions for these.
- The ‘high uncertainty’ referred to for the change in Total Combined Discharge is namely because it’s very difficult to predict changes in the DNSI stream, given seasonal variations and population changes. A projection has been made but it should be considered as a rough indication only.

5.7 Wastewater treatment

Condition 27(f) of the resource consent requires the Review to consider changes in wastewater treatment technologies that may be relevant to the Hastings Wastewater Scheme. The effects assessment (summarised in Section 5.9 below) concludes that there have been "no discernible effects" (outside the consented mixing zones) from the discharges of treated, combined wastewater via the offshore outfall during the nine-year review period. As such, a full assessment of treatment technologies was not required. Instead, the Review Report revisits the treatment technologies identified in the 2013 consent application and assesses them against seven key factors to justify why a change in treatment is not considered necessary. These factors are:

- Scientific / environmental effects
- Māori cultural values (A complete assessment could not be made, pending further engagement between HDC, the HDC-TWWWJC and Tangata Whenua)
- Extent of Outfall Mixing Zones for different contaminants
- Beneficial reuse
- Sustainability
- Financial incentive
- Community and stakeholder viewpoints

The alternatives included a mixture of secondary and tertiary treatment options (combinations of BTFs and other filtration processes, clarification, sludge treatment and disposal, UV disinfection and beneficial reuse of treated wastewater). Three additional treatment technologies are identified (building on the 2013 assessment) as follows:

- Reuse of primary and sludge treatment biosolids
- Membrane filtration
- Install a third Biological Trickling Filter (BTF) tank

The first two options (along with the alternative options identified in the 2013 assessment) will not be implemented, but the third option (installing a third BTF tank) is being investigated further by HDC in terms of asset management and allowance for future growth i.e. planned resilience).

The assessment further notes that there is additional capacity in the BTFs to treat wastewater (if flows to the WWTP increase) and to continue to transform kūparu (the human waste component) to biomass into the future. The concept of transformation of kūparu was introduced in Section 5.3 above. The appropriate degree of transformation may be a consideration for the cultural impact assessment.

5.8 Options assessment and the Best Practicable Option (BPO)

The current Hastings Wastewater Scheme is assessed against the Project Vision and Objectives identified in the 2013 consent application, and the definition of a Best Practicable Option as defined in the RMA 1991. A key component feeding into this assessment is a secondary assessment of options for the "treated wastewater disposal / discharge and beneficial reuses that may be appropriate" (from Condition 27(h)). The latter involves reviewing options previously identified (for example, as part of the 2013 consent application) and introducing any new options that may now be relevant, such as sewer mining. The Review focuses on options for discharge of the two treated wastewater streams (DNSI and Separable Industrial), either jointly after being combined in the outfall pumping station, or separately. As stated in Section 4.7 above, the effects assessment presented in the Review Report concludes that there is no need, from an environmental impact perspective, to increase the level of treatment for the discharge via the offshore outfall. Therefore, the options assessment in this report was not highly detailed. Options in the following general categories are assessed:

- Land discharge / land application: Rapid Infiltration; Slow Rate Irrigation; Surface Flow Wetlands, and Overland Flow.
- Beneficial reuse of wastewater (from one or both of the DNSI and Separable Industrial waste streams): Sewer mining; options for industrial / trade waste dischargers to reuse separable industrial wastewater for non-potable uses, and reuse in the Hastings Wastewater System for non-potable water supply (for example, to combat water scarcity and recharge groundwater aquifers).

A key objective identified in 2013 was that "*the Scheme shall be the Best Practicable Option (BPO) (in terms of the RMA definition) for Hastings future wastewater management that is in keeping with sustainable management principles and practices*". The Review Report identifies opportunities for improvement to the current BPO Scheme, and recommends future ways in which the Scheme could best fit a BPO solution. Key findings of the assessment include:

- Many of the Project Objectives are well aligned to the BPO interpretation, as set out in Section 3.2.3 of the Review Report.
- The current Hastings Wastewater Scheme still meets the 2013 Project Objectives well. The approvals and processes involved in achieving those Objectives also mean that the requirements of the Hawke's Bay RCEP regarding application of a BPO approach are met.
- A number of improvements that could be made to further enhance the BPO Scheme, mainly relating to the development and implementation of a strategic planning approach (which is detailed in Section 1.4.3 of the Review Report). There is scope for the project objectives and BPO criteria to be re-examined and, where appropriate, revised in the future either as part of the next nine-yearly review or at the behest of the HDC-TWWWJC. The strategic planning approach could be the mechanism by which this occurs.
- Several potential changes to the existing consent conditions could be adopted., The Review Report categorised these in terms of 'Defunct' conditions (those that are no longer relevant or applicable); conditions requiring further 'Review' with input from the HDC-TWWWJC, and conditions for which a change has already been recommended based on prior work or the Review Report findings. Further assessment of the changes requiring 'Review' is included as a recommendation in Section 7 of the Review Report.

5.9 Assessment of effects

The discharge via the offshore outfall has had **no discernible effects** outside the consented mixing zones since 2014, from those contaminants and parameters assessed. The majority of the effects assessed have a 'neutral' status, in that no adverse changes were obvious as evident from the consent monitoring records evaluated. This includes both temporal and spatial changes.

Table 5 Summary of assessment of effects of the discharge of treated wastewater into Hawke Bay from East Clive WWTP

Legend:

Compliance level	Assessed overall change
Full compliance over 9 years	↘ Improvement; positive effects
Mostly compliant, less than 5 non-compliances (e.g. exceedances of consented limits) over 9 years	➔ Neutral / no change
Non-compliant, multiple non-compliances over 9 years / historic issues	↗ Decline; adverse effects
N/A – No relevant consent condition to assess against	N/A – unable to assess long term change since 2014 (e.g. due to missing data)

Effects category	Compliance with relevant consent conditions	Assessed overall change	Comments / Relevant section(s) in Review Report
Water quality (physico-chemical)			
Suspended solids, colour and clarity	Some data gaps	→	Table 2-26 Drone Surveys have been implemented to monitor visual effects (e.g. plumes) since early 2024.
Oil and grease		→	Table 2-26 Assessment against Condition 7(c) limited due to occasional data gaps.
Ambient water temperature		→	Table 2-26 Temperature generally between 10-22°C.
Dissolved oxygen		→	Table 2-26 Dissolved oxygen levels typically greater than 80% saturation. Recommend a change to the wording of consent Condition 7(g) to clarify for future compliance assessments, as well as the introduction of Chlorophyll-α monitoring (top detect algal growth).
pH	Some data gaps	→	Table 2-26 Difficulties in interpreting trends due to gaps in data records.
Nutrients (nitrogen and phosphorus, in their different forms)		→	Section 2.9.3.3 Multiple exceedances of consented limits for total nitrogen, phosphorus, nitrate- and nitrite-nitrogen, and dissolved reactive phosphorus (DRP). However, there was no obvious difference between sites closest to the discharge and the sites farthest away (all locations had results that were similarly high). As described for cumulative effects below, this is likely indicative of other sources of nutrients in Hawke Bay.
Cumulative water quality effects on Hawke Bay	N/A	↗ (for the TANK coast)	Table 2-26 Difficult to separate out the direct effects of wastewater discharges via those from other sources (such as from rivers) using the available information. There are known issues with fine sediments, DRP and Dissolved Inorganic Nitrogen (DIN) along the coast where the Tūtaekurī, Ahuriri, Ngaruroro, and Karamū (TANK) rivers discharge.
Objectionable odour		→	Table 2-26 Inconsistent records for observations made close to the offshore outfall. Three complaints on record between 2014 – 2017.
Recreational values	N/A	↘	Table 2-26 Increased recreational usage in the area, particularly at Waitangi Estuary.
Public health			
Shellfish gathering	Some data gaps	→	Table 2-26

Effects category	Compliance with relevant consent conditions	Assessed overall change	Comments / Relevant section(s) in Review Report
			Nearest shellfish collection areas are over 6 km from the offshore outfall (Te Awanga, Clifton or Black Reef).
Contact recreation	Some data gaps	➔	Table 2-26 Section 2.9.3.2 The few exceedances for faecal coliforms appear to be isolated events related to warmer, wetter summers rather than indicative of any long-term change. There is also likely to be an influence from other sources such as the Tukituki and Ngaruroro Rivers.
Aquatic ecology			
Chemical-specific toxicity to marine organisms		➔	Table 2-26 No exceedances of guidelines for total ammoniacal-nitrogen toxicity.
Direct toxicity to marine organisms		➔	Table 2-26 All Whole Effluent Toxicity (WET) testing since 2014 has yielded results that are compliant with Condition 15; to date, a Toxicity Identity Evaluation has not been required.
Benthic sediment (sediment on the sea floor)		➔	Table 2-26 Mercury slightly elevated in sediment on three isolated occasions. No evidence of long term accumulation of contaminants in sediment.
Benthic ecology (organisms living on the sea floor)		➔	Table 2-26 Benthic Survey completed 2023.
Bioaccumulation (the accumulation of contaminants within aquatic organisms and sediment over time)	N/A	N/A	Table 2-26 Not able to assess long term change due to lack of previous assessment.
Marine mammals	N/A	➔	Table 2-26 No known observations on record.
Emerging contaminants	N/A	N/A	Section 2.9.3.4 No historic monitoring and no consent condition. A study (including testing) was initiated in 2023 and is ongoing.
Commercial aquaculture	N/A	➔	Section 2.10 Positive feedback from one commercial fishing organisation during public engagement.
Separation from other discharges / cumulative effects of discharges into Hawke Bay	N/A	➔	Table 2-26 No new discharges of wastewater consented since 2014. Dredging off-shore disposal also well away from the offshore outfall..

5.10 Recommendations and forward work programme

The Review Report identifies 35 actions for HDC to consider implementing , including recommendations to guide the scope of the next nine-yearly review. These are detailed in Table 7-1 of the Review Report and have been captured at a high level in Figure 4 below. The recommendations are intended as an indicative programme of work that HDC could undertake in the coming years before the next review in 2032. They have been assigned an interim high, medium or low priority with the view to developing a schedule for delivery , to be discussed with the HDC-TWWWJC after this Review Report is published.

Figure 4 Interim prioritisation of recommendations from the Review Report