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Auckland Unitary Plan RMA Section 35 Monitoring: B7.3 Freshwater systems and B7.4 Coastal water, freshwater and geothermal water

August 2022

Technical Report TR2022/14

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Plans and Places Department, Auckland Council

Auckland Council
Technical Report

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Photo on second page: Rangitopuni Creek Riverhead, photo taken by Jay Farnworth.

Executive summary

The Auckland Unitary Plan (AUP) became operative in part in November 2016. This report considers how effective and efficient the objectives, policies, rules and other methods of the AUP have been in meeting the outcomes intended by the Regional Policy Statement (RPS) in Chapter B7.3 Freshwater systems and Chapter B7.4 Coastal water, freshwater and geothermal water.

This monitoring work will contribute to our knowledge base – what is working in the plan and where there may be challenges. This knowledge will help to inform future plan changes and fulfil the policy cycle. Additionally, this report will address the section 35(2)(b) plan monitoring requirements of the Resource Management Act 1991 (RMA).

This report is part of a series of reports, each relating to different chapters of the AUP RPS. It is recommended that this report is read in conjunction with its companion technical topic reports. There is also a summary report available.

AUP Chapters B7.3 and B7.4 seek to achieve a range of inter-related outcomes. These outcomes have been summarised for the purpose of this report as:

- Water quality is maintained where it is excellent or good, and improved where it is degraded
- Water is allocated and used efficiently
- Loss of streams and wetlands is minimised
- Discharges are managed to minimise adverse effects
- Adverse effects of land use change on water are avoided, remedied or mitigated
- The AUP is amended to include National Policy Statement for Freshwater Management (NPS-FM) limits and targets

This report examines whether the AUP is being effective and efficient in achieving each of these outcomes. The assessment required consideration of the many different parts of the AUP that implement B7.3 and B7.4, including regional plan provisions relating to water takes, discharges and works in waterways, and district plan provisions relating to how and where development occurs.

The assessment has primarily relied on the following information sources: the council's environmental monitoring and modelling programmes; assessment of resource consents; workshops and discussions with council staff who implement the AUP water provisions; and consideration of relevant research reports and council working papers.

The AUP has a comprehensive range of provisions that aim to protect Auckland's water resources. Generally, the provisions address all the relevant matters, but there is still degradation of waterways occurring. Given the complexity of the outcomes sought in B7.3 and B7.4, it is difficult to draw definitive conclusions on the AUP's performance. Notwithstanding this, the monitoring has provided some overall observations.

The key findings and recommendations are set out below for each of the 11 topics considered in the report, and for issues that were apparent across several topics. Many of the recommendations relate to the work the council has underway to give effect to the NPS-FM 2020. Each chapter of the report also notes how management of that topic will need to change under the NPS-FM, in addition to addressing the findings of this report. The report is also important for achieving the Auckland Water Strategy (2022) vision: 'Te mauri o te wai, the life-sustaining capacity of Auckland's water, is protected and enhanced'.

1. Water quality

Water quality is fundamental to a range of uses and values, to ecosystem functions and to the life-supporting capacity of freshwater systems and coastal waters. Numerous parts of the AUP work together to ensure that water quality is maintained and enhanced, meaning this topic reflects the outcome of the whole plan rather than provisions relating to particular discharges or land uses.

The assessment for the water quality topic considered where Auckland's water is degraded, whether it is improving, and how that relates to the AUP.

In much of the region, the quality and ecological health of Auckland's waterways have been maintained or had minor improvements since the AUP became operative.

There is also evidence of water quality degradation across Auckland's coastal water, rivers, lakes and groundwater. All of the mainland harbours and estuaries are degraded with elevated levels of sediment, and this is affecting ecological values. Around the established urban areas there are hotspots where heavy metal levels in coastal sediment are high. Some swimming beaches have faecal indicator bacteria (FIB) levels above NZ guideline values at times, but there have been general improvements in the percentage of time that monitored beaches were swimmable. Litter and microplastics are found throughout coastal areas. The majority of Auckland's rural and urban rivers and streams are degraded for at least one regionally or nationally relevant attribute for ecosystem and or human health, but the streams in native forest areas are still in good health. The contaminants with widespread degradational effects on river water quality include FIB, some nutrients, and suspended fine sediment. It is less clear what is happening with water quality in Auckland's lakes, due to limited historic environmental monitoring, but there are indications of impaired clarity and a risk of nutrient enrichment that could result in excessive growth of algal biomass and aquatic plants. There are elevated nitrates in monitored aquifers in the rural Franklin area and in the Three Kings urban volcanic aquifer.

In general, areas that are excellent and good are being maintained, and degraded areas are slowly improving. However, where there is improvement, it is very slow and will take a long time to change a degraded area to a 'good' state. There are localised areas where the state is getting worse.

Many of these issues reflect the history of land use change and contaminant inputs, and cannot be directly attributed to actions under the AUP in the last five years. Factors that affect water quality include consents granted before the AUP was operative, climate change, and national regulations. The findings demonstrate the need for comprehensive and extensive action, including in ensuring that each relevant part of the AUP is effective in protecting and enhancing water quality.

2. Water allocation

The intent of the AUP is that water is made available to be allocated to Aucklanders to provide for social, economic and cultural purposes within limits that protect values and ensure that the future needs of Aucklanders are met. To measure the efficiency and effectiveness of the AUP in meeting this objective, a number of indicators were developed that related to setting limits to protect values, allocating water efficiently and within the established limits, efficient water use, and the protection that the relevant AUP overlays provide.

Assessment of the available data sources indicates that 10 per cent of the region's aquifers are over-allocated (more water has been allocated than is deemed available). Conclusions could not be established regarding the allocation of surface water bodies. While the AUP provides little direction about what is meant by 'efficient allocation', decision makers are drawing on a wide range of resources to ensure that water allocations are reasonable and justified. The efficient use of water is being promoted but there has been a large drop in compliance for water metering and reporting, meaning there is scope to better utilise water use data to support robust decision making. The AUP utilises high-use stream and aquifer overlays, natural stream and natural wetland overlays to protect specific values of water bodies, but the effectiveness of these overlays is varied. There is a need to undertake further work to ensure that water bodies with specific values are adequately protected. There is also a need to improve the operational management of water takes in times of low stream flow to ensure that natural values of these waterbodies are safeguarded year-round.

The current approach to data management is no longer fit for purpose and the management of water availability, water allocation and water use data must be improved. This will ensure that statutory responsibilities are being met and will support the effective implementation of the AUP and provide for future generations. The need for further guidance to support the implementation of the AUP is also recognised across many aspects of water allocation and use.

3. Streams and wetlands

Auckland's streams and wetlands are at risk of incremental loss and degradation from piping and infilling, in both rural and urban areas. The AUP seeks to minimise the loss of streams and wetlands, and to minimise the adverse effects of activities in the beds of streams and in wetlands. This topic considered how much stream or wetland had been lost, and whether the loss of extent and values was minimised by addressing all the matters set out in the AUP.

Under the AUP, 75 resource consents have been granted that allow for the permanent filling or piping (reclamation) of 10.5 km of permanent streams, 9.6 km of intermittent streams and 5.5 ha of wetland[1]. This is a very small proportion of Auckland's freshwater systems (approximately 0.06 per cent of the region's permanent streams, 0.2 per cent of the intermittent streams and 0.09 per cent of the region's wetlands). There was considerable variation in the amount consented in any one year, with only a few consents accounting for much of the consented works. Much of the stream and wetland loss was for residential development in greenfield areas. It is difficult to comment on whether this was an appropriate extent of loss, noting that the RPS seeks for loss to be 'minimised' rather than 'avoided'. There was no information available on how much reclamation has occurred that was unconsented and works under the legacy regional plan were reported only for 'stream disturbance' which includes all works in streams, not just reclamation.

Analysis of the consent decisions indicates there are decision making gaps in assessing relevant policy matters. It appears the AUP is not fully effective in limiting stream and wetland loss to instances where the specified criteria have been met.

The consent decisions appeared to have had little consideration of the requirement to consider the 'availability of practicable alternatives' and to only allow reclamation where it was needed for specific activities. In some cases, the protection of streams and wetlands has been de-prioritised when considered alongside other AUP provisions. The most common way this was justified by the decision maker related to the need to give effect to residential zoning or precinct development expectations.

[1] In this report, 'wetlands' refers to inland wetlands and does not include wetlands in the coastal marine area.

Almost all (96 per cent) of the stream reclamation consents included conditions requiring offset works. The most common offset action is riparian planting but often the consent conditions do not ensure that the values of the planting will be maintained in the long term. While offset actions have been secured to address residual adverse effects, and the majority were projected to achieve no net loss or net gain in ecological values, generally there was still an overall loss of extent. This reflects that 'no net loss' is stated in the AUP as a consideration rather than a requirement.

There are opportunities to provide greater direction and improved consistency for the relevant provisions, particularly as the AUP is amended to give effect to the NPS-FM with more specific identification of the instream values to be protected. The NPS-FM requires that a priority is placed on the effects on waterways, whereas a more 'overall' assessment of effects is typical under current practices.

4. Wastewater network discharges

The AUP defines a wastewater network as a "system of wastewater pipes and associated structures which convey, divert, store, treat, or discharge wastewater". Networks produce discharges of wastewater overflows, as well as discharges of treated wastewater from wastewater treatment plants. Discharges from the network need to be managed to minimise adverse effects, in line with direction from the RPS.

The majority of Auckland's wastewater network overflow discharges are consented under Watercare's wastewater network discharge consents (NDC). These consents were granted prior to the AUP under the now superseded Auckland Council Regional Plan: Air, Land and Water (2010). Watercare's implementation of the network consents reflects the obligations of that regional plan, however, the conditions of the consents align with relevant AUP policy. In particular, both the network consents and the AUP seek to reduce wet weather overflows to an annual average of two events per overflow point, and to prioritise overflow points exceeding that number for improvements, particularly in relation to sensitive environments.

Watercare reported a slight improvement in the wet weather overflow target trends in 2020-21 (Watercare 2021d) for overflows at pump stations. A decreasing trend of uncontrolled wet weather overflows was also reported and linked to drier weather; this analysis highlights that climate variability may have an increasing impact on overflow trends in the future. There was an increase in uncontrolled dry weather overflows under the NDC in the last reporting year (2020-21). Fats and rags have been an increasing cause of overflows; however, the apparent increase may also relate to improved reporting processes. These results illustrate the importance of other methods (such as public education) in addressing overflows.

There have been four consents granted under the AUP that involve network overflow discharges to land or freshwater, four consents for wastewater treatment plant discharges to land or freshwater, and five consents for wastewater treatment plant discharges to coastal waters. A high-level assessment of these consents suggests that the AUP policies have been effectively considered in the consenting process. It must be noted, however, that it is difficult to attribute wastewater network water quality outcomes witnessed today entirely to the effectiveness of the AUP. Wastewater networks are influenced by multiple factors, such as ongoing financial investment and improvements to overflow points (particularly in sensitive environments).

5. On-site wastewater discharges

On-site wastewater systems provide a method of wastewater disposal for properties not serviced by a wastewater network. Discharges from these systems need to be managed to minimise adverse effects, in line with direction from the RPS.

Auckland has approximately 45,000 on-site wastewater systems and 325 of these have been established with resource consents granted under the AUP. The assessment of a sample of resource consents found that on-site wastewater consents are generally being granted in appropriate locations with respect to the anticipated future provision of wastewater network infrastructure. However, constraints such as small site sizes and reduced wastewater disposal reserve areas witnessed in the consent sample highlight the importance of maintenance and monitoring of on-site wastewater systems. Discussion with regulatory wastewater specialists has highlighted an instance where subdivision for smaller sites has been enabled in one area awaiting planned network infrastructure (before it is available), which raises concerns over how effectively the AUP is preventing the need for on-site wastewater systems to be installed on small sites and the related risk of cumulative effects from on-site systems with insufficient disposal areas or inadequate maintenance. The efficiency of consenting processes is also possibly being impacted by the clarity of rules set out in Chapter E5 of the AUP which has resulted in minor variation in its implementation.

Most on-site wastewater systems operate as permitted activities under the AUP and have historically been subject to little regulatory oversight. In response, Auckland Council has developed a compliance programme under the Water Quality Targeted Rate which will improve the council's understanding of how effectively AUP standards are being implemented.

6. Stormwater

Stormwater runoff from impervious surfaces includes a number of contaminants such as sediment, heavy metals, nutrients and other pathogenic contaminants, that can significantly affect water quality and ecosystem health in freshwater and coastal receiving environments. The diversion and discharge of stormwater can also have other adverse effects through altering the natural hydrological regime, such as reducing baseflows, exacerbating flooding, stream bank and coastal erosion, and impacts on aquatic habitat. The AUP predominantly manages stormwater through controls on diversion and discharge in Chapter E8, addressing stormwater runoff quality from high contaminant generating car parks and high use roads in Chapter E9, and by requiring hydrological mitigation in the form of retention and detention in defined areas through Chapter E10.

The public stormwater network is managed in accordance with a comprehensive regionwide Stormwater Network Discharge Consent (NDC), which was granted by an Environment Court Consent Order in 2019. The performance standard requirements of the NDC have been designed to deliver the outcomes of the AUP and the document details objectives, outcomes and targets regarding assets, growth, flooding, stream, coastal and groundwater health, effects on the wastewater network and collaborative outcomes, and includes comprehensive reporting and monitoring requirements. The AUP provisions pre-date the regionwide NDC and as such, do not adequately reflect its existence or facilitate the achievement of the performance standards or outcomes sought.

Despite the identification of some issues with interpretation and a lack of clarity, particularly in relation to Chapter E8, the stormwater management provisions are generally comprehensive. However, there are examples where the stormwater management required by the AUP rules, including for treatment and hydrological mitigation, is less stringent than the requirements of the NDC and implementation of the AUP provisions is hindering optimal operation of the NDC.

Greater emphasis on stormwater quality and treatment requirements and greater consideration given to the management of cumulative effects, particularly on a catchment basis, is likely to be required through the implementation of the NPS-FM. Opportunities and methods to achieve greater hydrological mitigation, particularly in greenfield areas should also be pursued.

7. Rural production discharges

The AUP manages nutrient discharges by focusing on containing discharges from rural production activities on-site and managing discharges with an emphasis on the use of best industry practices to avoid or reduce potential adverse effects from activities.

Since November 2016 only four resource consents have been granted to discharge nutrients from rural production activities. This reflects the reality that most rural production operators can fall under the AUP permitted activity nitrogen leaching maxima. The council does not hold any records on permitted activity discharges except for dairy effluent and this, combined with the absence of proactive monitoring of permitted activities, makes it difficult to assess the effectiveness and efficiency of the AUP nutrient provisions and the management of cumulative effects. Further, the lack of guidance in the policies (E35.3) on what is an acceptable level of non-compliance, means the processing planner for any resource consent application must determine the maximum nitrate load to avoid more than minor adverse effects of discharges on waterbodies, aquifers and watercourses.

Future review of the AUP should consider amendments such as requiring rural operators to provide nutrient application records and proof of compliance with permitted activity standards; and should investigate whether formulating guidance on best management practice would be beneficial to achieve improved water quality. Opportunities on reporting and managing synthetic nitrogen use for dairy farm activities will be improved as the AUP is reviewed to give effect to regulations introduced by the Essential Freshwater Package.[2]

8. Discharges from boats

Boat discharges that are managed under the AUP (and the Marine Pollution Regulations) include discharges of sewage, litter and contaminants from hull antifouling. Such discharges can have significant localised effects on water quality, amenity and cultural values.

The AUP restrictions on the discharge of untreated sewage from boats rely on self-regulation, and so it is difficult to assess their effectiveness. However, the council has undertaken a range of work to increase awareness of the AUP restrictions. More targeted research with boat owners is needed to determine whether sewage discharges can be best managed through regular provision of information or whether the AUP should have requirements for sewage holding tanks for anyone staying overnight on a boat.

The AUP requires that upgrades at marinas, ferry terminals and ports include facilities for collecting and disposing of boat sewage, litter and boat maintenance residues. These matters have been addressed comprehensively in all four of the relevant consent processes. Marina consents have also included innovative conditions relating to antifouling paints on boats due to the localised effect they can have on

[2] Essential Freshwater is national direction to protect and improve rivers, streams, lakes, and wetlands. The package includes the new NES-F, new stock exclusion regulations, amendments to the Resource Management (Measurement and Reporting of Water Takes) Regulation 2010, the NPS-FM 2020, and amendments to the RMA to enable mandatory and enforceable freshwater farm plans, and the creation of regulations for reporting nitrogen fertiliser use.

coastal sediments. Future reviews of the AUP should consider whether to include more explicit controls relating to antifouling paints to ensure that similar conditions continue to be applied in other areas.

9. Land disturbance

Appropriate management of land disturbance is necessary to ensure that sediment is not washed into waterways. Over 6600 consents have been granted for land disturbance activities in accordance with the provisions of Chapter E11 (regional land use controls) and Chapter E12 (district land use controls) since the AUP became operative. An assessment of the consents undertaken within the Sediment Control Protection Area (SCPA)[3] indicates that a significant amount of land disturbance is being undertaken in close proximity to receiving environments.

The cumulative adverse effects of small earthworks sites can be significant, with two thirds of land disturbance undertaken throughout the region (in excess of 600 ha) being for small site development in urban areas. A recent council enforcement project targeting this small-scale development with regular compliance monitoring has proved very successful, with an initial 40% reduction in non-compliance with erosion and sediment control requirements achieved.

An assessment of a sample of resource consents granted indicated that the AUP provisions are, in the most part, resulting in conditions being imposed that require erosion and sediment control. There is, however, a heavy reliance on permitted activity standards and compliance monitoring. In this context, non-statutory methods are critical to achieve industry behavioural change and adoption of best practice. There is a significant gap within Chapter E12, with the provisions lacking guidance and requirements for erosion and sediment control (the activities are technically required to follow the permitted activity standards of Chapter E11 but that requirement is not clear within Chapter E12). The potential for adverse cumulative effects (particularly on a catchment basis) and consideration of the sensitivity of receiving environments, are poorly addressed by both Chapter E11 and E12 and this will need to be addressed through the implementation of the NPS-FM.

10. Land use intensification in existing developed areas

Within existing urban areas, re-development and intensification can lead to increases in adverse effects on waterways but also presents an opportunity for improved management of stormwater. Many of Auckland's most degraded streams and coastal areas are within existing urban areas. AUP provisions that manage the effects of re-development in existing areas include rules relating to impervious areas and activities in riparian areas. Policies also promote the use of integrated stormwater management in development design.

Assessment of consents to infringe the impervious area standards found that the degree of additional impervious area at each site is generally small but stormwater mitigation measures are not being consistently required. The cumulative effect of small infringements above the maximum impervious area standard are not adequately addressed by the provisions. It is recommended that the maximum impervious area standard be included as a core standard within each residential zone (instead of being a matter of discretion) and that greater guidance be provided to practitioners, including in relation to the requirement for, and on-going maintenance of, on-site stormwater mitigation measures. The

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[3] Sediment Control Protection Area is defined in the AUP as:
100m either side of a foredune or 100m landward of the coastal marine area (whichever is the more landward of mean high water springs); or
50m landward of the edge of a lake, river or stream, or the edge of a wetland of 1,000m^2 or greater.

implementation of the NPS-FM and requirement for contaminant (attribute) numeric objectives will support better consenting decisions.

Riparian areas are protected through building setbacks, vegetation removal controls and impervious area limits. However, there is a lack of integration between the controls and recognition of the diverse functions of riparian areas (as biodiversity corridors, providing stream shading, habitat connectivity, etc). The AUP could be enhanced through clearer guidance and direction for riparian activities, particularly regarding the role of riparian areas and riparian vegetation in maintaining and improving water quality and ecosystems.

The AUP includes many of the stormwater components of water sensitive design within policies relating to 'integrated stormwater management'. There is scope for refining the provisions to place a greater emphasis on water sensitive design and to have more explicit linkages to related guidance material. A recent plan change has removed some regulatory barriers to the installation of rainwater tanks in residential areas. Further work is required to require or incentivise rainwater tanks, clustered development and green infrastructure. Such changes could assist with addressing the cumulative impacts of development occurring throughout the urban area.

11. Land use change in growth areas

Urban growth in greenfield areas increases the sources of contaminants, changes the hydrological regime and often involves piping streams. The AUP provisions have ensured that stormwater management, and effects on waterbodies, have been key considerations in structure plan and plan change processes.

All five structure plans prepared by Auckland Council since the AUP became operative have included strong integration with water infrastructure provision and have included catchment management plans or stormwater management plans in their development process in order to direct how the effects of land use change on water are avoided, remedied or mitigated. The strategic nature of structure plans means that some responses are at a very general level. The plans have indicative maps and aspirational statements but the detail of how any particular goals will be achieved is often left for the plan change and consent stages.

Plan changes providing for urban growth have generally addressed the majority of the AUP requirements relating to effects on freshwater systems. However, some plan changes rely on zone and Auckland-wide provisions and so do not make a step forward in introducing targeted place-based rules to address cumulative effects and maintain and enhance local waterways. Most of the greenfield land is being zoned through private plan change applications which are not required to be consistent with structure plans. The plan provides greater direction for structure plans than plan changes.

The areas of the AUP that were shown to be less effective in directing the content of structure plans and plan changes include provisions relating to contaminants (other than for high contaminant generating areas), hydrology, litter, and efficient use of water. This may be because the relevant policies indicate they are desirable or optional rather than required.

The plan could be more directive regarding the water related matters that plan changes should address to ensure that large-scale land use change achieves improvements in waterways. There should be greater recognition within the AUP that new precincts providing for greenfield growth need to include controls relating to contaminants and changes in hydrology in order to achieve a multi-stage, 'treatment train' approach and protect sensitive receiving environments.

Some plan changes (and existing AUP provisions) have issues with requiring riparian enhancement only in relation to streams or wetlands that are shown on a particular map, rather than all waterways found on the site. Some maps have subsequently been found to not include all of the streams and wetlands. There is also a lack of clarity regarding whether the riparian enhancement required in relation to subdivision and land use change is the same or additional to the offset works that will be required for stream works in the same area.

Across-topic issues

Changes under the NPS-FM 2020

Significant change will be needed across almost all of the topics covered in this report in response to the NPS-FM 2020. A plan change to the RPS and regional plan provisions is required by December 2024. The plan change will need to give effect to Te Mana o Te Wai which sets a hierarchy of priorities for water management. The changes will need to be accompanied by a significantly enhanced freshwater accounting system based on extensive monitoring (of the environment directly, and of resource management actions) and modelling of freshwater values and attributes. This report is a key step in understanding the effectiveness of the current management regime, as the council works to develop improvements that meet the new requirements of the NPS-FM.

Cumulative effects

Cumulative effects are difficult to manage through consent processes but are particularly hard to manage where the plan relies on permitted activities. The pressure for development in Auckland means that there is widespread potential for cumulative effects from many different activities. This pressure on the environment will grow as the AUP is amended in future in response to the National Policy Statement for Urban Development to allow for more residential development as a permitted activity.

Resource consent processes have a limited ability to manage cumulative catchment-wide effects because they principally relate to the effects of the activity applied for, not the activity plus all earlier and subsequent potential works in the catchment. Cumulative effects must be considered but are seldom a deciding factor in decision making. Stronger plan provisions and more evidence of the scale of existing effects may assist with this as the NPS-FM is implemented.

The AUP has many permitted activities for small-scale activities that individually have only minor effects but can be widespread and numerous. Permitted activities rely on people being aware of any relevant standards and best practice approaches, and complying with the requirements. The wide range of permitted activities in the AUP need to be supported by targeted education, monitoring and enforcement. The monitoring identified several examples of education and compliance programmes that are resulting in significant improvements in the council's understanding of water related issues or in rates of compliance with the relevant requirements (for example, with respect to on-site wastewater systems, land disturbance and discharges from boats). Such programmes need to be supported and expanded to support the effective implementation of the AUP.

Information sources and data management

Several topics investigated for this report found issues with the council's consenting and compliance databases not being set up to facilitate s35 evaluative reporting. At present, individual consents need to be manually examined to determine matters such as the extent of stream loss or area of earthworks, rather than a summary being readily generated from an automated database. There is also a need for improved systems that can integrate monitoring by consent holders and consent compliance monitoring with State of the Environment monitoring to give a fuller picture of the effectiveness of plan provisions and the processes that implement them.

Integrated management

Improving the management of Auckland's water will require improved integration across different stages or aspects of development and water use. Implications for waterways need to be considered at all stages of development, and not only in relation to subdivision or discharge consents. For example, streams need to be protected in structure plans, precincts and subdivision processes, as there are few alternatives available if consent is sought for stream reclamation or culverting after the form and location of development is determined and is set in a subdivision consent.

Riparian management in the AUP includes a range of measures relating to building setbacks, impervious areas limits, earthworks and vegetation control, but there is little direction in the plan to link these provisions to a clear common purpose to assist with assessing applications.

Stream bank erosion is an example of how management needs to be integrated across urban and rural areas, and across all the activities that affect stream flow. Stream bank erosion is a major source of sediment for streams and coastal water, and contributes to habitat loss. Causes of stream bank erosion include cumulative change in the hydrological regime and change in catchment-wide riparian characteristics. Relevant AUP provisions include restrictions on impervious areas, building setbacks and stormwater controls (including in structure plans), limits on stock access to streams, and wetland protection.

Mana whenua values

AUP B7.4 has a specific objective relating to providing for mana whenua values, but this report does not assess whether the plan has been effective in achieving this objective. It was understood that relevant analysis would be included in a future s35 report relating to RPS Chapter 6 Mana Whenua. The way that the AUP provides for recognition of mana whenua values will change through the development of a plan change to give effect to the NPS-FM. The NPS-FM has a policy that tangata whenua are actively involved in freshwater management (including decision making processes), and Māori freshwater values are identified and provided for. The council is committed to actively involving tangata whenua in freshwater management, including throughout the development of the plan change. Other ways in which the council is working with mana whenua are set out in the Auckland Water Strategy (Auckland Council 2022a).

Contents

Abbreviations in this report include:

Abbreviation	Meaning
ALW Plan	Auckland Regional Plan: Air, Land and Water
AT	Auckland Transport
AUP	Auckland Unitary Plan Operative in Part
BPO	Best practicable option
DIN	Dissolved inorganic nitrogen
DRP	Dissolved reactive phosphorus
DCu	Dissolved copper
DWO	Dry Weather Overflows
DZn	Dissolved zinc
E. coli	*Escherichia coli* – a faecal indicator bacteria that is measured in freshwater.
EOP	Engineered Overflow Points
FUZ	Future Urban Zone
FWMT	Freshwater Management Tool
GD01	Cunningham, A., Colibaba, A., Hellberg, B., Silyn Roberts, G., Simcock, R., Speed, S., Vigar, N. and Woortman, W. (2017) Stormwater management devices in the Auckland region. Auckland Council guideline document, GD2017/001
GD04	Lewis, M., James, J., Shaver, E., Blackbourn, S., Leahy, A., Seyb, R., Simcock, R., Wihongi, P., Sides, E., & Coste, C. (2015). Water sensitive design for stormwater. Auckland Council Guideline Document GD2015/004.
GD06	Chen, Z. and Silyn Roberts, G. (2021) On-site Wastewater Management in the Auckland Region. Auckland Council guideline document, GD2021/006.
Marine Pollution Regulations	Resource Management (Marine Pollution) Regulations 1998
MHU	Residential – Mixed Housing Urban Zone
MHS	Residential – Mixed Housing Suburban Zone
NDC	Network Discharge Consent
NES-F	Resource Management (National Environmental Standards for Freshwater) Regulations 2020
NOF	National Objectives Framework under the NPS-FM
NPS-FM	National Policy Statement for Freshwater Management 2020
NZCPS	New Zealand Coastal Policy Statement 2010
Plans and Places resource consents database	Plans and Places resource consent decision tracking database

Abbreviation	Meaning
SHA	Special Housing Area
SMAF	Stormwater Management Area – Flow
SoE	State of the Environment
TON	Total oxidised nitrogen
TAM	Total ammoniacal nitrogen
THAB	Residential – Terrace Housing and Apartment Buildings Zone
the council	Auckland Council
RMA	Resource Management Act 1991
RPS	Regional Policy Statement
Watercare	Watercare Services Limited
WWO	Wet Weather Overflows

1 Introduction

This report considers how effective and efficient the objectives, policies, rules and other methods of the AUP have been in meeting the outcomes intended by the Regional Policy Statement in B7.3 Freshwater systems and B7.4 Coastal water, freshwater and geothermal water. The monitoring is undertaken in accordance with section 35(2)(b) of the RMA.

Section 35(2A) specifies that local authorities must publish the s35(2)(b) monitoring results every five years. The AUP became operative in part in November 2016. In November 2021 the plan had been operative in part for five years.

The findings of this report seek to tell a story of what the AUP is achieving and where challenges may be. With evaluative monitoring of the working plan being a key link in the policy development lifecycle, the report provides an evidence base for determining what action may be necessary.

The terms 'effectiveness' and 'efficiency' are not explicitly defined in the RMA. For the purposes of this monitoring report the terms are generally interpreted as[4]:

> ***Effectiveness*** *is the contribution that the provisions make towards achieving the objective, and how successful they are likely to be in solving the problem they were designed to address when compared with alternatives. The difficulty when assessing effectiveness is to be able to answer the question 'how do we know that implementing the policy, rule or method led or contributed to the outcome?'*
>
> ***Efficiency*** *is an assessment of whether the provisions will be likely to achieve the objectives at the lowest total cost to all, or achieves the highest net benefit relative to cost to all.*

The steps undertaken in this monitoring work are briefly summarised in Figure 1.1.

1. Establish links between the Regional Policy Statement and the rest of the Unitary Plan
2. Selecting indicators and measures
3. Ascertaining and collecting the information that is required for the assessment
4. Analysing and interpreting the information
5. Undertaking the assessment of efficiency and effectiveness
6. Reporting the results

Figure 1.1 Steps in the s35(2)(b) monitoring process.

The purpose of this assessment is to determine whether the outcomes sought by RPS B7.3 and B7.4 provisions are being achieved. If monitoring results suggest that the anticipated

[4] Auckland Unitary Plan Monitoring Strategy 2018.

outcomes of the RPS are not being achieved, further work will be needed to determine the most appropriate way to amend the AUP or whether other action is needed. Any changes to the AUP in response to this report will require a plan change process that includes public notification with the opportunity for submissions and hearings.

RMA section 80A requires the council to notify a plan change to the AUP by 31 December 2024 in order to give effect to the National Policy Statement for Freshwater Management 2020 (NPS-FM). This report will be a useful information source for development of that plan change.

1.1 RPS B7.3 and B7.4 overview

This report includes both RPS Topic B7.3 Freshwater systems and B7.4 Coastal water, freshwater and geothermal water. This is a combined topic because there is considerable overlap in the matters addressed in B7.3 and B7.4. Section B7.3 focuses on freshwater systems while B7.4 focuses on water quality and allocation. The health of freshwater systems is dependent on water quality and quantity. The activities and pressures addressed in B7.3 and B7.4 are often the same. This is illustrated by the way that the first policy in B7.3 is almost duplicated in the first policy of B7.4.

The AUP needs to have an integrated approach, ki uta ki tai (mountains to the sea) to the management of water. This report considers how Auckland's freshwater systems and coastal water are being impacted by activities and discharges, and how that then affects their values and their receiving environments where relevant.

The full wording of AUP B7.3 and B7.4 is included in Appendix A.

1.2 Connections with other parts of the plan

1.2.1 What AUP provisions does this report cover?

This report assesses the effectiveness of the AUP water management provisions in achieving the outcomes set out in B7.3 and B7.4. These provisions are spread over many different chapters of the AUP. The full list of relevant chapters is set out in Appendix B.

The principal parts of the plan for water management, and the focus of this report, are in Chapter E Auckland-wide and include regional plan and district plan provisions. Chapters E1 to E10 include provisions relating to water quality and quantity, lakes, rivers, streams and wetlands, discharges, water takes and stormwater quality and quantity management. Chapters E11 and E12 cover land disturbance which is part of water management because of the potential for sediment generation. Chapter E35 'Rural production discharges' manages the discharge of nutrients from activities such as disposal of effluent from dairy sheds, leachate from silage storage, and the application of fertiliser.

Provisions relating to discharges to the coastal marine area are set out in Chapter F which is part of the regional coastal plan, principally in Chapter F2 Coastal – General Coastal Marine Zone.

The values of particular waterbodies and coastal areas are recognised through the provisions in Chapter D Overlays. These include overlays relating to high use and quality sensitive aquifers, high use and natural streams, natural and urban lakes, water supply areas, significant wetlands and significant ecological areas.

Other chapters of the AUP are relevant due to their management of land uses which can then affect waterways. Relevant provisions include the controls on the form and extent of urban development, as they can impact on the quality and quantity of discharges to waterways, and on the retention of riparian areas. Also relevant are the controls relating to the intensity and location of rural activities (and the consequential discharges and change in vegetation cover), and to structure planning prior to developing greenfield areas. Relevant chapters include G1 Rural Urban Boundary, the Auckland-wide provisions on subdivision as well as Chapter H Zones and Chapter I Precincts.

Several parts of Chapter E are listed in Appendix B for completeness, as they have some relevance to the management of waterways or water quality, but are not assessed in this report. These include: E4 Other discharges of contaminants, E13 Cleanfills, managed fills and landfills, E26 Infrastructure, E32 Biosolids, E33 Industrial and trade activities, E34 Agrichemicals and vertebrate toxic agents, E38 Subdivision – Urban and E39 Subdivision – Rural. The Plans and Places resource consent database indicates that no consents have been granted under E32 Biosolids since the AUP became operative in part. The other listed parts of Chapter E have a relatively minor role in water management compared to E1 to 10, and they will be the subject of other s35 reports. The scale of provisions related to water management meant there was a need to rationalise the scope of the report to priority areas.

1.2.2 Links with other section 35 reports

Other section 35 technical reports will also cover some of the AUP chapters included in this assessment as they have links to water management. Relevant reports that are being published in the first tranche of s35 reports include those relating to Chapter B2 Urban growth and form and Chapter B10.2 Natural hazards & climate change. As noted earlier, the extent and form of urban development has a significant impact on the generation of contaminants, on the hydrological regime (how much and how fast rainwater reaches waterways), and on the values of freshwater systems. The Chapter B10.2 report includes flooding which is a water quantity issue but is addressed within the AUP in the natural hazards provisions.

Section 35 reports that will be published in the future, and have a linkage to water management, include those that cover:

- B3.2 Infrastructure
- B3.3 Transport
- B4.4 Waitākere Ranges Heritage Area
- B6.2 Recognition of Treaty of Waitangi/Te Tiriti o Waitangi partnerships and participation

- B6.3 Recognising Mana Whenua values
- B6.4 Māori economic, social and cultural development
- B6.5 Protection of Mana Whenua cultural heritage
- B7.2 Indigenous biodiversity
- B8.3 Coastal subdivision, use & development
- B9.2 Rural activities
- B9.3 Land with high productive potential
- B9.4 Rural subdivision
- B10.4 Land – contaminated

1.2.3 Plan changes

There have been no plan changes to B7.3 and B7.4 since the AUP became operative in part in 2016. There have been two plan changes that have affected several provisions in other chapters of the plan that implement B7.3 and B7.4.

> Plan Change 4: 'Corrections to technical errors and anomalies in the Auckland Unitary Plan Operative in part' amended many parts of the AUP where there were clear errors creating ambiguity or uncertainty with the administration of those provisions.
>
> Plan Change 14: 'Improving consistency of provisions for Auckland-wide and Overlays' amended several provisions in relevant chapters in order to improve their consistency, effectiveness and clarity.

In December 2020, Chapter E3 was amended to include a new objective relating to fish passage and two new policies relating to natural inland wetlands and the loss of river extent and values. The NPS-FM 2020 required that the objective and policies be inserted into regional plans under section 55 of the RMA without using the process in schedule 1 of the RMA. As noted earlier, work is underway to develop AUP plan changes to give effect to the NPS-FM.

There have been several AUP plan changes that provide for large-scale land use change, particularly in terms of greenfield development, and so have implications for water management. These are discussed below in Chapter 12 Land use change in growth areas.

1.3 Auckland and planning context

1.3.1 The challenges of managing Auckland's water

Auckland Council's water strategy discussion document, *Our Water Future* (Auckland Council 2019a), begins by noting that protecting streams, rivers, lakes and harbours is a top priority for Aucklanders, and that there are big challenges we need to tackle. It uses the diagram in Figure 1.2 to highlight the extent and complexity of the region's waterways and aquifers.

The Auckland Water Strategy (Auckland Council 2022a: 3) notes that “our connection with water is part of what makes Tāmaki Makaurau Auckland so special”. Historically, the region’s harbours and streams were abundant sources of food for mana whenua and visitors alike. They also formed important transport and trade routes. They provide spaces for recreation and amenity and form a key element of many Aucklanders’ sense of place and connection to the natural environment. Waterways provide some of the region’s drinking water and are home to a diverse range of ecosystems.

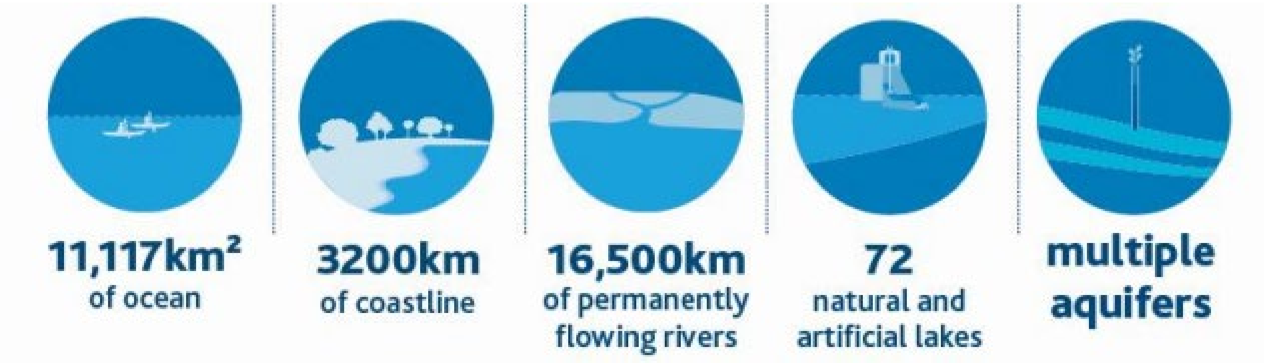

Figure 1.2 Quantifying Auckland’s water resources (Auckland Council 2019a: 4).

Auckland has a few large rivers but generally the region’s surface freshwater systems are characterised by soft bottomed, short streams that quickly feed into estuaries, harbours and the open coast. Naturally occurring high gradient, hard-bottomed rivers are generally restricted to catchments within the Waitākere Ranges, Hunua Ranges and Aotea / Great Barrier Island.

The development of Auckland has meant that many rivers were piped, wetlands were drained, springs and lakes were modified, and plumes of sediment and other pollutants were discharged into the harbours and estuaries. In both urban and rural areas, water quality has declined. Freshwater and coastal environments are showing the stress of decades of pressure. The key causes of degradation are shown in Figure 1.3 below. Freshwater quality and ecosystem health are affected by point source and diffuse discharges from rural and urban activities.

The impacts of urban development are a particular concern in Auckland due to the pressure for urban development and the impact that it can have on streams, harbours and estuaries. The AUP has enabled significant urban growth in greenfields areas and in existing areas over the last five years. The National Policy Statement for Urban Development 2020 (NPS-UD), and the Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021 mean that the AUP will be amended in August 2022 to enable higher-density housing across the city. Having appropriate controls on that development will be important for ensuring the values of Auckland’s waterways are maintained.

Development provided for by the AUP can enable further improvements to waterways and water quality. Auckland has areas where water quality is improving and where freshwater systems have been restored or enhanced due to conditions on resource consents and to the extensive enhancements works undertaken by infrastructure providers and the community.

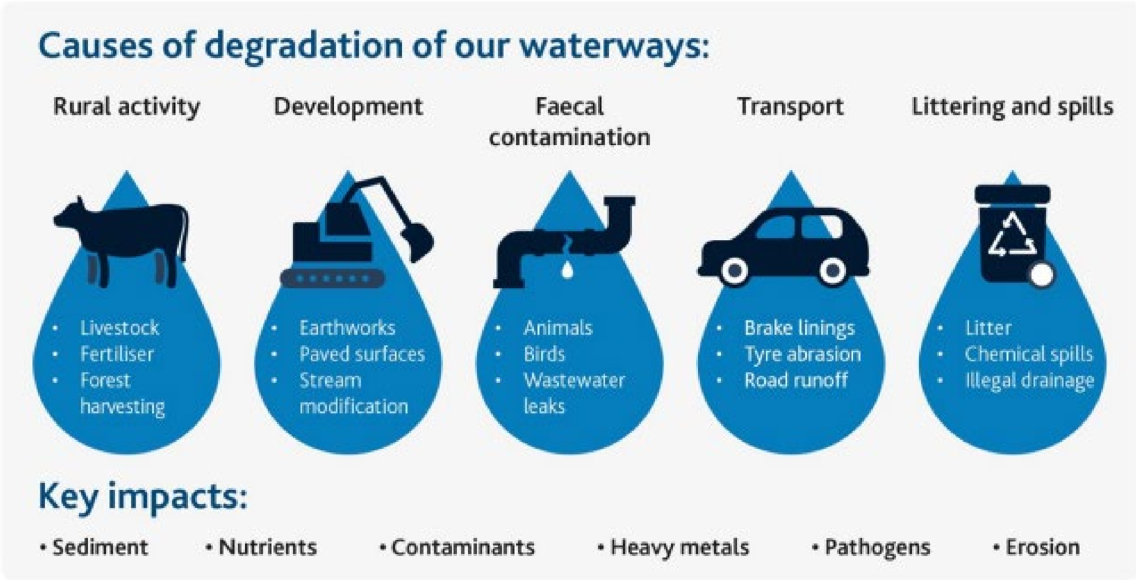

Figure 1.3 Ecosystem stressors impacting Auckland's waterways (Auckland Council 2019a: 20).

1.3.2 Implementing the NPS-FM and NZCPS in the AUP

B7.3 and B7.4 are the key RPS sections that establish the framework for the management of freshwater resources and coastal water quality. These are the AUP's foundation to giving effect to the NPS-FM and the New Zealand Coastal Policy Statement 2010 (NZCPS).

1.3.2.1 National Policy Statement for Freshwater Management

The NPS-FM sets out the national objectives and policies for freshwater management under the RMA. The NPS-FM was introduced in 2011, updated and replaced in 2014, and amended in 2017.

The NPS-FM was updated and replaced in September 2020 as part of the government's "Essential Freshwater" package of new rules and regulations. Other changes in Essential Freshwater included the National Environmental Standards for Freshwater (NES-F), amendments to the measurement and reporting of water takes regulations, and stock exclusion regulations. Regional councils are required to notify new or updated regional policy statements and plans that set out how the region will implement the new NPS-FM over coming decades. The new plans or plan changes must be notified by December 2024 and final decisions on those plans are due two years later (or three years later if an extension is granted[5]).

Policies in AUP B7.4 and Chapter E1 include several direct references to the NPS-FM, including directing the council to give effect to the NPS-FM by establishing new freshwater objectives,

[5] RMA schedule 1 clauses 51 and 52 establish that decisions on a freshwater planning instrument must be notified before the expiry of 2 years after the date on which the instrument was publicly notified. Clause 47 provides for the Chief Freshwater Commissioner to extend the timeframes for various parts of the freshwater planning process, but the total period of any extension must not exceed 12 months.

management units, water quality limits, environmental flows, and targets and methods where the units do not meet the objectives. There are also requirements to manage discharges by having regard to the NPS-FM National Bottom Lines and the Macroinvertebrate Community Index as a guideline for freshwater ecosystem health associated with different land uses, until the plan change is incorporated into the plan. This wording reflects the 2011 and 2014 versions of the NPS-FM.

This report assesses the effectiveness of the AUP in achieving its objectives, which were prepared to give effect to the earlier versions of the NPS-FM, not the 2020 version. As noted earlier, this report will feed into the process of developing a new plan change to give effect to the NPS-FM 2020.

The new NPS-FM requires significant changes to the AUP in managing freshwater. It directs regional councils, with active involvement of tangata whenua and in consultation with communities, to set objectives for the state of freshwater bodies in their regions and to set limits on resource use to meet these objectives. This must be done through a specific process (the National Objectives Framework (NOF)) by identifying the values that tangata whenua and communities have for water, and using a specified set of water quality measures (called attributes) to set objectives as desired attribute states (and use similar tools for water quantity).

Some other key requirements of the NPS-FM 2020 are as follows.

- Manage freshwater in a way that gives effect to "Te Mana o te Wai", including by prioritising the health and wellbeing of water bodies and freshwater ecosystems, then the health needs of people, followed by other uses (NPS-FM policy 1 and clause 1.3)
- Improve degraded water bodies, and maintain or improve all others using bottom lines defined in the NPS-FM (NPS-FM policy 5).
- Avoid any further loss or degradation of natural inland wetlands and streams, map existing wetlands and encourage their restoration (NPS-FM policies 6 and 7, clauses 3.21 to 3.25).
- Protect the significant values of outstanding freshwater bodies (NPS-FM policy 8).
- Ensure that freshwater is allocated and used efficiently, that all existing over-allocation is phased out, and future over-allocation is avoided (NPS-FM policy 9).
- Achieve the national targets for improvements in the proportions of rivers and lakes that are suitable for primary contact (NPS-FM policy 12, clause 3.27 and appendix 3).
- Systematically monitor and report on the condition of freshwater, and respond to any deterioration, including through the use of water quality and quantity accounting systems that can track over time the cumulative effects of activities and provide an assessment of whether the target attribute states are being achieved and, if not, whether and when they are likely to be (NPS-FM policies 13 and 14, clauses 3.18 to 3.20, 3.29, 3.30).
- Use the 'best available information' which is a requirement to use, if practicable, complete and scientifically robust data, and may include information obtained from modelling, as well as partial data, local knowledge, and information obtained from other sources (NPS-FM clauses 1.6, 3.10, 3.11, 3.14 and 3.16).

- Adopt an integrated approach, ki uta ki tai, that: recognises the interconnectedness of the whole environment, from the mountains and lakes, down the rivers to hāpua (lagoons), wahapū (estuaries) and to the sea; and manage freshwater, and land use and development, in catchments in an integrated and sustainable way to avoid, remedy, or mitigate adverse effects, including cumulative effects, on the health and well-being of water bodies, freshwater ecosystems, and receiving environments; and encourage the co-ordination and sequencing of regional or urban growth (NPS clause 3.5).

While the purpose of this report is to assess the effectiveness and efficiency of the plan in achieving its objectives (not the NPS-FM), this has been done with a view toward the changes that will be required to give effect to the NPS-FM 2020. Each of the chapters below ends with a section that highlights the changes that will be required under the new NPS-FM. The plan change required to give effect to the NPS-FM presents an opportunity to address any issues identified with the current AUP, as part of moving to a new freshwater management framework.

1.3.2.2 New Zealand Coastal Policy Statement

The NZCPS (2010) includes three policies that specifically relate to water:

- Policy 21: Enhancement of water quality
- Policy 22: Sedimentation
- Policy 23: Discharge of contaminants

Other NZCPS policies that are relevant to water management include:

- Policy 2: The Treaty of Waitangi, tangata whenua and Māori
- Policy 3: Precautionary approach
- Policy 4: Integration
- Policy 7: Strategic planning
- Policy 11: Indigenous biological diversity (biodiversity)
- Policy 13: Preservation of natural character
- Policy 14: Restoration of natural character

AUP B7.4 incorporates the NZCPS objective that coastal water quality should be maintained and enhanced where it is degraded. The assessment of whether the AUP is effective in achieving the objectives of the RPS will also therefore provide an assessment of how effectively it addresses these policies of the NZCPS.

1.3.3 Other methods

The council uses a range of regulatory and non-regulatory methods to implement the objectives and policies in the RPS. These methods are set out in AUP Chapter B1.6 Methods.

'Other methods' is a term used to describe all the implementation methods other than the direct implementation of the provisions of an RMA plan.

Other methods relating to water management include:

- structure plans prepared following the guidelines in AUP Appendix 1
- catchment management plans
- the Auckland Design Manual which includes several water related guidance documents on matters such as water sensitive design for stormwater (GD04)
- education and training programmes relating to water use and management
- funding for activities with water related benefits such as excluding stock from waterways and riparian planting
- local board plans (identifying and funding projects to enhance waterways)
- water quality targeted rate – initiatives to reduce wastewater, sediment and other pollutants contaminating fresh and coastal waters
- infrastructure operation, maintenance and upgrades, particularly those related to water quality improvement (e.g. wastewater upgrades, stream stabilisation, stormwater treatment ponds and wetlands)
- advocacy for changes to national controls and standards, e.g. banning of plastic bags.

The development of the Auckland Water Strategy (Auckland Council 2022a) allows for the provision of these 'other methods' by the council to be strategically planned and integrated toward a new vision: 'Te mauri o te wai, the life-sustaining capacity of Auckland's water, is protected and enhanced'.

1.4 Indicators and measures

Indicators and measures have been developed to assess the progress toward achieving the objectives and outcomes intended by the RPS. They are qualitative or quantitative gauges that are used to assess changes and help diagnose potential issues.

> *An **indicator** (for the purposes of this report) is a qualitative or quantitative gauge that displays degrees of progress to determine whether or not the AUP is moving in the right direction toward meeting its objectives. An indicator should be used to assess the condition of the environment, to identify changes to that condition, to diagnose problems and then to guide future changes to objectives, policies or methods (via plan change or plan review).*
>
> *A **measure** is the selected information that enables evaluation of the indicator. Methods of measurement will differ depending on the indicator.*

The selected indicators for this topic have been shaped by limitations. It was not possible to develop a set of indicators which encompassed all facets of the topic – this is due to constraints on time, resource, and data availability. In addition, some AUP objectives are very broad and encompass several subsidiary objectives. It has been necessary to select indicators that can be reported on, while acknowledging that these may not fully cover all of the outcomes sought by the AUP.

The indicators which have been developed for this s35 topic, and the measures used for each indicator, are described in chapters 2 to 12. The indicators are derived from the outcomes sought by the AUP objectives and policies. The relationships between the AUP provisions and the indicators and measures are set out in Appendix C.

1.4.1 AUP Chapter B11 Monitoring and environmental results anticipated

Chapter B11 in the AUP sets out the monitoring and environmental results anticipated (ERA) of the RPS. B11 is not exhaustive, and an ERA is not listed for every objective in the RPS. Chapter B11 explains:

> *Environmental results anticipated identify the outcomes expected as a result of implementing the policies and methods in the regional policy statement and provide the basis for monitoring the efficiency and effectiveness of those policies and methods as required by section 35 of the Resource Management Act 1991.*
>
> *Environmental results anticipated are not additional objectives, policies or rules: they are indicators to be used when assessing progress towards achieving the objectives in the regional policy statement. These indicators should be used:*
>
> - *to assess the condition of the environment;*
> - *to identify changes to that condition;*
> - *to diagnose the causes of environmental problems; and*
> - *to guide future changes to objectives, policies and methods.*

Table B11.6 Natural resources (B7) establishes indicators (or ERAs) for seven of the fifteen objectives contained in Chapter B7 Natural resources. Four of the selected objectives are from B7.3 and B7.4. Chapter B11 is silent on potential indicators for the other five objectives in B7.3 and B7.4. Accordingly, there is flexibility in developing additional indicators for the purpose of this report. The relevant parts of AUP Table B11.6 are shown below in Table 1.1.

Table 1.1 The water-related objectives and indicators listed in AUP Table B11.6 'Natural resources (B7)'.

Reference	Objective	Indicators
B7.3.1(1)	Degraded freshwater systems are enhanced	Degraded freshwater systems decrease over time.

Reference	Objective	Indicators
B7.3.1(2)	Loss of freshwater systems is minimised	Freshwater systems are maintained and enhanced over time.
B7.4.1(1)	Coastal water, freshwater and geothermal water are used within identified limits while safeguarding the life-supporting capacity and the natural, social and cultural values of the waters.	The ecosystem services provided by coastal water, freshwater and geothermal [water] are maintained or enhanced over time. Over-allocation of freshwater and geothermal water in the region decreases over time.
B7.4.1(2)	The quality of freshwater and coastal water is maintained where it is excellent or good and progressively improved over time where it is degraded.	Degraded freshwater systems and coastal water decreases over time. Sedimentation in freshwater systems and coastal water decreases over time.

In addition to the fact that several objectives are not addressed, several of the indicators listed in AUP B1.6 are unclear and are problematic to monitor as they are not fully aligned with the wording of the objectives. For example, the first indicator could mean either the number or the area of degraded freshwater systems would decrease if degraded systems were enhanced, and could be met if the relevant system is filled in so there are fewer degraded systems. It is unclear about whether it includes degraded systems that improve but are still in a degraded state.

The issues with the B11 indicators meant that new indicators needed to be developed for B7.3 and B7.4 to cover the topics more comprehensively. The new indicators refine the wording used in the B11 indicators to be clearer, and to cover all of the objectives. The intent of the B11 indicators is included within the revised indicators. The first step in identifying new indicators was to identify the outcomes sought by B7.3 and B7.4.

1.4.2 Is the AUP achieving the desired outcomes?

The assessment of effectiveness and efficiency relates to whether the provisions are achieving the desired objectives. The first step in the assessment is to identify the desired objectives or outcomes of B7.3 and B7.4. The topics were considered together to minimise duplication in assessment of overlapping policies.

The outcomes sought by B7.3 and B7.4 are summarised as:

1. Water quality is maintained where it is excellent or good and improved where it is degraded
2. Water is allocated and used efficiently
3. Loss of streams and wetlands is minimised
4. Discharges are managed to minimise adverse effects
5. Adverse effects of land use change on water are avoided, remedied or mitigated
6. AUP is amended to include NPS-FM limits and targets

This report is structured to address each of these outcomes in chapters as shown in Figure 1.4. The RPS has more detail than these high-level outcome statements, on what is sought for each topic, and that was used in developing the assessment approach for each chapter.

There is no chapter in this report that responds to the final outcome sought by the plan, which relates to the AUP provisions that direct the council to develop limits and targets in accordance with the NPS-FM. Those provisions relate to the 2011, 2014 or 2017 versions of the NPS-FM. The AUP has not been amended to set such limits or targets and a new NPS-FM came into force in 2020. It would be inefficient for this report to focus on the specific wording in the AUP regarding what should be done to implement the NPS-FM as that reflects earlier versions of the NPS-FM. Instead, a section at the end each chapter looks forward to the plan change that will give effect to the NPS-FM 2020.

The new NPS-FM requires a considerable shift in how water is managed. Each chapter notes how the relevant topic will be affected by the requirements of the current NPS-FM. This is not a full analysis of how the council needs to implement the new requirements; it is a signal that in addition to addressing any issues noted in the effectiveness and efficiency review, extensive other changes will also be required. The recommendations from the s35 review will be incorporated into the ongoing work of developing a plan change to implement the NPS-FM.

Water quality is maintained where it is excellent or good, and improved where it is degraded

- Chapter 2 Water quality

Water is allocated and used efficiently

- Chapter 3 Water allocation

Loss of streams and wetlands is minimised

- Chapter 4 Streams and wetlands

Discharges are managed to minimise adverse effects

- Chapter 5 Wastewater networks
- Chapter 6 On-site wastewater
- Chapter 7 Stormwater
- Chapter 8 Rural production discharges
- Chapter 9 Discharges from boats

Adverse effects of land use change on water are avoided, remedied or mitigated

- Chapter 10 Land disturbance
- Chapter 11 Land use intensification in existing developed areas
- Chapter 12 Land use change in growth areas

AUP is amended to include NPS-FM limits and targets

- All chapters

Figure 1.4 Report structure based on B7.3 and B7.4 desired outcomes[6].

[6] Note that the AUP land use controls in E9 and E10 relating to high-contaminant generating areas and stormwater flow management are considered in the stormwater chapter of this report along with the discharges aspects of stormwater controls.

1.4.3 Topic specific indicators and measures

Each of the chapters listed above includes a section on the indicators and measures for that topic. The indicators differ considerably between the topics. Appendix C shows how the AUP objectives and policies have been used to develop indicators applicable to each topic.

1.5 Data and information sources

The data and information used is described in each chapter of this report.

Some of the common information sources were:

- State of the environment (SoE) monitoring
- Freshwater Management Tool (FWMT) modelling
- Plans and Places resource consent decision tracking database
- Workshops and discussions with council staff who implement the AUP water provisions – from Regulatory Services, Healthy Waters, Research and Evaluation (RIMU), Environmental Services, and Natural Environment Strategy
- Research reports or working papers prepared by or for the council.

The SoE and FWMT are described in Chapter 2. The other information sources are described in each chapter.

There are some limitations to this approach as it is largely an internal review, rather than assessing whether the general public or consent holders consider the AUP provisions to be effective and efficient. There is also a focus on the consenting process as there is limited monitoring data available relating to permitted activities.

The resource consent compliance and monitoring database was examined but not used in this topic. It could not be determined how the database could be used to assess the effectiveness of the AUP water provisions. The database included separate spreadsheets for the monitoring of conditions on granted resource consents, and associated site inspections and issued abatement or infringement notices.

None of the compliance spreadsheets identified the rules or standards in the AUP relevant to the granted resource consent or the issued abatement and infringement notices. For each consent, abatement or infringement incident, an additional search in the electronic records (using the consent reference number or property ID) would be required to find contextual information, and the outcome of the monitoring or compliance interaction, creating a time-consuming exercise. It was not apparent how searching for further information would assist with assessing the effectiveness of AUP provisions, as opposed to the effectiveness of the consenting process or the actions of consent holders. Further investigation of infringement data may provide some information of the extent of unlawful stream reclamation or discharges to water that the council is aware of, but that may not relate to the effectiveness of the AUP as it is occurring outside of AUP consenting processes and permitted activity controls.

Although it was not possible to systematically assess all the compliance records, a case-study approach to compliance issues was possible in some topics, through discussions with compliance staff, from compliance records associated with consents that relevant staff had highlighted, and existing reports on compliance issues. These are noted below in the relevant chapters.

This report has not used any monitoring results which have been collected by consent holders in compliance with consent conditions (for example, monitoring water quality or ecological changes during and after a consent is implemented). There is no automated means of determining which consent files may contain applicable monitoring information. It would require manually finding the relevant consent numbers and searching for any data that had been sent to the council. This would be useful for assessing the effectiveness of individual consents, but is likely to have only limited efficiency for monitoring the effectiveness of the AUP provisions, given the time it would take to find relevant data. The council has work underway to incorporate consent monitoring where it aligns with the SoE monitoring in order to enable a more complete picture to be presented in the next five yearly SoE reporting.

1.5.1 Plans and Places resource consent tracking database

The Plans and Places resource consent decision tracking database has been developed by the Plans and Places Department to assist the s35 monitoring programme. Resource consent decisions are recorded through data entry processes in a series of spreadsheets. The methodology used to create this database means it has some limitations.

A new database was required because the council's existing systems for recording information relating to resource consents do not record which AUP provision a consent relates to. The database managed by Regulatory Services has standard information fields for consent reference numbers and property addresses, but not for the relevant AUP rule numbers. The section 35 monitoring process is dependent on identifying which consents relate to different parts of the AUP. This cannot be done through the Regulatory Services database. To find the relevant rules that triggered the need for each consent, a pdf of a resource consent decision report needed to be downloaded and then the reason for consent noted in a separate system, along with the consent reference number and address.

Extracting information from this database results in a list of consents issued under each rule. The numbers of consents triggered by different rules can provide useful information for some topics. In some cases, it has been necessary to also use the consent reference numbers to find additional information such as the decision report or technical advice reports for a specific consent.

A key limitation to note is that approximately 20 per cent of resource consents are missing from the database over the 2016-2021 period and there are errors in entries. In some cases the errors relate to the consent process (for example, noting the wrong rule number down in the decision report) and other errors relate to the data entry for the Plans and Places database. The missing consents appear to relate to a timing issue as the Plans and Places database is updated each month and not all consent decisions appear in the Regulatory Services database in the month they are granted. Unfortunately, there was no simple means of identifying which consents are missing from the Plans and Places database and it was not possible to address these gaps and errors for this topic.

Where each of the chapters of this report refers to data from this database, the date range that was extracted is noted (in general it is from November 2016 to March 2021). This reflects when the data gathering was undertaken, and the data analysis began. It is not quite a full five year review period. There was no simple means of subsequently adding any additional consents that were granted between April and October 2021 to the analysis for each topic.

1.5.2 Random sampling of consents

Where there were large numbers of consent decisions relating to a particular topic or provision, it was necessary to select a sample for more detailed analysis. The data to be selected from was treated as a 'population' and the sample size was selected using a web-based calculator[7]. The confidence level was set to 95 per cent and the relative standard error was set to either 10 or 20. The calculator then produced the appropriate sample size to select to derive the previously set parameters. Samples with a relative standard error of between 10 and 20 should be representative of the larger population. Once the sample size was determined, consents were assigned a random number in the excel spreadsheet, and the spreadsheet was reordered by the random numbers. The sample was the consents that were then listed at the top of the spreadsheet. This sampling approach means that similar sample sizes were required from quite different population sizes. For example, a population of 25 requires a sample size of 13 to be representative (at 95 per cent confidence level and relative standard error of 20), while a population of 250 requires a sample size of 23 for the same level of confidence and relative standard error.

1.6 Recommendations

In each chapter of this report, a series of recommendations are made. Considering the assessment of efficiency and effectiveness of each topic, the recommendations are suggested improvements that will help to ensure that the desired objectives and outcomes intended by the RPS are being achieved. The recommendations broadly relate to improvements to the AUP or to changes in the way the plan is being implemented.

To support further work to address the issues identified through this monitoring, the recommendations that are made throughout the report are assigned into the categories described in Table 1.2. The recommendations from each chapter are also collated into a summary table within Chapter 13 Summary and conclusions.

A large proportion of the recommendations overlap with the requirements of the NPS-FM and will be addressed in the plan change that is to be notified in 2024, or are closely related to aspects of the plan that will be altered to give effect to NPS-FM and should be addressed in the same plan change or in a complementary plan change to related district plan or regional

[7] See https://www.abs.gov.au/websitedbs/D3310114.nsf/home/Sample+Size+Calculator?opendocument

coastal plan provisions[8]. Some recommendations may be able to be addressed earlier, for example, where there is a plan change providing for a new area of greenfield development, it could implement any relevant recommendations in the new precinct provisions that will apply in that location.

There are no recommendations that are deemed significant enough that a water-specific plan change should be developed prior to the NPS-FM plan change.

It is important to note that these recommendations will need to be tested fully through an RMA section 32 assessment, and be considered alongside other recommendations from other section 35 topics and the Plans & Places Department work programme.

Table 1.2: Recommendation categories that are used throughout the following chapters of this report.

Category	Description
NPS-FM	Recommendations that relate to issues with the AUP that overlap with the requirements of the NPS-FM. These issues are likely to be addressed through the implementation of the NPS-FM, specifically through the plan change that will be notified in 2024.
NPS-FM related	Recommendations that relate to issues with the AUP that are not likely to be directly addressed through the plan change that implements NPS-FM but should be addressed through the same plan change (or a complementary plan change) in 2024. Predominantly aspects of the plan that are closely related to the topics impacted by NPS-FM but not directly related to a requirement of the NPS-FM.
AUP review process	Recommendations that relate to issues with the AUP that are not likely to be directly addressed through the NPS-FM plan change and are most appropriately managed through plan review which is scheduled to begin in 2026[9].
Process	Recommendations relating to process and implementation issues that could be improved to ensure that the desired objectives and outcomes intended by the RPS are being achieved. These recommendations may relate to actions that are required by NPS-FM, but do not require changes to the AUP. Further work should be undertaken outside of this monitoring work in 2022 to action these recommendations.
NES-F	Recommendations that relate to issues that may be addressed by implementation of the NES-F 2020. For these recommendations, it may be that there is not yet evidence to substantiate that the NES-F has addressed the issues, or that there is a need for more guidance to support implementation of the NES-F.
Further investigation	Recommendations that relate to issues that need further investigation before advice can be given about which course of action is most appropriate. It may be

[8] The 'freshwater planning process' set out in RMA s80A applies to plans prepared by a regional council (other than a regional coastal plan) for the purpose of giving effect to any NPS-FM or that relate to freshwater. A regional council must publicly notify a 'freshwater planning instrument' by 31 December 2024. The NPS-FM also requires that district plans are amended as necessary to give effect to the NPS-FM. A district plan change uses the process set out in RMA Schedule 1 (not the freshwater planning process) and is required to be notified as soon as reasonably practicable (RMA s55 and NPS-FM clause 4.1).

[9] The timing of the plan review may be affected by the development of the national Resource Management Reform process and the development of the proposed Natural and Built Environments Act.

Category	Description
	that a plan change is required, but that there is not enough evidence to substantiate this.

1.7 Gaps in this topic

Not all aspects of freshwater systems and water quality are covered in this report. In some cases this is due to issues with data availability, and in others it is because the matter will be addressed in other s35 reports or in other processes. The known gaps in this topic include the matters listed below.

1.7.1 Mana whenua values

AUP B7.4 has a specific objective (B7.4.1(6)) relating to recognising and providing for mana whenua values, mātauranga and tikanga associated with coastal water, freshwater and geothermal water. There is also a policy (B7.4.2(5)) requiring the council to engage with mana whenua to identify areas of degraded coastal water where they have a particular interest, and to remedy or mitigate adverse effects on these degraded areas and values.

To assess whether the AUP has been effective in achieving this objective would require engagement with mana whenua. It was not included in this report on the understanding that it will be considered as part of the wider consideration of mana whenua values through the s35 report relating to RPS Chapter B6 Mana Whenua.

Mana whenua values will be a core consideration in the development of the plan change to give effect to the NPS-FM 2020. The NPS-FM requires councils to actively involve tangata whenua (to the extent they wish to be involved) in freshwater management, including decision-making processes at every stage of developing the plan change. The process of developing the new plan change will allow mana whenua to reflect on the effectiveness of the current planning processes as well as developing the new plan change. This will include the requirement set out in AUP policy B7.4.2(5) to engage with mana whenua regarding degraded areas and how they should be managed.

Auckland's Water Strategy (Auckland Council 2022a: 17) identifies that the council and mana whenua must take a partnership approach to the protection, management and enhancement of water. It also sets out a range of actions under the strategic shift of 'Te Tiriti Partnership – the council and mana whenua working together in agreed ways on agreed things' (page 25). The commitment to partnership with mana whenua in monitoring and reporting should lead to enhancements in the knowledge base for future s35 reviews of the AUP water provisions.

1.7.2 Flooding

This report does not assess the AUP provisions relating to flooding. Flooding is a water quantity issue (i.e. when the amount of rainfall overwhelms the drainage capacity of an area) but is addressed in the AUP in the environmental risk and hazards provisions. It is addressed in the s35 report for 'Chapter B10.2 Natural hazards and climate change'.

Stream bank erosion can also be a hazard linked to water quantity, but is considered within this report in terms of being a source of sediment in rivers.

1.7.3 Damming, diversion, groundwater level control, dewatering and the drilling of holes and bores

The damming and diversion of surface water bodies, the diversion and dewatering of groundwater bodies and the drilling of holes and bores under AUP chapter E7 are not comprehensively assessed in this report (however several specific issues are touched on). This is because objective B7.4.1 directs that freshwater and geothermal water is allocated efficiently to provide for social, economic and cultural purposes. The assessment in relation to this objective has focused on the allocation and subsequent take and use of water, rather than on damming, diversion and dewatering.

Damming and diverting is covered where it is associated with structures in rivers and streams under AUP chapter E3.

1.7.4 Stock access to streams and wetlands

Stock access to waterways can contribute to sediment and nutrients in the water. The AUP has rules relating to stock access, however, they have legal effect in a staged manner. Stock is only required to be excluded from lakes, rivers, streams and wetlands (excluding intermittent stream reaches) by November 2021, and from November 2026 the rules will also apply to intermittent streams. This means there is not yet any consenting or compliance monitoring data to consider.

The Resource Management (Stock Exclusion) Regulations were introduced as part of the Essential Freshwater package in 2020 and they also have a staged introduction. The regulations applied from September 2020 for stock in a new pastoral system, and otherwise will apply from July 2023 or July 2025 depending on the stock type, land slope and waterway type.

1.7.5 Biosolids

The disposal of biosolids[10] can lead to discharges that contaminate waterways. Biosolids are not included in this report because the Plans and Places resource consents database indicated that no consents have been granted under Chapter E32 Biosolids since the AUP became operative in part.

[10] Biosolids are defined in the AUP as 'sewage or sewage sludge derived from a sewage treatment plant that has been treated and/or stabilised to the extent that it is able to be safely and beneficially applied to land and does not include products derived from industrial wastewater treatment plants'.

1.7.6 Climate change

Climate change will affect rainfall and the consequent changes in natural hydrological regimes will affect freshwater ecosystems. Climate change will also affect coastal water quality through ocean acidification and water temperature increases (increasing frequency of marine heatwaves), both of which will affect coastal ecosystems and activities (e.g. aquaculture)[11].

The effectiveness of the AUP water provisions in providing for climate change is not included in this report as it is covered in the RPS in B10.2 rather than in B7.3 and B7.4. Future plan changes to the AUP may need to consider how the impacts of climate change can be integrated into the RPS water-related provisions. For example, planning for water quality may need to consider the potential effect of increased high intensity storms on landslips and run-off, and the subsequent effects on streams and the coast. Water allocation may need to allow for greater climate variability and stress on water sources during droughts.

1.7.7 Marine biofouling

The passive discharge of biofouling from vessels is regulated under the discharges section of AUP Chapter F2. It is not included in this report because it is generally regarded as a biosecurity or biodiversity issue rather than a water quality issue. It may be considered in future s35 reports relating to biodiversity or coastal management.

1.7.8 Discharges from marine farming

Marine farming of oysters and mussels can remove contaminants from water and can add nutrients to water. The operation of marine farms can also contribute litter and plastic waste such as floats and ropes. Resource consents for marine farms include conditions to manage such effects and litter has been a focus of the sustainability efforts of the aquaculture industry for several years[12]. The management of marine farms under the AUP will be considered in future in the RPS topic relating to 'B8.3 Coastal subdivision, use and development'.

[11] Increases in air temperature can also affect coastal ecosystems, for example by over-heating shellfish in intertidal areas.
[12] The Aquaculture New Zealand Sustainable Management Framework ("A+ Programme") reports on progress regarding marine farming debris, recycling, and waste audits. See www.aquaculture.org.nz/sustainable.

2 Water quality

This chapter considers how effective and efficient the objectives, policies, rules and other methods of the AUP have been in meeting the outcomes intended by the Regional Policy Statement with respect to water quality and related ecosystem health.

The AUP has a significant role in determining how land use activities and discharges are affecting Auckland's water quality. While the AUP introduced new provisions to help contain urban contaminants at source, it also provided for the expansion of the urban area, and by doing so, potentially increased the future footprint of urban contamination (Hauraki Gulf Forum 2020: 94). The water quality effects of rural activities (such as farming and forestry) are also managed through the AUP provisions.

It is not always clear whether a change in water quality is a response to the policy direction of the AUP or to the various other regulations, plans and activities that can affect Auckland's water quality. For example, contaminants from stormwater and wastewater are managed under the AUP through the plan's consent requirements and these are considered in the discharges sections of this report. The extent to which contamination at rivers and beaches changes over time will, however, be dependent on many other factors such as natural variability, historic inputs and capital works projects planned prior to the AUP becoming operative, along with operational maintenance budgets and approaches to asset management.

This chapter provides a water quality assessment in order to show whether the AUP goals are being achieved (irrespective of whether it was due to the AUP or another reason), and to show the significance and context of the activities that other parts of this report address more specifically. It is important to understand the environmental issues that the AUP water provisions aim to address when assessing the effectiveness of the combined package of water-related provisions.

In many cases, the water quality and ecological health issues noted here are addressed by multiple different parts of the AUP (as illustrated in Table 2.1). Addressing the degradation of Auckland's water requires determining which contaminants are adversely affecting different waterways and which land use activities or discharges require management changes. This then requires consideration of a complex array of different AUP provisions.

Table 2.1 The role of the AUP in managing a contaminant source and linkages between contaminant sources and other parts of this report.

Contaminant types	Contaminant sources managed by AUP provisions (noting relevant AUP chapter)	Report chapter
Sediment	Earthworks at development sites (E11, E12) Farm and forestry related land disturbance (E11, E12) Stream bank erosion which is affected by changes in hydrological flows which are affected by changes in impervious areas and measures to detain or retain rainfall (E3, E8, E10, E38, H zones, I precincts)	3. Streams and wetlands 7. Stormwater discharges 10. Land disturbance 11. Intensification in existing areas 12. Growth areas

Contaminant types	Contaminant sources managed by AUP provisions (noting relevant AUP chapter)	Report chapter
	Exposed soil from vegetation clearance, particularly along riparian margins, which can be related to urbanisation of growth areas and redevelopment in existing areas (E15, H zones)	
Bacteria from faecal matter (*E. coli* in freshwater and Enterococci in coastal waters)[13]	Wastewater networks exfiltration, overflows and discharges (E6, F2) On-site wastewater systems (E5) Stormwater discharges (E8) Farm animals and dairy effluent to land discharges (regulated through land use controls and the rural production discharges limits on nitrogen inputs) (E35) Sewage discharges from boats (F2)	5. Wastewater network discharges 6. On-site wastewater 7. Stormwater discharges 8. Rural production discharges 9. Discharges from boats
Nutrients (e.g. nitrogen and phosphorus)	Rural production discharges (E35) Stormwater discharges (E8) Wastewater discharges (E5, E6, F2), Stream bank erosion (E3, E8, E10, E38)	5. Wastewater network discharges 6. On-site wastewater 7. Stormwater discharges 8. Rural production discharges
Heavy metals (e.g. copper and zinc)	Stormwater discharges (E8, E9) Discharges from industrial and trade activities (E33) Runoff from roads (E8, E9) Stream bank erosion (E3, E8, E10, E38) Land uses and development materials that increased contaminant sources (E33, E38, H zones, I precincts) Discharges from boat anti-fouling and maintenance (F2)	3. Streams and wetlands 7. Stormwater discharges 9. Discharges from boats 11. Intensification in existing areas 12. Growth areas
Litter	Stormwater management devices such as litter traps in streams and catchpits (E8, E9) New sources of litter created by expansion of urban areas (E1, H zones, I precincts) Management of litter in existing development areas (E1, E38, H zones, I precincts) Activities that could result in litter being discharged to waterways such as construction sites or industrial sites near streams, or at marinas and ports (E1, F2)	7. Stormwater discharges 9. Discharges from boats 11. Intensification in existing areas 12. Growth areas

[13] Faecal indicator bacteria (FIB) are explained at https://www.lawa.org.nz/learn/factsheets/faecal-indicators/

2.1 Indicators and measures

2.1.1 Outcomes

The B7.3 and B7.4 objectives set out clear environmental outcomes that the AUP aims to achieve.

- Degraded freshwater systems are enhanced (B7.3.1(1)).
- The quality of freshwater and coastal water is maintained where it is excellent or good and progressively improved over time where it is degraded (B7.4.1(2)).

There are corresponding objectives in the Auckland-wide and coastal provisions in chapters E1 and F2; all seeking that Auckland's water is maintained where it is excellent or good and that degraded water is progressively improved over time. The RPS policies, and the E1 and F2 provisions, provide further detail to this direction by also including the need to maintain or improve:

- sediment quality (E1.2(1), F2.11.2(1))
- the mauri of freshwater (E1.2(2))
- the life-supporting capacity of the Hauraki Gulf (F2.11.2(2))
- areas of degraded coastal water where mana whenua have a particular interest (B7.4.2(5)).

The policies also require that degraded freshwater systems and areas of water that have been degraded be identified (B7.3.2(2), B7.4.2(4), (5)).

These outcomes anchor the AUP water provisions to a common goal that is to be achieved through other plan provisions. Freshwater systems, and water quality[14] in areas identified as having degraded water quality, are to be improved through managing subdivision, use, development and discharges (B7.3.2(6), B7.4.2(6)). Understanding whether these outcomes are being achieved is important for determining whether the plan is being effective.

2.1.2 Indicators and measures

The outcomes set out in the objectives and policies have been used to develop the following indicators for this topic:

- Degraded areas are identified
- Good or excellent areas are being maintained and degraded areas are improving over time

[14] In this chapter, a general reference to 'water quality' means the quality of freshwater and coastal water and related ecosystem health. The term 'freshwater systems' refers to the physical form of rivers, lakes and wetlands, their margins and ecological health, as well as their water quality. Under the RMA, the term 'river' means a continually or intermittently flowing body of fresh water; and includes streams and modified watercourses. In this report, 'stream' is sometimes used in place of 'river' as stream is a more common way of describing the smaller watercourses that are characteristic of Auckland. This chapter does not include measures relating to wetlands. They are considered in Chapter 4.

The relationship between the indicators and the AUP objectives and policies is set out in Appendix C. The links between these indicators, the measures used to assess them, and the relevant information sources are shown in Table 2.2 and described below.

Table 2.2: Indicators, measures and information sources used to measure the efficiency and effectiveness of the AUP with respect to water quality[15].

Indicators	Measures	Information Sources
1. Degraded areas are identified	Comparison of the following against national or regional guidelines or the NPS-FM attribute bands as relevant for each matter:	
Coastal waters	• Benthic ecological health • Heavy metals – copper, zinc, lead[16] • Faecal indicator bacteria – Enterococci • Litter and microplastics	SoE Safeswim Litter intelligence
Rivers	• Nitrogen (N) – total and dissolved forms • Nitrate and Ammonia (toxicity) • Phosphorus (P) – total and dissolved forms • Copper (Cu) and zinc (Zn) – total and dissolved forms • Sediment – total suspended solids (TSS) or turbidity[17] • Faecal indicator bacteria –*E. coli* • Macroinvertebrate Community Index (MCI)	SoE FWMT
Lakes	• Total Nitrogen • Total Phosphorus • Dissolved reactive phosphorus • Ammonia (toxicity) • Chlorophyll a (phytoplankton) • *E. coli* • Cyanobacteria • Suspended sediment • Water clarity • Annual Trophic Level Index • Lake Submerged Plant Index (ecological assessment)	SoE
Groundwater	• Ammonia	SoE

[15] This table notes the key contaminants or attributes that are reported in the relevant sources. The SoE monitoring also includes other parameters such as temperature, conductivity, salinity, alkalinity, pH, dissolved oxygen, etc.
[16] Lead is largely a historical issue but is still monitored in marine sediments.
[17] The FWMT includes total suspended sediment apportionment, concentration and loading but does not include grading for suspended fine sediment under the NOF, as this requirement came in after the model was scoped. Work to address this gap is underway. The SoE includes interim SOE grading for suspended sediment (by converting turbidity to visual clarity using the national level regression equation – this approach will be refined on a site specific basis going forward).

Indicators	Measures	Information Sources
	• Nitrate • Dissolved reactive phosphorus • Metals – zinc, copper, iron, manganese, sodium • Faecal indicator bacteria – *E. coli*	
2. Good or excellent areas are being maintained and degraded areas are improving over time		
Coastal waters	• Trends identified in SoE reports	SoE
Rivers		
Lakes		
Groundwater		

The measures relating to faecal indicator bacteria (and cyanobacteria for lakes) relate to human health and the risk of illness from primary contact recreation. The other measures relate to ecosystem health and the risk of eutrophication, toxicity, or changes in clarity and substrate from sediment inputs.

This chapter of the report focuses on the identification of degraded waterbodies (state) and how water quality has changed historically through time (trends). This reflects the objectives of B7.3 and B7.4. There is also some consideration of the possible future state and the sources of degradation, but this is considered more fully in other chapters of the report.

When the AUP refers to degraded waterbodies, it does not clarify whether this was degraded when the plan was first drafted, finalised, or at any time in the future. The NPS-FM 2020 is clear in its expectation that councils will endeavour to halt further decline of water bodies into a degraded state. This chapter reports on known information about state at different times, rather than one set baseline period[18].

The council has work underway to develop 'baseline state reporting' for the NPS-FM which will systematically identify the known state of Auckland's freshwater bodies at the time-points required by the NPS-FM. That work will result in the formal identification of degraded areas for the purpose of the NPS-FM, not this report. As that work has not yet been completed, this report identifies degraded waterbodies from the most recent information available.

The AUP does not specify how 'degraded' or 'improved' should be determined. In contrast, the NPS-FM specifies attribute bands (gradings of A, B, C, D and sometimes E) and sets a requirement that water bodies be improved to at least the national bottom lines (an attribute

[18] In contrast to the AUP, the NPS-FM specifies that the baseline state, in relation to an attribute, means the best state out of: (a) the state on the date it is first identified by a regional council, (b) the state on the date on which a regional council set a freshwater objective for the attribute under the National Policy Statement for Freshwater Management 2014 (as amended in 2017), or (c) the state on 7 September 2017.

state identified in NPS-FM Appendix 2A or 2B, generally between attribute bands C and D[19]) unless existing natural factors prevent this from being a realistic outcome.

The freshwater SoE monitoring and FWMT modelling report against the NPS-FM attribute bands and the national bottom lines, where available. They also report against the proposed regional grading guidance for zinc and copper (Gadd et al. 2019). Identification of freshwater bodies that are below the national or regional bottom lines have been used in this report as an indication of 'degraded'. This is using the most recently available information, while acknowledging that the grading system is designed for NPS-FM implementation and is not directly related to the current AUP provisions. The work underway to implement the NPS-FM will include consideration with mana whenua and community of whether Auckland seeks to achieve a better state for degraded waterbodies than above the national bottom lines, and whether any additional regional attributes are needed for assessing the health of Auckland's waterbodies.

The measures noted above in Table 2.2 differ between coastal water, rivers, lakes and groundwater. Together they show which areas are degraded and whether there is a trend over time that is improving or worsening the state of the waterway. This section of the report covers measures relating to regional indicators for the overall outcomes of the AUP. Other measures relating to the effectiveness of particular management actions are addressed in other chapters of the report.

2.2 Data and information

2.2.1 Information sources

Auckland Council maintains three principal sources of information that inform our understanding of the region's fresh and coastal water quality: State of the Environment (SoE) monitoring, Safeswim monitoring and modelling, and the Freshwater Management Tool (FWMT) modelling. These information sources are summarised in Table 2.3 and described further below. This report also uses data on litter on Auckland's beaches that was accessed from the Litter Intelligence citizen science programme coordinated by Sustainable Coastlines (Sustainable Coastlines, 2021). These information sources have been supplemented, where relevant, with data from research reports or articles, and SoE synthesis reports relating to areas such as the Hauraki Gulf or the Manukau Harbour. The combination of modelled and monitored information offers the council a well-rounded assessment of water quality.

[19] For some attributes such as ammonia (toxicity) and nitrate (toxicity), bands C and D are both below the national bottom line (i.e. need to be improved). The *E. coli* (human contact), fish (rivers) and dissolved reactive phosphorus attributes do not specify a national bottom line. There is a national target for primary contact in NPS-FM Appendix 3 which relates to *E. coli* and cyanobacteria. There must be improvement in *E. coli* unless it is already at very low levels. Clause 3.11 requires that the target attribute state for human contact must be set above the baseline state of that attribute, unless the baseline state is already within the A band of Tables 9 or 10 in Appendix 2A.

Table 2.3 Summary of Auckland Council water quality data sources.

	SoE	FWMT	Safeswim
Purpose	Long term evaluation of environmental and human health state Trends over time	Assessment of baseline state Identifying and assessing sources of degradation Forecasting future state scenarios and mitigation	Awareness of safety for swimming
Type	Measured	Modelled (with continued targeted monitoring for validation)	Modelled (with continued targeted monitoring for validation)
Spatial coverage	Representative sites for coastal water, and river, lake and groundwater/land use combinations	All catchments throughout region (5,465 sub-catchment records) Representative river reaches (3,085 km) (Will include lakes in future)	119 swimming sites (105 coastal sites and 14 lagoon or freshwater sites), with new sites added over time.
Temporal coverage	Predominantly discrete, regular intervals for water quality (e.g. monthly or annually depending on the measure). Limited continuous monitoring.	All data is continuous (15-minute) – baseline spans 2013-2017 inclusive of event-based and longer-term effects. Continuously (15-minute) for future scenarios (15-year baseline period or 20-year representative concentration pathway period) inclusive of event-based and longer-term effects.	Hourly predictions

2.2.1.1 State of the Environment monitoring

The Auckland Council SoE monitoring consists of planned and repeated collection of data, its analysis, interpretation, reporting and review. The programme aims to be representative of a range of environmental conditions, provide regional coverage, and provide long term data that is collected consistently over time (Auckland Council 2021a). This monitoring is also aligned with best practice in terms of the National Environmental Monitoring Standards (NEMS). The SoE monitoring relating to water quality includes coastal and freshwater programmes:

Coastal – Monthly monitoring of coastal water quality (31 sites), intertidal sediment contamination (up to 120 sites) and intertidal ecology (110 sites – 33 in harbours and 77 in east coast estuaries).

Freshwater quality – River water quality is monitored monthly at 36 streams across the region using a range of physical, chemical and microbiological variables or attributes. Instream macroinvertebrates and habitat quality is monitored across 76 sites (annually and four yearly respectively). Four lakes have been monitored frequently since 1988[20]. Groundwater quality is

[20] Auckland Council has recently (2020) expanded the lake monitoring programme so that more lakes can be reported on in future.

monitored quarterly for nine aquifers, split into three geographical areas (Franklin, Kumeu and Auckland Isthmus), which are represented by 16 sites. There are also other long term river monitoring programmes such as the rural event-based sediment yield monitoring (Hicks et al. 2021) and large river ecosystem metabolism monitoring[21]

A series of technical reports that summarise the SoE monitoring results from the most recent 10-year period (2010-2019) were published in early 2021.

2.2.1.2 Safeswim

The council's Safeswim monitoring and modelling programme is the key information source for recreational water quality. Safeswim provides a surveillance level risk assessment for swimmers wanting to know whether it is safe to go for a swim for several intervals in any day (continuous, updated on sub-daily basis). In contrast, the SoE river and lake water quality monitoring includes monthly (discrete) *E. coli* monitoring in order to assess long term improvement in management of faecal discharges, relating to the human contact value and links to land use activities.

Safeswim has a website (http://www.safeswim.org.nz/) that provides real-time science-based advice on the level of risk associated with swimming at specific locations. Safeswim began in 1998 with weekly water sampling over the bathing season for assessing health risks for beach goers. That approach had significant limitations, including delays between taking a sample, analysing it and then notifying people of the risk, and the sampling frequently missing contamination events.

In 2017 Safeswim changed to a modelling and targeted monitoring approach that combines real-time data on the performance of Auckland's wastewater and stormwater networks with predictive models – underpinned by targeted sampling – to provide forecasts of water quality at swimming sites. Safeswim's water quality predictions are overridden if sensors on the wastewater and stormwater networks or operational staff detect overflows that are likely to cause a public health risk at a time when models had not predicted poor water quality. Safeswim is now provided year-round rather than only over the summer bathing season.

In April 2021, there were 119 locations on the Safeswim website, including 105 coastal sites and 14 lagoon or freshwater sites. The website has a map with colour-coded pins to alert users of health and safety risks in relation to current and predicted swimming conditions. The red 'no-swimming' pin (red-coloured swimmer with a cross) signals there is a consistently high public health risk at this site (i.e. greater than 1 in 10 swimmers are likely to become ill).

This report refers to the Safeswim results in relation to coastal sites but not the freshwater sites. There is a low number of freshwater sites, and they may not be representative of regional trends. The SoE and FWMT both include *E. coli* results for freshwater sites.

[21] Updated reporting for SoE and NPS-FM purposes to be delivered in mid-2022.

2.2.1.3 Freshwater Management Tool

The Freshwater Management Tool (FWMT) is a continuous and process-based water quality model for the Auckland Region[22]. The model can generate time-series of contaminant and flow responses to climatic variation (at 15 minute intervals) across 5,465 sub-catchments of the Auckland region (Auckland Council 2021b). The model catchment classification is based on the identification of a range of soil, slope, land cover and activity ("impact factors"), that together affect water quality parameters and processes, as well as including modelled discharges from 448 engineered overflow points for the reticulated wastewater network. The FWMT simulates the generation, transport and fate of contaminants via multiple flow paths, across and through land, and ultimately to instream freshwater environments.

The FWMT has been developed and externally peer-reviewed for baseline water quality over the period 2013-17, across all urban and rural catchments in the Auckland region (Auckland Council 2021b). The freshwater quality data available includes numeric attribute states (concentrations), grades and sources for all sub-catchments, integrated through 10 larger coastal-draining watersheds. The FWMT adopts NPS-FM NOF freshwater quality attribute grading guidance and the proposed regional grading guidance for zinc and copper (Gadd et al. 2019). For all sub-catchments, continuous modelled flow-records are available to assess surface water quantity outcomes. Flow and concentration data are combined within the FWMT to cumulatively account for differences in contaminant loading to fresh and coastal waterways.

The performance of the FWMT has been assessed for multiple performance metrics and approaches, across a range of conditions at 46 continuous (SoE) flow monitoring locations and 36 monthly (SoE) river water quality monitoring locations (Auckland Council 2021b). External peer review of the findings indicates that the FWMT is a suitable framework for modelling the baseline state of flow and contaminant generation and delivery to streams at catchment scale (Hamilton et al. 2021). In future there will also be targeted monitoring used to improve the performance of the modelling.

The FWMT includes a lake modelling component (Auckland Council 2021c) but the peer review identified that additional work was needed to improve the robustness of the modelling. This work is underway.

Whilst FWMT water quality data is available regionwide and continuously to expand on gaps in observational records, greater confidence is expected about predictions of streams in more degraded state (e.g., effects of uncertainty are reduced where contaminant concentrations are greater). Confidence in loads and sources of contaminant appear relatively insensitive to the current state or size of catchments.

Ongoing development of future scenarios with the FWMT will enable Auckland Council to forecast future water quality changes instream and to the coast, from climate change, development activities and changes in management approach. The FWMT can assess instream effects, mitigation option life-cycle costs and distribution of costs across activities/sectors and catchments in relation to varying water objectives, including optimisation to develop cost-effective action plans for integrated objectives (i.e., changes to baseline water quality at numerous locations). This will enable Auckland Council to undertake discussions with mana

[22] The FWMT has been externally peer-reviewed and is based on open-sourced software developed by the US-EPA.

whenua and the community about trade-offs between cost and time to achieve desired water quality outcomes, or to add in other factors to be considered.

2.2.1.4 Litter Intelligence

The Litter Intelligence programme is a citizen science project that collates the results of litter surveys around New Zealand. It is run by the Sustainable Coastlines charity who aim to "collect data, provide insights and inspire action for a litter-free Aotearoa" (Sustainable Coastlines 2021). Launched in May 2018, the programme is funded by the Ministry for the Environment's Waste Minimisation Fund and works in close collaboration with Statistics New Zealand and the Department of Conservation. Data from the programme was included in the last national environmental reporting series marine domain report (MfE and Stats NZ 2019).

Sustainable Coastlines provide training, equipment and technology required for people to take part in the programme using standard methods for gathering and reporting on the litter found. All data is then shared on the website www.litterintelligence.org/. Further information on matters such as site selection and data quality controls are available on the website.

The Litter Intelligence data is used in this report as an indicator of degraded areas of coastal water. Many of the survey sites only have a few surveys and so it is not yet possible to report on trends over time. The limited data also means that any comparisons between sites may reflect a particular point in time and does not mean that a site generally has more or less litter than any other site.

This data records what litter is present, not where that litter came from, or the activity that it relates to. Hydrodynamics mean that some areas will collect litter more than other areas and it may not be because it was dropped nearby. It is also hard to say how much litter is from marine sources, washed to the coast with stormwater, or blown from land. A simulation of how plastic moves around New Zealand's coast when it is dropped at different locations is available at https://oceanplasticsim.cawthron.org.nz/.

2.2.2 Limitations

It is important to recognise that while the available data indicates whether Auckland's water and freshwater systems are degraded, how they are changing over time, and the sources of degradation, that does not always provide a clear link to assessing the effectiveness of the AUP. There are many reasons why the environmental state of the region's water bodies may change, in addition to changes in discharges, takes, and land use management since the AUP became operative in 2016. There are also inherent uncertainties in all environmental data, meaning links to AUP decisions are also of varying strength.

Environmental change can take a long time to be demonstrated as a clear trend in monitoring data. The degraded state of some waterways is the result of the change in land use over hundreds of years. It can take a lot longer than five years to halt such a trend, including due to delayed landscape responses (e.g., eroding land might take years to decades to stabilise, with further years needed for the effect to be detected instream). Natural environmental variability also makes this more complex.

Our ability to detect change is affected by the length of time monitored and the number of locations monitored. Increased monitoring and modelling can identify degradation at a finer spatial scale as well as providing a better understanding of the state of the system as a whole. For instance, modelling can offer insights to whether actions taken will result in a change of state (based on what we currently know about mitigations and land use change), even if uncertainty is high about when such a change will ultimately be expressed at a location.

Environmental trends that are identified may be due to actions that are undertaken by Auckland Council, Auckland Transport and Watercare but are unrelated to the AUP. They may be a form of a 'non-regulatory method' or 'other method' the council uses to implement the RPS (as noted in AUP B1.6) but they could have been planned and consented before the AUP became operative. Such actions include:

- Upgrades to stormwater and wastewater infrastructure. Capital works such as the Central Interceptor wastewater pipe are a significant individual means of improving coastal water quality for parts of the region. Many of the works that have been constructed in the last five years were consented earlier under the Auckland Regional Plan: Air, Land and Water.
- Support for landowner and community planting, fencing, farm plans, or waterway health monitoring groups (e.g. Wai Care), including advice, coordination or funding. These require support in the council's Long-term Plan (which is noted as a method in AUP B1.6) but also achieve complementary goals sought in the Auckland Plan or Local Board Plans.

Environmental trends may also be due to actions undertaken by other people or agencies, with no linkage to the AUP. Such actions include:

- Changes to national legislation, for example, the National Environmental Standards for Freshwater (NES-F) (2020) introduced regulations that restrict various activities that affect rivers and wetlands (e.g., earthworks affecting wetlands and culverts affecting fish passage). The NES-F prevails over any similar provisions in the AUP unless the AUP is more restrictive[23]. Regulations relating to stock access to waterways were introduced at the same time and effectively replace the freshwater stock access provisions in the AUP. These new requirements came into force very near the end of the period for which consenting data was gathered and so their effect will not be apparent in that data.
- National regulations relating to petrol constituents, brake pads, building materials or boat anti-fouling paint can affect the levels of contaminants entering waterways.
- Private landowners and industry bodies such as Fonterra may decide to undertake or fund planting and fencing, or to introduce improved industry standards for land management.

Finally, changes may be due to natural variations, climate change and long-term external factors such as marine heat waves and existing historic sediment load.

Despite these limitations, it is important to understand the available information on the state of Auckland's waterbodies, and to determine whether it is improving or becoming more degraded. Understanding the state of the existing and anticipated future environment is fundamental to determining where the council needs to focus its regulatory and non-regulatory action. Where issues are identified, further work can be done to determine what is

[23] See RMA section 43B and NES-F regulation 6.

causing particular areas of water to be degraded, or why particular contaminants are increasing, and to determine whether amendments to the planning regime are needed. Such work needs to consider whether reasonable predictions can be made of future state in order to determine where action would be of most benefit. This would also include assessment of the relevant AUP provisions and consents as set out in other chapters of this report.

2.3 Findings and analysis

This section of the report presents the measures separately for coastal water, rivers, lakes and groundwater. For each of these, a ‘degraded areas’ sub-section describes any areas that have been identified as degraded, and then a ‘maintained or improved?’ sub-section outlines any trends that have been found to show whether good and excellent areas are being maintained and degraded areas improved.

2.3.1 Coastal water

2.3.1.1 Degraded areas

B7.4 includes a map of areas of coastal water that have been degraded by human activities (AUP Figure B7.4.2.1 and Figure 2.1 below). This map was included in response to policy 21 of the NZCPS which requires councils to identify areas “where the quality of water in the coastal environment has deteriorated so that it is having a significant adverse effect on ecosystems, natural habitats, or water-based recreational activities, or is restricting existing uses, such as aquaculture, shellfish gathering, and cultural activities”, and to “give priority to improving that quality”. The identified areas must be included in plans.

The areas shown in the map were identified by assessing three measures of ecosystem health using data from existing regionwide SoE monitoring programmes: coastal water quality, sediment contamination and benthic ecological health, along with identifying ports and marinas as areas with known degraded water quality (Carbines et al. 2013; Carbines 2014; Walker 2014). The ‘Degraded 1’ areas are those areas where monitoring data showed a high level of degradation and where it was possible to identify the level of degradation with ‘high’ certainty. ‘Degraded 2’ areas are those areas where monitoring data showed a moderate level of degradation, or where the level of degradation was identified with a ‘reasonable’ certainty due to fewer monitoring sites or data through time.

All of Auckland’s mainland harbours and estuaries are shown as degraded. Carbines (2014) notes that the distribution of ‘Degraded 1’ and ‘Degraded 2’ areas follows the spatial pattern that one would expect, with the most degraded areas generally found in estuaries receiving runoff from the older, intensively urbanised and/or industrialised catchments, particularly in the Tāmaki Estuary, and the tidal arms of the Manukau Harbour (particularly Mangere Inlet) and the Waitematā Harbour. Other degraded areas receive runoff from intensive agricultural or forestry catchments such as in the southern parts of the Kaipara and Manukau Harbours and in the upper part of Mahurangi Estuary. The main bodies or central parts of the Manukau, Waitematā and Kaipara Harbours tend to be less degraded due to their size and natural flushing capacity, whereas estuaries and their tidal arms tend to act as natural traps for sediments and contaminants.

In order to identify the areas with water quality that was restricting water based recreational activities, bathing beach water quality data from Safeswim monitoring was included on the map (Figure 2.1[24]). Beaches graded as either fair or poor (i.e. not excellent or good), or with permanent warning signs, were shown to indicate beaches that have been degraded (Walker 2014). The Safeswim data was not merged with the marine degraded areas assessment because it indicates the risk to public health associated with contact recreation, rather than the ecological health of the intertidal environment.

Walker (2014) noted that the management responses required to address issues impacting bathing beach water quality are responses to the specific bacterial sources in the relevant catchment, such as stormwater, wastewater and septic tank leachate. In contrast, the management responses required to address issues impacting marine ecological health are more complex with less direct linkages to sources. To reduce the impacts (e.g. from sediment and heavy metals) on ecological health in marine systems, whole of catchment initiatives are required (Walker 2014: 5).

[24] The bathing beach data was standardized to coastal Water Quality Index grades as they were defined in October 2014.

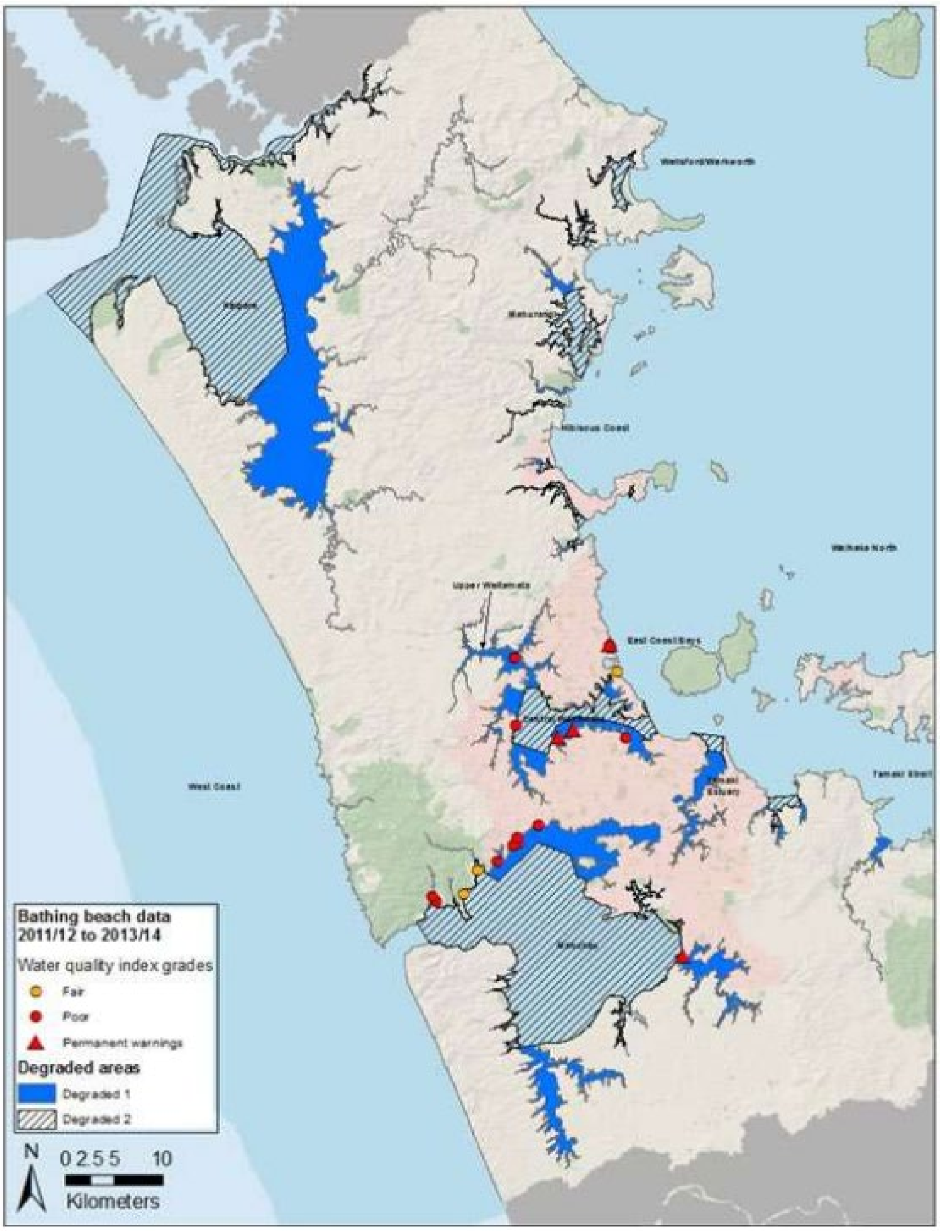

Figure 2.1 Areas of coastal water that have been degraded by human activities (AUP Figure B7.4.2.1).

The pattern of current coastal water quality degradation identified in the recent SoE synthesis report (Auckland Council 2021a: 33) is similar to that identified in 2013 in AUP Figure B7.4.2.1. Water quality in open coastal sites and at harbour mouths is generally good, while upper estuarine (tidal creek) sites have poorer water quality. Overall, half of the monitored sites had good to fair water quality, and approximately a quarter of sites had poor water quality (Figure 2.2). With respect to marine benthic ecological health, intertidal sites with a 'poor' score are clustered in the upper arms of the Waitematā and Manukau Harbours and the Tāmaki Estuary. The Manukau Harbour has lower water quality than the other harbours in the region (Ingley 2021a, Auckland Council 2021d: 33). This summary is explained further in the SoE technical reports on coastal water quality and marine ecology (Ingley 2021a, Drylie 2021). Nutrient concentrations are elevated compared to reference guidelines and are highest in the Māngere Inlet and near the Māngere Wastewater Treatment Plant. Levels of contaminants (copper, lead and zinc) in marine sediments are also elevated in the Māngere Inlet.

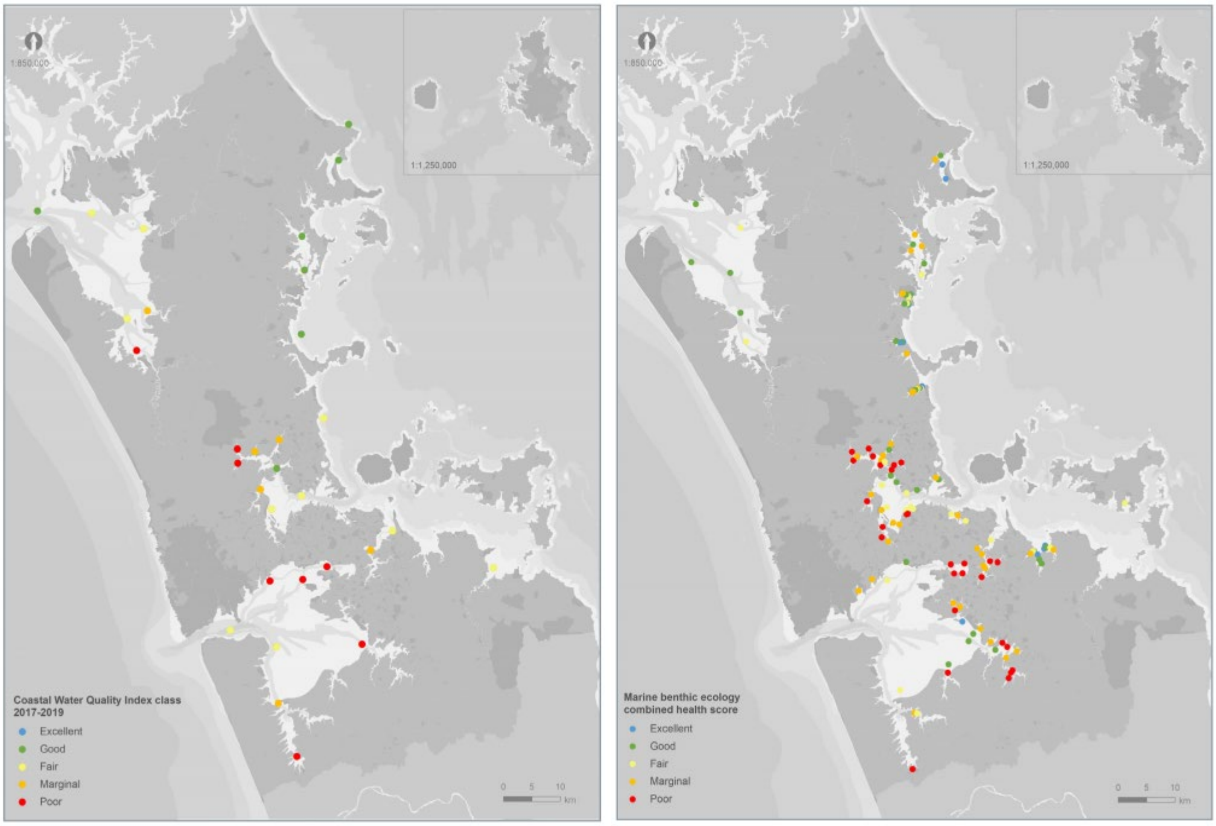

Figure 2.2 Coastal water quality and marine benthic ecology SoE grades (Auckland Council 2021a: 33, 34). The sediment contaminant grade map shows a similar pattern of degradation in the harbours.

2.3.1.2 Beach litter and microplastics

Litter is noted in AUP B8.6 (along with sediment and contaminants) as a major environmental issue for Auckland's coast. Several AUP provisions relating to stormwater, or the management of coastal areas, include requirements for litter management. These include:

- Managing litter in stormwater runoff from greenfield development (policy E1.3(8))
- Reducing the discharge of gross stormwater pollutants as part of intensification and redevelopment of existing urban areas (policy E1.3(9)(b))
- Prohibiting depositing litter in a lake, river, stream or wetland (rule E3.4.1(A7))
- Reducing the amount of litter entering coastal waters, by encouraging design, maintenance and management initiatives (policy F2.11.3(6))
- Requiring facilities for rubbish disposal facilities (policy F2.11.3(10), particularly when upgrading wharf facilities (F2.17.3(3)), marinas (F3.3(4)), minor ports (F5.3(7)), ferry terminals (F6.3(7)), and the Port of Auckland (I208.3(14))

- Requiring that all works in the coastal marine area remove any litter at the completion of works (rules F2.21.1(2), F2.21.4.1(5), F2.21.4.1(7), F2.21.9.3(1), F2.21.9.7(4)).

The policies are implemented through consent conditions which relate to litter traps, stormwater management devices, and targeted monitoring related to litter and plastics.

The latest national report on the state of the marine environment (MfE and Stats NZ 2019) and the State of Our Gulf 2020 (Hauraki Gulf Forum 2020) highlighted that litter and plastic debris are pervasive throughout the ocean. In New Zealand, plastics have been reported in fish, shellfish, and seabirds. In a study of plastic ingestion by fish in the South Pacific, 97 per cent of the species were found to have ingested plastic. Sampling near Auckland found that 70 per cent of parore and 37 per cent of leatherjacket sampled had plastic in their guts (Markic et al. 2018: 551). A new study has found that whales in Auckland's Hauraki Gulf consume around 3 million microplastics per day, with most of the microplastics coming from consumed prey rather than the water (Zantis 2022).

Litter Intelligence has 31 survey areas in Auckland with 128 surveys completed since 2018 (Sustainable Coastlines 2021[25]). A total 70,512 items have been collected. These had a combined weight of 795 kg. The average litter density is 418 items per 1,000m^2 and the average density by weight is 4,034 grams per 1000m^2. The sites with the greatest density of litter found have been:

- Rangitoto Island – one survey completed, litter density of 1,880 items per 1,000m^2.
- Cochrane's Gap on the Awhitu Peninsula – six surveys completed, average litter density is 1,817 items per 1,000m^2.

Plastic is the most commonly found litter item in Auckland (69 per cent of litter items) (Figure 2.3). Although plastic litter accounts for 69 per cent of all items found, it only makes up 7 per cent of total weight. Wood (74 per cent) and then glass and ceramic fragments (16 per cent) make up the greatest weight. Plastic is a particular concern because it is ingested by marine life (including fish, shellfish, seabirds and mammals) and can entangle seabirds, dolphins and turtles. The most common types of plastic are hard plastic fragments (41 per cent of litter items), bottle caps and lids (5 per cent), food containers (3 per cent), cigarettes, butts and filters (3 per cent) and food wrappers (2 per cent). The amount of litter and its plastic percentage varies considerably between different beaches. The litter density and the top two types of plastic found at various beaches are shown in Figure 2.4.

[25] This data was sourced from the Litter Intelligence website on 6 September 2021. The Auckland litter surveys considered were undertaken between February 2019 and August 2021. This data is the best available source of information on litter around Auckland's coast. The limited number of surveys at each site means it should be used with caution in assessing trends and comparing different sites.

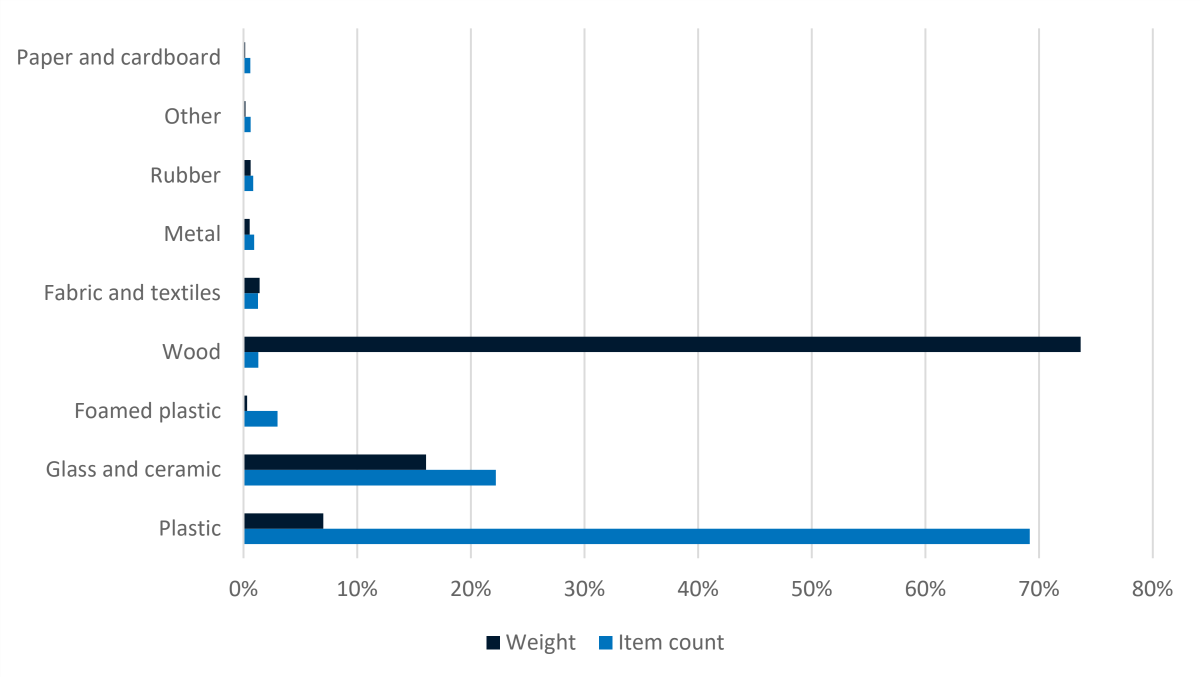

Figure 2.3 Auckland beach litter by category, all Auckland surveys (Sustainable Coastlines 2021).

Figure 2.4 Litter Intelligence survey sites in Auckland with examples from the latest surveys at selected sites (in 2020 or 2021) showing litter density (items per 1,000m^2) and the top two types of plastic found (percentage of plastic items).

Plastic litter can break down to become microplastic (plastics that are less than 5mm long). Microplastic can also be made for purpose (for use in industrial processes, personal and domestic care products, and preproduction pellets) (ESR 2021). Microplastic fibres are produced from washing of synthetic textiles. Bridson et al. (2020) sampled 39 beach sites across Auckland and found microplastic contamination was present at the majority of beaches studied (Figure 2.5). The west coast beaches exhibited higher microplastic contamination compared with east coast beaches. Microplastics were predominately fibres (88 per cent), with lower proportions of fragments (8 per cent) and films (4 per cent). The high proportion of fibres is consistent with international trends (De Falco et al. 2019).

Bridson et al. (2020) concluded that microplastic contamination on the east coast is primarily from local (Auckland) sources as there is a spatial relationship between population density and microplastic abundance. The lack of this relationship on west coast, and the much higher abundance of microplastic levels on the west led to a suggestion that microplastics may be transported to New Zealand's west coast from elsewhere. It may also be related to microplastics from washing machines being discharged from the Māngere Wastewater Treatment Plant. Further work is needed in this area and in 2018 MBIE awarded $12.5 M to a five year research programme to investigate microplastics in New Zealand which includes a case study in the Whau River (ESR 2021).

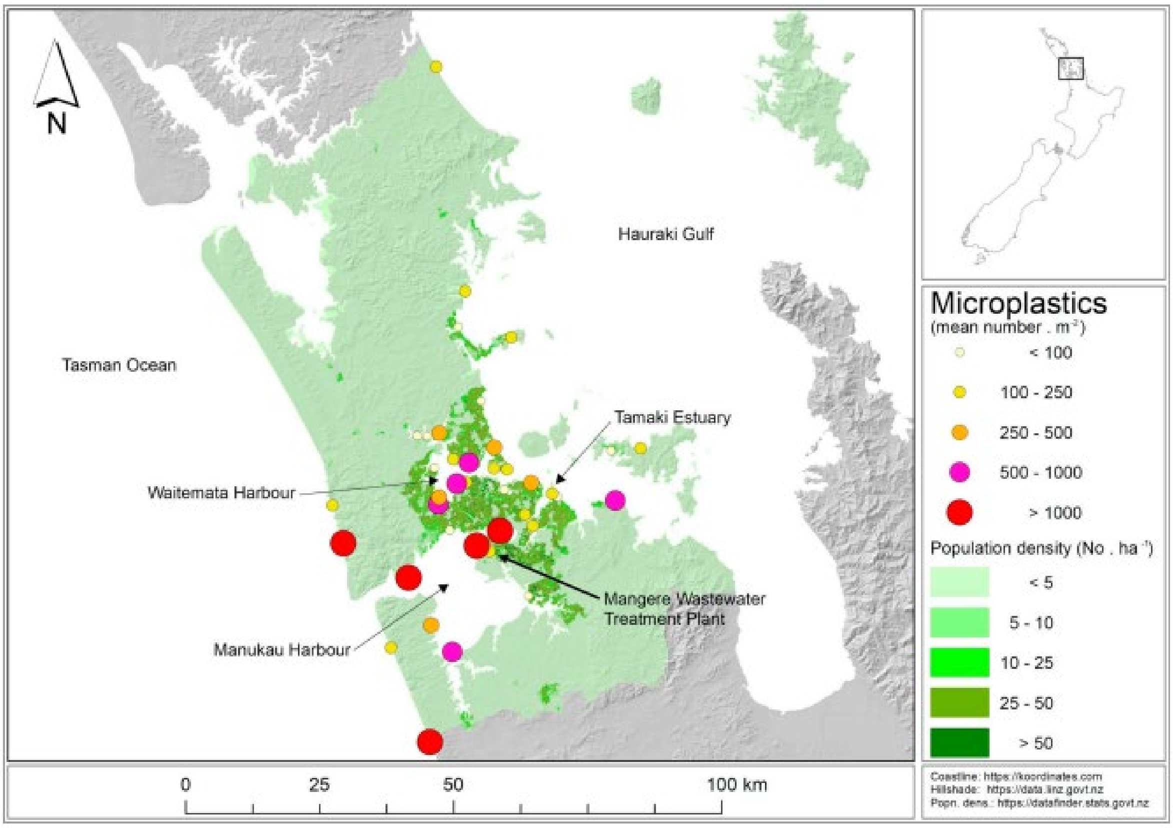

Figure 2.5 Map of the Auckland region showing microplastic levels across sampling sites (abundance reported as mean number of particles, m^{-2}) and population density (Figure 1 in Bridson et al. 2020).

2.3.1.3 Maintained or improved?

The SoE synthesis report (Auckland Council 2021a: 7) sets out the following key findings for coastal water:

- Coastal water quality is mostly improving but slowly.
- Ecological impacts from increased sedimentation have been detected in all harbours and estuaries.

- Levels of contaminants (copper, lead and zinc) in marine sediments are generally low. Hot spots of higher levels occur in muddy estuaries/tidal creeks with older intensively developed catchments.

More detail is provided in the synthesis report and in the technical reports relating to coastal water quality, ecology and contaminants (Auckland Council 2021a, Ingley 2021a, Drylie 2021, Mills and Allen 2021).

2.3.1.3.1 Coastal water quality

Regionally, areas with the highest concentrations of contaminants were mostly improving over the last 10 years. However, the rate of improvement is small and it may take decades before we see an overall improvement in water quality (Ingley 2021a). From 2010 to 2019, over 80 per cent of monitored sites were found to have improving trends in total oxidised nitrogen and chlorophyll *a* (phytoplankton), and over 50 per cent of monitored sites had improving trends in dissolved reactive phosphorus and water clarity (turbidity). More than 70 per cent of sites were found to have very likely decreasing dissolved oxygen saturation.

There were clear spatial differences across the region with a high proportion of degrading trends within the Waitematā Harbour for ammoniacal nitrogen, dissolved reactive phosphorus and turbidity. Sites within the Manukau Harbour tended to have poor water quality due to elevated nutrients, higher levels of chlorophyll (algae), and lower water clarity.

The greatest rates of improving trends in key nutrients were observed at sites within the Manukau Harbour. However, degrading trends in chlorophyll *a* (higher levels of algae) and dissolved oxygen were observed, suggesting that the effects of eutrophication may be increasing. The Tāmaki Estuary was generally improving, as was the Kaipara Harbour, particularly for turbidity.

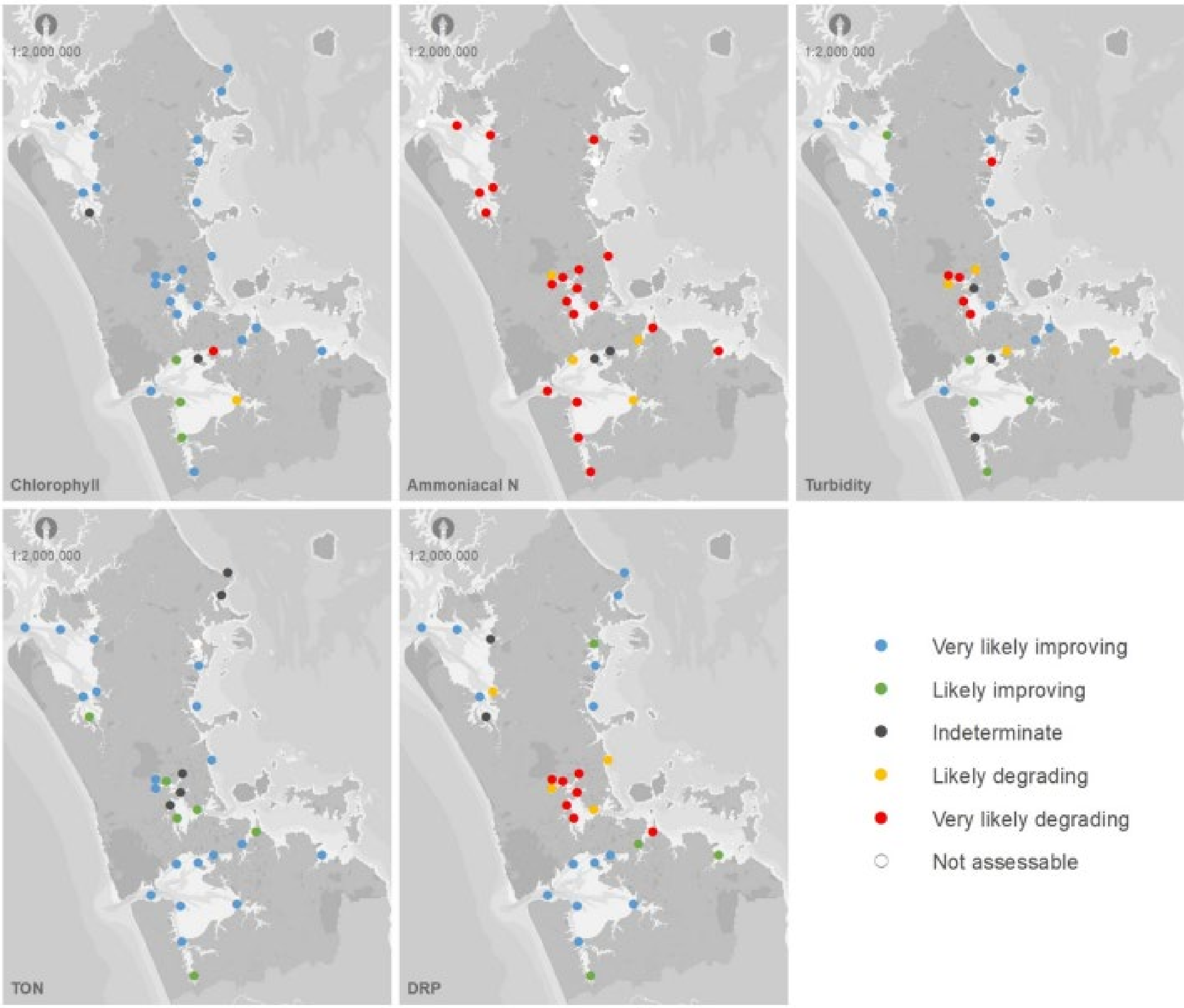

Figure 2.6 Summary maps of 10-year trends (2010-2019) in coastal water quality parameters per site (Ingley 2021a: Figure 3-4).

The Manukau Harbour SoE synthesis report examined water quality data since 1990, rather than the last 10 years as in the regional SoE reports (Auckland Council 2021d). Over the past 30 years (1990 to 2019), there have been long-term improvements in water quality including nutrient levels and water clarity across the harbour. The rate of change in nutrients was considerably greater in the northern Manukau Harbour with smaller changes over time in the southern part of the harbour. In the northern Manukau Harbour, several of these changes in long-term trends appear to be driven by rapid, large scale changes that occurred between 1998 to 2003 coinciding with the implementation of major upgrades to the Māngere Wastewater Treatment Plant. The greatest long-term improvements in water quality were for ammoniacal nitrogen in the northern harbour (Māngere Bridge, Puketutu Point, and Shag Point) (Figure 2.7).

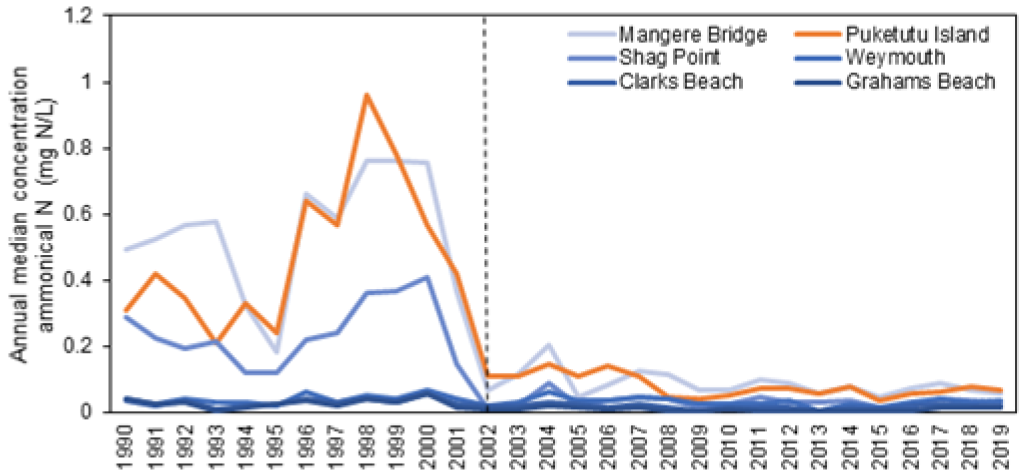

Figure 2.7 Long-term monitoring of ammoniacal nitrogen (1990-2019) showing reductions in levels post the Māngere Wastewater Treatment Plant upgrade (Auckland Council 2021d: 34).

2.3.1.3.2 Coastal ecology

Impacts from increased sedimentation have been detected in intertidal ecosystems in all estuaries (Drylie 2021). Although the Kaipara Harbour has predominantly 'good' health, multiple trends consistent with recent sedimentation were found at all sites except one. Likewise, all small east coast estuaries are affected by sedimentation with Okura, Mangemangeroa and Turanga exhibiting the greatest number of recent concerning trends. The tidal creeks of Manukau Harbour and the central Waitematā Harbour are very muddy, resulting in mostly low health. The open sandflats of these harbours tend to have lower sediment mud content and better health.

Nutrient enrichment may be affecting benthic health in some restricted areas, including the eastern side of Mahurangi, throughout the upper Waitematā and in the western side of central Waitematā.

Benthic health related to sediment-associated metals is improving in upper, central and outer Waitematā tidal creeks, suggesting historic rather than recent inputs.

Since 1987, tuangi (cockles) have increased in abundance at all sandflat sites in the Manukau Harbour (Auckland Council 2021d: 41). Tuangi (cockles) are moderately sensitive to terrestrial sedimentation, increases in suspended sediments and stormwater contaminants. The increase in abundance of this species throughout the harbour suggests the functionality and condition of the sandflats has improved over the monitoring period.

2.3.1.3.3 Coastal heavy metal contaminants

Most of the intertidal sites measured across the region still have relatively low levels of the heavy metal contaminants copper, lead and zinc (Mills and Allen 2021). These are typically lower in less developed and rural areas and at sites with firmer, sandier sediment (i.e., East Coast Bays and outer harbour sites). There are several hot spots of higher contamination across the region. These tend to be muddy estuaries and sheltered tidal creeks in intensively urbanised or industrialised catchments (i.e., central Waitematā and Tāmaki Estuary).

Meaningful trends in total recoverable metals were recorded at 18 of the 56 trends sites; 12 had decreasing concentrations of one or more metal, while six sites had increasing concentrations (Mills and Allen 2021). At the relatively small number of sites with reasonably robust and meaningful trends, decreases outnumbered increases for copper and lead, while for the four sites where zinc concentrations had changed more than two per cent per year, all the trends were increases.

The monitoring results described in Mills and Allen (2021) provide some reassurance that rapidly increasing contamination in Auckland's estuaries has not been a widespread occurrence over the past 15 years. The available evidence points to relatively low and generally stable or decreasing concentrations of heavy metals in most of the areas monitored. However, while few increasing trends have been detected in recent years, urban Auckland continues to expand, and pressures associated with increasing population, traffic, and associated infrastructure are likely to grow. These increasing pressures may be offset by improvements to the vehicle fleet, construction methods and materials, and infrastructure for managing wastewater, solid waste and stormwater, as well as declining heavy industry which may have historically been a significant source of contamination in some coastal areas.

Overall, and when compared with the Waitematā, there is a low level of contamination across the Manukau Harbour, but there are sites with higher contaminant levels in the Māngere Inlet (Auckland Council 2021d: 38). Long-term trend analysis of sites in Māngere Inlet indicates that things are improving, with sites showing decreasing levels of contamination for both copper and lead. Trends for zinc are more mixed, however none are occurring at a rate that would be considered ecologically meaningful. The council's Manukau SoE synthesis report (Auckland Council 2021d: 39) suggests that these improving metals trends may reflect improved site and stormwater management associated with modernising industry in the catchment.

Boats could be another source of heavy metal contaminants in the coast. Gadd and Cameron (2012) highlight the elevation of copper from antifouling paints on vessels at marinas. Ogilvie (2015) note that zinc anodes on boats and marine structures can be a source of zinc as they are designed to corrode preferentially to other metals, and therefore reduce corrosion of the structure being protected. Thus they constantly release zinc into the marine environment, requiring periodic replacement with new zinc anodes. Copper and zinc from these source may be contributing to intertidal contamination but that is not apparent from the SoE results.

2.3.1.3.4 Safeswim

The current Safeswim programme is focused on providing real-time advice on the level of risk associated with swimming at specific locations. The programme does not provide long-term trend assessments in the same way as SoE reporting can. Due to the change in Safeswim in 2017 (in how data is collected and reported to improve the health risk assessment) it is not possible to directly compare the number of 'poor' and 'fair' sites from AUP Figure B7.4.2.1 with equivalent grading from recent assessments.

When Figure B7.4.1 was developed for the AUP in 2013, there were 65 Safeswim monitoring sites at beaches.. At that time, a microbiology assessment criteria grading (MAC grade[26]) was

[26] MfE/MOH (2003) Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas Available at https://environment.govt.nz/publications/microbiological-water-quality-guidelines-for-marine-and-freshwater-recreational-areas/

used to categorise beaches into a four-point scale (A, B, C and D). Twenty two of the 65 sites were marked as 'C – fair or 'D – poor' and there were four permanent warnings due to public health concerns associated with known overflows.

Appendix D shows the percentage of water quality compliance for each site from the Safeswim modelling over the summer period (1 November to 30 April) for the last three years[27]. During the 2020/21 summer season, the percentage of time that Auckland's monitored beaches were swimmable according to national guidelines for recreational water quality[28] (known as swimmable hours[29]) across all the Safeswim beach sites averaged 85 per cent. This compares to 89.2 per cent compliance in the 2019/20 summer period. Overall, the trend in water quality is positive (see Table 2.4), up from 77.3 per cent in 2017/2018 and 83.4 per cent in 2018/19. The higher level of compliance during the 2019/2020 summer compared to the 2020/2021 summer was influenced by historically low levels of rainfall and drought conditions experienced during 2019/2020[30].

Table 2.4 Swimmable hours – percentage of time Auckland's beaches were swimmable according to national guidelines for recreational water quality.

Year	Swimmable hours
2017/2018	77.3%
2018/2019	83.4%
2019/2020	89.2%
2020/2021	85.0%

Of the 100 sites with water quality information for more than one year, the majority of sites were assumed to always comply or had a modelled average compliance of at least 90 per cent of the time over the summer period for the three years. However, 21 sites only complied for 80 to 89 per cent of the time and two sites had average compliance of only 70 to 79 per cent (Huia and Little Manly). Seven sites were assumed to always exceed the guideline and have a long term warning (Coxs Bay, Fosters Bay, Green Bay, Meola Reef, Titirangi Beach, Wairau Outlet, Wood Bay) (see Figure 2.8). The location of the sites is shown in Figure 2.9.

[27] Data provided by Healthy Waters on 17 September 2021.
[28] MfE/MOH (2003) Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas Available at https://environment.govt.nz/publications/microbiological-water-quality-guidelines-for-marine-and-freshwater-recreational-areas/
[29] Consistent with national guidelines, Safeswim reporting statistics are constrained to periods of peak use – during the day from 6am to 9pm (15 hours per day) during the summer period. Reporting statistics are based on a normal summer period for each beach (15 hours per day x 181 days) a total of 2,715 potential swimming hours. The percentage of these hours that are compliant (i.e. green) is the primary measure of swimmability for Safeswim.
[30] Auckland Council Environment and Climate Change Committee Agenda for 14 Oct 2021, Item 11, Attachment G – Update on the 2020/2021 Safeswim Programme, page 28.

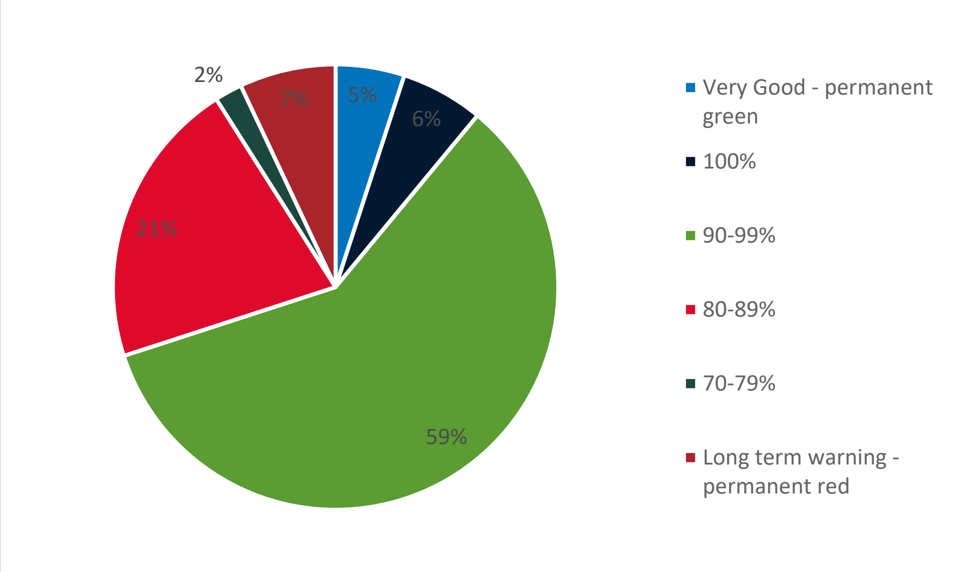

Figure 2.8 Safeswim average percentage water quality compliance (model). 'Very good – permanent green' means that there is no model running for these sites. They are permanently green due to evidence of consistently very good water quality. '100%' is a site where there is a model running and it has shown compliance 100% of the time. 'Long term warning – permanent red' means that there is no model running. There is a long term warning in place due to evidence of consistently very poor water quality.

Since the revised Safeswim programme was launched in 2017, Safeswim has worked to reduce the number of beaches with long-term warnings through a combination of removing sources of contamination and building a greater understanding of the effects of contamination on beach water quality. In the Manukau Harbour, this has seen the removal of five long-term warnings at Weymouth South, Armour Bay, Taumanu East and Clarks Beach (all in 2018) and Laingholm Beach in 2019 (Auckland Council 2021d: 36). Investigations into contamination sources continue through the Safe Networks Programme, which is a partnership between Auckland Council and Watercare.

A December 2021 update to elected members on developments to the Safeswim programme for the 2021/22 swimming season[31] noted that nine new beaches were being added to the programme, and that long term warnings were to be removed from Wairau Outlet and Titirangi. Modelling will be live at these locations and will display green or red pins depending on the current level of risk. There are now only five coastal sites with long term warnings[32]. Both the Wairau Outlet and Titirangi sites were amended after the Safe Networks Programme located and removed relevant sources of contamination and water sampling showed that it was generally a safe place to swim.

The changes in site numbers make it difficult to make overall conclusions about whether bathing beach water quality has improved since the AUP was developed. The best general indication is the swimmable hours shown in Table 2.4 which have improved over time. The decrease in sites with a long-term warning also demonstrates an improvement.

[31] Auckland Council Environment and Climate Change Committee Agenda for 10 March 2022, Item 14, Attachment B – Safeswim developments for the 2021/2022 swimming season, page 119.
[32] There are also permanent warnings at Piha, Bethells and Little Oneroa lagoons.

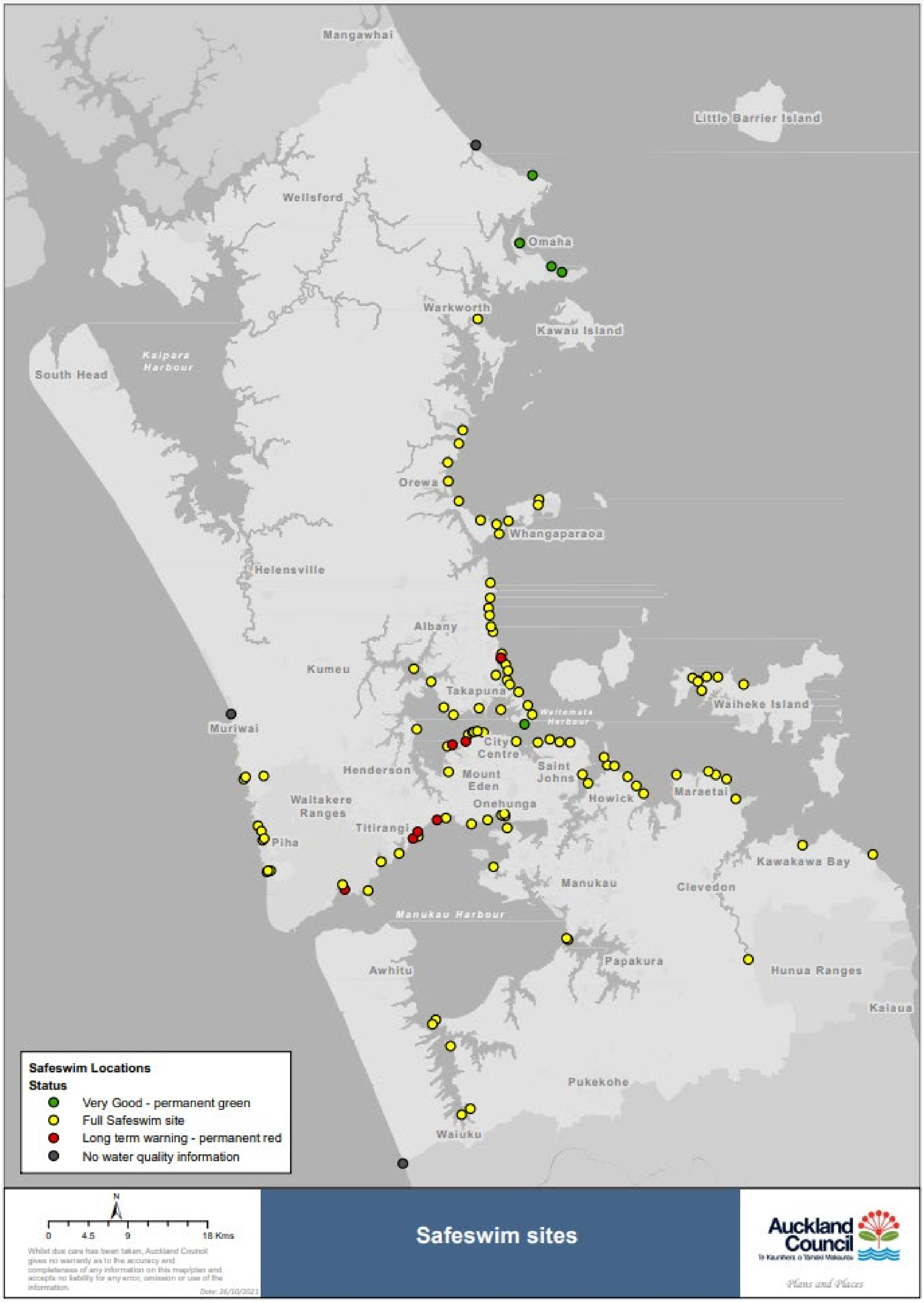

Figure 2.9 Safeswim locations and their status in 2021.

2.3.2 Rivers

2.3.2.1 Degraded areas

Degraded freshwater systems are not identified within the AUP. As noted earlier, work is currently underway to develop 'baseline state reporting' for the NPS-FM which will systematically identify the known state of Auckland's rivers at the time-points required by the NPS-FM[33].

At this time, the State of the Environment reporting and Freshwater Management Tool are the key means of identifying degraded waterbodies in terms of whether the outcomes sought by the AUP RPS are being achieved.

2.3.2.1.1 State of the Environment reporting

The recent SoE reporting (Auckland Council 2021a, Ingley 2021b, Chaffe 2021) used the NPS-FM compulsory attributes and their evaluative bands, along with some proposed regional attributes (dissolved copper and zinc) to grade water quality attributes from A (good) to C, D or E (bad) and identifies where rivers are below the nationally agreed bottom lines. This is regarded as 'degraded' for this report.

Ingley (2021b) includes the chart below (Figure 2.10) which shows the proportion of river water quality monitoring sites across each band by attribute.

At high concentrations, nitrate and ammonia can be toxic to sensitive fish and macroinvertebrate species. Both C and D bands are below the national bottom line for these attributes. For most of the region, little or no toxicity risk is expected as 90% of sites were above the bottom line for nitrate and 80% of sites were above the bottom line for ammonia toxicity. However, there are localised issues of nitrate toxicity in rivers in the Pukekohe area, and ammonia toxicity issues in some urban rivers (the spatial patterns can be seen in the maps in Figure 2.11).

Adverse effects of nutrient enrichment can occur at concentrations much lower than nutrient levels that cause toxicity. Both DIN[34] (nitrate, nitrite, and ammonia) and DRP should be considered together to assess nutrient enrichment. Guideline values for DIN were not confirmed and implemented in the NPS-FM 2020, and the NPS-FM has no national bottom line for DRP[35]. The natural variability in DRP means that it is problematic to determine a national bottom line. Nutrient concentrations need to be related to regional ecological outcomes such as periphyton abundance, and dissolved oxygen levels in streams to define degraded areas.

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[33] In the NPS-FM 'baseline state' is defined as:
baseline state, in relation to an attribute, means the best state out of the following:
(a) the state on the date it is first identified by a regional council
(b) the state on the date on which a regional council set a freshwater objective for the attribute under the National Policy Statement for Freshwater Management 2014 (as amended in 2017)
(c) the state on 7 September 2017

[34] DIN – dissolved inorganic nitrogen, DRP – dissolved reactive phosphorus, TON – total oxidised nitrogen, TAM – total ammoniacal nitrogen, DCu – dissolved copper, DZn – dissolved zinc.

[35] NPS-FM 2020 Appendix 2B Table 20 sets out attribute bands A to D for DRP but does not include a national bottom line specification. There can be considerable natural variability in DRP. NPS-FM clause 3.10(4) states that attribute states and baseline states may be expressed in a way that accounts for natural variability and sampling error.

DRP concentrations are high in many monitored streams across Auckland, including at some reference quality headwater streams.

The majority of monitored rivers are degraded in terms of *E. coli* (bands D and E)[36].

Only one monitored stream was found to be below the national bottom line for visual clarity (D band). This is an interim assessment based on turbidity converted to visual clarity. The visual clarity guidelines are based on the median or typical conditions at a site and do not reflect episodic events that deliver high sediment loads and reduce water clarity such as during heavy rain.

Monitoring of heavy metals (copper and zinc) has been undertaken at a subset of sites focusing on urban streams. Metal contaminants can also be toxic to sensitive fish and macroinvertebrate species. More than half of the urban streams monitored failed the proposed regional bottom line (band D) for zinc contamination. The toxicity of zinc is affected by other factors such as hardness, and dissolved organic carbon and these guidelines are currently under review at the national level.

[36] NPS-FM Appendix 2A Table 9 *E. coli* does not include a specified national bottom line. Bands D and E are regarded as degraded for the purposes of this report. NPS-FM clause 3.11(3) requires that the target attribute state for *E. coli* must be an improvement unless the water is already in an A band.

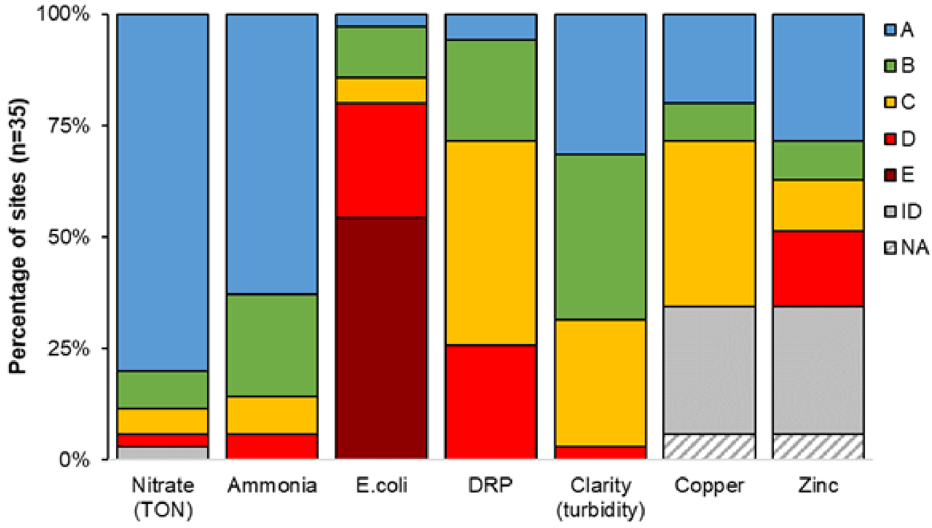

Figure 2.10 Summary of the proportion of all 36 SoE river sites within each overall band across NPS-FM 2020 NOF and proposed Tāmaki Makaurau specific water quality attributes (dissolved copper and zinc) (2015-2019) (Ingley 2021b Figure 3-1).

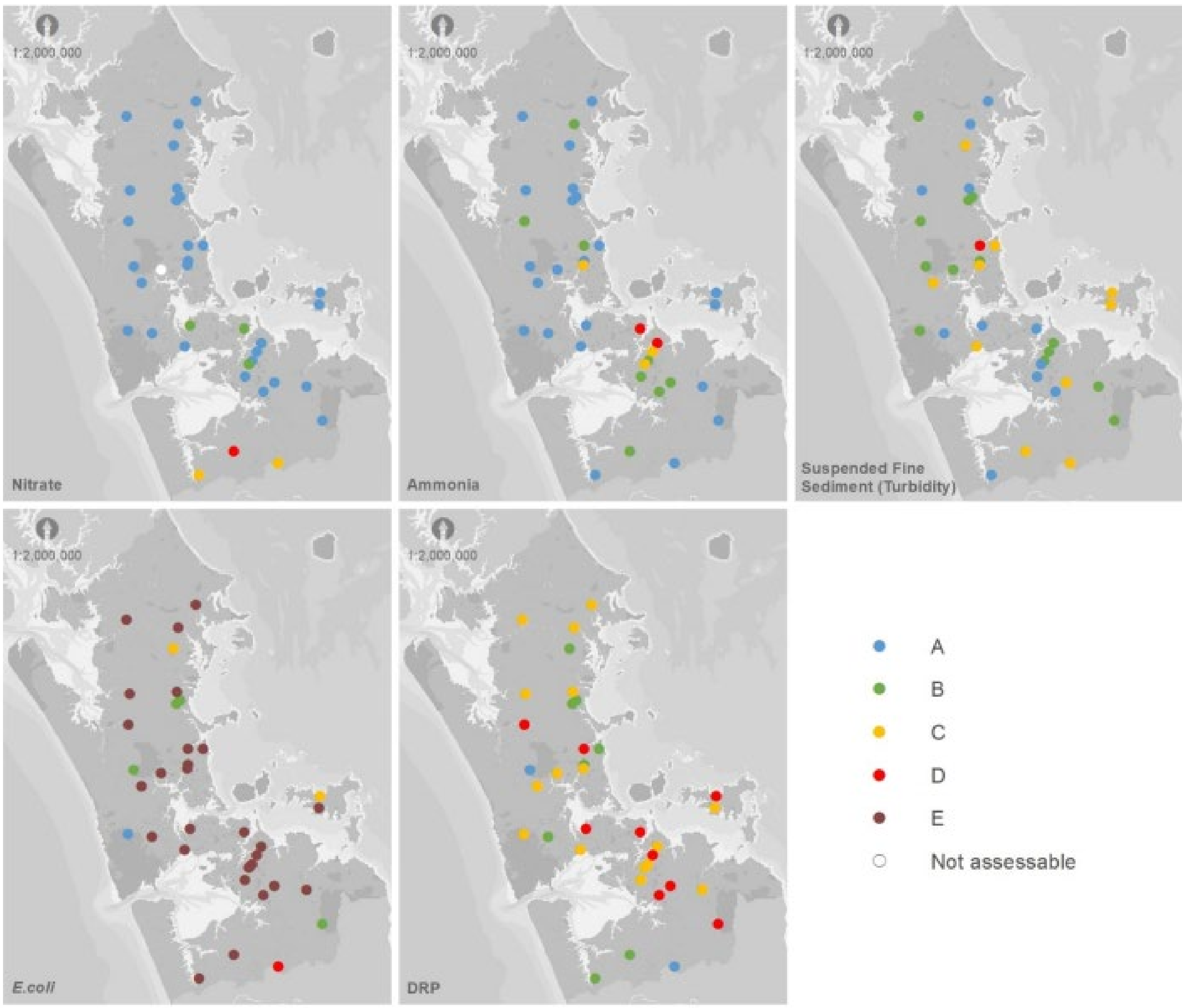

Figure 2.11 SoE Auckland region summary maps of current state (2015-2019) for NPS-FM overall NOF attribute band per site (Ingley 2021b Figure 3-3).

The SoE technical report on river ecology (Chaffe 2021) presents the Macroinvertebrate Community Index (MCI) data from 61 monitoring sites across the region. The MCI illustrates the types of macroinvertebrate communities present; as the numbers and species diversity of macroinvertebrates reflects water quality, water flow and instream habitat. When assessed against the MCI attribute in the National Objectives Framework of the NPS-FM, most of the river ecology sites (61 per cent) fall into attribute band D and are below the national bottom line for MCI. The vast majority of sites in band D are located within the more modified rural and the urban catchments, with 83 per cent and 93 per cent of sites respectively falling below the bottom line. (Figure 2.12) (Chaffe 2021: 25).

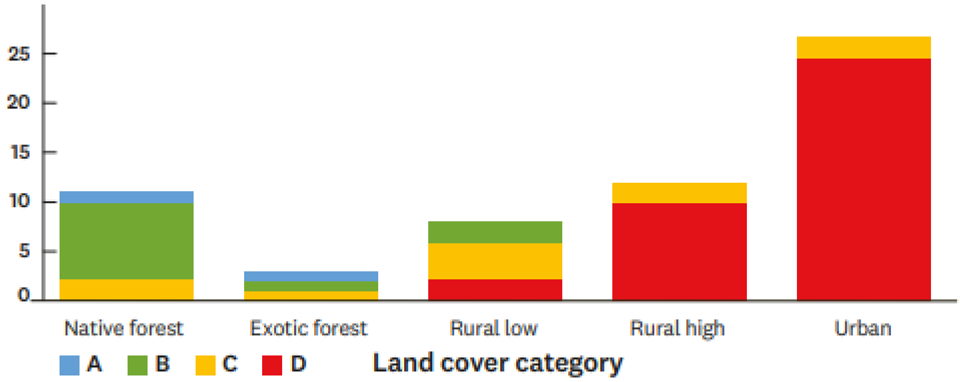

Figure 2.12 The number of sites in NPS-FM MCI attribute bands by landcover type (2015-2019) (Auckland Council 2021a: 31 and Chaffe 2021 Figure 4-6).

2.3.2.1.2 The Freshwater Management Tool

The Freshwater Management Tool (FWMT) Report 3 (Auckland Council 2021b) provides a complementary assessment alongside the SoE freshwater reporting, regarding the extent of degraded water quality in Auckland's rivers and streams. The FWMT modelling covers a baseline period of 2013-17. In general it shows a similar spatial distribution and land use association as the recent SoE results (for example in showing which contaminants are an issue in urban or rural areas). The following section highlights some key areas of degradation. More information is available in Auckland Council (2021b) and Hamilton et al. (2021).

The FWMT report (Auckland Council 2021b) presents output at ~1-3 km resolution for 3,085 km of FWMT reaches. It shows widespread issues across the region, with most rivers being degraded in terms of at least one attribute in urban and rural areas. The regional "failing" picture is driven predominantly by three contaminants – *E. coli* (83% of stream length in D or E grade), ammonia (51% of stream length in C or D grade) and DRP (59% of stream length in D grade)[37]. The proportion of streams and rivers failing other contaminants is lesser and more localised. For instance, although 4% of streams fail national bottom lines for nitrate-toxicity, the vast majority of such degraded streams are draining areas fed by aquifers in the Franklin area. The magnitude of the nitrate toxicity issues in these areas means this is a very significant issue, even though it is not occurring across the region.

[37] In the FWMT report a 'D' grade is assumed to be 'failing' for DRP. There is no 'national bottom line' in the NPS-FM for DRP and there can be considerable natural variability.

The following sections describe some of the differences between different attributes and note the general sources of each contaminant.

FWMT – *E. coli*

E. coli was consistently graded as poor state throughout the region by the FWMT for 2013-2017, in both urban and rural waterways (Figure 2.13[38]), a similar pattern to that shown for *E. coli* in the SoE reporting (Figure 2.11). Overall, 83 per cent of freshwater streams and rivers modelled by the FWMT were D or E graded at baseline state. More than 50 per cent of failing reaches require a halving or more of their 95^{th} percentile concentrations to achieve national targets for *E. coli (on 4th order* streams). Pasture is the predominant source of *E. coli* regionally (contributing 78 per cent of loads to freshwater) but with considerable contributions from wastewater and other urban sources in some catchments.

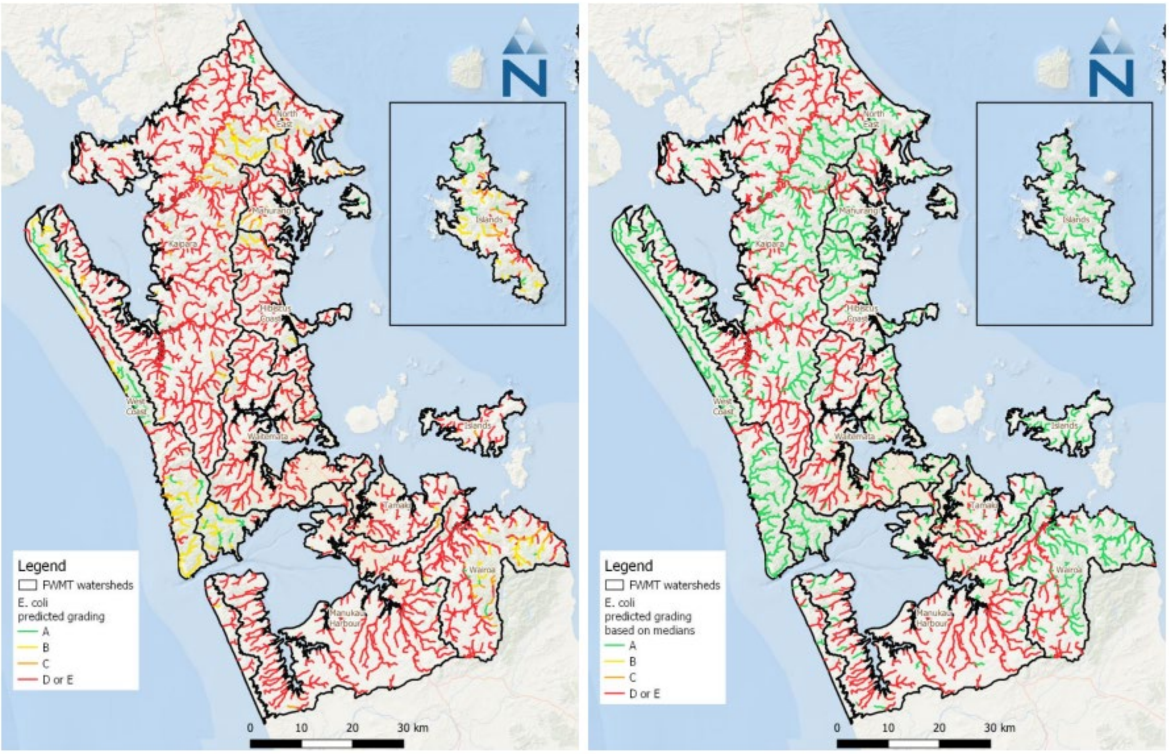

Figure 2.13 FWMT predicted grading for E. coli based on worst performing numeric attribute state (left) and median concentration (right) 2013-2017 (Figure 3-4 in Auckland Council 2021b).

FWMT – Nutrients

Consistent with the SoE monitoring, exceedance of national bottom-lines for nitrate-nitrogen toxicity was restricted largely to the Franklin area (102 of the 114 km of C or D-graded FWMT reaches were in Franklin) (Figure 2.14).

[38] Note the FWMT maps do not shade direct coastal outlets (they are white regardless of grading) because DRP, DIN and TAM grades were only readily available from the FWMT in explicitly modelled stream segments (e.g. generally the larger stream and river networks from 2nd order or greater) (Auckland Council 2021b: 56).

The FWMT indicates that there are potentially widespread toxicity risks to ecosystem health related to total ammoniacal nitrogen (TAM) (50 per cent of FWMT reaches in C or D grade) (Figure 2.15). In contrast, the SoE monitoring indicates that ammonia toxicity is principally an urban concern with infrequent exceedances of maxima (see Figure 2.11). The differences in ammoniacal nitrogen baseline grades are predominantly due to short-lived (acute) numeric attribute states (maxima); SoE and FWMT assessments are alike on long-term (chronic) numeric attributes (median). The council is working on a NPS-FM baseline state assessment that will consider the disparity between these two information sources and find a way forward for the NPS-FM process.

The FWMT found that dissolved reactive phosphorus (DRP) was the most frequently degraded contaminant for ecosystem health, with 59 per cent (1,814 km) of FWMT reaches predicted in D-grade (Figure 2.16). Predominant regional sources for TP are largely pastoral (75 per cent) with a significant contribution from bankside erosion (22 per cent).

This corresponds to the data from the SoE monitoring sites. However, caution may be needed because DRP may be naturally higher in some Auckland soil types. This natural variability is part of the reason why there is now no national bottom line for DRP in the NPS-FM.

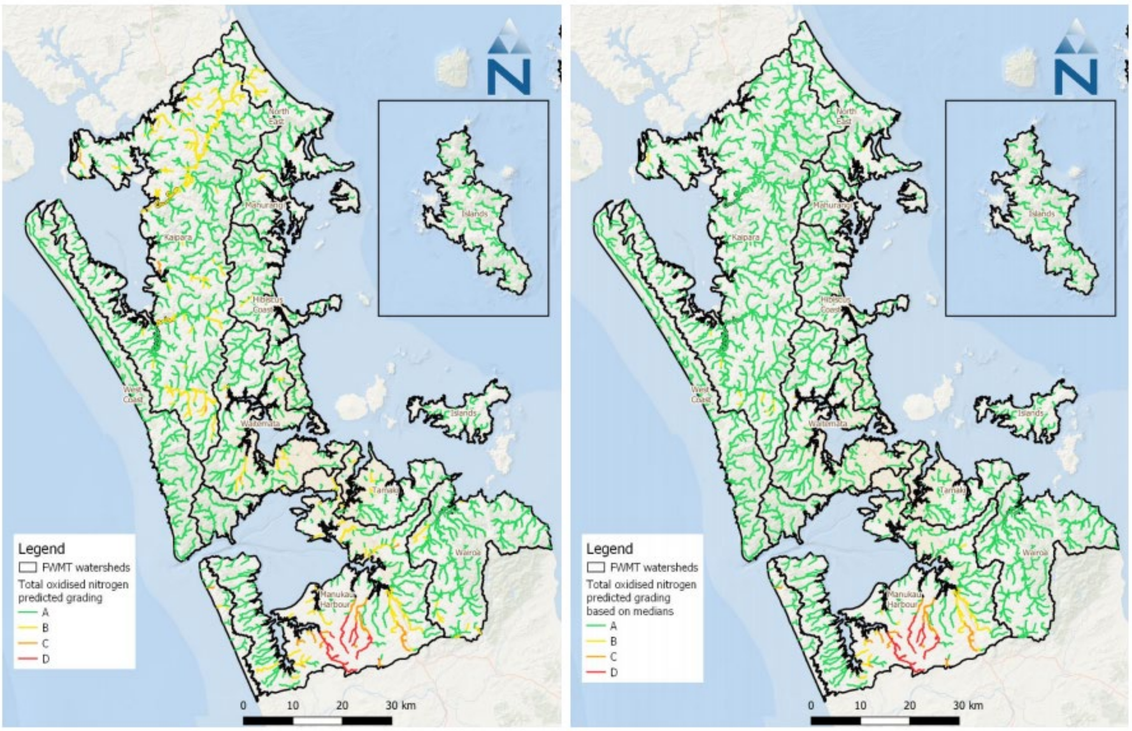

Figure 2.14 FWMT predicted grading for total oxidised nitrogen based on worst performing numeric attribute state (left) and median (right) 2013-2017 (Figure 3-21 in Auckland Council 2021b).

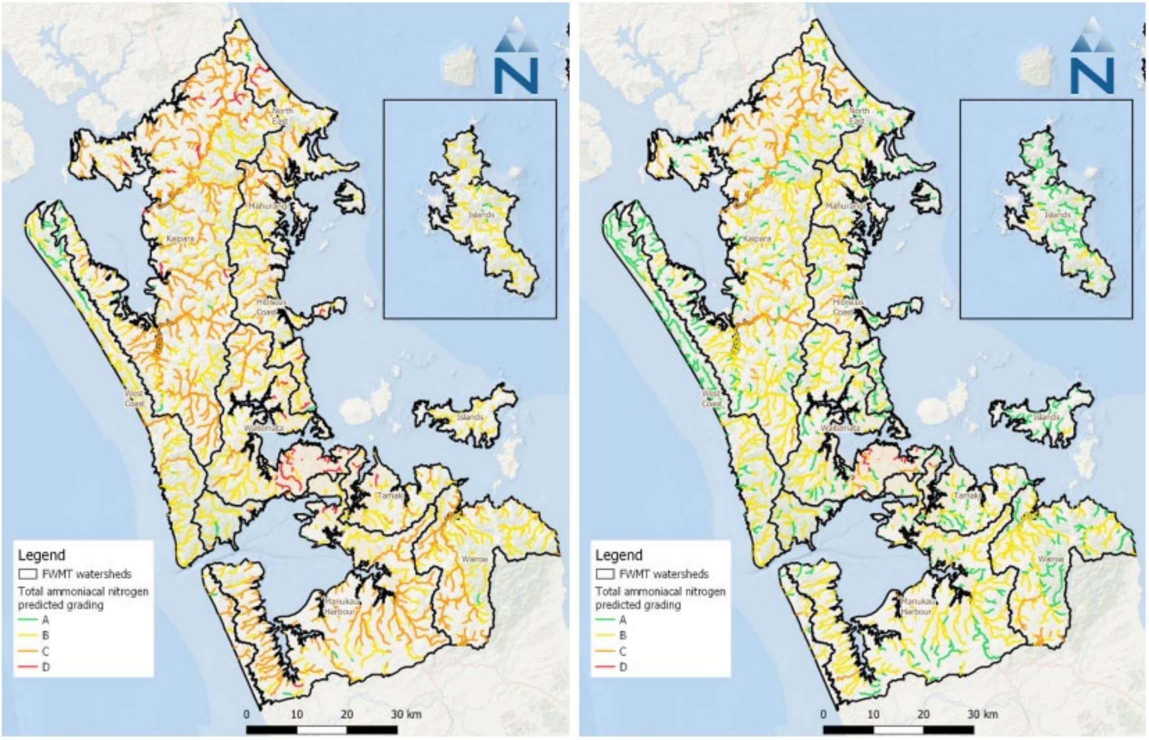

Figure 2.15 FWMT predicted grading for total ammoniacal nitrogen based on worst performing metric attribute 2013-2017: median or maxima (left) and median or 95th per cent(right) (Figure 3-26 in Auckland Council 2021b).

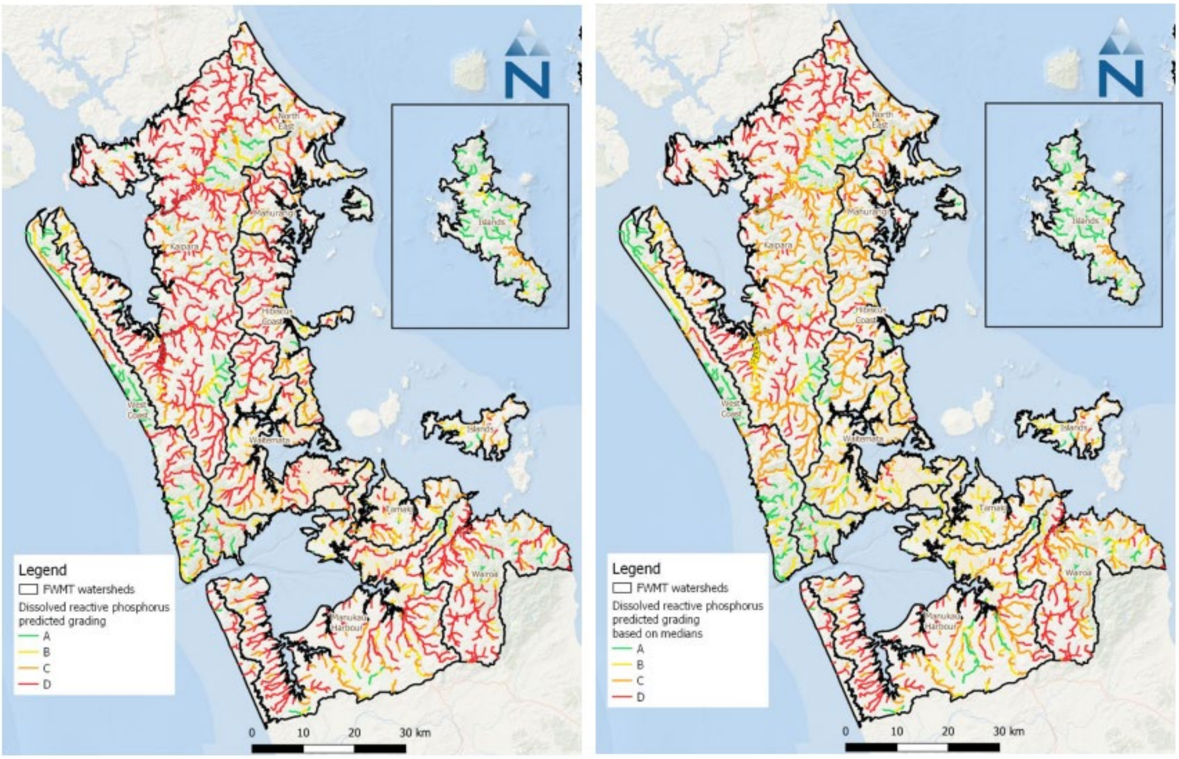

Figure 2.16 FWMT predicted grading for DRP based on worst performing metric (left) and median (right) 2013-2017 (Figure 3-36 in Auckland Council 2021b).

FWMT – Copper and zinc

The FWMT found that the extent of degradation in freshwater ecosystem health across Auckland is generally localised for copper (8 per cent in D-grade), to urban watersheds and caused largely by acute events (95th per cent concentrations) (Figure 2.17). Sources of copper vary with most intense yields from roads and motorways, and paved urban surfaces. There are also some rural sources of copper such as fungicide sprays. Similar patterns occur in degradation of ecosystem health caused by zinc toxicity (4 per cent of freshwater streams in D-grade during baseline, predominantly in urban watersheds and for 95th per cent numeric attribute state) (Figure 2.18). Zinc sources are diverse, albeit with most intense yields derived from roofing, roads and motorways, and paved urban surfaces.

Some caution may be required with these copper and zinc attributes as the proposed regional guidelines are under revision, and further targeted monitoring is required to improve the validation of the FWMT for heavy metals in rural areas. However, the overall message is similar between monitored and modelled information sources.

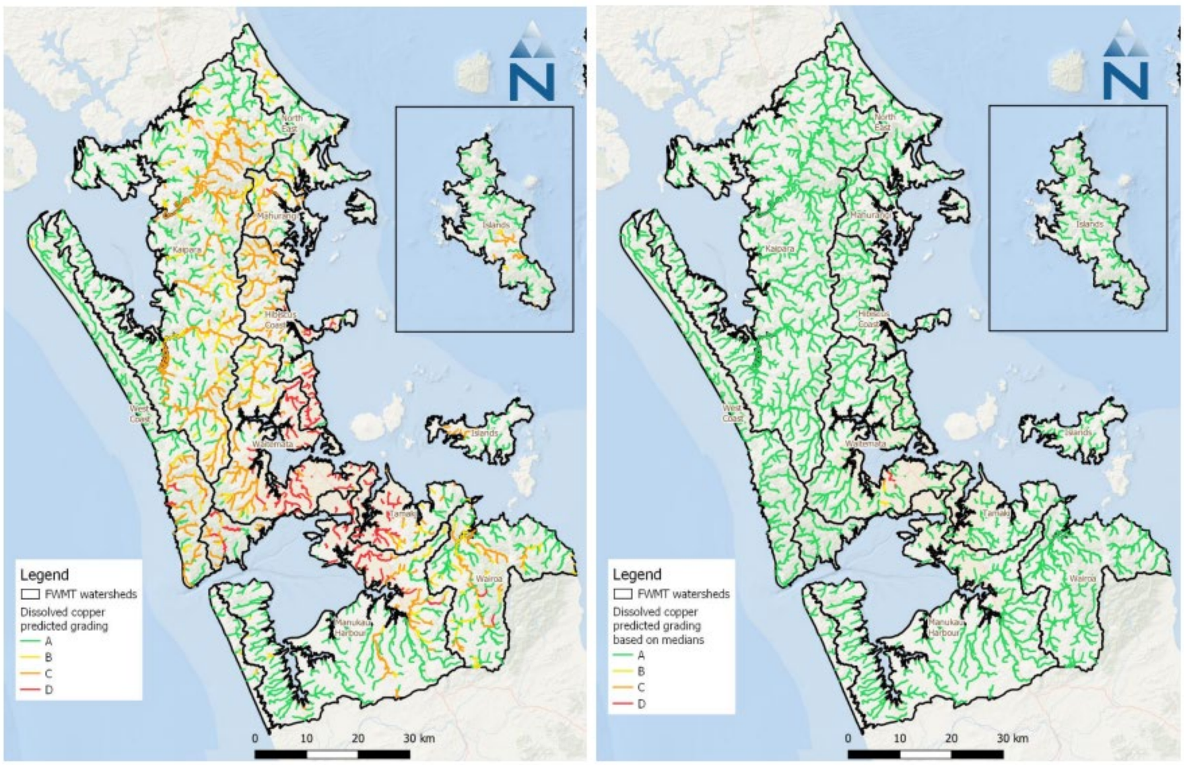

Figure 2.17 FWMT predicted grading for dissolved copper based on worst performing numeric attribute state (left) and median (right) 2013-2017 (Figure 3-11 in Auckland Council 2021b).

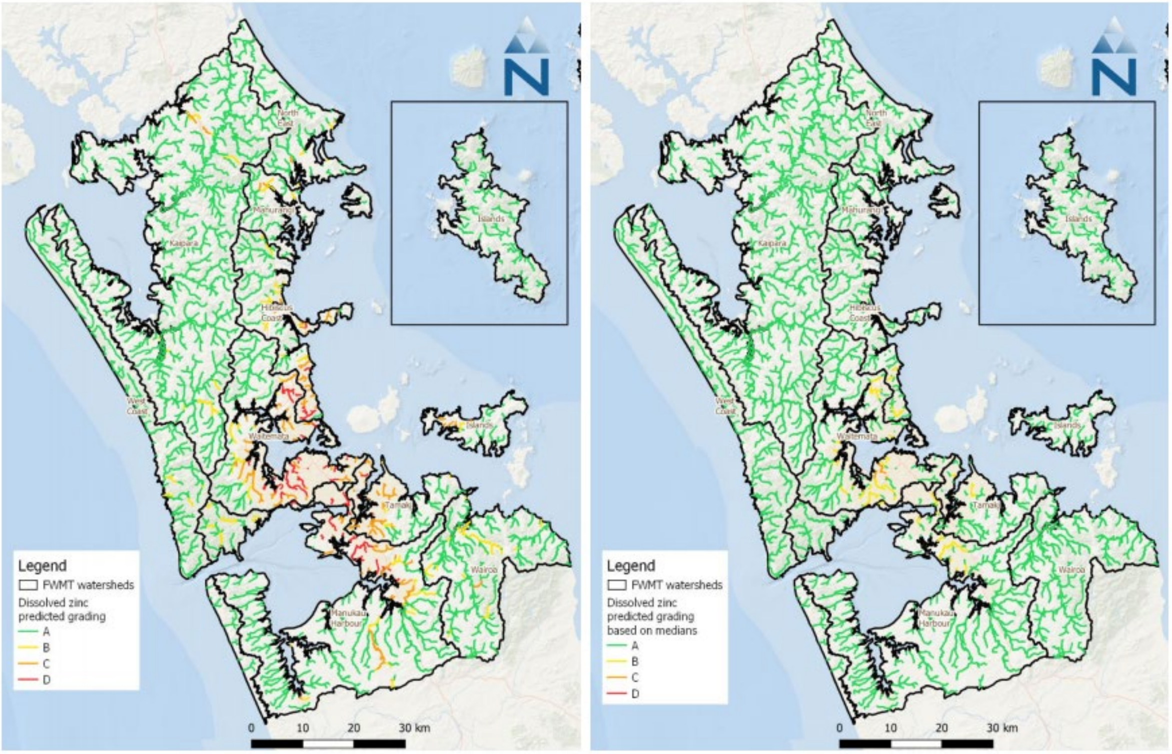

Figure 2.18 FWMT predicted grading for dissolved zinc based on worst performing numeric attribute state (left) and median (right) 2013-2017 (Figure 3-16 in Auckland Council 2021b).

FWMT – Suspended sediment

Total suspended solid (TSS) concentrations have been estimated across Auckland streams with the FWMT, however they have not been graded into attribute bands or produced as mapped outputs as there is no current NOF attribute banding or other guideline for TSS[39]. However, differences in the amounts and sources of sediment are available for the 3,085 km of freshwater receiving environments in the FWMT, over the baseline period (2013-2017). From this, whilst a range of erosional sources exist, as a region, the predominant source of sediment instream and to the coast is bankside erosion (57 per cent, 274,000 tonnes/year). The proportion of modelled sediment lost from streambanks varied amongst watersheds in the FWMT, from 43 per cent (Tamaki) to 73 per cent (Wairoa).

2.3.2.2 Maintained or improved?

Key findings relating to rivers in the SoE synthesis report (Auckland Council 2021a) include the following.

- Stream water quality improved at more sites than degraded over the last 10 years. However, streams continue to be nutrient enriched, have declining visual clarity and generally high levels of *E. coli*.

[39] The national objectives are based on visual clarity rather than TSS.

- Streams with native forest catchments generally have the best ecological health, whilst urban streams have the worst.

More detail is available in the state and trend technical reports on water quality (Ingley 2021b) and ecology (Chaffe 2021). The reports include more detail than the summary below regarding certainty in the relevant trends, for example whether they are likely or highly likely.

2.3.2.2.1 Water quality

Regionally Auckland's streams have instream nutrient enrichment and potential effects of eutrophication, declining visual clarity (based on turbidity), and generally high levels of *E. coli* (Ingley 2021b). Nitrate and ammonia can be toxic to sensitive native fish and invertebrates. Some south Auckland rural streams are at risk of nitrate toxicity, and many urban streams are at risk of infrequent ammonia toxicity events, with many of these streams continuing to degrade. Over a third of the SoE monitoring stream sites had low water clarity (based on turbidity) and these impacted streams had a higher proportion of degrading trends. While most rural and urban streams had very high levels of *E. coli* (NOF band E), over half were found to be improving in the last 10 years.

Most SoE monitored urban streams are contaminated with zinc at levels greater than the proposed regional bottom line (band D). However, for many of these streams the trend is one of likely or very likely improvement (collectively 70% of 26 SoE sites over the period 2010-2019) (Ingley, 2021b). No monitored streams were below the proposed regional bottom line for copper, however many rural and urban streams had very likely degrading trends in relation to instream copper concentrations. For most of the water quality indicators measured, more streams were likely or very likely improving than were degrading over the 10 years assessed (2010-2019). However, the rates of improvement were generally minor (<1%/year) and it may require decades to meaningfully improve water quality (e.g., by a grade) in those rivers and streams already in a degraded state. Of those that were degrading, the largest trends were generally associated with streams that have the poorest water quality (in the worst state) suggesting where pressures on waterways are greatest, the effects of activities continue to degrade rather than improve water quality. Notably, uncertainty remains on whether those predominant trends for degradation in already degraded streams, are the effects of existing activities and AUP rules, or ongoing legacy effects.

The technical report on river water quality (Ingley 2021b: 54) identifies two sites where the SoE monitoring shows links between recent urban development and river attributes. Of all the catchments upstream of the SoE monitoring sites, the catchments of Otara Creek East (Flat Bush) and Vaughan Stream (Long Bay) had the greatest changes in land cover over the past 10 years. Both Flat Bush and Long Bay were master planned urban areas developed with water sensitive design principles[40]. The current state of NOF attributes at Otara Creek East was typically one band better than the adjacent Otara Creek South catchment, and Vaughan Stream typically had better water quality than other monitored urban streams, being the only 'urban' stream to exhibit very low zinc concentrations

The council's event-based sediment yield monitoring programme has a monitoring site at Vaughan Stream that indicates the event sediment yield since development began in 2012 has

[40] See the Long Bay case study in the Auckland Design Manual at www.aucklanddesignmanual.co.nz/.

been similar to that of the pre-development state (Figure 2.19, Hicks et al. 2021). The development of Long Bay has increased the impervious areas in the catchment and that will have changed the hydrological regime of water reaching the stream. There was no significant trend in event sediment yield over 2012-2019, suggesting that urbanisation in the Vaughan catchment has as yet, had only a transient impact on elevating sediment yield (Hicks et al. 2021: 78). There is a likelihood that event-based changes to sediment yields might suffer lags and continued event-based monitoring is required to ascertain if changes in hydrological regime and erosion have not yet become expressed instream.

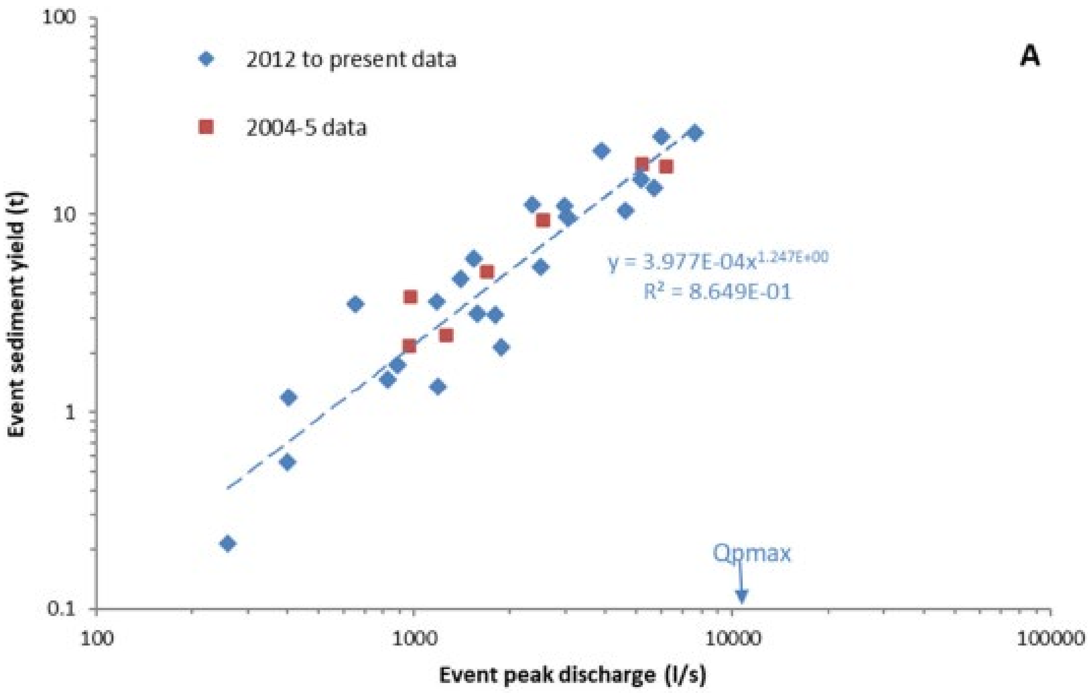

Figure 2.19 Rating between event sediment yield and event peak discharge for Vaughan Stream at Lower Weir, 2004-2019 (Figure 4-11 in Hicks et al. 2021).

2.3.2.2.2 Ecological values

Regionally streams within native forest catchments tend to provide the greatest ecological values (Chaffe 2021). This is in terms of macroinvertebrate community composition and overall stream habitat and function. All measures showed a clear pattern of decline with increased land cover modification.

Streams within the region are being adversely impacted by loss of vegetation and homogenisation of habitat as a result of channel modification and increased fine sediment loads. Urban sites were consistently found to be in the worst ecological health. Assessed against the AUP interim guideline values for MCI[41], 40 per cent of sites are currently failing to meet guidelines, compared to 37 per cent for the previously assessed period to 2014 (Chaffe 2021: 23).

[41] Note that the AUP interim guideline values for MCI are not the same as the MCI bands in the NPS-FM.

2.3.3 Lakes

2.3.3.1 Degraded areas

The SoE technical report on lake water quality (Groom 2021) presents the current state of Lake Pupuke, Lake Wainamu, Lake Tomarata and Lake Rototoa. These are the only lakes in Auckland that have long-term monitoring records[42]. The state of the lakes was assessed using water quality parameters, human contact attributes, ecological indicators, and graded according to the NPS-FM NOF. All four lakes were above the national bottom lines for all water quality attributes (Table 2.5). However, three of the lakes were in a eutrophic state (where elevated nutrients result in changes to algal biomass) with poor or non-vegetated ecological condition, with only one lake classed as mesotrophic with high ecological condition (Lake Rototoa) (Auckland Council 2021a, Groom 2021)[43].

Table 2.5 NPS-FM NOF bands for lake water quality attributes (2015-2019) (Auckland Council 2021a, Groom 2021 Table 3-1).

	Total nitrogen	Total phosphorus	Ammonia (toxicity)	Chlorophyll a
Pupuke	B	A	A	C
Wainamu	B	C	A	C
Tomarata	C	B	A	C
Rototoa	B	A	B	B

2.3.3.2 Maintained or improved?

The key finding relating to trends in lakes in the SoE synthesis report (Auckland Council 2021a) is:

- Health of monitored lakes continues to decline, with elevated nutrients and declining water quality particularly for nitrogen, water clarity and sediment.

[42] The SoE monitoring programme is being expanded to include additional lakes. The finalisation of the FWMT Lakes module (Auckland Council 2021c) will also provide additional understanding of the state of Auckland's lakes.
[43] Trophic state is a summary of the level of nutrients (e.g. nitrogen and phosphorus) and algae (chlorophyll-a) in the lake water, and clarity of the water. The different trophic states are:
Oligotrophic lakes are clear and blue, with very low levels of nutrients and algae.
Mesotrophic lakes have moderate levels of nutrients and algae.
Eutrophic lakes are green and murky, with higher amounts of nutrients and algae.
Supertrophic lakes are fertile and saturated in phosphorus and nitrogen, often associated with poor water clarity. Excessive phytoplankton growth can occur in ideal conditions - when there's a calm, hot and sunny period of a few weeks.
Hypertrophic lakes are highly fertile and supersaturated in phosphorus and nitrogen. They have excessive phytoplankton growth which contributes to poor water clarity, poor suitability for recreational uses, and restricts the habitat for desirable fish.

Groom (2021) identified that across the four historically monitored lakes, likely degrading trends in total nitrogen, water clarity and sediment parameters were more common, but there were also likely and more common improvements in total phosphorus concentration.

Key trends in each lake were:

- Lake Pupuke – degrading trends in parameters in the surface waters, supporting anecdotal reports of more frequent algal blooms in the lake.
- Lake Wainamu – generally improving trends suggesting an improvement in lake condition. This is a promising sign, particularly for total phosphorus, as this was the lake in the Auckland region that had the lowest grading for total phosphorus concentrations.
- Lake Tomarata – in poor condition with very likely degrading trends in most water quality parameters, with the biggest magnitude of change in several water quality parameters.
- Lake Rototoa – in the best state for water quality and ecological condition compared to other monitored lakes in the Auckland region. However, this lake had degrading trends in sediment attributes and total nitrogen, suggesting vulnerability to greater impacts on lake ecological communities in the near future and could fall into the C band in the NPS-FM within the next 10 years.

Several key pressures were identified as potential drivers of changes in water quality in these lakes including, but not limited to, catchment land cover type, pest fish, invasive plant species, internal nutrient loading, and a changing climate (Groom 2021).

2.3.4 Groundwater

2.3.4.1 Degraded areas

Elevated nitrate concentrations in some shallow south Auckland volcanic aquifers have been reported since the early 1990s, with data indicating increasing concentrations since the late 1960s (Auckland Council 2021a[44]). The aquifers are important water sources for horticulture; and long-term fertiliser use in this area is a source of nitrate contamination to groundwater. Foster and Johnson (2021) found that nitrates continue to be elevated in several shallow volcanic aquifers in the Franklin area.

The NPS-FM does not include a NOF attribute for nitrate in groundwater for ecosystem health, however the surface water NOF is relevant to aquifers which provide extensive baseflow to streams (Foster and Johnson 2021: vii). Six groundwater sites in the Franklin area had nitrate toxicity levels in the surface water NOF band D (noting that the national bottom line for nitrate is between band B and C). These sites are in shallow oxygenated volcanic aquifers that contribute high baseflow to nearby streams. This will impact on the values of the streams as they source a significant proportion of their flow from aquifers.

[44] Council's groundwater monitoring for water quality is not regionally representative and is more reflective of known historic key impacted areas, and is being updated to reflect recent management changes.

Nitrate also exceeded expected natural conditions in the Three Kings Volcanic aquifer, which suggests land use practices are impacting the aquifer. The Three Kings Aquifer provides baseflow to Western Springs Lake and Motions Stream, and is likely to be one source of nitrate contamination in surface waters. *E. coli* was present in groundwater samples for the Three Kings volcanic aquifer, most likely linked to stormwater and wastewater leakage in urban areas. Zinc concentrations in the Three Kings Volcanic aquifer exceeded the Australia and New Zealand Environmental Conservation Council (ANZECC) ecosystem health trigger value for surface water, suggesting that groundwater baseflow to Motions Stream may contribute zinc contamination to the stream and the coast.

2.3.4.2 Maintained or improved?

The key finding relating to groundwater trends in the SoE synthesis report (Auckland Council 2021a) is:

- Groundwater quality generally showed minor improvements
- Groundwater quality in specific areas is degrading.

The SoE technical report on groundwater quality (Foster and Johnson 2021) expands on this and explains that while many of the shallow Franklin aquifers show improving trends in groundwater nitrate levels, the rate of change is generally small, and slow to respond to changes in land management.

In the Three Kings Volcanic aquifer the long-term trend in *E. coli* was likely degrading, which indicates faecal bacterial contamination is likely increasing in this aquifer.

Results from the groundwater quality monitoring programme indicate that nitrate is the foremost contaminant of concern for shallow volcanic aquifers in the Franklin region. High nitrate observed in groundwater coincides with both horticultural and urban land uses but to a significantly greater degree in horticultural areas. The levels of nitrate observed exceeded expected concentrations for natural conditions [45], New Zealand drinking water standards, and the NOF national bottom line for surface water ecosystem health. Trends in nitrate were predominantly improving in the Franklin shallow volcanic aquifers, but degrading trends were observed in the Bombay Volcanic and Drury Volcanic aquifers. These aquifers provide significant baseflow to streams, suggesting that groundwater baseflow contributes to nitrate contamination in Franklin streams.

The state and trend for water quality in the three groups of aquifers are shown in Table 2.6, Table 2.7 and Table 2.8.

[45] Auckland Council acknowledges that nitrate levels of <1 mg/L may be more realistic when identifying 'natural conditions' in shallow well oxidized water, rather than the <2.5 mg/L used in the council reporting (Coral Grant, Auckland Council *pers. comm*. 9 February 2022).

Table 2.6 Water quality of the Franklin aquifers, a summary of state (2015-2019) and 10 year trends (2010-2019) (Foster and Johnson 2021: Table 4-8)[46].

Aquifer zone	AMA	Site	State	Long-term trends	Safe to drink**	Overall water quality
Franklin Volcanics	Drury Volcanic	Fielding Road Volcanic	No values above guidelines	*Very likely* **improving nitrate trend**	Yes	Good
		Hillview Springs	Nitrate exceeded both guidelines	***Likely*** **degrading nitrate trend**	No	Poor
	Bombay Volcanic	BP Bombay*	Nitrate exceeds ECNC	*Very* ***likely*** **degrading nitrate trend**	No	
	Pukekohe Volcanic	Hickey Springs	Nitrate exceeded both guidelines	*Very likely* **improving nitrate trend**	No	
		Rifle Range Deep	No values above guidelines	No degrading trends of note	Yes	Good
		Rifle Range Shallow	Nitrate exceeds ECNC and close to MAV	*n/a*	No	Poor
		Gun Club Road	Nitrate exceeded both guidelines	*Very likely* **improving nitrate trend**	No	
		Patumahoe Springs	Nitrate exceeded both guidelines	*Very likely* **improving nitrate trend**	No	
Franklin Kaawa	Pukekohe Kaawa	Ostrich Farm Road Deep	No values above guidelines	*Likely* **degrading nitrate trend**	Yes	Good
		Ostrich Farm Road Shallow	Iron exceeded aesthetic guideline[47]	*Very likely* **degrading iron trend**	Yes	Good
Franklin Sand	Bombay Drury Sand	Fielding Road Sand	Iron exceeded aesthetic guideline	*Likely* **degrading iron trend**	Yes	Good
Franklin Waitematā	Waitematā	Waiau Pa Waitematā	No values above guidelines	*Very likely* **degrading nitrate trend**	Yes	

*** The status of groundwater for drinking outlined here is only undertaken at a broad level and does not replace a compliance level assessment against the NZDWS for community supply.*

[46] ECNC - Expected Concentrations for Natural Conditions for nitrate. MAV - Maximum Acceptable Values in MoH Drinking Water Standards. A MAV is generally the maximum value of a chemical that is considered, based on current knowledge, not to cause any significant risk to the health of a consumer over 70 years of drinking 2L of water a day.

[47] The aesthetic based guideline values (AGV) are from the New Zealand Drinking Water Standards. Exceedances of aesthetic guideline values do not pose a human health risk but can create nuisances with water purification equipment, taste, staining, and scum build up with certain soaps.

Table 2.7 Water quality of the Kumeu West aquifers, a summary of state (2015-2019) and 10 years trends (2010-2019) (Foster and Johnson 2021: Table 4-9).

AMA	Site	State	Long-term trends	Safe to drink	Overall water quality
Kumeu West Waitematā	Waitākere Road Deep	Iron exceeded aesthetic guideline	*Likely* **degrading nitrate trend**	Yes	Good
	Waitākere Road Shallow	Iron exceeded aesthetic guideline	*Very likely* **improving iron trend**	Yes	Good

Table 2.8 Water quality of the Three Kings aquifer, a summary of state (2015-2019) and 10 years trends (2010-2019) (Foster and Johnson 2021: Table 4-10).

Parameter type	State	Long-term trends	Safe to drink	Overall water quality
Nutrients	Nitrate above ECNC	*Very likely* **improving nitrate trend**	Yes	Poor
Metals	Zinc above ANZECC surface water Trigger Value	*Likely* **degrading trends for zinc**	Yes	
Microbial	*E. coli* **exceeded guidelines**	*Likely* **degrading *E. coli* trend**	No	

2.3.5 Effectiveness and efficiency of the AUP

2.3.5.1 Degraded areas

Since the AUP became operative, significant advances have been made in understanding the state of Auckland's water and in identifying degraded areas. Comparing water quality attributes to the NPS-FM NOF bands (and the proposed regional bands for zinc and copper) for surface water rivers and streams, and relevant criteria for coastal water and groundwater, has presented a clear picture of which waterbodies and values are degraded.

Widespread degradation of ecosystem health is evident across the mainland estuaries and harbours of Auckland, particularly reflecting the ecological impacts of increased sedimentation. Levels of heavy metal contaminants (copper, lead and zinc) in marine sediments are generally low. Hot spots of higher levels occur in muddy estuaries/tidal creeks with older intensively developed catchments and are likely to be related to historic contamination. Several of the beaches used for swimming, including sites outside of estuaries and harbours, are degraded through faecal indicator bacteria contamination for part of the swimming season. Litter and microplastics are found throughout coastal areas.

A similar pattern of widespread degradation is evident in the NPS-FM attributes for rivers and streams. The majority of Auckland's rural and urban rivers and streams are degraded for at least one regionally or nationally relevant attribute for ecosystem or human health but streams in native forest areas are still in good health. The contaminants with widespread degradational effects on river water quality include faecal indicator bacteria (*E. coli*), some nutrients and suspended fine sediment. Heavy metals (zinc and copper) are a localised cause of degradation to ecosystem health in urban streams, although with more widespread trends for increasing total copper concentration (e.g., in rural and urban SoE sites). Nitrate-toxicity is likely to be a localised concern in rivers with significant groundwater input and intensive horticulture production, largely within the Franklin area.

The regional picture of freshwater lake health is less certain, due to a mix of more limited long-term SoE monitoring and indicative modelling. However, the monitoring indicates concerning nutrient availability, impaired clarity and risk of eutrophication[48]..

AUP B7.3 and B7.4 have objectives that require the identification of where Auckland's water is degraded and where it is good or excellent. This is an on-going requirement that must be continually re-assessed to determine whether management actions are achieving improvements in degraded areas, and maintaining excellent and good areas. Further planning, policy, and operational work is clearly needed to address sediment, nutrients, heavy metal contaminants and *E. coli* in Auckland's rivers, lakes, aquifers and coastal waters. This needs to be across the region as issues are spread across rural and urban areas. These requirements will be addressed through the NPS-FM plan change.

This assessment has also illustrated the linkages between different environments and issues. Sediment and other contaminants are being discharged from streams to the coast, and nitrate in groundwater is affecting the water quality of streams in catchments with intensive horticultural land use. The continued degraded state of some waterbodies highlights the extensive work that is still required.

2.3.5.2 Maintained or improved?

The goal to maintain water quality where it is excellent or good, and to improve water quality in degraded areas, is being achieved in some locations or with some contaminants, but clearly not across the majority of the region and not across all sources of degradation. Degraded states are currently widespread for *E. coli*, dissolved nutrients and suspended fine sediment (turbidity). Where improvement is more likely than not, rates are generally minor (<1%/year) suggesting long time frames for improvement under current management regimes.

A challenge to assessing AUP provision effectiveness is hysteresis – delayed responses to ongoing and new land use changes. There can be considerable time lags between the adoption of management practices and the detection of improvement in water quality, associated with the time it takes for a practice to be adopted, the time for that practice to produce an effect, and the time for rivers or coastal waters to respond to that effect. Differences in these processes for different water quality variables can range from years to decades. Long-term monitoring may also show a changing response with climate change, for example, sediment discharge from streams may increase with more frequent storms despite having improved controls on earthworks, and there may be increased algal blooms associated with increased

[48] Eutrophication is the gradual increase in the concentration of phosphorus, nitrogen, and other nutrients in an aquatic ecosystem such as a lake, leading to excessive plant growth and algal blooms.

temperatures even if nutrient inputs are decreased. The results may reflect many factors other than the AUP, or they may indicate that in general the AUP is managing the input of contaminants to Auckland's waterways. The improvements while small, and not everywhere, suggest that as a collective whole, environmental management including the AUP, is moving in the right direction. However, there is a need to do more and faster to continue to improve outcomes and reverse degradation. There is a need for better management of water quality throughout urban and rural areas given existing state, trends and uncertainty in the anticipated future outcomes of the AUP and changes in pressure on resources from development, climate change and land use intensification and change.

2.3.5.2.1 Source apportionment

Some of the preliminary findings related to source apportionment from the FWMT (Auckland Council 2021b: 123) are the following.

- Bankside erosion is a considerable regional source of many contaminants to streams, including for TSS (57 per cent), TP (42.5 per cent), TCu (44.1 per cent) and TZn (33.6 per cent).
- Pastoral (commercially farmed) land is a considerable regional source of many contaminants to streams, including for *E. coli* (19.6 per cent), TN (74.9 per cent), TP (53.4 per cent), TCu (19.1 per cent), TZn (18.7 per cent) and TSS (16.7 per cent). Urban areas are relatively modest sources on a regional scale but otherwise often higher-yielding (i.e. from more intensive activities). For some contaminants, the total load produced by rural areas is higher due to its greater extent but the yields of urban streams are higher.
- Overall, pastoral, forest and open space[49], and bankside erosion are the three recurring major sources of contaminants (between the three contributing about three quarters or more of regional edge-of-stream loads). Pastoral sources are the greatest regional source of three contaminants (*E. coli*, TN, TP) with bankside erosion the largest regional source of sediment (TSS).

Further work is being done to revise the land classification scheme used in the FWMT for source apportionment, including disaggregating forest types and clarifying the range of land uses within 'open space'. This may assist with issues such as determining how much bankside erosion is natural and how much is induced by human activity.

2.3.5.3 Assessment

The effectiveness and efficiency of the AUP water provisions may be better assessed by considering this section of the report together with subsequent sections. In many cases, the issues noted here are addressed by multiple different parts of the AUP.

[49] Forests and open spaces are often notable sources of contaminants for a range of natural factors (climate, soil, slope). The loads of contaminant discharged from forested and open space can be misleading if confused with either the manageable load (available for mitigation) and/or the loads in excess of naturalised conditions (e.g., pre-development, pre-clearance).

The role of the AUP in managing a contamination source varies between the different contaminants. In some areas, the AUP is one of the key determinants of the level of contaminant inputs to waterways. In other cases, it is one of a package of tools used to address a contaminant issue and may have relatively little impact if the other tools are not also being effective. The difference between contaminants is demonstrated in the following examples.

Sediment and nutrients are generally from diffuse sources and require catchment-wide management. They are strongly affected by the pattern of development and how existing land uses are managed. As a result, the AUP has a key role in minimising ongoing inputs of sediment and nutrients.

In contrast, the AUP may have had only limited influence on the degraded coastal areas identified in the Safeswim bathing beach water quality data in the five years since the AUP became operative. Changes in coastal faecal indicator bacteria near urban areas are generally a result of infrastructure upgrades. The AUP guides the expectations of environmental outcomes expected through resource consents for discharges, but that does not mean the whole wastewater network will be upgraded immediately. For example, the removal of the Laingholm, Wairau Outlet and Titirangi long term warning sites from Safeswim reflects work to improve the piped network in one sub-catchment, through the interconnection of the Safeswim and Safe Networks programmes. The greatest change in coastal water quality in terms of human health across the Central Isthmus in the near future is expected to result from the Central Interceptor wastewater pipe that will run from Grey Lynn to the Mangere Wastewater Treatment Plant and will reduce overflows in central Auckland by 80 per cent[50]. It is complemented by the Western Isthmus Water Quality Improvement Programme which involves numerous major infrastructure improvements to the stormwater and wastewater network in order to reduce wastewater overflows into the Waitematā Harbour and reduce stormwater entering the wastewater network.[51] The Central Interceptor project does not reflect the effectiveness of the AUP as it was consented in 2013 under the legacy plans, construction started in 2019, and it is expected to be completed by 2025.

Although the timing of these specific works may not be linked directly to the AUP, it should be recognised that a key driver of improvements to wastewater infrastructure is the regulatory regime and the consents required for discharges to land or water. The requirements in the Central Interceptor consent are consistent with what the AUP would require for similar works. The analysis in the wastewater network discharges section of this report examines how effectively the AUP has been addressing this issue over the last five years in the areas where it has had an influence.

For an issue such as litter, the AUP may have a relatively minor role. Several factors other than the AUP are more significant in determining how much litter reaches Auckland's waterways and the coast. These include national level changes that affect the sources of plastic, such as the ban on single use plastic bags and national anti-littering education campaigns. At the regional level, there is extensive work by the council and Auckland Transport in managing waste sources, rubbish collection, street sweeping and stormwater catchpit cleaning. There is also the work of groups such as Sea Cleaners and Sustainable Coastlines[52] who have collected

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[50] See https://www.watercare.co.nz/About-us/Central-interceptor.

[51] See https://www.aucklandcouncil.govt.nz/environment/looking-after-aucklands-water/water-quality-targeted-rate/Pages/western-isthmus-water-quality-improvement.aspx

[52] See http://www.seacleaners.com/ and http://www.sustainablecoastlines.org/

millions of pieces of litter from beaches and coastal waters. The role of the AUP relates to chapter E1 policies E1.3(8) and (9) that require that the adverse effects of stormwater runoff from greenfield development, and during intensification and redevelopment of existing urban areas, to be minimised by requiring measures to reduce the discharge of gross stormwater pollutants. Depositing litter in a lake, river, stream or wetland is prohibited (E3.4.1(A7)). There is also a policy in the coastal chapter that encourages activities that reduce the amount of litter entering coastal waters (F2.11.3(6)). Other policies require facilities for rubbish disposal at ports, marinas and ferry terminals ((F2.11.3(10), F2.17.3(3), F3.3(4), F5.3(7), F6.3(7), I208.3(14)). All works in the coastal marine area must remove litter at the completion of any works (F2.21.1(2)). The outcome of these policies is achieved through stormwater management plans and plan changes for greenfield areas, and in consent conditions for works or discharges in existing urban areas, and conditions on consents for works in the coastal marine area. The data presented above on litter shows the importance of ensuring that these provisions work as effectively as possible to fulfil the role of the AUP in ensuring that less litter reaches freshwater systems and coastal waters.

2.4 Recommendations

The extent of degraded areas, and the limited progress made on improving those areas, demonstrates the importance of the reviewing and improving the AUP provisions that manage discharges and the effects of land use change on water quality. The AUP needs to be strengthened in response to the environmental data summarised in this chapter, in addition to being a requirement of the NPS-FM.

General recommendations can be made for future reviews of the AUP.[53] The recommendations below are assigned into the categories outlined in section 1.6.

2.1 Extensive improvement in discharge and land use management is needed to ensure that improvements within waterbodies happen more quickly than they have over the last 10 years (category: NPS-FM)

2.2 The next plan review should include a review of the identification of degraded coastal areas currently included in the plan to reflect the monitoring data available since the AUP was developed (category: AUP review process).

2.3 Maintaining and enhancing water quality will need to be a primary consideration across the AUP provisions, including those applying in rural and urban areas, and in district plan provisions as well as those that will be in the NPS-FM plan change (category: NPS-FM related)

2.4 Issues such as sediment from stream bank erosion require clearer linkages within the AUP to show that multiple parts of the plan are part of a package to address cumulative effects (category: NPS-FM related)

[53] These recommendations will need to be tested fully through an RMA section 32 assessment, be considered alongside other recommendations from other topics and the Plans & Places Department work programme.

2.5 Monitoring (both direct environmental and indirect evaluative) and modelling need to be expanded and enhanced so that clearer linkages can be made between the AUP provisions and the state and trends in environmental values54 (category: process)

2.6 Consent related processes need to be improved to enable future section 35 reviews to make greater use of monitoring undertaken by consent holders and the council's consent compliance monitoring (category: process)

2.7 Further investigation and support for community initiatives such as Litter Intelligence are required to address litter in waterways and emerging contaminant issues such as microplastics (category: further investigation).

2.5 Future change under the NPS-FM

2.5.1 A freshwater quality accounting system

The NPS-FM requires that regional councils monitor water bodies and freshwater ecosystems and take action if degradation is detected (NPS-FM clause 3.18 to 3.20). This approach is based on the council having a 'freshwater accounting system' for every Freshwater Management Unit[55]. NPS-FM clause 3.29 sets out the requirements for freshwater quality and quantity accounting systems. The purpose of the systems is to provide the baseline information required for setting target attribute states (NPS-FM clause 3.11), environmental flows and levels (NPS-FM clause 3.16), and limits (NPS-FM clause 3.14), to track over time the cumulative effects of activities and to report on whether targets and visions are being achieved (NPS-FM clause 3.30). The freshwater quality accounting system must (where practicable) record, aggregate, and regularly update, for each FMU, information on the measured, modelled, or estimated:

(a) loads and concentrations of relevant contaminants; and

(b) where a desired contaminant load has been set as part of a limit on resource use, or identified as necessary to achieve a target attribute state, the proportion of the contaminant load that has been allocated; and

(c) sources of relevant contaminants; and

(d) the amount of each contaminant attributable to each source.

The NPS-FM allows councils to use both monitored and modelled information and requires that the best available information is used (NPS-FM clause 1.6).

[54] This work is being developed under the Auckland Water Strategy (2022) available at https://www.aucklandcouncil.govt.nz/environment/looking-after-aucklands-water/Pages/auckland-water-strategy.aspx

[55] NPS-FM clause 1.4: Freshwater management unit, or FMU, means all or any part of a water body or water bodies, and their related catchments, that a regional council determines under clause 3.8 is an appropriate unit for freshwater management and accounting purposes; and part of an FMU means any part of an FMU including, but not limited to, a specific site, river reach, water body, or part of a water body.

The combined modelling and monitoring datasets described in this chapter of the report will need to be expanded to meet the needs of the NPS-FM and to provide clearer linkages between data and management responses, including to enable better understanding of the effects of specific consents, both individually and cumulatively. The council has been addressing this need over recent years by developing continuous, integrated and regionwide process-models of international best-practice modelling (FWMT – Auckland Council 2021b), and the addition of more lake and groundwater monitoring sites, and additional accounting components relating to consent data are being developed.

Both SoE reporting and FWMT modelling (where possible) will need to generate states for attributes recently introduced to the NPS-FM in 2020. For example, the SoE technical report for river ecology (Chaffe 2021: 46) notes the need to include two additional metrics: the quantitative variant of MCI (QMCI) and Average Score Per Metric (ASPM) within SoE reporting. It was also noted that little is known about the state of intermittent streams in the region or the ability of river systems to support native fish species. The council has recently expanded the SOE monitoring work to address this gap in fish monitoring. Periphyton monitoring is underway in hard bottom streams, and in the 2021/22 summer monitoring began to include deposited sediment, fish, and continuous dissolved oxygen. The water quality and ecology monitoring networks are being expanded to include more sites. FWMT modelling is currently being applied to predict macroinvertebrate, periphyton and fish indicators, utilising regional and national datasets. However, whether modelled or monitored, greater ecological field sampling is required to improve the quality of evidence underpinning instream freshwater responses to altered hydrology, physiochemistry, fish passage barriers and habitat availability.

In addition to sampling, continuous improvement to the council water quality modelling programme is needed to permit the FWMT to explore a range of alternative management and altered climate scenarios. Underpinning future improvement is a shift in monitoring to additional model-targeted programmes, collecting a range of information (discrete, integrated, continuous) at critical locations and under critical conditions, to both better configure and validate FWMT modelling. Research is underway to develop novel monitoring programmes that are better suited to capturing high-resolution, critical information for the FWMT – generating observed information on instream processes, infilling gradients of climate and land-based contaminant loading, and infilling gradients of event-based instream loading. Research is ongoing for the Waitematā and Manukau Harbours, coupling catchment inputs from the FWMT to hydrodynamic models of coastal water quality to predict coastal baseline water quality, but also inform catchment optimisation modelling by the FWMT (i.e. FWMT is a dynamic intervention model, able to simulate the changes in water quality and hydrology from myriad differing but geospatially-located mitigation actions). Research is also ongoing for coupled lake-catchment process models, to better predict in-lake physicochemical and ecological outcomes, and set targets for action-planning (dynamic intervention) modelling in the FWMT. Coupled modelling of catchments and coastal processes is needed to address water quality and associated ecological issues, for integrated limit-setting (e.g., for freshwater and coastal outcomes combined). Ongoing catchment remediation for the Kaipara Moana is resulting in expansion of the FWMT to ensure better targeting of investment (e.g., optimised, dynamic intervention modelling for targeted reductions in sediment ~50%) but will require linkage with coastal models to show remedial effects of actions in-catchment on the harbour. In addition, Elliot et al. (2021) has set out a work programme for developing an integrated land and water model for the Hauraki Gulf to predict coastal eutrophication responses over a decadal timescale, and the application of the models to investigate the coastal implications of freshwater nitrogen limits.

The freshwater quality accounting system will need to include comprehensive assessments of how environmental change is related to the regulatory regime, climate change, operation delivery of infrastructure, ongoing resource use and with anticipation of future delayed outcomes of ongoing management (if regionally relevant contaminants are likely to experience delayed responses). This is an area of on-going work both nationally and regionally.

2.5.2 Moving to a limits-based approach

The latest Hauraki Gulf SoE report (Hauraki Gulf Forum 2020: 93) sets out a timeline showing how stormwater management has changed in Auckland over the last 20 years. It notes that in 2002 variations to the ARC regional plans introduced requirements for network operators to identify and apply “best practicable options” (BPO) for managing stormwater, rather than setting water quality standards that had to be met. This key decision largely set the direction for the management of urban stormwater contamination in the region. The BPO approach has been carried forward into the AUP and is applied to other discharges (including wastewater discharges) as well as stormwater.

The BPO approach allows for consideration of the cost of actions as well as their outcomes. BPO is defined in the RMA as:

> *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 NPS-FM now requires the council to move to a surface water catchment limits-based approach for rivers and lakes that restricts activities or discharges based on an understanding of the current environmental state, a future target attribute state, and the load reductions required to meet this state if improvement is required. This will need to be undertaken following the fundamental concept of te Mana o te Wai which prioritises the health of water bodies above the drinking water needs of people and above other uses of water (NPS-FM clause 1.3). Financial implications are still considered in this approach in terms of what Auckland’s communities are willing to pay and how target states are set. Once costs are considered, longer or shorter timeframes may be set for reaching a target state. This may not be the same for all areas and can be reassessed through time.

Moving from a BPO approach to a limits-based approach will require more explicit consideration of how different activities combine to address catchment load limits.

Information such as that noted in this chapter will not only inform the development of plan provisions, but will also provide on-going information about contaminant loads and sources and whether targets are being met. This is part of achieving long term visions that have 'goals that are ambitious but reasonable (that is, difficult to achieve but not impossible)' (NPS-FM clause 3.3). Improved understanding of the impacts of various activities on freshwater quality, including through comprehensive monitoring, modelling and scenario testing, will be vital for determining what management change is ambitious but reasonable.

3 Water allocation

This chapter considers how effective and efficient the objectives, policies, rules and other methods of the AUP have been in meeting the outcomes intended by the Regional Policy Statement with respect to water allocation.

3.1 Context

3.1.1 Auckland's freshwater bodies

The Auckland region has an estimated 19,000km of permanent rivers and streams, many natural lakes, and many productive aquifers. When compared to other regions in New Zealand, Auckland's streams and rivers have small catchments, short distances to the sea and smaller volumes of water flowing through them. Auckland's largest rivers are the Hoteo in the north, Kaipara in the west, and Wairoa in the south.

Auckland has many productive aquifers in diverse geological settings. The AUP defines aquifers as 'a permeable water bearing geological formation capable of yielding, storing, receiving or transmitting water at a sufficient rate to be a practical water supply'. For the purposes of management, many aquifers are split into smaller aquifer management areas. Groundwater is water that is held within the aquifer, in the pores between grains of sand and rock or fractures in rocks underground, below the water table.

Notwithstanding that most of the water provided for use through the municipal network comes from 10 large dams in Auckland's Hūnua and Waitākere ranges, more broadly as Auckland does not have many large rivers the availability of surface water to be taken and used is limited. As such, in many areas of Auckland, groundwater is taken and used as a reliable and clean source of water (Johnson 2021a).

Auckland also has approximately 72 lakes that are over one hectare in area (including constructed lakes and impoundments). There are 17 natural lakes identified in the AUP, the majority of which are dune lakes, except for Lake Pupuke which is a deep volcanic lake (Groom 2021). There are also many small farm ponds and large water supply reservoirs in which water is stored and subsequently taken and used. Many of Auckland's surface water systems (including lakes, rivers and wetlands) are connected to groundwater meaning that water moves between surface water and groundwater bodies. In most Auckland streams, a portion of the water in the stream comes from groundwater that flows into the stream (known as baseflow). In Auckland, the importance of groundwater in supporting surface water systems is recognised.

Auckland also has several important geothermal water sources. There are four known geothermal aquifers in the Auckland region: Waiwera, Parakai, Great Barrier and Whitford.

3.1.2 The AUP and the management of water quantity

The AUP recognises that there is high demand for water in the Auckland region, and that this demand is only likely to increase as the population grows. As is explained by Ministry for the

Environment (2008) establishing the volume of water that is available to be taken and used should be undertaken such that the environmental flows and water levels that remain in the water body provide for a given set of ecological, cultural, recreational and amenity values associated with a particular water body.

The AUP sets a direction that water is to be allocated while safeguarding spring flows, surface water body base flows, ecosystem processes, life-supporting capacity, the recharge of adjacent aquifers, and geothermal temperature and amenity. To manage the take and use of freshwater and geothermal water in the Auckland region, the AUP directs limits must be established. The allocation of water to be taken and used must not exceed the limits that are determined using these guidelines. The following sections provide important contextual material relating to limits and the allocation and use of water

3.1.2.1 Limits and availabilities

3.1.2.1.1 The relationship between limits and availabilities

Some regional councils across New Zealand have taken the approach of setting 'hard limits' which water allocation must not exceed. This approach involves including numeric allocation volumes in regional plans and an accompanying policy framework that directs that water can be allocated up to the limit. The AUP has taken a less directive and more flexible approach.

The RPS includes objectives and policies that direct that limits are to be set and water is to be allocated within these limits. Chapters E2 and E7 (as well as Appendix 2 and 3) then set guidelines that are to be used to calculate availabilities to manage the take and use of water. Policy E2.3(5) makes provision for the allocation and availability guidelines while the specific guidelines (or proportions of water bodies that can be allocated to be taken and used) are detailed in 'Appendix 2 River and stream minimum flow and availability' and 'Appendix 3 Aquifer water availabilities and levels' (Millar 2015a). The AUP only contains limits that were set prior to the point that the AUP was made operative, and as such does not contain all current limits set, and those which have been altered.

The relationship between limits and availabilities is not clearly explained in the AUP. The explanation is included in supporting evidence of Millar (2015a) that was written at the time of plan development. The intention was that availabilities established using the guidelines would function as limits in that water would be allocated within the availability, unless there was robust evidence that the availability should change.

Rather than the limits being 'hard', the plan provides flexibility for the limits to change. Bayliss (2015), in his evidence on behalf of Auckland Council for the AUP, explained that it was appropriate to provide a pathway through which the take and use of water in excess of the guidelines was allowed, where it is demonstrated that additional water is available for allocation. The justification for this was that the state of knowledge about some sources of freshwater in Auckland is variable and evolving, and therefore there was a need for flexibility. This is provided for by policy E2.3(11), an exception that provides for further information to demonstrate that there is additional water that is available for allocation. In practice this means that the plan provides a framework that allows the calculated availabilities to be changed through the consenting process if there is evidence that there is additional water available. It is important to note that the AUP does not provide for over-allocation to occur (over-allocation occurs where water is allocated beyond a limit[56]), on the contrary, the RPS directs that over-allocation should be avoided and existing over-allocation should be phased out (B7.4.2(11)(b)). Despite this, allocating water beyond a limit is not a prohibited activity in the plan.

These AUP guidelines were only intended to serve as interim guidelines that would be replaced by 'limits' as the council worked to fully implement the NPS-FM. At the time that the AUP was proposed, it was intended to provide a 'plan framework' that would be used to implement the NPS-FM 2014 (Holland 2015). The interim water quantity allocation guidelines were based on limited information and provide a default approach to establishing water availability for both ground and surface water. The default water availabilities are conservative (Millar 2015a).

3.1.2.1.2 Pathways to setting water availability

As a result of the policy framework established in the AUP, and the recognition that the best available information is constantly evolving and improving, there are several key pathways through which water availabilities are established. These are detailed in Table 3.1 below. The availabilities are established such that water is made available to be taken and used provided that values of waterbodies (surface or groundwater) are safeguarded.

The AUP takes a guidelines based approach to the establishment of availabilities and the allocation of water, meaning that addressing the risk of degradation is the primary consideration in the management framework. Numeric availabilities that were established prior to AUP being notified are set in the AUP where research was conducted to inform sustainable limits. These include assessment of flows, water levels, and water quality parameters for surface water. Groundwater availabilities are informed by hydrogeological investigations of aquifer characteristics, recharge rates, and interaction with surface water bodies. The use of targeted investigations to underpin limits reduces the risk of deleterious effects by using data and analysis that are specific to the water body.

Where water body specific research on sustainable limits has not been conducted, default limits are applied in the AUP. The default water availabilities are classified based on the characteristics of the water body and the relative risk of degradation. For groundwater bodies, the proportion of water that can be taken from a water body is calculated according to the annual recharge and the classification of the aquifer. As explained in Table 3.1, aquifers that border the coastline are recognised as being more at risk of saltwater intrusion and as such the default groundwater availability is 15 per cent of annual recharge to retain the majority of the groundwater in the aquifer. Moreover, aquifers that have connections to surface water are recognised as having an important role in providing water into streams in the form of baseflow, and as such the default groundwater availability is 35 per cent of annual recharge. For others 65 per cent of annual recharge is available to be taken and used.

[56] It is worth noting that the NPS-FM defines over-allocation, however the definition has changed as the various versions have been released. The NPS-FM 2017 defined over-allocation as 'the situation where the resource: a) has been allocated to users beyond a limit; or b) is being used to a point where a freshwater objective is no longer being met', whereas the NPS-FM 2020 defines it as 'the situation where: (a) resource use exceeds a limit; or (b) if limits have not been set, an FMU or part of an FMU is degraded or degrading'. While the AUP was not written to give effect to the NPS-FM, the future implementation of NPS-FM 2020 will need to give effect to the appropriate definition.

The determination of any water availability (and the subsequent allocation of water) is a risk proportionate exercise. The approach that has been used to date is that if the potential water availability from a given water body is large but the demand for water takes is low, then it follows that a high level of certainty in the determined amount of water availability is not necessarily required. In contrast, if the demand for water is significant in relation to the potential water availability, there is a greater need for a high level of certainty in the amount of water availability. While the framework provided by the AUP allows for the consideration of risk and uncertainty, the AUP is not clear on the level of confidence and risk that is considered appropriate, and why.

Table 3.1 Pathways through which water availabilities can be established.

	Numeric availabilities in AUP (Appendix 2 & 3) (Millar 2015a)	AUP default availabilities (Millar 2015a)	Technical publications, reports and consenting	Desktop estimates
Overview	The AUP includes some numeric limits expressed as a volume able to be taken per year for groundwater and a rate for surface water. These availabilities were determined through substantive investigation and have supporting technical reports.	Where a numeric availability is not set, the AUP provides guidance for a default proportion of a water body that can be taken and used. The default guidelines are conservative and precautionary.	Through the consenting process, or council commissioned research/publications, the default availabilities can be superseded (increased and decreased). Policy E2.3(11) provides for this.	Where there is little information available, a small percentage of water allocated or where the level of risk is deemed acceptable, a desktop calculation is undertaken to estimate the volume or flow of water in a water body.
Ground water (including geotherm al water)	For a number of aquifers that have significant demand for water, assessments have been made of aquifer water availabilities, and are included as numeric availabilities in the AUP. While these availabilities aim to adequately provide for environmental and other values, there are varying degrees of confidence regarding these estimates, i.e. low confidence for desktop only estimates	Default availability expressed as a percentage of average annual recharge. The approach to setting guidelines for groundwater is a precautionary one that takes into consideration the risk of degradation of different types of water bodies (i.e. a smaller proportion of recharge can be taken from aquifers with connections to surface water (35%) and coastal aquifers[57] (15%), than other aquifers (65%)[58]).	Policy E2.3(11) details the requirements that must be met in order for the default guidelines to be exceeded. Examples of scenarios where this policy may be used include: a) where the amount of recharge that an aquifer receives is greater than previously calculated, or b) where a higher proportion of recharge can be allocated without causing effects that are more than minor.	Groundwater recharge volumes calculated using rainfall data, aquifer management areas and estimated recharge rates by geology type. Proportion of recharge available is defined as per default guidelines.
Surface water	Where there has been significant demand for water, assessments have been undertaken of minimum flows and water availability. These assessments provide for in-stream values and determine the amount of water that is available for use.	The approach used is to determine the Mean Annual Low Flow (MALF) and make 30 per cent of that available to be used[59]. More clarity in the plan is needed about whether availabilities should be based on a one day MALF or a seven day MALF.	The availabilities may be increased by demonstrating that the MALF is greater than estimated, or that a larger proportion of the MALF can be allocated to be taken and used than the default whilst still protecting the instream values of the water body.	Desktop estimates of MALF can be made using existing tools (e.g. national MALF predictions, NZ River Maps, NIWA) and/or calculations using existing council data (e.g. correlations between gauged and ungauged, catchment yield analysis, etc.).

[57] While the default availability guidelines indicate that a smaller proportion of recharge in coastal aquifers should be allocated, 'coastal aquifers' are not defined in the AUP.
[58] One of the default guidelines values was determined by the Auckland Council after comparing established identified availabilities for similar aquifers in the region and the other two were based on the Proposed National Environmental Standard on Ecological Flows and Water Levels (Ministry for the Environment 2008). The interim limits included in the proposed National Environmental Standards were intended to accommodate a range of values including ecological, recreational, natural character, and cultural flows. They were only intended to apply where there was no environmental flows or water levels specified in a proposed or operative plan, and until a council develops default or catchment-specific limits.
[59] This was based on the Proposed National Environmental Standard on Ecological Flows and Water Levels and adjusted for Auckland by technical staff.

3.1.2.2 Water allocation

Through the implementation of the RMA 1991 and AUP, Auckland Council allocates water to users. Although a large majority of Aucklanders access water through the municipal network, there are many non-municipal water takes across the region. When it comes to the municipal network, Watercare must apply for consent from Auckland Council (and in the case of the water taken from the Waikato River, Waikato Regional Council) for the water it takes and then supplies.

3.1.2.2.1 Types of takes

The AUP provides the framework which is used to establish availabilities within which water is allocated to be taken and used. There are several pathways through which water can be taken and used, these takes can be categorised into three main groups (Figure 3.1).

1. Resource consented takes – takes of sufficient quantity to require a resource consent under the AUP.
2. Permitted activity takes – There are several permitted activity rules in the AUP. These rules allow small quantities of water to be taken from lakes, streams and aquifers. Of relevance to the analysis that follows are rules E7.4.1(A2) and (A4) which provide for the take and use of up to 5m^3 /day of freshwater from a river or spring or onstream dam. In addition, rules E7.4.1(A14) and (A15) relate to takes of groundwater. Rule (A14) provides for the take and use of up to 5m^3 /day when averaged over any consecutive 20-day period while (A15) provides for the take and use of up to 20m^3 /day, when averaged over any consecutive five-day period, and no more than 5000m^3 /year.
3. Takes provided for by sections 14(3)(b), 14(3)(c) and 14(3)(e) of the RMA 1991 as a right:
    - Section 14(3)(b) takes (freshwater) – takes for reasonable domestic use and/or stock drinking water, as provided for by the RMA 1991[60, 61].
    - Section 14(3)(c) takes (geothermal water) – geothermal water takes in accordance with tikanga Māori for the communal benefit of the tangata whenua of the area
    - Section 14(3)(e) provides for water to be taken or used for emergency or training purposes in accordance with section 48 of the Fire and Emergency New Zealand Act 2017.

[60] Section 14(3)(b) of the Resource Management Act 1991 provides for the taking, using, damming, or diverting any water, heat, or energy that is required for an individual's reasonable domestic needs; or the reasonable needs of a person's animals for drinking water, provided that the taking or use does not, or is not likely to, have an adverse effect on the environment.

[61] It became clear through the development of the AUP that there was a lack of robust understanding amongst water users regarding section 14(3)(b) rights, specifically the types of water use that are provided for. This was evidenced by a submission on the proposed plan by Federated Farmers who explained both the dairy industry and the council understood that the take and use of water needed for dairy washdown was provided for by section 14(3)(b) of the RMA. This was rebutted by technical staff responsible for developing both the Air, Land and Water Plan and the AUP who explained that at no point have council staff understood taking and using water for dairy wash-down was provided for under section 14(3)(b) of the RMA (Millar 2015). In the recommendations report to council, the Independent Hearing Panel (2016a) did not agree with Federated Farmers' recommended amendments. Since the AUP became operative, the allocation of water for dairy shed wash down has been through consent.

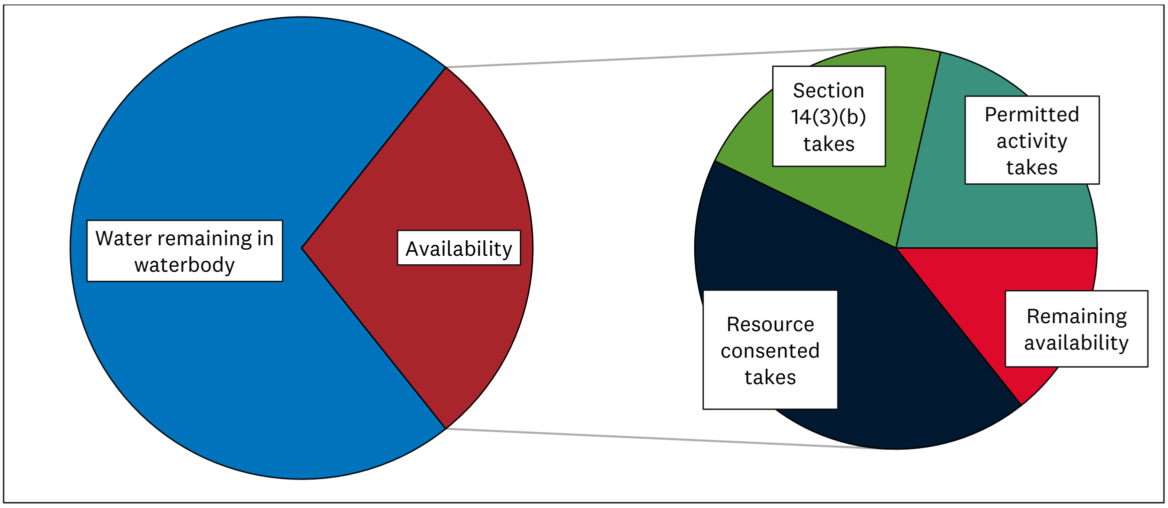

Figure 3.1 Schematic showing water availability and allocation approach (NB this does not reflect the current status of allocation in Auckland).

As a result of the legislative and planning frameworks, the knowledge and information that Auckland Council has in regard to each of these takes is variable. In addition, the level of regulatory control that Auckland Council has is also variable. This is explained in Table 3.2.

3.1.2.2.2 Consumptive and non-consumptive takes

A distinction is made in the water accounting (explained in detail in section 3.1.2.4) and therefore in the allocation of water, between 'consumptive takes' and 'non-consumptive takes'. Consumptive water takes are water takes where water is taken, 'used' and not returned to the hydrological system[62] (examples include water taken for irrigation, water used in the production of beverages and water used for dust suppression). Non-consumptive takes are takes where water is taken and returned to the hydrological system (examples include hydroelectric dams and dewatering where water is taken from an aquifer and discharged into a nearby stream or aquifer). Non-consumptive takes are not accounted for in the accounting tool.

3.1.2.2.3 Priorities of water allocation

The AUP provides a framework of priorities in policies E2.3(1) and (3) that are to be considered where there are multiple applications for water, or when a water body is over-allocated. For freshwater the priorities (in descending order of priority) are: existing and reasonably foreseeable domestic and municipal water supply and animal drinking water requirements; existing lawfully established water users; uses of water for which alternative water sources are unavailable or unsuitable; and all other uses. For geothermal water the priorities are: in accordance with tikanga Māori for the communal benefit of mana whenua of the area; existing lawfully established water uses; heating public pools; or all other uses.

[62] Notwithstanding return flow resulting from irrigation inefficiencies

Table 3.2: Details of the three main types of water take, commentary on the type of information that the council has in relation to each type of take and confidence and uncertainty with that information.

Take	Details relating to knowledge, information, confidence and uncertainty
Consented takes	Those wanting to take and use water that does not meet the standards or requirements of the permitted activity rules or section 14(3)(b) must apply for and obtain consent. As the regulator, the council has robust information regarding the number of consented water takes, the amount of water consented and the water bodies from which the water is being taken. The council can also include conditions of consent that require consent holders to provide meter readings and efficient use reports.
Permitted activity takes	For permitted activity rules E7.4.1(A1)-(A5), (A14) and (A15) from chapter E7 of the AUP, standards are included to ensure that the quantity of water taken under these rules is small, and there is a requirement to notify the council to ensure water that is taken can be accounted for. The AUP only requires that permitted activities are notified once and the AUP does not require permitted activities to be metered. The level of information is only as good as the notification process, education and communication that the council invests in to remind people of this requirement. It is unclear whether the council is being notified of permitted takes through other avenues (for example when applications for bore permits are submitted to the council, or through applications for consent for other land use activities). Bore permits with the potential to be used for 14(3)(b) use have been incorporated into the Section 14(3)(b) Model[63]. There are 450 permitted activity takes currently being accounted for, the oldest dating back to 1989[64] and only two being notified since the Unitary Plan became operative. The level of compliance with the requirement to notify the council of these takes has not been assessed, nor has an exercise been undertaken to understand how many of these notifications are still active. A precautionary approach is taken in assuming all these takes are still active.
Section 14(3)(b) takes	Section 14(3)(b) provides for reasonable domestic and animal drinking water use, provided that the taking or use does not, or is not likely to, have an adverse effect on the environment. Water takes under this provision of the RMA do not require a consent or notification of any regulatory authority and the AUP does not require metering or reporting. As a result, these takes have always been estimated, building a significant amount of uncertainty into allocation. The number of section 14(3)(b) takes from groundwater is more certain than for surface water, as drilling a bore requires consent[65]. While the knowledge about the location of bores is important information used in estimating section 14(3)(b) takes from groundwater, the same cannot be done for surface water takes as there is no equivalent consent needed to put a water pump in a stream[66]. In recognition of the need to improve information regarding section 14(3)(b) takes, the council has developed a geospatial model to estimate the amount of water that is likely being taken from each aquifer under section 14(3)(b). The approach makes many necessary assumptions but applies the best available datasets. The approach has been externally reviewed (Rutter 2021) and has been accepted as the most appropriate method of estimating section 14(3)(b) water use at the regional scale. While the model estimates provide an indication as to the magnitude of section 14(3)(b) groundwater takes, the model results can be used to highlight areas which require further investigation, including on the ground validation.

[63] The bore database was filtered by activity description, bore use, site name, purpose, and land use, in order to create a subset that could be used for section 14(3)(b) takes (filtering out those used for geotechnical, industrial, mining, water quality monitoring etc).

[64] Council has notifications dating back to the 1950s. For accounting purposes, permitted activities notified since 1989 were assumed to still be active, while those notified prior are not accounted for (based on the high likelihood of change of ownership and/or land use). There assumptions have not been investigated.

[65] Drilling a bore for the purposes of taking water is a controlled activity under AUP rule E7.4.1(A41) or a restricted discretionary activity under rule E7.4.1(A42)

[66] A 'surface water intake structure' is a permitted activity under rule E3.4.1(A41) unless it is in an overlay area.

3.1.2.2.4 Consented volumes

Through the consenting process, the council must decide a volume of water an applicant can take and use. This assessment can be complex, and a point of contention. The volume of water required is dependent on the purpose of water use. For activities such as the irrigation of crops there are a range of factors such as crop type, soil type, irrigation season and irrigation method that are considered. Moreover, for a given use, decisions must be made about how water demand is calculated (for example for orchards, should the demand be calculated based on canopy cover or on area of orchard which includes access space between crops).

Climatic variation is also a consideration that can be taken into account in making decisions relating to volumes, specifically whether allocation will be based on average climatic (rain) conditions, or based on drought conditions e.g. a 1:10 year drought or a 1:5 year drought. If based on normal conditions, when there is a drier period there may be insufficient water to ensure maximum production. If allocated on 'drought year use', whilst a water body may be deemed fully allocated, the amount of water normally taken may be less than the full allocation in all years except drought years.

Financial investment is also a factor which is considered when determining consented volumes. For many activities, the costs associated with establishing the activity and the associated water supply are significant. In the case of an irrigation activity, it may be that the initial volume of water needed is a small fraction of the water that will be required once a crop is fully established. In a situation such as this, as water is critical to the success of the crop and the business, water supply is often secured before the activity commences. The council can grant a staged consent, whereby water allocation increases over time as the water is required.

3.1.2.2.5 Water allocation and the role of overlays

As explained in 'Chapter A Introduction' of the AUP, overlays manage the protection, maintenance or enhancement of particular values associated with an area or resource. There are several overlays that have relevance to the allocation of water: the High-use Aquifer Management Areas Overlay (HUAMA), the Wetland Management Areas Overlay (WMA), the High-use Stream Management Areas Overlay (HUSMA) and the Natural Stream Management Area Overlay (NSMA) . Two overlays that relate to the management of water quality were not assessed as part of this assessment: Quality-sensitive Aquifer Management Areas Overlay[67] and Water Supply Management Areas Overlay[68].

The overlays that are assessed in the following sections are explained in detail in Table 3.3. At a high level the intent was water allocation in these overlays would be managed more stringently than in other areas to protect particular values that have been identified

[67] While the Quality-sensitive Aquifer Management Areas Overlay relates to aquifers, it is not a relevant consideration for the allocation of water. All objectives and policies relate to discharges and contaminants and are not relevant to water quantity. The overlay does not change the activity status in any rules (the overlay is only referred to within rules in Chapter E32 'Biosolids' in the matters of discretion and assessment criteria, and in Chapter E35 'Rural Production Activities' in the assessment criteria).

[68] The Water Supply Management Areas Overlay relates entirely to municipal water supply dams. As the damming and diversion of freshwater are not in the scope of this assessment, the effectiveness and efficiency of this overlay has not been assessed.

Table 3.3: A description of the High-use Aquifer Management Areas Overlay, Wetland Management Areas Overlay, the High-use Stream Management Areas Overlay and Natural Stream Management Areas Overlay, details about the way they were established and an explanation of the relevance of these to water allocation.

Overlay	Description of overlay	Relationship to water allocation provisions	Waterbodies in overlay
Wetland Management Areas Overlay (Chapter D8)	The Wetland Management Areas Overlay identifies significant wetlands listed in Schedule 1 Wetland Management Areas Schedule. The overlay provisions seek to protect wetlands from the adverse effects of discharges, water takes, wetland drainage, invasive pest species and their physical disturbance	Objectives and policies that relate to these water bodies. In many cases there is a more restrictive activity class for water takes in the overlay.	Only covers 'significant' wetlands. Wetlands were identified as part of the ALW Plan – unchanged in the AUP.
High-use Stream Management Areas Overlay (Chapter D3)	A number of streams in Auckland are under pressure from demands to take water or use water. The high use of these streams creates conflicts between the amount of water being abstracted, the amount of water needed for assimilating the adverse effects of discharges, and the amount of water required to maintain instream ecological values and base flows. Management of high-use streams can be particularly difficult during summer months when stream flows are generally at their lowest.	Objectives and policies that relate to these water bodies. Under rule E7.4.1(A6) that provides for the take and use of water from lakes, the rule classification in the overlay is more restrictive.	Streams that were 'high-use' or expected to become high use in the future. High-use streams were identified as part of the ALW Plan – unchanged through the development of the AUP
High-use Aquifer Management Areas Overlay (Chapter D1)	Some aquifers are highly allocated, providing water to users as well as being major sources of spring and stream flow. They are currently adversely affected by over pumping or are likely to become highly allocated over the life of the Plan, particularly in areas of high potential growth. These aquifers are identified in the overlay and require careful management of water availability to meet user needs and at the same time maintain base flows for surface streams. For this reason, most proposals to take or use groundwater from aquifers will be assessed through the resource consent process.	Objectives and policies that relate to these water bodies. The larger of the two permitted activity takes is not permitted in these water bodies. No permitted activities as in Omaha Waitematā aquifer.	Aquifers that were 'high-use' or expected to become high use in the future were identified as part of the ALW Plan. Unchanged through AUP except for the addition of the Mahurangi Waitematā (and some changes to names).

Overlay	Description of overlay	Relationship to water allocation provisions	Waterbodies in overlay
Natural Stream Management Areas Overlay (Chapter D4)	The overlay identifies river and stream reaches with high natural character and high ecological values. They generally have an unmodified river or stream bed with existing indigenous riparian vegetation on both sides (indicating that the river or stream has high ecological values and water quality). These areas are particularly important for native fish and macroinvertebrates, providing them with habitat, food sources and breeding areas. Many of these areas are located in the upper reaches of a catchment or in reserve areas with generally high water quality. They have high in-stream values which are a combination of a suitable temperature, pH and water quality and the presence of native aquatic plants and aquatic fauna.	Objectives and policies that relate to these waterbodies. The only rule that has a different activity class in this overlay is rule E7.4.1(A19) which relates to a take of water for the purpose of land drainage.	A natural stream management area may be determined from measurements taken from an aerial photograph or an accurately scaled plan. They are shown indicatively in the Natural Stream Management Areas Overlay on the planning maps. To avoid doubt, there is a definition which defines this area (included in Chapter J1).

3.1.2.2.6 Making the distinction between water allocation and water use

The distinction between allocation and use may seem self-explanatory, nevertheless it is an important distinction to make. Broadly, water allocation can be thought of as the decisions at the consenting phase that provide the permission for water to be taken for a particular purpose and time. Water use is the application or utilisation of the water that is taken once the consent is granted. In many cases, water users will not extract the full volume of water allocated to them (and in some cases, more water will be taken than is consented). This is particularly true for activities such as irrigation where water needs may vary depending on the volume of rainfall received. For water taken as a permitted activity, the assumption is made that the full permitted volume is taken and used, although this is not likely to consistently be the case. For takes under section 14(3)(b), the council estimates volumes taken and then incorporates these into the overall water available for allocation.

3.1.2.3 Stream flow and groundwater levels

The AUP directs that water allocation, and the subsequent take and use of water, can only occur where the natural values (and other values) of water are safeguarded. A reduction in stream flow can cause a reduction in the amount of habitat for flow demanding species, and physical water quality characteristics (such as temperature and dissolved oxygen, which in turn impact instream biota) (Johnson 2021a). Broadly speaking, low aquifer levels may increase the likelihood of saltwater intrusion in coastal aquifers, or in cases where there is a connection to surface water, the aquifer's ability to provide baseflow to streams may be compromised.

In times of low flow (where water levels in streams drop due to prolonged dry weather), or when aquifer levels are low, the risk that instream and aquifer values are degraded increases. In requiring the protection of these values, the AUP enables temporary water restrictions to be implemented in times of low flow in streams or low aquifer water level[69]. Specifically, through the consenting process, conditions of consent can be included that restrict takes in low flow conditions. Under section 329 of the RMA, a council can implement a 'Water Shortage Direction' which gives power to councils to apportion, restrict, or suspend the taking, use, damming, or diversion of water at any time that there is a serious temporary shortage of water in its region or any part of its region.

Throughout the year, environmental monitoring is undertaken in a subset of waterbodies across the region so that the council has a real-time understanding of stream flows and aquifer levels. With regard to water takes in aquifers where there is a connection to surface water, where there is evidence that groundwater takes have a direct effect on surface water, the plan

[69] The RPS directs that in allocating water to be taken and used, spring flows, surface waterbody base flows, ecosystem processes, life-supporting capacity, the recharge of adjacent aquifers, and geothermal temperature and amenity should be safeguarded. Policy E2.3(6) requires proposals to take and use water from lakes, rivers, streams, springs or wetlands to demonstrate that appropriate water levels and downstream flow regimes will be maintained, including low flows in rivers and streams to protect in-stream values. E2.3(7) requires all proposals to take and use groundwater from any aquifer to demonstrate that recharge to other aquifers is maintained; and aquifer consolidation and surface subsidence is avoided, that adverse effects on surface water flows be avoided, remedied or mitigated, in particular the minimum stream flow and availabilities established in the plan. Moreover, Policy E2.3(12) provides for the use of water shortage directions under section 329 of the RMA to impose temporary restrictions on water take, use and allocation in times of serious temporary water shortage.

enables restrictions on these takes in times of low flow. Water accounting and the importance of quality information

While the availability of quality information and evidence is critical for all resource management decision-making, the importance of data and information in water allocation should be emphasised. The accurate, transparent, and responsive management of water allocation and water use data is of the utmost importance to sound and robust decision making and is critical to achieve sustainable management.

Notwithstanding that water allocation is subject to a level of risk, water quantity decision making requires a water quantity budget or accounting system that accurately manages information relating to water availability and allocation. A given decision to allocate water to a potential user is made based upon information about the water availability of the water body and the level of allocation resulting from all other abstractive activities taking place in that water body. Moreover, the availability of quality information is critical to understanding the relationship between extractive activities and the environment. Water allocation and use is dynamic, and as a result keeping information up to date is challenging, but essential.

3.2 Indicators and measures

3.2.1 Indicators

Indicators and measures have been developed to assess the progress toward achieving the objectives and outcomes intended by B7.4 (Table 3.4). The RPS objective relating to the take and use of water is:

> *B7.4.1(3) Freshwater and geothermal water is allocated efficiently to provide for social, economic and cultural purposes.*

The indicators and measures have been developed using the objectives and policies of Chapters B7.4 and E2 of the AUP. For the development of the indicators, the primary driver was the objective and policies in Chapter B7.4, with further supporting evidence and detail being sought from the objectives and policies in E2 (and D1, D3 and D8 which relate to the relevant overlays). While the measures were developed drawing on objectives and policies, the rules relating to the take and use of water in Chapter E7, other management methods and knowledge of implementation were also drawn upon.

The intent is that the indicators and measures relate directly to the key outcomes sought by the relevant objectives and policies in Chapters B7.4, E2, D1, D2, D3, D4 and D8 of the AUP. These key outcomes are: Efficient allocation is promoted through establishing allocation limits that safeguard values. Water is available for use provided that values are maintained, and the established limits are not exceeded. Over-allocation is to be avoided and any existing over-allocation should be phased out. Water is allocated to provide for current and future water needs for social, cultural and economic purposes. Efficient use of water that is allocated is promoted. The take and use of groundwater is promoted over surface water, where available. With each related overlay, water is allocated and used in a way that protects the values identified for that overlay. Appendix C provides further detail regarding the relationship between the AUP provisions and the indicators and measures.

Table 3.4 also indicates the key information sources that were used to assess the efficiency and effectiveness. While some of these sources of information were introduced in section 1.5, those specific to water allocation are discussed in more detail in section 3.3.

Table 3.4: Indicators and measures used to measure the efficiency and effectiveness of the water allocation sections of the AUP

Indicators	Measure	Information Sources
1. Limits are set that safeguard the values of waterbodies	The number of water bodies that have clear limits that protect the values of the water body. The determination of the limits is peer reviewed. Limits required to be reasonably justifiable (methodology and assumptions). An assessment of how limits protect values in times of low flow or water level.	Groundwater accounting tool[70] and State of Environment Monitoring.
2. Water is allocated to be taken and used within the limits	Water availabilities are not exceeded through the allocation process. An assessment of whether consents are granted within limits. An assessment of the way that over-allocation is being phased out.	Groundwater accounting tool, Resources consent data (Plans and Places resource consents database and groundwater accounting tool) and State of Environment Monitoring (river and groundwater levels)
3. Water allocation allows Aucklanders to provide for their social, economic and cultural purposes	An assessment of how water allocation provides for social, economic and cultural purposes	Resources consent data (Plans and Places resource consents database and groundwater accounting tool).
4. Water is allocated efficiently	An assessment of how efficient allocation is undertaken and how water volumes are deemed to be reasonable and justifiable.	
5. Water is used efficiently	The number of consents that have a condition to require consent holders to provide efficient use reports.	
6. The relevant overlays provide the appropriate level of protection for waterbodies	An assessment of whether the HUAMA overlay is achieving the outcomes sought. An assessment of the level of allocation of the HUAMA and whether all 'high use' or fully allocated aquifers are captured by the overlay. An assessment of whether the HUSMA and WMA overlay are achieving the outcomes sought.	Groundwater accounting tool.
7. The take and use of groundwater is promoted over surface water	More consents are granted to take and use groundwater than surface water. Assessment of whether surface water applications have considered taking water from groundwater.	Resources consent data (Plans and Places resource consents database and groundwater accounting tool).

[70] The groundwater accounting tool is spreadsheet that Auckland Council use to account for water availability and allocation. This is explained in detail in section 3.3.1.

As explained in section 1.7.1, the effectiveness and efficiency of the RPS objectives and policies relating to mana whenua values, mātauranga and tikanga were not assessed in this report. There are several objectives and policies in Chapter E2 and standards and assessment criteria in Chapter E7 that relate to water allocation and mana whenua values. The effectiveness of these AUP provisions has not been addressed in this work.

All versions of the NPS-FM have included requirements relating to mana whenua values, mātauranga and the involvement of mana whenua in plan development. The release of the NPS-FM 2020 increases these expectations and strengthens and clarifies the role of Te Mana o te Wai in water management. Moving forward, as the council implements NPS-FM, the role of mana whenua, mātauranga, tikanga and te ao Māori will be elevated and will have greater emphasis through the planning process.

3.2.2 Efficient allocation and efficient use

The term 'efficient' is used a number of times in the AUP in relation to water quantity, particularly in relation to the allocation and use of water. Efficiency can be defined in several ways, for example volume of water allocated compared to volume used or market value per cubic metre of water. The AUP does not define the term efficient, so it must be interpreted in context of the objectives of the plan.

The 2014 version of the NPS-FM (and the subsequently amended 2017 version), defines the phrase 'efficient allocation' and uses the phrase 'efficient use' and the 2014 NPS-FM implementation guidance provides further detail on these terms (the NPS-FM 2020 continues to use the terms, however neither are defined).

A lack of clear direction regarding what is meant by these terms, and the outcomes that are desired and expected, is problematic both in the AUP and more broadly. The lack of clear and consistent detail regarding the meaning of the word 'efficient' embeds uncertainty in the plan and inhibits the effective implementation of the AUP.

3.2.3 Gaps in this topic

This section of the report focuses on determining the effectiveness and efficiency of the AUP in achieving the outcome sought by objective B7.4.1 that freshwater and geothermal water is allocated efficiently to provide for social, economic and cultural purposes. Consequently, the scope of the assessment has been focused on the allocation and subsequent take and use of water (i.e., consumptive water takes). AUP chapters E2 and E7 also contain objectives, policies and rules that relate to the damming and diversion of surface water bodies, the diversion and dewatering of groundwater bodies and the drilling of holes and bores. These topics are not comprehensively assessed in this report; however, several specific issues have been raised by regulatory services staff which are mentioned briefly through the analysis.

3.3 Data and information

The two key sources of information that were used to undertake the following analysis are the groundwater accounting tool and resource consents files. Water meter data and efficient use reports were not used in this analysis as neither data source was in a form that was able to be used in this investigation. The specific issues associated with water meter readings and efficient use reports are discussed in section 3.4.8.4, however at a high level the issues are caused by the council's resource consent database not having the necessary functionality. The following sections provide an overview of the two key data sources.

3.3.1 Groundwater accounting tool

The NPS-FM requires councils to utilise a freshwater accounting system to manage information in relation to environmental flows and levels, take limits and to track water allocation to ensure that water bodies do not become over-allocated. Auckland Council currently uses a spreadsheet-based groundwater accounting tool to undertake groundwater quantity accounting. The spreadsheet is used to document the availabilities for each aquifer management area, the amount of water that has been allocated to be taken and used (consented volumes, permitted volumes that the council has been notified of and volumes that the council estimates are taken under section 14(3)(b) of the RMA), and calculates the volume of water that is remaining and available to be taken and used. This spreadsheet is referred to as the 'groundwater accounting tool'. This tool was used to analyse a range of different aspects of water allocation as of 1 May 2021. There is not yet an equivalent tool for surface water for the region.

3.3.2 Resource consent files

Another key source of information available to determine the effectiveness and efficiency of the AUP are the 'decision reports' prepared by resource consent planners and the 'technical memos' prepared by members of the Specialist Input – Water Allocation Team. The 'Plans and Places resource consents database' (a collation of consents decisions issued since the AUP became operative) and the groundwater accounting tool were together used to determine the number of times each of the relevant rules within 'Chapter E7 Taking, using, damming and diversion of water and drilling' has been triggered since the AUP became operative. All surface water consents granted under rule E7.4.1(A9) and geothermal water consents under E7.4.1(A25)[71] were analysed. A random subsample of consents for groundwater takes granted under rule E7.4.1(A26) were also analysed (Table 3.5) using the tool to identify a statistically valid sample size referred to in section 1.5.2. The total number of groundwater consents sampled was determined by calculating the sample size that would result in 20 per cent error associated with the data. The subsample was taken by randomly assigning a number to each consent and analysing the 23 consents that were assigned the lowest numbers.

[71] While rules E7.4.1(A1-8) also manage the take and use of surface water, however according to the Plans and Places Consents Database, no consents have been granted under these rules since the plan was made operative.

Table 3.5: Relevant rules from Chapter E7 of the AUP, the number of times the rules have been triggered since the AUP became operative and the number of consents that were randomly sampled

Type of water body	Rule	No. times triggered	Sample Size
Surface water	(A9) Take and use of surface water, including dams not meeting the permitted activity, controlled activity or restricted discretionary activity standards or not otherwise listed	7	7
Geothermal	(A25) Take and use of geothermal water for non-bathing use	47[72]	47
Groundwater	(A26) Take and use of groundwater not meeting the permitted activity or restricted discretionary activity standards or not otherwise listed	187	23 (20 per cent uncertainty)

3.3.3 Uncertainty associated with information sources

As discussed earlier, there are known and perceived errors in both the groundwater accounting tool and the Plans and Places resource consents spreadsheet (these are also discussed in the following sections). Since known errors were identified, work has commenced to improve data management. Regardless, the data from both sources was the best available at the time this report was written. While there is uncertainty that the data is accurate, it represents Auckland Council's current understanding of water availability and accounting.

3.4 Findings and analysis

The following sections detail the findings from the analysis undertaken. The findings are discussed by indicator. Appendix E contains the raw data and is cross referenced throughout the following sections[73].

3.4.1 Indicator 1: Limits are set that safeguard the values of waterbodies

[72] A bundled application was submitted to the council for the renewal of existing consents and for a number of new consents to take geothermal water from the Waiwera Geothermal Aquifer. The takes were for 47 small takes for private spas and pools in the Waiwera township. Applicants submitted one application to the council to ensure that the process was affordable for the residents, to ensure that the application was of a high standard, and to enable the cost effective and efficient processing of applications. Council specialists assessed the consents as a bundled application, however unique decision reports were prepared for each consent.
[73] As the management of water availabilities and allocation is reliant upon large amounts of numerical data, this topic utilises large amounts of quantitative data for the analysis of the efficiency and effectiveness of the AUP. As such, it was deemed necessary to include all raw data in Appendix E.

Policy B7.4.2(11) of the AUP seeks to promote the efficient allocation of freshwater and geothermal water by establishing limits for water allocation and safeguarding spring flows, surface water body base flows, ecosystem processes, life-supporting capacity, the recharge of adjacent aquifers, and geothermal temperature and amenity.

3.4.1.1 Groundwater

As explained in Table 3.1, the AUP provides guidance for setting availabilities for water bodies to safeguard their values. Data from the groundwater accounting tool shows that availabilities have been established for 123 aquifer management areas[74]. There is only one identified aquifer management area that does not have an availability – the Franklin Alluvium aquifer management area. The reason for this is that the full extent of the aquifer has not been mapped, and as such a full availability cannot be determined. A partial availability for a portion of the aquifer has been established through the consenting process.

The aquifer availabilities are based on the best available information in relation to water accounting. However, while some aquifers have had considerable scientific investigation undertaken to determine the aquifer availability (such as the Pukekohe volcanic aquifers), there are many aquifers for which the availability has been determined using desktop recharge estimates. These estimates, while based on scientific understanding, rely on a range of assumptions and have higher levels of uncertainty.

Figure 3.2 shows that the level of investigation that has been undertaken to establish the availabilities is variable. A total of 54 per cent of the availabilities have been established using a desktop calculation (the limit has been established by the council through a desktop calculation, but that is not to say that water then has not been allocated to be taken and used through the consenting process). A total of 24 per cent of the availabilities have been established through the consenting process, 11 per cent through technical publications (such a technical reports commissioned by the council, research documents etc.) and 10 per cent are in the AUP. The availabilities included in the AUP (while also established through the consenting process and through technical publications) are differentiated as they are discussed in more detail in the sections that follow. The availabilities established through a desktop recharge estimate, though still credible, rely on a larger number of assumptions and have a less robust evidence base than those established through the consenting process, technical publication and through the AUP. As explained in Section 3.1.2.1.2, the plan's framework for setting availabilities and allocating water allows for the consideration of risk and uncertainty. Where demand is high in relation to supply, there is a need for more certainty in water availabilities.

[74] Data included in Appendix E Figure E 1.

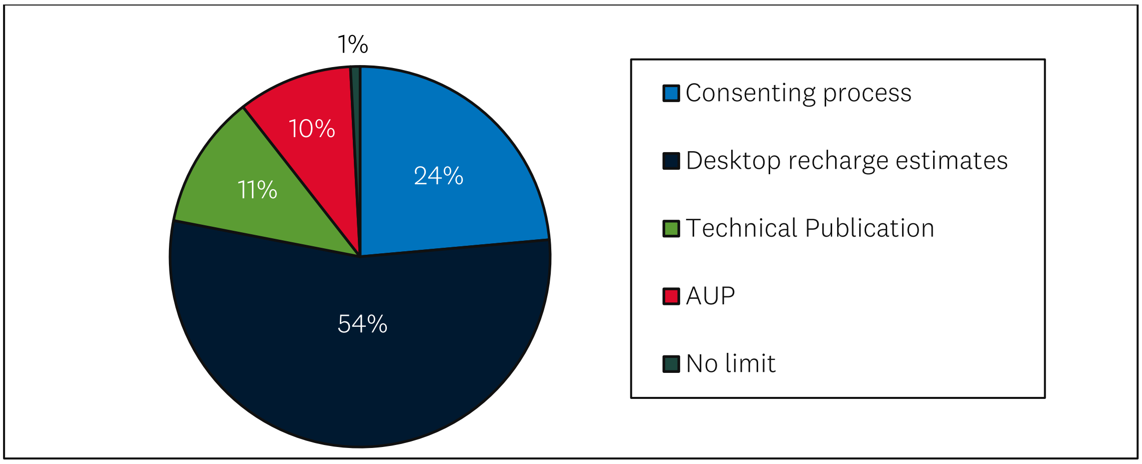

Figure 3.2: Graph showing the source of the availability assessments for groundwater aquifers.[75]

Comparing the numeric availabilities in AUP 'Appendix 3 Aquifer water availabilities and levels' to the availabilities in the groundwater accounting tool shows that 91 per cent of the numeric availabilities in the AUP are still current, and 9 per cent (or two) have been superseded by investigations through the consenting process (Figure 3.3).

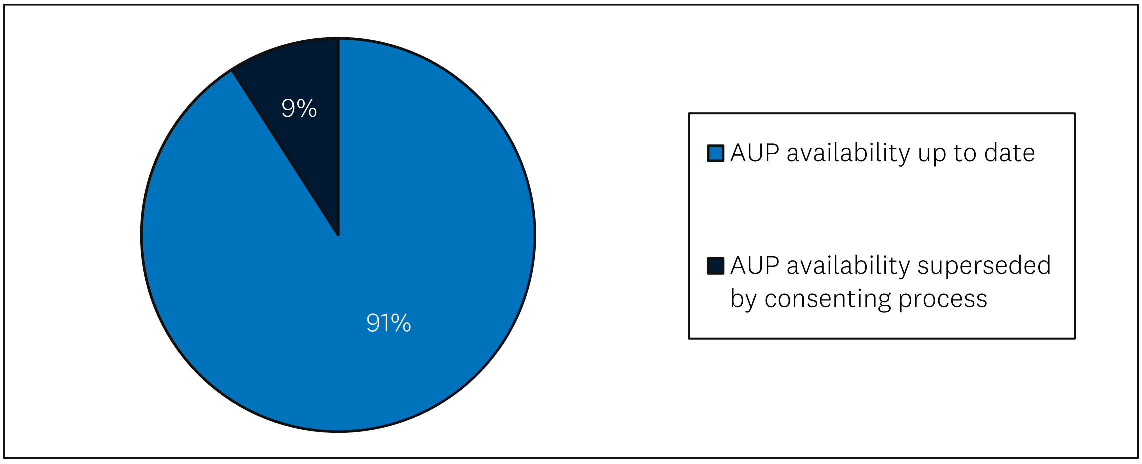

Figure 3.3: Graph showing the percentage of numeric availabilities in Appendix 3 Aquifer water availabilities and levels that are still up to date and those that have been superseded[76].

3.4.1.1.1 The relationship between allocation limits and water levels

The intention of setting limits or availabilities is to protect the values of waterbodies, and so water can continue to be used to provide for current and future water needs. It is important to understand setting limits does not preclude that the take and use of water will affect water bodies or that the levels of water in aquifers will decline, however, a change in water level may not necessarily cause adverse environmental effects or that values are compromised. There

[75] Data included in Appendix E Table E 2
[76] Data included in Appendix E Table E 1

are a number of examples where the take and use of water has been found to affect water level.

As reported by Johnson (2021a), State of the Environment monitoring and reporting shows two aquifers were found to be influenced by groundwater abstraction, leading to decreased groundwater levels in summer (Omaha Waitematā and Glenbrook Kaawa aquifers). In the Omaha Waitematā, groundwater levels decrease in summer as water is taken and used and recover in winter when abstraction is low. While the Omaha Waitematā aquifer is allocated within the established availability, Johnson (2021a) found that there has been a change in the annual pattern of groundwater levels that corresponds to increased abstraction which began in 2016. While this abstraction has resulted in much lower summer groundwater levels every summer since 2016, lower water levels over summer do not necessarily equate to environmental degradation. The low groundwater levels during the summer period do not appear to induce saltwater intrusion (seawater entering the freshwater aquifer) and it is thought the Omaha Waitematā has limited connections to surface water and thus provides limited water to streams through baseflow. Johnson (2021a) cautions as this increased abstraction regime is likely to continue into the future, these low water levels in summer must be carefully monitored.

Since the early 1990s the water levels in the Franklin-Waitematā aquifer have been declining (Thornburrow 2010). Research undertaken by White et al. (2020) found the decline in water levels has coincided with a significant increase in allocation and use of water. Thornburrow (2010) suggested the observed declines in groundwater level could be partly attributed to rainfall fluctuations and reduced recharge of the aquifer but could not exclude the role of water abstraction in this decline (a detailed analysis of historical groundwater use and its impacts could not be undertaken here due to the incomplete nature of metering data available). As a deep aquifer, it is unlikely the decreased groundwater levels are having an adverse effect on streams, estuaries, or shallow groundwater (the aquifer is a confined system and not directly linked to surface water or unconfined groundwater systems). There is also no evidence to date that the decreased levels are affecting existing water users. The aquifer is a coastal aquifer, therefore there is an increased risk of saltwater intrusion. Auckland Council do not currently have any monitoring wells near the coast, however there are consent conditions requiring conductivity monitoring for some takes in this area. The effect of decreased water levels on long-term water security has not been assessed.

3.4.1.2 Geothermal water

There are four geothermal aquifers in the Auckland Region. Two of the four have availabilities established in the groundwater accounting tool, the Parakai and the Waiwera Geothermal Aquifers[77]. These availabilities are also included in the AUP[78]. The two other geothermal aquifers, the Whitford Geothermal and Great Barrier Island Geothermal, do not currently have active water takes. These two do not have groundwater availabilities in the AUP. Groundwater availability is most appropriately set based on water level and temperature response to water use (rather than rainfall and recharge), therefore it is not appropriate to undertake a desktop

[77] Data included in Appendix E Table E 1
[78] Data included in Appendix E Table E 2

calculation to estimate a sustainable limit on water use. If these aquifers are to be utilised, a targeted study involving investigations of the aquifer will be required to establish limits.

3.4.1.3 Surface water

For surface water, there is currently no centrally located accounting tool for surface water (as there is for groundwater) where all information regarding availabilities and levels of allocation are stored. As such, information regarding availabilities is limited to those established in the AUP. High use streams have availabilities in the plan, however there is no database with information about the other streams. "Working" availabilities are established through consenting based on Assessment of Environmental Effects (AEEs) and supporting documents. As a result, all allocation information is embedded in consenting documents.

3.4.1.4 Limit setting, water allocation and low flows and levels

The AUP directs that water allocation, and the subsequent take and use of water, can only occur where the values of water are safeguarded. The purpose of setting water availabilities is to ensure there is adequate water remaining in each water body to protect the values. For much of the time, allocation of water within limits should protect the identified values, however, in prolonged dry periods, water levels and flows can become so low that water takes must decrease (or cease).

One mechanism that is available to the council to manage takes during low flows is via the consenting process; the council can impose conditions that limit the take and use of water during low flows. From analysing the seven surface water consents granted since 2016, four consents are for the take and use of water directly from a stream, while three are bundled consents for the operation and take and use of water from an on-stream dam. The consents that relate to a dam have conditions that require a low flow bypass (a device used to ensure a minimum flow is provided for during low flow conditions). Of the four consents for the take and use of water directly from a stream, three consents utilised specific conditions that manage/restrict takes in low flows[79]. For takes on tributary streams that are not monitored by the council, the conditions generally relate to a correlated minimum flow at a council monitoring site on the main stem. Where the council does not undertake flow monitoring at any location on the stream, the conditions require that the consent holder undertake independent flow monitoring to determine when minimum flows occur (and when the take must decrease or cease). From analysing the 23 groundwater consents, no specific conditions of consent were included that manage or limit water takes in low flow or water level conditions[80].

[79] For the consent that did not restrict flows, no minimum flow requirements were determined necessary as the lower reaches of the unnamed tributary of the Kaipara had low ecological value, had been straightened and the catchment extensively modified for pastural land.
[80] These conditions are not imposed on consents for the take and use of groundwater. The reasons being that most groundwater takes in Auckland do not have immediate impacts on surface water flows and that annual

Another mechanism available to reduce water takes in times of low flows is the implementation of ‘water shortage directions’ under section 329 of the RMA to impose temporary restrictions. While in 2020 Auckland Council and Watercare implemented water restrictions across its municipal network in response to low dam levels, Auckland Council does not have an approach for implementing water shortage directions to restrict consented and permitted takes.

The council does not systematically announce (publicly or otherwise) when rivers are below minimum flows. A manual consent-by-consent assessment would be required to determine the extent of impacts on water users and the level of low flow compliance. As such, for the purpose of this monitoring work, the frequency or spatial pattern of water restrictions cannot be reported on. Furthermore, a consent-by-consent assessment would be required to determine whether groundwater takes are being restricted where they are known to have a direct effect on surface water.

Therefore, while the council can restrict the take and use of water in times of low flow, the current council process for making decisions regarding this is largely ad hoc. At present, technical staff responsible for the monitoring network may contact Regulatory Services staff when low flows are observed, or Regulatory Services staff may access this data of their own accord as it is available online on the Auckland Council Environmental Data Portal (Auckland Council 2021e). For takes on streams where the council does not undertake monitoring, the onus is on the consent holder to determine if the flows are low.

There is no formal or agreed region-wide approach to managing takes in times of low flows, for example, how to ensure that takes cease in times of low flow (as required as a condition of consents), whether to begin a consent review under RMA section 128 or to issue directions to restrict takes under RMA section 329.

3.4.1.4.1 Case Study: Drought in Tāmaki Makaurau in 2020

In 2020, Auckland experienced one of the most severe droughts in the hydrological record. Johnson (2021b) analysed this drought to characterise the effects on the region’s rivers, lakes, and aquifers. Johnson (2021b) determined that during this time, rivers and streams in the region had low flows for an average of 97 days (the highest number of days below the MALF for the periods of analysis from 1980-2020). Extreme low flows took place across the region, in a wide range of catchment types. Although Johnson (2021b) did not analyse water use data, he states that demand for irrigation would have been at or near an all-time high during 2020 and that water use is likely to have had significant effects on river flows and groundwater levels. The ecological significance of MALF suggests that the extended periods of extreme low flows in 2020 likely had negative consequences for instream biota (Johnson, 2021b). During this drought, it is not clear what formal approach was used to ensure that water takes ceased.

The surface water consents (for water taken directly from a stream, rather than from a dam) that were granted since the AUP was made operative were investigated to understand water

winter recharge has been maintained under the existing groundwater allocation regime (the specific example of the Omaha Waitematā was discussed in section 3.4.1.1.1). Where there are specific values of groundwater that are to be protected or environmental concerns (such as saltwater intrusion), monitoring takes place to ensure those values are protected.

use during 2020 (the same period which was assessed by Johnson 2021b). As shown in Table 3.7, it was found that of the four consents, three had conditions that limited water takes during low flows. For one consent it was deemed that no minimum flow requirements were necessary as the lower reaches of the unnamed tributary of the Kaipara had low ecological value and had been straightened and the catchment extensively modified for pastural land. For two consents, meter readings were not present in the council's database (therefore compliance could not be assessed).

Table 3.6: Results of analysis undertaken to understand level of compliance with reduction of water take in low flow conditions for four surface water consents

Consents	Condition included to limit take in low flows	Water meter reading available in council database	Compliance with conditions to reduce/cease take during low flow
Consent 1	Yes	No	Could not be determined
Consent 2	Yes	No	Could not be determined
Consent 3	No – deemed unnecessary	Yes	n/a
Consent 4	Yes	Yes	22.6%

Compliance was assessed for the one consent that required reductions in take for which meter readings were available (Table 3.7). The conditions require staged reduction of the take of water once the flows at the Kaipara River at Waimauku council monitoring site reached 87 litres per second. Water meter readings and flow data for 2020 showed that for 11 of the 16 days where partial take reductions should have occurred, there was noncompliance. There were 46 days where the take of water should have ceased completely, and that for 37 of these days the consent holder continued to take water (19.6% compliance). This resulted in an overall compliance rate of 22.6%.

Table 3.7: Level of compliance for a surface water consent based on meter readings and flow gauging.

Staged reduction in take	Number of days at this flow	Number of days water take did not comply with conditions	Compliance rate
Stage 1: Stream flow 79 l/s - 87 l/s - take should reduce to 776 cubic meters per day	9	6	33.3 %
Stage 2: stream flow 71 l/s - 79 l/s - take must reduce to 383 cubic meters per day	7	5	28.6%
Stage 3: stream flow below 71 l/s - water take must cease totally	46	37	19.6 %
Total	**62**	**48**	**22.6 %**

3.4.2 Indicator 2: Water is allocated to be taken and used within the limits

Policy B7.4.2(11) seeks to promote the efficient allocation of freshwater and geothermal water by directing that over-allocation should be avoided.

3.4.2.1 Groundwater

The groundwater accounting tool suggests 82 per cent (101) of groundwater aquifers are allocated within the availabilities and 7 per cent are fully allocated (Figure 3.4). There are 12 aquifers (10 per cent) that are over-allocated.

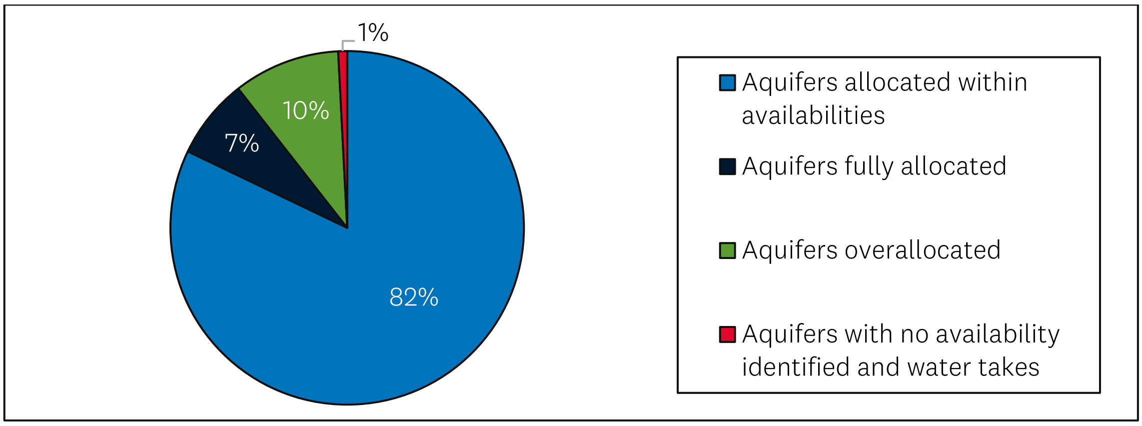

Figure 3.4: Graph showing the percentage of groundwater aquifers that are allocated within the availabilities, fully allocated and over-allocated and without an availability.[81]

In analysing consent decision reports and technical memos, it was found that, of the 23 consents investigated, two were granted outside the current availabilities. In the first case, although the water body is explicitly acknowledged to be over-allocated, the consent was granted. In the second case, the consent pushed the aquifer into being 101 per cent allocated. While this level of over-allocation may not be an issue given the level of error associated with water availability information, there is no commentary on this or assessment against the relevant objectives and policies within the decision report.

3.4.2.2 Geothermal water

From analysing the groundwater accounting tool, results suggest the two geothermal water bodies with established availabilities are allocated within the availabilities. There are no consented takes or notifications of permitted activity takes from the two geothermal waterbodies that do not have established availabilities (although water may be taken through section 14(3)(c) rights). From analysing the consented takes granted since 2016, it was found all takes were granted within the availability.

[81] Data included in Appendix E Table E 4

3.4.2.2.1 Case study: Waiwera Geothermal Aquifer

As reported by Johnson (2021a) in the State of the Environment report, between 2010 and 2019, the Waiwera geothermal aquifer experienced a sharp increase in water levels. The increase was influenced primarily by two events; a rapid water level rise caused by the Kaikoura earthquake in 2016 and increases in groundwater level after the Waiwera Thermal Spa and water bottling complex ceased taking water in February 2018. The water levels have risen such that there are natural geothermal springs occurring near the seawall and on Waiwera Beach, and water is overflowing in some unsealed wells. Overflows are currently being directed to stormwater drains and then to the coast. Capping of geothermal wells would prevent waste of the geothermal water and potentially increase pressure within the aquifer, potentially allowing for increased natural spring activity at the beach. Reinstatement of historical abstraction volumes will likely lower the pressure of the aquifer, thus reversing the presumed natural geothermal spring activity as currently observed.

3.4.2.3 Surface water

As there is no centrally located accounting tool for surface water, (as there is for groundwater) where all information regarding availabilities and levels of allocation are stored, conclusions about the relative allocation of surface water across the Auckland region cannot be drawn. However, of the seven surface water consents granted under rule (A9), all were within the guidelines according to the Specialist Input technical memo when the assessment was completed.

3.4.2.4 Over-allocated water bodies

In order to further understand the over-allocated aquifers, further analysis of the groundwater accounting tool was undertaken. Figure 3.5 shows the way in which availabilities have been established for the over-allocated aquifers. When compared to the way in which availabilities are established for the 123 aquifers (shown in Figure 3.2), it can be broadly concluded that the level of investigation that has been undertaken to establish the availabilities for the over-allocated aquifers is more in-depth. This is evidenced by a lower number of availabilities relying on desktop recharge estimates. This supports the tiered approach employed by Auckland Council as the aquifer is closer to full allocation.

The groundwater accounting tool also accounts for the amount of water that is allocated to be taken and used through each broad category of take (consented take, permitted activity and Section 14(3)(b) take). Figure 3.6 breaks down the total percentage of groundwater allocated to be taken and used by type of take. The results show that for every over-allocated water body, the largest proportion of water is taken through consent, followed by water taken under Section 14(3)(b), and the smallest portion is taken through the permitted activity rules (though these may be underestimated as there is a low level of confidence that the council has an accurate understanding of permitted takes (as discussed in Table 3.2 and again in Table 3.8)).

The specific reason each of these 12 waterbodies has become over-allocated is not investigated here. However, there are a range of reasons that a water body may become over-allocated. Table 3.8 includes examples of possible justification for the over-allocation of waterbodies (predominantly focusing on groundwater).

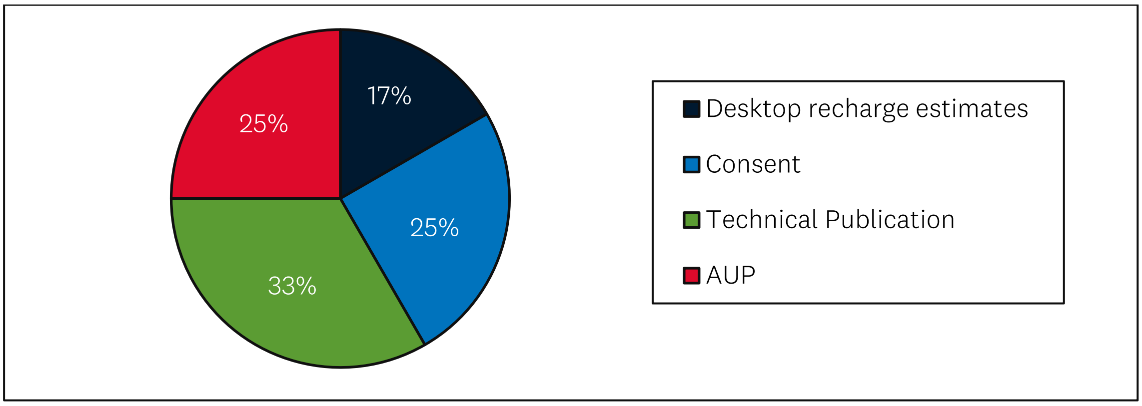

Figure 3.5: Graph showing the source of the availability for the 12 over-allocated groundwater aquifers[82]

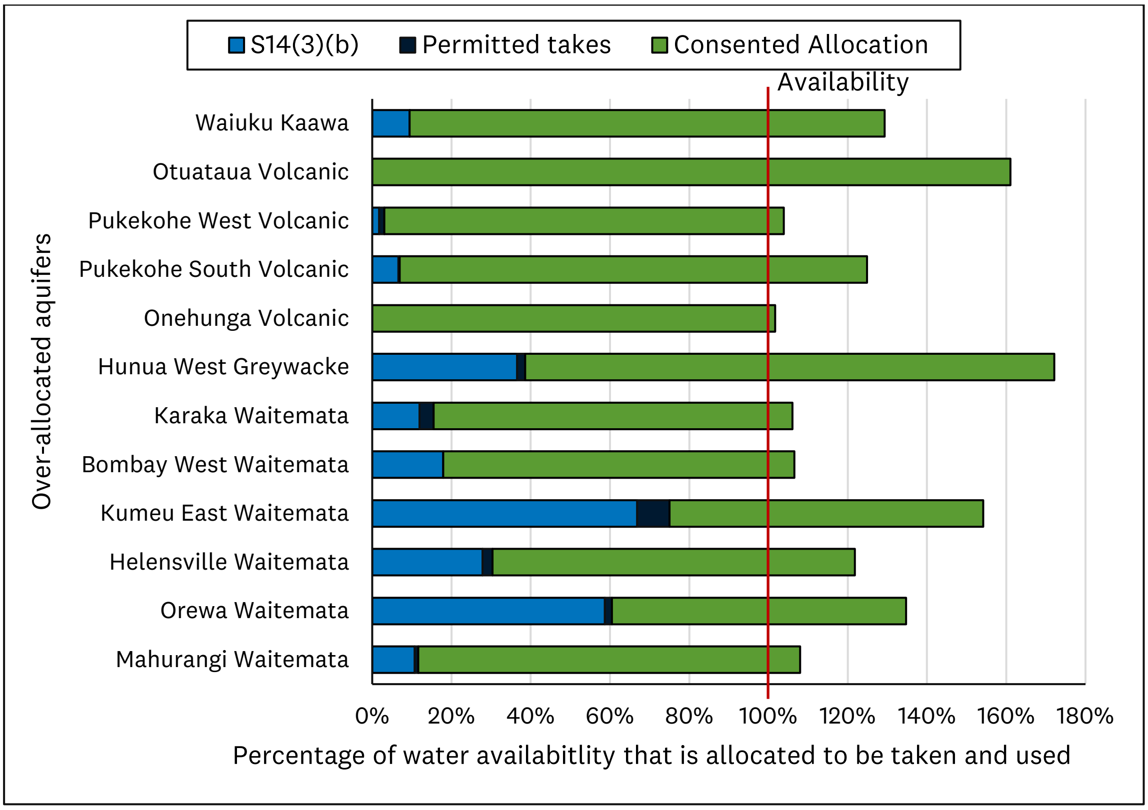

Figure 3.6 Graph showing the percentage of allocation for each of the over-allocated groundwater aquifers and the proportion of the allocation by consented allocation, permitted activity and Section 14(3)(b) take. Note, waterbodies are over-allocated when more than 100% of availability is allocated.[83]

[82] Raw data included in Appendix E Table E 5
[83] Raw data is included in Appendix E Table E 6.

Table 3.8: Examples of scenarios that can lead to over-allocation.

Scenario	Explanation
Changes to aquifer shape and availabilities	A cross council programme[84] has improved the accuracy of identified aquifer shapes and reliability of groundwater availability estimates for some 'priority' (i.e. high use) aquifers. As a result, the accounting was updated to make sure the takes are linked to the correct aquifer. This has resulted in a change in the water body that a number of existing takes are accounted against. It may be that this has increased the proportion of water allocated to more than 100 per cent.
Section 14(3)(b) model	The Section 14(3)(b) model has resulted in revised estimates of water being taken under Section 14(3)(b) of the RMA. At the time of writing this report, in many cases, the modelled outputs had been accepted as best available information and are being utilised in the council's water accounting[85]. In many cases the modelled estimates have increased the amount of water estimated to be taken which may have resulted in over-allocation. It is worth noting that in some cases the modelled outputs have been omitted from the accounting system due to the need for further work to validate the outputs[86]. In some cases, the modelled numbers are being superseded by the consenting process and the reasons are usually recorded in relevant technical memos for resource consent applications. Reasons often include institutional knowledge of activities associated with the aquifer/waterbody.
Quarrying	Quarrying activities may require access to earth materials below the water table. To facilitate access (e.g. by machinery), lowering of the water table, known as *dewatering*, is required. This usually entails construction of a central sump through which groundwater naturally drains and is removed via pumping or can be done through a series of dewatering wells. In all cases of dewatering, the removal of water from the site is necessarily at a rate greater than the natural recharge rate, otherwise the site would not be dewatered. If a dewatering activity is sufficiently large or the aquifer management area is sufficiently small (or has very low recharge rates), then over-allocation of the groundwater resource can occur (with respect to water accounting). Over-allocation is to be expected in some cases because a dewatering activity cannot be successful without exceeding the recharge rate (and typical groundwater availabilities are a proportion of, never greater than, annual recharge).
Data management	The first iteration of the groundwater accounting tool was completed in 2020. The tool needs to be audited to ensure its accuracy, however as it is the best available information the council has, and has been used by the Regulatory Services specialist input team since. Water accounting is complex and involves large amounts of data. There is the possibility that over-allocation has occurred due to data management issues and incorporation of modelled methodology for s14(3)(b) estimates. Council's resource consenting data base, SAP has not been configured to collect the necessary information required for automated accounting. To date, the improvements that are needed to make SAP a fit for purpose data management system for water allocation have not been prioritised.

[84] The Strategic Approach to Groundwater is a council programme that commenced in 2017 to address a number of research, technical and planning gaps in the councils' approach to the management of groundwater.
[85] At the time of writing, the section 14(3)(b) model estimates included in the accounting tool were those from the first iteration of the model (2020). The model was reviewed in late 2021 however these outputs are yet to be incorporated into the accounting tool.
[86] Under the RMA it is not clear whether a council could require the metering and reporting of section 14(3)(b) takes if it was deemed necessary. This leaves a significant gap in a council's ability to account with high levels of confidence. It may be that once the resource management reform has taken place, further investigation is undertaken to understand whether this option is available in the new framework.

Scenario	Explanation
	As a result, the council currently uses a spreadsheet-based groundwater accounting tool to undertake groundwater quantity accounting. The tool is not automated or connected to the council's resource consenting data base. It was intended that it be updated monthly, by council specialists, however due to the manual nature of the exercise and resourcing constraints this has not taken place. Furthermore, the manual nature of this approach to data management has several risks associated with data quality and ensuring that information is timely and accurate. Through this monitoring work the following inaccuracies have been identified: • a number of aquifer availabilities in the accounting tool are out of date as they have been superseded through the consents process without the accounting tool being updated. • there are a number consented takes that have not been accounted for in the tool, and there are also several takes that have been surrendered that are still being accounted for. • there are inconsistencies in the accounting tool regarding the calculations of remaining availability, specifically relating to the way that the Section 14(3)(b) takes and applications that are being processed are included in calculations. • through the consenting process new information may supersede existing data (i.e. aquifer availabilities or section 14(3)(b) estimates). This information is inconsistently updated within the accounting tool.
Permitted activities	Permitted activities are still allowed in fully allocated water bodies. There are no rules in the plan that prohibit the taking of water from fully allocated aquifers. The plan still provides for permitted takes from HUAMA (except from the Omaha aquifers as explained in Table 3.3) and from fully allocated aquifers. The permitted activity notifications do not suggest this is a primary cause of over-allocation, as there has only been one notification of a permitted activity in the 12 over-allocated aquifers since the plan was made operative in 2016. As previously mentioned, there has been no compliance undertaken to ensure the council has been notified of all permitted takes. As explained in Table 3.2, the AUP does not require permitted activities to be metered and the level of information is only as good as the notification process. Some of the notifications span back 40 years and no work has been undertaken to understand how many of these notifications are still active. A precautionary approach is taken in that these are all still considered when allocating water. Not only does this impact understanding of over-allocated waterbodies, but the lack of robust information also impacts on the council's understanding of the cumulative effect of permitted takes on groundwater levels and stream flows.
Allocation beyond the availabilities or 'limits'	Through the consenting process waterbodies may be allocated beyond the availabilities or 'limits'. As explained in Section 3.4.2.1, the results of an assessment of 23 groundwater consents suggest in two cases, water was allocated beyond the availability (i.e. consent decision making resulted in the water body being over-allocated, rather than the limit being changed because there was evidence to demonstrate more water was available than previously understood).
Lack of non-complying or prohibited	The AUP does not utilise prohibited activities or non-complying activities to prevent or discourage water takes being granted in water bodies that are fully or over-allocated.

Scenario	Explanation
activity classifications	

3.4.2.5 Phasing out over-allocation

Policy B7.4.2 (11) provides clear direction that over-allocation should be phased out. This is also required by the NPS-FM 2020 (and all previous versions of the NPS-FM). To date, work to phase out existing over-allocation has not commenced.

Over-allocation has not been phased out, however preliminary work has been undertaken to identify over-allocated waterbodies and investigation into availabilities has taken place. There is a need to develop an approach to phasing out over-allocation. Once an approach has been agreed there are a number of options available to undertake a phase out. As an example, Policy E7.2.2(17) provides for comprehensive reviews of consents:

> *Require resource consents granted to take, use or dam water and to discharge contaminants to land or freshwater to be for a duration and to include a condition setting the review date(s) of the consent, that will enable the concurrent processing or review of all consents/replacement applications, as a basis for a comprehensive and integrated assessment of water quality and water quantity issues in a specific catchment and/or aquifer system.*

The ability to review consents is particularly important. The approach used in regulatory services is that when water take consents are renewed for a given water body, the renewal date is set 15 years into the future (to allow for concurrent renewal once again). However, for consents that are granted in the interim period, decisions relating to duration are made to ensure that renewal occurs on the appropriate date. As a result, consent duration can vary. The average consent duration for the subsample of groundwater consents was 21 years, 14 years for surface water and 13 years for geothermal groundwater consents.

Section 128 of the RMA provides consenting authorities with the ability to review consent conditions. The RMA provides several specific circumstances where review can occur including to deal with any adverse effect on the environment which may arise from the exercise of the consent (section 128(1)(a)(i)) or where the regional plan contains an operative rule that relates to maximum or minimum levels or flows or rates of use of water (section 128(1)(b)). The RMA also makes provision that consenting authorities can review consents for any other purpose specified in the consent (section 128(1)(a)(iii), but to exercise these powers, a condition must be included that states the purpose of consent review. From analysing consent decisions, it was found that a review condition was included in 86 per cent of surface water consents, 100 per cent of geothermal consents and 91 per cent of the sample of ground water consents (Figure 3.7). All consents in which a condition was not included were for short term water use and had a duration of 5 years or less.

Policy E7.2.2(17) indicates that all consents to take water from a given water body should have common expiry dates to further provide for comprehensive review and to support efficient allocation. In all surface water, geothermal water and groundwater consents, durations were calculated to ensure that all consents in each water body expire on the same date. As a result, some consent durations were shorter than that requested, while others were longer than requested.

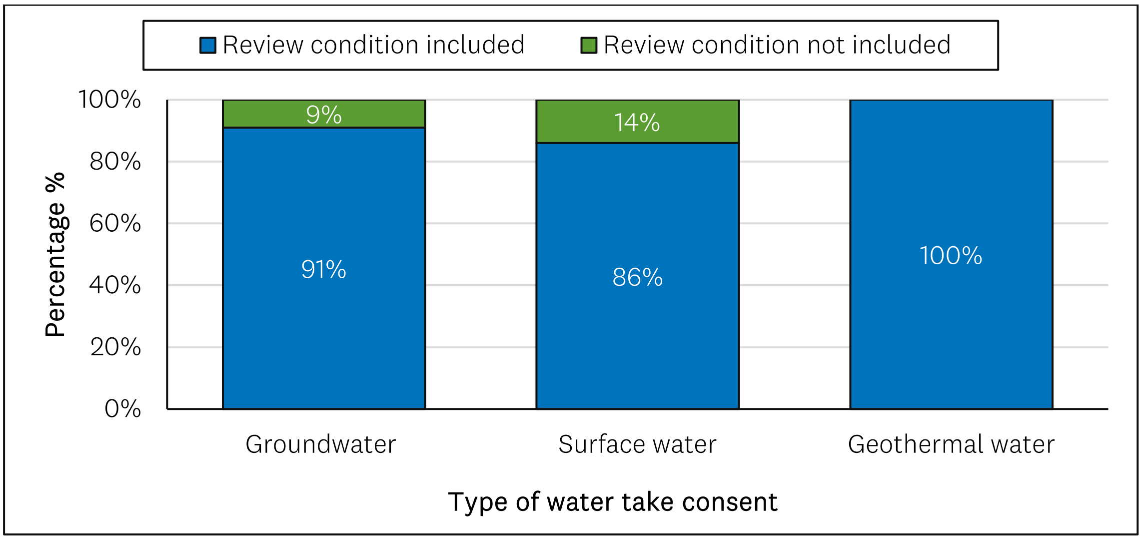

Figure 3.7: Graph showing the percentage of the sample of groundwater, surface water and geothermal water take consents that have a review condition included in the consent[87].

3.4.2.6 Diversion and dewatering

Chapters E2 and E7 provide for groundwater diversion and dewatering (which is also referred to as groundwater level control). These are often ancillary activities, that can be either temporary or permanent, and may be required to facilitate the excavations associated with quarrying, the building of underground basements and car parks, tunnels and in the construction of smaller structures such as retaining walls and swimming pools.

The rules introduced to the AUP to manage diversion and dewatering have been criticised as being overly conservative. It has been observed that resource consents are being required for minor developments, which from an adverse effects perspective, are not justified.

The relationship between the rules in E7 that relate to dewatering (E7.4.1(A17) and (A20)) and diversion of groundwater ((A27) and (A28)) is complex. Table 3.9 contains the rules from activity table E7. 4.1 that are discussed in the following section. Permitted activity rule E7.4.1(A27) provides for the diversion of groundwater caused by any excavation (including trench) or tunnel. Rule E7.4.1(A28) is a restricted discretionary rule that provides for the diversion of groundwater that does not meet the permitted activity standards or is not otherwise listed. In many cases diversions also result in dewatering and therefore either rule E7.4.1(A17) or (A20) apply. E7.4.1(A17) is a permitted activity for dewatering or groundwater level control associated with a groundwater diversion permitted under rule E7.4.1(A27). E7.4.1(A20) is a restricted discretionary activity for dewatering or groundwater level control associated with a groundwater diversion authorised as a restricted discretionary activity under rule E7.4.1(A28), not meeting permitted activity standards or is not otherwise listed.

[87] Raw data included in Appendix E Table E 7

There are several concerns associated with the rules, which are discussed in the following sections.

Table 3.9: Rules from activity table E7.4.1 that have caused confusion for dewatering activities.

Activity		Activity Status		
		All zones	High- Use Stream Management Areas Overlay	Wetland Management Areas Overlay
Take and use of groundwater				
(A1)	Pump testing a bore for seven days at an average rate of no more than 1000m^3/day	P	P	P
(A2)	Dewatering or groundwater level control associated with a groundwater diversion permitted under the Unitary Plan	P	P	RD
(A3)	Infiltration and leakage into stormwater and sewer pipes	P	P	P
(A4)	Land drainage	P	P	D
(A5)	Dewatering or groundwater level control associated with a groundwater diversion authorised as a restricted discretionary activity under the Unitary Plan, not meeting permitted activity standards or is not otherwise listed	RD	RD	RD
(A6)	Take and use of groundwater not meeting the permitted activity or restricted discretionary activity standards or not otherwise listed	D	D	D
Diversion of groundwater				
(A7)	Diversion of groundwater caused by any excavation (including trench) or tunnel	P	P	RD
(A8)	The diversion of groundwater caused by any excavation, (including trench) or tunnel that does not meet the permitted activity standards or not otherwise listed	RD	RD	RD

3.4.2.6.1 Definitions of 'dewatering' and 'groundwater diversion'

At present, the AUP does not define dewatering. In addition, the definition of groundwater diversion lacks specificity. The implications are that there is an unnecessary lack of clarity associated with dewatering and groundwater diversion rules.

3.4.2.6.2 Threshold for consent under E7.4.1(A17) is too low

It has been identified that the threshold for consent under rule E7.4.1(A17) is too low[88].

Specifically, the standards require that the dewatering must not be for a period of more than 10 days where it occurs in peat soils, or 30 days in other types of soil or rock, and regardless of soil type, must only occur during construction. Therefore, any permanent dewatering requires consent. The implications are that consents are being required for minor developments, which from an adverse effects perspective, are not justified. According to the Plans and Places consents database, a total of 208 consents have been granted under rule E7.4.1(A20) but it is not clear how many of these were of a sufficient scale to justify a consent process.

To provide an example, activities such as the construction of a swimming pool or retaining wall that involve excavation often require subsoil drainage (designed to remove excess water from the soil surrounding the structure) which results in permanent dewatering (not meeting the standards of E7) and thus requires consent under restricted discretionary activity rule (A20)[89]. In many cases similar to this, it is the opinion of expert technical staff that the effects are such that consent should not be required. This issue is exacerbated when activities take place in winter when groundwater levels are particularly high.

The issue is acknowledged by the council's planners and technical experts as well as by applicants and industry experts. The main concern is not the effect of the activity on the aquifer, water availability or surface water bodies[90, 91], rather the main risk associated with these activities is the risk of ground settlement which can affect surrounding buildings, land, and infrastructure.

The key issues associated with the AUP as it relates to dewatering have recently been discussed by Speight and Wansborne (2021) who explain that ground settlement is more likely to occur in areas where natural groundwater levels are near to the surface of the ground, and where compressible soils are prevalent. While these risks need to be managed, it is considered that permitted activity standards should be sufficient for managing these risks.

The exception may be for activities occurring in peat soils. The reason that the standards for rule (A17) distinguish peat soils from other soils is that peat soils have very high natural water content and can contain three to four times more water than soil by volume. This means that when draining these soils through dewatering, there is a higher risk of ground settlement and instability than for other soils. As such, it is considered that activities taking place on peat soils should be managed carefully and permitted activity thresholds should be lower and rules more stringent than for activities in other soils.

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[88] The approach to managing dewatering changed with the introduction of the AUP. The previous approach that was used in the Air, Land and Water Plan was that permanent dewatering was permitted if the depth of drainage was no deeper than 2 metres (Rule 6.5.35).

[89] While not the main issue associated with permanent dewatering, the maximum consent duration of 35 years and the subsequent the requirement to renew a consent for permanent activities is a concern. The time limit for regional consents is established through section 123 of the RMA and is not AUP matter.

[90] Often for small projects, the volume that is affected would likely be far less than the volumes allowed under permitted activity rules that manage the take and use of water (E7.4.1 (A14) and (A15)).

[91] Groundwater dewatering and diversion is almost always from shallow groundwater or near surface groundwater (the fringe of an inground water body) rather than from an aquifer. These activities can have effects on surface water and cause environmental effects. For example, if the zone of influence of groundwater dewatering includes a stream.

3.4.2.6.3 Rule E7.4.1(A17) only applies where a diversion has also taken place

Permitted activity rule E7.4.1(A17) only applies where there is also a groundwater diversion (as defined in Chapter J1). There are several instances where very minor dewatering takes place in the absence of diversion and therefore does not meet the requirements of this permitted activity rule. Consent is then required under restricted discretionary activity rule E7.4.1(A20)

For example, a small-scale activity like subsoil drainage for a retaining wall may not cause a groundwater diversion. This activity would always need consent under (A20). An assessment of the number of consents that have been affected by this has not been undertaken.

3.4.2.6.4 Defining 'natural groundwater level'

Speight and Wansborne (2021) explain that while permitted activity rule (A27) provides for groundwater diversion associated with excavation, in many cases the activities provided for cannot take place without also undertaking dewatering and groundwater level control. The reason for this is that the standards for rule (A27) require that excavation take place wholly above the 'natural groundwater level', and that in the scenario where they do not, the activity must also be assessed against permitted activity rule (A17) and restricted discretionary rule (A20). Given that the threshold for rule (A17) has been identified to be too low, often consent is needed under (A20).

Part of the issue is there is no clear definition of 'natural groundwater level' in the AUP. Speight and Wansborne (2021) stated that in the absence of a clear definition, the council's current interpretation is any free water present within the soil matrix (i.e. water sitting between layers of permeable and impermeable material that is percolating slowly into the ground) is being deemed 'natural groundwater'. This is a conservative and precautionary interpretation. The alternative interpretation is the 'natural groundwater level' occurs at the point in the soil and rock where there is permanent saturation (known as the 'phreatic surface' or the level at which porewater pressure is equivalent to atmospheric pressure). The more conservative interpretation results in applicants needing to consider rules (A17) and (A20), and given the low threshold of (A17), often consent is required under restricted discretionary rule (A20).

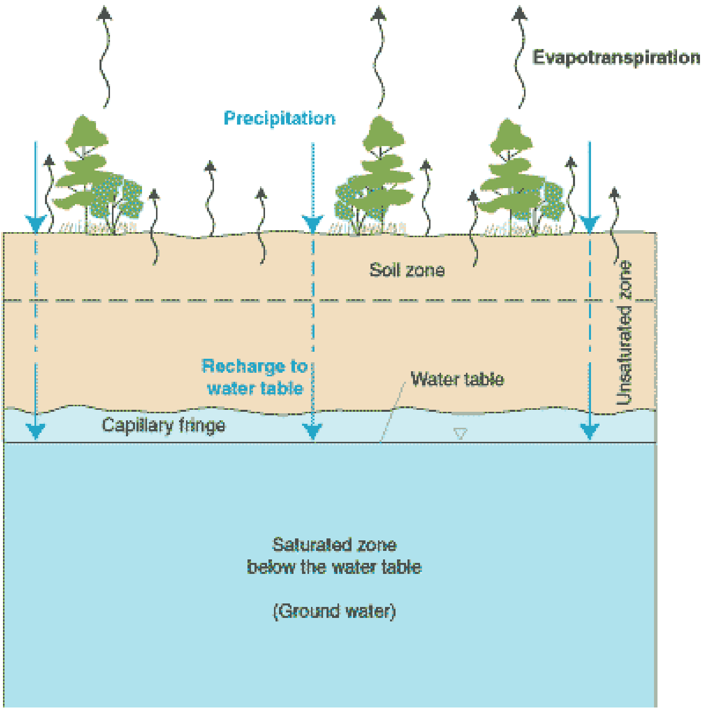

Figure 3.8: Diagram showing precipitation entering the soil and percolating through soil zone to the water table (Alley et al. 1999).

3.4.2.6.5 Lack of clarity around the application of rules (A20) and (A26)

There is a lack of clarity in the way that activity table E7.4.1 applies to dewatering activities. Specifically, the activity table does not provide enough clarity about which rules apply to the take and use of groundwater and which apply to dewatering. There has been confusion about whether discretionary activity rule (A26) applies to dewatering activities, or whether the 'catch all' rule for dewatering activities not otherwise provided for is (A20) (restricted discretionary).

In October 2021, the Auckland Council interpretations panel agreed that the intent was that discretionary activity rule (A26) was not intended to apply to dewatering activities. Rather, the dewatering activities should be managed through permitted activity rule (A17) and restricted discretionary activity rule (A20). As a result, (A20) applies in three situations:

- Groundwater dewatering or groundwater level control associated with a groundwater diversion authorised as a restricted discretionary activity under rules (A27) or (A28); or
- Groundwater dewatering or groundwater level control not meeting standard E7.6.1.6; or
- Groundwater dewatering or groundwater level control not otherwise listed.
- As a result of this interpretation, consents for dewatering activities will no longer be granted under discretionary rule (A26).

3.4.3 Indicator 3: Water allocation allows Aucklanders to provide for their social, economic and cultural purposes

The AUP seeks that water is allocated in a way that enables Aucklanders to provide for their social, economic and cultural purposes. The AUP provides a framework through which members of the public can apply for water takes to provide for different purposes.

The RMA approach to the allocation of resources including water sets up a 'first in first served' approach whereby applications are processed in the order they are received[92]. Additionally, under section 124B of the RMA, existing users whose consent is due to expire and who seek a new consent for the same activity have priority over others seeking an allocation of water. The AUP does set out a set of priorities in policies E2.3(1) and (3) that can be considered where there are multiple applications for water, or when a water body is over-allocated. The AUP contains little direction about how to manage takes to ensure that these priorities are given effect to. It is also worth noting that, existing water uses are also 'grandfathered' in, enabling a use to continue even if it is contrary to plan objectives and policies and would be declined if an application were made today.

The framework through which water is allocated seeks to ensure the resource is sustainably managed (safeguarding spring flows, surface water body base flows, ecosystem processes, life-supporting capacity, the recharge of adjacent aquifers, geothermal temperature and amenity and prevents saltwater intrusion). This approach protects the natural values, provides security for future demand, and the water that remains in the water body also provides for social and cultural needs.

With regard to water that is allocated through the consent process to be taken and used, analysis has been undertaken to understand the key purpose for each consent to take and use water. This was done by analysing the description of the activity in the master consent list and categorising the purpose. It is important to note this analysis did not include an analysis of permitted takes, or section 14(3)(b) takes. While section 14(3)(b) takes are provided for through the RMA, they allow Aucklanders to provide for their basic domestic water needs and stock drinking water needs. Therefore, section 14(3)(b) takes provide for social and economic purposes.

Figure 3.9 is a graph showing the freshwater takes (ground and surface water) granted under Rules E7.4.1(A9) and E7.4.1(A26) categorised by purpose of take. The figure shows the number of consents as a percentage, rather than the volume of water consented[93]. It is important to note that these consents were granted since the AUP was made operative (November 2016), and therefore the data does not reflect the entire situation in the region in relation to the purpose of water use.

Figure 3.9 shows water is being taken and used for a wide range of purposes. The largest proportion of takes were for horticultural use (45 per cent). A total of 10 per cent of consents were for water uses that were categorised as 'other' (which includes activities such as car

[92] As explained in the Report of the Resource Management Review Panel, this principle is not explicitly stated in the RMA but rather has been developed through case law in response to a lack of more substantive guidance. In Fleetwing Farms Ltd v Marlborough District Council, the Court of Appeal held that the scheme of the RMA requires decision-makers to hear appeals in the order in which they are lodged. Following this decision, the priority rule has come to mean that when two resource consent applications are processed for the same resource, the first application received by the local authority must be heard and decided first. Although the first-in, first served approach determines the order in which decisions are made, it does not provide a basis for comparison of competing or contemporaneous applications. Each application must be assessed at that point in time in isolation from other potential users (Randerson, et al. 2020)

[93] Due to data management an analysis of water volume could not be completed.

washing, firefighting, municipal water, pump tests, tourism operations, viticulture). A total of nine per cent of consented take decision documents were not able to be further assessed.

While the majority of takes have an economic purpose, many takes provide for several needs, for example sports facilities and community facilities often have economic benefits to operators, and although they may charge users, those users' social needs are being met. Another example is that the horticulture industry in Auckland is recognised as being of national significance for the production of vegetables. As such, while there is a direct economic benefit for those growers taking and using the water, there are secondary social and health benefits to consumers.

The 49 geothermal takes granted were for use in private spas and pools.

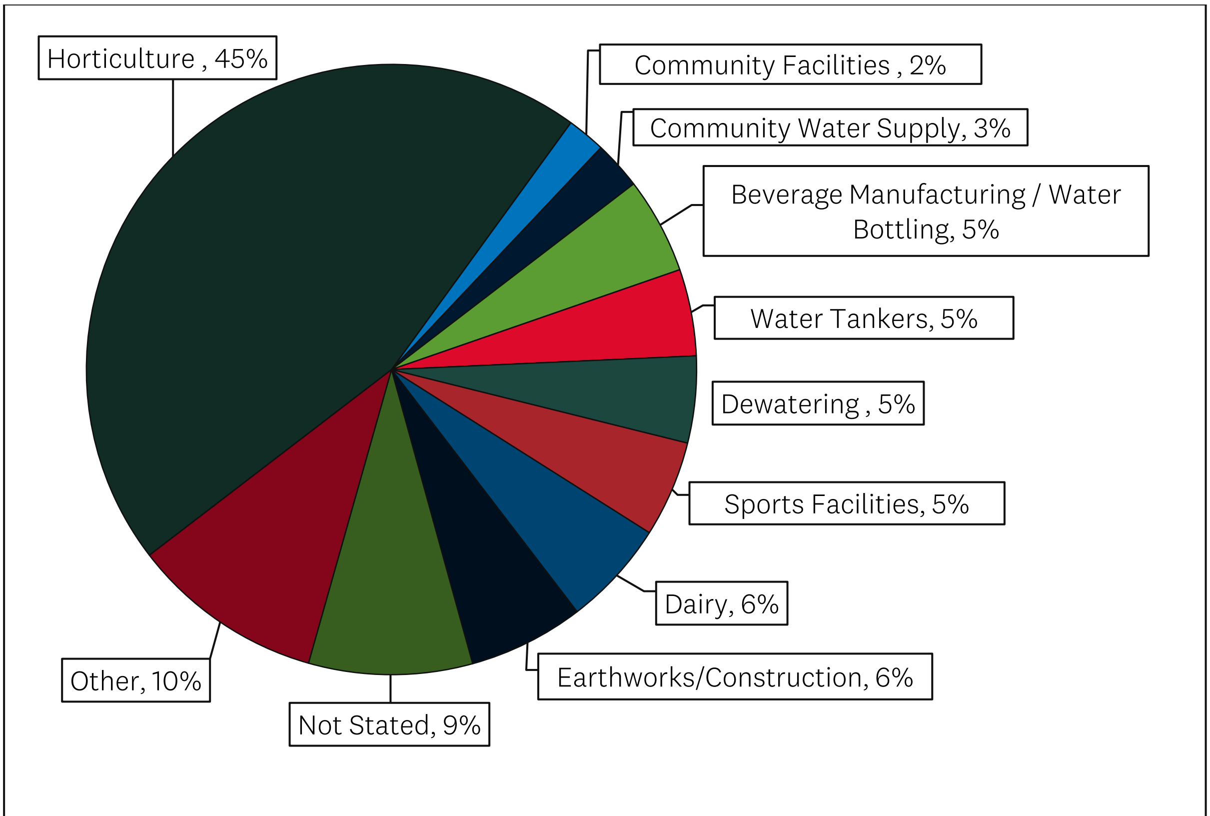

Figure 3.9: Graph showing the use as described by the consent description for ground water and surface water takes[94] [95]

3.4.4 Indicator 4: Water is allocated efficiently

The AUP directs water should be allocated efficiently. As explained, there is a lack of clarity around what 'efficient allocation' means. However, Policy E2.3(4) directs that through the consenting process the amount of water allocated for use must be reasonable and justifiable:

> *(4) Promote the efficient allocation and use of freshwater and geothermal water by:*

[94] Raw data included in Appendix E Table E 8.
[95] As discussed in section 3.4.2.6.5, dewatering activities will no longer be managed by this rule. .

(a) requiring the amount of water taken and used to be reasonable and justifiable with regard to the intended use, and where appropriate:

(i) municipal water supplies are supported by a water management plan;

(ii) industrial and irrigation supplies implement best practice, in respect of the efficient use of water for that particular activity or industry; or

(iii) all takes (other than municipal water supplies from a dam) are limited to a maximum annual allocation based on estimated water requirements

The plan does not provide clarity about what reasonable or justifiable is (or how it should be determined), nor is there any formal guidance outside the plan to support the implementation of this policy in the resource consent process. As explained in Section 3.1.2.2.4 the complexity of determining the volume of water that should be allocated to a consent holder should not be underestimated.

Through the consenting process, the Specialist Input team undertake a review of the application, and undertake an assessment of whether the water volume is reasonable and justifiable. In order to implement policy E2.3(4), technical specialists undertake an assessment of water use to ensure the volume of water allocated is reasonable and justifiable with regard to the intended use. From assessing the surface water, geothermal water and a sample of groundwater consents, findings suggest that in almost all cases an assessment was undertaken to determine whether the volume of water is reasonable and justifiable (Figure 3.10).

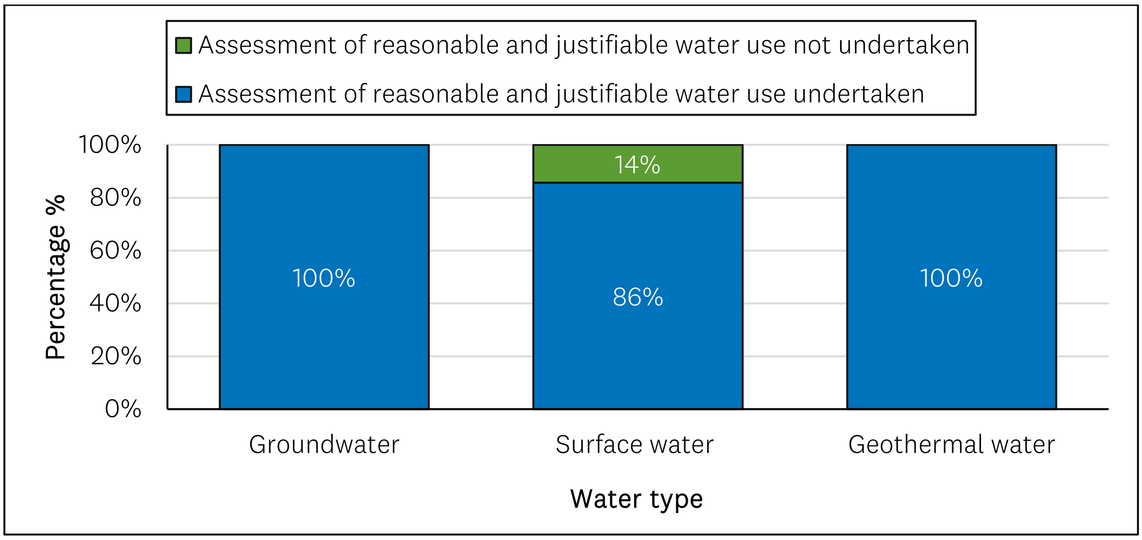

Figure 3.10: Graph showing the percentage of the sample of groundwater, surface water and geothermal water take consents that had an assessment of whether the amount of water consented was reasonable and justifiable[96]

An assessment of 23 groundwater consents was undertaken to understand the way in which the determination of a reasonable and justifiable volume is undertaken. Figure 3.11 shows that the consents span a wide range of activities, but that the majority are for irrigation activities.

[96] Raw data shown in Appendix E Table E 9

The 'other category' includes activities relating to viticulture, drink manufacturing and irrigation of sports fields.

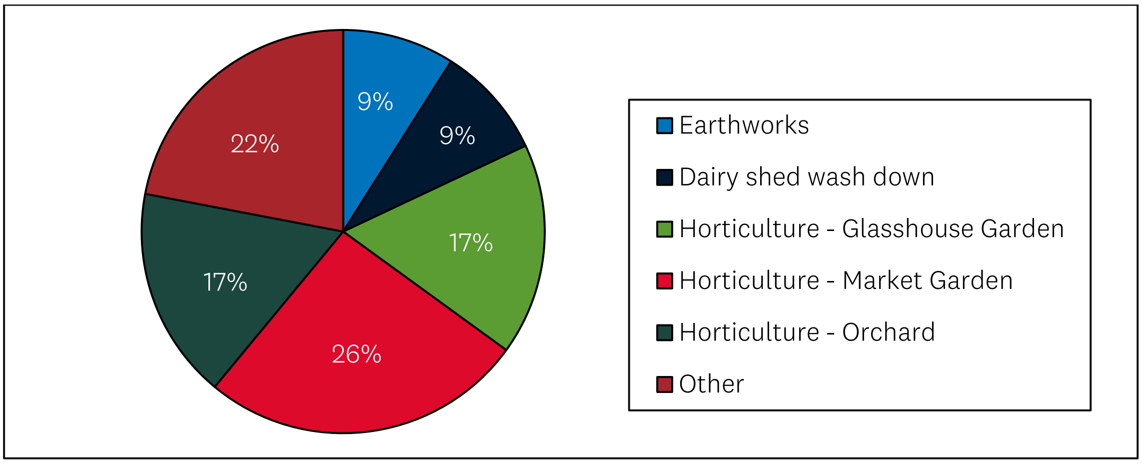

Figure 3.11: Graph showing the purpose of water use for the sample of 23 groundwater consents assessed[97].

The 23 groundwater consents were assessed to understand how the volume of water needed was calculated. Figure 3.12 shows that for most consents, the volume of water required was calculated by area. This is not unexpected given the majority of activities are for the irrigation of land. Within the orcharding activities, there was variability in whether water was calculated per tree or for the area of the orchard (whole orchard and canopy of trees).

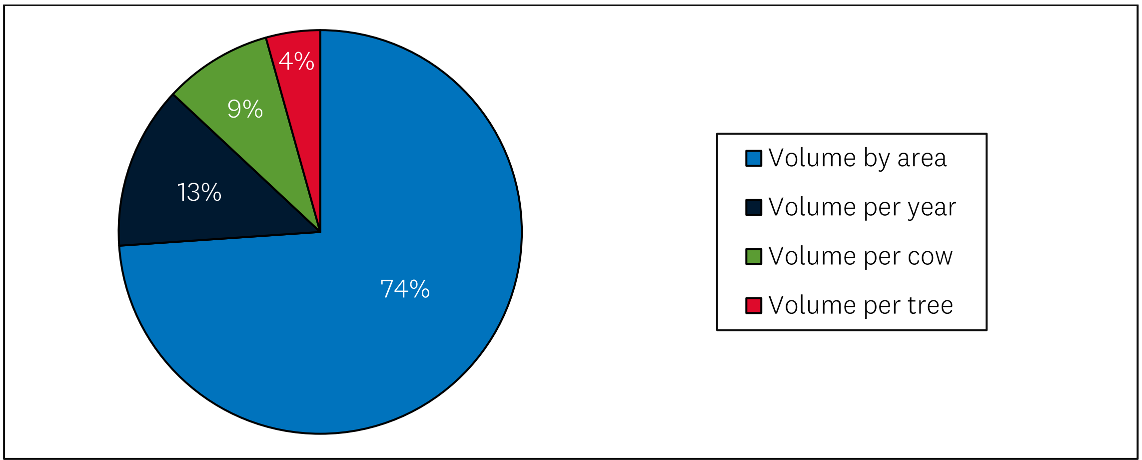

Figure 3.12: Graph showing how the consented volume of water was determined for the sample of 23 groundwater consents assessed[98].

For some activities, the volume of water required will vary depending on the climatic conditions of a given year, this is particularly the case for irrigation activities. For these

[97] Raw data shown in Appendix E Table E 10
[98] Raw data shown in Appendix E Table E 10

activities, it is important that consideration be given to water requirements in drought conditions. Only 30 per cent of consents took into consideration drought conditions, and amongst these consents there was variability in how ‘drought conditions’ or a ‘dry year’ were defined, and how water volumes were subsequently calculated. For 30 per cent of activities water volumes were only calculated based on ‘normal conditions’ and 22 per cent of consented activities did not state what conditions the volume was based upon, and it was not clear how climate was considered in the assessment. For 17 per cent of consents, climatic variability will not change demand (beverage production, café, dairy washdown) and therefore demand is not altered by climatic variability.

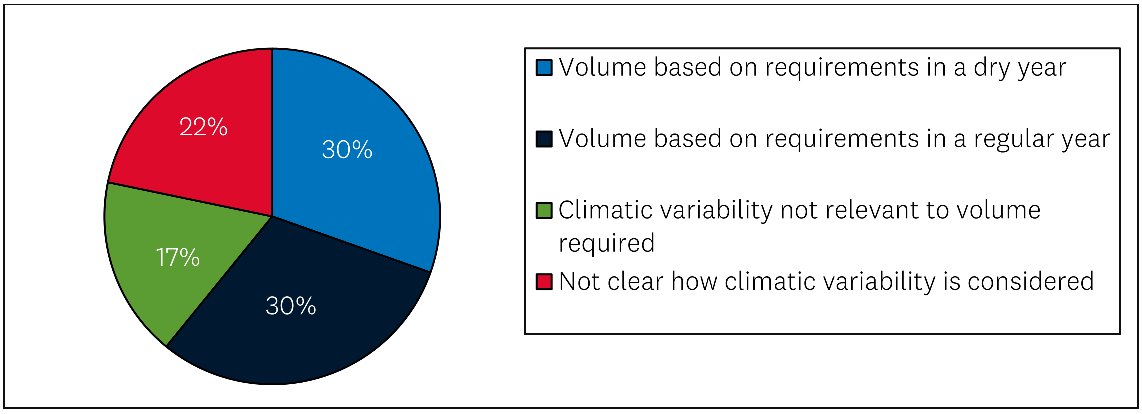

Figure 3.13: Graph showing how climatic variability was considered in determining the volume of water for the sample of 23 groundwater consents assessed[99].

There is a range of different types of information available to guide decision making in relation to a ‘reasonable and justifiable’ volume. Figure 3.14 shows that of the 23 consents, 57 per cent referred to a form of guide in justifying the volume of water. The Specialist Input team have developed a best practice guide to support their decision making, which was used in 43 per cent of technical memos for the consents. External guidance is also available for a number of specific activities, which 28 per cent of consents referred to. Examples of guidance include:

- the ‘Water Allocation Calculator’ or IrriCalc which is a national tool developed to function as a soil moisture and irrigation simulation model
- the Waikato Regional Council Guidelines for reasonable irrigation water requirements in the Waikato Region[100]
- Dairy NZ Sustainable dairying management standards
- Consultant reports

To further support good decision making, 30 per cent of the sample of consents compare water volumes to those in other consents (either other properties owned by the same applicant, or similar activities being undertaken nearby). Finally, for renewal consents, prior water usage could be investigated to support decision making. While 78 per cent of consents

[99] Raw data shown in Appendix E Table E 10
[100] These guidelines were developed using the ‘Water Allocation Calculator’ or IrriCalc. Waikato Regional Council commissioned these guidelines to ensure that policies in the Waikato Regional Plan were implemented as intended.

were not renewal consents, 17 per cent of the renewal consents did refer to water use data (four of the five applications for renewal).

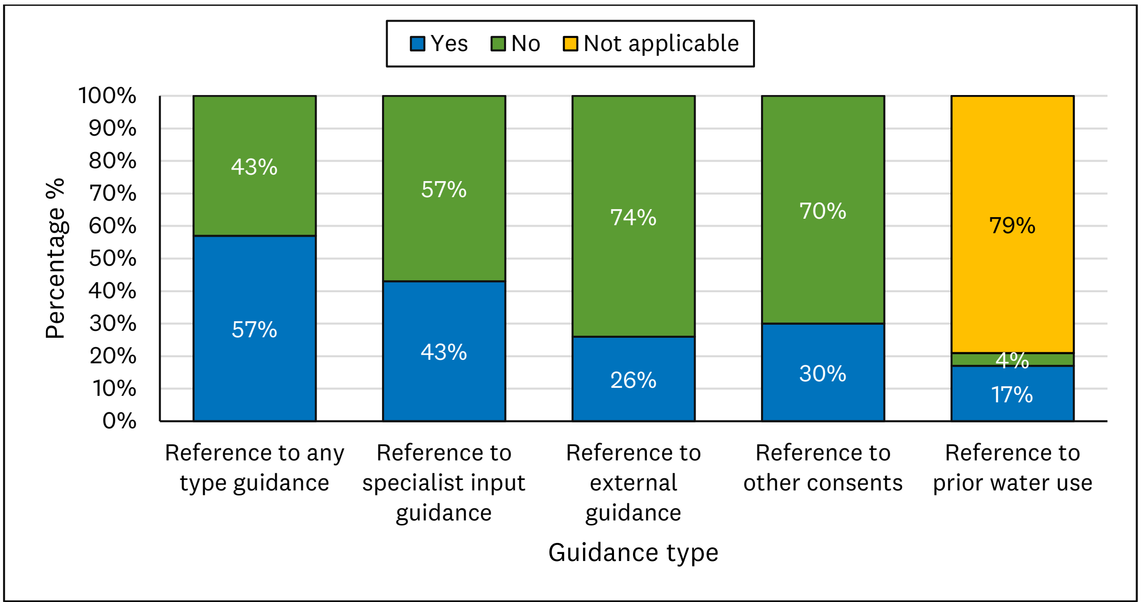

Figure 3.14: Graph showing the different forms of information used in determining whether the volume of water to be consented is 'reasonable and justifiable' for the sample of 23 groundwater consents assessed.

Finally, of the sample of groundwater consents, 43 per cent were put on hold and applicants were formally requested to provide further information under section 92 of the RMA (Figure 3.15). These requests were specifically in relation to the volume of water requested and the information was needed to determine whether the volume of water was 'reasonable and justifiable'.

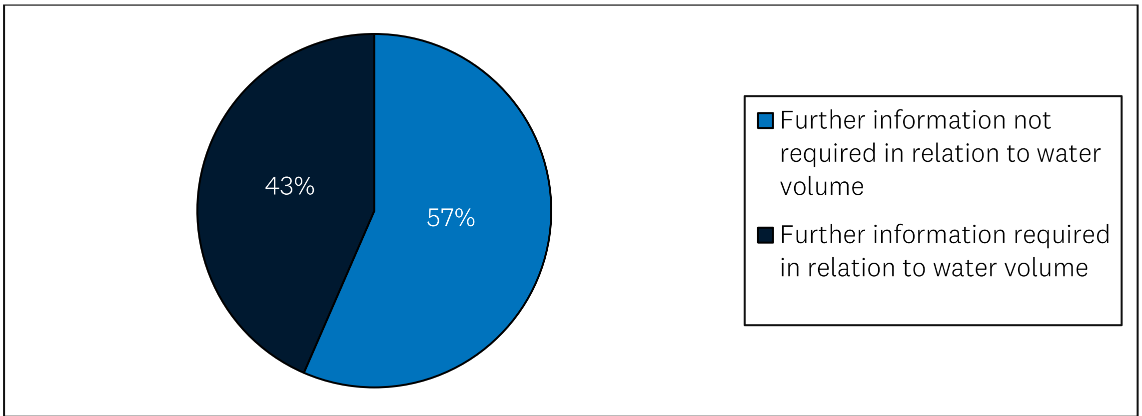

Figure 3.15: Graph showing the proportion of applications for which further information was required from the applicant to determine whether the volume of water was 'reasonable and justifiable' for the sample of 23 groundwater consents assessed[101]

[101] Raw data included in Appendix E Table E 10

3.4.5 Indicator 5: Water is used efficiently

Policy B7.4.2(12) promotes the efficient use of freshwater and geothermal water. There are a number of different mechanisms used to ensure water is used efficiently, however as the use of water occurs after the water is allocated and the consent is granted, the main way efficient use is promoted is through conditions of consent. Examples of such conditions relate to water conservation and efficient use reporting. These are discussed in more detail in the following sections.

3.4.5.1 Condition of consent: Efficient use reports

Since the AUP was made operative, it has become standard practice to include a condition of consent requiring consent holders to provide the council with 'efficient use reports' every five years. These reports must provide a summary of water usage and timing of use, justification for variability in water usage, information demonstrating the type of equipment used and decision making relating to water use, and water conservation steps taken. Prior to the AUP becoming operative, efficiency reports were only required through conditions of a very small number of consents. The information collected in these reports is then used when consents are renewed, specifically when determining whether the allocated volume of water is reasonable and justifiable. Conditions of consent are also included to provide the council with the ability to review consents on a five yearly basis, at which time allocations can be altered based on information provided through efficient use reports. Given it is not quite five years since the AUP was made operative, applicants have just started to submit these reports to the council. At present, there is no process in place to remind consent holders that their water efficiency reports are due to be submitted to the council and no repository specifically for these reports (they are uploaded to the council's consenting records system as a PDF file). As such, there is no automated way to be able to understand how many reports have been submitted, nor is the data in a form that is able to inform future consenting[102]. It is the council's intention to create a central database for the information provided in efficiency reports. This will then provide further information to ensure decision making is consistent.

From analysing surface water consents and a sample of groundwater consents, 87 per cent of the sample of groundwater consents and 43 per cent of the surface water consents include a condition requiring efficient use reports be submitted to the council. No such condition was included in the geothermal consents.

[102] It is not known how many five year efficiency reports have yet been received. The reports would only be due by now if a condition was added requiring them to a consent that was granted prior to the AUP becoming operative in part

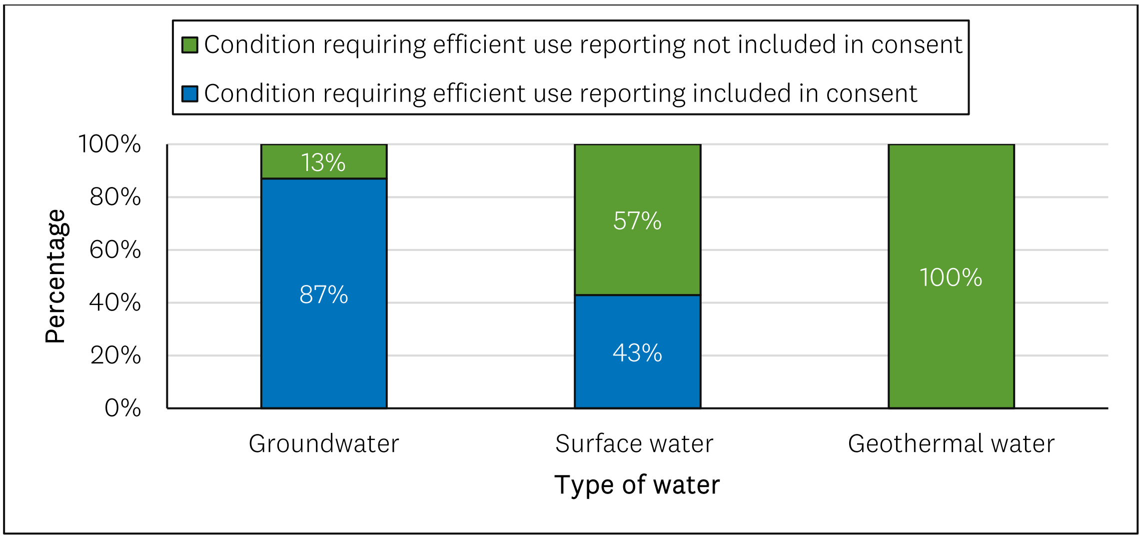

Figure 3.16: Graph showing the percentage of consent decisions for surface water takes, a sample of groundwater takes and geothermal takes that have a condition requiring efficient use reporting[103]

3.4.5.2 Condition of consent: water conservation

Policy E2.3(4)(b) requires consideration be given to water conservation. For 87 per cent of the sample of groundwater consents and 29 per cent of surface water consents, a condition of consent was included that requires consent holders to report steps taken to improve water conservation

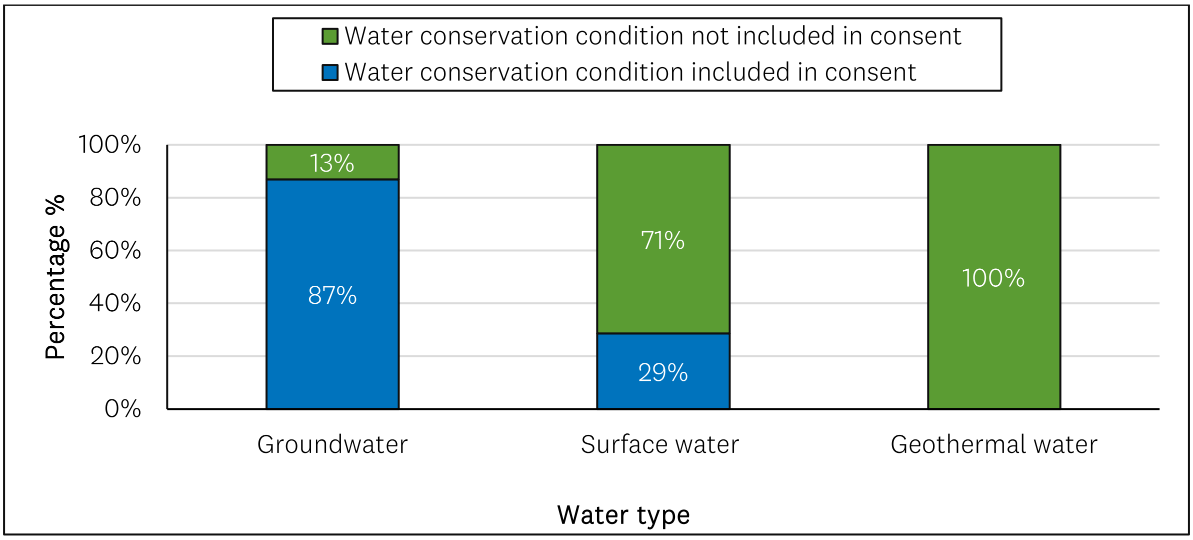

Figure 3.17: Graph showing the number and percentage of consent decisions for surface water takes, a sample of groundwater takes and geothermal takes that have a condition requiring water conservation measures to be reported to the council[104]

[103] Raw Data included in Appendix E Table E 11
[104] Raw data included in Appendix E Table E 12

3.4.6 Indicator 6: The overlays provide the appropriate level of protection for waterbodies

3.4.6.1 Wetland management area overlay

Wetlands are one of Auckland's rarest and most at-risk ecosystems, supporting valuable plant and animal communities. They naturally filter contaminants and regulate water flow (assisting in flood attenuation). Wetlands also present important cultural, recreational and amenity values.

There are several rules in Chapter E7 of the AUP that have a more restrictive activity class for activities taking place in the wetland management area overlay (predominantly in relation to surface water takes). In most cases, activities that are otherwise permitted, require a consent when occurring in the wetland management area overlay. From analysing the consents granted since the AUP was made operative, it has been found that no consents have been granted for activities taking place in the wetland management area overlay under the water take rules that have a more restrictive activity status in the wetland management area overlay than in other areas (rules A1-8, A17, and A21) (noting the limitations to the data outlined in section 1.5.1). Due to time constraints, analysis was not undertaken to understand how many of the consents granted under the E7 rules that have a discretionary activity status in all areas were in the WMA overlay[105].

The overlay represents 'significant' wetlands using points, rather than polygons to delineate the extent of the wetland. The extent of the wetland is shown in the 'ecosystem current extent boundary' layer on Geomaps. This layer covers a wide range of ecosystems, including but not limited to significant wetlands. As such, a geospatial assessment could not be undertaken to understand how many consents had been granted under E7 in the wetland management area overlay. Figure 3.18 shows two examples of wetlands identified in the WMA overlay as shown on Geomaps. While the extent of the wetland is depicted by the ecosystem extent layer, it is not clear which part of the wetland complexes are significant and which are not.

A full assessment of how water takes relate to wetlands in the WMA overlay may require consideration of takes within a much larger spatial area than the wetlands themselves. An improved GIS map of the wetlands would allow consideration of water takes from within the overlay, however, there may be other water takes in the wider catchment that could affect the hydrological regime of the relevant wetland. The complexity of how any wetland characteristics relate to water levels in the connected streams or aquifers is not covered in the WMA overlay schedule.

[105] An assessment could not be easily undertaken as the master consent data list that was developed for this work utilised consent data from the groundwater accounting tool, which does not document the overlays that apply. Therefore, the process would have been very manual, involving assessing a large number of consent decisions.

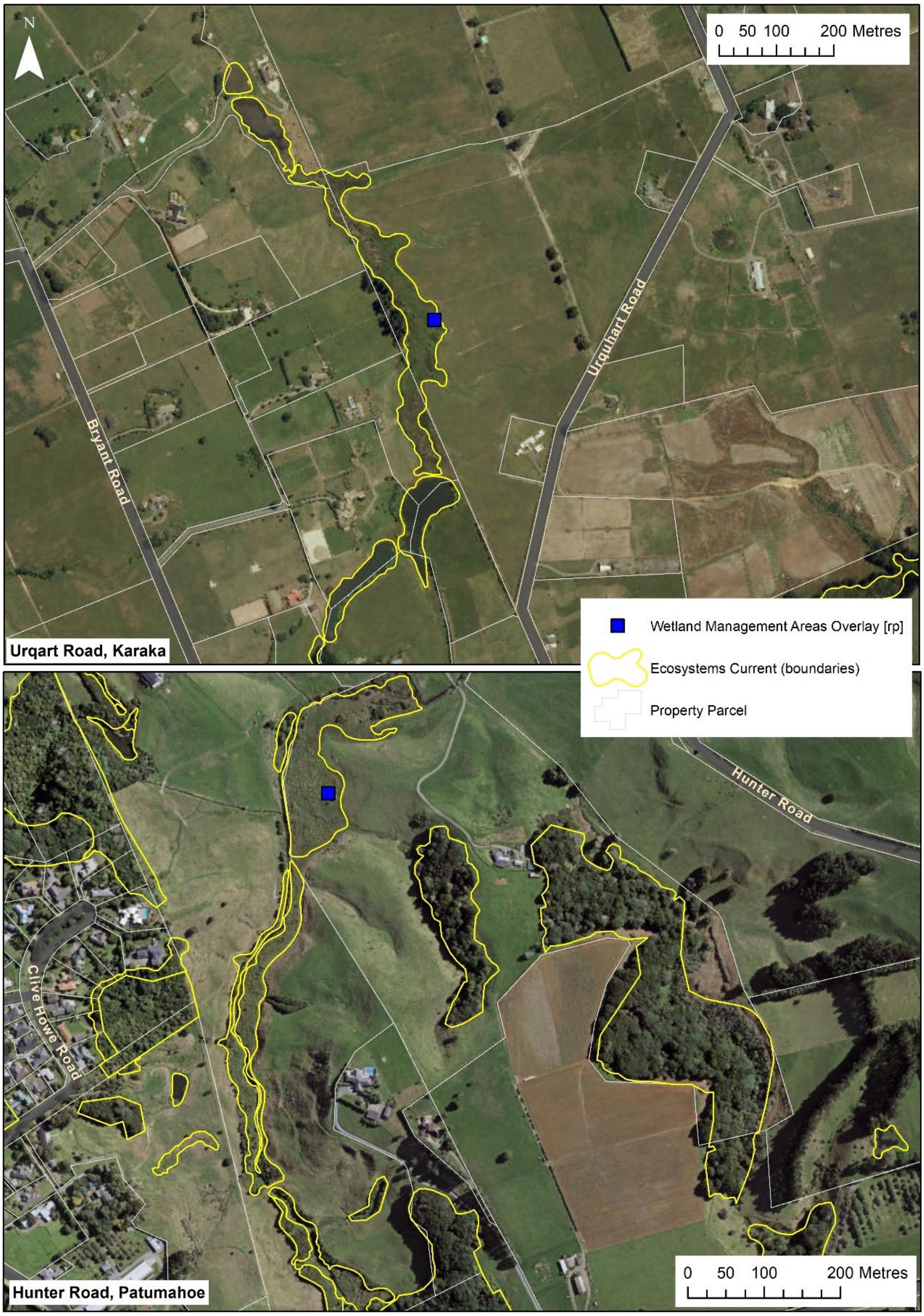

Figure 3.18: Images showing two significant wetlands from the WMA, with the 'ecosystem current extent boundary' layer

3.4.6.2 Natural Stream Management Area Overlay

Natural stream management areas are river and stream reaches with high natural character and high ecological values and are shown indicatively in the Natural Stream Management Areas Overlay. An investigation into the seven surface water takes showed that only one was located in the overlay. From an assessment of the application, technical memo, planner's report and decision report, it was found that there was no assessment of the application against the objectives and policies of the overlay. The only specific mention of the overlay was on the cover page of the council planner's report and the notification report.

The lack of explicit consideration of the overlay does not necessarily mean that the natural character or ecological values of the stream have been compromised by the take, or that the objectives and policies of the overlay have not been met. The consent was granted within the relevant limits; the limits were established with an ecological assessment, and there are conditions that require that the take cease in low flows.

An assessment of how many of the consents for groundwater takes are within the overlay was not undertaken due to time constraints.

3.4.6.3 High Use Stream Management Area Overlay

The High Use Stream Management Area (HUSMA) overlay was carried over from the legacy Auckland Regional Council Regional Plan: Air, Land and Water (2013). There was no reassessment of whether all high use streams are captured by the overlay. As there is no centrally located surface water accounting tool (as there is for groundwater) that can be used to draw conclusions about the level of allocation, a reassessment of whether the overlay is correctly categorising high use streams cannot be undertaken as part of this monitoring work. From the master consents list[106], it has been found that no consents have been granted under rule E7.4.2(A6), the only rule that has a more restrictive activity class for activities taking place in the HUSMA overlay.

3.4.6.4 High Use Aquifer Management Area Overlay

The purpose of the High Use Aquifer Management Area (HUAMA) overlay is to manage aquifers which are under threat by being highly allocated, are likely to become highly allocated in the lifetime of the plan and/or are adversely affected by over pumping. The AUP identifies water taken from these aquifers needs to be carefully controlled and managed in order to provide for existing and future water take demands and to provide base flow for streams. The overlay identifies 31 aquifers as 'high use'[107]

Analysis has been undertaken to understand whether the overlay has ensured that water is allocated within the availabilities and whether the overlay correctly captures all high-use aquifers. Figure 3.19 shows that of the 31 HUAMA, seven are over-allocated (18 per cent).

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[106] The "master consent list" is the list of consents granted since the AUP was made operative. The sources of data for this list were the Plans and Places resource consents database and the water accounting tool as described in section 3.3.2.

[107]A full list of aquifers identified as HUAMA is included in Appendix E Table E 13

Moreover, Figure 3.20 shows only 50 per cent of the aquifers which are over-allocated are categorised as high use. As the overlay was intended to capture the aquifers which were or likely to become high use, it is not unexpected that several aquifers are nearing full allocation at 80-100 per cent allocated (11 per cent).

With 10 aquifers (26 per cent) in which less than 50 per cent of the water is allocated, and 14 aquifers (45 per cent) in which there is between 50-80 per cent allocation, the majority of HUAMA are allocated at less than 80 per cent. Rule E7.4.1(A15) is a permitted activity rule allowing 20m^3 per day to be taken and used when averaged over any consecutive five-day period, and no more than 5000m^3/year, however this rule does not apply to takes from aquifers that have been identified as being high use. Therefore, in these high use aquifers that are less than 80% allocated the AUP may be unnecessarily requiring water users to gain consent for small takes that would otherwise be permitted in a water body not identified as high use.

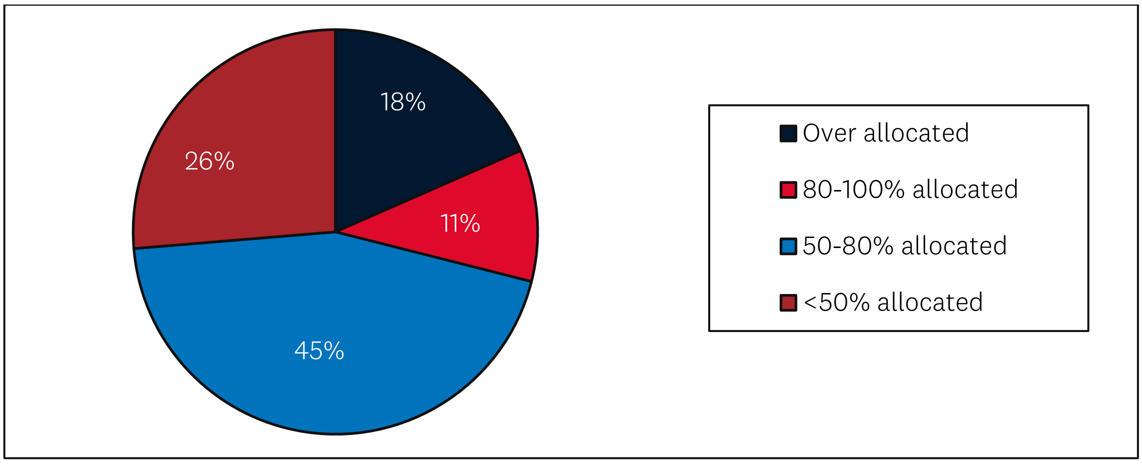

Figure 3.19: Graph showing the proportion of High use aquifers at each allocation[108]

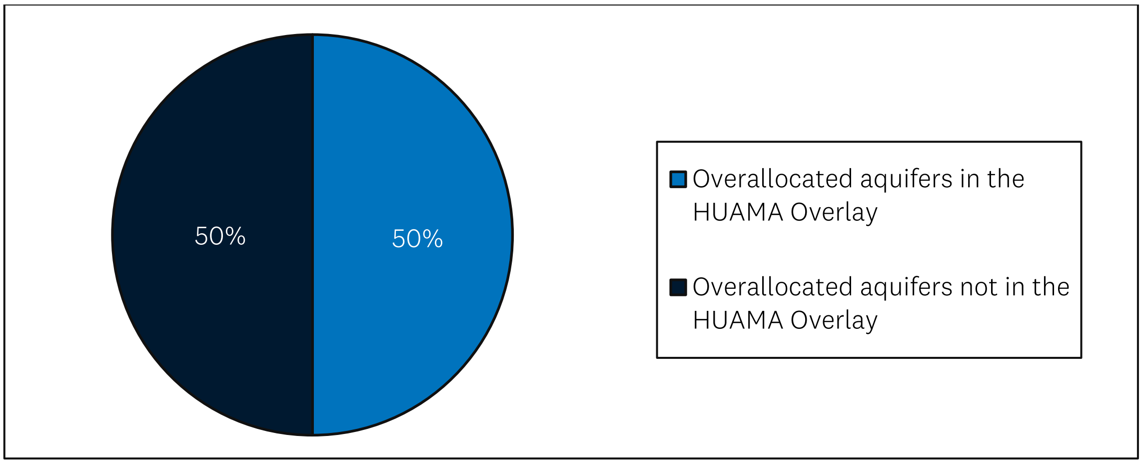

Figure 3.20: Graph showing the proportion of the over-allocated aquifers that are categorised as high use[109]

[108] Data included in Appendix E Table E 13
[109] Data included in Appendix E Table E 14

3.4.7 Indicator 7: The take and use of groundwater is promoted over surface water

In the RPS, policy B7.4.2(13) promotes the taking of groundwater rather than the taking of surface water in areas where groundwater is available for allocation. However, in the regional plan provisions, the intent of this policy is included only in policy E2.3(8) as a matter for consideration where significant adverse effects are anticipated. The policy direction is not reflected in the rules in E7[110].

Despite this, since the AUP became operative, the master consents list shows the majority of consents for the take and use of water have been for groundwater (96 per cent or 187 takes) rather than surface water (4 per cent or 7 takes) (Figure 3.21).

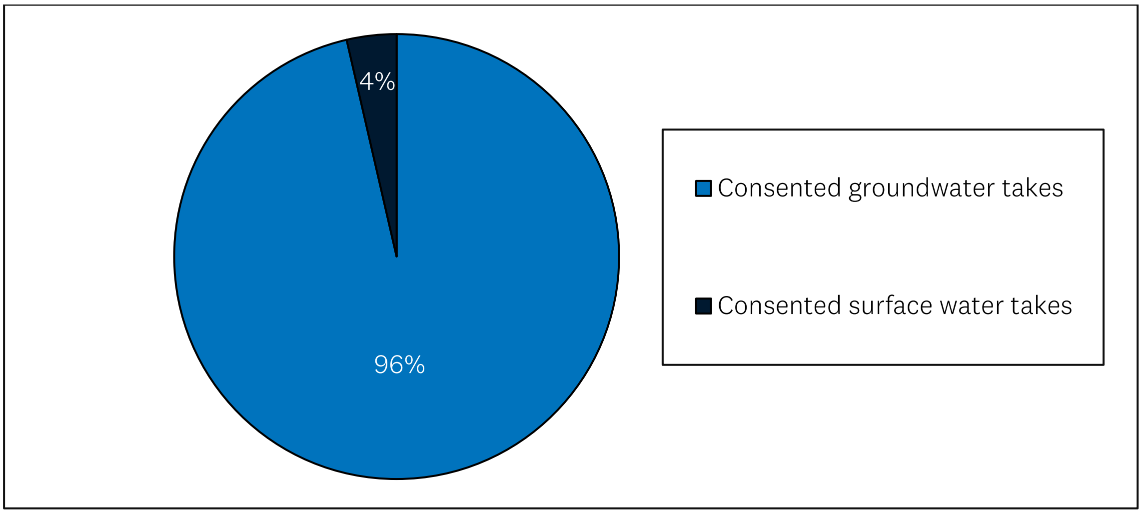

Figure 3.21: Graph showing the proportion of consented freshwater takes granted for surface water and groundwater since the AUP was made operative

Because policy E2.3(8) directs that alternative water sources only need to be considered where an activity is likely to cause significant adverse effects, the seven consented surface water takes granted under rule E7.4.1(A9) were assessed to understand if consideration was given to whether the application was for takes that were 'in areas where groundwater is available for allocation'. In no case was an assessment of groundwater availability provided in the consent decision. Specialist input reports detail three of the seven consent holders also have actively used bores on their properties but this does not necessarily mean water could be taken from the bores instead of the surface water.

3.4.8 Effectiveness and efficiency of the AUP

[110] Policy E2.3(8) directs that where there are significant adverse effects mitigation options should be considered including consideration of alternative locations, rates and timing of takes for both surface water and groundwater and use of alternative water supplies.

The AUP generally applies a conservative approach to water allocation. Data sources are not of a high enough quality to draw any firm conclusions and can only be used to provide an indicative position of the current allocation situation. Environmental data and reporting suggest sustainable water allocation is generally being achieved however it is currently difficult to reconcile environmental observations with consent compliance data. There is a need to develop a data-driven, automated Freshwater Accounting System that provides real time information about water allocation.

The following sections provide an assessment of the effectiveness and efficiency of the AUP against each of the indicators (while recommendations are included in section 3.5). Although the distinction was made between groundwater, surface water and geothermal water in the preceding sections, the same approach has not been used in the sections that follow. There are many common themes, conclusions and recommendations that span across all water types.

3.4.8.1 Indicator 1: Limits are set that protect the values of water bodies

The objectives and policies in the RPS direct that limits must be set to protect the values of water in relation to abstractive takes. As discussed in section 3.1.2, through the development of the AUP experts recommended that, due to the variable and evolving state of knowledge about some of Auckland's freshwater bodies, the most appropriate approach was to use interim guidelines for establishing water availabilities.

The relationship between limits and availabilities is not clearly explained in the AUP, rather the justification is included in supporting evidence (Millar 2015a). It was intended the availabilities established using the guidelines would function as limits. Water would be allocated within the availability, unless there was robust evidence the availability should change. To improve clarity and usability, this approach should be explained in Chapter E2. There is a lack of transparency regarding the availabilities, the majority of availabilities are not readily available to the public (with the exception being those included in appendices 2 and 3 of the AUP, two of which have been superseded through the consenting process). The groundwater accounting tool is not actively made available to the public, and surface water availabilities are only calculated on an as-needed basis. There is also no transparency about the level of allocation of each water body. Moreover, there is a lack of clarity about the intended process, and it is not clear to the plan user that applicants seeking consent should contact the council prior to applying for consent to understand the current availabilities. The lack of transparency and clarity compromises the effectiveness and efficiency.

There are a range of options available for improving the transparency of water accounting. Improving the transparency of water availability and allocation is an aspect of water management other councils across the country have invested resource in. For example, Bay of Plenty Regional Council utilise an online portal to provide indicative information for the public relating to availability and consented takes[111].

[111] The online portal can be accessed here: https://www.boprc.govt.nz/environment/fresh-water/water-use

The findings of this work show, as was the case when the AUP was developed, there is considerable variability in the quality of information being used to establish availabilities. Generally, the level of scientific investigation supporting availabilities is proportional to the demand for water from the water body, the level of existing allocation and risk to the environment. Under the AUP the consenting process is an important avenue through which water availabilities are established, and applicants often undertake investigations to improve knowledge of water availability. There has been an incremental improvement in the quality of information about water availability since the AUP was made operative. Many aquifer management areas continue to have low levels of demand, as a result a large proportion of availabilities are still calculated through a desktop calculation. These calculations rely on a larger number of assumptions and have a less robust evidence base than those established through more detailed analyses. More detailed analysis is generally undertaken for an aquifer when demand reaches or exceeds the existing level of allocation.

Although the availabilities are based on information of variable quality and are not transparent or easily accessed by the public, that does not necessarily mean the guideline availabilities are not achieving the same outcomes sought through the inclusion of limits in the RPS. The guidelines outlined in Appendix 2 and 3 of the AUP serve as a framework through which water availabilities are set to protect the values of water bodies. The proportion of surface water and groundwater that are made available to be allocated are considered conservative and precautionary.

However, as is evidenced by Johnson (2021a) and White *et al*. (2020), establishing availabilities to protect values does not necessarily ensure water levels in water bodies are not affected by abstraction of water. In situations where water levels are affected by the take and use of water, increased monitoring of water takes and water levels (through the State of the Environment monitoring network, or through information provided by consent holders) can help to establish greater scientific and technical understanding of the system. In situations such as the decline in groundwater levels from the early 1990s to approx. 2010 in the Franklin Waitematā aquifer (Johnson 2021a) and the shift to very low summer groundwater levels in the Omaha Waitematā aquifer starting in 2016/17 (Johnson 2021a), it may be that the change in water levels do not translate to compromised values. Although in both scenarios there is no evidence that the change in levels is causing adverse effects, without further targeted assessments and investigation conclusions cannot be drawn with certainty. The values of Auckland's water bodies as they relate to water quantity are not well established. In a situation where there is change in a natural system that is not causing obvious significant adverse effects, it is difficult to measure the effect of changes on values without these values being well-defined.

3.4.8.1.1 Stream flows and aquifer levels

Instream values are those identified in a river system including; ecological, habitat, and water quality characteristics, aesthetic (including recreational and landscape), and cultural. These values are reliant on water quantity characteristics and the abstractions, diversion and damming of water can alter flow regimes and reduce streamflow to the point these values are compromised (Ministry for the Environment 1998).

In the AUP, these values are identified at a very high level and are generic for water bodies rather than specific to particular waterbodies. When it is not clear what values are to be protected at different rivers, it is difficult to set a limit or water level of concern, and to determine whether a low flow is having an adverse effect on the relevant values.

While limits are established to protect these natural values, in times of prolonged drought and subsequent low flows, the plan makes provision for temporary water restrictions that seek to ensure water levels are high enough to protect natural values. At present the plan directs the consideration of the use of water shortage directions under section 329 of the Resource Management Act 1991 to impose temporary restrictions (E2.3(12)). The provisions that are currently in the plan are not directive enough and should be strengthened to ensure that year-round, regardless of climatic variability, natural values are protected. Conditions of consent are generally used to manage/restrict takes in low flows. Where the council does not undertake flow monitoring, the conditions require that the consent holder undertake independent flow monitoring to determine when flows are low.

Consents granted since 2016 were investigated to understand whether water takes ceased or reduced as required during the 2020 drought. Although the number of consents was small, poor compliance with the requirement to provide water meter readings to the council means that there was insufficient data available to draw conclusions (the poor compliance rate is discussed further section 3.4.8.4). The one consented take for which the council has water meter readings was non-compliant with the requirement to restrict or cease takes for 78% of the low flow period in 2020.

The plan should be more directive about the approach that is intended to reduce takes in times of low flows. The current approaches used in water shortage events are not documented, consistent or well understood. With no evidence of regulatory intervention taking place to restrict water takes during low flows, there is a need for a clear action plan to be developed.

Auckland Council is not alone in recognising regional plans, consenting and monitoring and response to water shortage events must be strengthened to ensure that values are protected in drought conditions. Work commissioned by Waikato Regional Council suggested there should be a formalisation of flow trigger levels for the implementation of water restrictions, and that to successfully implement water restrictions metering and reporting (as well as data management) must be of a high quality (Rout 2004).

Other regional councils across New Zealand have developed approaches or operating procedures for managing water shortage events. The established process can be used in times of low flow or water level when decisions must be made quickly. For example, Bay of Plenty Regional Council have developed a standard operating procedure for managing water shortage events that was adopted by the council in 2020 and has since been reviewed and reindorsed (Bay of Plenty Regional Council 2021). Detailed recommendations are made in section 3.5.1.

3.4.8.2 Indicator 2: Water is allocated to be taken and used within the limits

The AUP provisions direct that water should be allocated to be taken and used within the limits. Conclusions cannot be drawn about surface water as there is no centralised accounting tool, although all surface water consents granted since the AUP was made operative have been within the availabilities. Definitive conclusions cannot be drawn about the allocation of groundwater, because of the uncertainties associated with the groundwater accounting tool. With that in mind, the AUP has not been totally effective in achieving this outcome as 10 per cent of groundwater bodies are allocated beyond the availabilities

For the purpose of this monitoring work, a full assessment of why each individual water body is over-allocated has not been undertaken. However, Table 3.8 provides details of several possible scenarios through which over-allocation may have occurred, which can broadly be grouped in two causes.

The first is the rules in chapter E7 are not effective in ensuring the outcomes of the RPS are being achieved. Although the AUP is clear that the intent is that water is allocated within limits, the plan does not take a strong enough approach to managing allocation and in some cases the rules are too permissive. For example, the plan does not utilise prohibited or non-complying activities to clearly signal those new applications for takes in fully allocated waterbodies are not acceptable, and the plan allows permitted activities in fully allocated water bodies. As a result, the plan it is not considered effective in preventing over-allocation.

The second group of scenarios that are likely contributing to the over-allocation of water bodies relate to how the plan is implemented. Despite the clear intent of the AUP that water is to be allocated within limits, the results of this monitoring work show there are cases where water is allocated through the consenting process beyond the limit of availability. While over-allocation only occurred in a small number of cases, it further highlights the potential need for the provisions in the AUP to apply a more restrictive activity status for the allocation of water in fully allocated water bodies.

In implementing the plan, robust data management of availability and allocation information is critical. Water allocation is dynamic and constantly changing and without a fit for purpose automated data management system, the reliability and accuracy of allocation information is compromised. It is likely that poor data recording systems are a contributing factor in the over-allocation of Auckland’s waterbodies. At the time of writing this report a business case was being developed to improve data management.

Following the identification of data issues and gaps, the council has invested resource to improve the quality of information relating to availabilities and allocation (such as changes to aquifers shapes and the introduction of the section 14(3)(b) model). It is likely that the level of allocation has changed because of these improvements, however, in some cases it results in over-allocation in the accounting tool.

As highlighted, over-allocation is not yet being fully addressed. While there is provision to undertake a comprehensive review of consents, and common consent expiry dates are being widely utilised, the council does not have a strategy or approach for reducing allocations in over-allocated water bodies. Recommendations around this issue can be found in Section 3.5.

3.4.8.2.1 Dewatering and diversion

The rules in chapter E7 that relate to diversion and dewatering are not fit for purpose. Expert advice from regulatory services staff and external consultants is that the rules are too complex and, in some cases, too stringent resulting in consents being required for activities that should be permitted. In addition, many terms are either not defined or have vague definitions that lack specificity.

As a result, the plan has not efficiently managed dewatering and diversion activities. The implications of this are that plan users are required to spend resources on obtaining consent, and in some cases, this is likely to delay activities. This also affects consenting planners and specialist input staff resourcing. It also introduces longer term inefficiencies associated with a requirement to monitor these consents to ensure that the activities authorised under them have ceased upon consent expiry (should they not be renewed).

Detailed recommendations are included in section 3.5.1.

3.4.8.3 Indicator 3: Water allocation allows Aucklanders to provide for their social, economic and cultural purposes

The AUP provides a framework through which members of the public can apply for water takes to provide for different purposes, however, the plan is not directive on how water should be allocated to users to meet the social, economic and cultural needs of people. While there are a set of priorities for water allocation in policies E2.3(1) and (3), these do provide some additional direction to the default allocation system under the RMA (see section 3.4.3) in that they identify a priority of use for municipal water supply and animal drinking requirements. However, notwithstanding this plan priority, allocation is still largely on a first-in-first-served approach, in which there may be equity implications.

The water takes consented since the AUP was made operative span a wide range of uses (horticulture, dairy farming, community facilities, geothermal for private pools). While this could be interpreted to mean that people are generally able to provide for their economic, social and cultural needs, the council does not have sufficient information to draw this conclusion.

In addition, wellbeing associated with water use other than through the granting of a consent is not understood. The section 14(3)(b) takes allow Aucklanders to provide for their basic domestic water needs and stock drinking water needs and so provide for social and economic purposes but the council has a limited understanding of how many of these takes there are.

Another way to measure and assess whether the AUP is enabling Aucklanders to provide for their social, economic and cultural needs is to assess the impact on Aucklanders where water bodies are fully allocated. In areas where water bodies are fully allocated, it may be that Aucklanders are not able to meet their needs as they cannot access water. The fact that no applications for water takes have been declined under the AUP may indicate that all the potential water users were able to take and use water in a given water body. However, the council does not have robust information about the number of consents that have been withdrawn by an applicant, nor does it understand how many applications are never lodged due to full allocation.

To understand whether the AUP has been effective in providing for cultural needs, or the effect of water takes on cultural values, the council would need to engage with mana whenua. Engagement with mana whenua about values was not undertaken for this report, on the understanding that it will be considered as part of the wider consideration of mana whenua values through the s35 report relating to RPS Chapter B6 Mana Whenua. Further work will also be undertaken as part of implementing the NPS-FM.

It is noteworthy to mention that the AUP does not currently mention or address issues relating to rights and interest in water[112]. While it was the intention that the AUP not mention or attempt to resolve issues relating to water rights, as the resource management system evolves to address the ongoing contention, the AUP will need to respond to ensure it gives effect to central government direction. The government has signalled it will address the issue through the ongoing Essential Freshwater Programme.

3.4.8.4 Indicator 4: Water is allocated efficiently

The AUP seeks that water is allocated and used efficiently. There is little to no direction in the AUP regarding what is meant by 'efficient allocation'. There is a need to be more prescriptive regarding what efficient allocation of water means in the region, and to provide guidance of some kind (statutory or non-statutory) to those implementing the plan about how to achieve this. This clarity will support and guide robust, fair and equitable decision making in the challenging and likely litigious process of phasing out over-allocation. This issue will become even more important through time as Auckland continues to experience population growth, land used change and as the realities of the rapidly changing climate become more apparent and impacts on water availability are realised.

The only clear direction (albeit limited) in chapters E2 and E7 that indicate specifically what efficient allocation might entail is in Policy E2.3(4) which directs that through the consenting process the amount of water allocated for use must be 'reasonable and justifiable'.

The analysis undertaken in this investigation suggest there is significant variability in how this determination is made, and in the information used to guide these decisions. While this is to be expected given the wide range of purposes for water use, there is variability even between similar activities. Moreover, the way in which climatic variability and drought conditions are incorporated into the allocation decisions is varied.

There is a wide range of different information used to support the Water Allocation Specialist Input Team in making a decision about whether the volume of water requested is reasonable and justifiable, including externally produced guidance, past water use, and comparative water use from similar activities. The Water Allocation Specialist Input team have developed a best practice guide to support rigorous and consistent decision making. It has previously been identified that this guidance may need to be formally reviewed, or publicly released to assist applicants. This need is further exemplified by this investigation that found that for just under half of the sample of consents, the applicant was asked to provide further information (under section 92 of the RMA) in relation to the volume of water applied for. As more efficient use

[112] Under British common law, naturally flowing freshwater is treated as a public good and is not owned by anyone. While this is still the legal position in New Zealand today, there is an unresolved issue as to Māori rights to freshwater. The courts have established that the introduction of common law to New Zealand from England did not extinguish Māori customary title meaning that customary titles held by Māori, prior to the assertion of British Sovereignty in 1840, will continue to exist unless it has been lawfully extinguished. Regarding resource management, Māori rights and interests continue to be a matter of dispute and are largely unresolved (Environment Foundation 2021).

reports are submitted to the council, the information included in this report could be used to support the iterative improvement of this guidance.

Further guidance would support high-quality decision making, the effective implementation of the AUP and would also support efficient consenting. Improved clarity and guidance about efficient allocation is also closely linked to the need to phase out over-allocation. In these over-allocated waterbodies it is inevitable that allocations will have to be reduced, and clear direction about efficiency will be needed to support these decisions. Moreover, as the climate changes and water scarcity become an increasing issue, efficient allocation is only going to become increasingly important.

The lack of guidance to support the implementation of the AUP is an issue that spans across many of the indicators relating to water allocation, and it is an issue that has been identified by technical staff in the past. At present there is no publicly available guidance relating to the take and use of water (except for activities relating to dewatering and the diversion of water). Examples of other regional councils that have released comprehensive guidance to support consenting are Bay of Plenty Regional Council (2018) and Horizons Regional Council (2021).

The requirement for consent holders to meter water takes and report readings to the council provides the council with the opportunity to assess the meter readings to ensure that water usage is within consented allocations, and to understand whether water has been allocated efficiently. Currently, this requirement can either be included through a condition of consent, or as required by the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010[113].

Auckland Council makes use of the Water Use Data Management System (WUDMS) to collect water meter data. Meter data can also be emailed to the council in various formats (for example as PDF files, or scans of handwritten documents); however this is not the preferred method[114]. To function as intended, WUDMS must communicate with the consent records system, however with the introduction of a new consent records system in 2017, the functionality of these systems has been significantly reduced.

This has led to a decline in the compliance rate for meter readings. While in the 2012-2013 hydrological year 86 per cent of consent holders returned their quarterly meter readings (Stansfield, 2015), for the period between 1 September - November 2021 25 per cent of consent holders returned their quarterly meter returns[115] The known difficulties with the database and lack of functionality is preventing the council from meeting its statutory responsibilities to collect meter readings under the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010.

In addition, at present, the council is unable to report the level of compliance by water body. There are a number of issues with the systems used to record and report meter readings. In the case of groundwater, the council database does not collect data on the aquifer from which

[113] These regulations were amended in 2020 to require that holders of resource consents that allow taking fresh water at a rate of 5 litres per second or more, must: measure their water use every 15 minutes, store their records and electronically submit their records to their regional council every day, or as instructed by their regional council.

[114] Consents granted in recent years have conditions that specifically require the use of WUDMS, however older consents that have not been reviews do not specify that this system must be used.

[115] This data is unpublished. A Senior Environmental Data Specialist undertook an assessment of water meter readings to determine the level of compliance.

the water is extracted (with the exception of the information embedded in PDF documents on the database). None of the approximately 1100 meter readings received electronically can be linked back to the water body from which they are taken, except through manual lookup at the consent level. This results in a prohibitively complex process of tracking compliance. While this manual process could be undertaken as consents are renewed, for the purpose of this investigation meter readings could not be analysed.

3.4.8.5 Indicator 5: Water is used efficiently

The AUP promotes the efficient use of water, water that is allocated for a specific purpose and is used by the consent holder efficiently. The primary way in which the intent of this policy is implemented is through conditions of consent that require efficient use reporting and the metering and reporting of takes. Since the AUP was made operative, these conditions of consent have largely been included in groundwater and surface water consents, however the compliance with these conditions is not well understood. Moreover, there is confusion from consent holders about how efficiency reports should be written and what must be included. There is a need to provide guidance to consent holders to ensure they are able to easily write the reports, the reports contain the necessary information, in the necessary format and it is a simple process. It is considered that the AUP is being somewhat effective in promoting the efficient use of freshwater water given the requirement for efficient use reporting, however the compliance with the requirement for reporting (and therefore the known level of water use efficiency) is not clear.

Efficient use reports are not required as a condition of consent for geothermal water consents, nor are conditions of consent included that require consent holders to report steps to improve water conservation. As such, while the council may be effective in allocating geothermal water, there is no evidence that the efficient use of this water is being promoted.

There is an opportunity for efficient use reporting to be better managed and for the information to be utilised to inform robust decision making, particularly in ensuring water is allocated efficiently.

3.4.8.6 Indicator 6: The relevant overlays provide the appropriate level of protection for waterbodies

3.4.8.6.1 Wetland Management Areas Overlay

The effectiveness and efficiency of the wetland management area (WMA) overlay (which protects regionally significant wetlands), as it relates to water allocation, could not be fully assessed. No consents have been granted for activities taking place in the overlay under the water take rules that have a more restrictive activity status in the wetland management area overlay than in other areas (rules A1-8, A17, and A21). Analysis was not undertaken to understand how many of the consents granted for discretionary activities under the E7 were in the overlay.

The overlay represents ‘significant’ wetlands using points, rather than polygons to delineate the extent of the wetland. While the boundary of the wetlands is then shown on another layer in Geomaps, the usability of the overlay is compromised by this approach as the area to which the rules apply is not clear. The implications of this are that the effectiveness of the overlay in protecting the values of these wetlands may be undermined and the efficiency of the plan may be reduced. As there are many activities in E7 that are permitted across the region, except for in the WMA overlay (A1-5, A17, A19, A27, A36-A39), this overlay needs to be clear and easily used by the public. For activities that require consent across the region, while the WMA overlay may offer more protection, the specific values in the area and the likely adverse effects are considered on a case-by-case basis for the activity. Wetlands have recently been recognised through the 'Essential Freshwater' package as needing to be protected, and both the NPS-FM and the National Environmental Standards for Freshwater (NES-FW) have raised the requirements to manage wetlands. While the WMA overlay manages wetlands in Auckland that have been identified as 'significant', the NES-FW requires stringent management of activities occurring in (and in close proximity of) *all* natural wetlands. Therefore, the NES-FW applies to a much larger number of wetlands than the WMA overlay. A full assessment of the rules needs to be undertaken to understand which are most stringent and therefore which prevails. However, at the time of writing, the government is considering further amendments to the NES-FW provisions applying to wetlands, and this exercise will be completed once the new provisions are clear. In relation to the take and use of water within 100m of a wetland, the NES-FW provides for this in relation to a list of specified activities [116], and the take and use of water for any other reason is a non-complying activity (which is more stringent than the AUP). It is likely a full analysis of the WMA overlay will need to be undertaken outside of this monitoring process to determine whether it still fit for purpose in light of the new national regulations, and whether it is necessary for the management of water takes.

3.4.8.6.2 Natural Stream Management Area Overlay

Conclusions could not be drawn about the effectiveness of the Natural Stream Management Area Overlay as it relates to water allocation. The assessment of consents showed that the overlay was not explicitly considered in the one consent granted for the take and use of surface water within the overlay. While this may not have resulted in the activity compromising the values of the stream, the added value of the overlay in ensuring the protection of the identified values is not clear.

3.4.8.6.3 High Use Aquifer Management Areas Overlay

The High Use Aquifer Management Areas (HUAMA) overlay has not achieved the outcomes intended. Chapter D1 High-use Aquifer Management Areas Overlay includes objectives and policies to manage aquifers identified as HUAMA. The objectives and policies reiterate aquifers should be managed such that they meet existing and future water take demands and provide base flow for surface streams, and that proposals should be managed to prevent groundwater allocation exceeding availability.

The management approach of the overlay provides very minimal further protection of high-use water bodies and does little above and beyond the basic approach of the plan to ensure

[116] Restoration, scientific research, construction and maintenance of wetland utility structures, construction, maintenance and operation of specified infrastructure and natural hazard works

existing and future water take demands are met. The only aspect of the overlay that directs water allocation should be more rigorous is policy D1.3(2) that clearly states all takes (except Section 14(3)(b) takes) should require consent:

> *Require resource consents for all proposals to take and use water from the High Use Aquifer Management Areas in Table D1.3.1 (other than takes permitted by section 14(3)(b) of the Resource Management Act 1991) to assess the impacts of the proposal on water availability levels and to take account of new information on water availability as it becomes available.*

However, the rules in chapter E7 are not in alignment with this policy, as rule E7.4.1(A14) provides for permitted activities in HUAMA (with the exception of the Omaha Waitematā aquifer). Therefore, policy D1.3(2) cannot be effective.

Policy D1.3(1) reiterates HUAMA should be managed within the availabilities and allocations should not exceed availabilities. The AUP has not been effective in achieving this as 18 per cent of the waterbodies identified as HUAMA are currently over-allocated.

The objectives and policies that relate to HUAMA do not require any further management in relation to efficient allocation or efficient use. The efficient allocation of water and subsequent efficient use of water are critical in ensuring water bodies are able to continue to meet existing and future demand.

The approach to identifying water bodies as high use has not been effective. The findings of this analysis show there are a number of waterbodies that are more recently or currently over-allocated that are not included in the overlay. In contrast, there are large proportion of waterbodies classified as HUAMA that are not in fact high use and have less than 50 per cent allocation. While the plan sought to protect waterbodies that were likely to become highly allocated in the lifetime of the plan, the erroneous categorisation of low use waterbodies as high use as the potential to be causing inefficiencies as less water is allowed to be taken without consent, resulting in undue costs being put on the public to take and use water from these waterbodies.

3.4.8.6.4 High Use Stream Management Area Overlay

Very few conclusions can be drawn about whether the High Use Stream Management Area overlay is achieving the outcomes sought. As there is no surface water accounting tool, an assessment of whether the overlay accurately captures all high use streams could not be undertaken.

The rule categories are more stringent for activities taking place in high use streams, providing the council with greater ability to manage activities. However, as with the HUAMA overlay, the approach of the HUSMA overlay to allocation does not differ significantly from that of non-high use streams. There are no increased requirements of applicants to demonstrate their demand requirements, nor are there requirements to increase efficient use.

3.4.8.7 Indicator 7: The take and use of groundwater is promoted over surface water

Since the AUP was made operative, the vast majority of consented water takes have been for the take and use of groundwater, rather than for surface water. The RPS directs the taking of groundwater should be promoted over the taking of water from rivers and streams in areas where groundwater is available for allocation. However, in the regional plan provisions, the intent of this policy is included only in policy E2.3(8) as a matter for consideration where significant adverse effects and the policy direction is not reflected in the rules in E7[117]. Therefore, while the intent of the policy may be being realised, this has not been achieved through strong policy in the regional provisions.

It is likely the disparity between the number of surface water and groundwater consents is due to the perception that Auckland's groundwater sources are a reliable source of clean water all year round and Auckland's streams and rivers are less reliable sources of water or they are of varied quality. Auckland has many small streams that are not suitable for consistent year-round supply of water. This is also reflected in the total number of active consents, with there being approximately 200 surface water consents and 1200 groundwater consents.

It is noteworthy to mention that to extract groundwater, a bore must be drilled. This requires a consent (separate from the consent to take groundwater). Bores must be drilled to strict standards by a professional driller.

3.5 Recommendations

The following sections detail recommendations that have been developed in response to the assessment of efficiency and effectiveness of the AUP. The recommendations are assigned into the categories described in section 1.6[118]

Most of the recommendations are likely to be addressed through the implementation of the NPS-FM (the specific implications of the NPS-FM on water allocation are discussed further in section 3.6).

There are a number of common themes across all indicators:

- The first is that there is a need for improved management of water quantity data. The accurate, transparent, and responsive management of water allocation and water use data is of the utmost importance to sound and robust decision making and is critical to achieve sustainable management.
- There is also a need for greater guidance for the implementation of the plan. Although guidance does not have legal weighting unless referenced in the plan, publicly available practice and guidance notes as well as internal guidance for staff can support implementation of the AUP and ensure that the objectives of the RPS are being realised. The lack of guidance to support the implementation of the AUP is an issue

[117] Policy E2.3(8) directs that where there are significant adverse effects mitigation options should be considered including consideration of alternative locations, rates and timing of takes for both surface water and groundwater and use of alternative water supplies.
[118] These recommendations will need to be tested fully through an RMA Section 32 assessment, be considered alongside other recommendations from other topics and the Plans & Places Department work programme

that spans across many of the indicators relating to water allocation, and it is an issue that has been identified by technical staff in the past

3.5.1 Indicator 1: Limits are set that protect the values of water bodies

The relationship between availabilities and limits should be clearly explained in the AUP to ensure that plan users understand the intention that availabilities function as limits (category: NPS-FM).

3.1 A practice note should be developed that details the criteria that are used to establish and change availabilities to ensure that that they are reasonably justifiable (methodology and assumptions) and sufficiently peer reviewed. (category: process)

3.1 Water availabilities should be made more transparent and easily accessible to the public. This could be undertaken by either a) adding further availabilities to the AUP as was intended when the AUP was written or b) by making the availabilities accessible online (category: NPS-FM).

3.2 The two updated availabilities in the AUP that have been superseded through the consenting process should be amended (category: NPS-FM).

3.3 The values for Auckland's water as they relate to water quantity should be better defined. That is indicators need to be identified to provide greater direction of the values that are to be maintained and protected through the process of setting limits. (category: NPS-FM).

3.4 There is a need to develop an approach to ensure that in times of low flow the take and use of water is reduced or ceased as per conditions of consent. Specifically:

3.5 The AUP needs to be strengthened to be more directive regarding water availability, limits and the ceasing or reducing of water takes during times of low flow. With regard to the implementation of the plan, water restriction in times of low flow must be better managed, such that instream values are protected year-round (category: NPS-FM).

3.6 There is a need to develop a council approach which establishes clear roles and responsibilities of relevant departments, an approach to data management, record keeping and compliance, a method that will be used to reduce takes and a communication and engagement plan to ensure water users are aware of the approach (category: process).

3.5.2 Indicator 2: Water is allocated to be taken and used within the limits

Preventing further over-allocation

3.7 Further work should be undertaken to ensure further over-allocation does not occur in the future (category: NPS-FM).

3.8 Data management must be improved, and a freshwater accounting system should be improved. (category: process).

3.9 The plan should be strengthened the regional rules to ensure over-allocation by consent cannot occur in the future (consider removing permitted activities and introduce non-complying or prohibited activities for fully allocated water bodies) (category: NPS-FM).

Phasing out existing over-allocation

3.10 Phase out existing over-allocation to ensure all water bodies are allocated within limits (category: process and NPS-FM). A clear and agreed process/strategy must be developed which includes the following steps:

(a) improvement of data management to ensure over-allocation information is accurate.

(b) validation and ground truthing of permitted activity takes and section 14(3(b) takes to ensure that the council's accounting of these takes is accurate.

(c) further investigations into water availabilities to ensure that the current knowledge is the best available, and that phasing out over-allocation is defensible.

(d) develop a strategy for the approach that will be used to reduce allocations to progressively phase out over-allocation.

Dewatering and diversion

3.11 The rules as they are relative to dewatering and diversion need to be amended through a plan change so that they are fit for purpose and so that consent is only required when justified (category: NPS-FM related).

3.12 Amend the standards for rule E7.4.1(A17) such that permanent dewatering is allowed as a permitted activity (category: NPS-FM related). There are several options available to adequately manage this activity:

a) Delete standard E7.6.1.6. (3) and the words "or 30 days in other types of soil or rock; and" from E7.6.1.6. (2). This would allow for permanent subsoil drainage as a permitted activity under this rule in all areas other than peat soils, where the current controls would still remain.

b) Include a standard that limits the volume of the water that can be taken over any given period of time (again noting the volumes currently permitted under rules E7.4.1 (A14) and (A15) are likely to be substantially greater than those from retaining walls and around basements).

c) Include a standard that permits dewatering to a certain depth of drainage, or of a specific volume[119].

[119] This approach is similar to the approach that was utilised in the Air, Land and Water Plan. The rules in the ALW Plan aimed to allow diversion and dewatering of groundwater in circumstances that were unlikely to cause any significant adverse environmental effects without requiring a resource consent and require a resource consent in all other circumstances. It is important to note that the interpretation of the rules was complicated and required a detailed hydrogeological, and these issues would need to be addressed if a similar approach was adopted. These issues were discussed at length by Neilson (2015) in his evidence on behalf of Auckland Council for the AUP.

3.13 Provision needs to be made for minor dewatering to take place in the absence of groundwater diversion as a permitted activity (category: NPS-FM related).

3.14 Include a definition in the AUP for 'natural groundwater level'. Speight and Wansborne (2021) recommend the definition should be 'The phreatic surface, where the pore pressure in the soil is equal to or greater atmospheric pressure, and below which a hydrostatic pressure profile exists with depth. This includes 'perched groundwater levels' where the geological setting permits the presence of such (category: NPS-FM related).

3.15 Include a definition in the AUP for 'dewatering' (category: NPS-FM related).

3.16 Amend the definition in the AUP for 'groundwater diversion' so that it is more explicit. Specifically, the definition needs to be clearly state there is no removal of groundwater associated with the activity. For example, in a situation where water is pumped outside of an excavation or discharged to anywhere other than the aquifer where it came from (via any method including gravity), then the activity is no longer a diversion (category: NPS-FM related).

3.5.3 Indicator 3: Water allocation allows Aucklanders to provide for their social, economic and cultural purposes

3.17 Consider how information could be collected to better assess whether social, economic and cultural needs are being met, or are being affected, through the allocation of water (category: further investigation).

3.5.4 Indicator 4: Water is allocated efficiently

3.18 Revise and improve the approach for 'efficient allocation' for the Auckland region and update the AUP to ensure the plan is clear and directive (category: NPS-FM).

3.19 Produce guidance to support allocation decision making. As a minimum, this guidance should address the expectation of the way in which water is to be allocated in the Auckland region, how climatic variability should be considered and incorporated and how water demand could/should be calculated. The Water Allocation Specialist Input teams unpublished best practice guide should be used as a basis (category: process).

3.20 Investigate opportunities that would allow metering and reporting data to be better used to support consenting and allocation decision making (category: process).

3.5.5 Indicator 5: Water is used efficiently

3.21 Undertake work to better define, measure and monitor the efficient use of freshwater. Develop guidance for consent holders to ensure that the correct information is being submitted (category: process).

3.22 Develop an approach to encourage and promote the efficient use of geothermal water (consider requiring efficient use reports and the inclusion of conditions of consent requiring consent holders to report steps to improve water conservation) (category: process).

3.23 Develop an improved data management approach for the data collected through efficient use reports. The data submitted to the council has the potential to be very valuable for consent decision making, the development of guidance topics and for the development of the NPS-FM plan change (category: process).

3.24 Compliance with the requirement to meter water takes and report meter readings to the council must be improved (for the period between 1 September - November 2021 only 25 per cent of consent holders returned their quarterly meter returns) (category: process).

3.25 System improvements should be made such that the council is able to report the level of compliance by water body (category: process).

3.5.6 Indicator 6: The relevant overlays provide the appropriate level of protection for waterbodies

3.26 A full analysis of the WMA overlay needs be undertaken to determine whether it still fit for purpose for the management of the take and use of water in wetlands (category: NES-F).

3.27 Once the surface water accounting tool is developed, an assessment should be undertaken to determine whether all high use streams are captured by the overlay (category: process and NPS-FM).

3.28 Consideration should be given as to whether overlays are the most appropriate mechanism for the management of high-use water bodies. The overlays are static and do not have the ability to respond to rapid changes in water demand (category: NPS-FM).

Alternatives to the current overlays include:

- establishing trigger levels that move a stream or aquifer into the high-use category, e.g. 70% allocation (noting that this (and any other solution) requires fit-for-purpose accounting systems
- non-statutory layer that is more readily updatable. This could be updated five yearly in line with the state of the environment reporting. Regardless of whether the overlays are deemed the most appropriate approach to managing high use waterbodies, further consideration should be given to whether the requirements in relation to efficient allocation and use of water in high use water bodies need to be raised (category: NPS-FM).

If the high-use aquifer and stream overlays are deemed to be the most appropriate method to manage high-use waterbodies, there is a need to clearly define ‘high-use stream’ and ‘high-use aquifer’ in the AUP.

•

3.5.7 Indicator 7: The take and use of groundwater is promoted over surface water

3.29 The RPS policy relating to this needs to be better reflected in Chapters E2 and E7 (category: NPS-FM related).

3.30 Further consideration should be given to whether alternative water sources should be considered more broadly than only where there are significant adverse effects as a result of an application (category: Process)

3.6 Future change under the NPS-FM

The NPS-FM policy 11 directs that freshwater is allocated and used efficiently, all existing over-allocation is phased out, and future over-allocation is avoided. The approach the AUP takes to manage water allocation needs to be fully assessed to understand whether it will meet the requirements of the NPS-FM. Specifically, an assessment needs to be undertaken to understand whether the management approach will successfully prevent future over-allocation, and whether the plan is clear enough to direct how over-allocation should be phased out.

From this assessment of the efficiency and effectiveness of the AUP there are number of specific implications for the NPS-FM implementation process that have been identified. These are explained briefly below.

3.6.1 Setting take limits under the NPS-FM

Clause 3.17(2) of the NPS-FM requires take limits be included in the plan in the form of a volume, rate or both. Although not tested in law, it is unlikely the current approach in the AUP to setting ‘guidelines’ that are used to establish availabilities through consenting will meet these requirements. The NPS-FM directs take limits must:

(a) provide for flow or level variability that meets the needs of the relevant water body and connected water bodies, and their associated ecosystems; and

(b) safeguard ecosystem health from the effects of the take limit on the frequency and duration of lowered flows or levels; and

(c) provide for the life cycle needs of aquatic life; and

(d) take into account the environmental outcomes applying to relevant water bodies and any connected water bodies (such as aquifers and downstream surface water bodies), whether in the same or another region.

In addition, the council must identify flows and levels at which the take and use of water will be restricted or no longer allowed (clause 3.17(3)).

There is further work required to understand how clause 1.6 'best information' of the NPS-FM relates to take limits, and how limits are to be set in cases where there is an absence of complete and scientifically robust data. The NPS-FM is also directive that water take limits must be set to protect instream values.

The NPS-FM requires take limits be expressed as a rule in the plan. Under section 128(1)(b) of the RMA (which provides for consent conditions be reviewed where the regional plan contains an operative rule that relates to maximum or minimum levels or flows or rates of use of water) existing consented allocations could be reviewed. This will ensure flows and levels are adequate and in turn values are protected, and environmental outcomes achieved.

3.6.2 Efficient allocation under the NPS-FM.

The NPS-FM 2020 (as well as the 2014 and 2017 NPS-FM) requires regional councils improved and maximise efficient allocation. Specifically, the NPS-FM states:

> 3.28 (1) Every regional council must make or change its regional plan(s) to include criteria for:
>
> > (b) deciding how to improve and maximise the efficient allocation of water (which includes economic, technical, and dynamic efficiency).

At present, the plan promotes efficient allocation, but is silent on how efficient allocation should be improved and maximized over time.

The NPS-FM suggests three key components of efficient allocation are economics, technical and dynamic efficiency:

- Economic efficiency (also known as allocative efficiency): allocating water to enable optimum economic outcomes (e.g., allocating water to the uses which have the highest value to society).
- Technical efficiency: maximising the proportion of water beneficially used in relation to that taken. It relates to the performance of a water use system, including avoiding water wastage.
- Dynamic efficiency: adjusting the use of water over time to maintain or achieve allocative efficiency (e.g., enabling movement of allocated water and minimising the transaction costs for doing so).

As the AUP has not been written (nor changed) to give effect to any of the NPSs for freshwater management, it is not fully in alignment with central government direction on efficient allocation. Specifically, economic efficiency is not a consideration in the way in which water is allocated in Auckland. While the plan does promote technical efficiency and dynamic efficiency to a certain extent, whether it improves and maximises it still needs to be determined.

3.6.3 Development of a freshwater accounting system

The NPS-FM 2020 (and its predecessors) clearly set the requirement for regional councils to develop a water quantity accounting system. MfE have also developed guidance to support councils in the development of accounting systems (Ministry for the Environment, 2015b) The current system, and the subsequent level of data quality, does not meet the requirements. Further direction setting regarding longer term national water quantity accounting goals is being developed for consultation with regional councils by central government and will be released in the first half of 2022. This will provide discussion around how national and regional level accounting tools will work together going forward.

3.6.4 Water allocation, priorities and providing for wellbeing

The examination of the implementation of the AUP provisions has not indicated the allocation regime is impacting negatively on Aucklanders ability to take and use water to meet their social, cultural, economic needs, or their well-being and is not disadvantaging specific uses. However, through working with mana whenua, stakeholders and the wider community to implement the NPS-FM, it may be identified there is a need for a more directive allocation approach. While this is not a specific requirement of NPS-FM, it is a possible outcome of the implementation process.

4 Streams and wetlands

This chapter considers how effective and efficient the objectives, policies, and rules of the AUP have been in meeting the outcomes intended by the Regional Policy Statement (RPS) with respect to the loss and modification of freshwater systems. For the purpose of this topic, freshwater systems assessed include streams and wetlands, as only a limited number of resource consent applications affecting lakes have been granted under the AUP[120].

Streams and wetlands are addressed under section B7.3 of the RPS and Chapter E3 of the Auckland-wide provisions. As outlined in Chapter E3, while the RMA defines the term 'river' as including streams, the AUP refers to both 'rivers and streams'. Auckland has many small streams and a few larger rivers such as the Hoteo, Kaipara, Rangitopuni, and Wairoa rivers. This topic refers to 'rivers and streams' as 'streams' as it is a more common way of describing the smaller watercourses that are characteristic of Auckland and to recognise that streams are at greater threat of loss and modification. In this chapter 'wetlands' refers to wetlands that are part of freshwater systems and does not include any wetlands in the coastal marine area. Coastal wetlands will be considered in other s35 topics that relate to the coastal provisions of the AUP. This chapter considers consents granted under AUP chapter E3 which is marked as a regional plan provision and not as regional coastal plan.

Within the RPS, objective B7.3.1(2) seeks that the 'loss of freshwater systems is minimised'. Objective B7.3.1(3) seeks that the adverse effects of changes in land use on freshwater are avoided, remedied, or mitigated.

The relevant RPS policies are B7.3.2(3), (4), and (5), as set out in Appendix A. Of particular relevance is policy B7.3.2(4) which seeks that the permanent loss and significant modification or diversion of lakes, rivers, streams, and wetlands are avoided, unless in circumstances that satisfy the criteria set out in the policy:

> *(4) Avoid the permanent loss and significant modification or diversion of lakes, rivers, streams (excluding ephemeral streams), and wetlands and their margins, unless all of the following apply:*
>
> *(a) it is necessary to provide for:*
>
> > *the health and safety of communities; or*
> >
> > *the enhancement and restoration of freshwater systems and values; or*
> >
> > *the sustainable use of land and resources to provide for growth and development; or*
> >
> > *infrastructure;*
>
> *(b) no practicable alternative exists;*
>
> *(c) mitigation measures are implemented to address the adverse effects arising from the loss in freshwater system functions and values; and*

[120] One out of the 119 resource consent decisions analysed in detail involved works in a lake to replace an existing jetty.

(d) where adverse effects cannot be adequately mitigated, environmental benefits including on-site or off-site works are provided.

The rules that manage streams and wetlands are contained in Chapter E3. Rivers and streams are classified as permanent, intermittent, or ephemeral[121]. Resource consent is required for the reclamation of streams and wetlands, the diversion of streams, and new structures (including associated bed disturbance) affecting the bed of streams or wetlands. The requirements in relation to activities affecting streams only apply to permanent and intermittent streams. Resource consent is not required for activities affecting ephemeral streams.

Reclamation is defined in the AUP as the "*permanent filling of the coastal marine area or the bed of any lake, wetland, river or stream to create dry land*". It includes filling associated with the piping of a stream but excludes culverts parallel to the direction of water flow. The diversion of a stream is not defined in the AUP.

Chapter E3 also recognises that the natural values of rivers, streams and wetlands are higher in the following overlays (referred to as 'the relevant overlays' henceforth):

- D4 Natural Stream Management Areas Overlay
- D5 Natural Lake Management Areas Overlay
- D6 Urban Lake Management Areas Overlay
- D7 Water Supply Management Areas Overlay
- D8 Wetland Management Areas Overlay; and
- D9 Significant Ecological Areas (SEA) Overlay.

4.1 Indicators and measures

4.1.1 Indicators

The indicators, measures, and information sources for streams and wetlands are outlined in Table 4.1 below. Indicators 1 and 2 correspond to objective B7.3.1(2) and Indicators 3, 4, and 5 correspond to objective B7.3.1(3). Indicators have also been informed by the relevant RPS policies. The relationship between the indicators and the AUP objectives and policies is further detailed in Appendix C[122].

The information sources are further detailed in Section 4.2 below.

[121] Permanent, intermittent, and ephemeral rivers and streams are defined in AUP Chapter J1 Definitions.
[122] This topic does not address policy E3.3(13)(c) in relation to mana whenua values, as noted in Section 1.7.1.

Table 4.1 Indicators, measures, and key questions for the Streams and Wetlands topic.

Indicators	Measures	Information Sources
1. Extent of stream and wetland lost over time	• Consented extent of stream and wetland loss • The number of resource consents affecting streams and wetlands that have been granted under Chapter E3	Plans and Places resource consent database
2. Resource consent processes for works in, on, and over streams and wetlands protect the values of the waterways	• Whether resource consents granted under Chapter E3 demonstrate consideration of the relevant matters outlined in the AUP	Plans and Places resource consent database
3. Development is designed to retain streams and wetlands	• The number of resource consents affecting streams and wetlands in greenfield areas	Plans and Places resource consent database
4. Sediment is retained in stream banks and beds	• Whether resource consents granted under Chapter E3 demonstrate consideration of erosion and sediment effects • Trends for erosion scarring and the extent that stream bank erosion contributes to total sediment sources	Plans and Places resource consent database FWMT modelling Lignite catchment case study
5. Loss of streams resulting from permitted culvert activities	• Extent that permitted culvert activities are being undertaken	Auckland Council GIS

The AUP does not define the term 'minimise' in relation to achieving the direction in objective B7.3.1(2) that the 'loss of freshwater systems is minimised'. Having regard to policy B7.3.2(4), this objective has been interpreted to encompass reclamation being limited to only those instances where the parameters in policy B7.3.2(4) have been met. The consideration of the parameters within the resource consent process are included under indicator 2. The council's regulatory resource consent staff have advised that the term 'minimise' can also be interpreted to include reducing the extent of reclamation to the minimum extent necessary, while having regard to the parameters within policy B7.3.2(4). This interpretation acknowledges that the term 'minimise' anticipates some loss and has also been considered as part of the analysis for indicator 1.

An indicator identified under Chapter B11 for freshwater systems is that 'freshwater systems are maintained and enhanced over time'. For the purpose of this topic, the indicator has been adapted (indicator 1) to address the extent that streams and wetlands have been lost. The indicator measure is the extent of loss that has been consented. This indicator has been adapted as at the time of writing, limited information was available to quantify the extent that streams and wetlands have been maintained within Auckland since 2016.

With regard to indicator two, the AUP contains direction on various matters relevant to the consideration of stream and wetland loss. This analysis will address the following key matters:

Stream and wetland loss within the relevant overlays;
Effects on freshwater system values;
Offset actions;
The consideration of practicable alternatives to stream and/or wetland loss;
The necessity of the stream and/or wetland loss; and
The functional need or operational requirement of structures

Indicator three will address the resource consent process only, with a focus on greenfield areas as they present a greater opportunity than brownfield areas or infill development to design development in a manner that retains streams and wetlands. The management of freshwater systems as part of structure planning and plan change processes have been assessed separately under Section 12 Land use change in growth areas.

4.2 Data and information

Data and information sources for this topic include the Plans and Places resource consent database, Auckland Council GIS information, and various reports, case studies, and publications.

4.2.1 Plans and Places resource consents database

The extract period from the Plans and Places resource consent database for this topic is from November 2016 until March 2021. All resource consent decisions extracted were made prior to the AUP being updated in December 2020 to include the objectives required under the NPS-FM[123]. The methodology and limitations to this data source are set out in greater detail in section 1.5.1.

A total of 156 resource consent decisions were identified as relevant for analysis (Table 4.2). These resource consent decisions are associated with proposals for activities in Table E3.4.1 of the AUP that involve reclamation, diversion, or new structures that affect the bed of streams and wetlands, but do not result in their permanent loss. Activities not provided for within Table E3.4.1 and activities that infringed the applicable standards were also included[124]. Appendix F shows all of the rules for which consents were sourced from the Plans and Places resource consents database.

[123] See AUP modification schedule: https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/unitary-plan/auckland-unitary-plan-modifications/Documents/aup-modification-schedule-2020.pdf

[124] Activities were excluded where they were unlikely to result in the permanent loss or modification of streams and wetlands, including activities involving planting, depositing of substances, disturbance and associated sediment discharge, and works on lawfully established structures.

Table 4.2: Resource consent decisions identified from the Plans and Places resource consents database.

Consent type	Total no. of decisions identified	Date range of decisions issued
Reclamation and/or diversion	75	December 2016 – March 2020
New structures and other activities	44	January 2017 – August 2020
Not utilised	37	April 2017 – June 2020
TOTAL	156	

From the 156 identified resource consent decisions, 119 (76 per cent) were analysed in detail[125]. The numbers of resource consent granted under each rule are shown in Figure 4.1. Thirty-one resource consent applications required more than one consent under Chapter E3. Resource consent was most commonly required under rule E3.4.1(A49), "new reclamation or drainage, including filling over a piped stream" (non-complying activity). This is followed by E3.4.1(A44), for "any activities not complying with the general permitted activity standards", and E3.4.1 (A19), "diversion of a river or stream to a new course and associated disturbance and sediment discharge" (both discretionary outside of relevant overlays and non-complying within overlays).

[125] If the random sample calculator had been applied to determine a sample size from a population of 156 (as described in section 1.5.2), the sample would be between 22 consents (20% relative standard error) and 61 consents (10% relative standard error). The approach taken for this topic was to assess all of the relevant consents.

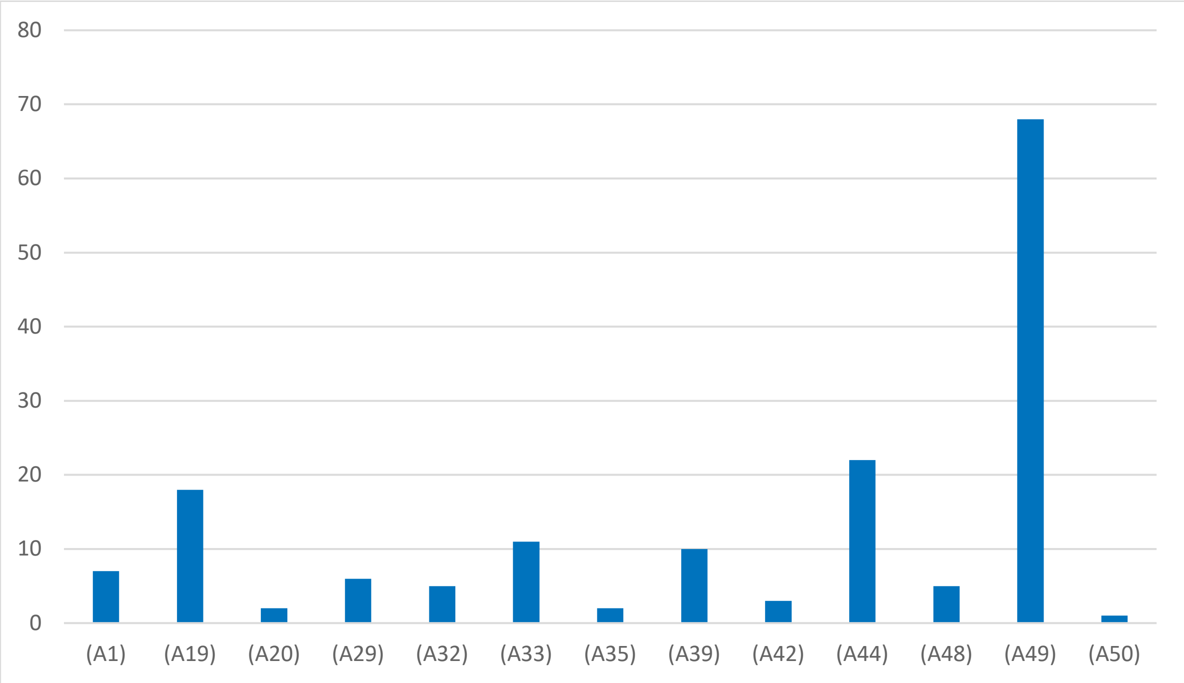

Figure 4.1 Numbers of resource consents granted under the rules in Table E3.4.1 Activity Table.

A total of 37 resource consent decisions were not included in the analysis for various reasons, including: a) the resource consent was processed under the Housing Supply and Special Housing Areas Act 2013 and PAUP provisions (8 recorded decisions), b) the relevant documents could not be located (20 recorded decisions), and c) the resource consent was not considered to be relevant to this analysis (e.g. retrospective works, emergency works, works affecting a manmade water body) (9 recorded decisions).

Documents analysed include the resource consent notification and decision reports, and the assessments by Resource Consent Department technical streamworks specialists where these could be located.

The analysis is limited to resource consents required under Chapter E3. All precinct provisions have been excluded, including where reclamation can be undertaken as a permitted activity[126]. It is also acknowledged that there may be inaccuracies with the manual analysis and input of data, particularly as the analysis fields are largely qualitative, addressing whether matters relevant to the indicators were assessed as part of the resource consent process and reflected in the documents analysed.

4.2.2 Auckland Council GIS

Auckland Council GIS data was utilised to quantify the combined length of vested culverts that are less than 30m in length. Thirty metres corresponds to the length that can be constructed

[126] At the time of writing, certain reclamation and piping activities are permitted in the Auckland Airport, Long Bay, and Puhinui precincts. Some of these provisions will be replaced by the NES Freshwater 2020, where the reclamation of rivers is a discretionary activity under Regulation 57.

as a permitted activity under rule E3.4.1(A32), where the culvert is located outside of the relevant overlays. The council's GIS data is updated on a daily basis following the receipt of as-built engineering plans. The data is limited to culverts that vest to the council or Auckland Transport, as current regulatory processes do not require details of privately owned infrastructure to be provided.

Complete information on privately owned culverts was not readily available within the Plans and Places resource consent database due to the permitted activity status. While some culverts will be captured via permitted activity assessments when they form part of a wider resource consent application, these applications cannot be specifically identified in the Plans and Places resource consent database.

4.3 Findings and analysis

4.3.1 Indicator 1: Extent of stream and wetland lost over time

A total of 75 resource consent decisions relate to reclamation and/or diversion, as detailed in Table 4.3.

Table 4.3: Reclamation and diversion resource consent decisions analysed.

Consent type	No. of decisions identified	Percentage of decisions identified
Reclamation	55	73%
Diversion	2	3%
Reclamation and diversion	18	24%

All 75 analysed resource consent decisions were granted, with none being declined in the period December 2016 – March 2021. A total of 10,506 m of permanent stream, 9,609 m of intermittent stream, and 55,295 m^2 (5.5 ha) of wetland were consented to be reclaimed. A total of 4,147 m of permanent stream and 100 m of intermittent stream were consented to be diverted. A figure for the annual average for consented reclamation would not be representative as there is considerable variance between the consented extents in the period December 2016-March 2021, as shown below in Figure 4.2 and Figure 4.3.

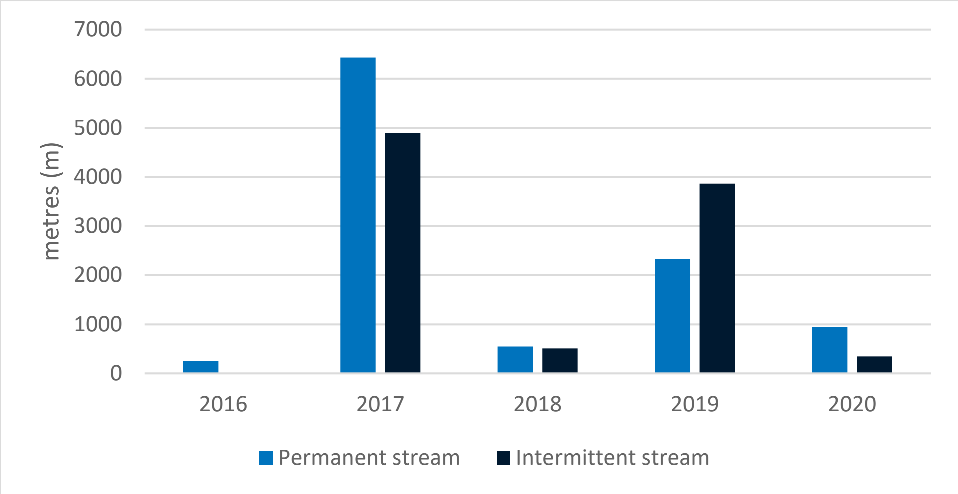

Figure 4.2 Consented extent of stream reclamation in the period December 2016 – March 2021 (note that the 2016 is only for one month).

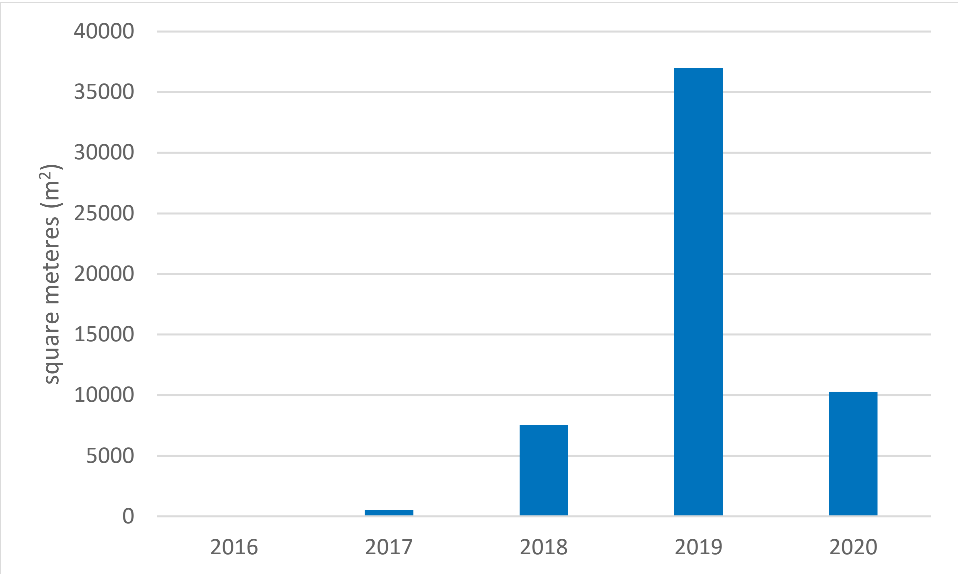

Figure 4.3: Annual consented extent of wetland reclamation in the period December 2016 – March 2021.

A total of 4,147 m of permanent stream and 100 m of intermittent stream were consented to be diverted.

The total length of streams in Auckland has been estimated at 16 650 km of permanent stream, and 4480 km of intermittent stream (Storey and Wadhwa 2009). Using those figures, the consented stream reclamation under the AUP was approximately 0.06% of the region's permanent streams and 0.2% of the intermittent streams.

A wetland mapping programme estimated in 2017 that Auckland has 5,980 ha of inland wetland (Lawrence and Bishop 2017: 16). This means the area of consented reclamation was approximately 0.09% of the region's wetlands.

It was not possible to compare the amount of reclamation and diversion with earlier time periods. The only similar analysis found was noted in ARC (2009: 47) as:

"Between 2000 and 2008, about 80 km of streams (an average of 8.9 km each year) were subject to a resource consent for stream disturbance"

The Air, Land and Water Plan only regulated activities in permanent streams (not intermittent streams), so a comparison can be made for the length of permanent streams that were reclaimed or diverted. This is a total of 14,653 m over 4.3 years under the AUP. This is 3408 m (3.4 km) consented stream loss and diversion per year. This appears to be a significant improvement under the Unitary Plan. However, this is not a valid comparison as the 2009 document refers to consents for 'stream disturbance'. This would include channel lining and works along the banks of streams. The AUP figure would need to also include the length of any stream disturbance associated with the 44 consents for new structures and other activities.

The eight individual resource consent decisions with the largest consented extent of reclamation and diversion are summarised in Table 4.4.

Table 4.4: Resource consents with the largest consented extent of reclamation and diversion.

Description of resource consent	Reclamation (permanent stream)	Reclamation (intermittent stream)	Reclamation (wetland)	Diversion (permanent stream)	Diversion (intermittent stream)
Largest extent of stream reclamation and diversion (greenfield residential activity)	5,763m	2,164m	-	3,513m	-
2nd largest extent of stream reclamation (greenfield residential activity)	-	1,778m	-	-	-
3rd largest extent of stream reclamation (private environmental restoration and landscaping activity)	1,764m	-	-	-	-
Largest extent of wetland reclamation (greenfield residential activity)	-	257m	29,280m^2	-	-
2nd largest extent of wetland reclamation (residential activity)	920m	-	9,164m^2	-	-
3rd largest extent of wetland reclamation (clean	-	80	5,388m^2	-	-

Description of resource consent	Reclamation (permanent stream)	Reclamation (intermittent stream)	Reclamation (wetland)	Diversion (permanent stream)	Diversion (intermittent stream)
fill or managed fill activity)					
2nd largest extent of stream diversion (quarry activity)	330m	-	500m^2	260m	-
3rd largest extent of stream diversion (infrastructure activity)	55m	-		250m	-

For seven of the reclamation decisions and 12 of the diversion decisions, the consented extent could not be identified in the documents analysed[127]. In one instance, the unknown extent of diversion was identified as being temporary.

A limitation of this analysis is that it excludes instances where the extent of reclamation or diversion was reduced through a pre-application meeting or the processing of the resource consent. Applications that have been withdrawn are also excluded. Had they been identifiable, these examples would have provided relevant information as to whether the AUP provisions had been effective in reducing the extent of reclamation through the resource consent process so that it is 'minimised' in terms of achieving objective B7.3.1(2).

All information presented relates to the consented extent of reclamation or diversion only. The figures do not represent whether the resource consent has been implemented.

4.3.2 Indicator 2: Resource consent processes for works in, on, and over streams and wetlands protect the values of the waterways

4.3.2.1 Stream and wetland loss within the relevant overlays

Policy E3.3(1) seeks that significant adverse effects are avoided within the relevant overlays. Of the 75 resource consents, a total of 26 resource consents (35 per cent) were granted for reclamation and/or diversion on sites that were subject to one or more of the relevant overlay areas (Table 4.5).

[127] A quantified extent is likely to have been provided as part of the resource consent process. The consented extent could not be located in instances where it was not specified in the notification and decision reports and the technical streamworks specialist assessment could not be located.

Table 4.5: Resource consents granted on sites that are located within the relevant overlays.

Overlay	No. of resource consents granted	Percentage of total resource consents granted
Natural Stream Management Areas and Significant Ecological Areas	3	4%
Wetland Management Areas and Significant Ecological Areas	1	1%
Significant Ecological Areas	22	29%

The Plans and Places resource consent database records whether the application site is located within an overlay. However, it does not detail whether the overlay applies to the entire site, or a part of the site. It has been estimated that approximately seven resource consents involved reclamation or diversion activities within mapped overlay areas. This was determined based on a desktop analysis of the resource consent documents, overlaps between the extent of mapped overlay areas and waterbodies within the council's GIS system, and whether the resource consent triggered other resource consent requirements in the relevant overlays. The estimated extent likely to have been consented within the relevant overlays is summarised in Table 4.6.

Table 4.6: Estimated extent of reclamation and diversion consented within the relevant overlays.

Overlay(s) applying to waterbodies consented to be reclaimed or diverted	Reclamation (permanent streams)	Reclamation (intermittent streams)	Reclamation (wetland)	Diversion (permanent streams)	Diversion (intermittent streams)
Natural Stream Management Areas and Significant Ecological Areas[128]	-	110m	-	-	-
Significant Ecological Areas	2,602m	171m	37m^2		-

4.3.2.2 Effects on freshwater system values

Policy B7.3.3(4)(c), objective E3.2(5), and policies E3.3(2)(a) and E3.3(5) seek to manage adverse effects on streams and wetlands[129].

128 In this case, both overlays applied to the application site.
129 Policies E3.3(17) and E3.3(18), which address the loss of extent of natural inland wetlands and the loss of river extent and values, were included in the AUP in December 2020, as required by the NPS-FM. As previously discussed, these policies did not apply at the time the resource consents analysed in detail were granted.

Of the 119 granted resource consents, 106 (89 per cent) identified that the actual and potential adverse effects of the work on freshwater system values would be appropriately managed. For streamworks and structures, effects were commonly managed through ensuring appropriate erosion and sediment controls were in place, works were carried out during dry periods, and that native fish capture and relocation plans were implemented where required. In the case of resource consent applications for reclamation, it was observed that adverse effects would be considered to be appropriately managed only once the positive effects of proposed offset actions had been taken into account.

While a high percentage of granted resource consents managed adverse effects on the affected water body, the cumulative effects of works affecting streams and wetlands could not be assessed as part of this analysis. The assessment of adverse effects when considering a resource consent application occurs on a case-by-case basis, and is predominantly on the impacted water body and its catchment. There are limited opportunities to assess cumulative effects.

4.3.2.3 Offset action

Chapters B7.3 and E3 of the AUP (E3.1 Introduction) require that permanent loss is minimised, and significant modification or diversion streams and wetlands are avoided. Where there are residual adverse effects, the AUP anticipates that they are offset by providing environmental benefits. However, offset actions are identified as inappropriate in instances where the existing natural values of waterbodies are high, and the policy framework identifies that such waterbodies be protected from degradation and permanent loss. Anticipated outcomes regarding offset actions are further detailed under objective E3.2(3), policy E3.3(4), and Appendix 8 Biodiversity Offsetting.

Of the 75 resource consents granted for reclamation and/or diversion, 72 (96 per cent) proposed offset action. Of the remaining three, two were associated with diversions only and in one instance, the council's reporting officers considered that an offset action was not required.

Though it was not specifically assessed as part of the resource consent decision analysis, it was observed that reporting documents generally did not discuss whether an offset action was an appropriate response. Detail of whether the proposed offset action would achieve the principles of 'no net loss', 'proximity' and 'like for like' were more commonly discussed.

With regard to ecological values, 31 (43 per cent) of the resource consents specifically identified that the proposed offset action would achieve no net loss or a net gain. Six (8 per cent) of the resource consents identified that there would be a net loss of ecological value. In one of these instances, it was identified that the wording of 'preferably' achieving no net loss is not a mandatory requirement, and that policy E3.3(4) does not provide more or less weighting to each of the outcomes sought (like for like, proximity, and no net loss). It was also considered that the policy was not strongly directive. For 35 (49 per cent) of the resource consents, discussion on the ecological value of the offset could not be located in the documents that were analysed, though 17 of these 35 included discussions on the type of offset action proposed.

The most common offset action was planting or riparian planting, which was proposed in 42 (60 per cent) applications. Other proposed offset or compensation actions include the construction of wetlands, stream daylighting, weed and pest management, and stock-proof fencing.

Of the 44 resource consents granted for structures and other activities, three included offset actions that were assessed to achieve no net loss of ecological value. In these instances, resource consent was required under rules E3.4.1(A33) and E3.4.1(A44)[130].

As previously discussed, the AUP recognises that offset action can be an appropriate means of addressing significant residual adverse effects. Stream length offset to loss ratios are prescribed in Technical Report 2011/009: Stream Ecological Valuation (SEV): a method for assessing the ecological functions of Auckland Streams. This report is included in Chapter E3 as a document to reference when considering restoration and enhancement actions. A recent study of 62 offset sites consented within the Auckland Region between 2008-2018 (where 26 are likely to have been consented under the AUP) found that many offset sites were not on trajectory to achieve no net loss. This has been attributed to low ratios of stream length offset to loss and insufficient conditions of consent addressing a) the ongoing monitoring of ecological values and b) the protection of offset sites in perpetuity from future degradation (Price, 2019: 30-31, 99).

Finally, it has been noted by staff within the council's Healthy Waters department that there are projects where it is unclear whether an offset will be required. The Healthy Waters department often undertake works in the stream corridor that are aimed at improving stream health and/or public safety. Works can include the construction of retaining walls and embankments, installation of rip rap, and the upgrade of stormwater outlets. The works undertaken by Healthy Waters differ to that of private landowners as they are primarily maintenance, repair, or upgrade works addressing existing issues such as streambank erosion.

While the AUP provides for most of these activities as permitted activities, resource consent can be required under rule E3.4.1(A44) if there is an infringement to the relevant standards. Where a resource consent is required, the potential adverse effects on freshwater ecological values are quantified having regard to the potential value of the stream. This can result in the proposed works being assessed through the resource consent process as reducing freshwater ecosystem values, despite the proposal being aimed at improving the existing condition of the stream. Residual adverse effects that cannot be sufficiently mitigated are then required to be offset. It has been found that the requirement for offset action substantially increases the consenting timeframes and costs for these projects.

4.3.2.4 Practicable alternatives

Policies B7.3.2(4)(b) and E3.3.13(a) both seek to avoid reclamation unless no practicable alternatives exist. Of the 75 resource consents granted for reclamation and diversion, 48 (66 per cent) identified whether practicable alternatives had been considered. The assessment of practicable alternatives varied between applications. Rationale provided to demonstrate this parameter includes consideration of alternative site layouts or efforts made to retain other streams and/or wetlands within the application site. Giving effect to the purpose of residential or special purpose zones was also commonly cited as reasons why there were no practicable

[130] Rule E3.4.1(A33) applies to culverts or fords more than 30m in length and rule E3.4.1(A44) is any activity not complying with the relevant standards.

alternatives to stream or wetland loss. This approach indicates that providing for the zoning prevails over the Auckland-wide rule when both parts of the plan should apply.

In nine instances (12 per cent), it was identified that the proposal had not demonstrated consistency with the relevant Chapter E3 objectives and policies regarding practicable alternatives. All nine resource consents were granted when considered on balance with wider AUP provisions, including those which address the accommodation of urban growth.

4.3.2.5 Necessity

Policy B7.3.2(4)(a) seeks to avoid reclamation unless the works are necessary for:

the health and safety of communities; or

the enhancement and restoration of freshwater systems and values; or

the sustainable use of land and resources to provide for growth and development; or

infrastructure;

Similarly, E3.3.13(b) seeks to avoid the reclamation of permanent streams and wetlands unless the works are necessary:

as part of an activity designed to restore or enhance the natural values of any lake, river, stream or wetland, any adjacent area of indigenous vegetation or habitats of indigenous fauna;

for the operation, use, maintenance, repair, development or upgrade of infrastructure; or

to undertake mineral extraction activities;

Of the 75 resource consents granted for reclamation and diversion, only five (7 per cent) specifically identified a relevant matter under B7.3.2(4)(a). Three related to '(iv) infrastructure' and two for '(iii) providing for growth and development'. The results highlight that in 93 per cent of resource consent decisions analysed, there was no evidence that an assessment had been made against the necessity of the proposed reclamation against the activities identified in the policy. No specific references to policy E3.3.13(b) were made.

4.3.2.6 Functional or operational need

Policies B7.3.5(c) seeks that structures in, on, under or over the bed of a stream or wetland have a functional need or operational requirement to be in that location. Similarly, objective E3.2(4) recognises that such structures are to be provided for where there is a "functional or operational need". The AUP defines functional need as "the need for a proposal or activity to traverse, locate or operate in a particular environment because it can only occur in that environment". Operational need is defined as "the need for a proposal or activity to traverse, locate or operate in a particular environment because of technical or operational characteristics or constraints."

Of the 44 resource consent decisions for new structures and other activities, 35 relate to new permanent structures. Of these, seven (20 per cent) specifically referred to a functional or operational need, while eight others (22 per cent) included general discussion on the purpose or need for the proposed works. While there were no prominent trends in the rationale provided, 12 of the 15 resource consents were associated with infrastructure works.

4.3.3 Indicator 3: Development is designed to retain streams and wetlands

A total of 38 (51 per cent) of the 75 reclamation and/or diversion resource consents were associated with greenfield sites. Of the 38 greenfield sites, 34 were associated with a residential activity.

Reclamation and diversion resource consents most commonly occurred in the Residential Mixed Housing Suburban and Residential Mixed Housing Urban zones (Figure 4.4). Activities in rural zones were the second most common.

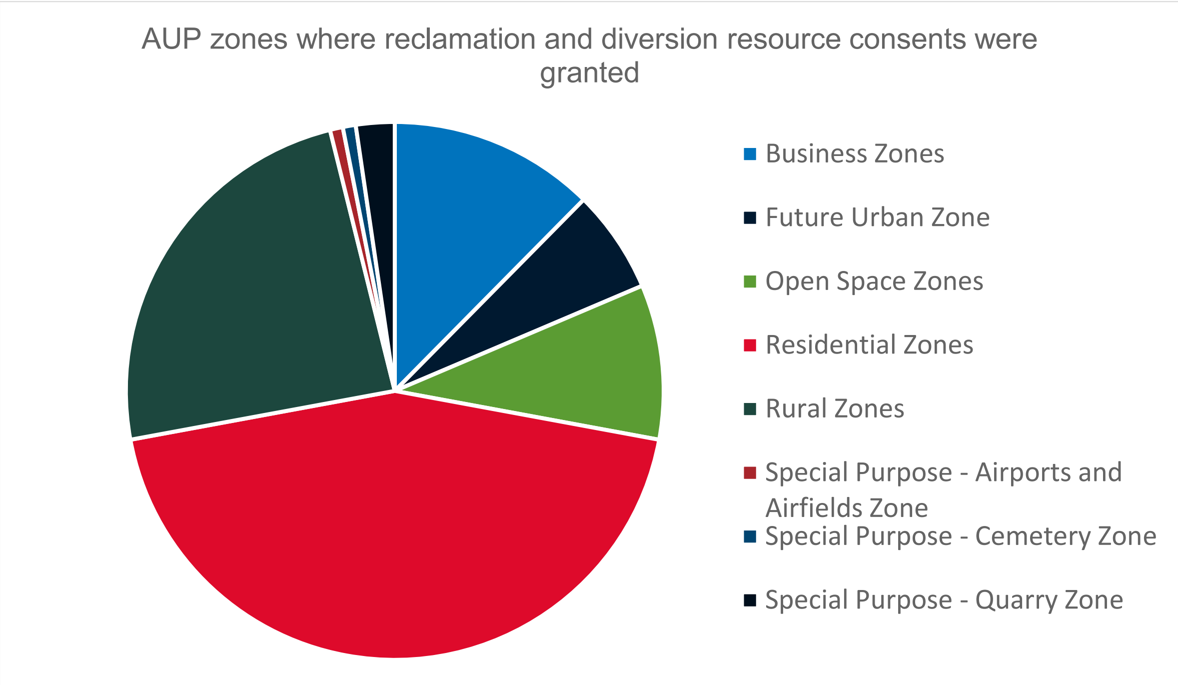

Figure 4.4: AUP zones where reclamation and diversion resource consents were granted.

Of the 34 resource consents associated with greenfield residential activities, the reclamation of streams and wetland account for an estimated 72 per cent and 80 per cent of the consented totals for reclamation respectively. The diversion of streams account for 85 per cent of the consented total.

Of the eight consents outlined in Table 4.4, three were associated with greenfield residential activities. These three resource consent decisions account for the largest extent of stream reclamation and diversion, the second largest extent of stream diversion, and the largest extent of wetland reclamation within all resource consents analysed.

4.3.4 Indicator 4: Sediment is retained in stream banks and beds

Policy B7.3.2(5)(b) requires that subdivision, use, and development including discharges and activities in the beds of lakes, rivers, streams, and in wetlands, are managed to minimise erosion and modification of the beds and banks of streams and wetlands. Of the 119 granted resource consents which were analysed in detail, 73 (61 per cent) identified that the proposed streamworks would appropriately manage actual and potential effects associated with erosion and sediment. Similar to freshwater system values, the resource consent process includes an assessment that is predominantly focused on the impacted water body and the streamworks methodologies specific to the application. There are limited opportunities to address the cumulative effects of erosion within streams and wetlands. There has also been limited time to assess on the ground whether the consented streamworks have led to long term effects.

Regionally, data indicates that stream bank erosion is consistently the highest source of sediment contamination, accounting for 57 per cent (274,000 tonnes/year) of total contaminant source load (Auckland Council 2021b: 126) (Figure 4.5). Bankside erosion is the principal source of sediment loading in all 10 watersheds[131] (Auckland Council 2021b: 127). It is not clear at this stage how much of this load is due to the natural process of stream evolution and how much is a result of human influence and changes in hydrological regimes. The Healthy Waters Department has a bank erosion modelling exercise underway to better understand bankside contributions of sediment (Auckland Council 2021b: 126).

[131] Watersheds reflect major harbours and coastlines within the Auckland region. Watersheds comprise the land from which all the natural rain run-off discharges to a particular water body, such as the Manukau and Waitematā Harbours.

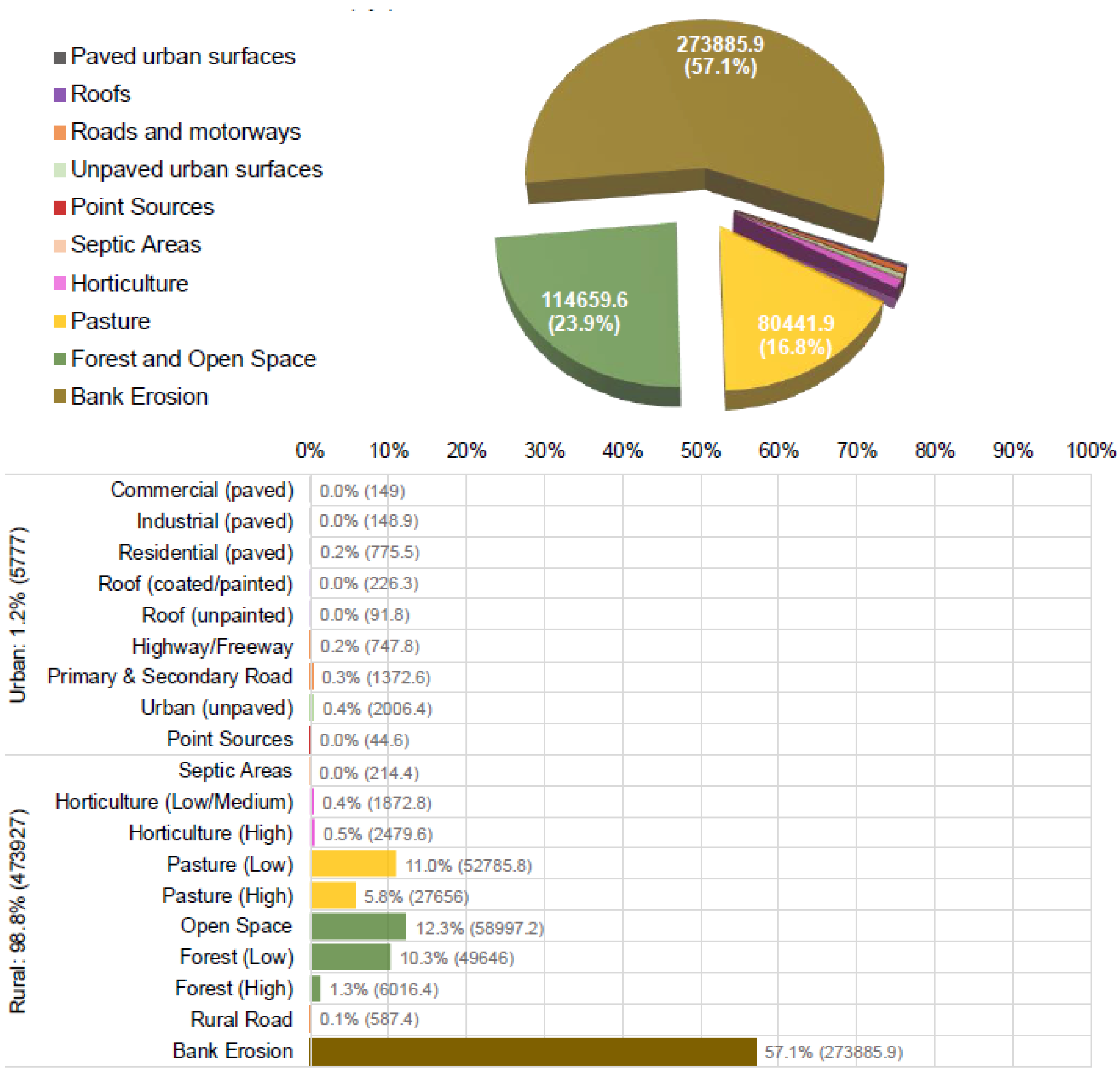

Figure 4.5: Total Suspended Sediment (t/yr) source apportionment analysis to edge-of-stream for stream reaches in the Auckland Region (2013-2017) modelled using the Freshwater Management Tool (Auckland Council 2021b: 116)[132].

Bank erosion in Auckland has consistently been linked to the incision of streams as a result of increased peak flow velocities following urbanisation (Simon et al. 2017: 8, Brightley et al. 2021: 3). Studies also indicate that the extent of bank erosion within the region is increasing. In 2021, the council's Healthy Waters department found that over 31 kilometres of stream channels within Auckland have greater than 60 per cent of their banks in an active state of erosion (Brightley et al. 2021: 4).

A separate case study of the Lignite catchment in Auckland's North Shore also shows increasing extents of bank erosion as the surrounding land has been urbanised over time. In 2019, the Lignite catchment was resurveyed for comparison with results from a 2002 survey.

[132] Bank erosion was classified as a 'rural' source as the simulated sources were grouped into the rural classification to distinguish from anthropomorphic urban development such as impervious surfaces and point sources (Auckland Council 2021b: 126). Some bank erosion will be in urban areas.

Comparison of aerial photography (Figure 4.6 and Figure 4.7) between 2003 and 2016 indicates that land use change in the catchment during this time includes an estimated 22 per cent increase in residential land use and an 11 per cent increase in impervious surfaces (Brockerhoff et al. 2020: 28).

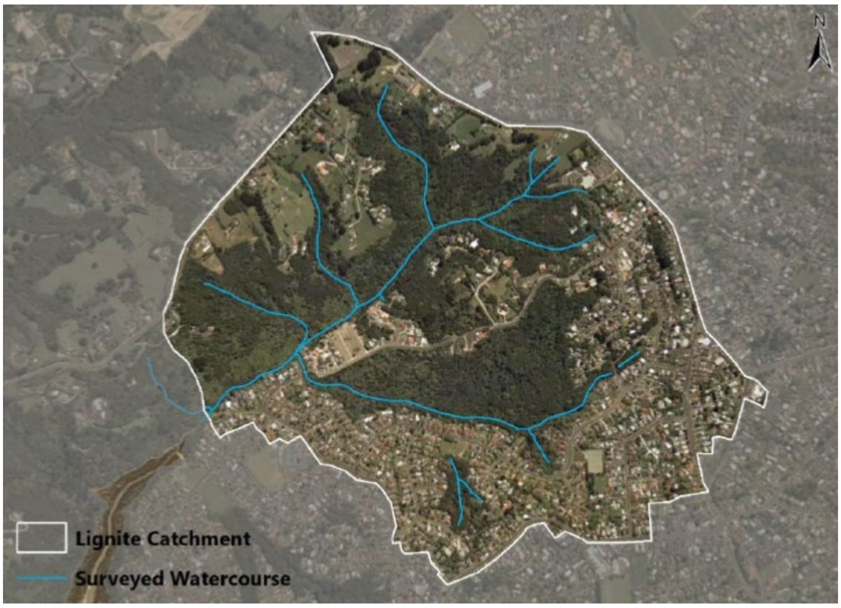

Figure 4.6.: 2003 aerial photograph showing land cover in the Lignite catchment (Brockerhoff, et al. 2020: 6).

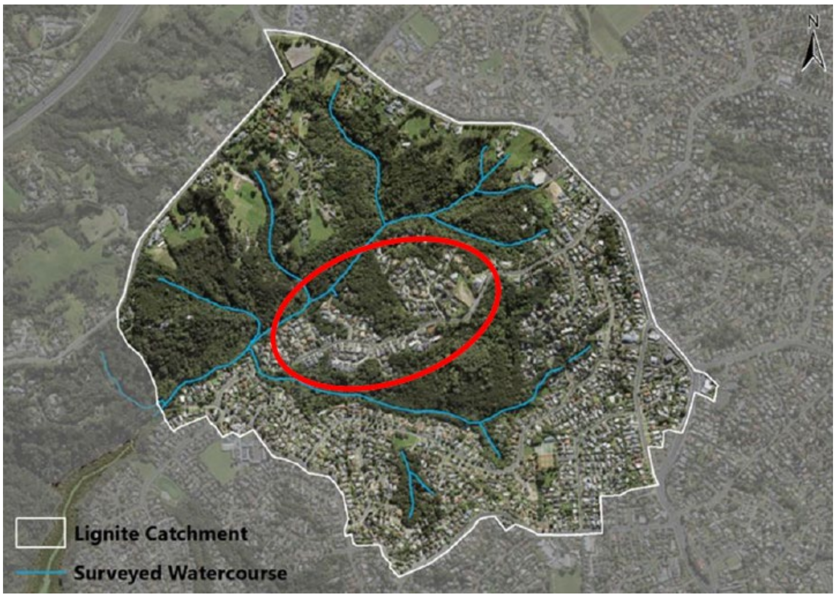

Figure 4.7: 2016 aerial photograph showing land cover in the Lignite catchment, new development is shown in red (Brockerhoff, et al. 2020: 6).

The resurvey in 2019 found that the degree of stream channel incision had increased throughout the catchment. In particular, erosion within the lower banks of the catchment had increased significantly when compared to the initial 2002 survey. No reaches were recorded with no erosion scarring and reaches with over 50 per cent erosion scarring increased from 7 per cent in 2002 to 20 per cent in 2019. Tributaries that showed the least change in channel stability were those with less intensive adjacent residential development (Brockerhoff, et al. 2020:12-13).

While the changes in land use activity (observed from 2002 to 2016) are likely to have been granted consent under legacy plans, the case study illustrates the impact of urbanisation on stream modification, and provides a baseline for future monitoring. It would be useful to look at similar case studies in future to assess whether the AUP's new requirements for hydrological mitigation works in SMAF (chapter E10) areas have mitigated the effect on bank erosion.

4.3.5 Indicator 5: Loss of streams resulting from permitted culvert activities

Chapter E3 provides for culverts as a permitted activity where they are located outside of the relevant overlays, less than 30m in length when measured parallel to the direction of water flow and comply with the relevant standards. Culverts are defined under the AUP as "a structure with an inlet from and an outlet to a lake, river, stream or the coastal marine area, designed to enable access across a river, such as a road or stock crossing". Structures with an inlet from and an outlet to a wetland are excluded from this definition. Culverts that are parallel to the direction of water flow are also specifically excluded from the AUP definition of reclamation.

At the time of writing, over 1,000 sections of culverts less than 30m in length are vested to the council and council-controlled organisations (CCOs). Based on installation date, from November 2016 to August 2021, a total combined length of approximately 1,500m has been installed and vested across the region. This compares to a total of approximately 1,700m between October 2011 and October 2016 (five years prior to the AUP becoming operative in part), and approximately 1,200m between October 2010 and October 2015 (five years following the Air, Land and Water Plan becoming operative in part). The ALW Plan had similar rules to the AUP where culverts less than 30m in length were a permitted activity[133].

Discussions with council staff have identified two areas where the permitted activity rule and associated standards for culverts are unclear. Firstly, it is unclear whether the "less than 30m" referenced in rule E3.4.1(A32) applies to a single culvert or multiple culverts on a stream. Second, is whether the rule is to be applied to a stream within the application site or an entire stream and its tributaries. This interpretation is relevant to the application of standard E3.6.1.14(1)(c), which requires that a new culvert must not be placed in individual lengths where it would progressively encase or modify the bed of a stream. The standard is currently applied to the cumulative total of culverts and to streams within the application site boundary.

An additional observation is that the permitted activity status hinders the ability for the council (as the future asset owner) to review the appropriateness of culverts that are intended to vest. As a resource consent is often not required, the council has limited oversight of design suitability for matters that are not addressed under the associated standards until the culverts are constructed and submitted for vesting.

Council staff have also identified issues where there are unintended design outcomes when culverts are designed to stay below the permitted length and avoid resource consent. For

[133] ALW Plan rules 7.5.5(i) and 7.5.5.2.

example, a steeper grade may be required to ensure that the road surface is level with the invert of the stream (Figure 4.8), or additional structures such as retaining walls are required to ensure stability and manage erosion.

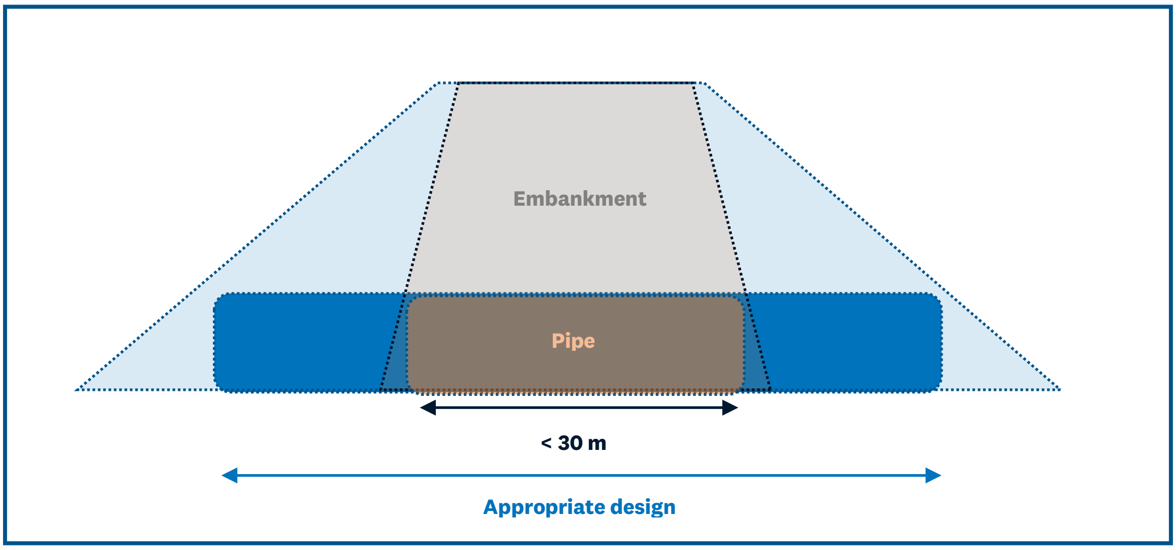

Figure 4.8 Schematic comparing grades needed to accommodate different culvert lengths.

In these instances, extending the culvert length to meet the invert of the stream may be an improved outcome for stream health, as opposed to a shorter culvert length that requires a steeper grade and additional stability structures. However, these outcomes are difficult to secure as extending the culvert length would create additional resource consent requirements. There are also limited opportunities to address these issues at the design stage due to the permitted activity status. These design issues increase the risk of poorly designed publicly vested infrastructure that are more likely to affect stream health due to poor performance or failures.

4.3.6 Effectiveness and efficiency of the AUP

4.3.6.1 Indicator 1: Extent of stream and wetland lost over time

Available data for analysis was limited to granted resource consents. While data shows the extent of granted reclamation and diversion, it is difficult to assess how effective the AUP has been in ensuring that the extent of stream and wetland loss has been minimised by being reduced or avoided, in accordance with policy B7.3.2(4). This is because pre-application meeting advice, and amended, refused, or withdrawn resource consents could not be located and reviewed. It is difficult to see how these information gaps could be addressed in future without creating significant changes to the recording administration for resource consents. The priority should be on improving the accessibility of consent decisions to avoid the current gaps in the Plans and Places resource consent database.

There are also limitations to assessing the appropriateness of the consented extent, as there are no clear criteria that indicates what an appropriate level of loss is, noting that the RPS seeks for loss to be 'minimised' rather than 'avoided', and therefore a degree of loss is anticipated. The extent to which reclamation has been minimised by being limited to instances identified in the AUP are further discussed below under Indicator 2.

It appears that the extent of stream loss is less than it was under the legacy ALW Plan but the only earlier data available for comparison included all stream disturbance as well as reclamation and diversion.

4.3.6.2 Indicator 2: Resource consent processes for works in, on, and over streams and wetlands protect the values of the waterways

4.3.6.2.1 Stream and wetland loss within the relevant overlays

An estimated total of seven resource consents for reclamation and diversion were granted on sites located within the relevant overlays. One resource consent was located within both the Natural Stream Management Areas and Significant Ecological Areas overlays and six were located within the Significant Ecological Areas overlay. While the consented extent of reclamation and diversion within the overlays are an estimation based on desktop analysis, they are a relatively small proportion of the total consented extents. This suggests that the AUP may provide a clear direction that streams and wetlands within the relevant overlays are to be afforded higher levels of protection.

4.3.6.2.2 Effects on freshwater system values

The AUP has been effective in managing effects on freshwater system values on a site-by-site basis as part of the resource consents process. Resource consents required under Chapter E3 consistently considered effects of the proposed streamworks methodology on freshwater system values. In particular, it was observed that effects were commonly managed through ensuring appropriate erosion and sediment controls were in place, works were carried out during dry periods, and that native fish capture and relocation plans were implemented where required.

In terms of limitations for this indicator, it is difficult to address cumulative regionwide effects through the resource consent process, and to attribute environmental trends to the five-year period that the AUP has been operative due to the time delay between cause and effect for waterbodies.

4.3.6.2.3 Offset action

A significant number of resource consents included offset action. Just under half of these resource consents specifically identified that the proposed offset action would achieve no net loss or net gain in accordance with policy E3.3(4). A significantly smaller number of resource consents specifically identified that there would be a net loss of ecological value.

In the instances where net loss was identified, it was noted that the wording of policy of E3.3(4) identifies that it is only 'preferable' that offset actions achieve no net loss, enabling resource consent applications to be assessed on their specific circumstances and merits.

While offset actions were commonly proposed, it is unclear if the AUP has been effective in ensuring that offset actions were implemented only after appropriate avoidance and remediation measures have been demonstrated. The requirement for this is outlined in the introduction text of Chapter E3, supported in objective E3.2(3), and referenced in greater detail in Appendix 8 Biodiversity offsetting. Objective E3.2(3) states that "significant residual adverse effects on lakes, rivers, streams or wetlands that cannot be avoided, remedied or mitigated are offset where this will promote the purpose of the Resource Management Act 1991". It is considered that the wording of objective E3.2(3) does not provide sufficient direction that offset action should only be considered once these other measures have been undertaken. While Appendix 8 is more specific in stating that actions will only be considered for a biodiversity offset where it is used "to offset the significant residual effects of activities after the adverse effects have been avoided, remedied or mitigated", the wording of policy E3.3(4)(d) directs plan users to 'consider' the use of offsetting outlined in Appendix 8, rather than requiring it. By comparison, policy D9.3(1) seeks to manage effects on indigenous biodiversity values of areas identified as significant ecological areas by clearly setting out that offsetting is to be considered in relation to residual adverse effects following the avoiding, remedying, and mitigation of adverse effects. While policy D9.3.(1) is relevant for actions affecting SEAs it does not apply in other areas. The AUP appears to have a less directive regime for offsets relating to lakes, rivers and wetlands.

Issues raised regarding offset requirements for works aimed at improving stream health were not assessed as part of the resource consent analysis. However, in terms of facilitating efficient outcomes, the issues highlight the opportunity to further investigate whether existing resource consent processes and methodologies appropriately assess the effects of activities with the primary aim of improving the current condition of streams.

Finally, the finding that offset sites have limited value in achieving no net loss (Price 2019) is relevant. While the majority of sites in the case studies were consented prior to 2016, conclusions drawn on stream length offset to loss ratios and consent conditions have implications for the effectiveness and efficiency of the AUP. The findings are relevant as the majority of streamworks include offset action and observations from the analysis show that adverse effects on streams and wetlands were only considered to be acceptable once the positive effects of proposed offsets were also taken into account. However, evidence of offset sites not meeting their projected ecological values suggests a risk that consent conditions do not secure the ecological outcomes that formed the basis of the application. In these instances, activities with significant adverse effects on streams and wetlands may be granted on the basis of positive outcomes that are not being achieved.

As previously discussed, the stream length offset to loss ratios are currently prescribed in Technical Report 2011/009, and included in Chapter E3 as a document to reference when considering restoration and enhancement actions. At the time of writing, a workstream within the council has been established to further investigate the suitability of the methodology used to determine the ratio. If changes are made to the methodology and incorporated into the AUP, the extent of positive effects secured through offset actions will be directly affected.

With regard to resource consent conditions not adequately addressing the ongoing monitoring and protection of offset sites, it should be acknowledged that in many, if not all cases, it is too early to assess the ecological outcomes of offset sites consented under the AUP. Confirming that offset sites achieve no net loss requires on-going monitoring, often beyond the five years that the AUP has been operative. Notwithstanding, at the time of writing, work is underway to develop resource consent conditions that would require offset sites to be monitored in a manner that considers whether their predicted ecological values made at the time of application can be achieved. In particular, the conditions would require the frequent monitoring of offset sites to ensure that works are on a trajectory to achieve predicted ecological values. Where they are not on that trajectory, a condition would also require further enhancement work to occur.

4.3.6.2.4 Practicable alternatives

Policies B7.3.2(4)(b) and E3.3(13)(a) are some of the most directive provisions in the AUP that apply to streams and wetlands, seeking to 'avoid' reclamation unless there are no practicable alternatives. It is considered that the AUP has only been partially effective in limiting reclamation to instances where no practicable alternatives were available. While over half of resource consent decisions analysed specifically discussed the lack of practicable alternatives, this is a low proportion given the strong directiveness of the policies.

Where specifically discussed, resource consent applications generally provided variable reasons and detail to demonstrate the lack of practicable alternatives. This information being provided on an inconsistent and variable basis may be attributed in part to the lack of clear direction in the AUP as to what acceptable practicable alternatives are and the information needed to satisfactorily demonstrate it as part of a resource consent application. The lack of direction is also likely to create inconsistent decision making and outcomes across the region.

It was also demonstrated in a small number of resource consent decisions that the 'avoid' policy does not comprehensively protect streams and wetlands. Resource consents have been granted in instances where it was specifically recognised that the application did not fully demonstrate a lack of practicable alternatives. In these instances, the AUP provisions addressing permanent stream and wetland loss were not achieved, indicating that the protection of streams and wetlands can be deprioritised when considered alongside other AUP provisions as part of the resource consent process.

4.3.6.2.5 Necessity

Policies B7.3.2(4)(a) and E3.3.13(b) are also strongly directive, seeking to 'avoid' reclamation unless the works are necessary for specific purposes outlined in the policies. These parts of the policies have not been effective, as the necessity of reclamation was not specifically identified in a significant number of resource consent decisions. This may be attributed in part to inconsistencies between the RPS (Chapter B7) and the Auckland-wide provisions (Chapter E3). Policy E3.3.13(b) in its entirety does not apply to the reclamation of intermittent streams and does not identify growth and development as an acceptable reason for reclamation. By contrast, Policy B7.3.2(4)(a) applies to all permanent loss and significant diversion and recognises that loss may occur when it is providing for the sustainable use of land and resources to provide for growth and development.

The application of these policies may change in future as they now need to be applied along with the NPS-FM and the new policy E3.3(18) which requires that stream loss is avoided unless there is a functional need for the activity in that location and the effects management hierarchy is applied.

4.3.6.2.6 Functional or operational need

The functional or operational need of structures was specifically identified in less than half of the relevant resource consents analysed. The terms 'functional need' or 'operational need' were not always specified, with resource consent decisions instead discussing the need or purpose of the new structure. This suggests that it may be unclear that both are defined terms under the AUP.

There is also no guidance on which term should apply over the other, which may be limiting the effectiveness of the provisions. This is significant as 'operational' has a lower threshold than 'functional', given it does not require activities to demonstrate that they can only occur within the stream or wetland, although the technical or operational characteristics or constraints requiring that location will still need to be demonstrated.

4.3.6.3 Indicator 3: Development is designed to retain streams and wetlands

Over half of the granted resource consents for reclamation and/or diversion were located within greenfield areas, with the majority being developed to accommodate residential activities. This is despite greenfield areas providing greater opportunities to avoid stream and wetland loss than brownfield or infill development. Analysis of the rationale provided within the relevant resource consent decisions to the lack of practicable alternatives indicates that the AUP has had limited effectiveness when retaining streams and wetlands in greenfield areas at the resource consent stage. The lack of practicable alternatives being available was commonly attributed to the need to give effect to residential zoning or precinct development expectations. It was also observed that the suitability or appropriateness of alternatives were not discussed, such as a lower intensity of development that retained streams or wetlands or reduced the extent of loss. It is also unclear whether development intensity or yield being fully maximised is enabled under policy B7.3.2(4)(a)(iii), where reclamation may occur to support the "sustainable use of land and resources to provide for growth and development".

Other trends observed include streams and wetlands being consented to be reclaimed or diverted where precinct provisions or existing development patterns indicated that they were located in the position of future roads. Some precincts also identified significant waterbodies to be retained, resulting in the subsequent loss of streams and wetlands that had not been identified. Resource consent outcomes indicate that there may be limited opportunities to secure protection at the resource consent stage, where applications are considered on balance against wider AUP provisions. The findings also demonstrate the significance that AUP provisions for greenfield areas clearly identify the expectations for stream and wetland protection. Chapter 12 'Land use change in growth areas' includes further consideration of the management of freshwater systems as part of any plan change process that enables the development of greenfield land.

4.3.6.4 Indicator 4: Sediment is retained in stream banks and beds

The consents analysis indicates that AUP chapter E3 has been moderately effective in ensuring that consent processes for works in the bed of a stream have addressed the need to manage any potential erosion and sediment effects. Only 61 per cent of 119 consent decisions expressly identified that the streamworks would appropriately manage effects associated with erosion and sediment, but erosion and sediment control measures were generally included in consent conditions.

However, as with effects on freshwater system values, there are limited opportunities to consider long term cumulative effects of streamworks on streambank erosion as part of the resource consent process. A consent process relates to the effects of the activity applied for, not that activity plus all earlier and subsequent potential works in the catchment.

Notwithstanding effective effects management as part of the resource consent process for streamworks, region-wide data shows that streambank erosion is a significant sediment contaminant source. In urban Auckland, it has been recognised that the main cause of bank erosion is stream channel incision, resulting from increased peak flow and variability in flow following urbanisation and the addition of new impervious areas. Stream channel incision can also in turn lead to the need to carry out streamworks to address hydrology changes. Findings on stormwater management and impervious areas are further detailed in Chapter 7 .

4.3.6.5 Indicator 5: Loss of streams resulting from permitted culvert activities

The effectiveness of provisions for permitted activity culverts cannot be assessed comprehensively as the AUP does not provide guidance on what the anticipated outcomes for permitted activities are. Additionally, current regulatory processes do not require details of privately owned infrastructure to be provided, and the information available has been limited to culverts vested in the council.

Analysis of the information available for the length of vested culverts indicates that the extent that new culverts less than 30m that were installed as a permitted activity has been roughly the same before and after the AUP rules came into effect. Minor increases in culvert installation are more likely to be attributed to new development opportunities under the AUP. These results can be expected as the relevant AUP provisions are similar to legacy provisions in the ALW Plan.

Discussions with council staff have identified a number of issues associated with the effectiveness and efficiency of the provisions applying to permitted activity culverts. Ambiguity in the wording of the provisions affects all plan users while the permitted activity status and current suit of relevant standards are creating issues in terms of the quality of privately constructed culverts that are then vested as public infrastructure. These issues could not be confirmed as part of this analysis due to limited records being available for permitted activities. However, they highlight the opportunity to further investigate the relevant AUP provisions to provide greater clarity and address, as required, any unanticipated outcomes that may be occurring.

4.4 Recommendations

The following recommendations are made in response to issues identified, and are assigned into the categories outlined in Section 1.6 [134]:

4.1 Review existing provisions relating to permitted activity culverts to address issues raised regarding their clarity. This work would also need to ensure consistency with regulations under the NES-F (category: NPS-FM related).

4.2 Investigate the extent that existing provisions relating to permitted activity culverts and internal processes for assessing new culverts are creating unanticipated design outcomes for vested infrastructure. Consideration should be given to whether any changes would create unnecessary regulatory requirements (category: further investigation).

4.3 Investigate whether the AUP appropriately facilitates activities with the primary aim of improving the condition of waterbodies, including the processes and methodologies that apply to the assessment of associated effects. Improvement works are also likely to be encouraged by the implementation of the NPS-FM, which contains strong direction that the health and well-being of water bodies is improved[135]. Investigation of the existing AUP framework will likely need to consider the regulatory requirements for activities achieving improvement outcomes (category: further investigation).

4.4 Introduce new systems for data recording to give effect to monitoring requirements of the NPS-FM[136] and inform future monitoring of the AUP. A limitation to the completeness of this analysis has been the need to manually collect data relating to the extent of permanent stream and wetland loss from granted resource consents only, as a system for data generation and reporting was not available. Data recording should include means to address the extent and location of proposed reclamation, diversion, and any offset actions (category: process).

4.5 Finalise resource consent conditions that are being developed for offset sites and implement a programme to ensure that the conditions are consistently monitored. This

[134] These recommendations will need to be tested fully through an RMA Section 32 assessment, be considered alongside other recommendations from other topics and the Plans & Places Department work programme.
[135] NPS-FM policy 5, policy 12, clause 3.3(4) and others require that various aspects of freshwater systems or values be improved..
[136] NPS-FM clause 3.23 'Mapping and monitoring natural inland wetlands' and 3.24(4) 'Every regional council must: (a) develop and undertake a monitoring plan that:(i) monitors the condition of its rivers; and (ii) contains sufficient information to enable the council to assess whether its policies, rules, and methods are ensuring no loss of extent or values of the rivers; and (b) have methods to respond if loss of extent or values is detected.

will ensure that offset sites reach the projected ecological values determined at the time of resource consent application that also formed the basis of resource consent being granted can be achieved. It is likely that this monitoring programme will also support requirements for data recording and reporting, as the NPS-FM will require the council to identify losses to the value of rivers or natural inland wetlands and respond accordingly (category: process).

A number of key issues have been identified in relation to when permanent loss may occur and the appropriateness of offset action[137]. Recommendations in response to these issues have not been made, as they are likely to be addressed by the inclusion of new policies E3.3(17) and (18) in the AUP as required by the NPS-FM. The new policies both include 'effects of the activity are managed by applying the effects management hierarchy'. The NPS-FM (clauses 3.21 to 3.24) sets out the hierarchy and when offsetting should be required. The likely impacts of these new policies are discussed in section 4.5.1 below.

4.5 Future change under the NPS-FM

4.5.1 NPS-FM policies in the AUP

Natural inland wetlands and rivers are addressed under clauses 3.22 and 3.24 of the NPS-FM. Clause 3.22(1) sets out criteria that are to apply when considering the loss of natural inland wetlands or their values. These include limiting loss of the extent or value of natural wetlands to: a) when it is necessary to support various specified activities or b) where there is a functional need for specified infrastructure in that location. Clause 3.24(1) limits the loss of extent or values of rivers[138] to where there is a functional need for the proposed activity in that location. For both natural inland wetlands and rivers, the effects management hierarchy[139] is to be implemented. As required by the NPS-FM, both clauses 3.22(1) and 3.24(1) were included into the AUP in December 2020 as new policies E3.3(17) and E3.3(18) respectively.

As previously discussed, a number of the issues identified in this chapter are likely to be addressed in part by the inclusion of policies E3.3(17) and E3.3(18) into the AUP. This could not be assessed in the analysis above as none of the consents reviewed were granted after the policies were incorporated into the AUP. Anecdotally, council staff have noted a reduction in resource consent applications for stream and wetland reclamation since the NPS-FM and Freshwater NES have had effect.

Policy E3.3(17) provides greater clarity that works affecting the extent or value of natural inland wetlands are only to occur where they are providing for certain activities. Detailed review of the AUP will be needed to ensure consistency between policy E3.3(17) and the other relevant provisions in the RPS and Chapter E3 which address the purpose of reclamation work affecting natural inland wetlands.

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137 Issues relate to the implementation of RPS policies B7.3.2(4)(a) (necessity) and B7.3.2(4)(b) (practicable alternatives).
138 The NPS-FM adopts the RMA term 'river', which incorporates both rivers and streams.
139 NPS-FM clause 3.21.

Limiting the loss of extent or value of rivers and natural inland wetlands to where there is a functional need is also considered to be more stringent than the AUP requirement of requiring there be no practicable alternatives, which currently applies when considering the loss of extent. The term 'functional need' also provides greater clarity than 'no practicable alternative' as it is a defined term in the AUP and NPS-FM. However, as varied rationale was provided to demonstrate 'no practicable alternative', it may be appropriate that national direction is provided on how 'functional need' is to be interpreted and applied. Collaboration with regional councils across the country may be beneficial to ensure that the NPS-FM is consistently applied.

Finally, the effects management hierarchy is likely to provide clearer direction than existing chapter E3 provisions that an aquatic offset action cannot be the default response, and efforts to avoid, minimise, and remedy adverse effects must first be demonstrated. An aquatic offset will also be required to achieve no net loss or net gain in terms of both extent and values for rivers and natural inland wetlands.

4.5.2 Future plan changes

The NPS-FM identifies Te Mana o te Wai, which refers to the fundamental importance of water, as a fundamental concept.[140] Clause 1.3(5) identifies a hierarchy of obligations in Te Mana o te Wai with the following priorities:

- first, the health and well-being of water bodies and freshwater ecosystems
- second, the health needs of people (such as drinking water)
- third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

Clauses 3.22(3), 3.22(4), and 3.24(3) will require regional councils to make changes to regional plans in relation to the restoration of natural inland wetlands and the protection of the extent and value of natural inland wetlands and streams. Clause 3.2(2)(c)(iii) requires that councils apply the hierarchy of obligations when making these changes.

A plan change giving effect to the NPS-FM is likely to require a comprehensive review of provisions that are inconsistent with the hierarchy of obligations, particularly where they address urban growth. At the time of writing, it has been identified nationally that provisions in the NES-F for works within or adjacent to wetlands are limiting urban growth, and a review of consenting pathways for urban development activities affecting natural inland wetlands is underway[141].

This review has not been finalised, and it is unclear if changes to consenting pathways will affect how the hierarchy of obligations will be applied for decisions affecting natural inland wetlands. Currently, the AUP does not consistently give effect to giving first priority to protecting the health and well-being of water bodies and freshwater ecosystems. In particular, the introduction text of the chapter recognises that there is a balance to be struck between providing for growth and the protection of streams and wetlands. The retention and

[140] NPS-FM clause 1.3(1).
[141] MfE released the 'Managing our Wetlands' discussion document on 27 Oct 2021 for submissions and released an exposure draft of proposed amendments to the NPS-FM and NES-F for feedback on 31 May 2022.

enhancement of streams and wetlands are acknowledged as being important only where practicable during development. The RPS also anticipates that permanent loss of waterbodies may occur where it is necessary to provide for the sustainable use of land and resources to provide for growth and development. Under the NPS-FM, the AUP will likely be required to provide greater protection to both the extent and value of streams and natural inland wetlands. The degree to which protection is provided for in the context of accommodating urban growth may need to be reconsidered and changes to current resource consent processes may also be required as the AUP is amended.

5 Wastewater networks

This chapter considers how effective and efficient the objectives, policies, rules and other methods of the AUP have been in meeting the outcomes intended by the Regional Policy Statement with respect to wastewater networks.

A wastewater network is a system of wastewater pipes and associated structures which convey, divert, store, treat, or discharge wastewater. It does not include ‘on-site wastewater systems’ (discussed in Chapter 6). While some areas of Auckland have privately operated wastewater networks, the majority of the city’s network infrastructure is operated by Watercare. Watercare provides wastewater services from Te Hana in the north of the region to Waiuku in the south; and collects and treats approximately 410 million litres of water every day (Watercare 2021b). Watercare's wastewater network consists of approximately 7,999 km of wastewater pipes, 167,264 manholes, 518 pump stations and 18 wastewater treatment plants (Watercare 2021b). Figure 5.1 below shows the spatial distribution of wastewater treatment plants across the region.

The wastewater network has the potential to create significant impacts on water bodies, through the discharge of untreated and treated wastewater to land and water. Point source discharges of wastewater overflows caused by rainfall events and/or network failures are a particularly significant potential source of faecal contamination of freshwater and coastal waters. Nutrients from wastewater can alter the ecological integrity of waterways, disturbing the habitat of native flora and fauna. Contaminants also need to be managed within human health limits to avoid impacts on recreational activities and food gathering. Direct discharges of wastewater (even treated) to water are objectionable from a Māori perspective, due to the impact on the mauri of water bodies, and on the value of mahinga kai (Austin, Madison, Simmonds, 2019: 1).

Challenges to Auckland’s wastewater infrastructure include population growth, aging infrastructure, infrastructure solutions which include privately maintained communal assets; and areas serviced by combined stormwater/wastewater infrastructure. Existing adverse impacts from wastewater on water quality are tangible to the community, for example through water quality alerts on Auckland Council’s Safeswim website (section 2.2.1.2). These issues maintain ongoing public interest in the wastewater infrastructure quality. Accordingly, management of the existing network and infrastructure provision in relation to growth areas, are important matters in the assessment of the effectiveness and efficiency of the AUP in meeting its water outcomes outlined in the RPS.

Figure 5.1 Spatial distribution of Auckland's wastewater treatment plants[142] (Watercare 2015: 2)

The majority of Auckland's wastewater network overflow discharges are consented under Watercare's Auckland Wastewater Network Comprehensive Discharge Permits (Network Discharge Consent, or NDC). The network discharge consents include the principal Network Discharge Consents[143] (NDC), the Central Interceptor Catchment Network Discharge Consents (NDC-CI) which relate to the Central Interceptor (Western Isthmus) Catchment, and three additional consents which extend the NDC to cover the networks in Waiwera, Parakai and Helensville. The consents cover discharges from both Watercare's existing and identified future public wastewater networks to land, freshwater and coastal receiving environments. Wastewater discharges provided for include those that may occur as a result of network

[142] It is noted that while the Pukekohe wastewater treatment plant treats wastewater from Auckland, the plant is located in the Waikato Region and outside the territory to which the AUP applies.
[143] The NDC includes consents for discharges to land and freshwater and the coastal marine area.

blockages and failures; network damage by third parties; failure at pump stations or storage facilities; and capacity constraints. The discharge of treated wastewater from wastewater treatment plants is consented separately from the network discharge consents. The key difference between the principal NDC and the NDC-CI is explained in the Auckland Wastewater Network Annual Performance Report 2018-2019 Final Draft (Watercare 2019: 5). The report notes that while the NDC overflow target concerns overflow frequency, the NDC-CI overflow target concerns volume reduction. This is due to the presence of a combined network in the Western Isthmus/central interceptor catchment, and the significant improvements expected from the Central Interceptor project[144].

Watercare's network discharge consents provide significant data on Auckland's wastewater network performance. Watercare reports on overflow occurrences, as well as inflow and infiltration management and network improvement works, in the 'Annual Wastewater Network Performance Report' prepared for the network discharge consents. This report satisfies condition 57 of the principal NDC and identical conditions in the additional network discharge consents. Council's Proactive Compliance team review data submitted by Watercare on an ongoing basis; and assess how well Watercare demonstrate that they are meeting their relevant consent conditions. In addition, Watercare is subject to requirements such as the assessment of reported overflows in accordance with the Wastewater Overflow Regional Response Manual (Attachment 8 of the NDC). Incidents that score a level 3 or above (out of 5), are reported to the council's pollution response team, who undertake desktop reviews and – dependent on risk – site visits. These site visits assess clean up as well as review Watercare's assessment of the incident.

The network discharge consents were sought and granted under the now superseded Auckland Council Regional Plan: Air, Land and Water (2010). As such, an assessment of Watercare's actions to improve water quality over time under the network discharge consents is more reflective of Watercare's obligations under the Auckland Council Regional Plan Air, Land and Water than the AUP. However, the conditions of the network discharge consents that relate to wastewater overflows are aligned to the most relevant AUP RPS policy (B7.4.2 (10) – Wastewater). With respect to the existing wastewater network, policy B7.4.2 (10) requires management of the adverse effects of wastewater discharges to freshwater and coastal water by:

(b) progressively reducing existing network overflows and associated adverse effects by all of the following:

(i) making receiving environments that are sensitive to the adverse effects of wastewater discharges a priority;
(ii) adopting the best practicable option for preventing or minimising the adverse effects of discharges from wastewater networks including works to reduce overflow frequencies and volumes;
(iii) ensuring plans are in place for the effective operation and maintenance of the wastewater network and to minimise dry weather overflow discharges;
(iv) ensuring processes are in place to mitigate the adverse effects of overflows on public health and safety and the environment where the overflows occur; and

[144] This project was consented prior to the AUP under the Auckland Council Regional Plan: Air, Land and Water (ALW Plan).

(c) *adopting the best practicable option for minimising the adverse effects of discharges from wastewater treatment plants.*

Watercare's network discharge consents and the AUP (in policy E1.3(21)(a)) both seek to reduce the frequency of wet weather overflow events to an annual average of two events per discharge location, and to prioritise overflow points exceeding that number for improvements, particularly in relation to sensitive environments. Despite being granted under the superseded Auckland Council Regional Plan: Air, Land and Water (2010), there is therefore an overall alignment between the outcomes sought in the network discharge consents granted to Watercare and the outcomes sought in the AUP.

Whether the wastewater related outcomes sought by the AUP (in B7.4.2(10) and E1.3(19) to (22)) are being achieved is largely dependent on the operation of the network discharge consents. It is possible to consider the effectiveness of those policies by considering the operation of the NDC because the consents were granted under very similar policies. If significant issues were found with the NDC, it would indicate a need for a change in policy direction in the AUP.

It is also noted that while granted under a legacy plan, the NDC has the potential to be subject to review in the context of the AUP. Under s128(1) of the RMA the council has the ability to review the NDC consent conditions, including on the basis of arising adverse effects. This is noted in conditions 67 and 68 of the NDC. For these reasons – the significant data provided by the NDC on wastewater overflows in Auckland, the general alignment of the NDC with key AUP policies, and the potential for consent conditions to be reviewed under the current planning framework - the NDC has been considered as relevant to this assessment. The extent of the network discharge consents is shown in Figure 5.2 below.

A limited number of wastewater network consents have also been granted under the AUP, for example where projects are located outside of the scope of the Watercare network discharge consents. Discharges to land or freshwater are covered under Chapter E6 'Wastewater network management' of the AUP. Discharges to the coastal marine area are covered under Chapter F2 'Coastal – General Coastal Marine Zone'.

This analysis therefore considers Watercare's network discharge consents (for reasons described above), and consents granted for wastewater network discharges under the AUP. Beyond the scope of this report are wastewater discharges consented prior to the AUP (excluding those covered by Watercare's network discharge consents). This includes discharges from the majority of Auckland's wastewater treatment plants, the network at Kawakawa Bay which is consented separately to the NDC, some privately operated wastewater networks (notably the Papakura District Wastewater Network Consent, operated by Veolia), and other smaller network assets consented outside of the NDC.

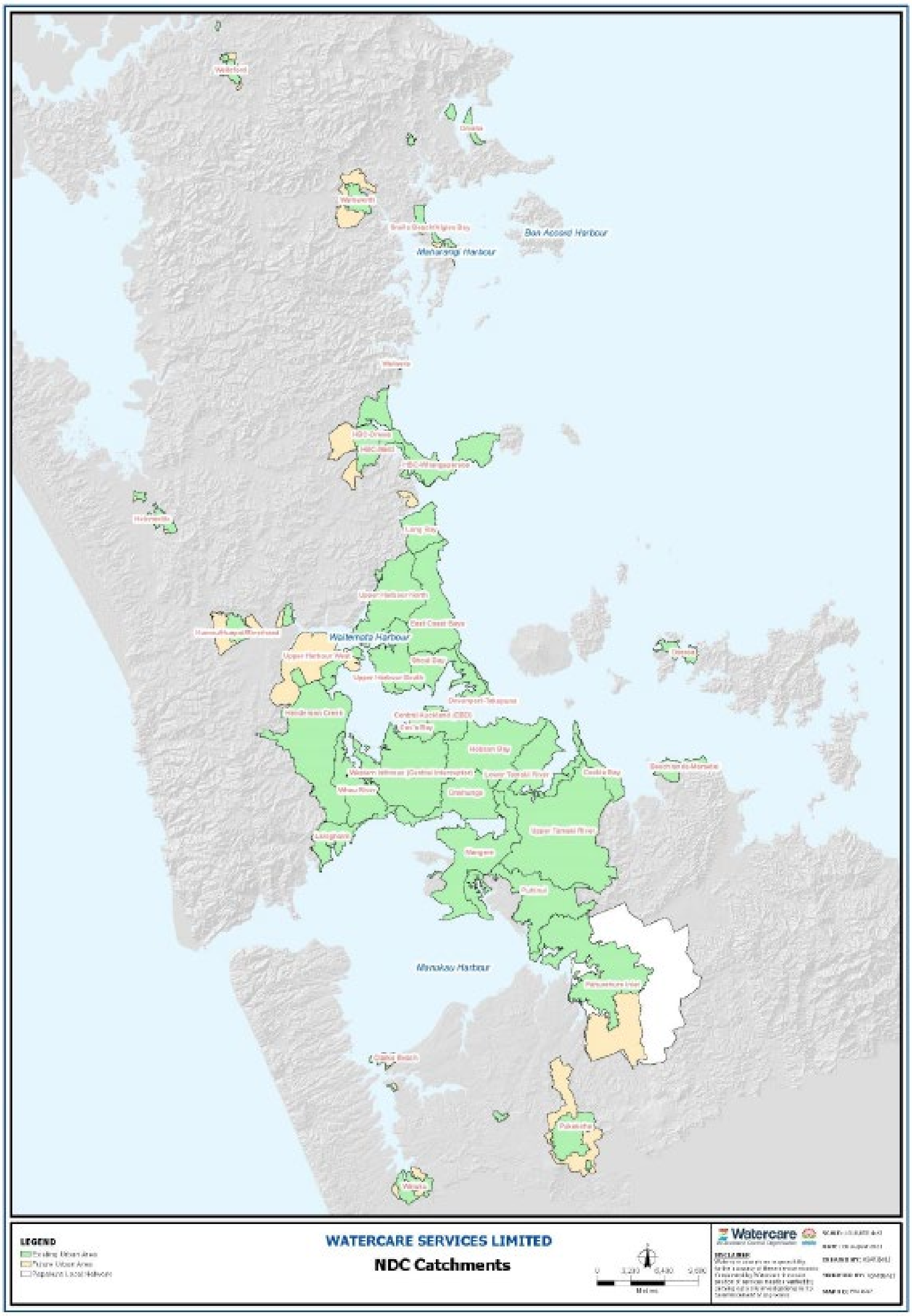

Figure 5.2 Geographical extent of the catchments in Watercare's Network Discharge Consents (Watercare 2021d: 14).

5.1 Indicators and measures

5.1.1 Outcomes sought by B7.3 and B7.4

Sections 'B7.3 Freshwater systems' and 'B7.4 Coastal water, freshwater and geothermal water' of the RPS set a policy direction to minimise adverse effects of point discharges on water bodies[145]. In particular, RPS objective B7.4.1. (4) states that:

> *The adverse effects of point and non-point discharges, in particular stormwater runoff and wastewater discharges, on coastal waters, freshwater and geothermal water are minimised and existing adverse effects are progressively reduced.*

This is particularly relevant to wastewater network consents, and the direct discharges to land and water which occur from both wastewater treatment plants and engineered overflow points. Further objectives and policies related to wastewater network discharges are contained in Chapter E1 'Water quality and integrated management' and Chapter F2 'Coastal – General Coastal Marine Zone'.

5.1.2 Indicators, measures, and information sources

It is important that Auckland's wastewater network performance is improved so that the effects of discharges are reduced. This includes improvements to the existing network and ensuring that growth areas have adequate wastewater systems and treatment plants. In the absence of a relevant indicator for objective B7.4.1. (4) in Chapter B11 of the RPS (B11 'Monitoring and environmental results anticipated'), two indicators were developed to monitor progress towards meeting the outcomes of the RPS, specific to wastewater networks. To see the relationship between the AUP objectives and policies, and the indicators developed for this report, please see Appendix C[146].

The relationship between indicators, measures, and information sources is set out in Table 5.1 below.

Table 5.1 Indicators, measures and information sources.

Indicators	Measures	Information Sources
1. Point-source wastewater overflows and their potential adverse effects are minimised by: • adopting the Best Practicable Option (BPO) for preventing or minimising the adverse effects of discharges; including by reducing overflows,	A review of the Watercare network discharge consents, including: • number of dry weather overflows • number of wet weather overflows • number of overflow points that operate within the wet	Annual performance reports for Watercare's network discharge consents. Correspondence with/data shared by Watercare staff and an Auckland Council Senior Wastewater Specialist from Proactive Compliance, Licensing and Regulatory Compliance.

[145] This includes effects on groundwater systems, in accordance with the AUP definition of a freshwater system.
[146] Please note that this topic does not address the mana whenua aspects of the identified policies, as noted in section 1.7.1.

Indicators	Measures	Information Sources
• preparing plans for wastewater network operations and maintenance, • prioritising areas sensitive to wastewater overflows; and • ensuring processes are in place to manage the effects of overflows on human health and the environment.	weather overflow target identified in consent conditions • number of human health incidents attributed to a particular overflow point (not assessed due to limitations in sourcing data)[147].	
2. Growth is managed and supported by infrastructure provision which uses the best practicable option to minimise adverse effects.[148]	A review of consents granted under the AUP for wastewater overflows. A review of consents granted under the AUP for wastewater treatment plant discharges and upgrades to the network. Consideration of how growth and stormwater flows are managed in areas serviced by a combined sewer.	The Plans and Places Resource Consents Database. Correspondence with/data shared by a Senior Wastewater Specialist from Proactive Compliance, Licensing and Regulatory Compliance.

5.2 Findings and analysis

5.2.1 NDC overflow reporting

Watercare's annual report on the NDC provides information on wastewater overflows, which are classified as Dry Weather Overflows (DWO) if they occur on days with up to 10 mm of rain, or as Wet Weather Overflows (WWO) on days with more than 10 mm of rain (2021d: 9).

Overflows are further categorised by location types. Type 1 overflows occur at pump station Engineered Overflow Points (EOPs) which are monitored by telemetric devices. Type 2 overflows occur at EOPs constructed throughout the network and discharge to local receiving environments. They provide relief points when the network capacity is overloaded, to avoid

[147] Data was not available for this report which could identify the number of Safeswim alerts linked to particular overflow points. The Water Quality discussion contained in section 2.3.1.3.4, however, provides further information on Safeswim data.

[148] It is important to integrate the timing of new development and infrastructure provision, particularly in areas with critical capacity issues. This chapter considers the consents granted for wastewater discharges and upgrades. Chapter 12 'Land use change in growth areas' considers the integration between large-scale land use planning and infrastructure provision through structure plans and plan changes.

uncontrolled discharges that pose public health risks, however only some sites are monitored. Type 3 overflows refer to overflows which occur at uncontrolled locations, from manholes and gully traps. These overflows are reported to Watercare by members of the public.

Table 5.2 provides a summary breakdown of Type 1 and Type 3 dry weather overflows and wet weather overflows for Watercare's last three reporting years. Data on Type 2 overflows was excluded by Watercare in this summary table due to only some sites being monitored. Watercare also notes inadequate data to be able to report on Type 2 overflow trend analysis (2021d: 31 & 44). Overall, the total number of overflows reported by Watercare in 2020-2021 increased 36% from the 2019-2020 period, due to an increase in Type 3 DWOs (Watercare 2021d: 101). Discussion with Watercare staff indicates that improvements to overflow monitoring and data collection has likely been a principal driver of the increase in overflows reported. This is an important consideration when interpreting the NDC data.

Table 5.2 Comparison of Type 1 (pump stations) and Type 3 (uncontrolled) dry weather overflows (DWO) and wet weather overflows (WWO) for the last three reporting years. (Watercare 2021d: 101).

Overflows	Type	2018-2019	2019-2020	2020-221
DWO	Type 1	28	61	18
	Type 3	3,635	3,487	4.957
	Type 3 DWO L3+	71	80	117
WWO	Type 1	178	194	102
	Type 3	617	393	519
	Type 3 WWO L3+	5	4	9
Overall	Total DWO overflows	3,663	3,548	4,975
	Total WWO overflows	795	587	621
	Total Type 3 L3+	**76**	**84**	**126**
	Total overflows	**4,458**	**4,135**	**5,596**

5.2.1.1 NDC Dry weather overflows

The NDC requires that Watercare must manage the network so that dry weather overflows only occur from network failure such as breakages, blockages or third-party damage to the network[149]. Watercare must also minimise discharges, including by investigating the cause of repeat dry weather overflows and implementing measures to avoid similar re-occurrences[150]. Repeat dry weather overflows are those which occur twice or more within a 12-month period (Watercare 2021d: 12). Dry weather overflows which occur three or more times within 24 months are prioritized for investigation. Remedial actions may include sewer cleaning, removal of blockages, asset renewal, public education, or other site-specific solutions (Watercare

[149] Condition 11 of the NDC.
[150] Condition 36.d. of the NDC.

2021d: 12). These requirements show a general alignment to AUP policy E1.3.(22)(a) which requires that wastewater networks and combined sewer networks are operated and maintained to minimise the likelihood of dry weather overflows occurring.

Table 5.2 shows a spike in Type 1 dry weather overflows in 2019/2020 compared to the 2018/2019 and 2020/2021 reporting periods. Watercare's analysis of 5-year trends in the NDC 2020-2021 annual report showed that no Type 1 engineered overflow point had increasing dry weather overflow trends, while 12 of the 92 Type 1 EOPs have decreasing dry weather overflow trends (2021d: 30).

Type 3 dry weather overflows were higher in 2020/2021 than in the previous two reporting years, with a 42 per cent increase observed from 2019/2020 to 2020/2021 (Watercare 2021d: 28). Of the latest Type 3 DWOs, 29 per cent were attributed to roots growing into pipes, and 23 per cent were attributed to fats (Watercare 2021d: 28). Nearly half of the 2020/2021 incidents were observed in 5 (out of Watercare's 36) catchments, being Upper Tamaki River, Western Isthmus, East Coast Bays, Henderson Creek, and Hobson Bay (Watercare 2021d: 28). Watercare's analysis of 5-year trends shows that the Upper Harbour West catchment has a statistically significant trend of increasing Type 3 dry weather overflows, and that Type 3 DWOs in the 2020/2021 period nearly doubled the number reported in 2016/2017 for this catchment (2021d: 31). Roots have been a predominant cause of overflows in this catchment, while across the network fats and rags have been an increasing cause of overflows (Watercare 2021d: 101).

5.2.1.2 NDC Wet weather overflows

The NDC sets a performance target (measure) of an "average overflow design target of two wet weather events a year". This is set out in consent condition 9 as follows:

"(a) an average of no more than two wet weather overflow events per engineered overflow point per year as assessed by computer modelling or actual recorded performance; or

(b) if (a) is not achieved for a particular engineered overflow point, an alternative discharge frequency using the BPO methodology and (where appropriate) methodology to prioritise catchments and wastewater network improvements works."

Condition 9(b) means that Watercare can use an alternative discharge frequency using the Best Practicable Option concept which provides for the authorisation of a discharge where it can be demonstrated that the best method has been adopted with respect to preventing or minimising the adverse effects on the environment.

The target in condition 9(a) above is from the first Auckland Plan (Auckland Council 2012: 290) and is also set out in Watercare's 2015-2018 Statement of Intent. It is strongly aligned to policy E1.3.(21)(a) from Chapter E1 Water quality and integrated management of the AUP. Policy E1.3.(21) directs us to:

Progressively minimise the adverse effects of wet weather overflows from wastewater networks by:

(a) adopting the best practicable option to reduce wet weather overflows to an average of no more than two events per discharge location per year in areas serviced by a separated wastewater network with priority for: …

It is noted that this target includes the BPO approach and a prioritisation of works which follows a risk-based approach for managing wet-weather overflows, and as such aligns with AS/NZS ISO 31000, the recognised international standard for risk management (Watercare 2016: 26). Implementation of the risk-based approach through the NDC means that catchments are prioritized based on risks relating to loss of service, public health and ecological values, and financial risk. Catchments are ranked from low to high priority and these rankings guide the allocation of improvement works. The initial prioritisation of catchments is set out in Attachment 4 to the NDC and is subject to subsequent review through the preparation of the Wastewater Network Strategy at 6-yearly intervals.

Table 5.2 shows that the number of Type 1 wet weather overflows was lower in the 2020-2021 reporting period than in the previous two reporting years, with a 47 per cent decrease from the 2019-2020 period. The 'Brigitte' pump station in the Snells-Algies catchment was the worst performing in the network in the 2020-2021 period; and accounted for 19 (also 19 per cent) of the Type 1 WWOs reported (Watercare 2021d: 39). This pump station has since been decommissioned and replaced. Watercare has undertaken trend analysis of Type 1 EOPs using rolling five-year averages. Data from the 2016-17 to the 2020-21 reporting years showed that 131 out of 166 (79 per cent) Type 1 engineered overflow points complied with the overflow target of two overflows a year (2021d: 44). Twenty-five of the pump stations which did not meet this target are either stable or showing a decreasing trend (2021d: 44). This is a slight improvement from the 2015-16 to 2019-20 result of 76 per cent Type 1 EOPs meeting the target (Watercare 2021d: 44).

An increase in Type 3 wet weather overflows was observed for 2020-2021 compared to the previous year (519 up from 393), however the number reported was still lower than any of the three reporting years prior, which recorded between 617-1,461 overflows (Watercare 2021d: 41). For Type 3 WWOs, 24 per cent were attributed to roots, and 23 per cent to fat; similar to the causes reported for Type 3 dry weather overflows (2021d: 41). Trend analysis considering data over the last five years shows a decreasing trend of surcharging across all catchments. Watercare notes this trend is likely attributable to drier weather over these years (2021d: 44).

The catchments that experienced most Type 1 (pump station) wet weather overflows were Snells-Algies (24 overflows), Shoal Bay (9 overflows) and Western Isthmus (8 overflows) (Watercare 2021d: 39-40). The catchments which had the highest number of reported uncontrolled (Type 3) wet weather incidents were Henderson Creek (65 overflows) and Western Isthmus (64 overflows) (Watercare 2021d: 41). It is anticipated that planned network improvement projects will help reduce the high number of overflows in these areas and consequently improve fresh and coastal water quality and minimise the adverse effects from wastewater discharges, in line with the direction set by the RPS sections 'B7.3. Freshwater systems' and 'B7.4. Coastal water, freshwater and geothermal water'.

Mitigation projects identified by the 2020-2021 Annual Report (Watercare: 102) include:

- improvement works in the Lower and Upper Tāmaki River catchments,
- long term solution in Snells Beach-Algies Bay that will cater for population growth, particularly the Warkworth to Snells Transfer Pipeline (in association with the

Warkworth Wastewater Scheme and the new Snells Beach Wastewater Treatment Plant) and the Brigitte Pump Station replacement (developer led),

- the Central Interceptor programme in the Western Isthmus, which will reduce the annual volume of overflows by up to 80 per cent,
- the Northern Interceptor stage 1 project to divert wastewater from the Northern Strategic Growth Area and South Rodney (Kumeu / Huapai / Riverhead) to the Rosedale Wastewater Treatment Plant, to cater for growth and reduce uncontrolled overflows; and
- Herne Bay and Grey Lynn wastewater catchment improvements to reduce overflow volume and frequency in the Cox's Bay catchment.

5.2.2 AUP overflow consents

Four consents were identified from the Plans and Places resource consents database to have been granted (since the AUP became operative in part) for the discharge of untreated wastewater from engineered overflow points. These consents were all granted under Chapter E6 'Wastewater network management' of the AUP which relates to discharges to land and freshwater. This small number of consents is reflective of the scope of the existing NDC which covers the majority of discharges from new pumping stations in the network. All applications were in association with the development of new wastewater pump stations. A summary of the basic details for each project is provided in Table 5.3, and of the nature of the discharge in Table 5.4. Two of the four consents specify that wet weather overflows are not anticipated. Notably, in one case this is attributed to the network design, including its flow capacity and the minimisation of stormwater infiltration. In the other case it is noted that wet weather overflows will occur at an upstream pump station. Decision reports were reviewed for evidence/discussion of the 'Best Practicable Option' being applied, and for discussion on the consistency of the proposal with relevant policy. These matters are discussed below.

Table 5.3 Summary of consents granted under the AUP for wastewater overflows.

Area	Applicant	Date granted	Project
Upper Orewa	Private landowner	7/12/2016	A 575-lot subdivision from two existing rural lots. Associated features include the discharge of stormwater and occasional wastewater overflows.
Warkworth	Watercare Services Limited	21/03/2017	Three new wastewater pump stations between Warkworth and Snells Beach, a replacement ocean discharge outfall for the new Snells Beach WWTP, and discharges in association with short term upgrades to the Warkworth and Snells/Algies WWTPs, and the new Snells Beach WWTP.
Ardmore	Watercare Services Limited	19/12/2018	A new wastewater network pump station. Reasons for consent include the location of infrastructure within the 1 per cent annual exceedance probability floodplain and overland flow paths, as well as the provision of an engineered overflow point for emergency wastewater discharges.

Area	Applicant	Date granted	Project
Okura	Private landowner	30/01/2020	Potential discharge of emergency wastewater to land from a privately owned and maintained new pump station servicing 24 residential allotments in the Rural – Countryside Living Zone.

Table 5.4 Nature of the discharge in consents granted under the AUP for wastewater overflows

Area	Nature of the overflow discharge consented
Upper Orewa	Emergency discharge from three sewage pump stations, to land well away from water bodies. The new assets will be vested to Watercare and the consent merged into Watercare's current network consent. No wet weather overflows are envisaged as the network is a new, sealed system which will be constructed to meet Watercare's design flow capacity and to minimise stormwater infiltration. Discharges from the wastewater pump station are not expected, but if they do occur, they will be rare, temporary, and unlikely to deteriorate the environmental values identified in their locality.
Warkworth	Discharge of untreated wastewater overflows onto land, where contaminants may enter water, from one pumping station outside of the urban area. The receiving environment of any overflows is an overland flow path and unnamed tributary of the Mahurangi River. Watercare have advised that this pumping station will not be subject to Wet Weather Overflows given the network design provides for any such discharges occurring at an upstream pump station. The Consent Holder shall manage the Existing Network so that Dry Weather Overflows only occur as a result of network failure including breakages, blockages, third party damage and mechanical or power failure at pump stations or storage facilities.
Ardmore	The potential discharge of untreated wastewater will be to a terrestrial receiving environment that is considered to be low in sensitivity. The Engineered Overflow Point will be managed by the consent holder to achieve an average of no more than one wet weather overflow event every 50 years. Consent conditions require that dry weather overflows only occur as a result of network failure including breakages, blockages, third party damage and mechanical or power failure at pump stations or storage facilities.
Okura	Discharge of wastewater to land. Future residential developments within the subdivision shall be managed to achieve no more than one overflow event every 10 years and shall not exceed 22 m^3 /24 hours. The network will be managed and maintained so that dry weather overflows do not occur as a result of network failure including breakages, blockages, third party damage and mechanical or power failure at pump stations or storage facilities.

5.2.2.1 Evidence of the 'Best Practicable Option'

RPS policy B7.4.2.(10) pertaining to wastewater requires 'adopting the best practicable option for preventing or minimising the adverse effects of discharges from wastewater networks including works to reduce overflow frequencies and volumes'. Further direction to implement the Best Practicable Option (BPO) in relation to wastewater overflows is also provided by Chapter E1 'Water quality and integrated management', particularly policies E1.3.(17)(a) and E.1.3.(21)(a). The BPO is defined by the RMA as:

> … *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*.

It is noted that in-depth BPO analysis was not evident in the decision reports and may instead be contained in various supporting documents, such as the applicant's AEE, technical memos and the planners report. The decision reports for these consents were reviewed however for overarching evidence that the BPO was applied, and in most cases this was evident. Only one of the four decision reports did not directly refer to the BPO (the Upper Orewa consent). As this consent has a condition that requires it to be managed in accordance with the conditions applying to Watercare's NDC it will nevertheless be subject to BPO requirements. Two of the decision reports (Okura and Ardmore) briefly confirmed that the proposals provided the BPO, with one of these stating "In terms of positive effects, the proposal provides the Best Practicable Option and will generate positive effects for the community to provide for their social and economic wellbeing and for their health and safety". Further evidence of the BPO being applied was seen in the consent conditions of these reports, with one having a 'Best Practicable Option Assessment (BPO)' listed as a supporting document in condition one (Okura), and the other containing a condition allowing the conditions to be reviewed, including to "require the adoption of the best practicable option to remove or reduce any adverse effects on the environment, in particular adverse effects on soils, surface waters or groundwater" (Ardmore).

The consent in Warkworth had a more in-depth discussion of the BPO as the decision was determined by a hearing, in which a submitter had challenged that a series of decentralised systems would present a better alternative than the proposal. The hearing found that:

> *"Watercare has undertaken an extensive assessment of alternatives for the proposal in order to determine what it considered to be the most appropriate and sustainable long-term wastewater treatment servicing option for the Warkworth, Snells Beach, Algies Bay and Martins Bay communities…*
>
> "*… the assessment required by section 105 (1)(c) requires that regard be given to any other possible alternative methods for discharge or receiving environments and*

whether the proposal is the best practicable option. These assessments have been undertaken for the proposal and are detailed in the AEE, the Officer's Report and Watercare's evidence. We accept that Watercare has had regard to other possible options and has met its statutory and planning requirements".

Overall, between the four consents granted there appears to be relatively consistent evidence from the decision reports that the BPO was applied.

5.2.2.2 Consistency with policy

In all four consents, the decision reports show that the proposals were determined to be consistent overall with the policies of the AUP. Further to that, the consents were briefly reviewed for evidence of consistency with aspects of the RPS and other policies specific to wastewater network overflow discharges contained in Chapter E1[151].

The RPS directive to minimise adverse effects of wastewater discharges on water, is underpinned by policies directing the design and location of overflow points to minimise (among other things) adverse ecological effects, and policies to prioritise sensitive receiving environments. Discussion of ecological effects is quite clear in two of the consents (Upper Orewa and Ardmore). In these reports the processing planner has noted that the discharge will be to terrestrial ecological communities. The ecological effects are considered to be lower as terrestrial ecological communities are less sensitive to pathogens and other contaminants, as compared to aquatic ecological communities. The Ardmore consent, however, is bundled to other consent triggers including for development within a floodplain. In the reasons for deciding to grant the consent the processing planner has noted:

> "*In the unlikely event of a discharge occurring, during a significant rainfall event the direct receiving environment of the farm drain would be exceeded by flooding with overland flows needing to travel approximately one kilometre before entering a stream or wetland area. Appropriate prevention and clean-up procedures … to minimise the risk of potential effects of wastewater overflow to the open roadside drains that run along the northern property boundary and reduce the risk of spreading further to surface waters will be utilised*."

There was a clear statement in the Okura consent, which also involves the discharge of wastewater to land, that the sensitivity of the receiving environment to the potential adverse effects of the discharge will not be compromised. The Warkworth consent relates to an overflow discharge for which the receiving environment includes a tributary to the Mahurangi River. It is noted that wet weather overflows are not anticipated from this pump station, and instead will occur at an upstream pump station. Other elements of the bundled proposal also include upgrades to wastewater treatment plants (WWTPs). The application of the BPO approach in this project has provided for new DWO discharges of untreated wastewater which may enter the sensitive receiving environment. However, these discharges will be infrequent (being dry weather overflows caused by network failure) and Watercare (2021c) has noted that in the context of the whole project, overflows and discharges to the river will be reduced. The

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[151] Policies specific to wastewater network overflow discharges from Chapter E1 Water quality and integrated management include polices E1.3.(19)- (22).

decision report also notes that impacts on the Mahurangi River are anticipated to be reduced by the bundled proposal as:

> *"In the longer term, treated wastewater discharges to the sensitive Mahurangi River and Harbour will be removed entirely, resulting in significant enhancement of that degraded waterbody. This will result in positive cultural, ecological and social effects."*

The RPS and Chapter E1 policies also require that plans are in place for the effective operation of the network, including aspects such as the minimisation of dry weather overflows. All of the four consents have conditions relating to maintenance and management of the wastewater assets, excluding the Upper Orewa consent which is subject to the conditions of Watercare's NDC. The more complex proposal of the four (Warkworth) has more complex consent condition requirements. All of the consents (excluding Upper Orewa) have a condition specifically including a clause to investigate the cause of dry weather overflows and implement measures to avoid a re-occurrence of similar dry weather overflows in the future.

Policy direction from the RPS and Chapter E1 requires that processes are in place to minimise the adverse effects of overflows on public health and safety and the environment where the overflows occur. All of the consents (excluding Upper Orewa, subject to the conditions of Watercare's NDC) contain a condition requiring the clean-up of overflows to minimise effects on the public and to prevent overflows from entering surface water. The Ardmore consent provided a particularly useful discussion on the risk from the proposal's overflows:

> "*Potential adverse amenity and public health effects during emergency wastewater discharges could be anticipated … The pump station has been designed to ensure a very low risk and frequency of such potential overflow discharges – as such, the design has seeks [sic] to first and foremost avoid such an effect from occurring. However, should such a discharge occur, the effects will be managed through … Watercare's ''Wastewater Overflow Regional Response Manual" – which includes containment options as well as clean up and recovery procedures – so as to mitigate the potential adverse effects*".

5.2.3 AUP wastewater treatment plant consents

Nine consents were identified to have been granted, since the AUP became operative in part, for the discharge of treated wastewater from wastewater treatment plants (WWTPs). This comprised a mix of consents triggered under Chapter E6 and Chapter F2. Chapter E6 relates to discharges to land and freshwater, while Chapter F2 relates to discharges into the coastal marine area. Consents were initially identified from the Plans and Places resource consents database. A list of wastewater treatment plant consents obtained from Proactive Compliance was then cross checked, and two additional consents were identified. A summary of the details for each project and nature of the discharge is provided in Table 5.5. Decision reports were reviewed for evidence/discussion of the BPO being applied, and for discussion on the consistency of the proposal with relevant policy. These matters are discussed below.

Table 5.5 Consents granted under the AUP for wastewater treatment plant discharges.

Area	Applicant	Date granted	Project
Consents triggered under Chapter E6			
Wellsford	Watercare Services Limited	27/11/2017	Continued (and expanded) operation of the Wellsford Wastewater Treatment Plant (WWTP). Includes discharge to an unnamed tributary of the Hoteo River.
Warkworth	Watercare Services Limited	21/03/2017	Three new wastewater pump stations between Warkworth and Snells Beach, a replacement ocean discharge outfall for the new Snells Beach WWTP, and discharges in association with short term upgrades to the Warkworth and Snells/Algies WWTPs, and the new Snells beach WWTP. The discharge consent is a short term (5-year expiry) consent for the discharge of treated wastewater from the Warkworth WWTP to the Mahurangi River.
Omaha Flats and Omaha	Watercare Services Limited	20/03/2017	Continued operation of the WWTP (volume of discharge will not change). The proposal involves providing an additional 9.1 hectares of irrigation fields at the WWTP site. The bundled project includes two wastewater discharge consents for discharges to land, at the irrigation areas at Jones Road and Mangatawhiri Spit.
Consents triggered under Chapter F2			
Glenbrook	Watercare Services Limited	22/06/2019	Continued operation of the Waiuku Wastewater Treatment Plant (Waiuku WWTP) whilst the South-Western Sub Regional Wastewater Scheme is constructed. An 8-year duration is sought. Discharge is from the existing Waiuku WWTP into the Waiuku Estuary.
Martins Bay	Watercare Services Limited	21/03/2017	Three new wastewater pump stations between Warkworth and Snells Beach, a replacement ocean discharge outfall for the new Snells Beach WWTP, and discharges in association with short term upgrades to the Warkworth and Snells/Algies WWTPs, and the new Snells beach WWTP. The discharge consent involves discharge of treated wastewater to the Hauraki Gulf from the Snells / Algies WWTP. Short- and long-term discharge standards are provided, to account for the new WWTP.

Area	Applicant	Date granted	Project
Clarks Beach (1)	Watercare Services Limited	22/03/2017	Discharge in association with the operation of the WWTP at Clarks Beach, to the coastal marine area. A 10-year duration is sought.
Clarks Beach (2)	Watercare Services Limited	05/12/2017	In association with the new Waiuku WWTP, the discharge of treated wastewater into the Waiuku Estuary (in the south Manukau Harbour) and the construction of a new sub-surface/submerged pipeline and outfall structure to convey and diffuse wastewater into the coastal marine area.
Army Bay	Watercare Services Limited	19/12/2019	Discharges from operating the existing Army Bay WWTP, and for the staged upgraded WWTP to be constructed on the site, servicing the communities of Whangaparaoa, Orewa, Silverdale, Hatfields Beach, Wainui, Dairy Flat, Stillwater, Okura Bush and Redvale. Discharges will be to the coastal marine area in the Whangaparaoa Passage. Short- and long-term discharge volumes are consented to account for the upgrade to the WWTP.

5.2.3.1 Evidence of the 'Best Practicable Option'

Two of the consents (Warkworth and Martins Bay) in Table 5.5 are part of a bundled project which also contains an overflow component. Please refer to discussion of 'the Warkworth consent' in section 5.2.2.1 above, for discussion of the BPO for this bundled project. Of the remaining consents triggered under Chapter E6 for wastewater treatment plant discharges, one had clear discussion relating to the BPO (Wellsford). The decision report noted that:

> "*The provisions of section 105 of the RMA will be met, as the proposed discharge represents the best practicable option, the receiving environment will not be adversely affected in an unacceptable manner and discharge into an alternative receiving environment is neither practical nor necessary*".

There are no direct references to the BPO in the decision report for the Omaha Flats and Omaha bundled consents. A consent condition is provided for these consents, however, allowing the council to review the consent conditions for purposes including "to consider developments in technology and management practices that would enable practical reductions in the discharge of contaminants".

Considering consents triggered under Chapter F2 for wastewater treatment plant discharges, there is clear discussion on the BPO in the decision report for the Glenbrook consent. The report notes "Management of wastewater is an essential and necessary function that will inevitably result in some contaminants discharging from the network. With this in mind, the applicant has identified the continued operation of the Waiuku WWTP as an interim solution is the best practicable option and can ensure that contaminants are managed in the most efficient and effective way for the environment." Clear discussion of the BPO was also present in the Clarks Beach (2) consent. The proposal was subject to a hearing, in which the ‘consideration of alternatives to the proposed discharge’ was one issue of contention. The commissioners noted that “Watercare’s application included an extensive description and consideration of alternatives....” which led to the adoption of the proposal as the BPO. The Clarks Beach (1) consent contains no direct references to the BPO. The Army Bay consent also does not discuss the BPO; but does include a consent condition requiring the consent holder to commission a periodic ‘Technology and Growth Review’ which includes consideration of the future BPO.

Overall, distinct discussion of the BPO was not consistent throughout all the decision reports reviewed. It is noted that discussion of the BPO may be evident in further documents that were not reviewed in this exercise due to time constraints, such as technical memos and planners’ reports.

5.2.3.2 Consistency with policy

In all the consents reviewed for wastewater treatment plant discharges, the decision reports show that the proposals were determined to be consistent overall with the policies of the AUP. Further to that, there was a clear narrative that the consents provided key infrastructure projects to support urban growth in their areas, in line with direction set by the RPS[152]. It was noted in relation to the Warkworth and Martins Bay bundled consents that:

> “*The upgrades to the Warkworth Plant and Snells Plant will provide for Auckland's growth in the short and long term. The communities currently served by the two treatment plants are anticipated to grow considerably and reach a population of 11,300 by 2021, and 30,000 by 2051. Watercare's proposal will ensure that adequate infrastructure is in place to enable that growth, while avoiding or mitigating adverse effects on the receiving environments.*”

For the Omaha Flats and Omaha consents, it was noted that the project would support existing and ongoing growth for Omaha, Matakana and Point Wells. For Clarks Beach (1), the project would:

> “*... provide positive effects by facilitating urban development through enabling the first stages of development in the McLarin Road and Clarks Beach SHA areas, as well as providing an efficient use of the existing land and infrastructure whilst the medium- and long-term wastewater solutions for the wider area are progressed*”.

The decision report for the Clarks Beach (2) consent contained some in-depth discussion on the ability of the project to support the Southwest Growth Area, where the population is expected to grow from approximately 10,000 to 30,000 people by 2050. It was noted that the proposal would provide short term water quality improvements in comparison to the continued operation of the existing WWTP. In the long term, and as the population serviced by the new WWTP grows, the commissioners noted it is difficult to determine impacts on the Waiuku Estuary and the Manukau Harbour (especially looking beyond 10 to 15 years). Potential

[152] Policy B7.4.2. directs that we:
‘(10) Manage the adverse effects of wastewater discharges to freshwater and coastal water by all of the following:
(a) ensuring that new development is supported by wastewater infrastructure with sufficient capacity to serve the development; …’

future effects would be managed through consent conditions, particularly in relation to regular monitoring and reporting.

5.2.4 Managing the adverse effects of wastewater discharges with intensification of land use

Objective B7.4.1.(5) from the RPS section 'B7.4. Coastal water, freshwater and geothermal water' directs that "*The adverse effects from changes in or intensification of land use on coastal water and freshwater quality are avoided, remedied or mitigated*". In Chapter E1, policy E1.3.(20) provides specific direction that development in areas serviced by a combined sewer be managed to avoid increasing stormwater flows to the combined sewer, and to reduce existing flows where practicable at the time of intensification. This matter is discussed further in Chapter 7 Stormwater discharges, where a sample of relevant consents indicated that applications for increased stormwater flow to the combined network are generally mitigated by the provision of a detention tank. The use of water sensitive design to reduce overflows is aligned to direction provided by Auckland's Water Strategy.

Beyond managing stormwater flows, council staff have raised concern that the AUP contains limited provisions to manage the adverse effects on wastewater overflows from intensification of land use. The AUP has a clear policy direction that new development should be 'supported by wastewater infrastructure with sufficient capacity to serve the development' (policy B7.4.2(10)(a)) but little explicit guidance on how development can be delayed until there is an infrastructure upgrade to provide the relevant capacity. This timing misalignment is particularly challenging with intensification where new developments may occur as permitted activities, even where there are critical capacity issues.

5.2.5 Effectiveness and efficiency of the AUP

In assessing the findings on the indicators for this topic, it is difficult to attribute improved water quality and the reduction of adverse effects from wastewater discharges to any one policy response. Improved water quality is a result of multiple influences, including past regulatory processes (initiated many years, if not decades, ago), market intervention and technological changes. Network improvement projects are likely to have a significant contribution and are influenced by various factors, including technological changes, political decisions, and budget approval. There are also obstacles to network improvements which sit outside of financial and political influences, such as constraints on the physical environment, e.g., limited space in the road corridor for additional infrastructure assets. The improvements to the Mangere Wastewater Treatment Plant (consented under the ALW Plan) in the early 2000s is an example of how an infrastructure improvement project can have a significant influence on water quality. State of the environment monitoring has shown long term improvements in coastal water quality in the Manukau Harbour, driven by significant changes that occurred around the time of the WWTP upgrades (Auckland Council 2021d; 33-34). Watercare's Central Interceptor is another significant example of the influence of an infrastructure improvement project. Complemented by the western isthmus water quality improvement programme (funded by the Water Quality Targeted Rate), the project will reduce overflows in the area by up to 80 per cent (Watercare 2021a).

While the key to achieving the water outcomes set by the AUP may lie in a range of inputs and influences, an overview of the consistency of wastewater network consents in Auckland with the directives of the AUP is set out below.

5.2.5.1 Extent to which the network discharge consents are achieving the intent of the AUP

The network discharge consent data examined through this monitoring exercise cannot be used to conclude whether the AUP has been effective or efficient in managing wastewater overflows from the existing network, as the consents were granted prior to the AUP becoming operative However, there is an overall alignment between the outcomes sought in the AUP and the network discharge consents granted to Watercare, particularly in that the intent of both is to reduce the frequency of wet weather overflow events to an annual average of two events per location, and to prioritise overflow points exceeding that number for improvements, particularly in relation to sensitive receiving environments.

There was a slight improvement in the trend analysis results from 2019-20 to 2020-21 for the wet weather overflow target. The latest trend analysis shows that the majority (131 out of 166, or 79 per cent) of Type 1 EOPs consented under the NDC are achieving the wet weather overflow target of two overflows per year; this is a slight improvement from the 2019-20 result of 76 per cent. Twenty five out of the 35 remaining pump stations have either a decreasing trend or are stable. These figures indicate that the method of managing overflows under the NDC has been relatively effective. A limitation in linking data on the wet weather overflow target to water quality improvements, however, is that this target on its own does not illustrate the volume of overflows, as well as increases to the number of EOPs which may be added to the network. Watercare's analysis of the NDC data notes that a decrease in Type 3 WWOs may be due to drier weather over the past few years. This analysis highlights the impact that climate variability may have on wastewater overflow frequencies in the future. While drier weather has shown a positive impact on overflows in the latest NDC reporting, extreme weather events in future may lead to an increase in the number and volume of wet weather overflows. An increase in Type 3 dry weather overflows was reported in 2020-2021 under the NDC, and fats and rags have been identified as an increasing cause. These results, despite the network maintenance requirements included in the consent, illustrate the importance of other methods (such as public education) in effectively achieving wastewater overflow reductions.

While Watercare undertakes a significant process of identifying and prioritising sensitive environments for network improvements, it cannot be overstated that a key barrier for network improvements is financial capability (GHD, Beca & Boffa Miskell 2020: 107).The progressive reduction of wastewater overflows is dependent on the funding available for such projects, with priority necessarily given to those larger projects that provide the greatest 'bang for buck' (e.g., the Central and Northern Interceptor projects).

This process is most responsive in relation to Type 1 (pump station) EOPs and Type 3 (uncontrolled) discharges, where telemetry and complaints (respectively) provide data to Watercare about the frequency and volume of overflows. Both Type 1 (pump station) and Type

2 (pipe) overflow points are modelled. It is more difficult to establish monitoring equipment at Type 2 overflow points, however, which is a limitation in understanding the performance of the network. Record keeping of Type 2 overflow points has historically been poor – however the schedule of engineered overflow points originally provided in Attachment two to the NDC is updated and published annually (in the NDC annual report). This must include any further overflow points identified by Watercare within the existing network, as required by condition 56. Watercare undertakes ongoing improvements for the modelled information, and that information is used to prioritise ongoing improvements to the network. At a catchment level, the modelling and any available monitoring or consents data serves as an appropriately scaled method to progressively reduce the volume and frequency of overflows over time, in accordance with the criteria set out for the BPO and assessment of effects on the receiving environment of the NDC.

5.2.5.2 Extent to which consents granted under the AUP are achieving the intent of the AUP

There was varied evidence from consents granted under the AUP for wastewater overflows and treatment plant discharges that the BPO was applied, based on the review of associated decision reports. Discussion of the BPO appeared to be more consistent in overflow consents compared to treatment plant discharge consents, however this could be attributed to the smaller number of overflow consents granted (therefore giving a small number of consents to review). For consents where the BPO was not discussed in the decision report, it may still be premature to say that the BPO was not considered, due to the nature of this monitoring assessment which only covered one document (decision report) out of the many documents associated with the consent.

For wastewater overflows consents, there seemed to be fairly consistent evidence across the four consents reviewed that other aspects of the RPS and Chapter E1 policies had been considered. This included discussion of ecological effects and sensitive receiving environments, consent conditions for maintenance, management and the minimisation of dry weather overflows, and the mitigation of the adverse effects of overflows on public health and safety. Wastewater treatment plant consents also showed relative consistency with the RPS objectives and policies, including through the provision of wastewater infrastructure to support population growth. While seeing such evidence in the decision reports is a positive indicator that AUP policies are being integrated into decision making, it is noted that only a high-level assessment has been undertaken. In addition, feedback from a regulatory wastewater specialist has noted that it is difficult to fully understand the effects of wastewater discharges on the receiving environment, as monitoring is limited to a site-by-site or catchment-by-catchment basis. While catchment-by-catchment monitoring is consistent with the RPS direction to prioritise sensitive receiving environments, there is a lack of direction to assess the cumulative effects from wastewater discharges across the region.

5.3 Recommendations

Due to the limitations of this assessment, only two recommendations have arisen which could improve the effectiveness and efficiency of the achievement of the AUP's outcomes.

5.1 Investigate strengthening growth management measures under the AUP as an interim measure to reduce strain on the network in areas with critical capacity issues. (Category: NPS-FM related)

5.2 Investigate how Type 2 overflow points could be better managed under the network discharge consents, including whether any improvements could be prompted under the existing consent conditions or whether these would require review. The NDC annual report currently provides limited monitoring information for these overflow points. (Category: further investigation)

In addition to these recommendations, it is important to note the importance of 'other methods', and that the regulatory arm cannot operate by itself to achieve Auckland's aspired water outcomes. Education of the community is one such other method. For example, increased awareness on what should not enter the wastewater network (such as disposable wipes) can have an impact on reducing blockages of the network pipes and subsequent dry weather overflows. Additional other methods could include identifying and fixing cross connections to the network, and it is noted that this is a component of Auckland Council and Watercare's Safe Networks project. These other methods were not explored in detail as part of this monitoring work.

5.4 Future change under the NPS-FM

The council's work to implement the NPS-FM is underway, with the statutory requirement to notify plan changes by the end of 2024. A potential implication for NPS-FM processes relating to wastewater networks is that the current approach to managing wastewater has a focus on applying the best practicable option. This approach includes consideration of (amongst other things) the financial implications of an option when undertaking decision making; and will have to be amended to apply Te Mana o te Wai, which prioritises the health and well-being of freshwater.

Such changes may have a more significant impact on wastewater overflow discharges rather than wastewater treatment plant discharges, noting that the NPS-FM planning process does not apply to wastewater discharges to the coastal marine area as it cannot include regional coastal plan provisions (RMA s80A(8)). Freshwater planning, however, does need to take an integrated management approach and consider the effects of freshwater on sensitive down-stream receiving environments, which may include coastal areas in relation to nutrient management, particularly in estuaries. The council will need to consider all inputs to receiving environments, even where those are not to be regulated under the freshwater planning process.

Future changes to the AUP to implement the NPS-FM 2020 may also mean that features of Watercare's network discharge consents granted under the ALW Plan may start to diverge from planning policy. Like the AUP at present, the network discharge consents focus on the application of the BPO approach in the minimisation of overflows. Consideration of whether the NDC consent conditions are appropriate in the NPS-FM context may be required, and this is provided for specifically in condition 67 of the consent. This condition notes that consent conditions may be reviewed, including to enable water quality standards set by a rule in an operative Unitary Plan to be met. In order for Auckland to meet targets and limits set under the NPS-FM, additional mitigation measures to reduce overflows, such as increased implementation of water sensitive design, may also need to be investigated.

6 On-site wastewater systems

This chapter considers how effective and efficient the objectives, policies, rules and other methods of the AUP have been in meeting the outcomes intended by the Regional Policy Statement with respect to discharges from on-site wastewater systems.

Contaminants discharged to land have the potential to enter freshwater networks and coastal receiving environments, and consequently must be considered in the assessment of the AUP's efficiency and effectiveness in achieving water outcomes. On-site wastewater systems result in one such type of discharge of contaminants to land; these systems provide an alternative method of wastewater disposal for properties not serviced by a wastewater network. A range of treatment systems are available that treat wastewater effluent to a high quality and reduce potential adverse effects on the environment. Septic tanks and small package treatment plants are common mechanisms used across the region.

On-site wastewater systems have the potential to impact water quality, and the region's amenity values through system failures. On-site disposal problems can be exacerbated by inappropriate design, use or maintenance of systems, increased occupancy rates and changing lifestyle expectations. Wastewater discharges into groundwater, overland flow paths, freshwater bodies, and the coastal receiving environment can result in eutrophication of waterbodies, public health threats and odour. Auckland is estimated to have approximately 45,000 on-site wastewater systems[153].

Section 15 of the RMA precludes the discharge of a contaminant into land or water unless expressly allowed by (amongst other things) a rule in a regional plan, or a resource consent. The AUP (specifically, policy E1.3.(23)) sets direction that on-site wastewater systems should only be used where there is no practicable wastewater network connection available. Where on-site systems are required, the RPS and cascading policy contained in Chapter E1 'Water quality and integrated management' also direct that they avoid significant adverse effects on water quality, public and environmental health, and amenity; and that other adverse effects are remedied or mitigated[154]. Policy E1.3.(24) requires that the design of an on-site system is appropriate to the site conditions and minimises the level of contaminants to the greatest extent practicable, that adverse effects on mana whenua values are avoided, and that management and response procedures are in place to ensure the on-going performance of the system. Chapter E5 'On-site and small scale wastewater treatment and disposal' sets out the rules and standards to give effect to this policy direction.

On-site systems established lawfully prior to the AUP can operate as a permitted activity (subject to compliance with the relevant standards) under rule E5.4.1(A2), and the majority of systems in Auckland are operating under this rule. On-site systems can also be established as permitted activities under the AUP, subject to compliance with the relevant standards. Resource consent is required to establish systems in a few scenarios, including where the permitted discharge flow is exceeded, and where other permitted activity standards (such as accordance with 'Technical Publication 58 On-site Wastewater Systems: Design and Management Manual 2004' (TP58)) are not met. Whether or not resource consent is required,

[153] This figure has come from the on-site wastewater system compliance programme, discussed further in section 6.2.4.
[154] Related AUP policies include B7.4.2.(10)(d), E1.3.(23) and E1.3.(24).

building consent must be obtained for the installation or alteration of an on-site wastewater system. There has historically been limited regulatory oversight (or even accounting) of on-site wastewater systems across Auckland, due to the vast number which operate as permitted activities, however this gap is being addressed through the Water Quality Targeted Rate.

6.1 Indicators and measures

6.1.1 Outcomes sought by B7.3 and B7.4

Sections B7.3 'Freshwater systems' and B7.4 'Coastal water, freshwater and geothermal water' of the RPS set direction to minimise impacts from land use and discharges (from both point and non-point sources); this includes the adverse effects from on-site wastewater system discharges on water bodies and the receiving environment. Of particular relevance to on-site wastewater systems is RPS objective B7.4.1.(4):

> *The adverse effects of point and non-point discharges, in particular stormwater runoff and wastewater discharges, on coastal waters, freshwater and geothermal water are minimised and existing adverse effects are progressively reduced.*

Further objectives and policies specific to on-site wastewater systems are provided in Chapter E1, specifically policies E1.3.(23), E1.3.(24) and E1.3.(25). As noted above, this cascading policy sets direction that on-site wastewater systems should only be used where no wastewater network connection is available and provides further direction on the avoidance of adverse effects.

6.1.2 Indicators, measures and information sources

In the absence of a relevant indicator for objective B7.4.1.(4) in Chapter B11 'Monitoring and environmental results anticipated' of the RPS, two indicators were developed for the purpose of this report. The relationship between indicators, measures, and information sources is set out in Table 6.1 below. The indicators reflect the intention of the RPS and cascading policy, that land disposal systems should only be utilised in locations where there is no sewerage reticulation and be designed to an appropriate standard (e.g., in relation to the site characteristics and number of occupants) to minimise adverse effects on the environment. Ensuring systems are maintained and operated correctly will also reduce potential and existing adverse effects from sub-standard systems. Further details on the relationship between AUP objectives and policies and the indicators developed for this report are contained in Appendix C[155].

Table 6.1 Indicators, measures and information sources.

Indicators	Measures	Information Sources

[155] Please note that this topic does not address the mana whenua aspects of the identified policies, as noted in section 1.7.1.

1. On-site wastewater systems are approved in appropriate locations and are suitably designed to minimise adverse effects of discharges on water bodies.	• Number of consents granted for on-site wastewater systems in the Future Urban Zone and urban zones. • Assessment of whether on-site wastewater consents were approved after technical review and a review of some key characteristics of the systems (such as site area and reserve disposal area). • Assessment of whether granted consents were consistent with the policy approach and whether there are issues in the policy implementation (including through the implementation of rules and standards contained in Chapter E5).	The Plans and Places resource consents database. Discussions with/ information shared by regulatory specialists who provide specialist input into resource consents for on-site wastewater systems.
2. On-site wastewater systems are operated effectively to minimise adverse effects and progressively reduce existing adverse effects on water bodies.	• Number of on-site wastewater systems that are complying with consent conditions or permitted activity standards.	The Plans and Places resource consents database. Discussions with/ data shared by Healthy Waters specialists relating to the Water Quality Targeted Rate and the on-site wastewater system compliance programme.

6.2 Findings and analysis

This section presents the results of an analysis of consents granted for on-site wastewater systems under Chapter E5 of the AUP. Consents triggered under Chapter E5 include those under rule E5.4.1(A5) 'Discharges of up to 6m^3 per day of treated domestic type wastewater via a land application disposal system – restricted discretionary activity' and rule E5.4.1(A6) 'Discharge of treated domestic-type wastewater and wastewater (excluding trade waste) that does not meet the relevant standards or is not provided for by any other rule in the Plan – discretionary activity'.

In total, 325 consents were identified from the Plans and Places resource consents database[156] to have been processed under the AUP for on-site wastewater systems, with a date span from November 2016 – December 2020[157]. Of the 325 results found, 242 consents were triggered

[156] Three searches were undertaken in the Plans and Places resource consents database for each rule (E5.4.1(A5) and E5.4.1(A6)), to capture some of the different formats by which the rules may have been recorded. E.g., for E5.4.1(A5), the searches were: "E5.4.1(A5)" "E5.4.1 (A5)" and "E5.4.1.(A5)".
[157] The actual date span of the search was from November 2016 until April 2021 when the data was requested.

under rule E5.4.1(A5), 75 consents under rule E5.4.1(A6) and 8 consents were triggered under both rules[158].

This report considers an assessment of a random sample of 56 consents. The sample includes consents triggered under both rules E5.4.1(A5) and E5.4.1(A6), with all consents considered together as one 'population'. This decision was made in part due to the similarities between the two activity types[159]. Furthermore, the points considered are relevant to both activity types (e.g., whether they provided a sufficient reserve area). Within the sample, 41 of the consents were triggered under rule E5.4.1(A5), 13 were triggered under rule E5.4.1(A6) and two of the consents were triggered under both rules. The total sample size has a relative standard error of 12.29.

6.2.1 Location of on-site wastewater consents

Figure 6.1 illustrates all consents processed under Chapter E5, and also shows the location of the Future Urban Zone (FUZ). The map shows that some consents have been granted in the FUZ where we would expect future municipal wastewater infrastructure to be provided. Notably, this is a small proportion of the consents granted (3.4 per cent), and may include the renewal of existing discharge consents, upgrades to existing on-site wastewater systems, as well as new systems where subdivision may have occurred in the FUZ (with subdivision being granted under the AUP or under a legacy plan).

[158] The small number of consents which appear to have been triggered under both rules indicates an error that may have occurred either in the processing of these consents or the subsequent data recording.
[159] Activities which fall under rule E5.4.1(A5) and E5.4.1(A6) are distinguished by their discharge volume and/or their associated activity. Seven of the 13 consents assessed which were triggered under activity E5.4.1(A6), fall within the same daily discharge volume for which a consent can be triggered under E5.4.1(A5) (up to $6m^3$ per day). In four of these consents rule E5.4.1(A6) was applied due to the associated activity, whereas three appear to have come under this rule due to a minor variation in how processing planners have categorised consents into each rule (this is discussed further in section 6.2.3.1.2).

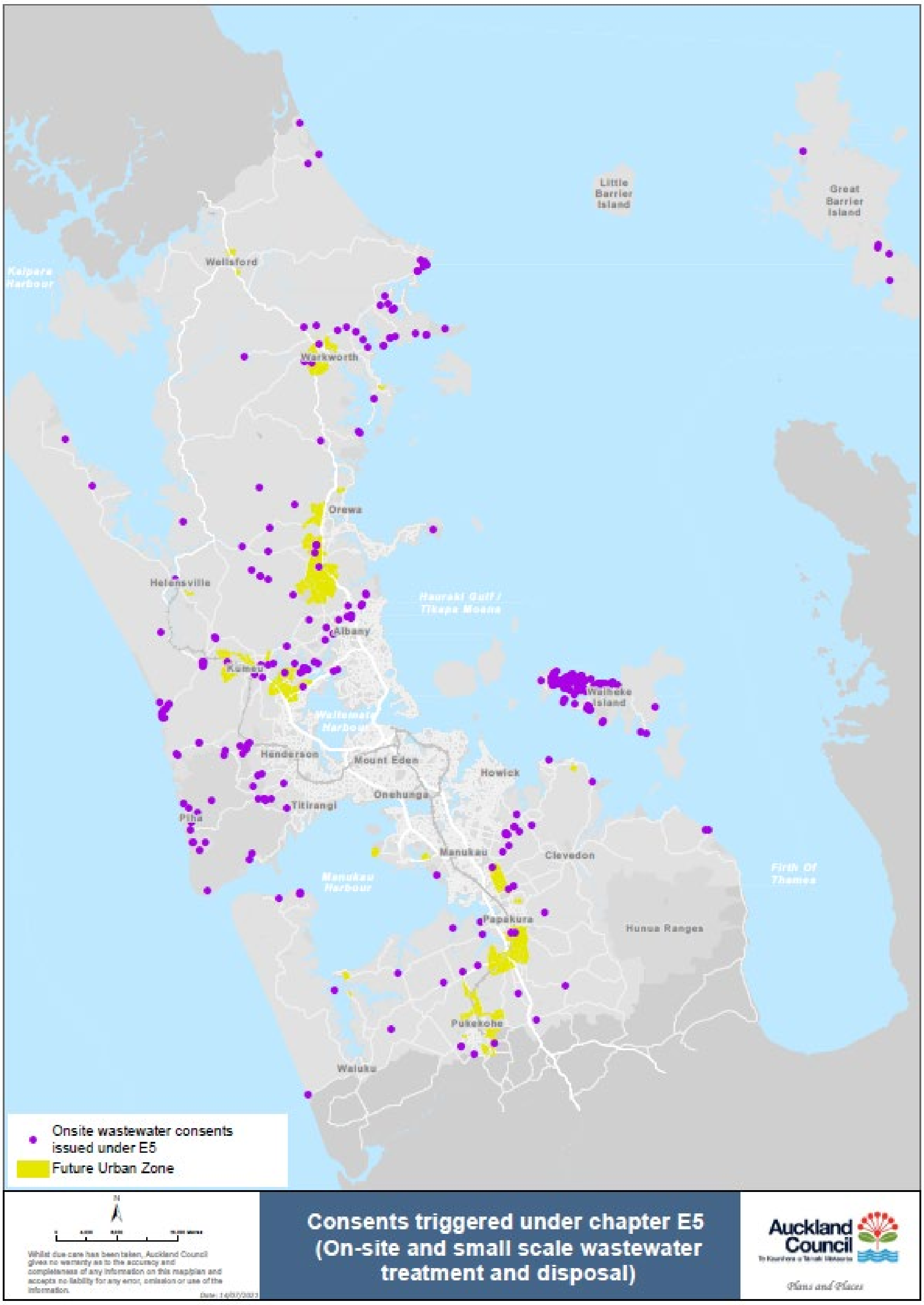


Figure 6.1 Consents triggered under Chapter E5 in relation to the Future Urban Zone

Consents from the sample were also categorised in relation to different groups of zones (see Figure 6.2), to give an indication on the proportion of consents being granted in rural and urban areas. Most notably, a significant number of consents have been granted in the Hauraki Gulf Islands residential and commercial zones which historically have relied on land disposal systems. The sample also showed a notable proportion of consents granted in the AUP residential zones (21 per cent of the sample, 12 consents). All but one of these consents were for sites zoned either Residential – Large Lot Zone or Residential – Rural and Coastal

Settlement Zone. The AUP anticipates that sites within these zones may be constrained by a lack of reticulated wastewater services and as such it is not unexpected for on-site wastewater systems to be located within these zones.

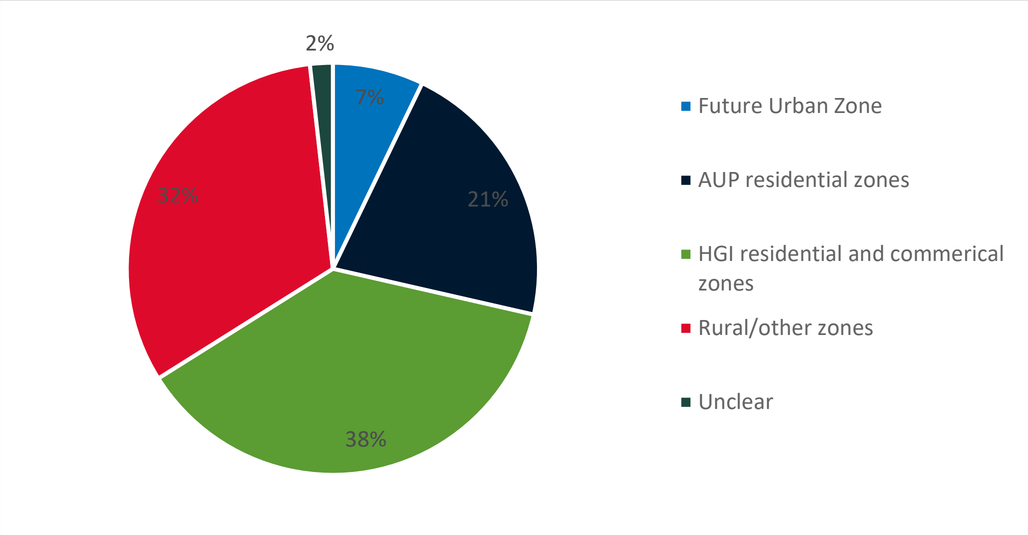


Figure 6.2 Zoning of sites where on-site wastewater systems have been installed (from the consent sample)

Discussion with the regulatory wastewater specialist team indicates that when a consent is granted in an area expecting a network, a condition requiring that a connection be made to the network once available may be included on the consent, if the timing of infrastructure delivery is certain. Some precincts (such as Long Bay) include specific policies requiring on-site disposal systems to be used only as an interim solution. Anecdotal evidence from the regulatory specialists shows that renewal applications for on-site wastewater systems in areas serviced by a public network do not occur very frequently. When they do occur, the applicant is usually able to demonstrate that it is not practicable to connect to the network, which aligns with policy direction from Chapter E1 that on-site disposal should only be used where no practicable network connection is available.

6.2.2 Characteristics of consented on-site wastewater systems and their associated sites

Nearly all applications in the consent sample received technical review, and of those that did, 100 per cent were granted generally in accordance with the recommendation and recommended conditions of the regulatory wastewater specialist who provided input. Of the consents assessed, six proposals were identified as not having a sufficient reserve disposal area. The reserve disposal area is an area set aside for future use as a disposal area in case the original land application area fails or becomes inadequate over time; it is a design contingency to minimise potential adverse effects over the lifetime operation of an on-site wastewater system (Chen and Silyn Roberts 2021: 40). Technical input for these consents was reviewed to provide insight as to why consents are granted where a sufficient reserve area is not available. Insights gained into the consent reasoning are summarised in Table 6.2.

Table 6.2 Insight into the reasoning for consents granted without a sufficient reserve area (from the consent sample)

Consent reference and location	Reserve disposal area[160]			Insight into consent reasoning[161]
	TP58 recommendation	Proposed	Granted	
Consent 1 (Waiheke Island)	33-100%	0%	0%	The proposed method of discharge is considered an improvement over the current method of deep bore discharge.[162]
Consent 2 (Waiheke Island)	50-100%	43%	43%	The proposal has been approved with conditions to address the challenges of the site, as discussed in the specialist's memo: "*An intense monitoring of wastewater, effluent quality monitoring, installation of water saving devices and a wastewater system audit has been discussed and agreed by the applicant's consultant during the course of processing the discharge consent. Due to the nature of the site, topography and location of disposal fields with respect to the steep slope and overland flow path, the quality of the wastewater treatment needs to be high and the system needs to be well managed and maintained. The 10-yearly audit of wastewater treatment and disposal system and effluent monitoring condition is included to ensure the system will be operating as designed.*"
Consent 3 (Waiheke Island)	33-100%	17%	17%	The proposal has been approved with conditions to address the challenges of the site which limit the reserve disposal area, as discussed in the specialist's memo: "*The applicant has proposed only 17% per cent of reserve disposal area due to the limited suitable area available for effluent disposal. A good wastewater treatment system, regular flow monitoring, audit of proposed wastewater treatment and disposal system including sealed overflow pipe for stormwater*

[160] The reserve disposal area recommendation is based on the TP58 guidelines and is a percentage of the primary disposal area. For each of the applications assessed, this is noted in the AC wastewater specialist memo associated with the application. The TP58 recommended reserve disposal area (percentage) varies between applications as it is proportional to the degree of risk of the proposed system. The 'proposed' percentages in Table 1.2 represent the design proposed by the applicant.
[161] Insight into consent reasoning was gained from the AC wastewater specialist memo associated with the application.
[162] The AUP makes the discharge of domestic type wastewater by new deep bore disposal a prohibited activity under rule E5.4.1 (A7).

Consent reference and location	Reserve disposal area[160]			Insight into consent reasoning[161]
	TP58 recommendation	Proposed	Granted	
				disposal away from disposal fields is proposed. Auckland Council accepts the reduced reserve disposal area with the suite of other mitigation measures proposed."
Consent 4 (Swanson)	33%	17%	17%	The proposal has been approved with conditions to address the challenges of the site which limit the reserve disposal area, as discussed in the specialist's memo: "*While insufficient reserve area presents a degree of risk should the primary disposal area fail in the future, as long as the design is conservative, and the information provided with the application is accurate and the conditions of this consent are complied with, I consider the risk as low and acceptable.*"
Consent 5 (Whitford)	50-100%	33%	100%	The consent was approved with a condition altering the proposal to require that a 100 per cent reserve area be provided.
Consent 6 (Swanson)	33%	29%	29%	The proposal was considered acceptable, in line with comments from the specialist's memo: "… *While this is less than 33 per cent as recommended by TP58 (2004), based on the proposed wastewater design, and subject to full compliance with the conditions of this consent, this is considered acceptable*".

Figure 6.3 shows the number of consents granted within the consent sample for different site sizes. Fourteen of the 56 consents assessed were granted for sites with an area below 1,000m^2. Eleven of these smaller sites were properties on Waiheke Island. All fourteen consents were in association with development occurring on the site (including new dwellings and additions to existing dwellings), and the installation of new or upgraded systems. Discussion with regulatory specialists has also shown concern that under the AUP and structure plans, subdivision in Whenuapai Village has been enabled with a reduction in lot sizes to provide greater density (from 1,500m^2 to 600m^2). The area is unreticulated with a dependency on on-site wastewater systems to service properties, until a reticulated wastewater network is made available. The Whenuapai Structure Plan identifies that Whenuapai's network capacity will be enhanced by the completion of stage 1 of the Northern Interceptor Project (expected 2021), (however this will not provide reticulation to the Whenuapai Village area at this time). Further network capacity in Whenuapai is to be provided by later stages of the project (up until 2035) (Auckland Council, 2016: 57-58). Lot sizes under 1,000m^2 are considered to be technically difficult in terms of the installation and long-term operation of a functioning on-site

wastewater system, in accordance with recommendations from TP 58[163] (Auckland Regional Council 2004).

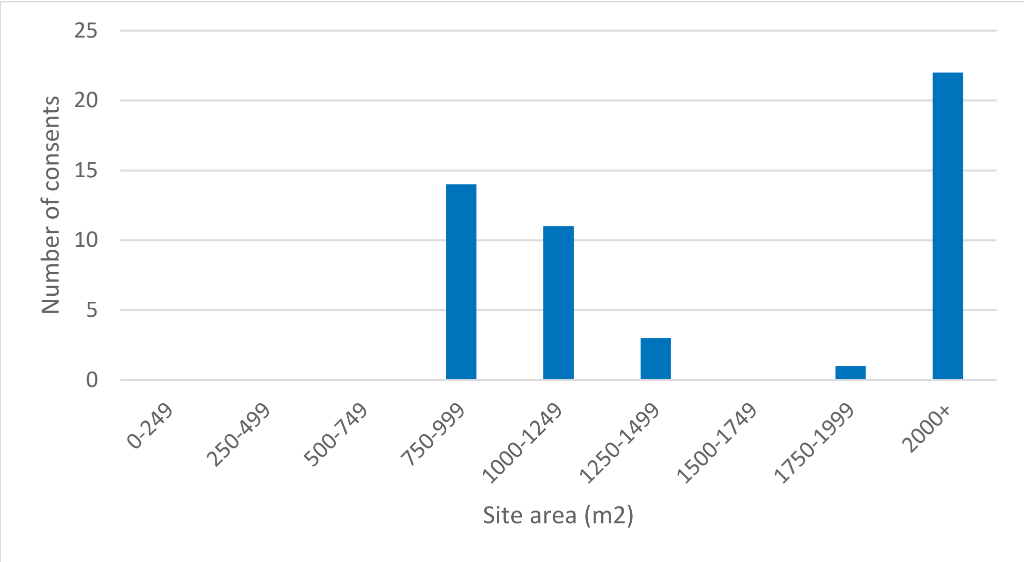


Figure 6.3 Site areas for consented on-site wastewater systems (from the consent sample)

While data collection relating to this matter has not been undertaken as part of this exercise, Healthy Waters specialists have also raised the issue of on-site systems being consented in flood hazard areas. Rules regarding the location of on-site wastewater systems within hazard areas are set out by AUP Chapter E36 'Natural hazards and flooding', although policy direction specific to this activity is limited within the chapter. TP 58 does set further direction in relation to system design and flood hazards, and new systems must accord with this guidance document to meet the permitted activity standards contained in Chapter E5.

6.2.3 Policy implementation issues associated with on-site wastewater systems

As previously noted, the RPS (and particularly policy B7.4.1.(4)) sets direction that the adverse effects from on-site wastewater system discharges on water bodies and the receiving environment must be minimised. Chapter E1 contains further objectives and policies specific to on-site wastewater systems, and Chapter E5 sets out the rules and standards to implement the policy position. The following analysis considers whether granted consents show evidence of consistency with the policy approach and whether there are issues in the policy implementation.

[163] TP 58 is the current Design and Management Manual for on-site wastewater systems across Auckland. An updated publication (GD06) is currently in development to replace this guidance.

6.2.3.1 Consistency of on-site wastewater consents with AUP policy

Decision reports from the consent sample (particularly the section 104(1)(b) discussion on the consistency of a proposal with policy) were reviewed as part of the data collection and all reports in the sample generally confirmed the on-site wastewater systems were consistent with AUP policy. There was a range in the depth of discussion on policy, from decisions with statements about the proposal being consistent 'with the relevant policy documents', to those that referred to the relevant sections or objectives and policies from the AUP. Some variability is to be expected, as the depth of discussion should be proportional to the complexity of the project. In this case, 37 of the 56 reports referred directly to AUP Chapter E1 which contains the relevant objectives and policies for water quality.

6.2.3.2 Implementation issues associated with Chapter E5 of the AUP

Insight into the implementation issues associated with Chapter E5 of the AUP were gained both through the consent analysis and discussions with council staff, particularly regulatory wastewater specialists.

Some minor variation was observed from the consent sample of the situations where rules E5.4.1(A5) (restricted discretionary activity) and E5.4.1(A6) (discretionary activity) were applied. This variation highlighted a level of ambiguity and conflict that exists within the E5.4.1 Activity table. This is explained as follows.

- Permitted activity E5.4.1(A1) applies to the 'discharge of treated domestic type wastewater onto or into land within a site via a land application disposal system'. This rule is subject to permitted activity standards under E5.6.2.1, including that "the wastewater design flow and actual flow must not be greater than 2m^3 per day."
- Restricted discretionary activity E5.4.1(A5) applies to 'Discharges of up to 6m^3 per day of treated domestic type wastewater via a land application disposal system'.
- Discretionary activity E5.4.1(A6) applies to the 'Discharge of treated domestic-type wastewater and wastewater (excluding trade waste) that does not meet the relevant standards or is not provided for by any other rule in the Plan'.

In a scenario where the proposed wastewater flow is under 2m^3, (and where no other activity in the E5.4.1 activity table applies) the activity appears to be a permitted activity under rule E5.4.1(A1). However, if other relevant permitted activity standards under E5.6.2.1 are not met, it appears ambiguous which rule (and activity status) should apply. Should such proposals be processed under activity E5.4.1(A5), which provides a relevant description of the activity, or under activity E5.4.1(A6), which specifically applies to a discharge "that does not meet the relevant standards". Both activity descriptions relate to the scenario. If the 'or' in the description of activity E5.4.1(A6) was an 'and' it would be quite clear that E5.4.1(A5) should be applied.

Discussion with regulatory wastewater specialists revealed that legal advice was sought on this matter in 2018 in relation to one such application, and this advice has guided implementation of the activity table since. Correspondence leading up to this legal advice being sought shows that while staff believed such scenarios should logically be processed as a restricted discretionary activity (activity E5.4.1(A5)), the wording in Chapter E5 does not provide reliable support for this and could be interpreted the other way. The received legal advice favours the application of activity E5.4.1(A5) (restricted discretionary activity) in such scenarios where this ambiguity exists. The reason for not applying rule E5.4.1(A6) was partly attributed to the application being provided for by another rule in the Plan – specifically Rule (A5).

As application of the two rules would not necessarily be clear to users outside of the council, this activity table cannot be described as robust. However, as there is now a clear approach to its use for consent processing, and internal correspondence indicates the rules are being used as intended when the AUP was developed and as is appropriate to the scale of the infringement, it is perhaps not impacting environmental outcomes.

Concern was also raised by the regulatory specialist team about the lack of a rule which clearly provides for upgrades to and replacements of existing on-site wastewater systems. As previously mentioned, the majority of on-site wastewater systems in Auckland operate under rule E5.4.1(A2)[164], which provides for discharges from on-site wastewater systems legally established prior to the AUP, as a permitted activity. This rule addresses s15 of the RMA which precludes the discharge of a contaminant into land or water unless expressly allowed by (amongst other things) a rule in a regional plan. There is a lack of clarity in consent processing around when this rule provides for the scenario of replacing or upgrading an existing system. It is felt that a separate permitted activity rule is needed to deal with upgrades to existing wastewater treatment systems so that there is a clear distinction between the two scenarios. This additional rule would clearly set out what standards need to be met when an on-site system is upgraded. Applications for upgrades to wastewater treatment systems are currently assessed on a case-by-case basis to see whether they will require consent. In the meantime, the cost of a discharge consent application (requiring a $7,000 deposit) can put owners off doing work to upgrade their systems or getting their work consented.

References in Chapter E5 to TP58 were also raised as an issue, due to the complexity and lack of awareness surrounding this technical document as well as its dated status. There is an Onsite Wastewater Plan Change, currently underway by council staff, which is expected to change references to the more up to date GD06 (Chen and Silyn Roberts 2021).

The inclusion of non-domestic wastewater under activity E5.4.1(A6) was noted as a point of concern within Chapter E5 due to unclear boundaries between a non-domestic discharge, and industrial or rural discharges, for some discharges (e.g., equine waste).

The National Environmental Standards for Freshwater (NES-F) was also raised as an issue for the regulatory specialist team due to activities which are non-complying under the NES-F (on-site wastewater discharges within 100m of a wetland), but which would be permitted activities under the AUP. A lack of guidance on processing these consents and regarding the level of information required from the applicant has been causing delays for the team.

[164] E5.4.1(A2) specifically provides for the 'Discharge of treated domestic type wastewater onto or into land via a land application disposal system that was a permitted activity and/or lawfully in existence without the need for a resource consent at the date of this rule becoming operative'.

6.2.4 Compliance of on-site wastewater systems

As part of the resource consent sample data collection, files were checked for completed compliance monitoring reports[165]. Compliance monitoring is undertaken by council compliance officers and involves the observation of granted resource consents, to monitor whether the conditions of consent are being achieved. After undertaking a site visit, officers will complete a report and score the site from 1-4. All of the 19 monitoring reports found reported scores of 1 (fully compliant) or 2 (evidence of minor effects or potential for minor effects, including missing information) (see Figure 6.4)[166]. The main comments from the monitoring reports were about missing information, such as management plans or maintenance contracts. Examples of other comments include instructions to mulch dripper lines or to plant out the disposal area.

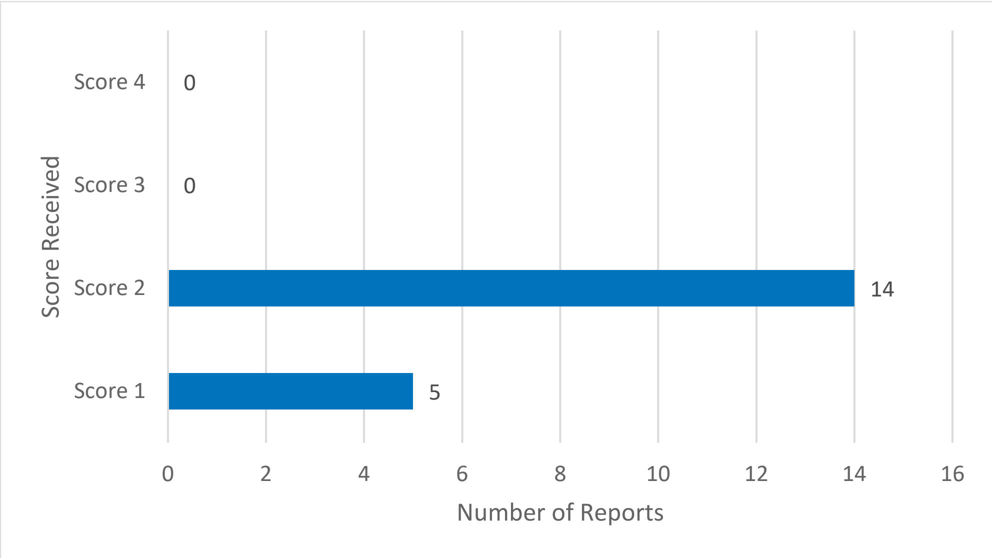


Figure 6.4 Scores received in compliance monitoring reports (from the consent sample). Score 1= fully compliant. Score 2= evidence of (or potential for) minor effects. Score 3= evidence of (or potential for) moderate effect(s). Score 4= evidence of major effect(s).

Out of the estimated 45,000 on-site wastewater systems across Auckland, only approximately 900 of these are consented activities (Auckland Council 2017: 14). This leaves the vast majority as permitted activities under the AUP, which have historically been subject to little regulatory oversight. Compliance of this large proportion of systems with permitted activity standards is thus an essential part of the AUP being able to achieve its intended outcomes. As shared by the regulatory specialist team; anecdotal evidence from wastewater system installers indicates that a lack of inspection, servicing and maintenance undertaken by property owners, is one of the biggest issues they encounter. Wastewater service operators are often only called out when there is a problem, and until then on-site systems are often 'out of sight, out of mind' for

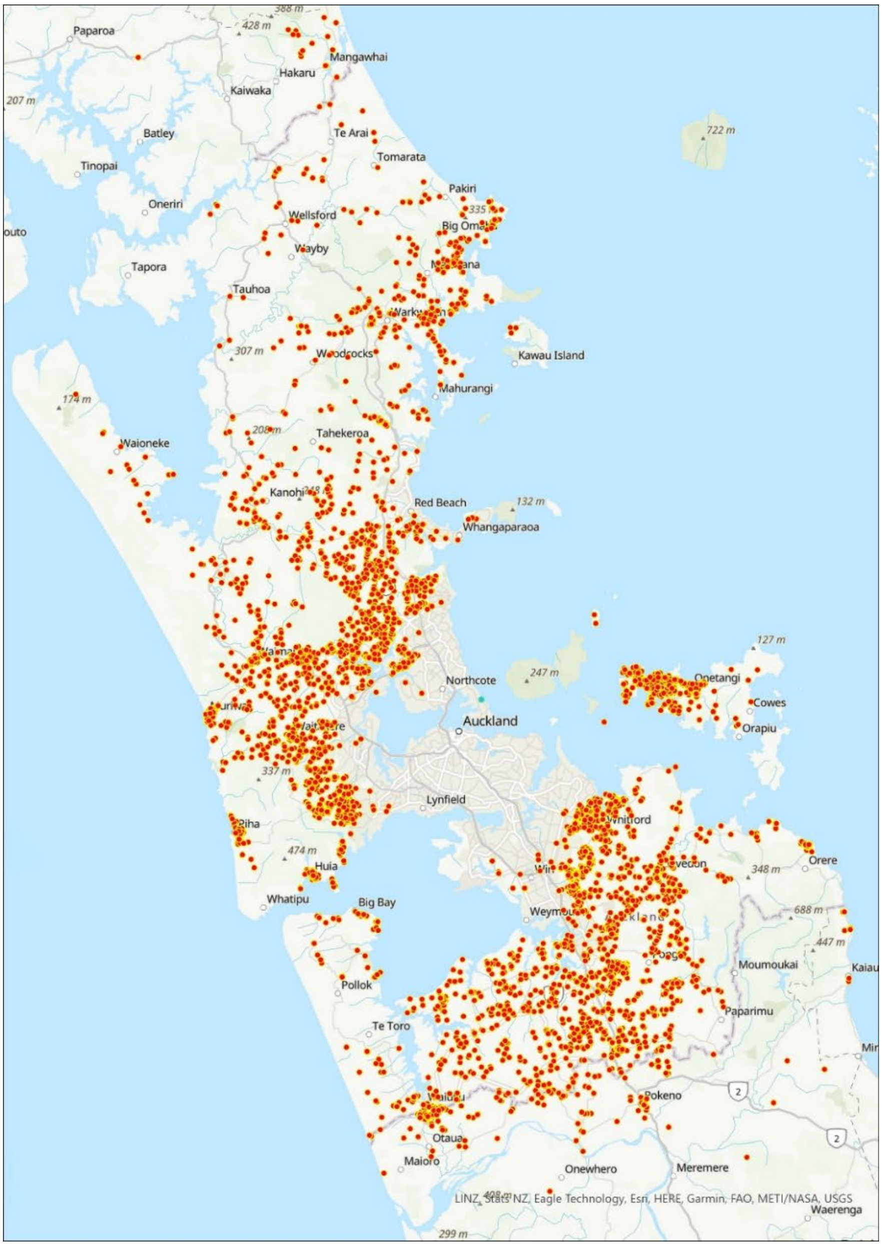
[165] For bundled consent projects, monitoring reports that did not relate to the discharge component of the project were disregarded. E.g., reports related to the land use component of the proposal.
[166] The score rating key progresses from 1-4. A score of 3 would indicate 'Evidence of moderate effect(s) or potential for moderate effect(s). Enforcement action will be considered for level 3 non-compliance.' A score of 4 would indicate 'Evidence of major effect(s). Enforcement action likely.'

a lot of property owners. the council has recently launched a compliance programme for on-site wastewater systems across the region (consented and not). This programme is entirely funded from the water quality targeted rate (WQTR), and the request of records under the new compliance framework is due to begin mid-2022. The programme does not yet comprehensively capture the compliance of on-site wastewater systems across Auckland as at present approximately 12,000 maintenance/monitoring records have been received (with some of these from the same property due to the 6 monthly inspection requirements), in relation to the estimated 45,000 properties with on-site systems.

Development of the WQTR compliance programme has involved two main components, 1) the establishment of an information database for on-site wastewater systems across Auckland and 2) the development of an online tool for use by commercial companies which maintain wastewater systems, when undertaking maintenance checks. This online tool will help progress a move away from paper records which are time consuming and difficult to analyse. The database has been established using GIS and other sources and has provided the estimated number of approximately 45,000 on-site wastewater systems in Auckland. Work is underway to create a SAP module so that the database can be systematically updated, for example when a building consent is processed that involves a new on-site wastewater system. The database and the online tool will together streamline the process for sending records and tracking the compliance status of properties.

The online tool for maintenance checks (Survey 123) is currently being used by about 10 companies, out of an estimated 30-40 in the industry. Note that all these companies have voluntarily begun to use this tool, with a more proactive roll-out of the system to the remaining companies programmed to align with the SAP build. Use of the tool will remain voluntary, but contractors using the system will be promoted in council communications. Data from the reports will inform the council database, by both identifying properties not on the database and identifying where the wrong system is recorded – for example, due to the property owner having upgraded to a new system. the council will be sending letters to people who have not had their systems inspected, when it shows through the database that no maintenance information is coming through. It is intended that the reports will also go on property files and LIM reports to help make people more aware of the maintenance requirements and development potential of a site when buying it. At present, the AUP permitted activity standards do not require property owners to submit their maintenance records to the council, rather they must hold them on site where they can be inspected by an officer. This was raised by a Healthy Waters specialist staff member as an issue they are investigating to change.

A snapshot of the new on-site wastewater monitoring database in early 2022 showed the results in Figures 6.5-6.7 These figures relate to all systems where the relevant data has been captured by the monitoring database. Figure 6.6 shows the type of water supply at sites with an on-site system, where this has been recorded. Wastewater disposal issues can occur in areas serviced by reticulated drinking water but not by a reticulated wastewater system; this issue is discussed further in this section in relation to Foster Bay at Huia. Figure 6.7 shows that where systems are shown not to be performing adequately, this is more likely to be due to more minor causes rather than critical failure of the system. This aligns with the compliance monitoring report results and comments from the consent sample, discussed above. The database also shows that 4,577 properties are recorded as having secondary systems[167] (54 per cent of properties where this data has been recorded), and 3,876 properties are recorded as having only primary systems[168] (46 per cent of those recorded). Information on system type is currently unknown for 36,099 properties.



[167] Technical guidance GD06 defines secondary treatment as “Aerobic biological treatment process, including settlement and/or filtering of wastewater. Secondary treated wastewater is expected to be equal to or better than 20g/m^3 5-day biochemical oxygen demand and 30g/m^3 suspended solids. Wastewater units that can provide secondary treatment include well designed and operated aerated treatment plants” (Chen and Silyn Roberts 2021: vii).

[168] Technical guidance GD06 defines primary treatment as “The separation of suspended material from wastewater by settlement and/or flotation in septic tanks, primary settlement chambers etc. prior to effluent discharge to either secondary treatment process or to a land application system” (Chen and Silyn Roberts 2021: vii).

Figure 6.5 Location of completed inspections of on-site wastewater systems logged in the compliance database[169]

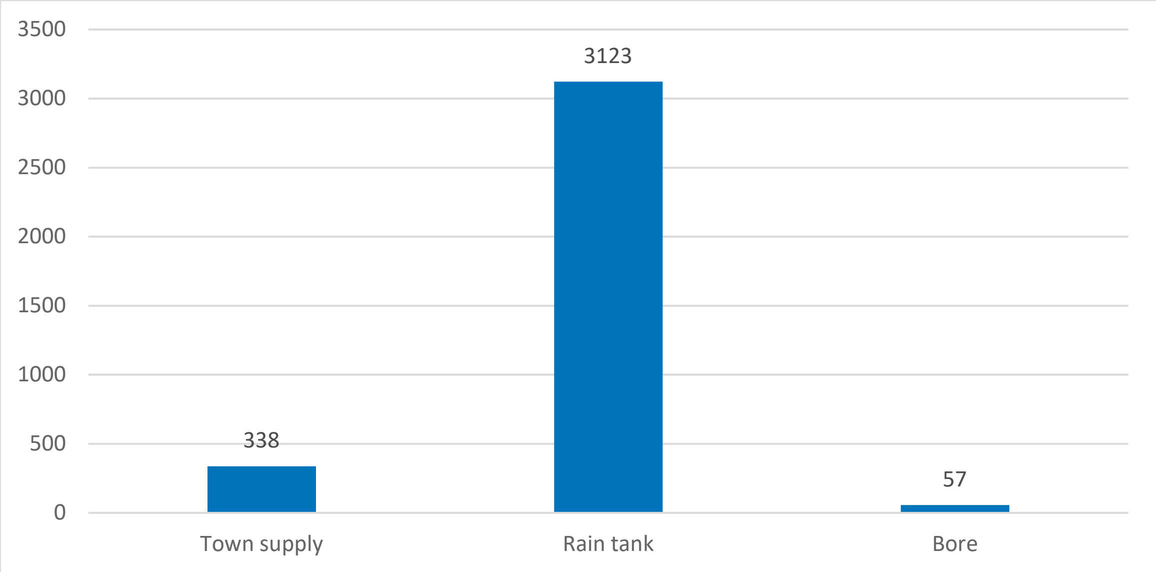


Figure 6.6 Type of water supply at sites with an on-site wastewater system[170]*. Information is unknown for 41,037 sites.*

[169] Source: snapshot of data generated from the on-site wastewater system compliance programme database (March 2022).
[170] Source: snapshot of data generated from the on-site wastewater system compliance programme database (March 2022).

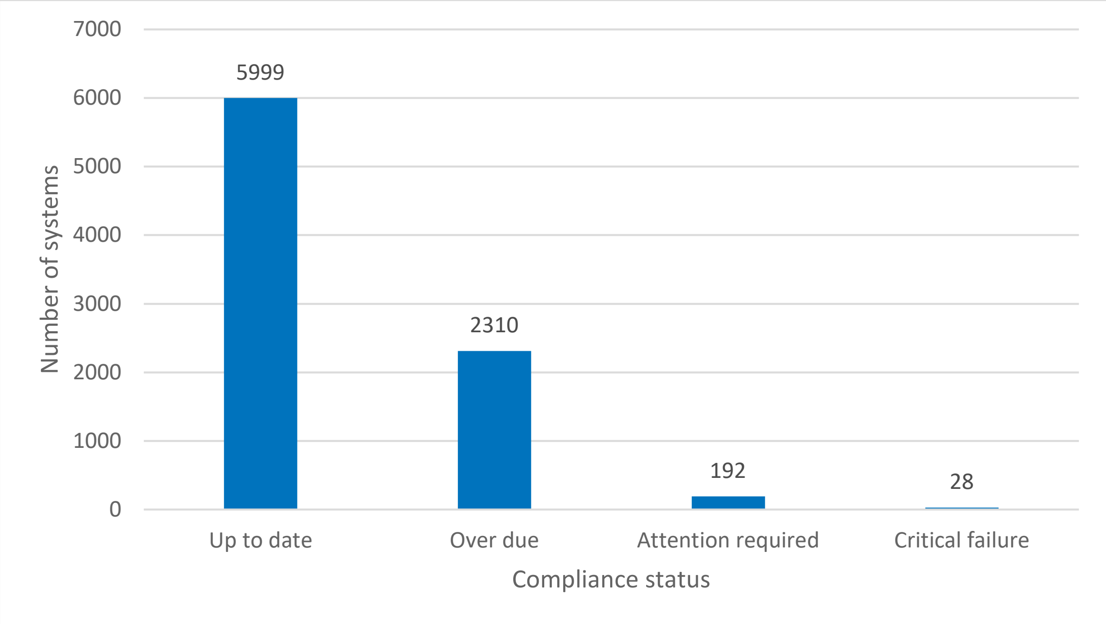


Figure 6.7 Compliance status of on-site wastewater systems in the database (at the date of data request)[171]. Information is unknown for 36,026 sites.

The WQTR on-site wastewater system compliance programme is linked to and supported by the Safeswim[172] and Safe Networks[173] projects. Where Safeswim identifies that water quality poses a risk to public health, Safe Networks conducts monitoring and investigations in streams, watercourses and the stormwater network to identify contaminants and track them to their source. The investigation process can take a couple of years, as the team will need to wait for certain weather events during the investigation, before undertaking the intervention and then post-intervention monitoring. Due to the long-term nature of this process, there is a time lag in determining results. There are also limitations in the water testing technology, which can identify if there is bird, dog, or human faecal waste but cannot identify the relative proportion of each.

Little Oneroa Lagoon on Waiheke Island, for which Safeswim has advised a long-term water quality alert, is one area the programme has targeted. After carrying out testing and an intervention programme, water quality had improved but was still poor. With the limitations in water testing technology, it cannot be determined whether the amount of human-waste related pollution has reduced due to the first intervention.

Foster Bay in Huia is the only beach where poor water quality has been attributed to on-site wastewater systems, with the remaining areas being lagoons or freshwater. The community surrounding Foster Bay is connected to a reticulated water network (drinking water); but has no public wastewater network available and is dependent on on-site wastewater disposal

[171] Source: snapshot of data generated from the on-site wastewater system compliance programme database (March 2022). Note that at the time this data was received, data input to the system may have been subject to a slight lag.
[172] Safeswim is a joint initiative between Auckland Council, Watercare, Surf Lifesaving Northern Region and the Auckland Regional Public Health Service.
[173] The Safe Networks project is a Water Quality Targeted Rate funded programme.

systems. Concern was shared by Healthy Waters specialist staff that in communities where a public water supply is available, water use (and the production of wastewater) will generally be too high in relation to the capacity of on-site wastewater treatment systems. Healthy Waters has suggested to Watercare that it is appropriate to prioritize communities supplied by a drinking water network for the installation of public wastewater network infrastructure. In addition, they are exploring the option of raising community awareness of the issue through education.

6.2.5 Compliance incidents

Compliance incidents associated with on-site wastewater system discharges could not be investigated for this report due to resource constraints which included the lack of an existing concise and comprehensive data set specific to wastewater discharges.

6.2.6 Effectiveness and efficiency of the AUP

6.2.6.1 Location of consented systems

The analysis of consents identified from the resource consents database showed that relatively few consents have been granted for systems located in the Future Urban Zone, where future wastewater network infrastructure may be expected. In addition, the breakdown of the consent sample showed that a significant proportion of consents are being granted in the Hauraki Gulf Islands residential and commercial zones, where there is limited reticulated wastewater infrastructure available. These results from the consent analysis indicate that the AUP has been generally effective in ensuring that on-site wastewater systems are approved in appropriate locations, in relation to the likely availability of wastewater network infrastructure.

Concern was expressed by regulatory specialists, however, that there are instances where subdivision for smaller sites has been enabled in areas earmarked for reticulated services, before these services are available. Cumulative adverse effects of on-site systems increase with increasing density of development (Horizons Regional Council 2007: 9), and discussions with council staff indicate that the council has had to apply a higher level of compliance management in Whenuapai where this scenario has occurred. This indicates that the provisions in Chapter E38 'Subdivision – Urban' have not efficiently contributed to the achievement of the AUP's water outcomes.

6.2.6.2 Characteristics of consented systems and their associated sites

The consent sample analysis and discussion with regulatory specialists showed that consents are being granted on sites constrained by factors such as size, which will increase the risk of adverse effects occurring in future. These smaller sites identified through the consent sample were predominantly located on Waiheke Island. Six proposals were identified through the consent sample analysis that did not provide a sufficient reserve disposal area. The associated technical memos show that for one of these cases, the proposal was amended by a consent condition requiring that a sufficient reserve area be provided. For the remainder, council's specialists were largely satisfied that consent conditions and mitigating design features could capably address the site constraints and the risk presented by the proposals. This matter highlights the critical role of maintenance and monitoring to ensure the efficient operation of on-site wastewater systems over time, and the awareness that property owners must have of the constraints on development potential when purchasing or developing sites. Consented on-site wastewater systems are highlighted in the on-site wastewater compliance database and are managed by the Compliance Monitoring team through their own prioritisation process. Healthy Waters intend to increase the awareness that property owners have of the requirements and the reality of having an on-site system, by linking maintenance records from the on-site wastewater system database to property files. The matter raised by regulatory specialists of subdivisions for smaller sites being enabled in areas awaiting network services shows, however, that the AUP provisions are not effectively preventing current installation, or likely future installation, of on-site wastewater systems on inappropriately sized sites.

6.2.6.3 Implementation of AUP policies and Chapter E5

The consent sample analysis indicated that consents are generally being granted in accordance with the AUP policies related to on-site wastewater systems. However, efficiency of the AUP is potentially being impacted by some aspects of Chapter E5. References to the outdated and complex TP 58, a lack of clarity around upgrades to systems lawfully established before the AUP, and ambiguity in the language of the activity table do not promote usability of the provisions for users outside of and within the council. While the issues being created for the regulatory specialist team by the NES-F sit outside the AUP, if the provisions of the AUP and the NES were better aligned it would likely create a clearer and more efficient process for consent processing. This, however, is not to say that the AUP provisions should be changed to align to the requirements of the NES-F as they currently stand. There appears to be concerns from both council's specialists and wider community groups (Pennington 2020), over a lack of clarity and reasoning behind some aspects of the NES-F which may first need to be addressed. This will inform the On-site Wastewater Plan Change work currently underway to incorporate the new technical guidance GD06.

6.2.6.4 Integration of the AUP

Concern was raised by Healthy Waters staff regarding the granting of consents for on-site wastewater systems in flood hazard areas. This activity is controlled by Chapter E36 'Natural Hazards and Flooding', rule E36.4.1(A30), which is a restricted discretionary activity. Discretion in the assessment of applications is currently restricted to the design of the device including flood proofing; the potential risk to public health; as well as the potential contamination of groundwater (matters of discretion E36.8.1.(7)). To adequately assess the risk of on-site disposal within floodplains, it is suggested that the potential contamination of any water body and adverse effects on a floodplain should be able to be considered, and a more restrictive activity status would be appropriate. In TP 58 all wastewater treatment systems (excluding primary systems) are able to be considered at the 1:20 year flood event rather than the 1:100

year flood event. It is noted that development occurring in flood-prone areas is subject to ongoing concerns with the anticipation of increasing extreme weather events due to climate change. The plan should be facilitating resilient design that can restrict runoff and limit the impact of new development on floodplains, for example through design for extra storage to cope with wastewater and stormwater.

The relationship between the provisions for on-site wastewater systems and the D2 'Quality-sensitive Aquifer Management Areas Overlay' was highlighted during the development of this report. At present the only AUP rules specific to this overlay are in matters of discretion and assessment criteria in Chapter E32 'Biosolids' and assessment criteria in Chapter E35 'Rural production discharges'. The setback distances for on-site wastewater discharges to groundwater are contained in TP 58 (considered by the council's wastewater specialists when assessing consents) and are based on the soil category and the level of wastewater treatment provided by the wastewater treatment system. Figure 6.1 which illustrates on-site wastewater systems consented under the AUP shows that systems have been consented in the areas of the Kaipara Sand, Franklin Volcanic, Drury Sand and Āwhitu Sand aquifers. These aquifers are all identified by the Quality-sensitive Aquifer Management Areas Overlay policy D2.3.(1), which directs us to recognise the sensitivity of the aquifers to groundwater contamination and to minimise the discharge of contaminants in quality sensitive aquifer management areas. As on-site systems have the potential to create adverse effects on groundwater, there is a question of whether there should also be a clearer link between the overlay and the Chapter E5 provisions, in addition to the provisions of underlying technical guidance such as TP 58.

6.2.6.5 Compliance of on-site systems with AUP standards and consent conditions

The effectiveness of the Chapter E5 provisions relies on their implementation and achievement. Overall, there are currently gaps in the council's knowledge regarding permitted activity on-site wastewater systems and their compliance with AUP standards. In part, this is being remedied by the recently launched WQTR compliance programme. The AUP provisions, which require property owners to maintain their systems and hold these records on site, are working well as a compliance mechanism. A change in the plan, however, requiring property owners to submit these records to the council on request would make this stronger, and this is being considered. With the high number of systems that are permitted under the plan this could be a beneficial change. Healthy Waters specialist staff also noted that compliance monitoring of consented sites has not been comprehensive. This indicates challenges in implementing the plan, rather than to the plan itself. There are plans to introduce further compliance capacity over the next year as part of the on-site wastewater system compliance programme.

6.3 Recommendations

The issues identified by this report largely have the potential to be addressed by work programmes already underway. Based on the findings of this report, the following recommendations (assigned into the categories described in section 1.6)[174] are provided:

6.1 Address the following issues relating to Chapter E5, through a future plan change:
- replacing references to TP58 to reference GD06,
- improving ambiguous wording in activity table E5.4.1,
- altering permitted activity standards in relation to matters such as maintenance records; and
- clarification of the regulations surrounding upgrades to existing wastewater systems (category: NPS-FM related).

6.2 Continuation of the WQTR on-site wastewater compliance programme as a key method to ensure the effectiveness of the AUP, due to the vast number of systems which are permitted activities (category: process).

6.3 Development of further clarification and advice regarding the implementation of the NES-F to support regulatory staff processing consents for on-site wastewater discharges in proximity to wetlands (category: NES-F).

6.4 Further consideration of whether the relationship between on-site wastewater systems and floodplains and the Quality-sensitive Aquifer Management Areas Overlay are appropriately addressed by the AUP (category: NPS-FM related).

6.5 Further consideration of whether the provisions within Chapter E38 Subdivision – Urban are appropriate to avoid the installation of on-site wastewater systems on inappropriately sized sites (category: NPS-FM related).

6.4 Future change under the NPS-FM

The council's work to implement the NPS-FM is underway, with statutory requirements to notify plan changes by the end of 2024. Potential implications for NPS-FM processes relating to the management of on-site wastewater systems include:

- Giving effect to Te Mana o te Wai and the hierarchy of obligations may necessitate changes to standards applying to on-site wastewater systems.
- Continued progression of the WQTR compliance programme and the Safe Networks investigations will play a part in enabling prevention and quicker identification of where on-site wastewater systems may be impacting on waterways. Proactive monitoring will aid the council in responding to the degradation of waterways, as required by the NPS-FM.

[174] These recommendations will need to be tested fully through an RMA section 32 assessment, be considered alongside other recommendations from other topics and the Plans & Places Department work programme.

- Impacts on regulatory staff and specialists awaiting plan change outcomes and becoming familiar with any new/changed provisions relating to on-site wastewater systems, once developed.
- The potential for variation between FMUs relating to on-site wastewater system management, in response to water quality degradation. Where adverse effects from on-site wastewater systems persist, despite implementation of the on-site wastewater compliance programme, system upgrades may need to be considered in order to achieve limits and environmental outcomes set under the NPS-FM.

7 Stormwater discharges

This chapter considers how effective and efficient the objectives, policies, rules and other methods of the AUP have been in meeting the outcomes intended by the Regional Policy Statement (RPS) with respect to managing the effects of stormwater discharges.

Stormwater results when rainfall runs over land, ultimately discharging into rivers, coasts, and aquifers. Within urban areas, this runoff typically reaches waterways more quickly and in greater volumes than waterways in pastoral or forested areas due to the presence of impervious surfaces and reticulated drainage networks. In Auckland most of our urban area and rural and coastal settlements are serviced by a public stormwater network, owned and operated by Auckland Council (Auckland Council 2021g).

The diversion and discharge of stormwater, particularly on a large scale or as a result of multiple small-scale discharges, can lead to a range of adverse effects including hydrology modification, the increased extent and severity of flooding, stream and coastal erosion, loss/modification of habitat (particularly streams, and loss of stream baseflow and aquifer recharge). Stormwater runoff from impervious areas also includes contaminants such as sediment, metals and hydrocarbons and other biological contaminants which can (and currently do) significantly affect water and sediment quality and associated ecosystem health in freshwater and coastal receiving environments. An increase in stormwater runoff to the combined system can also lead to a corresponding increase in combined sewer overflows (Auckland Council 2021f).

7.1 Indicators and measures

7.1.1 Outcomes sought by B7.3 and B7.4

The objectives and policies of the RPS (specifically B7.3 and B7.4) seek the following outcomes in relation to the management of stormwater discharges.

- The adverse effects of point and non-point discharges, in particular stormwater runoff are minimised and existing effects progressively reduced.
- Subdivision, use and development minimises the generation and discharge of contaminants and minimises adverse effects on freshwater, coastal water and the capacity of the stormwater network.
- Every diversion and discharge of stormwater adopts the best practicable option.
- The diversion and discharge of stormwater is controlled outside of areas serviced by the public stormwater network.
- Stormwater infrastructure is adequately provided for in areas of new growth/intensification.

7.1.2 Indicators, measures and information sources

In the absence of relevant indicators for objectives B7.3 and B7.4 in Chapter B11 of the RPS (Monitoring and environmental results anticipated), the following indicators were developed to monitor progress towards meeting the outcomes of the RPS, specific to the management of stormwater. The relationship between the AUP objectives and policies and the indicators developed for this report is detailed in Appendix C[175].

Table 7.1 Indicators, measures and data sources.

Indicators	Measures	Information Sources
1. Adverse effects of stormwater on coastal, freshwater and geothermal water is being minimised, and existing adverse effects are being progressively reduced. 2. Subdivision, use and development is being controlled to minimise the adverse effects of stormwater runoff (including quantity and quality) on freshwater, and coastal receiving environments. [Note: subdivision is not addressed in this report] 3. The best practicable option is being adopted. 4. The discharge of contaminants is minimised, particularly from high contaminant generating carparks and high use roads 5. The E10 Stormwater management area control – Flow 1 and Flow 2 is effective, with hydrology mitigation required where the maximum impervious area is exceeded.	• The measures for the water quality indicators as detailed and assessed in Chapter 2. • The discharge of stormwater from the public network is compliant with the conditions of the Network Discharge Consent. • The number of new independent stormwater discharge consents (i.e. not to the network) and an assessment of conditions imposed in relation to policy outcomes. • The number of stormwater discharge and diversion consents granted under E8 rules and assessment of the conditions imposed in relation to policy outcomes. • The number of consents granted under the E9 rules and assessment of the conditions imposed in relation to policy outcomes. • The number of consents that are being granted under the RD or D rules in E10 and assessment of the conditions imposed in relation to policy outcomes.	• State of Environment Monitoring and FWMT modelling. • NDC monitoring and reporting data. • Consent data (Plans and Places resource consents database). • Discussions with council staff.

175 Please note that this topic does not address the mana whenua aspects of the identified policies, as noted in section 1.7.1.

	• Review of the relevant AUP provisions and identification of any implementation issues.	

7.2 Findings and analysis

7.2.1 Monitoring data

A summary of the results of State of the Environment monitoring is detailed above in section 2.3. River water quality is monitored monthly at 36 sites across the region, with monitoring sites chosen to achieve regional representativeness in the data (based on dominant land cover). The 2020 report[176] assessed trends across the 10-year period from January 2010 to September 2019 and identified that urban streams are in the poorest condition, as had been identified in previous reporting.

Some of the key pollutants associated with stormwater include sediment, nutrients, bacteria and viruses, oil and grease, total and dissolved metals, organics, pesticides and gross pollutants.[177] Many of these pollutants play significant roles in the key regional issues identified by the SoE river monitoring, including:

- instream nutrient enrichment
- high levels of *E.coli* generally throughout the region;
- declining visual clarity;
- risk of ammonia toxicity in almost 50 per cent of urban streams;
- high levels of zinc contamination in most urban streams; and
- degrading trends in relation to copper.

Auckland Council monitors the health of our marine environments through three main programmes: water quality (approximately 32 sites), sediment contamination (approximately 120 sites) and ecology (approximately 150 sites) covering all the major harbours and most of the smaller estuaries on the east coast.[178] A summary of data relating to coastal water, including the identification of degraded areas is detailed at Section 2.3.1.1. The 2021 coastal and estuarine State of the Environment monitoring report[179] states that generally open coastal sites have good water quality, while tidal creek sites have poorer water quality. As noted above (at 2.3.1.3), the SoE synthesis report (Auckland Council 2021a: 7) sets out the following key findings for coastal water:

- Coastal water quality is mostly improving but slowly.
- Ecological impacts from increased sedimentation have been detected in all harbours and estuaries.

[176] River Water Quality State and Trends in Tamaki Makaurau / Auckland 2010-2019
[177] Stormwater Management Devices in the Auckland Region: 2017/001 (GD01)
[178] Environment Auckland website
[179] Coastal and estuarine water quality state and trends in Tāmaki Makaurau / Auckland 2010-2019. State of the Environment reporting, Technical Report 2021/02, February 2021

- Levels of contaminants (copper, lead and zinc) in marine sediments are generally low. Hot spots of higher levels occur in muddy estuaries/tidal creeks with older intensively developed catchments.

7.2.2 Freshwater Management Tool Modelled data

The Freshwater Management Tool (FWMT) is described as[180] a freshwater accounting and decision-making tool for water quality, integrating all catchments from mountain to sea (rural and urban) throughout the Auckland region (see further details in section 2.2.1.3). The FWMT has modelled the current state baseline data (2013-2017) for water quality within the region's rivers. Key findings of the current state modelling, relevant to the potential impacts of stormwater discharges, include:

- *E.coli* is a widespread contaminant (including in urban streams), resulting in frequent and marked exceedances of national targets;
- the predominant source of sediment instream and to the coast is bankside erosion;
- the streams likely to fail to meet bottom lines for levels of cooper and zinc are predominantly within urban watersheds.

7.2.3 The Stormwater Network Discharge Consent (NDC)

The majority of the urban area, including rural and coastal settlements is serviced by the public stormwater network. The stormwater network includes the built network comprised of structures such as pipelines, manholes, channels, outfalls, detention and treatment ponds and wetlands, water sensitive infrastructure (e.g. rain gardens) and catchpits; and some natural assets such as urban streams, overland flow paths and wetlands. The discharge of stormwater from this network is regulated through the conditions imposed by a comprehensive discharge consent.

The Stormwater Network Discharge Consent (NDC) is a single, region-wide public network diversion and discharge consent for stormwater, granted under the AUP and approved by Environment Court Consent Order, late 2019, for a term of 33 years. Auckland Council's Healthy Waters Department is responsible for the operation and maintenance of the public stormwater network and for implementing the requirements of the NDC. The NDC replaced 116 previous network consents and numerous other authorisations and covers:

- diversions and discharges of stormwater from the public network that existed at the time of commencement;
- new or modified diversions and discharges resulting from stormwater network upgrades, subject to compliance with the performance requirements or an adopted Stormwater Management Plan; and

[180] Described in Freshwater Management Tool: Report 3. Current State Assessment (Rivers): August 2021 (Auckland Council 2021b).

- new diversions and discharges resulting from extending the public network to service intensification and growth (i.e. new discharges resulting from increases or changes in impervious areas).

Schedule 1 of the NDC, depicted below, maps the extent of the public stormwater network as at 16.12.2016.

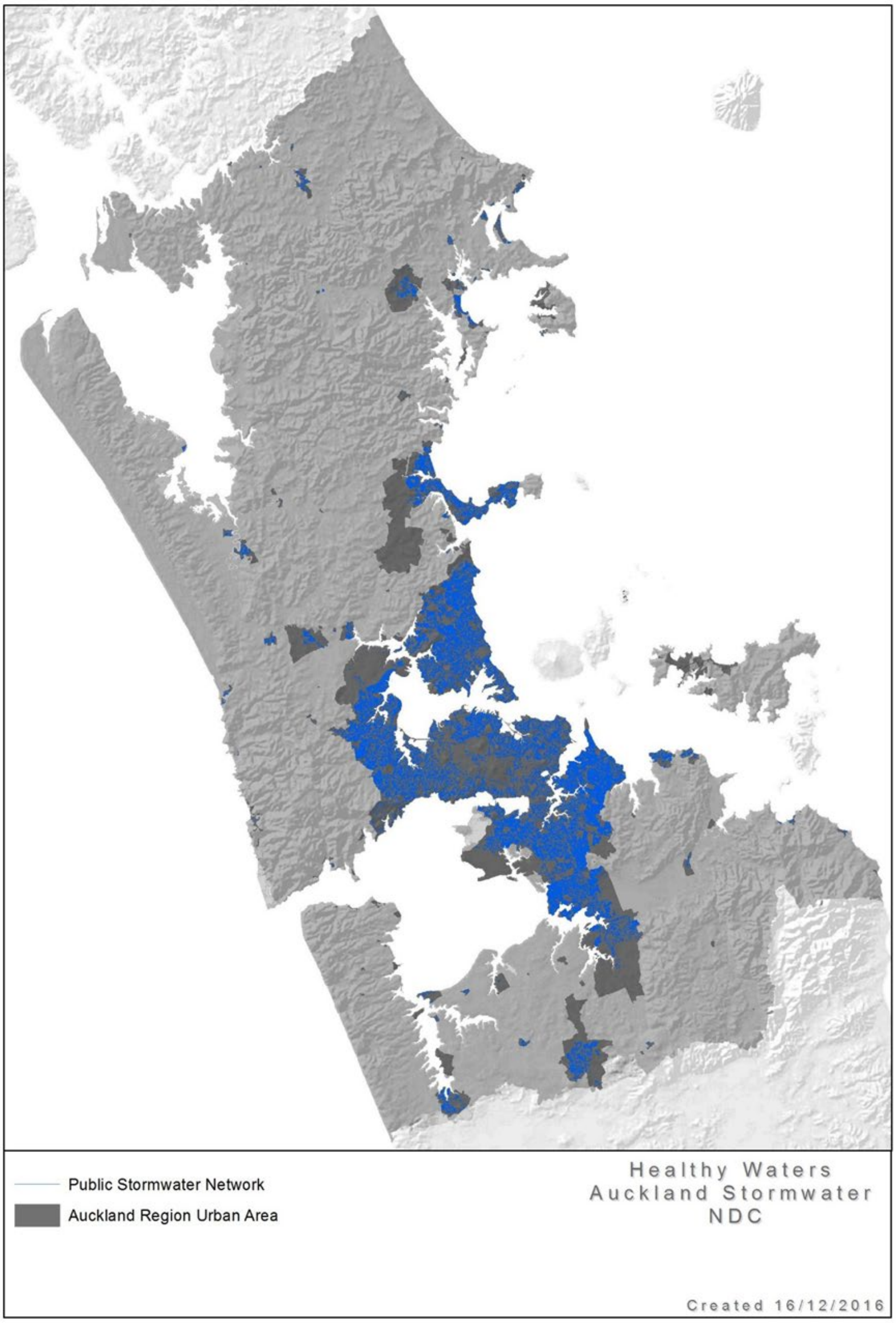


Figure 7.1 Map of the Public Stormwater Network as depicted in Schedule 1 of the NDC.

An assessment of the effectiveness and efficiency of the AUP provisions that relate to the discharge of stormwater, requires an assessment of how the provisions interact with the requirements of the NDC, plus an assessment of the performance of the public stormwater network and its contribution to the water quality in receiving environments throughout the region.

The performance standard requirements are set out in Schedule 4 of the NDC and have been designed to deliver the outcomes sought by the AUP. The NDC outlines objectives, outcomes and six-yearly operational targets regarding assets, growth, flooding, stream health, coastal health, groundwater health, effects on the wastewater network and collaborative outcomes and includes comprehensive reporting and monitoring requirements. The network is required to be operated and maintained in accordance with a defined Best Practicable Option methodology and prioritisation (set out in Schedule 3 to the NDC).

Three-yearly performance reports and a six-yearly Stormwater Network Discharge Review are required. The initial (out of cycle) six-yearly review will be undertaken in 2022 (as is required by condition 26 of the consent order). The conditions of the NDC enable the Best Practicable Option of managing the network to be updated should the six-yearly review identify any changes necessary to address unanticipated adverse effects.

The initial (out of cycle) Triennial Performance Report has recently been prepared. Given that the NDC has only been operative for 18 months, the report is high level but details that:

- 281 capital projects to improve the performance and resilience of the network have been initiated, including 46 specifically targeted at improving water quality (many of the others would also result in ancillary improvements);
- 87 Stormwater Management Plans have been received for review, with 17 formally adopted into Schedule 10 and 12 provisionally approved;
- the monitoring strategy has been prepared;
- the Mana Whenua Engagement Strategy has been developed; and
- managing cumulative effects of growth and reconsidering the most appropriate way to achieve the water quality objectives has been identified as a key focus for the six-yearly Stormwater Network Discharge Review.

As noted above and as required by Condition 37 of the NDC, a Monitoring Strategy has been developed to:

- assess the impacts of the stormwater diversion and discharges authorised by the NDC;
- provide evidence of the effectiveness of the NDC best practicable option (BPO) (including associated schedules, requirements and interventions) in managing these effects;
- increase public transparency regarding the performance of the NDC; and
- provide important information for the NDC review cycles so that the BPO to manage stormwater evolves to changing circumstances and remains fit for purpose over time.

The NDC Monitoring Strategy notes that:

> "*assessing the effect that urban stormwater discharges have on the environment is a complex task. A large number of urban activities and land uses contribute to the generation of stormwater and the contaminants in it. Effects on the environment are cumulative and may take some time before they are measurable and interventions to address effects may similarly, take some time before a measurable improvement is detected.*"[181]

The NDC Monitoring Strategy details the following monitoring and modelling tools and programmes against which the effects of the stormwater will be monitored over the term of the consent, including:

- Hydrological monitoring
- Regional Sediment Contaminant Monitoring Programme (RSCMP)
- Safe networks
- State of the Environment coastal monitoring
- State of the Environment stream monitoring
- Wai Care programme
- Wai Ora Cultural Monitoring Framework
- Watercare's Manukau Harbour monitoring
- Watercourse assessments
- Flooding risk modelling
- Freshwater Management Tool
- Manukau Harbour Hydrodynamic Model
- Safeswim
- Stream erosion modelling
- Validation monitoring

A comprehensive assessment of the NDC's current state of performance will be detailed in the first six-yearly performance report to be prepared late 2022. The assessment below is therefore focussed on the role of the NDC in contributing to the management of stormwater discharges through the provisions of the AUP and whether the opportunities the comprehensive network discharge consent provides to achieve integrated management of urban stormwater and improvements in water quality, are being realised.

7.2.4 Combined network

Watercare operate the combined stormwater and wastewater network which remains in existence in the older parts of the central city and is specifically excluded from the stormwater network covered by the NDC. During heavy rainfall, stormwater volumes draining to the

[181] Auckland Council Network Discharge Consent Monitoring Strategy

combined network can cause overflows resulting in wastewater discharges to receiving environments. This situation is considered unacceptable, and the network is progressively being upgraded. It is the council's preference that new areas of impervious surfaces do not result in increased stormwater discharges to the combined network. As noted in Section 4.6.1.1 of the Stormwater Code of Practice[182], no new combined sewer connections will normally be approved. However, dispensation may be granted (subject to conditions) in the event that the existing combined sewer is the only option for stormwater disposal. Conditions of connection include that approval is obtained from Watercare as owner of the combined system, that private plumbing is to be separated to the property boundary and that on-site mitigation measures are installed. On-site mitigation requirements are further detailed in Section 4.3.15 of the Code of Practice and require all new developments in all combined sewer areas to install stormwater storage devices as part of a site's private drainage system to ensure that the rate of stormwater discharge does not increase when the site is developed.

Watercare holds Network Discharge Consents for the discharge of wastewater from overflows from the combined network. These consents and the management of wastewater discharges are covered in Chapter 5 – Wastewater Discharges.

7.2.5 AUP provisions and resource consent data analysis

The provisions in Chapters E8 – stormwater discharges and diversion, E9 – High contaminating car parks and high use roads and E10 – stormwater management areas, regulate stormwater runoff from impervious areas in response to sections 9(2) (land use), 14 (diversion of water) and 15 (discharge of water and contaminants) and the functions of regional councils under section 30(1)(e) and (f) of the RMA. The provisions of the three chapters have been assessed through a review of a sample of resource consents granted[183] and informed by discussions with regulatory and technical staff. Chapter 11 of this report is also relevant to the management of stormwater and assesses the effectiveness of the maximum impervious area standard for development in the residential zones H1 – H6.

7.2.5.1 Chapter E8 – Stormwater Discharges and Diversion

The provisions in Chapter E8 regulate stormwater runoff from impervious areas that is either:

- diverted and directed to a stormwater network or the combined sewer network; or
- diverted and discharged to land, water or the coastal marine area (i.e. not to a network).

Diversion relates to changes in the volume, rate and direction of stormwater as a result of the establishment of impervious area preventing infiltration into the ground or run-off through overland flow paths. Diversions are controlled under section 14 of the RMA. Discharges relate to the discharge of stormwater to receiving environments (e.g. a stream, natural wetlands, the

[182] Code of Practice for Land Development and Subdivision: Chapter 4 – Stormwater (Auckland Council 2015)
[183] Analysed from the Plans and Places Resource Consents Database

coastal marine area, or to land/aquifers via soakage), generally via a drainage network or overland flow path. Discharges are controlled under section 15 of the RMA.

The chapter links to the objectives and policies in Chapter E1 (water quality and integrated management) and Chapter E2 (water quantity allocation and use) which address matters such as taking an integrated stormwater management approach; minimising the generation and discharge of contaminants (particularly from high-risk areas); minimising and mitigating changes in hydrology; minimising or mitigating new adverse effects; adopting the best practicable option; and ground soakage. Activity Table E8.4.1 splits the rules into the two broad criteria bulleted above (i.e. diversions and discharges to the network or otherwise).

As detailed above, Healthy Waters operates the public stormwater network that services most of the urban area and some rural and coastal townships under the NDC. The diversion and discharge of stormwater runoff to the public stormwater network is encouraged through provision as a permitted activity in rule E8.4.1(A1). The majority of private properties within urban areas connect to the public stormwater network. Connection to the public stormwater network constitutes joining the council's NDC and therefore an additional consent under the stormwater provisions of E8 is not required. Auckland Council is then responsible for the new stormwater diversion/discharge and the related infrastructure (if vested in the council). There are requirements for connecting to the network which are set out in the NDC and Stormwater Code of Practice and enforced through the Stormwater Bylaw 2015.

Outside of the urban area, sites are generally not connected to the public stormwater network and discharge stormwater via private drainage systems. This also occurs in limited circumstances within the urban area. Private diversions and discharges are either to ground soakage (i.e. to aquifers), directly to an adjacent watercourse (streams), or directly to the coastal marine area where proximity allows. Such private diversions and discharges do not join the council's NDC and therefore, unless provided for as a permitted activity, a discharge consent is required. The operation and maintenance of associated infrastructure generally remains the responsibility of the private property owner.

The following tables outline the assessment of consents granted under the rules in Activity Table E8.4.1[184] with sample sizes equating to a 95 per cent confidence interval and 20 per cent relative standard error. Note: Rules E8.4.1(A1), (A3), (A4), (A6), (A7) and (A8) are permitted activities and are therefore not included in the tables.

[184] Consents data since May 2016 through until May 2020 (analysed from the Plans and Places resource consents database)

Table 7.2 – Resource consent data for the diversion and discharge of stormwater to a network

Rule: E8.4.1(A2) Diversion of stormwater runoff from lawfully established impervious areas directed into an authorised stormwater network or a combined sewer network that does not comply with Standard E8.6.2.1 Restricted Discretionary activity in all zones	
Total number	87
Observations/comments While the stormwater network is included in this rule, the permitted activity standards at E8.6.2.1 only address the combined network and therefore only discharges to the combined network would trigger the need for consent under the rule (i.e. discharges to the stormwater network would be assessed as permitted). This should be clarified in the rule by deleting reference to the stormwater network. The sample of consents assessed (20) indicated that: • All were for discharges to the combined network that did not comply with the standards (e.g. they increased stormwater runoff and/or did not have approval of the operator (i.e. Watercare)). • All were for residential development (usual alterations and additions) in suburbs such as Ponsonby, Grey Lynn, Herne Bay and Freemans Bay, serviced by the combined network. • Generally, the increase in stormwater runoff was mitigated by the installation of a detention tank.	

Table 7.3 – Resource consents for diversion and discharge of stormwater runoff from impervious areas onto or into land, water or the coastal marine area (i.e. not to a network)

Rule	Total No.	No. since NDC	Observations/comments
Note: The resource consent analysis for these rules has focused on consents granted after the NDC was approved as this represents the current regulatory regime for stormwater management. The consents in this table are for diversions and discharges that are not directed to the network and the assessment included ascertaining the reasons why (within the urban area), the applicant chose not to discharge to the network and therefore join the NDC (i.e. due to the discharge being to soakage, the network not being available or out of choice to retain private ownership and operational responsibility). Where relevant, additional consents prior to the NDC were also included in the assessment.			
E8.4.1(A5) Diversion of stormwater runoff from additional impervious areas greater than 5000m² of road (which include road ancillary areas that are part of a road, motorway or state highway operated by a road controlling authority) or rail corridor that complies with E8.6.1 and Standard E8.6.4.1 Restricted Discretionary activity in all zones	21	1	• A sample of 12 consents granted prior to the NDC indicated that the majority of consents were for new roads created as a result of large subdivisions (roads to eventually vest in the council). Treatment and hydrology mitigation were consistently required (in accordance with the activity standards at E8.6.4.1), however the standard of the conditions imposed varied (e.g. in specificity). Final details of the stormwater management were usually deferred to the Engineering Plan Approval (EPA) process. Stormwater related conditions were included in both the subdivision and discharge consents with often duplicate but

Rule	Total No.	No. since NDC	Observations/comments
			inconsistent conditions (e.g. specifying different requirements for operation and management). The discharge was often to a public network. • The one consent granted since the NDC's existence was in relation to a new road at Auckland Airport. Consent was also required as a high use road under E9.4.1(A7) and E10.4.1(A7) as being within the SMAF1. All stormwater discharged to a bioretention swale (designed in accordance with GD01 for treatment and attenuation) prior to discharge to a stream. The approach was assessed as being the best practicable option.
E8.4.1(A9) Diversion and discharge of stormwater runoff from impervious areas greater than 1000m^2 and up to 5000m^2 <u>within an urban area</u> that complies with standard E8.6.1 and E8.6.3.1 Controlled activity in all urban zones	93	15	Note: Where the stormwater runoff is discharging to a stream receiving environment, the activity standards require hydrology mitigation (retention and detention[185]) consistent with that required in the Stormwater Management Area Flow 1 (see Table 7.6). A sample of 8 consents granted (post NDC) indicated that: • 50 per cent discharged to soakage. • 25 per cent discharged to the public network and could have been permitted activities (one was reassessed as permitted through the application process). • 25 per cent were private discharges and cited that connection to the public network was not possible. • 12 per cent (1 consent) did not provide the required hydrological mitigation and should have been assessed as discretionary activities under (A10).
E8.4.1(A10) All other diversion and discharge of stormwater runoff from impervious areas not otherwise provided for. Discretionary activity in all zones	202	35	A sample of 15 consents granted (post NDC) indicated that: • 66 per cent of applications triggered the rule as the impervious area was greater than 5000m^2 (i.e. as opposed to the standards not being met). The total impervious area was often significantly greater than 5000m^2 (e.g. >15000m^2). • Stormwater management was consistently imposed as a condition of consent, with devices generally specified and required to be consistent with the technical standard

[185] See section 7.3.3 for an explanation of retention and detention.

Rule	Total No.	No. since NDC	Observations/comments
			applicable to the method e.g. GD01, TR2013/018 or TR2013/040. Consents also consistently required pre-construction meetings, as-built plans and operation and maintenance plans. • 53 per cent of consents were for outside of the urban area, with the majority triggering the rule due to impervious areas of greater than 5000m^2 (impervious areas of less than 5000m^2 outside of the urban area are provided for as a permitted activity (subject to standards) by Rule E.8.4.1(A7)). • 28 per cent of consents within the urban area discharged to streams (the remainder were to soakage) and did not vest the stormwater management devices in the council (and therefore did not join the NDC). • 6 per cent of consents were specifically for roading that did not meet the standards of Rule E8.4.1(A5). • In 26 per cent of consents, the incorrect rule was applied (most commonly due to the standards of other rules being met e.g. (A7) or (A9)).

Table 7.4 Diversion and discharge from a stormwater network.

Rule: E8.4.1(A11) Diversion and discharge of stormwater runoff from an existing or a new stormwater network Discretionary activity in all zones	
Total number	24
Number since NDC granted	1
Observations This is the rule under which the NDC was granted. The one consent granted since the NDC became operative was for a new stormwater network servicing a new large-lot subdivision in Whenuapai. The Decision Report noted that the stormwater discharge was in accordance with an approved Stormwater Management Plan. Conditions included that the stormwater infrastructure and individual lot connections be constructed in accordance with Auckland Council's Code of Practice for Land Development and Subdivision and that the connections were to be vested in the council. The activity also triggered rule E8.4.1(A5) due to a new area of roading greater than 5000m^2. The stormwater discharged from the road was via overland flow paths.	

As the stormwater network to be constructed as part of the subdivision was to be vested in the council and had been constructed in accordance with a Stormwater Management Plan, which is consistent with the requirements of the NDC, it is likely that the main trigger for this consent was the discharge via overland flow paths (i.e. not to the network) from the new roading impervious area and consent under E8.4.1(A11) may not actually have been necessary.

7.2.5.1.1 Implementation of the E8 rules

Discussions were held with staff from Auckland Transport, Healthy Waters and Specialist Technical Advisors from the council's Stormwater, Wastewater and ITA Team (resource consents) and concerns were raised regarding the implementation of the provisions in Chapter E8.

It is the council's preferred approach that when available, new diversions and discharges connect to the network and as such this is provided for as a permitted activity. While this does appear to be occurring, the provisions of E8 predate the NDC and do not clearly reflect its existence. There are no permitted activity standards detailing the requirements (as specified in Schedule 4 of the NDC) for connections to the stormwater network and NDC. This was raised as a significant concern by Healthy Waters. There is also lack of guidance in the provisions that the Stormwater Bylaw 2015 applies and compliance with the Stormwater Code of Practice is also required (for assets vested in the council). In some specific circumstances, the requirements for connection to the public network set out in the NDC, including requirements for contaminant removal and flood mitigation and treatment devices for roads, are more stringent than the requirements within the activity standards of Chapter E8. Healthy Waters staff have expressed concern that this is inhibiting the optimal operation of the network and achievement of the outcomes sought by the NDC.

Healthy Waters staff also raised concerns with the way in which applications for resource consent are processed under the provisions, specifically the inability, as the operator of the stormwater network, to influence stormwater outcomes prior to connection to the public network. New connections from small sites (including permitted activities) are generally approved by Development Engineers, without the input of Healthy Waters and in some cases have resulted in cumulative effects and required network upgrades that could have been avoided.

The permitted activity standards in E8.6.2.1 require the prior approval of Watercare Services for connection to the combined network, reference the relevant Bylaw and encourage applicants to seek input from Watercare Services early in the design process. The equivalent requirements and guidance are not included in relation to connection to the stormwater network and seeking early design input from Healthy Waters. A note was added (early 2021) stating that any new connection also requires approval by Auckland Council and Watercare under the Stormwater Bylaw 2015, Section 9, however, with no statutory weight, it is not considered adequate to address the concerns raised.

The Stormwater Technical Specialists in the council's Stormwater, Wastewater and ITA Team (resource consents) have identified that the standards for ground soakage (General Standards E8.6.1) require strengthening, particularly to require treatment devices in accordance with TR2013/040[186]. The assessment of the sample of consents determined that when specified as a

[186] Stormwater Disposal via Soakage in the Auckland Region – October 2013: TR2013/040

condition of consent, devices are often required to be in accordance with TR2013/040, however this requirement could be made mandatory through the standards and relevant assessment criteria.

It was noted through the assessment of consents that anecdotally, there is some inconsistency in how the impervious area requirements are applied and when the scale of development triggers the need to assess the total impervious area on site, as opposed to being limited to addressing only new impervious areas generated by the activity. Both the Specialist Technical Advisors and Healthy Waters staff raised concerns regarding the interpretation of the rules in relation to how impervious areas are assessed. It appears that the application of the terms within the rules is causing confusion and inconsistencies and greater clarity is required. The following terms apply through the rules:

- *lawfully established impervious areas* (e.g. in rules E8.4.1(A1) and (A2));
- *lawfully established impervious areas as at 30 September 2013* (e.g. in rule E8.4.1(A3));
- *impervious areas* (e.g. in E8.4.1(A4), (A7), (A8), (A9) and (A10));
- *additional impervious areas* (e.g. in rule E8.4.1(A5)); and
- The definition of '*total impervious area'* provided in Note 1 of the General Standards, which states: "For the purpose of these standards "the total impervious area" includes any additional impervious area plus existing impervious area on the site."

The controlled activity standards in E8.6.3.1, applicable through rule E8.4.1(A9), specify contaminant removal and hydrological mitigation. However, due to the inclusion of 'within the urban area' (in the wording of the rule), developers often contend that the rule does not apply to urban development occurring in greenfield sites with Rural or Future Urban zonings. Policy E1.3(10)187, which recognises that greenfield areas provide greater opportunities to achieve integrated stormwater management, is particularly relevant to this matter and the provisions should be clear in requiring hydrological mitigation and contaminant removal when greenfield sites are developed. This could be achieved through also applying the hydrological mitigation requirements through the permitted activity standards of Rule E.8.4.1(A7), which provides for impervious areas of up to 5000m^2 outside of the urban area.

A Practice and Guidance Note is currently being drafted by Healthy Waters and this will help with implementation of the rules and provide greater guidance for developers, however, as detailed below in Section 3.4, amendments to the provisions themselves are recommended.

[187] Policy E1.3(10) states that: "*In taking an integrated stormwater management approach have regard to all of the following:*

The nature and scale of the development and practical and cost considerations, recognising:
Greenfield and comprehensive brownfield development generally offer greater opportunity than intensification and small-scale redevelopment of existing areas……"

7.2.5.2 Chapter E9 – Stormwater quality – high contaminant generating carparks and high use roads

Chapter E9 addresses the diversion and discharge of stormwater from high contaminant generating carparks and high use roads, which are considered high risk for the discharge of contaminants and are defined in the AUP as follows:

- *High contaminant generating car park*
  Formal vehicle parking areas on a site (including that which is an accessory activity to the main use of the site) that are:
  - *exposed to rainfall; and*
  - *designed for a total of more than 30 vehicles.*

  The parking area includes associated accessways (manoeuvring, entries and exits) but excludes any parking or accessways located within an industrial and trade activity area.
- *High use road*
  A road, motorway or state highway that carries more than 5000 vehicles per day, excluding cycle lanes, footpaths and ancillary areas that do not receive stormwater runoff from the road carriageway.

The following tables outline the assessment of a sample of consents granted under the rules in Activity Table E9.4.1[188] with the sample sizes consistent with a 95 per cent confidence interval and 20 per cent relative standard error:

Table 7.5 Consents granted under Activity Table E9.4.1.

Rule	Total No.	No. Sampled	Observations/comments
E9.4.1(A6) Development of a new or redevelopment of an existing high contaminant generating car park greater than 5,000m^2 Controlled activity in all zones	47	18	Note: The controlled activity performance standards require treatment devices in accordance with GD01 or equivalent. The consents sampled indicated that: • All of the consents sampled required stormwater treatment for the high contaminant car parks with the vast majority being achieved by bioretention (raingardens/swales) and/or Stormwater 360 Stormfilters. • 95 per cent of decisions specified the stormwater treatment required as a condition of consent and directly referenced TP10/GD01 and also required as-built and Operation and Maintenance Plans.

188 Consents data since May 2016 through until May 2020 (analysed from the Plans and Places resource consents database)

Rule	Total No.	No. Sampled	Observations/comments
			• 5 per cent of decisions relied on the Engineering Plan Approval process to determine the stormwater management/treatment.
E9.4.1(A7) Development of a new or redevelopment of an existing high use road greater than 5,000m^2 Controlled activity in all zones	17	10	Note: The controlled activity performance standards require treatment devices in accordance with GD01 or equivalent. The consents sampled indicated that: • The majority of consents required bioretention (raingardens and vegetated swales) for stormwater treatment. • 40 per cent of decisions specified the stormwater treatment required as a condition of consent, directly referenced TP10/GD01 and also required as-built and Operation and Maintenance Plans. Other decisions relied on the Engineering Plan Approval process or simply stated that stormwater management was to be constructed in accordance with the plans submitted with the application. • 20 per cent of consents assessed the wrong rule and should have been processed under (A6) as they were high contaminant car parks. This could simply be a typographical error. • 10 per cent of consents assessed the stormwater treatment as not meeting the requirements specified in the activity standards, yet this did not elevate the activity status of the application (i.e. it should trigger E9.4.1(A9) and be assessed as restricted discretionary).
E9.4.1(A8) Development of a new or redevelopment of an existing, high contaminant generating car park that <u>does not comply</u> with the relevant permitted or controlled activity standards. Restricted Discretionary activity in all zones	7	7	Note: The activity status of these rules is consistent with the general approach of the AUP where activities that do not meet the standards are restricted discretionary in accordance with C1.9. However, it is inconsistent with the approach of most of the regional plan chapters where activities that don't meet the standards are discretionary activities e.g. E4.4.1(A15), E8.4.1(A10). The consents sampled indicated that: • All except one consent required treatment as a condition of consent. The one exemption was for a temporary activity with on-site constraints. • 75 per cent of consents for both high contaminant generating car parks and high use roads relied on prior approval being obtained from the council for the final design of the treatment devices (e.g. Engineering Plan Approval process). • The vast majority of consents proposed treatment in the form of bioretention. Conditions
E9.4.1(A9) Development of a new or redevelopment of an existing, high use road that <u>does not comply</u> with the relevant permitted or controlled activity standards.	5	5	

Rule	Total No.	No. Sampled	Observations/comments
Restricted Discretionary activity in all zones			were inconsistent in specifying that devices be in accordance with GD01. • Assessments rarely referred to the relevant objectives and policies or assessment criteria (including consideration of cumulative effects and the sensitivity of the receiving environment). • The vast majority of consents are bundled and require resource consents for other aspects of the proposed activity.

7.2.5.2.1 Implementation of the E9 rules

In addition to the consent assessment above, discussions were held with staff from Auckland Transport, Healthy Waters and Specialist Technical Advisors from the council's Stormwater, Wastewater and ITA Team (resource consents).

There are provisions that relate to roading throughout the three chapters E8, E9 and E10, which makes the treatment for contaminants and hydrological mitigation requirements, particularly those contained in activity standards, difficult to decipher and apply. This is discussed further below in relation to the Stormwater Management Area Control – Flow 1 and Flow 2 (SMAF) and again in relation to the effectiveness and efficiency of the AUP.

The definition of terms within the rules and the corresponding application of the rules has been raised as a concern. The AUP defines 'redevelopment of a road' as:

> *Works that involve the reconstruction of the road carriageway and incorporate the addition of more than 1,000m^2 of new road impervious surfaces.*

The term "new road impervious surface" in this definition, can be interpreted as the redevelopment of a road only relating to the construction of a new road surface of greater than 1000m^2, whereas within the rules above, redevelopment applies to existing roads and is not limited to consideration of new impervious surface only (e.g. the wording "development of a new or redevelopment of an existing." is used). Technically, the definition of 'redevelopment of a road' should use an 'or' rather than 'and' (or 'including' instead of 'and incorporates') if it was intended to cover reconstruction of a road that does not also include the addition of more than 1000m^2 of new road surfaces.

A similar issue has been highlighted for the roading rules in Chapter E8, which are inconsistent in that E8.4.1(A5) (restricted discretionary for >5000m^2) applies to "additional impervious areas" while E8.4.1(A4) (the corresponding permitted activity for up to 5000m^2) relates to all impervious areas (i.e. the word "additional" is omitted).

Greater clarity could also be included within the definition of high use road to clarify if the threshold of 5,000 vehicle movements a day is to be calculated at the time that the road is constructed or should future anticipated vehicle movements be taken into account.

Concerns have also been raised in relation to the use of permeable paving for high contaminant generating car parks. As permeable paving is excluded from the definition of impervious area, Specialist Technical Advisers (resource consents) have noted that developers often utilise it as a means of avoiding the need for treatment devices (and consents under Chapter E9) and this is of concern in areas which drain to sensitive aquifers. Clarification could be included in the definition of high contaminant generating car park or through the provisions.

The proposed AUP included additional provisions in Chapter E9 to address other high contaminant generating surfaces such as untreated roofing material and cladding and required stormwater treatment at the time any new such surfaces were developed and at times of redevelopment for existing activities (where 50 per cent or more of the surface is included in the redevelopment).

These provisions were removed from the AUP through the Independent Hearings Panel process. While the water quality policies in Chapter E1 have been amended to focus on high contaminant generating car parks and high use roads in particular for the reduction of contaminants, there are still outcomes sought through the policies, including Policy E1.3(10)(d) which seeks to reduce contaminants at source generally. Other than specifying that contaminants should not be increased above existing levels (as at September 2013) within the permitted activity standards for diversions and discharges not directed to a network, and requiring devices to reduce or remove contaminants for urban impervious areas 1000m^2 – 5000m^2 (Chapter E8), the AUP rules only address contamination through the rules in Chapter E9, which are limited to high contaminant generating car parks and high use roads. Regardless, it was noted through the assessment of consents across the three chapters (E8, E9 and E10) that use of inert roofing materials was often proposed by applicants and imposed as a condition of the stormwater discharge consent.

In order to achieve the water quality outcomes sought, the NDC requirements in relation to the treatment of contaminants go beyond the provisions of the AUP and require treatment for all impervious areas, in accordance with GD01, in large greenfield and brownfield areas and with additional requirements in small brownfield sites, including gross pollutant traps and restrictions on contaminant generating building materials.

The implementation of the NPS-FM could require a review of the AUP's limited approach to the management of stormwater derived contaminants (see Sections 7.4.5 and 7.4.6 below).

7.2.5.3 Chapter E10 – Stormwater Management Area Control – Flow 1 and Flow 2 (SMAF)

The provisions of Chapter E10 aim to reduce stormwater runoff from new or redeveloped impervious areas within specified urban catchment or sub-catchment areas that contain streams that have been identified as being particularly susceptible to the effects of stormwater or having relatively high values warranting of protection (e.g. ecological and amenity values). The Stormwater Management Area Control – Flow 1 and Flow 2 (SMAF) identifies the areas that are subject to the provisions of Chapter E10. It is mapped in the AUP and contains two 'Flow Areas' defined as follows:

- Flow 1
  Those catchments which discharge to sensitive or high value streams and that have relatively low levels of existing impervious area.

- Flow 2
  Areas that typically discharge to streams with moderate to high values and sensitivity to stormwater, but generally with higher levels of existing impervious area within the catchments.

The chapter links to the objectives and policies of Chapter E1 (water quality and integrated management) and Chapter E2 (water quantity allocation and use) but also contains an additional objective (E10.2) and policies (E10.3), which seek to: protect high value rivers and streams and aquatic biodiversity from further adverse effects of stormwater runoff and achieve enhancement where possible; retain and where possible enhance, stream naturalness, biodiversity, bank stability and other values; and require hydrology mitigation while recognising its limitations.

The rules require stormwater runoff from new or redeveloped impervious areas to be mitigated by requiring on-site (at source) hydrological mitigation (retention and detention) for frequently occurring storm events (<2yr ARI). The hydrological mitigation as detailed in the table below is required for the entire site where the new/redeveloped impervious area exceeds 50 per cent of the site area.

Table 7.6 Hydrological mitigation requirements (Table E10.6.3.1.1).

Stormwater management area control	Hydrology mitigation requirements
(1) Except as provided for in (2) below the following applies	
Stormwater management area – Flow 1	• provide retention (volume reduction) of at least 5mm runoff depth for the impervious area for which hydrology mitigation is required; and • provide detention (temporary storage) and a drain down period of 24 hours for the difference between the predevelopment and post-development runoff volumes from the 95th percentile, 24-hour rainfall event minus the 5mm retention volume or any greater retention volume that is achieved, over the impervious area for which hydrology mitigation is required.
Stormwater management area – Flow 2	• provide retention (volume reduction) of at least 5mm runoff depth for the impervious area for which hydrology mitigation is required; and • provide detention (temporary storage) and a drain down period of 24 hours for the difference between the predevelopment and post-development runoff volumes from the 90th percentile, 24-hour rainfall event minus the 5mm retention volume or any greater retention volume that is achieved, over the impervious area for which hydrology mitigation is required.
(2) Where: • a suitably qualified person has confirmed that soil infiltration rates are less than 2.mm/hr or there is no area on the site of sufficient size to accommodate all required infiltration that is free of geotechnical limitations (including slope, setback from infrastructure, building structures or boundaries and water table depth); and • rainwater reuse is not available because: o the quality of the stormwater runoff is not suitable for on-site reuse (i.e. for non-potable water supply, garden/crop irrigation or toilet flushing); or	

- there are no activities occurring on the site that can re-use the full 5mm retention volume of water.

The retention volume can be taken up by detention as follows:

- Provide detention (temporary storage) and a drain down period of 24 hours for the difference between the pre-development and post-development runoff volumes from the 95th percentile (SMAF 1) / 90th percentile (SMAF 2), 24-hour rainfall event minus any retention volume that is achieved, over the impervious area for which hydrology mitigation is required.

The following tables outline the assessment of consents granted under the rules in Activity Table E10.4.1[189] based on sample sizes with a 95 per cent confidence level and 20 per cent relative standard error[190].

Table 7.7 – Impervious areas other than for a road, motorway or state highway.

Rule: E10.4.1(A3) Development of new or redevelopment of existing impervious areas within the Stormwater Management Area Control – Flow 1 or Flow 2 that is greater than 50m² and complies with standard E10.6.1 and Standard E10.6.4.1 [*the standards include the requirements in Table 7.6 above]* Restricted discretionary activity	
Total number	2,693 (25 sampled)
Zoning Split	91 per cent Residential zones, 4 per cent Business zones and 5 per cent Open Space and other zones
Observations/comments The assessment of a small sample of consents indicated: • Most development within the SMAF triggers this rule. For 60 per cent of the sampled applications, E10.4.1(A3) was the only AUP rule triggered. The need for a resource consent is often picked up as part of the assessment of the building consent. Applications are assessed by a Development Engineer to determine compliance with the standard without input from the Stormwater Technical Specialists (Resource Consents). • 100 per cent of the consents sampled provided hydrological mitigation generally consistent with the standard (see Table 7.6 above). • 8 per cent discharged to off-site systems serving a wider catchment area e.g. wetlands/ponds constructed at the time of an earlier subdivision. This is provided for within the standards where the off-site system has been designed to receive and manage the additional stormwater and the discharge is authorised by the operator of the device. • 12 per cent provided detention only (i.e. the retention requirement was offset by detention). While this is provided for within the standards in specific circumstances (e.g. where on-site reuse isn't possible), the specific circumstances were not discussed in the decision reports. • In 12 per cent of the consents, driveways did not drain to the stormwater management system (i.e. retention/detention tank) and were either constructed of permeable paving or discharged to the network. Permeable paving (if maintained correctly) is a form of retention that allows water to infiltrate into the soil however, discharging stormwater from newly developed impervious areas directly to the network (i.e. without hydrological mitigation) is not provided for within the standards and this could potentially trigger rule E10.4.1(A4).	

[189] Consents data since November 2016 through until May 2020 (analysed from the Plans and Places resource consents database)
[190] The sample size calculator is discussed in Section 1.5.2.

• In 12 per cent of the consents, the rule (E10.4.1(A3)) had been incorrectly assessed as being for activities "not meeting the standards". In some cases, the assessment was identical, including the description of the rule and the reasons for granting the application and could have been a report template. • Conditions regarding stormwater management were generally limited to requiring the system to be built in accordance with the application and any plans submitted, with no conditions requiring ongoing operation and maintenance or that as built plans be submitted to the council as is required by the general standards (E10.6.4.1). Only 4 per cent of consents sampled required a covenant to be registered on the title of the property.	
Rule: E10.4.1(A4) Development of new or redevelopment of existing impervious areas within the Stormwater Management Area Control – Flow 1 or Flow 2 that is Greater than 50m² that <u>does not comply</u> with standard E10.6.1 or Standard E10.6.4.1 (the standards include the requirements in Table 7.6 above] Discretionary activity	
Total Number	125 (21 sampled)
Zoning Split	76 per cent Residential zones, 10 per cent in Business zones and 14 per cent in Open Space and other zones.
Observations/comments	

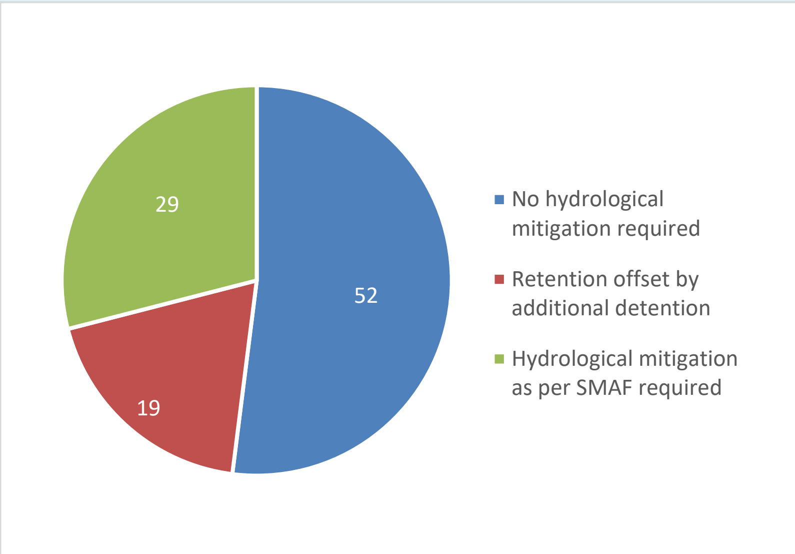


Figure 7. – Hydrological mitigation required by consents granted under E10.4.1(A4) (percent)

- Of the 52 per cent of sampled consents that did not require hydrological mitigation (in the figure above), 10 per cent discharged directly to the Coastal Marine Area and therefore as "not directed to a stream" should have been permitted activities under E10.4.1(A1).
- As depicted above, 19 per cent of consents sampled involved off-setting the required retention with additional detention. This is provided for as an option within the hydrological mitigation requirements in specific circumstances (see option (2) in Table 7.6). Generally, there was no assessment as to whether the offset was justified. If the offset does meet the circumstances detailed in the activity standards, the activity could be considered to meet the requirements of rule E10.4.1(A3) (i.e. rather than being processed under (A4)). Anecdotally, this could account for the high number of consents which were assessed as restricted discretionary (which is the activity status of (A3)) rather than discretionary (23% of the consents sampled) and signals interpretation issues.

Table 7.8 – Impervious areas for a road, motorway or state highway.

Rule: Development of new or redevelopment of impervious areas for a road, motorway or state highway operated by a road controlling authority or rail corridor within the Stormwater Management Area Control – Flow 1 or Flow 2 that is:			
Rule	**Total No.**	**No. Sampled**	**Observations/comments**
E10.4.1(A6) Greater than 1000m^2 and up to 5000m^2 that complies with standard E10.6.1 and Standard E10.6.3.1 Controlled activity in all zones	8	7	The majority of the new roading included in the consents sampled was constructed as part of significant subdivisions and often the bundled development triggered other SMAF rules (e.g. E10.4.1(A3)). All required hydrological mitigation, usually in the form of raingardens. One deferred the final details of the mitigation to the Engineering Plan Approval process, while for the others it was specified in the conditions.
E10.4.1(A7) Greater than 5000m^2 that complies with Standard E10.6.1 and Standard E10.6.4.2. Restricted Discr**etionary** activity in all zones	9	9	The majority of roading activity that triggered this rule also required consents under chapters E8 and E9. All provided the required hydrological mitigation and usually treatment as well.
E10.4.1(A8) Up to 1000m^2 that does not comply with standard E10.6.2 Discretionary activity in all zones	1	1	This rule appears to be redundant as the standards at 10.6.2 state that the development does not need to comply with the general standards (i.e. hydrological mitigation requirements) and the only other standard specifies that the 1000m^2 excludes footpaths, cycleways and ancillary areas where stormwater runoff is dispersed over vegetated or grassed areas. Therefore, the only way to not meet the standards is to be greater than 1000m^2, which is provided for in rules E10.4.1(A9) and E10.4.1(A10). This likely explains why activities are not triggering this rule. The one consent processed under the rule was for 14,422m^2 of new road associated with a subdivision and residential development and should not have been processed under this rule.
E10.4.1(A9) Greater than 1000m^2 and up to 5000m^2 that does not comply with standard E10.6.1 and E10.6.3.1. Discretionary activity in all zones	3	3	Some form of hydrological mitigation and treatment, usually in the form of raingardens at source was provided in 75 per cent of consents. No assessments of any detention volume shortfalls were given.

E10.4.1(A10) Greater than 5000m^2 that <u>does not</u> comply with standard E10.6.1 and Standard E10.6.4.2. Discretionary activity in all zones	6	6	For 50 per cent of the consents sampled, the rule had been recorded incorrectly, either in the report itself or in the consents spreadsheet. The remaining 50 per cent incorporated some form of hydrological mitigation, usually through the use of rain gardens with greater focus given to treatment rather than assessment of the detention volumes provided. 17 per cent discharged directly to the Coastal Marine Area and therefore should have been permitted activities in accordance with E10.4.1(A10).

The location of consents that have been granted under the E10 rules are mapped below.

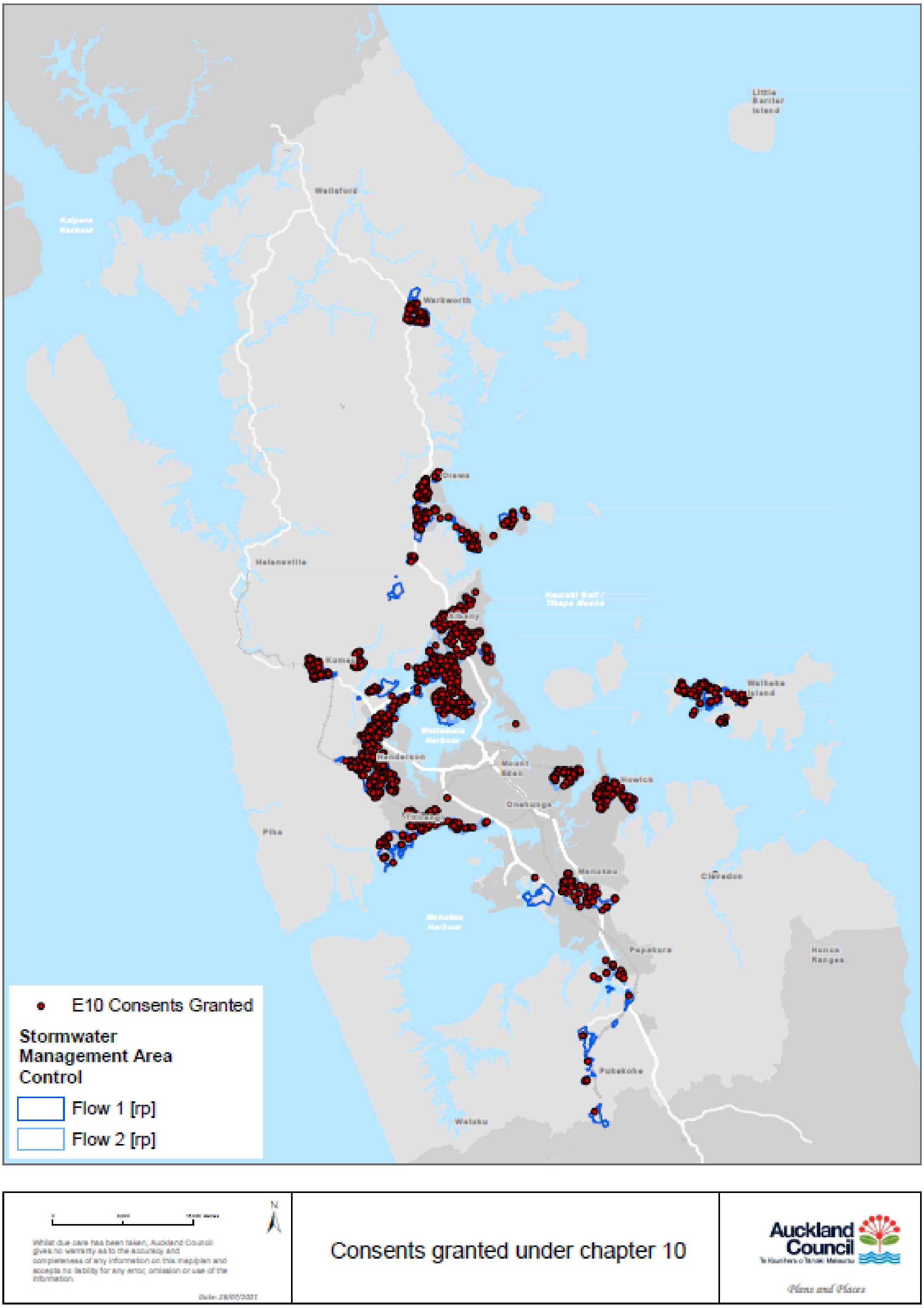


Figure 7.2 Consents granted under the Chapter E10 SMAF rules.

7.2.5.3.1 Implementation of the Chapter E10 rules

Discussions were held with staff from Regulatory Engineering, Auckland Transport, Healthy Waters and Specialist Technical Advisors from the council's Stormwater, Wastewater and ITA Team (Resource Consents).

It was noted that the Stormwater Technical Advisors rarely provide any advice on SMAF consents, with the vast majority assessed by Development Engineers. Given the high level of discretionary activity consents being granted with no hydrological mitigation (i.e. 52 per cent of the E10.4.1(A4) consents sampled) and the potential for cumulative impacts, a review of this approach is warranted.

The NDC stream hydrology requirements apply more widely than the AUP SMAF provisions, with retention/detention requirements for large brownfield and greenfield areas outside of the identified SMAF areas, where the discharge is to a stream via the network.

An additional application of the hydrological mitigation requirements is triggered through some of the activity standards in Chapter E8 (e.g. E8.6.3.1(1) and E8.6.4.1(3)) for new impervious areas not discharging to the network. Hydrological mitigation, consistent with the SMAF requirements, is also applied to roading outside of the SMAF areas through the activity standards of Chapter E8. Comments received indicate that this is generating confusion and assertions that the SMAF requirements are being applied more broadly than intended. Having hydrological mitigation requirements split over two chapters is not helpful and this is discussed further below in relation to the effectiveness and efficiency of the AUP.

By their nature, roads are very linear and the road corridor is narrow, which restricts and hinders what hydrological mitigation can be achieved at source. These restrictions and difficulties are reflected in the AUP rules and account for the more permissive SMAF rule regime (i.e. hydrological mitigation is required above 1000m^2 of road versus 50m^2 for other impervious surfaces).

The majority of the roads that triggered the SMAF rules were new roads being developed as a result of large residential subdivisions. Healthy Water staff have identified this as a misinterpretation of the SMAF roading rules (see Table 7.8 above), which are specifically worded to apply to roads "*operated by a road controlling authority*". Roading developed as part of a subdivision should be included in the overall impervious area of the development and assessed against the general SMAF rules applying to development of new or redevelopment of existing impervious areas greater than 50m^2 (see Table 7.7 above). This is not clear in Activity Table E10.4.1, particularly as the general SMAF rules are grouped under the heading "development of new or redevelopment of existing impervious areas *other than for a road, motorway or state highway." (i.e. "operated by a road controlling authority" has been omitted).*

Roading developed as part of a subdivision is not subject to the same constraints as roading within existing road corridors in urban areas and there are generally greater opportunities to incorporate appropriate hydrological mitigation devices within the design of the development. Most of the consents assessed incorporated bioretention (rain gardens and/or swales) for the purpose of stormwater management. Bioretention can (if appropriately designed in suitable soil conditions) perform the dual functions of contaminant removal and hydrological mitigation.

Auckland Transport have raised specific concerns regarding the interpretation and implementation of the rules in Chapter E10, including that the rules lack clarity, particularly as they relate to the permitted activity standards at E10.6.2.1. It is stated at E10.6.2 that the standards apply to all permitted activities in Activity Table E10.4.1, yet they are then worded to specifically only apply to Rule E10.4.1(A5), which addresses roading up to 1000m^2. Activities triggering these standards are excluded from having to meet the general standards.

The standards also specify that footpaths, cycleways and ancillary areas where stormwater runoff is dispersed over vegetated or grassed areas are excluded from the calculation of impervious area. While a legitimate exclusion (as the area is not discharging to a stream), this additional consideration in relation to determining the impervious area contributes to the interpretation issues noted above in relation to Chapter E8 and the various applications of the term impervious area.

In addition to the concerns raised regarding the definition of redevelopment of road and the Chapter E9 provisions above, issues have also been raised in relation to the interpretation of the definition through the SMAF rules. Auckland Transport consider that it is resulting in the SMAF hydrological mitigation requirements being applied even when there is no increase in the volume of stormwater generated. Healthy Water staff consider that the definition is inhibiting opportunities to manage stormwater discharges from greater areas of roading and that often only areas of new impervious surface are subject to hydrological mitigation, as opposed to the whole area of a road redevelopment project. No particular evidence regarding the issue was determined through the consent analysis. It is noted however, that both the NDC and the provisions of the AUP (through the restricted discretionary activity standards) require not only treatment of new roading impervious surface, but also any existing area of roading discharging to the same point. In addition, for roading 100m^2 – 5000m^2, the controlled activity standards apply the hydrological mitigation standards to the whole site where the area of new impervious surface is greater than 50 per cent of the site.

Auckland Transport also raised concerns that the rules of Chapter E10 do not give effect to Policy E10.3(3), which recognises that there are limitations to achieving hydrological mitigation. This policy states:

> *Recognise that there may be limitations to the hydrology mitigation that can practicably be achieved in some circumstances, particularly in association with redevelopment, including:*
>
> *(a) space limitations;*
>
> *(b) requirements to provide for other utility services; and*
>
> *(c) the function of roads as overland flow paths conveying stormwater runoff from surrounding land uses which the road controlling authority has limited ability to control.*

Through the assessment of the provisions, it was determined that the policy is reflected in the more lenient permitted activity threshold of 1000m^2 for hydrology mitigation requirements for roads (as opposed to 50m^2 elsewhere); recognition within the hydrology mitigation requirements that retention (infiltration and re-use) is not always possible; the provision in the general standards and matters of discretion for the hydrology mitigation requirements to be provided by a device located off-site/downstream; recognition within the matters of control and matters of discretion of site and operational constraints; and direct reference in the assessment criteria.

Concerns were also raised regarding the consenting costs associated with the SMAF rules, particularly for small insignificant increases in stormwater runoff, with Auckland Transport providing examples of high consenting costs (e.g. engineering and consultant fees). An assessment of consenting fees was not undertaken as part of the consent analysis, however as outlined in Table 8 above, only 17 consents have triggered the E10 rules for roading since the AUP became operative and this level of consenting does not appear to be excessive. There will always be debate regarding where to set the consenting thresholds to strike the balance between acknowledging roading as significant infrastructure, with unique constraints and achieving the stormwater management outcomes sought for the region. An assessment of consenting costs is recommended in Section 7.3.4 below.

The effectiveness of the SMAF hydrological mitigation requirements is discussed further in Section 7.3.3 below.

7.2.5.4 Chapter E33 – Industrial and trade activities

While the AUP predominantly manages stormwater through the three chapters discussed above, other provisions are relevant, particularly Chapter E33 – Industrial and trade activities. Industrial and trade activities (ITAs) involve the use, handling and storage of environmentally hazardous substances in their production and operation. The provisions of Chapter E33 seek to manage ITAs in accordance with s9(2) RMA – regional land use, and s15 RMA – discharges, to prevent where possible, or where not possible, to manage, the discharge of contaminants (either to land or water). ITAs are assessed under two sets of rules, one for the use of land (Activity Table E33.4.1) and the other for the discharge of contaminants (Activity Table E33.4.2). ITAs are managed in accordance with the level of risk associated with the nature and scale of the activity and the types of hazardous substances onsite (e.g. low, moderate and high risks). Common ITAs and the associated risk classification are set out in Table E33.3.3 and the rules regime references this table (see table below). ITAs not listed in Table E33.3.3 are classified as 'unlisted' in the rule regime.

A full assessment of ITAs and Chapter 33 will be undertaken as part of the s35 monitoring of Chapter B10 of the RPS – Environmental Risk. The assessment undertaken for this report is focused on the potential for the discharge of contaminants from ITAs to stormwater.

Chapter E33 contains Objective E33.2, which seeks to avoid adverse effects (on land and water) from environmentally hazardous substances and the discharge of contaminants, or to minimise adverse effects where it is not reasonably practicable to avoid them. The corresponding policies at E33.3 relate to the management approach to ITAs and require onsite management systems (e.g. for containment and treatment) and disposal of contaminants as trade waste to the wastewater network. The provisions note that the ITA rule framework should be read in conjunction with Chapter E8 – Stormwater Discharge and Diversion (and E31 Hazardous Substances and the relevant zone rules).

Since the AUP became operative, there has been a total of 59 discharge consents granted through the rules of Activity Table E33.4.2 – Discharge of contaminants from ITA areas.[191] The

[191] These totals were obtained from the Plans and Places resource consent database (note: there are known inaccuracies in this database).

number of consents per rule and the corresponding sample sizes to achieve a 95 per cent confidence interval and 20 percent relative standard error, are detailed in the table below.

Table 7.9 Discharge consents granted under the rules of Activity Table E33.4.2

Rule	Total Number	Sample Size
Unlisted ITA areas		
E33.4.2(A12) Discharge of contaminants from an existing or new ITA area not listed in Table 33.4.3, where the permitted activity standards are not met. Controlled Activity	15	9
E33.4.2(A13) Discharge of contaminants from an existing or new ITA area not listed in Table E33.4.3 where controlled discharge standards are not met. Discretionary Activity	3	3
Low Risk ITA areas		
E33.4.2(A15) Discharge of contaminants from an existing or new ITA area listed as low risk in Table E33.4.3 where the permitted discharge standards are not met. Controlled Activity	0	-
E33.4.2(A16) Discharge of contaminants from an existing or new ITA area listed as low risk in Table E33.4.3 where the controlled discharge standards are not met. Discretionary Activity	0	-
E33.4.2(A18) Discharge of contaminants from an existing or new ITA area listed as moderate risk in Table E33.4.3 where the permitted discharge standards are not met. Controlled Activity	5	4
E33.4.2(A19) Discharge of contaminants from an existing or new ITA area listed as moderate risk in Table E33.4.3 where the controlled discharge standards are not met.	2	2
High Risk ITA areas		
Existing sites		
E33.4.2(A21) Discharge of contaminants from an existing ITA area listed as high risk in Table E33.4.3 (before Table E33.4.3 timeframe expires*) where the permitted discharge standards are not met. Controlled Activity	0	-
E33.4.2(A22) Discharge of contaminants from an existing ITA area listed as high risk in Table E33.4.3 (before Table E33.4.3 timeframe expires*) where the controlled discharge standards are not met.	0	-

Rule	Total Number	Sample Size
Discretionary Activity		
E33.4.2(A23) Discharge of contaminants from an existing ITA area listed as <u>high risk</u> in Table E33.4.3 (after Table E33.4.3 timeframe expires*). Discretionary Activity	12	8
New sites		
E33.4.2(A24) Discharge of contaminants from a new industrial or trade activity area listed as <u>high risk</u> in Table E33.4.3. Discretionary Activity	22	12

*Activity Table E33.4.3, which details industrial and trade activities and their risk criteria, contains a timeframe which relates to the activity status and standards of high-risk activities and is generally either 12 months from, or at the date that the AUP became operative. This timeframe has expired and is now irrelevant and therefore the rules that are specific to prior to this timeframe are also redundant.

Observations from the consent sample analysis include:

- Nearly 60 per cent of discharge consents were for high-risk activities and included activities such as concrete batching plants, asphalt plants and waste management and treatment facilities.
- The discharge consents for high risk activities (i.e. those that triggered E33.4.1(A23) and (A24)) consistently imposed a comprehensive suite of conditions including requirements for an Environmental Management Plan (EMP), specified structural controls (stormwater management and treatment devices), construction meetings and as-built plans, Operation and Maintenance Plans, a specified discharge monitoring programme, annual environmental performance reporting and provision for a review of the conditions.
- It was noted that stormwater discharge rules under Chapter E8 or Chapter E9 were sometimes also triggered by the activities. In this scenario the conditions were sometimes split between the two discharge consents, with the focus of the ITA discharge consent being limited to the EMP and the structural controls and required operation and maintenance being included in the stormwater discharge consent.
- All of the high risk ITAs also required land use consent under the rules of Activity Table E33.4.1, most often E33.4.2(A7) for existing activities and E33.4.2(A8) for new activities, both of which are controlled activity rules.
- Some ITAs were noted as being processed in accordance with two of the rules (e.g. both E33.4.2(A23) and E33.4.2(A24)) due to different aspects of the activities on site, most often existing ITA and proposed new ITA.
- 30 per cent of consents were for ITAs not listed in Table 33.3.3. Subject to compliance with the permitted activity standards, unlisted ITAs do not require land use consent as they are provided for as permitted activities through rule E33.4.1(A3). Only one of the consents assessed required land use consent (through Activity Table E33.4.1) in addition to the discharge consent, due to not meeting the standards. The consents sampled were for activities including data storage facilities, equipment hire yards, sand

washing, shipping container storage, a works depot and landscape supplies. Conditions imposed on these consents were less consistent than for the moderate or high-risk activities, with the requirement for an EMP and/or discharge monitoring programme often not imposed.

7.2.5.4.1 Comments from Regulatory Services

Comments regarding the implementation of the provisions of E33 were provided by ITA and Stormwater Specialists of Regulatory Services, with the following issues raised:

- The description of the rule framework for Activity Table E33.4.2 – Discharge of contaminants from an ITA (and also E33.4.1 – Use of land for ITA) states that the "rules address stormwater quality aspects of the discharge of contaminants from an ITA area". While stormwater management is an important aspect of managing ITA areas, contaminants can reach the stormwater system and receiving environments through discharges from wash-water, spills and other activities on-site and the risks are not limited to during rainfall, as is implied by the description.
- The rule activity tables are notated [rcp/dp] indicating they are Regional Coastal Plan and District Plan rules. This is incorrect as the rules are not district plan rules and are regional land use rules under s9(2) RMA and discharges managed in accordance with s15 RMA (a regional council function). The notation should read [rcp/rp]. This is likely a typographical error as the provisions clearly refer to correct sections of the RMA (i.e. in the first sentence following each of the tables).
- New definitions are required for:
    - "Environmentally hazardous substance" as the term is often confused with "hazardous substance".
    - "Unlisted ITA area". Where an activity is not included in the listed ITAs in Table E33.4.3, greater guidance is needed to assist in determining what constitutes an ITA.
- Greater guidance is required in relation to how a large site with multiple land uses/operators should be assessed e.g. is it the predominant activity that determines the risk classification and activity status or is it that of the highest risk. It was noted during the assessment of consents that in some cases more than one ITA rule was triggered by an activity. For example, redevelopment or expansion of activities on a site being assessed under both the rules relating to existing activities and the rules relating to new activities.
- Investigation into potential additional activities to be added to Table E33.4.3 – ITA risk criteria is required (e.g. transformers and substations, managed cleanfills, solar farms, landscape suppliers, car wash facilities) and greater clarity that ancillary activities are to be included in the ITA area where the primary land use is listed.
- The date specified in Table E33.4.3 has expired rendering the rules that apply prior to the date redundant.

- The permitted activity standards refer to “Part 4 of the Hazardous Substances (Emergency Management) Regulations 2001”. These regulations have since been revoked.
- Greater specification is required within the rules and standards as to when an ITA requires an Environmental Management Plan i.e. is it a requirement for all ITAs (including through the permitted activity standards) or just those of moderate and high risk.
- To achieve greater consistency, monitoring parameters and obligations could also be specified within the standards. Currently there is heavy reliance on the imposition of a standard condition.
- The permitted activity standard for discharges requires compliance with the following:

  The discharge of contaminants from an industrial or trade activity area must result in less than minor adverse environmental effects on the receiving environment <u>without the need for stormwater treatment</u> (with the exception of on-site vehicle refuelling areas requiring stormwater treatment and spill contaminant devices under the permitted activity Standard E33.6.1.1(12)). [emphasis added]
  Concerns have been raised that stormwater treatment is intentionally not being implemented in order to meet this standard.

7.2.5.4.2 Proactive compliance monitoring

It is estimated that there are 5000 moderate risk and 3000 high risk ITA activities operating throughout the region. Non-compliance has been raised as a concern, with the pollution hotline having recorded 537 ITA pollution incidents during the 12 months prior to October 2021[192]. Regulatory Services and Healthy Waters are collaborating to reduce the number of non-compliant industrial and trade businesses and their associated discharges of contaminants, through the establishment and implementation of a proactive monitoring programme.

The Industrial and Trade Activities Proactive Programme (ITAPP) intends to promote sustainable management practices through proactive compliance monitoring and enforcement, coupled with engaging with and informing industry in relation to the environmental implications of non-compliance and providing greater clarity as to the obligations of operators. The programme builds on Healthy Waters’ Industrial Pollution Prevention Programme which has been in place for 8 years (and evolved from legacy programmes run by the Auckland Regional Council), educating and informing industry of the potential impacts of their activities and includes spill training and promotion of waste minimisation.

A business case for the ITAPP has been drafted and Water Quality Targeted Rate funding is being pursued to progress the initiative.

[192] As detailed in the document: Business Case – Industrial and Trade Activities Proactive Programme (ITAPP), Regulatory Compliance and Healthy Waters Collaboration, 4 October 2021.

7.2.5.5 Chapter E38 – Subdivision

Chapter E38 – Subdivision includes Policy E38.3(22) in relation the management of stormwater, which states:

> *(22) Require subdivision to be designed to manage stormwater:*
>
> *(a) in accordance with any approved stormwater discharge consent or network discharge consent;*
> *(b) in a manner consistent with stormwater management policies in E1 Water quality and integrated management;*
> *(c) by applying an integrated stormwater management approach to the planning and design of development in accordance with stormwater management policies in E1 Water quality and integrated management;*
> *(d) to protect natural streams and maintain the conveyance function of overland flow paths;*
> *(e) to maintain, or progressively improve, water quality;*
> *(f) to integrate drainage reserves and infrastructure with surrounding development and open space networks; and*
> *(g) in an integrated and cost-effective way.*

Healthy Waters have questioned whether subdivision consents are achieving the outcomes sought by this policy and have raised concerns that subdivision consents are being processed without assessment of the resulting end land use and the likely levels of new impervious surfaces that will be created, which had been the standard practice prior to the AUP. Healthy Waters have also raised concerns regarding land use led subdivisions compromising achievement of stormwater management outcomes. It was noted through the assessment of consents for this chapter and also through the assessment of land disturbance consents that rule E38.4.1(A14), which provides for subdivision around approved land use consent, appeared to be the most common subdivision rule triggered by the bundled consents reviewed. However, due to resourcing constraints, it was not possible to undertake a comprehensive assessment of the provisions of Chapter E38 – Subdivision to determine the effectiveness and efficiency of the provisions in achieving appropriate stormwater management, consistent with Policy E38.3(22). Given the complexities of subdivision, it is recommended that Chapter E38 be the focus of an additional comprehensive s35 report.

7.3 Effectiveness and efficiency of the AUP

As outlined in Section 7.1.2, indicators were identified to assist in measuring the effectiveness and efficiency of the AUP stormwater management provisions.

In consideration of these indicators, the assessment above (including the analysis of the provisions, samples of consents and comments received from Auckland Council staff), indicates that the stormwater management provisions in Chapters E8, E9 and E10 could be more effective and efficient in achieving the water quality outcomes sought by the RPS. Issues identified largely relate to interpretation (including lack of clarity in the rule framework), the structure of the chapters and opportunities to manage stormwater quality and quantity not being maximised. The issues are discussed above in relation to each of the chapters and summarised below.

7.3.1 Indicator 1 – Existing adverse effects of stormwater discharges are being progressively reduced

As noted in Section 7.2, stormwater is a source for a number of key pollutants affecting the Region's waterways, including *E. coli*, sediment and heavy metals. While water quality in some areas (e.g. coastal water) is improving slowly, urban streams are generally degraded. The Regionwide Stormwater Network Discharge Consent (NDC) will assist in achieving integrated management of the stormwater network and discharges and requires that comprehensive performance standards be met. The monitoring and reporting cycles required by the NDC will assist in determining trends in relation to the performance of the network and alignment to the outcomes sought by the AUP. The first (out of cycle) monitoring report is due late 2022.

7.3.1.1 Recognition of, and inconsistency with, the NDC

As highlighted through the relative sections above, the provisions of the AUP predate the existence of the NDC and there are examples in each of the three chapters where the stormwater management required by the rules is less stringent than the requirements of the NDC. The process through which consents are assessed and granted is also not providing adequate opportunities for the network operator to influence stormwater management at source, prior to consent being granted and/or connections to the network being approved. This is having implications for achieving the outcomes of the NDC, compromising the opportunities that this comprehensive consent provides to address the effects of stormwater.

7.3.2 Indicators 2, 3 and 4 – Managing the adverse effects of stormwater

7.3.2.1 Stormwater quality

Stormwater runoff naturally contains numerous physical, chemical and biological constituents (from soils, plant material and aerial deposition). However, urbanisation and urban activities, including development and redevelopment, typically increase and introduce new constituents into water which impact the health of the receiving environment. Some of the key pollutants associated with stormwater include sediment, nutrients, bacteria and viruses, oil and grease, total and dissolved metals, organics, pesticides and gross pollutants (Cunningham A et al

2017[193]). As noted above, the 6-yearly performance report required through the conditions of the NDC, the first of which is to be prepared late 2022, will be a key document in assessing the performance of the public stormwater network, particularly in relation to stormwater quality.

While the objectives and policies of Chapter E1 seek to minimise the adverse effects of stormwater discharges on water quality and to reduce contaminants at source generally, the requirement for stormwater treatment is largely limited to the provisions of Chapter E9 and the high-risk activities of high use roads and high contaminant generating car parks. The implementation of the NPS-FM could require that the stormwater management provisions of the AUP be extended to more comprehensively address the key urban stormwater contaminants and effects on instream temperature, beyond the existing scope of Chapter E9.

7.3.2.2 Roading

As roads represent significant areas of impervious surface and the stormwater discharging from them contains vehicle derived contaminants such as heavy metals and hydrocarbons, it is essential that both the quality and quantity of stormwater discharging from roads is appropriately managed. However, roading is unique in its linear nature and the constraints the narrow roading corridor imposes on achieving stormwater management outcomes.

There are rules which relate to roading within all three of the chapters and as such, the various consenting requirements and activity standards can be difficult to decipher. As noted above, some of the rules appear to regularly be incorrectly applied and E10.4.1(A8) appears to be redundant. To provide greater clarity, the roading provisions could be better placed within one comprehensive activity table, with its own specific rule regime and associated activity standards and assessment criteria etc.

7.3.2.3 Chapter structure and use of terms

Having the stormwater management provisions split across the three chapters is resulting in issues with implementation and inconsistencies, particularly in the use and application of key terms (e.g. redevelopment of road and impervious area) and the clarity of, and interrelationship between the rules. While the issue this creates with roading is briefly discussed above, hydrological mitigation is also a requirement that traverses more than one chapter. It is not just specific to SMAF areas addressed by Chapter E10 and is applied through the activity standards of Chapter E8. The activities that require consent under the Chapter E9 provisions also often trigger the E10 provisions and require hydrological mitigation. An end user of the AUP must read and fully comprehend all three chapters to determine the consenting requirements or permitted activity standards for an activity and this is not an easy task.

The review of consent samples indicated that the rules are at times incorrectly applied or referenced. Stormwater management is also often not comprehensively assessed, with the focus either being treatment or hydrological mitigation, rather than both and the relevant

[193] Stormwater Management Devices in the Auckland Region: Guidance Document 2017/001 (GD01) (page 8)

assessment criteria are rarely referred to, including those relating to cumulative effects and the sensitivity of receiving environments.

It was noted that approximately 30 per cent of the consent reports/decisions assessed included the rules triggered under Chapter E9 and Chapter E10 under the assessment of Regional land-use consents (often with earthworks), separate to the assessment of the stormwater discharge consent they were bundled with (Chapter E8 rules). The remainder (70 per cent) assessed all aspects of stormwater together. While the rules in Chapters E9 and E10 are land use controls in accordance with s9(2), their ultimate purpose is to manage adverse effects on water quality and quantity and an assessment of a bundled activity against the rules should be undertaken in an integrated manner. Anecdotally, this could highlight a disconnect with stormwater management being assessed simplistically as an engineering infrastructure issue, rather than as a broader water quality/quantity issue in some cases. Both Chapter E9 and E10 only refer to Section 9(2) of the RMA as the legislative basis of the provisions and greater guidance could be provided within both chapters regarding the integrated management of stormwater.

7.3.3 Indicators 2 and 5 – Stormwater quantity and the effectiveness of SMAF

Increases in impervious surfaces prevent rainfall infiltration and lead to greater volumes of water entering the stormwater network and receiving streams at greater velocity. The SMAF provisions are intended to manage the volume and flow of stormwater from impervious surfaces during frequent storm events to protect streams from effects such as bank instability and erosion and stream bed incision.

Detention/retention devices, such as those required by the SMAF provisions, moderate stormwater peak flows, reduce runoff velocities and also allow contaminants to settle out. The process of retention and detention is depicted in the figure below. The retention component offsets the increase in stormwater volume produced by an increase in impervious surface by reducing the volume of stormwater discharging through re-use on site or infiltration, while the detention component detains the stormwater and slowly releases it over a longer period of time (24 hours), to moderate the peak flow rate generated by the additional impervious area.

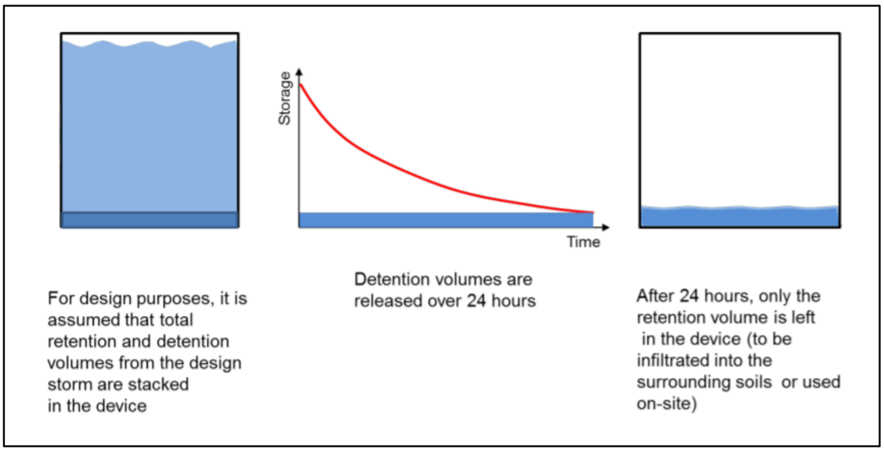


Figure 7.3 Retention and detention design for stream protection (Figure 1 from GD01).

This approach to stormwater management is an improvement on historical approaches which had a predominantly engineering focus and simply sought to convey stormwater into the network/stream and receiving environment as quickly as possible. However, the effect of impervious surfaces on peak flows is significant (in comparison to vegetated land) and often the level of retention and detention required through the SMAF hydrological mitigation will not be adequate to fully address the impacts of stormwater, particularly cumulatively downstream throughout a stream catchment. Areas of brownfield development can be subject to constraints and as such, the hydrological mitigation required by the SMAF provisions of Chapter E10, in many scenarios, represents the best practicable option. However, in greenfield development, which is subject to significantly less constraints, greater hydrological mitigation could be achieved.

Stream bank/bed erosion continues to be a significant issue throughout the Auckland Region and indicates that greater mitigation to that currently being achieved is likely required. Despite this, the consent sample analysis above determined that 52 per cent of the applications processed as not complying with the SMAF requirements (Rule E10.4.1(A4)) were granted with no hydrological mitigation and an additional 19 per cent offset the retention requirement with detention (therefore 71 per cent of the consents sampled were granted with no retention). These consents generally did not detail a comprehensive assessment of the objectives and policies of the AUP, including those in Chapter E10 specific to hydrological mitigation.

Auckland Council is undertaking significant work to better understand and address the issue of stream bank/bed erosion[194] and it is likely that the role of the SMAF hydrological mitigation and other stormwater management provisions of the AUP will require revision to better address this issue through the implementation requirements of the NPS-FM. It is particularly imperative that in areas of greenfield development that all opportunities to achieve integrated stormwater management (i.e. water sensitive design) are realised.

7.4 Recommendations

To address the issues identified above, the following actions are recommended[195]. The recommendations are assigned into the categories outlined in section 1.6.

7.1 The three chapters of E8, E9 and E10 be reviewed with consideration of combining the provisions into one comprehensive stormwater chapter, to achieve greater integrated management of stormwater, with clear objectives and policies (including greater focus on streambank erosion) and potentially separate activity tables for the specific matters currently covered in the three chapters (including one specific to roading) (category: NPS-FM related).

7.2 The provisions be reviewed and amended to:

a) Better reflect and be consistent with the connection requirements of, and outcomes sought by the NDC.

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194 See the paper: Tackling Streambank Erosion in Auckland – You Can't Manage What You Don't Measure – H. Brightley, S. Speed, Z. Zhou, C. Brent and N. Nolan (Auckland Council): 2021 Stormwater Conference and Expo; and report: Stream Erosion Planning Analysis – TEKTUS Consultants for Auckland Council's Healthy Waters Department (2020), which was in draft form at the time of writing.

195 These recommendations will need to be tested fully through an RMA section 32 assessment, be considered alongside other recommendations from other topics and the Plans & Places Department work programme.

b) Provide greater clarity in their interpretation (particularly to address the inaccuracy noted in applying the correct rules to consents) and remove inconsistency of terminology (particularly in relation to the terms: total impervious area and redevelopment of roading).
c) Require the use of stormwater management devices to be consistent with relevant technical or guidance documents (e.g. GD01, GD04, TR2013/040 (now updated to GD07[196]) and TR2013/18) (category: NPS-FM related).

7.3 The provisions be amended to better reflect that the need for hydrological mitigation is not limited to the SMAF area and that greater mitigation should be achieved in greenfield areas. The rules and/or permitted activity standards for the SMAF also need to be amended to clarify that those discharges that are direct to the coastal marine area are excluded (category: NPS-FM related).

7.4 The inclusion of additional contaminant removal requirements be investigated, consistent with the requirements of the NPS-FM. To achieve the enhancement focus of both the existing water quality objectives of the AUP and the NPS-FM, stormwater discharges should provide a level of treatment commensurate with the nature of contaminants present and address cumulative effects (category: NPS-FM).

7.5 A Practice and Guidance Note be drafted for stormwater discharges that not only covers the AUP provisions but also the requirements of the Stormwater Bylaw 2015 and Stormwater Code of Compliance (particularly for permitted activities) and also the requirements of the NDC (category: process).

7.6 A review of an example of roading consents be undertaken in consultation with Auckland Transport to determine any concerns with excessive consenting fees or associated costs (category: further investigation).

7.7 With the heavy reliance on permitted activity standards, that the adequacy of compliance monitoring be assessed (category: process).

7.8 A plan change be pursued (either through the AUP review or earlier) to address the matters raised under Section 7.2.5.4 in relation to Chapter E33– Industrial and trade activities, including: removing the rules and provisions that are now redundant due to the expiration of specified dates or the revocation of standards referred to; and in consideration of including greater guidance through additional definitions, or within the provisions (e.g. a definition for unlisted ITAs and greater guidance in relation to assessing large sites of mixed land use). (category: AUP review)

7.9 A Practice and Guidance note for Chapter E33 be developed to provide guidance to practitioners and the industry. (category: process)

7.10 The proposed Industrial and Trade Activities Proactive Programme for industry education and compliance monitoring and enforcement be pursued. (category: further investigation)

[196] Stormwater Soakage and Groundwater Recharge in the Auckland Region Guideline Document 2021/007 Version 1

7.11 A comprehensive analysis of Chapter E38 – Subdivision be undertaken that includes assessment of the effectiveness of the provisions in achieving stormwater management outcomes (category: further investigation).

7.5 Future change under the NPS-FM

A full outline of the NPS-FM is contained in the introduction to this report at 1.3.2.1. Auckland Council is required to make changes to the AUP provisions to give effect to the NPS-FM and these changes must be publicly notified by December 2024.

Amongst other things, the NPS-FM requires the council to improve degraded waterbodies and maintain or improve all other waterbodies so that they achieve national bottom lines, including relevant measures for stormwater contaminants such as sediment and *E. coli* (and potentially heavy metals if identified as regional attributes). As noted in Section 3.2.1, both SoE Monitoring and FWMT modelling have clearly shown that this will be a difficult requirement given that the majority of urban streams monitored or modelled are currently degraded by such contaminants, with most showing trends of continuing degradation.

The NPS-FM includes compulsory values (i.e. ecosystem health, human contact, threatened species and mahinga kai) to which the National Objectives Framework (NOF)[197] applies. The potential impacts of stormwater (e.g. the delivery of contaminants, changes in hydrological processes, temperature and contribution to stream bank erosion) are relevant to all of these compulsory values (as well as other values). Specific action plans may be required in urban sub-catchment freshwater management units (FMUs) to address the effects of stormwater. Improved management of cumulative adverse effects, particularly on a catchment or FMU basis and in consideration of sensitive downstream receiving environments will be required.

Condition 40A of the NDC requires that the conditions of the NDC be amended to reflect any plan changes to give effect to the NPS-FM.

[197] See section 1.3.2.1 of the Introduction to this report for a full explanation of the NOF.

8 Rural production discharges

This chapter considers how effective and efficient the objectives, policies, rules, and other methods of the AUP have been in meeting the outcomes intended by the Regional Policy Statement with respect to nutrient management from rural production activities.

The main sources of nutrients are farming activities such as fertiliser application, animal effluent discharges and other wastewater discharges from rural activities which contribute to elevated contaminant levels in freshwater. The AUP categorises nutrient discharges into three discharge types (rural production activities, wastewater and biosolid disposal) that are addressed in separate sections of the Plan. Rural production activities (the subject of this chapter) are addressed in Chapter E35 of the AUP and include discharges from dairy effluent from dairy sheds and feedpads, fertiliser use and application, greenhouse wastewater discharges, and other activities including leachate from offal holes, silage storage and composted materials.

The AUP regional plan provisions give effect to the RPS by a framework under which nutrients and pathogens from farming land use activities are regulated through water quality objectives, policies, and rules. The activity status of a discharge is based on the level of risk the activity is likely to contribute to elevated contaminants in groundwater or surface water. The AUP does this for nitrogen by setting a nitrogen leaching maxima[198] as a permitted activity and farming activities that exceed that threshold require a discretionary activity resource consent application.

8.1 Indicators and measures

8.1.1 Indicators

The RPS (specifically B7.3 ‘Freshwater Systems’ and B7.4 ‘Coastal water. Freshwater and geothermal water’) establishes freshwater quality and value objectives and a framework under which rural production activities are regulated pursuant to section 15 of the RMA.

There are no specific indicators for rural production activities listed in Chapter B11, however there are two environmental indicators for the overarching RPS freshwater management objectives. Indicator 1 (below) corresponds to objective B7.3.1(1) while indicator 2 corresponds to objective B7.3.1(2).

[198] Permitted activity standard E35.6.1.1(3) of the Auckland Unitary Plan sets the maximum application rate of nitrogen from any combination of dairy effluent (excluding urine from grazing animals), nitrogenous fertiliser and other discharges dependent upon the soil type.

Table 8.1 Indicators, measures and information sources for rural production discharges.

Indicators	Measures	Information Sources
1. Degraded freshwater systems decrease over time. 2. Freshwater systems are maintained and enhanced over time	• Monitoring of four identified lakes water quality data to show comparison with NPS-FM NOF values.	• State of the Environment lake monitoring (Groom 2021).
	• Assessment of whether granted consents demonstrate evidence of undertaking best practice to manage the actual or potential adverse effects on the environment and to operate within identified environmental limits e.g., nutrient budgets.	• The Plans and Places resource consents database.
	• Identification of operational issues of implementing the AUP provisions.	• Monitoring case studies.
	• Annual monitoring of dairy farm effluent storage systems.	• Permitted Activity Dairy Farm Monitoring Data

Ideally the topic would include measures such as the number of farms with demonstrable reduced nitrogen leaching rates, and activities operating within identified environmental limits such as nutrient budgets, but this type of information was not available.

8.2 Data and information

The data and information sources relied on to assess the above measures, and the effectiveness and efficiency of the Auckland Unitary Plan are:

- State of the Environment Reporting 2021
- The Plans and Places resource consents database
- Monitoring case studies identified in the Auckland Council Internal Report 2019/031 "Auckland Unitary Plan Water Provisions Evaluation – Nutrient Management", November 2019 (Xu 2019a).

It is noted that the stock exclusion standards for permanent streams in the AUP did not become operative until 15 November 2021 and standards for intermittent streams do not become operative until 15 November 2026, therefore there are no consent applications on stock exclusion at this stage. There are no biosolid land disposal consents granted under the AUP or any known permitted activities of this land use.

8.2.1 State of the Environment Reporting

The State of the Environment reports reported that micro algal growth in lakes and nitrate in groundwater are key issues for Auckland.[199] Of particular concern is the Franklin area where some south Auckland volcanic aquifers have high nitrate readings that exceed drinking water standards (Meijer et al., 2016). Some Franklin streams (Waitangi and Whangamaire) are failing the National Policy Statement for Freshwater Management National Bottom Line for nitrate toxicity (Ingley, 2021b).

8.2.2 Freshwater Management Tool (Baseline 2013-17)

The FWMT reports noted widespread degradation of riverine water quality throughout the Auckland region over the baseline period (2013-2017) originating from pastoral and horticultural activities (see Chapter 2, Section 2.3.2.1.2).

Risks of nitrate toxicity are notably elevated in the Manukau watershed, particularly waterways draining the Franklin area. The FWMT reported streams of D-grade for nitrate-nitrogen toxicity are limited to the Manukau watershed, as are 80 per cent of streams in C-grade (note: C and D grades are below national bottom-line – 2013-2017). Sources for nitrogen loads to waterways within the Manukau watershed are predominantly agricultural, as they are throughout the other nine major watersheds of the Auckland region (2013-2017). Approximately 42 per cent of baseline total nitrogen discharged to waterways in the Manukau watershed originates from horticultural activities (mostly from more intensive types of horticulture like market gardening) whilst 52 per cent originates from pastoral activities (mostly from more intensive pastoral farming like dairying and beef finishing). Despite comparable total nitrogen loads, it is important to note that the areas occupied by both horticulture and pasture are markedly different in Auckland; meaning total nitrogen yields from horticulture are nearly fivefold greater than pasture in the Manukau watershed.

The FWMT identified widespread risks of excessive ammoniacal nitrogen toxicity (fail national bottom-lines) across the Auckland region, predominantly for acute conditions. Depending on choice of numeric attributes, between 50 per cent (median and maxima) or 12 per cent (median and 95^{th}%) of streams were predicted in C or D-grade. Proportions of such failing streams vary widely across the region, affecting both rural and urban watersheds alike. For a highly conservative but NOF compliant approach using worst of baseline median or maxima numeric attribute states, most freshwater stream length in the Kaipara watershed (64 per cent) and Waitemata watershed (46 per cent) would fail national bottom-lines (drops to 26 per cent and 14 per cent respectively, if using median or 95^{th}% concentrations). Overall, pastoral and horticultural activities account for 75 per cent and 16 per cent of total nitrogen discharged to waterways. Combined, both latter productive rural activities contribute disproportionately to total nitrogen discharged to waterways in rural watersheds. For instance, pastoral and

[199] The State of the Environment monitoring uses water quality parameters, human contact attributes, ecological indicators, and graded according to the National Policy Statement for Freshwater Management 2020.

horticultural users contribute 96 per cent of total nitrogen discharged to waterways in the Kaipara watershed. Depending on grading approach, between 68 per cent (median and maxima) and 26 per cent (median and 95th%) of stream length was C or D-graded under baseline conditions. Overall, across the entire Auckland region, pasture and horticulture account for approximately 91 per cent of total nitrogen losses to waterways during the 2013-2017 baseline period.

Pastoral activities are also a dominant source of faecal indicator bacteria and by association, faecal pathogens, to waterways across the Auckland region. Pastoral activities are estimated to contribute 80 per cent of *E.coli* loading to waterways over the baseline period (2013-2017). Regardless of watershed, a widespread unacceptable risk to human health from primary contact recreation is likely in Auckland waterways. For example, the FWMT indicates 83 per cent of regional streams and rivers were in D or E-grade for *E.coli* over the 2013-2017 baseline period. Whilst the FWMT identifies failures of national primary contact recreational targets in most urban streams, the same is true of rural streams where pastoral sources are predicted to dominate *E.coli* loading to waterways.

Whilst dissolved reactive phosphorus (DRP) lacks a national bottom line, FWMT reporting indicates widespread degradation with 59 per cent of stream length in D-grade. Proportions of stream in D-grade vary widely by watershed but occur in both urban and rural watersheds (i.e., <1 per cent of Hauraki Gulf Island waterways through to 74 per cent of waterways in Kaipara watershed). Caution may be needed in assessing the significance of DRP results because DRP may be naturally higher in some Auckland soil types. This natural variability is part of the reason why there is no national bottom line for DRP in the NPS-FM. Across the region, pasture is the predominant source of total phosphorus (75 per cent) but noting a considerable fraction of the nutrient is lost from bankside erosion (22 per cent).

8.2.3 Plans and Places resource consents database

8.2.3.1.1 Methodology

The Plans and Places resource consents database was searched for consents triggered under Chapter E35 'Rural Production Discharges' of the AUP, which cover the following rural activities:

- discharges of dairy farm effluent
- fertiliser use
- other rural production activities including the stockpile and composting of vegetative material and animal waste; silage facilities; and the discharge of greenhouse waste.

Four granted consents were found within a date span from November 2016 – April 2021.

8.2.3.1.2 Summary of consents

Consent 1 (Tapora)

To establish and operate a free-range poultry farm which involves the discharge of poultry excrement to land within a free-range operation.

Reason for application – AUP trigger for consent

The discharge of excrement from the poultry broiler sheds and free range areas is a Discretionary Activity under rule E35.4.1 (A14) under the AUP as it does not meet the permitted activity standards or controlled activity standards. The proposal results in discharge greater than 10m³ per day and exceeds 200kg nitrogen/hectare/year and 50kg nitrogen/hectares/31 days onto grazed pasture.

Consent Decision Assessment

That the risks of runoff and leaching into groundwater and / or surface water from the activity are low due to the site characteristics, proposed management plan and proposed mitigation and monitoring conditions. The effects on the environment are appropriately managed and mitigated by:

<u>Application timing</u>
When rainfall is at its highest (during winter) nitrogen application is reduced naturally as air temperature and wet conditions will limit the number of days birds can go outside to below 3 days/run during winter. This is estimated to reduce the application of nitrogen to well below 10 kg/ha at that time of the year.

<u>Removal of Nitrogen</u>
10-25 per cent of range area will be planted in trees/shrubs to provide shade for the birds and the deeper rooting trees will take nitrogen up from lower in the soil profile. Nitrogen discharge will mostly occur in the warmer months when pasture growth is strong, and uptake of N is at its highest. When soil temperatures are above 6 degrees, pasture will be actively growing and taking N out of the soil.

A 'cut and carry' system on the free-range areas will remove nitrogen from the site and prevent excess nitrogen from accumulating in the soil, resulting in increased leaching of nitrate.

<u>Phosphorus</u>
The site is in a High Use Stream Management Area but the risk of phosphorus transport to the stream is relatively low as application does not occur during saturated soil conditions. While removal rates would be expected to range from 40 to 60 kg/ha/year depending on forage yields it is predicted that there will be a high accumulation rate of phosphorus as animal excrement has high concentrations of phosphorus. Consent conditions are proposed that will require assessment of the soil conditions (monitoring of soil and surface will be used as triggers to take further mitigation action and identify if additional land is required to manage the excrement).

Consent 2 (Waitoki)

To extend an existing implement shed and operate a home kill butchery that will involve the preparation and packaging of home killed carcasses resulting in the discharge of up to 1.6m³ per day of wastewater to land.

Reason for application – AUP trigger for consent

The discharge of rural production discharges onto or into land not otherwise provided for under Activity Table E35.4.l(A15) is a discretionary activity.
Consent Decision Assessment That wastewater will be suitably disposed of on site as sufficient treatment and disposal method and separation distances are provided on site, to avoid off site water quality effects.

Consent 3 (Pakuranga) To discharge greenhouse nutrient solution from greenhouses with a total floor area exceeding 1 hectare. **Reason for application – AUP trigger for consent** To discharge greenhouse nutrient solution onto or into land where the total floor area of the greenhouse is greater than 1 hectare and that complies with Standard E35.6.2.1 is a Controlled Activity under Rule E35.4.1 (A11).
Consent Decision Assessment The wash water from the packhouse will be appropriately disposed of via the stormwater forebay pond. There will be no direct discharge to surrounding land and water and the forebay pond will provide a suitable level of contaminant treatment.

Consent 4 (Pukekohe) To authorise a rural production discharge from the consented goat farming activity. **Reason for application – AUP trigger for consent** Rural production discharges that do not meet the permitted activity standards or controlled activity standards are a discretionary activity under Rule E35.4.1 (A14). Note: The application is also made on the basis that it demonstrates that the permitted standards are met as they apply to the application and discharge of fertiliser onto or into land under Rule 35.4.1 (A5)
Consent Decision Assessment The risks associated with the discharges generated by the goat farming activity can be appropriately managed through: • the maintenance of the capacity of the storage ponds for wastewater; • ensuring that irrigation avoids areas of risk; and • the maintenance of appropriate records of nitrogen loading. The assessment of standard conditions relating to monitoring and reporting on the activity in accordance with the Farm Management Plan and nutrient budget models are considered to be effective and appropriate management tools for an activity of this nature to ensure that any adverse effects are maintained as less than minor.

8.2.4 Nutrient Management Case Studies

A recent review of the AUP nutrient provisions (Xu 2019a) used case studies to evaluate whether:

- the water management objectives are being achieved effectively; and
- whether implementation of the AUP provisions meet the objectives of the National Policy Statement for Freshwater Management 2017.

While the report provides some evaluation of the AUP, the primary purpose was to provide evidence to recommend a future plan change to the AUP based on qualitatively assessing operational issues of implementing the AUP provisions. It provides a preliminary snapshot assessment to help set the direction and scope of more detailed, quantitative assessments, such as section 35 assessments (Xu 2019).

8.3 Findings and analysis

8.3.1 State of the Environment Reporting

The council's Lake Water Quality State and Trends in Tamaki Makaurau / Auckland 2010-2019, Technical Report 2021/04 (Groom 2021) identifies that there were no changes in dominant land cover between 1996 and 2018 within the catchments surrounding the four monitored lakes (Lake Pupuke, Wainamu, Tomarata and Rototoa) except for slight changes to the harvest forest composition in Lake Rototoa.

The table below shows that all four lakes were above the national bottom lines for total nitrogen, total phosphorus, ammonia (toxicity) and chlorophyll a as per the NPS-FM 2020 (Appendix 2A – Attributes requiring limits on resource use). The lakes fall predominately in the NPS-FM A band for ammonia toxicity, indicating a higher percentage of species protection, and mainly B or C for total nitrogen and phosphorus indicating elevated nutrients that can cause eutrophication and stimulate the growth of algae and plants in lakes. There were three lakes in the C band for chlorophyll a, suggesting ecological communities are moderately impacted by algal and plant growth, with subsequent reduced water clarity.

Table 8.2 NPS-FM NOF bands for lake water quality attributes (2015-2019) (Auckland Council 2021a, Groom 2021 Table 3-1).

	Total nitrogen	Total phosphorus	Ammonia (toxicity)	Chlorophyll a
Pupuke	B	A	A	C
Wainamu	B	C	A	C
Tomarata	C	B	A	C
Rototoa	B	A	B	B

Lakes Pupuke, Wainamu and Tomarata were in eutrophic state, where elevated nutrients result in changes to algal biomass, and were in a poor or non-vegetated ecological condition. Observed degrading trends over the 10 years in all four monitored lakes for total nitrogen, water clarity and sediment attributes suggest declines in lake health over time (Groom 2021).

The decline in lake health requires further assessment to understand what actions are necessary to improve water quality. Further and more frequent monitoring of the four lakes[200] is necessary to understand environmental natural variability and anthropogenic pressures such as changes in land cover. Monitoring results will assist in future analysis in the effectiveness and efficiency of rural production activities against actual water quality and the objectives and policies of the AUP.

8.3.2 Plans and Places resource consents database

The following is a summary of the resource consent data:

Applications for resource consent:

- Council has received four resource consent applications for rural production discharges activities to:
  - establish and operate a free-range poultry farm
  - discharge wastewater from a home kill butchery
  - discharge greenhouse nutrient solution from greenhouses
  - obtain a retrospective discharge consent for a goat farm

Activity status:

- The application to discharge greenhouse nutrient solution was considered as a controlled activity and the three remaining applications were assessed as discretionary activities.

AUP overlay:

- One application (the poultry farm) is sited within the High Use Stream Management Area.

The main sources of nutrient discharges are effluent discharges from dairy farming, fertiliser application and discharges from rural waste disposal such as discharges from poultry, piggery, vegetable wash or greenhouses. Most of these activities are presumed to fall within the permitted activity status as reflected in the low number (four) of resource consents recorded within the Plans and Places resource consents database. There is no record held on permitted activity discharges (with the exception of dairy effluent from farm dairies which are monitored annually).

Under the general standards for permitted activities there is a numeric limit for nitrogen land application on grazed land (150 or 200kg N/ha/year depending on soil type, and 30 or 50kg N/ha/31 days). Nitrogen land application onto other types of land shall "not exceed the reasonable nitrogen requirement of the crop" as follows:

[200] Previously the lakes were monitored quarterly, but now they are monitored every month which will provide better understanding of lake dynamics.

Rule E35.6.1.1 General Standard for all permitted activities

(3) *The application rate of nitrogen from any combination of dairy effluent (excluding urine from grazing animals), nitrogenous fertiliser and other nitrogen discharges from other rural production activities must not:*

(a) exceed 150kg nitrogen/hectare/year and 30kg nitrogen/hectare/31 days onto grazed pasture underlain by sandy and volcanic soil; or

(b) exceed 200kg nitrogen/hectare/year and 50kg nitrogen/hectare/31 days onto grazed pasture underlain by soils other than those listed above; or

(c) exceed the reasonable nitrogen requirements of the crop being grown on ground other than grazed pasture.

There is no industry standard on what is the "reasonable nitrogen requirements of the crop" as farmers implement best industry practice with respect to the assimilative capacity of the soil and its vegetative cover. The lack of a standard, and the permitted activity status, means that it is unclear how the council can assess accurately whether permitted activity Rule 5.6.1.1(c) is being complied with or whether the policy intent of policies E35.3(1) and (5) are being met.

Policy E35.3(1) and (5):

(1) Avoid more than minor adverse effects of discharges from rural production activities on water bodies, aquifers and artificial watercourses.

(5) Manage discharges from rural production activities to land that could run overland into water where:

(a) best industry practice will be used to avoid more than minor effects on land, water bodies and groundwater; and …

Because there is no industry standard available (nationally or internationally), growers at the hearings to the legacy Auckland Regional Plan: Air, Land and Water (2010) submitted that best practice is appropriate for regulating fertiliser application and use. This was accepted by hearing commissioners for the legacy plan and this approach was subsequently adopted by the Independent Hearings Panel of the AUP. The AUP references the fertiliser code of practice and industry guideline on vegetable crop nutrient management, however the council does not hold information on how many growers have adopted best practice and what the outcomes of best practice implementation are. The effectiveness and the efficiency of the AUP's nitrogen limits and the methods (best practice) in achieving the water quality objectives of both the regional plan and the regional policy statement cannot be measured given the lack of monitoring and the ability to assess nitrogen loadings. However, the continued use of best practice to manage fertiliser application and use requires further investigation as State of the Environment shallow groundwater monitoring show aquifers in Franklin (shallow volcanic aquifers) and Kumeu (shallow and deep sedimentary aquifers) are affected by rural activities such as fertiliser leaching (Foster and Johnson 2021).

8.3.3 Nutrient management monitoring data

Only consented discharge activities or permitted activity dairy effluent discharges require monitoring, and only four discharge consents have been issued within the period November 2016 to April 2021. There is no proactive monitoring on other rural discharge permitted activities such as fertiliser application, dry stock farming or arable farming. As mentioned above, the effects of nutrient discharges are not easily observed and there are very few nutrient pollution complaints.

Approximately 200 dairy farms are monitored annually to ensure that their effluent storage system meet permitted activity standards E35.6.1.2. Monitoring of dairy effluent discharge systems is undertaken by the council's compliance monitoring team using a simple yes/no checklist against a range of criteria including winter milking, system type, feedpad, leachate management system and freshwater farm plan. No further explanation is given on these criteria which makes it very difficult for the compliance team to effectively monitor compliance or remediate identified risks and problems. This is exacerbated by the fact that the compliance team are not trained in the assessment of rural land use issues, however, the team are in the process of developing training for officers on rural effluent discharges. While annual monitoring is undertaken, there is no environmental reporting on this issue. This is a lost opportunity to identify key trends and benchmark them against regional water quality objectives as dairy effluent discharge systems have been monitored since the late 1990s.

The AUP requires dairy activities to provide a copy of their nutrient budget during dairy compliance inspections (consented and permitted) but there is no requirement to provide actual fertiliser and effluent application records. The poor records and information held does not enable the council to assess whether the rules and methods in achieving the water quality objectives of both the regional plan and the regional policy statement are being met. A potential requirement for rural land users to demonstrate their compliance with permitted activity standards by providing actual operation record should be investigated further.

The introduction of the NES-F 2020 imposes a new requirement that dairy farm operators must report to the council on their synthetic nitrogen fertiliser usage, and limits the discharge of synthetic nitrogen fertiliser to land. The requirement to report on fertiliser use will assist the council in monitoring and managing nitrogen.

The Fertiliser Code of Practice requires that operators have a Nutrient Management Plan (NMP) but the AUP does not require fertiliser users to have an NMP (except for permitted activity dairy effluent operators, rule E35.6.1.2(6)). The AUP does not provide details on what a nutrient budget should cover but requires that it satisfy best practice. The lack of information requirements and compliance monitoring of operations further highlights barriers to effectively implementing the AUP. Central government's Essential Freshwater package, in particular the NES-F, provides an opportunity to introduce national best practice and consequently the reduction of effects from farming practices such as the overuse of fertiliser.

Auckland is one of the main regions in New Zealand which uses greenhouses for crop growing. In 2017 there were 140.1 ha of indoor crops in the region, 53 per cent of the total 264 ha in New Zealand (Xu 2019). Greenhouse nutrient waste solution disposal is a permitted activity under the AUP if the growing area is less than 1 ha (Rule E35.4.1). The threshold is risk based on growing area and the volume of waste generated. The appropriateness of this threshold should be reviewed as the volume of discharge is also related to crop type, irrigation water sources, and management technique (Xu 2019).

The council has limited information on greenhouse numbers, location, system types, discharge volume, and current practice on discharge management. As with the other nutrient discharge activities identified above, the lack of relevant information and monitoring does not enable the council to assess whether the permitted activity rule can reasonably be implemented. This issue merits further investigation and may include amending the permitted activity standards to require greenhouse operators to provide a nutrient management plan which could be monitored annually, like dairy farms.

8.3.4 Effectiveness and efficiency of the AUP

8.3.4.1 Policy direction

The default discretionary activity rule (Table E35.4.2) of rule E35.6.1.1 'general standards for all permitted activities' does not provide an upper limit on nitrate application from rural production land use. Nor is there any guidance as to an acceptable level of non-compliance in the policies. The policies in E35.3 do not specify an upper limit but rely on activities avoiding nutrient discharges into water bodies and for fertiliser application reference is made to the assimilative capacity of the soil and its vegetative cover. This means the processing planner in assessing a discretionary activity consent application must determine the maximum nitrate load to "avoid more than minor adverse effects of discharges from rural production activities on waterbodies, aquifers and artificial watercourses" (Policy 35.3(1)).

This creates an uncertainty and inconsistency as to what is an acceptable load, and it does not consider the cumulative effect of nitrate loads within a catchment. A recommendation is to further investigate the need to have clear and directive objectives and policies specific to nutrient water quality and catchment nutrient limits to ensure the environmental results (improved water quality) sought by the AUP can be implemented effectively. This approach may provide clearer guidance for any nutrient discharge resource consent application process.

However, this issue is now partially resolved as applications being processed now must have regard to the NPS-FM. The plan change to the AUP to implement the NPS-FM (due in late 2024) will introduce objectives and limits on nutrients on a catchment-wide basis.[201] The NPS-FM also confirms special provisions for areas of Pukekohe and Horowhenua to be exempt from nitrogen toxicity bottom lines for 10 years as they are critical vegetable growing areas.[202] When implementing the NPS-FM the council must have regard to the domestic supply of fresh vegetables; and the maintenance of food security for New Zealanders. The presence of the Pukekohe vegetable growing area will impact the process for identifying the target attribute state[203] of the FMU that the Pukekohe vegetable growing area falls under.

[201] the NPS-FM includes nitrate toxicity as an attribute for the compulsory ecosystem health value.
[202] NPS-FM clause 3.33 Specified vegetable growing areas and Appendix 5 – Specified vegetable growing areas
[203] The purpose of the target attribute state is to achieve the environmental outcome sought for each value of the FMU included as objectives in the regional plan and the relevant long-term vision included as objectives in the regional policy statement.

8.3.4.2 Compliance monitoring

Many nutrient discharge activities are permitted under the AUP and limited permitted activity compliance monitoring means the council does not know the scale of discharges (by site, and cumulatively). Given that most of the rural discharge activity is permitted, the effectiveness of the AUP regarding water quality cannot be fully understood. Improved compliance monitoring of permitted activities is recommended for the following reasons:

- enable the council to assess whether the permitted activity rules are being implemented effectively. As monitoring of permitted activities is resource intensive, an option may be to require nutrient discharge operators to provide information to the council demonstrating that they are complying (as a permitted activity standard) with permitted activities.
- enable the assessment of the cumulative effects of rural discharges on fresh and coastal water quality as this is informed by State of the Environment reporting and modelling results of the Freshwater Management Tool.

Any change to the AUP would require a plan change. Investigation into a specific plan change is not recommended at this time as the regional provisions will be amended by a proposed plan change to implement the National Policy Statement for Freshwater (scheduled to be notified in 2024). Furthermore, the introduction of the NES-F 2020 and the requirement for Freshwater Farm Plans will provide a further tool to obtain information and manage nutrient discharges.

8.3.4.3 Best management practice

The AUP does not provide guidance as to what best management practice is for all the types of rural production activities. The AUP only refers to best industry practices for the application of fertiliser and that the use of the Overseer model[204] is a best practice method to undertake a nutrient budget. Nationally Overseer is the most used model for calculating nutrient losses as it is used by farmers to improve nutrient losses on farms and used by councils to help inform regulation around water quality. The Ministry for Primary Industries is currently reviewing Overseer and exploring multiple options going forward. However, Government has decided to continue to support the use of Overseer in the meantime on the basis that it has become legally hard-wired into many operative regional plans (Parliamentary Commissioner for the Environment 2021).

The processing planner in assessing a discretionary activity consent application must consider what is appropriate best practice to "avoid more than minor adverse effects of discharges from rural production activities on waterbodies, aquifers and artificial watercourses" (Policy 35.3(1)). This creates uncertainty as to what is best practice and raises the question of the effectiveness

[204] The AUP references the Overseer model as a note that it would satisfy best practice in E35.6.1.2 Discharge of dairy effluent onto or into land.

of best practice from one farm in achieving the RPS objective of enhancing degraded freshwater systems and minimising the loss of freshwater systems (RPS Objective B7.3.1).

Notably the lack of best practice monitoring data means the council does not have detailed information on the number of:

- rural production activities undertaking best practice to manage the actual or potential adverse effects on the environment; or
- the number of growers that operate within identified environmental limits e.g., nutrient budgets – Nutrient Management Plans based on the Code of Practice for Nutrient Management

Insufficient data makes it difficult to assess whether the objectives and policies[205] in the regional plan are effective and efficient in giving effect to RPS Policy B7.4.2 (7), namely:

> *Manage the discharges of contaminants into water from subdivision, use and development to avoid where practicable, and otherwise minimise, all of the following:*
>
> *(a) significant bacterial contamination of freshwater and coastal water;*
>
> *(b) adverse effects on the quality of freshwater and coastal water;*
>
> *(c) adverse effects from contaminants, including nutrients generated on or applied to land, and the potential for these to enter freshwater and coastal water from both point and non-point sources; …*

8.4 Recommendations

The following actions are recommended[206] to ensure the AUP is effective in managing discharges from rural production activities. The recommendations are assigned into the categories outlined in section 1.6.

8.1 Consider including AUP rules that require rural land users to provide actual fertiliser and effluent application records; and demonstrate their compliance with permitted activity standards to apply fertiliser, effluent, or rural production waste (category: NPS-FM).

8.2 Consider including rules requiring a nutrient management plan in accordance with the Fertiliser Code of Practice when fertilisers are applied and, managing adverse effects from fertiliser use and application by developing systems and practices in freshwater farm plans to reduce their impact (category: NPS-FM).

8.3 Consider amending the AUP rules to require greenhouse operators discharging nutrients to provide a nutrient management plan which could be monitored annually similarly to dairy farmers (category: NPS-FM).

[205] AUP, Objective E35.2, Policies E35.3(1) to (5).
[206] These recommendations will need to be tested fully through an RMA section 32 assessment, be considered alongside other recommendations from other topics and the Plans & Places Department work programme.

8.4 Investigate how the objectives and policies specific to nutrient water quality can be made practicable, implementable, and enforceable to achieve improved water quality (category: further investigation).

8.5 Investigate the impact of cumulative effects of nutrient discharges on fresh and coastal water quality (category: further investigation).

8.6 Investigate whether formulating guidance on best management practice (for all rural production activities) is beneficial to achieving the outcomes sought by the AUP (category: further investigation).

8.5 Future change under the NPS-FM

The rural production discharge provisions of the AUP will need to be amended to meet the requirements of the NPS-FM as nitrate toxicity is an attribute for the compulsory ecosystem health value. The council will need to introduce new rules including limits or targets to meet the bottom lines. The Essential Freshwater package[207] including the Pukekohe specified vegetable growing area, the introduction of planning instruments in the NES-F and amendments to the RMA (e.g., the requirement for freshwater farm plans, limits, and reporting requirements to the council on synthetic nitrogen usage) will inform the content in the AUP.

[207] The Essential Freshwater package is a set of standards and regulations designed to achieve freshwater improvements for New Zealand's lakes, rivers, wetlands and other freshwater waterways within a generation. It is made up of several policy documents and regulations namely the NES-F, the Stock Exclusion Regulations 2020, the Measurement and Reporting of Water Takes Amendment Regulations 2020 and the NPS-FM 2020.

9 Discharges from boats

This chapter considers how effective and efficient the objectives, policies, rules and other methods of the AUP have been in meeting the outcomes intended by the Regional Policy Statement (RPS) with respect to managing the effects of discharges from boats.

Auckland has thousands of boats that are a potential source of direct discharges to coastal waters. It is estimated that 25% of Auckland households have a boat and that there are a total of around 132,000 boats in the region (Beca 2012). Most of these are small boats such as dinghies, canoes, small yachts, kayaks and windsurfers. There are approximately 11,000 cruising vessels (yachts and launches that might occupy a marina berth or mooring) and 38,000 trailer boats in the region. These larger boats can travel further from on-shore facilities and may result in discharges that affect water quality.

Discharges from boats can have significant localised effects and are a key concern in terms of amenity and cultural values.

The discharges from boats that are considered in this section relate to:

- Sewage – The Resource Management (Marine Pollution) Regulations 1998 ('Marine Pollution Regulations') set limits restricting where sewage from vessels can be discharged into the coastal marine area. Six additional estuaries, bays and harbours are identified in the AUP as locations where untreated sewage from vessels should not be discharged.
- Vessel maintenance and antifouling – Maintenance activities can discharge contaminants into coastal waters, particularly from antifouling paint. The AUP provides for most maintenance as a permitted activity with standards that must be met to minimise the discharge of contaminants.
- Litter – The discharge of garbage from boats is prohibited by regulation 13 of the Marine Pollution Regulations. The AUP requires that adequate and convenient facilities for the disposal of litter are provided in ports, marinas, ferry terminals and other marine facilities. Other methods undertaken by the council to contain waste from boats include the regular provision of litter barges at islands in the Hauraki Gulf.

Sewage discharges are a particular concern as the direct discharge of untreated human sewage from vessels can have localised adverse effects on the values and uses of coastal waters. Sewage discharge is culturally offensive to Māori, who value the coastal marine area as taonga, and who recognise that the degradation of water quality as a result of sewage discharge adversely affects the mauri or life force of the water. Furthermore, there is a wide range of potential adverse effects, including health risks from food gathering, swimming and aquaculture, as well as effects on amenity values. The AUP recognises that boats can be a problem in this regard, especially where they congregate in anchorage areas with poor tidal circulation and limited capacity to flush contaminants, and seeks to safeguard activities in coastal waters from the effects of untreated sewage discharge from vessels (Sea Change 2017: 306).

Marinas and mooring areas are a direct source of copper and other antifouling contaminants in the marine environment due to the nature of antifouling paints on vessel hulls and marina structures. In particular, copper is found in most antifouling paints in use in New Zealand.

Gadd and Cameron (2012) undertook a survey of eight marinas in Auckland and found that dissolved and total copper concentrations are elevated in marina waters compared to ambient concentrations in the Waitematā Harbour. They also estimated of the total export of copper from Auckland marinas due to vessel leaching as approximately 3100 kg/year, which is roughly double that predicted from stormwater for the entire Waitematā Harbour catchment (Gadd and Cameron 2012: 68).

There are several other potential discharges from boats that are not included in this report, including:

- Hull bio-fouling and marine pests – AUP chapter F2 includes objectives, policies and rules relating to the discharge of hull bio-fouling organisms resulting from cleaning of a boat, and the passive discharge of hull-biofouling organisms resulting from their presence on a boat. These provisions relate to marine biosecurity, rather than water quality, and will be addressed in future s35 reports relating to biodiversity and/or coastal use and development.
- Ballast water – The discharge of ballast water is managed by the Ministry for Primary Industries through the 'Import Health Standard: Ballast Water from All Countries'[208] and Maritime New Zealand through the Maritime Transport Act 1994 and Marine Protection Rules Part 300 – Ballast Water Management[209]. Under the RMA, the Marine Pollution Regulations make the discharge of ballast water a permitted activity (regulation 14). Regional coastal plans cannot contain rules (and consents cannot be granted) relating to a discharge of ballast water (regulation 16).
- Oil spills – The discharge of oil from boats is regulated through the Marine Pollution Regulations and managed by Maritime NZ through the New Zealand Marine Oil Spill Readiness and Response Strategy 2018-2022[210]. Auckland Council has a role in responding to oil spills, but that does not relate to any AUP provisions[211].
- Zinc anodes on boats – Ogilvie (2015) noted that zinc anodes could be a significant source of marine contamination in Auckland due to the high numbers of boats. Zinc anodes are designed to corrode preferentially to other metals, and therefore reduce corrosion of the structure being protected. The use of zinc anodes is not regulated by the RMA or the AUP and so is not included in this report.

9.1 Indicators and measures

The outcome sought by the RPS in relation to discharges from boats is that the adverse effects of discharges are minimised and that existing adverse effects are progressively reduced (objective B7.4.1(4)).

Policy B7.4.2(7) identifies that this includes adverse effects on mana whenua values.

[208] See https://www.mpi.govt.nz/import/border-clearance/ships-and-boats-border-clearance/ballast-water/
[209] See https://www.maritimenz.govt.nz/commercial/environment/operators/documents/Ballast-water-management-guidelines.pdf
[210] See https://www.maritimenz.govt.nz/public/environment/responding-to-spills/response-strategy.asp
[211] See https://at.govt.nz/boating-marine/marine-oil-spills/

Objective B7.4.1(4) The adverse effects of point and non-point discharges, in particular stormwater runoff and wastewater discharges, on coastal waters, freshwater and geothermal water are minimised and existing adverse effects are progressively reduced.

Policy B7.4.2(7) Manage the discharges of contaminants into water from subdivision, use and development to avoid where practicable, and otherwise minimise, all of the following:

(a) significant bacterial contamination of freshwater and coastal water;

(b) adverse effects on the quality of freshwater and coastal water; …

(d) adverse effects on Mana Whenua values associated with coastal water, freshwater and geothermal water, including wāhi tapu, wāhi taonga and mahinga kai; and …

The provisions of AUP chapter F set out the specific requirements relating to discharges from boats. The objectives relating to boat sewage discharges highlight that the restrictions relate to protecting the high recreation and amenity values of the inner Hauraki Gulf (F2.12.2(1) and (2)). Policy F2.12.3(1) requires the avoidance of the discharge of untreated sewage from vessels within areas that have been identified as inappropriate due to the proximity to shore, marine farms, marine reserves, or shallow water depth while providing for the health and safety of vessels and their occupants.

The sewage discharge policy is implemented through rules which set restrictions on where discharges are permitted or prohibited.

Similar requirements were identified in Sea Change – the Marine Spatial Plan for the Hauraki Gulf (Sea Change 2017: 153):

2. Address sewage discharge from recreational vessels

r) Work towards eliminating raw sewage discharges from recreational vessels in inshore areas by:

i. Avoiding the discharge of untreated sewage from vessels within areas that have been identified as inappropriate due to the proximity to shore, marine farms, marine reserves, or shallow water depth while providing for the health and safety of vessels and their occupants.

ii. Providing encouragement and assistance to boat owners to install appropriate equipment on board, acknowledging that not all vessels will have room for holding tanks.

iii. Requiring provision of sewage collection and disposal facilities for vessels at ports, marinas and other allied facilities, or at the time of significant upgrading of these facilities.

iv. Promoting the installation of public toilet facilities at high use boat ramps and boating destinations, at construction, or during significant upgrades of such facilities.

Other relevant AUP policies encourage works and initiatives that reduce the amount of litter entering coastal waters (policy F2.11.3(6)) or require ports, marinas and ferry terminals to have facilities for the containment, collection and appropriate disposal of sewage, bilge water and litter from vessels and residues from vessel servicing, construction, maintenance and repair (policy F2.11.3(9)[212], policy F2.11.3(10)(a) and (c), policy F2.12.3(2)).

The policies relating to works and facilities which help to reduce the amount of litter and other contaminants entering coastal waters are implemented as matters of consideration in consent processes for new or upgraded facilities at relevant ports, marinas and ferry terminals.

The outcomes sought in the AUP objectives and policies have been used to develop the indicators and measures shown in Table 9.1. Appendix C sets out the relationship between the AUP provisions and the indicators and measures.

Table 9.1: Indicators, measures and information sources used to measure the efficiency and effectiveness of the AUP with respect to discharges from boats.

Indicators	Measures	Information Sources
1. Untreated sewage is not being discharged from boats in areas that have been identified as inappropriate	Identification of actions taken to ensure that boat owners are aware of the boat sewage discharge restriction areas	Collation of work undertaken by the council
2. Consents for new developments (or upgrades of facilities) at ports, marinas and ferry terminals have provision for collection and disposal of: • sewage from vessels • litter • residues from vessel maintenance and repair	An assessment of whether consents have been granted with conditions that require facilities relating to vessel sewage collection, litter and vessel maintenance and repair.	Plans and Places resource consents database

Information sources: Sewage discharges from boats

It is not possible to monitor the number and location of sewage discharges from boats. The effectiveness of the restrictions on sewage discharges depends on boat owners knowing about the rules and then complying with them. There are no surveys of boat owners regarding how they dispose of sewage, so the best proxy measure available is to review the actions that have been taken to ensure that boat owners are aware of the restrictions.

The information gathering consisted of collating a record of the work undertaken by the council to improve awareness of the sewage discharge restrictions. As some of the actions relate to a website and app, it was possible to also identify how many times the website and app have been viewed or downloaded.

[212] There are also similar policies in the Chapter F sections relating to the Minor Port Zone, Ferry Terminal Zone and Marina Zone.

9.2 Findings and analysis

9.2.1 Indicator 1: Sewage discharges from boats

Sewage discharges from boats can have localised adverse effects on amenity values, recreational activities, cultural values, ecology, and marine farming. The effects of discharges from boats cause most concern during peak summer months and holiday periods, particularly in enclosed bays, harbours and popular anchorages. To avoid these effects, untreated sewage should be discharged away from the shore and sensitive activities, so that the discharge is dispersed and diluted. Boats need to have holding tanks that can be emptied at sea in appropriate locations or at pump-out facilities on-shore. Some boats also have treatment systems onboard.

When the AUP was developed, the council proposed a new requirement that discharges of untreated sewage from boats would need to be at least 2km from shore. Submitters questioned the workability of the 2km rule due to several issues, including that: it is difficult to identify instances of non-compliance; some boats cannot be retrofitted with holding tanks; it can be difficult to access pump-out facilities; there are safety issues with requiring vessels to move further offshore to discharge; and more onerous requirements may actually lead to less compliance if the control is too difficult to comply with (Sea Change 2017: 307). Through the hearing process the council changed its approach from a blanket distance increase offshore to identifying six particular harbours and bays where the other controls left small gaps where it was lawful to discharge and that could cause adverse effects. The Independent Hearings Panel supported the revised approach in its recommendations to the council.

To discharge untreated sewage, boats must be in water that is more than five metres deep and be more than:

- 500 metres from shore
- 500 metres from a marine farm
- 500 metres from a customary fishing reserve (Mataitai)
- 200 metres from a marine reserve.

They must also not be in six specified bays and harbours:

- Waitematā Harbour
- Mahurangi Harbour
- Bostaquet Bay Kawau Island
- Port Fitzroy Great Barrier Island
- Nagle Cove Great Barrier Island
- Tryphena Harbour Great Barrier Island[213]

Discharges that comply with the regulations are a permitted activity.

The area covered by the AUP boat sewage discharge restrictions is shown in Figure 9.1.

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[213] AUP rule F2.19.7(A58) and standard F2.21.8.2(6).

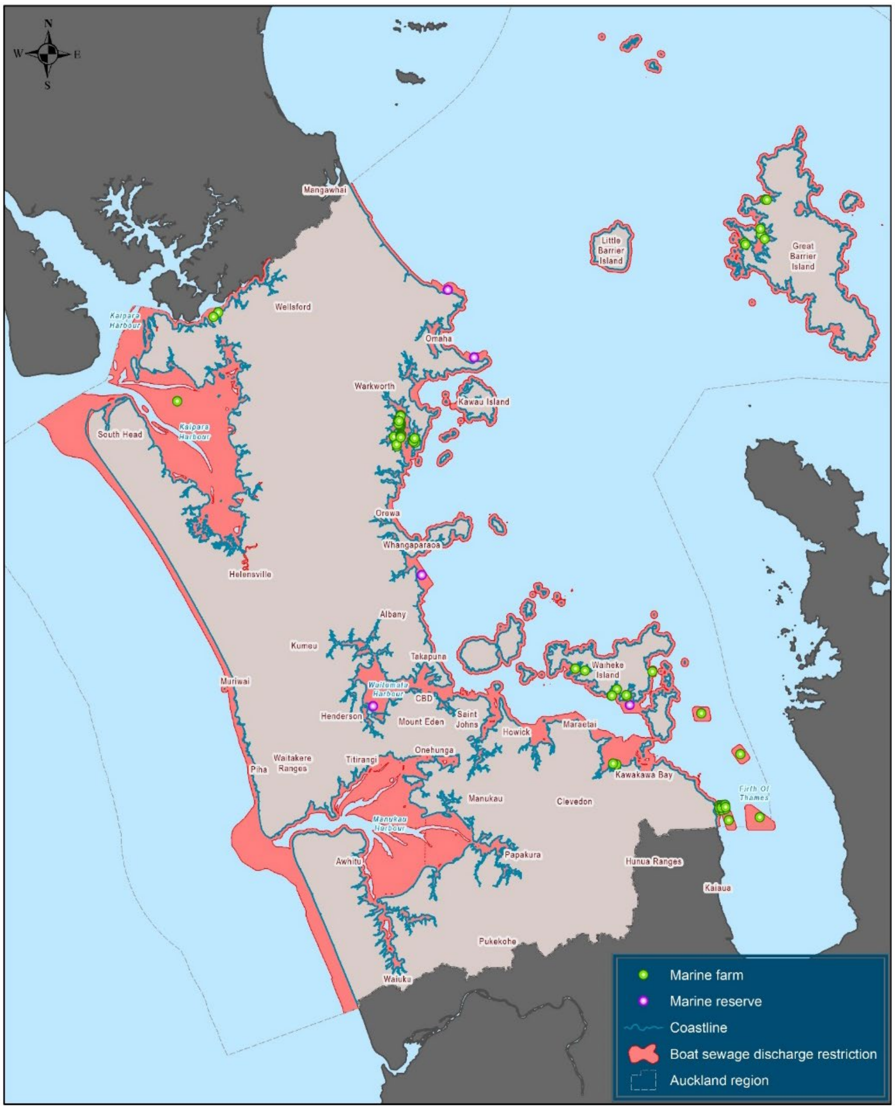

Figure 9.1 Boat sewage discharge restriction areas for the Auckland region.

The following actions have been undertaken by Auckland Council to improve awareness of the boat sewage discharge restrictions in the AUP:

- A new webpage was included on the council website in October 2020.[214] The webpage sets out the sewage discharge restrictions and has links to relevant advice on sewage system guides by the Ministry for the Environment and Maritime NZ.
- A leaflet was developed that explains the restrictions and includes the map in Figure 9.1.
- The leaflet can be downloaded from the website.
- Several hundred copies of the leaflet were distributed at boat shows and at boat ramps by the council's marine biosecurity team.

[214] https://www.aucklandcouncil.govt.nz/environment/looking-after-aucklands-water/looking-after-our-waterways/Pages/boat-sewage-discharges.aspx

- A phone app was developed with Northland Regional Council that works offline and allows people to identify whether they are within the restriction area.
- The leaflet and an explanation of phone app was emailed to 52 Auckland boat clubs and boating organisations in December 2020.
- The map layer showing the sewage restriction area was sent to Navionics (a Garmin brand) and they have incorporated it into their marine charts. This means that people using Navionics charts for navigation will see the restriction area[215]. (See Figure 9.2.)
- Information about the sewage discharge restrictions was included in the material for some Great Barrier Local Board environmental education programmes.

The boat sewage discharges webpage received 511 unique page views between October 2020 and September 2021. The page had about 40 views each month except in December 2020 when it had almost 200 views. This was when the email was sent to the boat clubs.

The Northland and Auckland boat discharge rules app was downloaded 124 times between October 2020 and September 2021.

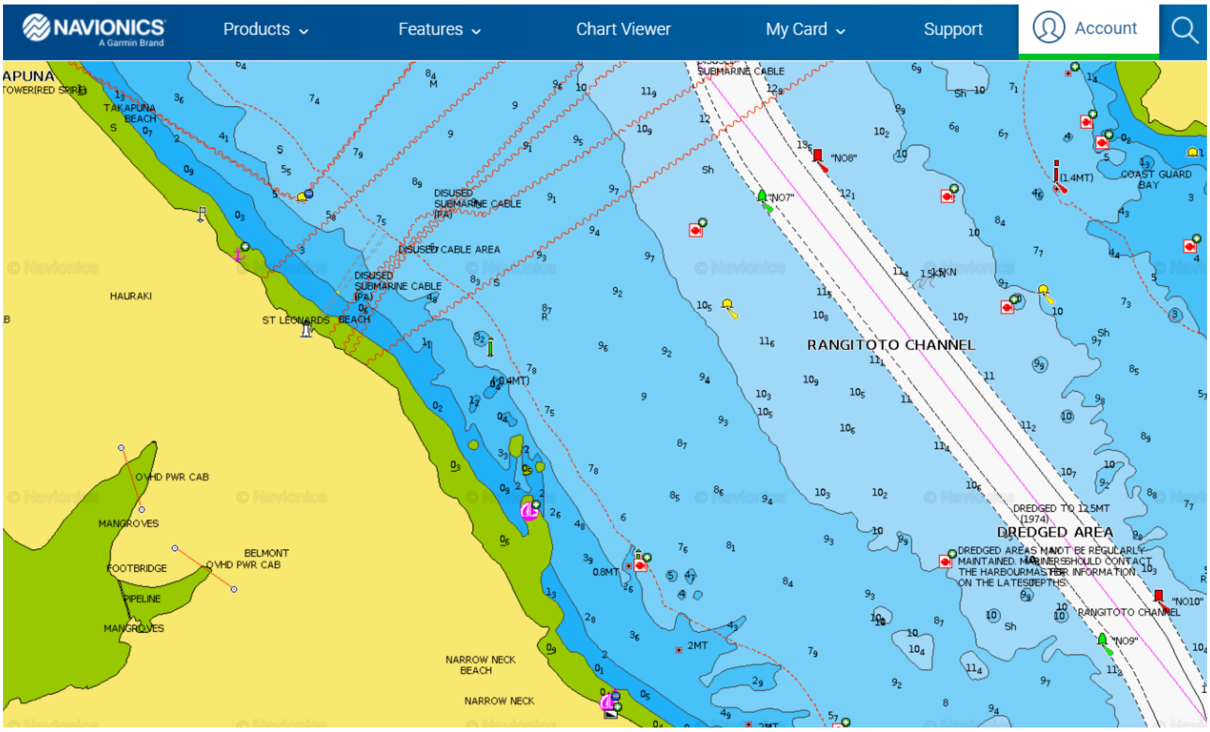

Figure 9.2 Navionics WebViewer chart showing the sewage discharge restriction as a dashed red line parallel to the coast. Clicking inside this line produces an information panel noting that there is a discharge restriction.

215 See the Navionics WebViewer: https://webapp.navionics.com/#boating@6&key=pijzEalpf%60%40

9.2.2 Indicator 2: Facilities for vessel sewage collection, litter, and vessel maintenance and repair

The Plans and Places resource consent database was used to identify consents for relevant works at ports, marinas and ferry terminals. The spreadsheets were filtered for consents in F3 Marina Zone, F5 Minor Ports Zone, F6 Ferry Terminals Zone and I202 Central Wharves Precinct. The consent for the only new marina consented since the AUP became operative (in the General Coastal Marine Zone) was also reviewed. The conditions for each consent were reviewed to determine whether they included conditions relating to facilities for boat sewage, litter and boat maintenance residues.

Marinas

A consent for a 186 berth marina and associated facilities at Kennedy Point, Waiheke Island, was granted by the Environment Court on 30 May 2018[216]. The consent conditions comprehensively cover the need for facilities relating to sewage collection, litter and vessel maintenance and repair.

The consent conditions require:

- A water and sediment quality monitoring programme that provides information in relation to accidental discharges of human sewage from boats and discharges of trace metals and co-biocides from antifouling paints on the hulls of vessels (conditions 39 to 45).
- A public facilities plan covering final design and maintenance of all proposed public facilities, including location and design of rubbish collection facilities (conditions 52 and 53).
- A marina management plan relating to the day to day operation of the marina that includes an oil spill contingency plan, the refuse, recycling and waste oil collection facilities to be provided for marina berth users (condition 97).
- Marina rules that include:
    - a rule restricting boat maintenance and repairs able to be undertaken in the marina
    - a rule which prohibits deliberate discharge of bilge water, fuel, sewage, waste oil and litter to marina waters
    - a rule which prohibits the cleaning of boat hulls within the marina
    - a rule requiring berth holders not to use antifouling products incorporating the co-biocide diuron[217]

[216] The consent was subsequently appealed but not on matters relating to this report. The appeal was declined.
[217] Since June 2017, it has not been lawful in New Zealand to import or manufacture antifouling paints containing diuron, octhilinone or ziram (https://www.epa.govt.nz/news-and-alerts/alerts/is-your-boat-paint-legal-to-import-and-manufacture/).

    - a rule requiring berth holders to use low impact antifouling products such as non-copper, low-copper formulation or low-copper release antifouling paint
    - provision of information and advice to berth holders regarding all NZEPA directions concerning antifouling paints on an ongoing basis
    - provision of information and advice to berth holders concerning the use and availability of best practice antifouling paints
    - mechanisms for the enforcement of the rules by the consent holder (condition 99).
- Provision of a sewage holding tank and related pump-out facility for use by berth holders and the general public (conditions 101 and 102).
- Provision of refuse recycling and waste oil collection facilities (condition 108).

It was noted in the Environment Court decision that conditions of consent were proposed innovatively to control the nature of antifouling paints and other contaminants in the marina[218]. The conditions aim to ensure that the new marina does not contribute to contaminated marine sediments in the way that other Auckland marinas currently have localised contamination around the marinas.

The risk of contamination from antifouling paints was also addressed in a consent for an extension to the Half Moon Bay Marina that was granted in January 2019. The extension provides for 90 additional berths and a waka berth. Similar to the Kennedy Pt consent, the Half Moon Bay consent requires a water and sediment quality monitoring programme and a set of marina rules that relate to the use of best practice with respect to antifouling by berth holders. It notes that alternative antifouling systems to antifouling paint include pen and brush facilities, freshwater or air bubble dosing, or hull 'wrap and remove' systems.

The marina extension proposal addressed sewage, litter and vessel maintenance through expansion of services and practices that operate in the existing marina. The new berths will be serviced by the existing portable sewage pump-out facility which can pump out a vessel’s holding tank at any berth in the marina. Rubbish collection facilities will be provided within the new car parking area.

Ports and ferry terminals

A consent was granted for a marine services berthing facility in the Gabador Place Minor Port Zone in the Tāmaki Estuary that includes construction of piled floating pontoon structures to provide berthage for 16 vessels and installation of a marine travel lift adjacent to the existing pier. The AEE included specific consideration of policy F5.3(7) requiring the provision of adequate and convenient facilities for the collection of rubbish from vessels, sewage from vessels, and the containment and disposal of residues from vessel maintenance. The AEE stated that no direct discharge of sewage or litter will be permitted by the operator. Users of the facility will have access to the existing office facilities associated with the existing dry stack operation. Any discharge associated with servicing and repair of vessels will comply with the AUP permitted activity standards.

[218] SKP Incorporated and Anor v Auckland Council [2018] NZEnvC 081, paragraph [134].

Consent applications and decisions for ferry terminal upgrades at Northcote Point and Kennedy Pt had no specific mention of the chapter F6 litter and sewage policy. These terminals do not have ferries staying for long periods where they could discharge from sewage holding tanks so adding sewage disposal facilities was not relevant to the upgrades being undertaken. Similarly, rubbish facilities for passengers leaving the ferries may have been improved as part of the renewal of the facilities but it is a relatively minor aspect of the upgrade works and probably did not require explicit evaluation in the consenting process.

Litter and sewage facilities were considered as part of the extensive work undertaken to upgrade the ferry facilities in the downtown ferry basin. The consents granted for the ferry terminal upgrade noted that there was provision for rubbish storage and a new stand-alone ferry wastewater handling and disposal system to service three of the six additional berths along Queens Wharf. The wastewater is discharged into a new holding tank which has sufficient capacity for emptying two ferry sullage tanks at a time when the tank is initially empty. The consent for the new public space between Princes Wharf and the Ferry Building noted that the proposal included rubbish bins as part of the public amenities along with planting, seating, signage and bike racks. There was no discussion of litter in these consent decisions, but convenient rubbish facilities could encourage people to dispose of rubbish on shore rather than from a ferry.

9.2.3 Effectiveness and efficiency of the AUP

9.2.3.1 Sewage discharges from boats

It is not possible to determine whether the AUP restrictions on discharges of sewage from boats are effective and efficient. There is no evidence-based means of determining whether people are complying with the restrictions or whether any other boat users or marine farms have been affected by discharges from vessels. In 2013 the council proposed making the rules significantly more restrictive but submissions from boating organisations identified that requiring smaller recreational boats to travel more than 2km from shore could be a health and safety risk, particularly in challenging weather, and that additional restrictions needed to be limited so they were simple for mariners to understand and recall (Willison 2015). Enforcement of the rules relies on self-regulation and so it is important that they are easy to understand and to comply with.

For the boat sewage rules to be effective, it is important that boat owners are aware of the rules. The work undertaken by the council to increase the visibility of the rules will have assisted with this to some degree. The level of interest was demonstrated by the increase in visits to the website after contacting boat clubs in December 2020. The level of users who have accessed the website and phone app are relatively low. However, the number of people reached directly through distribution of the leaflet at boat shows and boat ramps, and through the Navionics charts, is likely to be higher.

Awareness raising through these mechanisms should be continued. If possible, it would be useful to also undertake targeted research to understand whether boat owners know about the rules and why they do or do not comply. If levels of compliance are low, it may be necessary to introduce new requirements that boats have holding tanks or treatment systems, as has been done in the Northland Regional Coastal Plan[219]. Such a requirement would impose costs on boat owners and some boats may not be able to fit a holding tank. However, requiring boats to have a holding tank would increase the ability of boat owners to comply with the discharge rules as boats could hold sewage until they were in an appropriate location to discharge, and it could be enforced more effectively than the discharges rule. Compliance officers can check whether a boat has a holding tank whereas it is very difficult to police when and where boat discharges occur. Further work on the costs and benefits would be needed before introducing such a requirement. Debates on this issue have been on-going for many years. Any change is likely to require new evidence or a significant shift in political and community acceptance of imposing new costs on boat owners.

9.2.3.2 Facilities for vessel sewage collection, litter, and vessel maintenance and repair

The assessment of consents relating to marinas, ferry terminals and boating facilities indicates that vessel sewage, litter and residues from vessel maintenance are being considered comprehensively. The consent processes do not always explicitly reference the relevant AUP policies but there does not appear to be any need to introduce more restrictive requirements.

The innovative use of conditions relating to antifouling paints at Kennedy Pt marina was repeated for the Half Moon Bay marina even though it does not relate to any specific AUP provisions relating to antifouling. The plan could be amended to make this a clear requirement and ensure that similar provisions are used in any future marina developments.

One matter that this report does not address, is discharges from boat maintenance that is undertaken at hardstands, tidal grids and other locations along the coast. Discharges from boat cleaning (other than removal of hull biofouling) is generally a permitted activity (rule F2.19.7(A59))[220] with a standard requiring that contaminant materials or debris must be collected as far as practicable and removed from the coastal marine area (F2.21.8.3). No data is available that identifies where such work is occurring.

Awareness of the boat cleaning rule is being raised as part of the work undertaken by the council's marine biosecurity team with respect to hull biofouling and marine pests. That work includes investigations into where hull cleaning is being undertaken and how best practice can be promoted. The marine biosecurity work will be described more fully in a future s35 report relating to biodiversity and/or coastal use and development.

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[219] Under Northland rules, it is illegal to stay overnight on a boat within the marine pollution limits – even at anchor – without a proper way of treating or containing the boat's sewage. This means having (and providing proof if requested):
A well-maintained treatment system that complies with the Marine Pollution Regulations; or
A sewage holding tank, a portable toilet or a composting toilet; and
Regularly and legally pump out all the sewage from the boat's sewage holding tank or portable toilet at a sewage pump-out facility or navigated into waters seaward of the marine pollution limit. (Proposed Regional Plan for Northland (appeals version July 2021) rule C.1.2.2.

[220] Vessel cleaning in the Significant Ecological Area – Marine 1 Overlay and the Outstanding Natural Character Overlay is a non-complying activity and it is prohibited within 500m of mean high water springs at the conservation islands in the Hauraki Gulf (rule F2.19.7(A77).

9.3 Recommendations

The following actions are recommended[221] to ensure the AUP is effective in managing discharges from boats. The recommendations are assigned into the categories outlined in section 1.6.

9.1 Continue with actions that raise awareness of the sewage discharge restrictions and promote tools that make it easy for boat owners to know where the restrictions apply (category: process).

9.2 Investigate whether any surveys being undertaken by the council or other parties can include questions on the sewage discharge rules to track awareness over time (category: further investigation).

9.3 Undertake targeted research with boat owners to understand whether they are aware of the sewage discharge rules and whether they comply with them or not (category: further investigation).

9.4 When the regional coastal plan part of the AUP is next reviewed, consider including rules that require holding tanks or treatment systems on boats (category: AUP review).

9.5 When the AUP is next reviewed, consider including provisions relating to antifouling paints to ensure any future marinas have consent conditions similar to those at the Kennedy Pt and Half Moon Bay marina consents (category: AUP review).

9.4 Future change under the NPS-FM

The plan change to give effect to the NPS-FM will not include any changes to the AUP provisions relating to discharges from boats because the RMA freshwater planning process does not include amendments to regional coastal plan provisions (RMA s80A(8)).

[221] These recommendations will need to be tested fully through an RMA section 32 assessment, be considered alongside other recommendations from other topics and the Plans & Places Department work programme.

10 Land disturbance

This chapter considers how effective and efficient the objectives, policies, rules and other methods of the AUP have been in meeting the water quality outcomes intended by the Regional Policy Statement with respect to managing the effects of sediment from land disturbing activities. Other aspects of land disturbance e.g. landscape and amenity effects have not been assessed.

Auckland Council's technical guidance *Erosion and Sediment Control for Land Disturbing Activities in the Auckland Region (GD05)*[222] details the need to address sediment discharges from land disturbing activities as follows:

> *As Auckland continues to grow and develop, land continues to be stripped of vegetation and laid bare during construction of subdivisions, roads and other developments. Activities that expose bare earth can significantly increase the potential for the generation and discharge of elevated levels of sediment and other contaminants and consequently, have an adverse effect on the quality of water bodies and coastal waters.*
>
> *The majority of Auckland's surface geology comprises fine clays. Clay particles are easily mobilised during rain events and take much longer to settle out than coarser sand and silt material. Since clays are more difficult to retain within standard sediment control measures, erosion control plays a significant role in effective management of land disturbance within the Auckland context.*
>
> *The physical geography of the Auckland region is characterised by a network of relatively short, soft bottomed streams and rivers. The coast includes the sheltered, low-energy environments of the Waitematā, Manukau and Kaipara Harbours and the inner Hauraki Gulf. Their shallow estuarine embayments form depositional zones where fine sediment eroded from surrounding catchments settle. This makes the Auckland region particularly vulnerable to adverse impacts of erosion and sediment discharge.*
>
> *Where appropriate erosion and sediment controls are not implemented, there is potential for a range of adverse effects on the social, natural, environmental, cultural and economic wellbeing of the region.*

10.1 Indicators and measures

10.1.1 Outcomes sought by B7.3 and B7.4

The objectives and policies of the RPS (specifically B7.3 and B7.4) seek the following outcomes in relation to the management of sediment:

- Freshwater systems and coastal water degraded by sediment discharges (from anthropogenic sources) are progressively enhanced.
- Subdivision use and development minimises the loss of sediment and manages the discharge of sediment into freshwater and coastal water.

[222] Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region June 2016, Guideline Document 2016/05 (Incorporating Amendment 2)

- Soil conservation and measures to retain soil and sediment on land are promoted.
- Land disturbing activities use industry best practice and applicable standards.

10.1.2 Indicators, measures and information sources

In the absence of relevant indicators for objectives B7.3 and B7.4 in Chapter B11 of the RPS (Monitoring and environmental results anticipated), the following indicators and measures were developed to monitor progress towards meeting the outcomes of the RPS, specific to the management of sediment. The relationship between the AUP objectives and policies and the indicators developed for this report is detailed in Appendix C[223].

Table 10.1 Indicators, measures and information sources for land disturbance.

<table>
<tr><th>Indicators</th><th>Measures</th><th>Information Sources</th></tr>
<tr><td>1. Freshwater systems and coastal water degraded by sediment discharges (from anthropogenic sources) are progressively enhanced.</td><td>• The water quality measures detailed and assessed in Chapter 2.
• Changes in sediment discharge and deposition rates.</td><td>• State of the Environment Monitoring.
• Modelling – Freshwater Management Tool (FWMT)</td></tr>
<tr><td>2. Subdivision, use and development minimise the loss of sediment. [Note: this report does not assess subdivision.]</td><td rowspan="3">• The number of land disturbance consents granted and assessment of the conditions imposed in relation to policy outcomes.
• Assessment of compliance monitoring data.
• Assessment of permitted activity compliance monitoring data.
• Assessment of the use of non-regulatory initiatives to promote erosion and sediment control best practice.
• Review of the relevant provisions and identification of any implementation issues.</td><td rowspan="3">• Consent and permitted activity compliance data.
• Strategic Approach to Sediment data.
• Modelling – FWMT/ Watershed Story Map.
• Plans and Places resource consents database
• Discussions with council staff.
• Council reports[224].</td></tr>
<tr><td>3. Soil conservation management measures are being promoted and implemented.</td></tr>
<tr><td>4. Land disturbance activities use best practice appropriate to the activity and sensitivity of the receiving environment.</td></tr>
</table>

[223] Please note that this topic does not address the mana whenua aspects of the identified policies, as noted in section 1.7.1.1.1.
[224] s35 Plan Effectiveness and Efficiency Monitoring – Phase 1 Report (an unpublished draft report) Auckland Council (2019b); Sedimentation: A Comparison between Auckland's Legacy Provisions and Current Provisions under the Auckland Unitary Plan – Output 2.3 of the Strategic Approach to Sediment; and Xu, M. (2019) AUP Water Provisions Evaluation: Sediment Discharge and Faecal Contamination, 2019/005

10.2 Findings and analysis

10.2.1 State of the Environment Monitoring and Modelling

10.2.1.1 River Water Quality State and Trends in Tāmaki Makaurau/Auckland – State of the Environment Reporting – Technical Report 2021/07

River water quality is monitored monthly at 36 sites across the Region, with monitoring sites chosen to achieve regional representativeness in the data (based on dominant land cover). The 2021 report assessed trends across the 10-year period from January 2010 to December 2019, with suspended sediment (turbidity) one of the attributes measured.

Declining visual clarity[225] is identified as a key regional issue. Approximately one third of the streams monitored showed moderate to high impacts from suspended solids, at levels where sensitive native fish species may be lost (NPS-FM Bands C and D depicted in the figure below), with the majority of these streams showing degrading trends (i.e. increasing turbidity/ decreasing water clarity). One stream (Okura Creek – shown in red below) is below the national bottom line for suspended fine sediment, which is the minimum state that is required to be met.

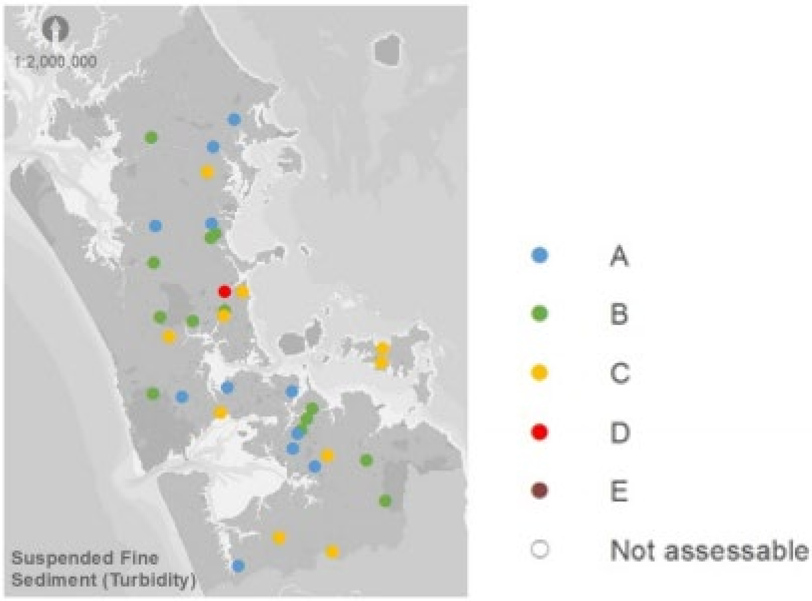

Figure 10.1 Summary of the current state depicting NPS-FM grading bands (A = minimal impact of suspended sediment, B = low to moderate impact, C = moderate to high impact and D = high

[225] See page 11 of River Water Quality State and Tends in Tāmaki Makaurau / Auckland – State of the Environment Reporting – Technical Report 2021/07 for a description of how the measures for turbidity have

impact of suspended sediment and below the national bottom line. E is not applicable to suspended sediment).

As noted in Section 2.3.1.3, coastal water quality State of the Environment monitoring[226] has determined that coastal water quality is mostly improving (including at over 50 per cent of sites monitoring for visual clarity (turbidity)), however ecological impacts from increased sedimentation have been detected in all harbours and estuaries.

10.2.1.2 Rural Catchment Sediment Yields from the Auckland Region. State of the Environment Reporting – Technical Report 2021/12

This report outlines the results of monitoring rural stream sediment yields derived from storm events at 10 river sites across the region, as part of the regional State of the Environment monitoring. The data is collected via permanent automatic samplers.

Consistent with other studies, the results show a wide annual variability in storm-derived sediment yield. High and low-yield years correlate reasonably well across the region, indicating that the same weather patterns generally affect the whole region. The report confirms the conclusion of other studies, that the large amount of interannual variability in sediment yields (due to the corresponding hydrological/rainfall variability) makes it difficult to attribute measured reductions in sediment yield to catchment management interventions. This large annual variability requires a long averaging window to detect even substantial changes in storm related sediment yield.

The two State of the Environment monitoring reports provide good baseline information on the current state of the region's rivers in relation to levels of suspended fine sediment derived from the cumulative activities occurring within specific river catchments or broad land-use types. However, the reports do not contain specific analysis which enables an accurate assessment of the effectiveness of the provisions of the AUP in achieving the outcomes sought in relation to the management of sediment generating activities.

10.2.1.3 Freshwater Management Tool Modelling

The Freshwater Management Tool (FWMT) is described as a freshwater accounting and decision-making tool for water quality, integrating all catchments from mountain to sea (rural and urban) throughout the Auckland Region[227]. The FWMT has modelled the current state baseline data (2013-2017) for water quality region-wide, at sub-catchment scale. Key findings of the current state modelling, including in relation to sediment, are detailed in the Water Quality chapter at 2.2.1.3. As noted in that section, the FWMT includes total suspended solids (TSS), but the results were not graded into attribute bands due to a lack of national guidance. However, the FWMT outputs for TSS show the variation in concentration and load between

[226] Coastal and Estuarine Water Quality State and Trends in Tāmaki Makaurau / Auckland 2010-2019. State of the Enviornment Reporting – Technical Report 2021/02

[227] Freshwater Management Tool: Report 3. Current State Assessment (Rivers): August 2021 (Auckland Council 2021b).

different freshwater receiving environments throughout the 2013-2017 baseline period. They also allow the source of sediment to be identified, linking over 100 activity types to their associated instream and at coast sediment footprint. This information will inform the implementation of the NPS-FM.

10.2.2 AUP provisions and resource consent analysis

The key provisions to manage the effects of sediment generating activities are contained in the following chapters of the AUP:

- E11 – Land disturbance – Regional
  Fulfils s30 RMA Regional Council functions and seeks to manage the effects of land disturbance, primarily on water quality and soil conservation, through regional land use controls (s9(2) RMA) and diversion and discharge (s14 and s15 RMA).
- E12 – Land disturbance – District
  Fulfils s31 RMA District Council functions and seeks to manage the actual and potential effects of the use, development and protection of land through district land use controls (s9(3) RMA) (e.g. effects on amenity values, vegetation, infrastructure, roading, land stability and natural hazards).
- E26 – Infrastructure
  Addresses the potential effects of earthworks associated with the construction or maintenance of infrastructure.

Other relevant provisions which indirectly address the effects of sediment, particularly through stream bank and bed erosion, are discussed in other sections of this report (e.g. works in watercourses and the management of impervious surfaces, stormwater and stream hydrology).

The following sub-sections detail the findings of an assessment of resource consent data (from consents granted since May 2016 through until May 2020 and recorded in the Plans and Places resource consents database) and discussions with internal regulatory and compliance staff and the conclusions of various Auckland Council reports[228].

10.2.2.1 E11 – Land Disturbance – Regional Plan provisions

Chapter E11 contains three objectives which seek to manage land disturbance to protect the safety of people, avoid remedy or mitigate adverse effects on the environment, minimise sediment generation and achieve soil conservation. The corresponding policies at E11.3 seek to minimise the potential effects of land disturbance to retain soil and sediment on land, through managing the operational aspects of earthworks (e.g. the amount of land disturbed at any one time and accidental discovery protocols etc), ensuring stability and safety and in consideration of the sensitivity of receiving environments. A specific policy also seeks to enable land

[228] Including: (1) s35 Plan Effectiveness and Efficiency Monitoring – Phase 1 Report (an unpublished draft report)
(2) Auckland Council (2019b) Sedimentation: A Comparison between Auckland's Legacy Provisions and Current Provisions under the Auckland Unitary Plan – Output 2.3 of the Strategic Approach to Sediment
(3) Xu, M. (2019) AUP Water Provisions Evaluation: Sediment Discharge and Faecal Contamination, 2019/005

disturbance necessary for a range of activities, in recognition that land disturbance is an essential prerequisite for the development of land.

Chapter E11 contains three separate activity tables:

- Activity Table E11.4.1 generally requires resource consents for large-scale land disturbance activities and uses area thresholds and whether the site is located within a Sediment Control Protection Area (SCPA), or on a slope greater than 10°, to determine activity status. Resource consent is required for areas greater than 2,500m² within a SCPA or on a slope of >10°, while in all other areas the permitted threshold is up to 10,000m². The same activity status applies across all zones, with the exception of the Special Purpose Quarry Zone and for ancillary forestry activities. The Sediment Control Protection Area is defined in the AUP as:

  100m either side of a foredune or 100m landward of the coastal marine area (whichever is the more landward of mean high water springs); or

  50m landward of the edge of a lake, river or stream, or the edge of wetland of 1,000m² or greater.

- Activity Table E11.4.2 identifies the diversion, damming and discharge of sediment laden water from activities ancillary to erosion and sediment control across all zones as a permitted activity, if from land disturbance activities compliant with permitted activity standards or a land use consent.

- Activity Table E11.4.3 sets out the rules for land disturbance in the Significant Ecological Area and Water Supply Management Area overlays, with resource consent triggers set at 5m² or 5m³ for the majority of activities (with exclusions).

There have been a total of 1004 resource consents granted for land disturbing activities under the Chapter E11 rules since the AUP became operative, with approximately two thirds being triggered by the rules in Activity Table E11.4.1.

The AUP seeks to manage land disturbance more rigorously within areas where the amount of sediment generated is likely to be greater (sloped land), or where the effect of sediment run-off is of greater risk to water quality (near receiving environments). The key rules in this regard are E11.4.1(A8), which addresses earthworks greater than 2,500m² on land with a slope greater than or equal to 10°; E11.4.1(A9), which addresses earthworks greater than 2,500m² within the SCPA and E11.4.3(A28); and E11.4.3(A30), which address activities greater than 5m² or 5m³ respectively, within the Significant Ecological Area and Water Supply Management Area Overlays. As a snapshot of activities consented under E11, the following tables summarise data for the consents granted under these rules.

Table 10.2 Consents granted under Rule E11.4.1(A8).

E11.4.1(A8) General earthworks greater than 2,500m² where the land has a slope equal to or greater than 10 degrees. **RD activity in all zones except Quarry**	
Total number	190 Based on the minimum area of land disturbance triggering the rule being 2,500m², 190 consents equate to a minimum of 48ha of potential land disturbance on sloping land. [Note: the rule is triggered if any part of the land disturbance is on land with a slope ≥10°, which may only be a portion of the land disturbance activity].
Zoning split	23% rural, 47% residential, 11% business 5% open space, 4% future urban and 10% other zones
Number sampled for analysis below	24

Table 10.3 Consents granted under E11.4.1(A9).

E11.4.1(A9) General earthworks greater than 2,500m² within the SCPA. **RD activity in all zones except Quarry**	
Total number	367 While noting that the rule is triggered if any part of the land disturbance is within the SCPA, based on the trigger of 2,500m² being the minimum area of land disturbance per consent, 367 consents equate to a minimum of 92ha of potential land disturbance within the SCPA approved under this rule. This indicates that there is a significant amount of land disturbance taking place within close proximity to freshwater and coastal receiving environments (i.e. within the SCPA).
Zoning split	23% rural, 37% residential, 17% business, 6% open space, 4% future urban and 13% other zones.
Number sampled for analysis below	24

The general standards, matters of discretion and assessment criteria associated with these rules comprehensively address water quality matters, including the potential adverse effects of land disturbance and sediment discharge on water bodies, particularly sensitive water bodies. The general standards state that best practice erosion and sediment control measures must be implemented for all activities, including permitted activities. Cumulative effects are not included as a matter of discretion, other than for land disturbance within the Significant Ecological Areas Overlay or Water Supply Management Areas Overlay. This is discussed further below in relation to effectiveness and efficiency.

A random sample of the above consents was assessed, with the assessment reports and/or decisions reports together with specialist advice (if available on the consent record) reviewed. The sample sizes (i.e. 24 consents under each rule) equates to a 95 per cent confidence interval and 20 per cent relative standard error. Applications are generally assessed by technical specialists within the council's Earth Streams and Trees Team (Resource Consents) however, their advice was not often available on the consent record.

The following observations were made from reviewing the sample of consents granted across both rules:

- Approximately two thirds of consents are part of a bundled consent application, with land disturbance only one aspect of the activity for which resource consent is required.
- The assessment of the consents detailed in the reports is generally focused on the operational aspects of the land disturbance and the adequacy of the erosion and sediment control measures proposed, with no assessment of the topography that triggered the rule (i.e. the slope) or the proximity to, or nature or sensitivity of, the receiving environment (for those consents within the SCPA).
- The consents assessed consistently imposed a full suite of conditions regarding erosion and sediment control, including requiring Erosion and Sediment Control Plans with measures consistent with GD05, chemical treatment plans[229], as-built certification, ongoing operation and maintenance plans and seasonal restrictions (winter works requirements).
- Two examples of conditions being imposed requiring Adaptive Management Plans were noted, which included comprehensive environmental monitoring requirements.
- The majority of the consents sampled also triggered the district land disturbance controls E12.4.1(A6) and either E12.4.1(A9) or E12.4.1(A10).

The location of land disturbance activities granted resource consent under E11.4.1(A8) and (A9) is mapped below.

[229] Chemical Treatment Plans are prepared when flocculants and coagulants are proposed to be used. Flocculants and coagulants can be added to sediment retention ponds etc to increase the rate of fine particle settlement, improving the efficiency.

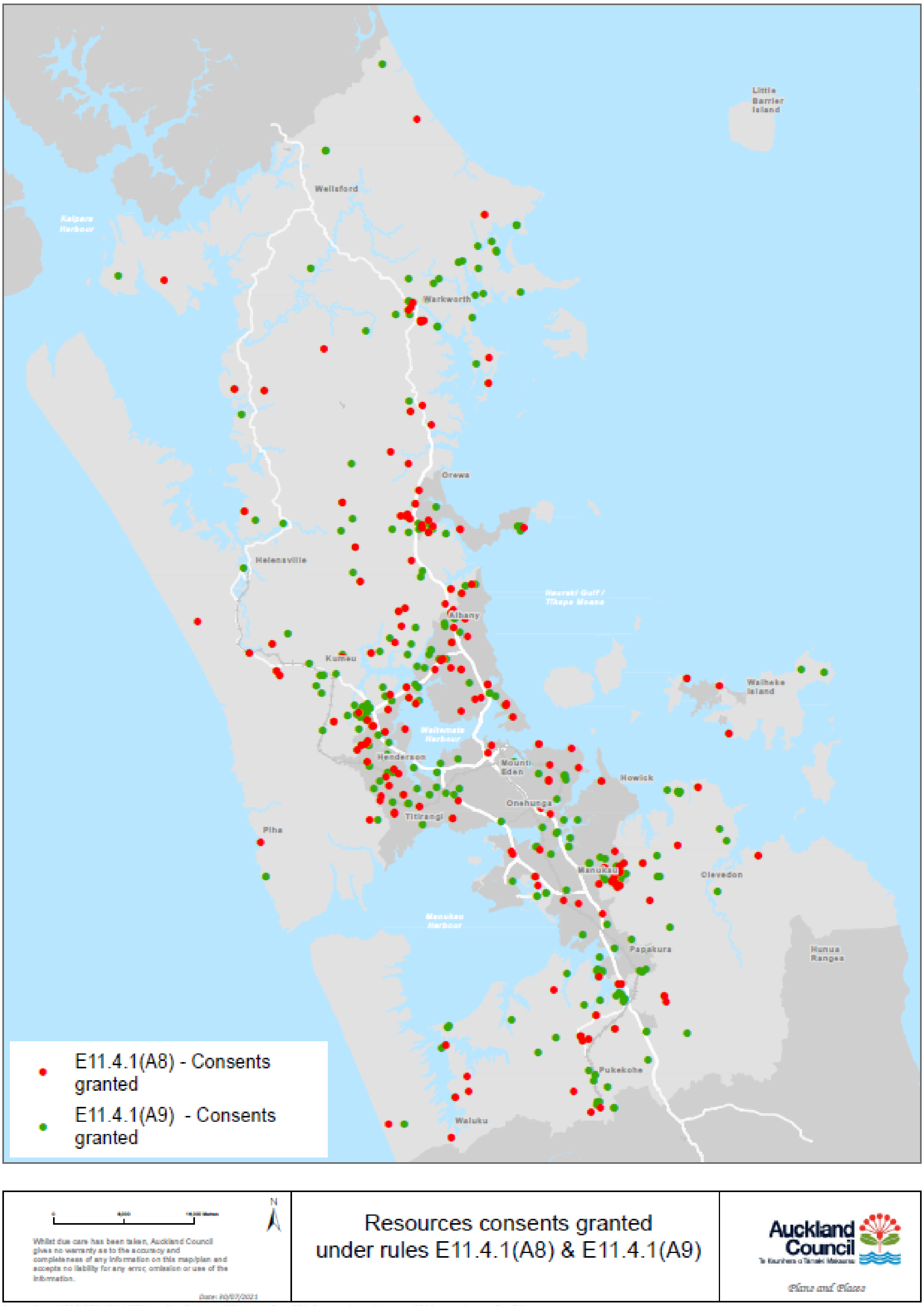

Figure 10.2 Consents granted under E11.4.1(A8) and E11.4.1(A9) across the Auckland region (for the period May 2016 – May 2020).

Table 10.4 Consents granted under Chapter E11 overlay rules.

Overlay Rule	Total Number
E11.4.3(A28) Land disturbance greater than 5m^2 within the Significant Ecological Areas and Water Supply Management Areas Overlays. RD in both overlays.	208 Based on the minimum of 5m^2, 208 consents equate to a minimum of 1040m^2 of land disturbance within the overlay areas.
E11.4.3(A30) Land disturbance greater than 5m^3 within the Significant Ecological Areas and Water Supply Management Areas Overlays. RD in both overlays.	199 Based on the minimum of 5m^3, 199 consents equate to a minimum of 995m^3 of land disturbance within the overlay areas.

The Significant Ecological Area Overlay identifies areas of indigenous vegetation or a habitat of indigenous fauna in both terrestrial and freshwater environments. Without looking at each individual consent, it is not possible to determine the number of land disturbance activities within areas that have been identified as Significant Ecological Areas due to, or including, freshwater values. The potential adverse effects of land disturbance on Significant Ecological Areas are also not limited to effects on water quality. Therefore, to avoid duplication, it is recommended that the assessment of the effectiveness and efficiency of using overlays as a planning management tool to address the potential effects of land disturbance, be assessed in the s35 report on biodiversity, which is scheduled to be prepared in 2022.

10.2.2.2 E12 – Land Disturbance – District Plan provisions

Chapter E12 contains Objective E12.2(1) which seeks that land disturbance is undertaken in a manner that protects the safety of people and avoids, remedies or mitigates adverse effects on the environment. The corresponding policies at E12.3 address: effects on natural and physical resources scheduled in the AUP (including Outstanding Natural Features); operational considerations including managing the amount of disturbance to address noise, vibration, odour, dust, lighting and traffic effects, accidental discovery protocol and cultural and spiritual values of mana whenua; recognition of environmental site constraints and opportunities and implementation of integrated water principles; and stability.

Chapter E12 has three activity tables:

- Activity Table E12.4.1 addresses land disturbance activities based on zoning, with area and volume thresholds determining the activity status (e.g. greater than 500m^2 or 250m^3).
- Activity Table E12.4.2 addresses land disturbance within the following overlay areas: Outstanding Natural Character Overlay, High Natural Character Overlay, Outstanding Natural Landscapes Overlay, Historic Heritage Overlay, and the Sites and Places of Significance to Mana Whenua Overlay. Area and volume thresholds of 5m^2 and 5m^3 determine activity status.

- **Activity Table E12.4.3** addresses land disturbance within the Outstanding Natural Features Overlay.

  The rules in Activity Tables E12.4.2 and E12.4.3 do not seek to address potential effects of land disturbance on water quality and are therefore not included in the analysis for this chapter.

There has been a total of 5,682 resource consents granted for land disturbing activities under the Chapter E12 rules since the AUP became operative, with approximately 95 per cent triggered under Activity Table E12.4.1.

The following table contains an overview of the key rules which trigger the requirement for a resource consent within Activity Table E12.4.1.

Table 10.5 Consents granted under the rules in Activity Table E12.4.1.

Rule	Total	Zoning Split	Area/Volume Calculation*
E12.4.1(A4) General earthworks greater than 500m^2 up to 1000m^2 RD in Residential Zones and Rural/Rural Conservation and Open Space – Conservation. PA in other zones:	1903	94% residential 6% other	Min 95ha – max 190ha
E12.4.1(A5) General earthworks greater than 1000m^2 up to 2500m^2 RD in Residential, Future Urban, Open Space and Rural Zones, PA in other zones.	938	68% residential 22% rural 2% open space 2% future urban	Min 94ha – max 234.5ha
E12.4.1(A6) General earthworks greater than 2500m^2 RD in all zones (except Quarry)	1047	44% residential 26% business 16% rural 3% open space 2% future urban	Min 267ha
E12.4.1(A8) General earthworks greater than 250m^3 up to 1000m^3 RD in Residential and Rural Zones PA in other zones.	1813	92% residential	Min 453,250m^3 – max 1,813,000m^3
E12.4.1(A9) Greater than 1000m^3 up to 2500m^3 RD in Residential, Future Urban, Open Space and Rural Zones, PA in other zones.	433	59% residential 28% rural 4% business 3% open space 2% future urban	Min 433,000m^3 – max 1,082,500m^3
E12.4.1(A10) General earthworks greater than 2500m^3 RD in all zones (except Quarry)	782	42% residential 18% rural 27% business 3% open space 3% future urban	Minimum 1,995,000m^3

**Calculation of the potential minimum and maximum area/volume of land disturbance generated by the number of consents granted under the rule multiplied by the minimum and maximum area /volume specified by the rule.*

The majority of land disturbance consented in accordance with the E12 rules occurs within residential zones. This is reflective of the permitted activity threshold for resource consent being lower (i.e. more restrictive) within the residential zone (and rural conservation and open space conservation zones). The following permitted activity thresholds apply in each zone.

Table 10.6 Permitted activity thresholds for land disturbance under E12

Zone	Threshold at which consent is required	Rules
Residential zones Rural conservation and open space – conservation zone	$500m^2$ and $250m^3$	E12.4.1(A4) and E12.4.1(A8)
Future urban zone and rural zones Open space zones	$1000m^2$ and $1000m^3$	E12.4.1(A5) and E12.4.1(A9)
Business zones and city centre zones All other zones and roads	$2500m^2$ and $2500m^3$	E12.4.1(A6) and E12.4.1(A10)

There is no maximum level of land disturbance beyond which an activity would be elevated to discretionary or non-complying, with the regional planning rules in Chapter E11 being triggered beyond $2500m^2$ within the SCPA or on sloped land, or from $10,000m^2$ for general land disturbance.

Applications are assessed by Development Engineers with Earthworks Technical Specialist advice generally not sought, which indicates more of an engineering stability and safety focus, rather than erosion and sediment control. Activity standards and assessment criteria do not address soil conservation or the effects of sedimentation on receiving environments and small-scale land disturbance activities, such as that approved under E12.4.1(A4), are generally considered low-risk for compliance monitoring. These matters are discussed further below in the assessment of the effectiveness and efficiency of the provisions.

Due to resourcing constraints, an assessment of a random sample of the consents granted was only undertaken for rule E12.4.1(A4) (the most frequently triggered rule) and rule E12.4.1(A5), with the recommendation reports and/or decision reports, together with specialist advice (if available on the consent record) reviewed. A sample of 25 consents granted under each rule was assessed, which equates to a 95 per cent confidence interval and 20 per cent relative standard error. The following observations were made:

- The majority of consents are part of a bundled consent application with land disturbance only one aspect of the proposed activity requiring resource consent and with multiple other AUP rules often triggered (e.g. subdivision, stormwater, zone rules).
- Earthworks plans, including the details of erosion and sediment measures proposed, are often included in the consent application documentation, particularly for those involving subdivision. The most common erosion and sediment control measure employed is silt fences, however additional measures are utilised commensurate with the scale of activity.

- A large number of consents included retaining walls. This was also noted in the analysis undertaken in preparation of the s35 plan effectiveness monitoring report: A Quality Built Environment. The implications of excessive retaining are discussed in that report.
- Conditions addressing erosion and sediment control were consistently imposed. The use of generic conditions was frequent, however additional conditions specifying the need for erosion and sediment control to be undertaken consistent with the application documentation or for finalised erosion and sediment control plans to be submitted, were often imposed.
- Conditions are inconsistent in explicitly requiring erosion and sediment control to be implemented in accordance with GD05, however where the generic sediment control conditions are imposed, advice notes are often included which recommend that the consent holder refer to GD05 in determining the erosion and sediment control to be implemented.
- Only one consent reviewed included a condition imposing seasonal restrictions (winter works).
- The assessment of an activity against the relevant assessment criteria and matters of discretion very rarely involves any consideration of erosion and sediment control or the nature of the receiving environment. The assessments are generally focussed on stability and the potential for adverse effects on neighbouring properties and/or amenity effects such as noise, dust and traffic management. Brief mention of the adequacy of the erosion and sediment control was however often noted in the assessment against the objectives and policies. Assessments against the provisions of the AUP (i.e. assessment criteria and objectives and policies) are not consistently or comprehensively included in the reports.
- Details of the aspects of the proposed activity that have been assessed as permitted activities is sometimes included in the report, however, the permitted activity standards of Chapter E11 (which include requirements for erosion and sediment control) were not noted to have been included in any such assessment.
- Where an activity required consents in addition to land use consent for land disturbance e.g. discharge consent and subdivision consent, conditions addressing erosion and sediment control were imposed by (or noted in advice notes) each of the consents and at times were inconsistent across the documents. This could lead to difficulties in interpreting the requirements and issues with compliance.
- Many land disturbance activities trigger both the area and volume thresholds and therefore more than one E12 rule.

The location of activities granted resource consent under E12 are mapped below.

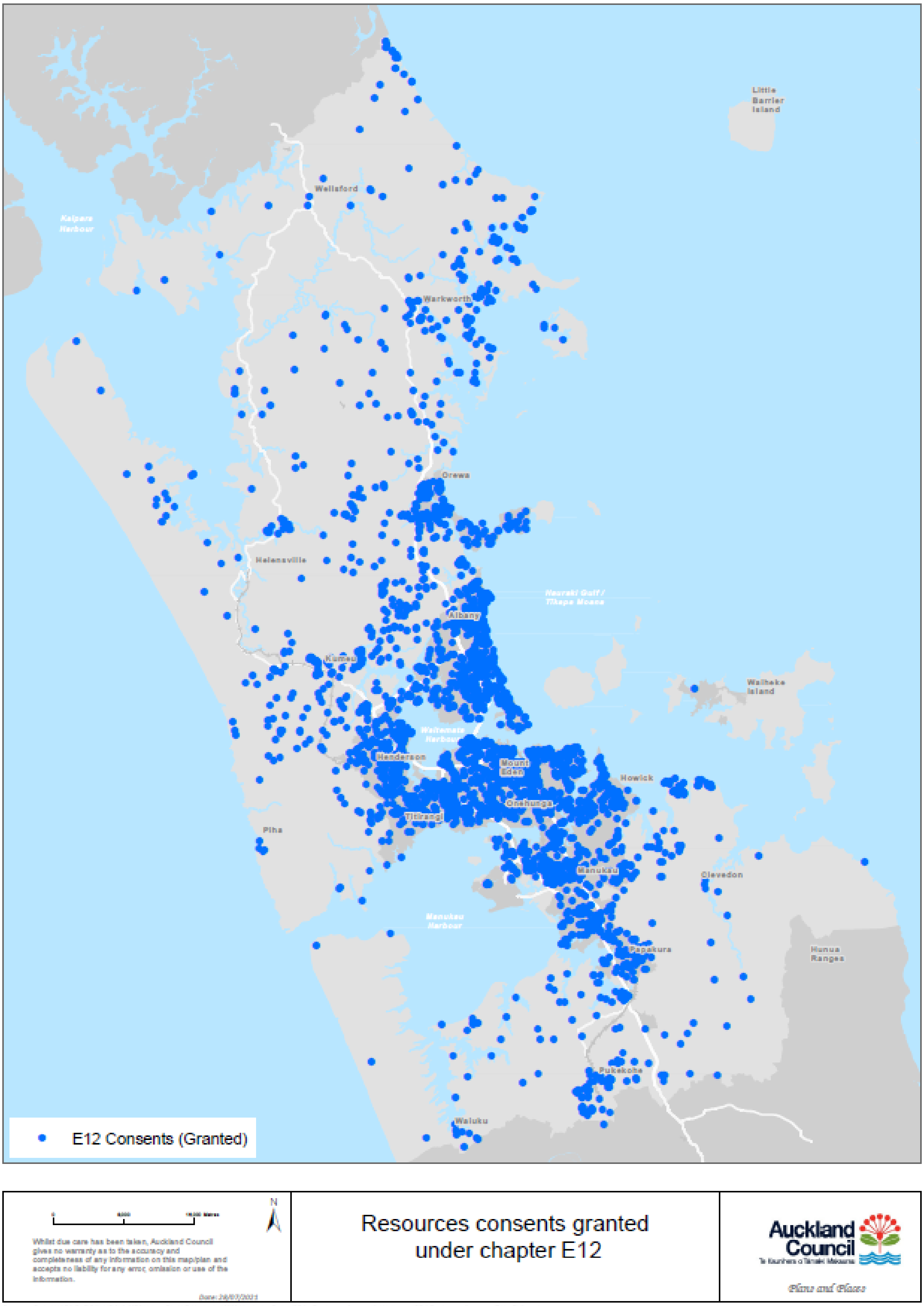

Figure 10.3 Consents granted under the rules in Activity Table 12.4.1.

10.2.2.3 Ancillary Farming and Forestry Earthworks

Ancillary farming earthworks are defined in the AUP[230] as:

> *Disturbance of soil, earth or substrate land surfaces ancillary to farming. Includes:*
>
> - *land preparation and cultivation (including establishment of sediment and erosion control measures), for planting and growing operations and harvesting of agricultural and horticultural crops (farming);*
> - *burying of material infected by unwanted organisms as declared by Ministry for Primary Industries Chief Technical Officer or an emergency declared by the Minister under the Biosecurity Act 1993;*
> - *irrigation and land drainage; and*
> - *maintenance and construction of facilities, devices and structures typically associated with farming activities including but not limited to farm tracks, driveways and unsealed parking areas, stock races, silage pits, farm drains, farm effluent ponds, and feeding lots, fencing, crop protection and sediment control measures.*

Ancillary forestry earthworks are defined in the AUP as:

> *Disturbance of soil, earth or substrate land surfaces ancillary to forestry. Includes:*
>
> - *land preparation for the establishment, planting and growing operations, and harvesting of forestry including establishment of erosion and sediment control measures; and*
> - *construction and maintenance of infrastructure and facilities typically associated with forestry including but not limited to tracks, roads and landings, and related erosion and sediment control measures.*

Ancillary farming earthworks are provided for as a permitted activity in all zones within the activity tables of both Chapter E11 and Chapter E12. Ancillary forestry earthworks are provided for as a permitted activity within the activity tables of both Chapter E11 and Chapter E12, except for within the Rural – Rural Conservation Zone and Open Space – Conservation Zone, where they are classed as a discretionary activity in accordance with rule E11.4.1(A12). Within the Significant Ecological Area and Water Supply Management Area Overlay, permitted activity status for ancillary earthworks for both farming and forestry is limited to earthworks for the maintenance of tracks (farming) or maintenance (forestry). The permitted activity standards of Chapter E11 for ancillary earthworks (both farming and forestry), include (among other matters):

- requiring the avoidance of adverse effects on receiving waters (e.g. no conspicuous change in visual clarity).
- that best practice erosion and sediment control measures be implemented, which is specified for cultivation as requiring compliance with the Horticulture New Zealand publication 'Erosion and Sediment Control Guidelines for Vegetable Production' and for

[230] Chapter J1 - Definitions

other ancillary farming earthworks, compliance with GD05 (or TP90), with no specific technical guidelines specified for forestry.
- where cultivation occurs up-slope of an adjoining river, lake, stream or the coastal marine area, a specified minimum separation distance (2m, 5m or 10m) must be maintained in a vegetated state.

The effectiveness of the ancillary farming and forestry earthworks provisions was assessed through the s35 Phase One[231], which found that the earthworks associated with agriculture and horticulture are generally undertaken as a permitted activity. There is therefore a reliance on the permitted activity standards to manage discharges and ensure that the objectives for freshwater and marine receiving environments are met. Some concerns were raised over the effectiveness of relying on industry best practice, particularly where they vary from the council's guidance document, for example, the horticulture industry guideline for sediment detention pond capacity is a quarter of the capacity recommended in the GD05 guideline. It was noted that the horticulture industry also certifies growers who practice sustainable farming practices that protect soil and water under the NZ Good Agriculture Practice (GAP) system and this system has been endorsed by Environment Canterbury.

Since the AUP became operative, no consents have been granted under the Chapter E11 or Chapter E12 rules for earthworks ancillary to farming or forestry.

The Resource Management (National Environmental Standards for Plantation Forestry) Regulations 2017 (NES PF) provide nationally consistent regulations to manage the environmental effects of plantation forestry and came in to effect in May 2018. The NES-PF regulations were developed in conjunction with the forestry industry and provide a rule framework for eight core plantation forestry activities, including: afforestation, pruning and thinning-to-waste, earthworks, river crossings, forestry quarrying, harvesting, mechanical land preparation and replanting. Some ancillary activities such as slash traps and vegetation clearance are also addressed by the regulations.

Like the AUP, the NES-PF is largely a permitted activity regime and as national standards, the provisions generally supersede those of the AUP for comparable activities (with some exceptions e.g. Significant Ecological Area provisions). The standards contain comprehensive performance standards addressing earthworks and the management of erosion and sediment. Auckland Council regularly receives notification of earthworks and other forestry activities being undertaken in accordance with the permitted activity standards of the NES-PF (e.g. 50 earthworks notifications were received in 2018/19 and 41 in 2020/21) and maintains oversight by requesting to view the required earthworks management plan (if not provided with the notification) and undertaking site audits. Incidences of non-compliance at a level requiring enforcement proceedings have been low across all activities (e.g. earthworks, harvesting, river crossings), with 4 incidences in 2018/19 and 3 in 2020/21.

Concerns have recently been raised by the Regulatory Compliance Team that the definition of ancillary farming earthworks and the associated permitted activity standards are enabling large amounts of imported fill to be used for earthworks and land contouring activities, essentially establishing clean fill operations as ancillary farming earthworks. Such activity was

231 s35 Plan Effectiveness and Efficiency Monitoring Phase 1 Report (Plans and Places internal draft, unpublished)

not envisaged and is not the intent of providing for earthworks ancillary to farming in the AUP provisions and could result in significant adverse environmental effects, including on water quality. Amendments to the provisions to strengthen the definition and activity standards have been identified as being required to address the issue, and this work is currently progressing.

10.2.2.4 Chapter E26 Infrastructure

Chapter E26 provides for land disturbance associated with infrastructure development for network utilities (including road network utilities) and electricity generation. Applicable rules are determined by area and volume thresholds, with the permitted activity thresholds higher (i.e. more enabling) than those in Chapters E11 and E12. The chapter includes both regional plan and district plan provisions denoted as [rp] and [dp] respectively. The chapter links back to the objectives and policies contained in Chapters E11 and E12.

The land disturbance provisions of Chapter E26 are more enabling in recognition of the strategic importance of infrastructure. The rule thresholds relate to the area or volume of work being undertaken at any one time at a location, which is a different approach to the E11 and E12 provisions, which apply to the cumulative total area or volume of land disturbance works. This approach in E26 provides for staging, where progressive closure and stabilisation of works can be adopted to maintain the land disturbance activity below the threshold requiring a resource consent.

Earthworks for infrastructure maintenance, repair, renewal, minor infrastructure upgrading, and service connections is provided for as a permitted activity (subject to compliance with the standards), including within the Sediment Control Protection Area and on areas of land with a slope greater than 10 degrees. For other land disturbance related to infrastructure, the activity thresholds are consistent with the E11 thresholds, however they are more lenient than E12 with thresholds set at 2,500m^2 and 2,500m^3 (as opposed to 500m^2 or 1000m^2 and 250m^3 and 1000m^3 depending on zoning). The permitted activity standards and assessment criteria for infrastructure related land disturbance are consistent with those contained within E11 and E12. Many network utility operators have designations over their land and therefore district land use consent (E12) is not required for land disturbance that is consistent with the purpose of the designation and outline plan of works.

The following table details the number of consents which have been granted for land disturbance activities associated with infrastructure. Due to resourcing constraints, a sample of these consents was not assessed.

Table 10.7 Consents for land disturbance granted under the E26 infrastructure rules

E26 Activity Table	Total
E26.5.3.1 – District Plan	55
E26.5.3.2 – Regional Plan (10 consents were granted for land disturbance greater than 2500m2 and 25 for land disturbance greater than 2500m3 within the Sediment Control Protection Area.	38

10.2.3 Compliance monitoring information

Discussions were had with senior regulatory staff responsible for compliance monitoring of land disturbance consents (granted under Chapters E11 and E12), both for this assessment and during the preparation of other Auckland Council reports[232]. Auckland is under unprecedented pressure to provide for a significant level of new housing and infrastructure and keeping pace with consenting and monitoring of activities is a challenge for the council. Larger scale land disturbance activities are monitored to a higher degree than smaller site developments.

Resource consents issued under Chapter E11 are generally referred to specialist Earthworks Monitoring Officers for compliance monitoring. Activities will be flagged as high risk if near a stream, while low risk activities are not actively monitored. Chapter E11 consents generally have the full suite of conditions applied, including erosion and sediment control plans which require additional approval from the council prior to works on-site commencing and Adaptive Management Plans may be adopted to enable a process whereby erosion and sediment control practices can be modified as works progress (i.e. adapted to achieve the best environmental outcomes).

Compliance monitoring officers consider that imposing seasonal restrictions to limit or further control earthworks during winter months, when higher amounts of rainfall on saturated ground can lead to greater amounts of sediment runoff entering waterways, is a very effective tool however, it is not consistently imposed. Conditions regarding seasonal limitations are generally only applied to larger sites with high risk for environmental effects and either state that no works can be undertaken on site between 1 May and 30 September of any year, or provide for limited winter works through the following condition (or similar):

> *No earthworks on the subject site may be undertaken between 01 May and 30 September in any year, without the submission of a 'request for winter works' for approval to Council. All requests must be renewed annually prior to the approval expiring and no works must occur until written approval has been received from Council. All winter works will be re-assessed monthly or as required to ensure that adverse effects are not occurring in the receiving environment and approval may be revoked by Council upon written notice to the consent holder.*

Approval for winter works triggers additional, more frequent compliance monitoring visits (e.g. fortnightly). As a snap-shot, 962 approvals for winter works were granted in 2020 (11 requests were declined), with 29 infringing to some extent and requiring enforcement action of either a warning letter, abatement notice or fine.

Large-scale activities are generally subject to appropriate compliance monitoring. The cumulative effects of sediment discharge from small sites (both permitted and consented) however, is significant and historically such activity has received little active compliance monitoring, largely due to resourcing capacity. A relatively new targeted initiative to directly address this issue, the "Closing the Gap Project", is discussed below.

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[232] Relevant work includes:
(1) s35 Plan Effectiveness and Efficiency Monitoring – Phase 1 Report (an unpublished draft report)
(2) Auckland Council (2019b) Sedimentation: A Comparison between Auckland's Legacy Provisions and Current Provisions under the Auckland Unitary Plan – Output 2.3 of the Strategic Approach to Sediment
(3) Xu, M. (2019) AUP Water Provisions Evaluation: Sediment Discharge and Faecal Contamination, 2019/005

10.2.4 The Strategic Approach to Sediment initiative and the management of small sites

In response to concerns raised by local boards, the Manukau Harbour Forum and the public, the Strategic Approach to Sediment was initiated in late 2018[233]. The initiative is led by the Natural Environment Strategy Team (NES) and seeks to work collaboratively across Auckland Council to address the issues associated with erosion and sediment management through six work areas:

- Better information – identifying gaps in research and evidence and the co-ordination of existing information, data and research.
- Strategy and policy – identifying where we can improve the management of sediment in regional strategies, the AUP and policies across the council group and with industry partners and how council can influence Central Government.
- Interventions – examining what interventions are currently working and investigating how key learning can support improved compliance.
- Monitoring and evaluation – defining what we need to monitor and how that can be used to evaluate how well policies and interventions are working.
- Coordinating and building capacity – identifying what skills and resources the council group needs to make informed decisions to implement the strategic approach.
- Communications and engagement – establishing how we engage the council group, mana whenua, industry partners and other stakeholders in helping to make the strategy a success.

The first phase of the initiative identified that addressing the sedimentation effects of small-scale earthworks was a significant gap. Over 13,500 building consents are granted annually for small-scale residential development that is most often below the 500m^2 permitted activity threshold in Chapter E12 (for residential zones). Together with small-scale land disturbance activity granted under E12, this accounts for approximately two-thirds of land disturbance throughout the Region.

Proactive monitoring is required to address this significant potential for sediment and as such, the Targeted Initiatives Team launched the “Closing the Gap Project”, which aims to address the gap between the start of earthworks on site and the first scheduled visit by a building inspector. The project initially involved two full-time dedicated compliance officers (supported by one part-time administrator) undertaking compliance visits to small residential building sites to assess the levels of erosion and sediment control.

During the initial four-month trial period in 2019, significant non-compliance was observed, with 90 per cent of sites lacking the required erosion and sediment control. Through proactive compliance monitoring, non-compliance has now been reduced to 51 per cent (2021) and the

[233] Auckland Council Environment and Community Committee Meeting Minutes – Resolution Number ENV/2018/169.

project has secured funding (through the Water Quality Targeted Rate) for the next three years, with four dedicated compliance officers and additional administrative support. In addition, 120 building inspectors have received additional training and are also able to report on compliance with erosion and sediment control measures as part of their routine inspections.

Compliance officers operate on a zero-tolerance basis for infringements on site and are able to issue infringement notices and fines on the spot. In the year July 2020 – June 2021, 5,929 inspections were conducted, and 2,024 abatement notices issued (there could be multiple notices per site). Behaviour change within the industry is required to drive further improvements and council staff regularly run field days and industry training events. In addition to the guidance in GD05, there is also a booklet targeted at small sites on the Auckland Design Manual website which includes links to YouTube how-to videos. http://www.aucklanddesignmanual.co.nz/regulations/technical-guidance

Another initiative of the Strategic Approach to Sediment is the Kia Marama Project, which is a project aimed at using permanent monitoring sensors to collect real-time sediment monitoring data within a developing sub-catchment. Sensors have currently been placed on one trial site. The project has the potential to enable cost-effective, proactive compliance monitoring and rapid responses to discharge incidents and failures in erosion and sediment control measures.

10.2.5 Effectiveness and efficiency of the AUP

The management of land disturbance activities through the regulatory process of resource consenting, the associated compliance monitoring, together with non-regulatory initiatives such as permitted activity compliance monitoring, industry training and best practice guidance, all inform the assessment of the AUP provisions against the indicators stated in section 10.1.2.

10.2.5.1 Indicator 1 – Levels of sediment

Indicator 1 relates to the outcome sought in the RPS objectives and policies that waterbodies that are degraded by sediment are progressively enhanced. As discussed above in relation to the results of State of the Environment monitoring and water quality modelling, it is currently not possible to correlate between the provisions of the AUP and any changes in sediment rates (as determined by monitoring and modelling), particularly as the provisions have only been operative for five years and there can be considerable time lags between the adoption of management practices and the detection of improvement or degradation in water quality. As noted in the water quality section however, increased sedimentation continues to have ecological impacts in all harbours and estuaries. It is well established that water quality is intrinsically related to how the land is used and where land use change occurs (Ingley, R 2021b). It is the sediment from anthropogenic land use and land use change that the land disturbance provisions of the AUP seek to minimise.

The effectiveness of the provisions at achieving that purpose have previously been assessed through a number of internal reports[234] and together with this assessment, it has been

[234] Relevant work includes:

concluded that the land disturbance provisions of the AUP could be more effective and efficient in achieving the water quality outcomes sought by the RPS. The key issues with the land disturbance provisions that have been identified are outlined below.

10.2.5.2 Indicators 2, 3 and 4 – Management of the effects of land disturbance

Indicators 2, 3 and 4 address the outcomes sought in the RPS objectives and policies in relation to the management of the potential adverse effects of land disturbance i.e. that the loss of sediment be minimised, soil conservation management measures be implemented and that best practice appropriate to the activity and sensitivity of the environment be adopted.

10.2.5.2.1 Chapter E11 – Regional Plan provisions

The assessment of resource consent data above indicates that, reflecting the outcomes sought in the objectives and policies, a comprehensive suite of conditions is generally imposed on consents processed under E11, including (but not limited to) conditions requiring:

- erosion and sediment control plans;
- that erosion and sediment control be constructed and maintained in accordance with best practice (GD05 – Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region);
- chemical treatment plans;
- as built certification for erosion and sediment control; and
- restrictions on works within the winter months.

The Sediment Control Protection Area (SCPA) is a defined area adjacent to waterbodies which acts as a trigger for resource consent for specified areas and volumes of land disturbance. It is not mapped and instead is defined in the AUP as:

> *100m either side of a foredune or 100m landward of the coastal marine area (whichever is the more landward of mean high water springs); or*
> *50m landward of the edge of a lake, river or stream, or the edge of a wetland of 1,000m^2 or greater*

The number of consents being granted within the SCPA indicates that there is a significant amount of land disturbance occurring in close proximity to watercourses and/or the coastal marine area throughout the region. The SCPA has potential as a tool to address the increased risk of sediment discharges to receiving environments from land disturbance in close proximity, however with it only applying to large areas of land disturbance activity (i.e. greater than 2500m^2 or 2500m^3) and not having any additional assessment criteria, matters of discretion or any clear direction set out in the policies, it is currently only effective as a threshold trigger for consenting. There is potential to extend the application of the SCPA to smaller-scale land disturbance activities and to include additional guidance for assessing

(1) s35 Plan Effectiveness and Efficiency Monitoring – Phase 1 Report (an unpublished draft report)
(2) Auckland Council (2019b) Sedimentation: A Comparison between Auckland's Legacy Provisions and Current Provisions under the Auckland Unitary Plan – Output 2.3 of the Strategic Approach to Sediment
(3) Xu, M. (2019) AUP Water Provisions Evaluation: Sediment Discharge and Faecal Contamination, 2019/005

activities within the SCPA and managing potential effects (including cumulative effects) on water quality and receiving environments, including specific policy direction and assessment criteria.

There is heavy reliance on compliance with the permitted activity standards for land disturbance below the thresholds of Chapter E11.

10.2.5.2.2 Chapter E12 – District Plan provisions

Despite the provisions of Chapter E12 lacking any clear guidance on the need for erosion and sediment control, with the focused being on the other potential effects of land disturbance (e.g. instability, noise, dust and heavy vehicle movements), consents granted under the E12 rules do appear to consistently contain conditions addressing erosion and sediment control. The conditions imposed however, are inconsistent with some requiring erosion and sediment control to be in accordance with best practice guidance (i.e. GD05[235]), while others only reference the document in an advice note or not at all. A generic condition is often imposed, which states that earthworks must be managed to minimise the discharge of sediment-laden water beyond the site, with no details as to the appropriate erosion and sediment control measures to be implemented specified. The generic condition may be appropriate for some low-risk situations however, it would be more robust if a requirement for consistency with GD05 was incorporated.

The best practice guideline, GD05, is applicable to all scales of development, from small sites (e.g. single house construction) to major developments, including both permitted activities and those requiring resource consents. It promotes an integrated approach to erosion and sediment control based on fundamental principles, including minimising the amount of land disturbance from the outset and includes a wealth of guidance for those undertaking land disturbance activities.

The granting of consents under E12, without requiring erosion and sediment control in accordance with best practice, could compromise the achievement of the water quality objectives of the AUP. Sediment is a significant stormwater contaminant and the vast majority of E12 consents are granted in urban areas, which drain to the public stormwater network.

Applicants for activities that trigger Chapter E12 rules often state within their applications that they will implement erosion and sediment control in accordance with GD05 and it is therefore inadvertently imposed through the general condition of requiring development to be undertaken in accordance with the application and plans submitted. This is positive and indicates a level of industry awareness. However, relying on proactive applicants is not adequate to address such a significant issue and the erosion and sediment control requirements should be clearly detailed within Chapter E12. The actual design and suitability of the erosion and sediment control proposed is not assessed through the consenting process, with compliance with the condition relied upon.

The proposed AUP included all of the land disturbance rules within one chapter. The chapter was eventually split into Chapter E11 and Chapter E12 through the Independent Hearings Panel (IHP) process and this inadvertently resulted in the provisions regarding the minimisation of sediment and the management of the adverse effects of sediment, including consideration of the receiving environment, only being included in Chapter E11, the regional plan provisions.

[235] Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region June 2016, Guideline Document 2016/05 (Incorporating Amendment 2, 2018)

The split in the provisions is also reflected within Auckland Council's structure and approach to processing land disturbance consents. Chapter E11 consents are assessed by Earthworks Technical Specialists (Resource Consents), while the Chapter E12 consents are generally assessed by Development Engineers (Regulatory Engineering). Compliance monitoring of Chapter E12 consents is also less frequent than consents under Chapter E11, despite the potential level of sedimentation from small site development being cumulatively significant.

With the purpose of fulfilling Auckland Council's district planning responsibilities, Chapter E12 is predominantly focused on addressing the potential effects that land disturbance may have on people and engineering matters (e.g. stability, noise, dust, vibration, impeding public access, impacts on infrastructure etc) and greater direction regarding potential environmental effects, including sedimentation is required. While a significant focus, the benefits of erosion and sediment control are not limited to preventing sediment entering waterways, with effective erosion and sediment control also preventing adverse effects on neighbouring properties and public infrastructure, such as footpaths, roads and raingardens, and adverse effects on the operation of the stormwater network (including flooding). Erosion and sediment control, in accordance with best practice, should be required for all land disturbance activities at a level commensurate to the scale of the activity and the degree of risk to receiving environments, regardless of the activity triggering a regional plan or district plan rule.

Comments received from those implementing the provisions (through this process and as detailed in the other council reports noted in Table 10.1), indicates that Development Engineers and processing planners feel constrained when assessing applications, with their discretion limited to the maters contained in the assessment criteria and matters of discretion, which do not include erosion and sediment control or consideration of the effects of sediment on receiving environments and limits their ability to impose comprehensive conditions.

All of the legacy district plans (except the Auckland City Council District Plan – Central Area which did not contain relevant land disturbance provisions) required the implementation of erosion and sediment control measures in the activity standards and the design and suitability of erosion and sediment control measures as matters of discretion for land disturbance activities[236]. As the permitted activity standards in Chapter E11 apply to land disturbance activities of less than 10,000m^2, they technically do also apply to smaller-scale land disturbance activities which may be assessed under E12, however, this is not clear and not widely understood by all administrators, or the public end users, of the AUP.

The general activity standards in E12.6.2(1) set small permitted activity thresholds of 5m^2 and 5m^3 for works within the Riparian Yard and Coastal Protection Yard. There is, however, no guidance in the standards which indicate the intent of the restriction or give any direction and it is understood through discussion with regulatory staff, that the limits are not interpreted or implemented as a means of addressing sediment runoff in close proximity to watercourses, but rather intended to address effects on vegetation, stability (stream bank/coastal cliffs) and other matters such as potential effects on overland flow paths or flood exacerbation.

[236]Auckland Council (2019b) Sedimentation: A Comparison between Auckland's Legacy Provisions and Current Provisions under the Auckland Unitary Plan – Output 2.3 of the Strategic Approach to Sediment.

A Land Disturbance Guidance and Practice note[237] has been developed to assist with the interpretation and implementation of the provisions. This document is very helpful, however, as discussed below, amendment to the provisions themselves is recommended.

10.2.5.2.3 Management of cumulative effects

Earthworks Technical Specialists (Resource Consents) have raised concerns regarding the assessment and management of cumulative effects, particularly on a catchment basis and in relation to the assimilative capacity and sensitivity of, receiving environments. In the absence of an evidence base against which to accurately assess the cumulative effects of sediment, it is extremely difficult to manage the potential for cumulative effects through the consenting of individual activities. There is also heavy reliance on compliance with GD05 as achieving best practice, however even residual sediment discharged from erosion and sediment control constructed and maintained in accordance with GD05 can have adverse effects in some sensitive receiving environments. Greater emphasis needs to be placed on preventing erosion from the outset, through minimising the required land disturbance and staging works.

The cumulative effect of sedimentation is included as an additional matter of discretion specific to the assessment of restricted discretionary land disturbance activities within the Significant Ecological Area Overlay and Water Supply Management Overlay in E11.8.1. The consideration of cumulative effects is, however, not just relevant for the overlay areas and should be applicable to the assessment of all consents and reflect that cumulative effects are often experienced outside of the immediate area (e.g. not only in the overlay areas), downstream in receiving environments.

As detailed above, the cumulative effects of sediment discharges from small sites contributes significantly to the levels of sediment discharged regionally, yet these small sites, as managed under the provisions of Chapter E12, are generally considered low risk and are not subject to regular compliance monitoring. There is little to no guidance in the provisions of Chapter E12 in relation to the assessment of cumulative effects.

Additional information regarding receiving environments that are sensitive to the effects of sediment is required to assist in the assessment of land disturbance activities, particularly potential cumulative effects. The Freshwater Management Tool will likely be invaluable in identifying such areas on either a catchment or sub-catchment basis and this information could be used to set limits for land disturbance within catchments/sub-catchments. This potential is discussed further below in relation to implications for NPS-FM processes.

10.2.5.2.4 Seasonal restrictions

The longer an earthworks site is exposed, the greater the chance it will be subject to rainfall. In Auckland, working from May to September presents a higher likelihood of experiencing more frequent rainfall and less opportunity for ground surfaces to dry between rainfall events, which in turn, increases the total amount of runoff that occurs in any given event[238]. Seasonal restrictions imposed as a condition of consent, leading to additional considerations within erosion and sediment control plans and additional scheduled compliance inspections, was identified by specialist Earthworks Monitoring Officers as an effective way to manage land

[237] Auckland Unitary Plan Practice and Guidance Note – Land Disturbance: July 2020
[238] Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region June 2016, Guideline Document 2016/005 (Incorporating Amendment 2)

disturbance during the winter months. Currently there is no guidance in the provisions of either Chapter E11 or Chapter E12 regarding seasonal restrictions.

10.2.5.2.5 Importance of other methods

As highlighted by the initial level of non-compliance discovered through the Closing the Gap project discussed above, there is heavy reliance on compliance monitoring and a need for industry behavioural change to manage the sedimentation effects of small site development. While reductions in the permitted activity threshold could bring a greater number of activities within the consenting regime and therefore increased monitoring oversight, this would have resourcing implications for the council and industry buy-in and behavioural change is likely to achieve greater results than regulatory mechanisms alone.

As a targeted initiative, the Closing the Gap project is vulnerable to funding fluctuations and changing priorities. Key lessons garnered through the project need to be adopted as business as usual (e.g. training building inspectors to assess erosion and sediment control) and amendments to regulatory mechanisms pursued where necessary (e.g. amendments to the permitted activity standards in E12 to strengthen requirements for erosion and sediment control).

Unlike the legacy document, Auckland Regional Plan – Sediment Control, the AUP does not identify any specific 'other methods' through which the effects of sediment will be addressed to achieve of the water quality outcomes sought and instead includes a generic section within Chapter B1 of the RPS. This section could be strengthened to specifically identify the other methods and council-wide initiatives being employed to address the adverse effects of sediment (e.g. other non-statutory documents, advocacy and education, monitoring and research, review of best practice etc) which may assist in ensuring they remain a priority for the council, including for funding.

10.2.5.2.6 Other matters not covered by this section

It has been recognised that the land disturbance provisions of the AUP are not adequately addressing the following matters, which are not assessed in this section:

- Sedimentation caused by stream bank/bed erosion - This issue is assessed in the section on streams and wetlands in Chapter 4.
- Soil Conservation - It has previously been identified that while the AUP includes objectives in relation to soil conservation, complementary provisions such as standards and rules are absent, with the focus in relation to sediment being on water quality (i.e. the effects of sediment discharge), rather than retention of soil (minimising land disturbance). This matter was assessed in the Phase 1 Report and the report: Auckland Unitary Plan Water Provisions Evaluation: Sediment Discharge and Faecal Contamination.
- Landscape - It has been identified that the land disturbance provisions of the AUP do not address the potential landscape effects of land disturbance activities and in some cases, this is resulting in unmitigated landscape modification and degradation. As landscape effects are generally not a water quality issue, this matter has not been addressed in this report.

- Mana Whenua Values - Assessment of the protection of mana whenua values across the provisions of the AUP form part of future monitoring work.

10.3 Recommendations

To address the issues identified above, it is recommended that:[239]

10.1 To address the discrepancies between the two chapters, particularly the weaknesses identified in Chapter E12, that either the two chapters:

- be combined to address all land disturbance activities currently split between E11 and E12 within the one chapter, with the regional and district functions identified through separate activity tables; or
- remain split, but that comprehensive policies, activity standards, assessment criteria and matters of discretion in relation to managing the potential effects of sedimentation (including requiring best practice erosion and sediment control), be added to Chapter E12 so that each of the two chapters can be read as stand-alone chapters. (category: NPS-FM related)

10.2 The threshold between the district and regional land disturbance rules be reviewed to ensure it is set at the appropriate level to enable comprehensive management of the potential effects of sedimentation on water quality. (category: further investigation)

10.3 That the application of the Sediment Control Protection Area be reviewed, including the scale of land disturbance activities to which it applies, development of comprehensive activity standards (e.g. addressing the fundamental principles of erosion and sediment control, including minimising disturbance and staging, as detailed in GD05) and to provide greater direction to regulatory staff assessing applications for land disturbance in close proximity to receiving environments (e.g. policies and assessment criteria). (category: NPS-FM related)

10.4 Erosion and sediment control, implemented in accordance with best practice, be requirement for all land disturbance. GD05 has been specifically prepared in consideration of the geology, topography and receiving environments of the Auckland region, includes measures appropriate for every scale of development and is updated as required. (category: NPS-FM related)

10.5 Additional guidance be included within the assessment criteria and matters of discretion (of both chapters), to further direct imposing seasonal restrictions (winter works) on consented activities. Currently the matters of discretion for restricted discretionary consents E11.8.1(1)I include “timing and duration of works”. This could be expanded on. (category: NPS-FM related)

10.6 Guidance be developed (and direction incorporated in the plan provisions) in relation to:

- the assessment and management of cumulative effects. (category: NPS-FM related)

[239] These recommendations will need to be tested fully through an RMA section 32 assessment, be considered alongside other recommendations from other topics and the Plans & Places Department work programme.

- managing land disturbance in response to the effects of climate change, particularly the increased frequency and intensity of storm events. This could potentially be addressed though GD05. (category: further investigation)

10.7 Non-regulatory initiatives, such as the Closing the Gap Project, be identified in the AUP as valuable 'other methods' for managing sediment. (category: NPS-FM related)

10.8 Compliance monitoring be adequately resourced and prioritised, particularly for high-risk activities, but also reflective of the potentially significant cumulative effects of sediment from small-site land disturbance, including permitted activities. (category: process)

10.9 Amendments to the AUP provisions be progressed to address the concerns raised in relation to ancillary farming earthworks and cleanfill. (category: further investigation)

10.10 The appropriateness of relying on industry guidance over GD05 for horticulture activities be reviewed. (category: NPSFM)

10.11 The effectiveness of using overlays (e.g. the Significant Ecological Area Overlay) to manage the effects of land disturbance be assessed through the s35 biodiversity work. (category: further investigation)

10.12 An assessment of the management of the potential adverse effects of land disturbance on landscape (including the approach to retaining walls and bulk earthworks) be undertaken. (category: further investigation)

10.4 Future change under the NPS-FM

Auckland Council is required to make changes to the AUP provisions to give effect to the National Policy Statement for Freshwater Management 2020 (NPS-FM). These changes must be publicly notified by December 2024.

Amongst other things, the NPS-FM requires the council to improve degraded waterbodies and maintain or improve all other waterbodies so that they achieve national bottom lines, including relevant measures for sediment. This is a challenging requirement given that 30 per cent of the streams currently monitored are degraded by adverse levels of sediment. The council is engaging with mana whenua and will consult with the wider community to determine the targets and environmental outcomes sought in relation to sediment.

The current land disturbance provisions of the AUP are not adequate to give effect to the NPS-FM and achievement of the requirements set out in the NPS-FM will likely require tighter controls (including limits) on sediment generating activities in some catchments or sub-catchments; greater emphasis on integrated management and the management of cumulative effects; and additional approaches such as action plans detailing regulatory and non-regulatory mechanisms to address sediment. A move away from setting permitted activity thresholds for land disturbance based on zoning (i.e. the approach of E12) may also be required, with the nature of, and proximity to, receiving environments playing a greater role in determining the consent requirements for activities.

There is also likely to be greater onus on minimising the level of land disturbance and working within natural topographical and receiving environment constraints. This could elevate consideration of, or regulate, the fundamental principles of erosion and sediment control outlined in GD05 (e.g. minimise disturbance, stage construction, protect slopes, protect receiving environments, rapidly stabilise exposed areas, install perimeter controls and diversions and employ sediment retention devices).

11 Land use intensification in existing developed areas

This chapter considers how effective and efficient the objectives, policies, rules and other methods of the AUP have been in meeting the outcomes intended by the Regional Policy Statement with respect to land use intensification in existing developed areas.

This topic focuses on the intensification provided for in the AUP residential zones, as these areas were significantly up-zoned to enable residential capacity to meet long term growth (Independent Hearings Panel, 2016b and 2016d). The effectiveness of the AUP provisions in terms of providing for residential development has been assessed in separate s35 reports relating to B2.2 Urban growth and form, B2.3 A quality built environment, and B2.4 Residential Growth. This report considers how residential intensification has been managed to avoid, remedy or mitigate adverse effects on waterways.

Objective B7.4.1(5) of the RPS directs that the adverse effects from intensification of land use on coastal water and freshwater quality be avoided, remedied or mitigated. Policy B7.4.2(1) then seeks to:

> *Integrate the management of subdivision, use, development and coastal water and freshwater, by:*
>
> *(a) ensuring water supply, stormwater and wastewater infrastructure is adequately provided for in areas of growth; and*
>
> *(b) requiring catchment management planning as part of structure planning;*
>
> *(c) controlling the use of land and discharges to minimise the adverse effects of runoff on water and progressively reduce existing adverse effects where those water are degraded; and*
>
> *d) avoiding development where it will significantly increase adverse effects on water, unless these adverse effects can be adequately mitigated.*

Parts (c) and (d) of the above policy are relevant to the consideration of land use intensification in existing developed areas. Policies B7.3.2(5)(d) and B7.3.2(6) also seek that when use and development occurs, freshwater systems are maintained, restored, or enhanced.

This topic also has overlap with objectives B7.2.1(1) and B7.2.1(2) of the RPS, which seek to protect significant indigenous biodiversity value in freshwater areas from the adverse effects of subdivision, use, and development.

This chapter of the report focuses on controls that relate to the extent and form of residential intensification and the effect that can have on waterways, rather than the management of point-source discharges or on land uses that have particular implications for waterways. These controls are complementary to the discharge and land use controls in Chapters E8 'Stormwater discharge and diversion', Chapter E9 'Stormwater quality - high contaminant generating car parks and high use roads', and E10 'Stormwater Management Area - Flow 1 and Flow 2' that are covered above in Chapter 7 and the land disturbance controls covered above in chapter 10.

The key AUP provisions that manage the effects of urban intensification on water quality include the ‘maximum impervious area’ and ‘yards’ standards in the Chapter H zones, and the rules and standards within Chapters E15 ‘Vegetation management and biodiversity’ and in E38 ‘Subdivision – Urban’ of the Auckland-wide chapters. These rules and standards are intended to ensure that development retains riparian margins along streams and rivers, and includes open areas that enable infiltration of runoff. Infiltration can remove contaminants, decrease water temperature and slow the speed at which rainwater reaches streams, compared to water flowing over roofs, paved areas and roads. The rules and standards support enhanced riparian processes and maintenance of instream ecosystems, and reduce streambank erosion and land-derived sediment in streams.

This chapter of the report includes consideration of how the AUP provides for water sensitive design and green infrastructure as part of brownfield developments. Intensification and re-development of urban areas can be an opportunity to change the form of development to include features that retain more of the natural hydrological system, for example through rainwater tanks, rain gardens, swales and by clustering development so that there is more space for infiltration. Such changes may be required to achieve the RPS provisions which seek to improve the state of waterways rather than only avoiding or minimising the effects of development. The RPS seeks enhancement and improvement through provisions such as:

> *B7.3.1(1) Degraded freshwater systems are enhanced*
>
> *B7.3.2(3) Promote the enhancement of freshwater systems identified as being degraded to progressively reduce adverse effects*
>
> *B7.3.2(6) Restore and enhance freshwater systems where practicable when development, change of land use, and subdivision occur*
>
> *B7.4.1(2) The quality of freshwater and coastal water is maintained where it is excellent or good and progressively improved over time where it is degraded*
>
> *B7.4.2(6) Progressively improve water quality in areas identified as having degraded water quality through managing subdivision, use, development and discharges.*

11.1.1 Maximum impervious area

The maximum impervious area standard applies to residential activities in all of the residential zones, either as a permitted activity core standard to be complied with, or as a matter of discretion and assessment criteria for restricted discretionary activities. The various applications of the standard are detailed in Table 11.1 below. In the Mixed Housing Urban (MHU) and Mixed Housing Suburban (MHS) zones, the development of up to three dwellings per site is a permitted activity. Compliance with the maximum impervious area standard is required to maintain the permitted activity status. A resource consent is required for all new dwellings in the Terrace Housing and Apartment Buildings (THAB) zone and developments involving four or more dwellings in the MHU and MHS zones. In these instances, the maximum impervious area standard is not identified in the relevant activity tables as a core standard to be complied with, and non-compliance does not create any additional resource consent requirements. However, the relevant matters of discretion and assessment criteria for these activities include the extent to which the proposed development achieves the purpose outlined in the maximum impervious area standard.

Table 11.1 Application of the maximum impervious area standard across the residential zones

Zone	Permitted Activity Core Standard	Matter of Discretion	Assessment Criteria
Large Lot (single dwelling)	✓	✓	✓
Rural and Coastal Settlement (single dwelling)	✓	✓	✓
Single House (single dwelling)	✓	✓	✓
Mixed Housing Suburban			
• up to 3 dwellings	✓	✓	✓
• 4+ dwellings	×	✓	✓
Mixed Housing Urban			
• up to 3 dwellings	✓	✓	✓
• 4+ dwellings	×	✓	✓
Terrace Housing and Apartment Buildings (dwellings)	×	✓	✓

The maximum impervious area standard requires that development within the relevant zones does not exceed the thresholds specified in Table 11.2 and that the maximum impervious area in a riparian yard, lakeside yard or coastal protection yard does not exceed 10 per cent of the yard area.

Table 11.2 Maximum impervious area in the residential zones.

Zone	Maximum impervious area
Large Lot	35 per cent of site area or 1400m^2 (whichever is the lesser)
Rural and Coastal Settlement	35 per cent of site area or 1400m^2 (whichever is the lesser)
Single House	60 per cent of site area
Mixed Housing Suburban	60 per cent of site area
Mixed Housing Urban	60 per cent of site area
Terrace Housing and Apartment Buildings	70 per cent of site area

The purpose statement for the maximum impervious area standard is (emphasis added):

- ***to manage the amount of stormwater runoff generated by a development, particularly in relation to the capacity of the stormwater network and potential flood risks;***
- ***to support the functioning of riparian yards, lakeside yards and coastal yards and water quality and ecology;***
- *to reinforce the building coverage and landscaped area standards; and*

- *to limit paved areas on a site to improve the site's appearance and cumulatively maintain amenity values in a neighbourhood.*

As this report is focused on water, the analysis below is limited to the first two bullet points in bold and does not include those aspects of the maximum impervious area standard that relate to landscape and amenity.

As examples of the application of the maximum impervious area standard within the zone chapters, the provisions of the Single House zone and Mixed Housing Urban zone are detailed in the following table.

Table 11.3 Examples of maximum impervious area provisions.

Zone	Core Standard	Matter of Discretion for RD Activities	Assessment Criteria for RD Activities
Singe House	H3.4.1(A3) One dwelling per site: Standard H3.6.9 Maximum impervious area	H3.8.1(2) for buildings that do not comply with.....Standard H3.6.9 Maximum impervious areas....: • any policy which is relevant to the standard; • the purpose of the standard; • the effects of the infringement of the standard;	H3.8.2(5) for maximum impervious areas: (a) refer to Policy H3.3(6).
Mixed Housing Urban (up to 3 dwellings)	H5.4.1(A3) Up to 3 dwellings per site: Standard H5.6.9 Maximum impervious area	H5.8.1(4) for buildings that do not comply with .....Standard H5.6.9 Maximum impervious areas....: • any policy which is relevant to the standard; • the purpose of the standard; • the effects of the infringement of the standard;	H5.8.2(10) for maximum impervious areas: (a) refer to Policy H5.3(7);
Mixed Housing Urban (4+ dwellings)	No	H5.8.1(2) for four or more dwellings per site:.... all of the following standards: Standard H5.6.9 Maximum impervious areas;........	H5.8.2(10) for maximum impervious areas: (a) refer to Policy H5.3(7);

The policies referred to in the assessment criteria for the restricted discretionary activities in Table 11.3 have the same wording in both policy H3.3(6) and H5.3(7):

(6) Restrict the maximum impervious area on a site in order to manage the amount of stormwater runoff generated by a development and ensure that adverse effects on water quality, quantity and amenity values are avoided or mitigated.

11.1.2 Riparian areas

Riparian areas are managed by a suite of rules and standards within various different chapters. The relevant provisions are summarised in Table 11.4, and further detailed below.

Table 11.4 Summary of rules and standards in the AUP that manage riparian areas.

AUP Chapter	Rule or standard	Description	Width from urban stream	Width from a lake	Width from a wetland	Activity status
H Residential zones	H1.6.5(1) H2.6.7(1) H3.6.8(1) H4.7.7(1) H5.6.8(1) H6.6.9(1)	Buildings to be clear of riparian yard and lakeside yard setbacks	10m	30m	NA	RD to infringe standard
H Residential zones	H1.6.6(2) H2.6.8(2) H3.6.9(2) H4.6.8(2) H5.6.9(2) H6.6.10(2)	Maximum impervious area of 10% within a riparian and lakeside yard	10m	30m	NA	RD to infringe standard
E15 Vegetation management and biodiversity	E15.4.1(A13) E15.4.1(A14) E15.4.1(A18) E15.4.1(A19)	Vegetation alteration or removal within riparian areas	10m	50m within Natural Lake Management Areas Overlay only 30m within Urban Lake Management Areas Overlay only	20m	RD
E11 Land disturbance – regional[240]	E11.4.1(A7) E11.4.1(A9)	Earthworks within the Sediment Control Protection Area	50m	50m	50m	P (up to 2,500m^2) RD (greater than 2,500m^2)

[240] The riparian controls in E11 'Land disturbance – regional' are not assessed further in this chapter as they are covered above in Chapter 10 'Land disturbance'.

AUP Chapter	Rule or standard	Description	Width from urban stream	Width from a lake	Width from a wetland	Activity status
E38 Subdivision – Urban	E38.4.1(A8) E38.4.1(A9) E38.4.1(A10) E38.7.3.2	Requirement to establish esplanade reserves or strips	20m	20m	NA	RD (to establish reserve) D (to establish with reduction or to waiver) D (to establish strip)
E38 Subdivision – Urban	E38.8.1.1(k)	Vacant site building platform to be clear of riparian and lakeside yards	10m	30m	NA	RD to infringe standard

The 'D4 Natural Stream Management Areas Overlay' also includes controls relating to activities in riparian areas. The overlay protects river and stream reaches with high natural character and high ecological values. It includes the area of rivers and streams and associated riparian vegetation identified in the overlay that have predominantly indigenous riparian vegetation cover along a length of at least 600m and an average total width of vegetation cover of 80m (i.e. an average width of 40m on either side of the river). Where it does apply, there are controls in E3 Lakes, rivers, streams and wetlands, E7 Taking, using, damming and diversion of water and drilling, E11 Land disturbance – Regional and E15 Vegetation management and biodiversity. The overlay has not been considered any further in this chapter as it has not been applied to any streams in areas of existing residential development.

11.1.2.1 Yards

The yards standard applies in all relevant zones. In the MHU and MHS zones, the development of up to three dwellings per site must comply with the yards standard to maintain the permitted activity status. However, the standard is also a standard to be complied with for activities that require resource consent, being four or more dwellings in the MHU and MHS zones, or all new dwellings in the THAB zone. In all relevant zones, the yard standard requires that a riparian yard apply, and that buildings are to be set back a minimum depth of 10m from the edge of all permanent and intermittent streams. In addition to the riparian yard, the standard also requires setbacks from the front, side, and rear boundaries, the margin of a lake, and the landward side of Mean High Water Springs.

The purpose statement for the yards standard is (emphasis added):

- to create an urban streetscape character and provide sufficient space for landscaping within the front yard;

- to maintain a reasonable standard of residential amenity for adjoining sites;
- **to ensure buildings are adequately set back from lakes, streams and the coastal edge to maintain water quality and provide protection from natural hazards**; and
- to enable buildings and services on the site or adjoining sites to be adequately maintained.

The analysis below is focused on the riparian yard. The setbacks from lakes and the coast also have benefits for water quality. In the urban area, the lakeside yard only applies around Lake Pupuke and is 30m wide. The coastal protection yard has limited benefit for coastal water quality as stormwater and other contaminants generally flow through overland flow paths to rivers and streams or the stormwater system, rather than directly from the land directly adjacent to the sea. The coastal protection yard is irrelevant for water quantity issues whereas the riparian yard can be important in slowing the flow of water to rivers and streams.

11.1.2.2 Vegetation management and biodiversity

Chapter E15 manages vegetation within riparian areas, recognising that vegetation contributes to a range of ecosystem services including erosion and sediment control and protecting or enhancing water quality. In an urban residential context, resource consent is required for vegetation alteration or removal within 10m of urban streams or 20m from a wetland. The matters of discretion include:

- the effects that the vegetation alteration or removal will have on ecological values, including on threatened species and ecosystems; and
- the effects the vegetation alteration or removal will have on soil conservation, water quality and the hydrological function of the catchment.

11.1.2.3 Subdivision – Urban

Chapter E38 manages subdivision within urban zones. The standards provide for riparian yards by requiring that all vacant sites provide for a sufficiently sized building platform that is located outside of the riparian yard. In a residential context, this requirement does not apply where subdivision is proposed around existing dwellings or dwellings that have been approved in a land use resource consent. Chapter E38 also requires esplanade reserves be established when new sites are created, and they adjoin a lake or the bank of a river or stream that is 3m or more in width.

11.1.3 Water sensitive design

Water sensitive design prioritises the avoidance of receiving water adverse effects of development, rather than focusing on remediation and mitigation of effects. It does this through 'Urban Design' approaches that minimise stormwater generation rather than prioritising stormwater management once the stormwater has been generated. Water sensitive design can also consider water use and retention to address water supply issues. Urban design that retains vegetation and natural freshwater systems and processes has benefits for biodiversity and amenity as well as for stormwater management.

Water sensitive design was defined in the proposed AUP (2013) as:

> *Water sensitive design*
>
> *An approach to freshwater management. It is applied to land use planning and development at complementary scales including region, catchment, development and site. Water sensitive design seeks to protect and enhance natural freshwater systems, sustainably manage water resources and mimic natural processes to achieve enhanced outcomes for ecosystems and our communities.*
>
> *Water sensitive design approaches:*
>
> *• utilise and maintain, enhance or restore natural freshwater systems*
>
> *• minimise hydrological changes to, and the adverse effects of land use development on, natural freshwater systems*
>
> *• mimic natural processes and minimise the requirement for hard constructed infrastructure to manage stormwater runoff*
>
> *• maintain, enhance or restore amenity, open space and other community and cultural values.*

This definition was not included in the Independent Hearing Panel's (IHP) recommendations version of the AUP. The IHP's recommendations report noted it as an example of a definition that appeared to establish policies or make rules (IHP 2016d: 11 (Topic 065 report)). The IHP also noted that "it is not a definition: it is a description of an approach to doing something. It does not state what the relevant sensitivities are and it does not specify how the design is to occur". A substantially revised definition had been advanced by the council and submitters in the water quality topic. It was the Panel's view "when considering the elements that made up the policy, that in fact most of the items were not about water sensitive design but about how stormwater should be managed in an integrated way" (IHP 2016a: 114). The IHP considered that "the approach would be better described as an integrated stormwater management approach and set out in the policies on water quality" (IHP 2016d: 12). The amended approach resulted in amendments to the RPS policies in B7 and the policies in E1 relating to water quality and integrated management.

The council's Auckland Design Manual includes a guidance document on water sensitive design (Lewis et al. 2015) ("GD04") and a comprehensive case study on how the development of Long Bay has incorporated water sensitive design.

11.2 Indicators and measures

There are no indicators under AUP Chapter B11 that are directly relevant to the AUP standards which seek to manage the potential adverse effects of land use intensification on water.

The indicators in Table 11.5 have been developed from the AUP provisions that manage the effects of residential intensification on water quality. The relationship between the indicators and the AUP objectives and policies is shown in Appendix C.

Table 11.5 Indicators, measures and information sources for land use intensification in existing developed areas.

Indicators	Measures	Information Sources
1. Residential intensification in urban areas protects freshwater systems and coastal water	• Trends for water quality within urban areas	• State of the Environment Monitoring
2. Impervious area extent is managed to minimise adverse effects on freshwater systems	• Number of new dwellings infringing the impervious area standard • How adverse effects on freshwater systems are managed where the impervious area standard is infringed	• Plans and Places resource consent database • Findings for Topic B2.3 Quality Built Environment
3. The functioning of riparian areas is supported	• Number of resource consents granted for vegetation removal and new buildings within urban riparian areas • Whether resource consent processes protect the functioning of riparian areas	• Plans and Places resource consent database • Discussions with council staff
4. Water sensitive design is enabled	• Assessment of whether the AUP has barriers to water sensitive design and green infrastructure (e.g. swales, rain gardens, green roofs, etc.)	• Discussions with council staff • Desktop review of the AUP

It would be ideal if indicator 2 could be assessed through a measure relating to the actual extent of impervious areas and how they have changed over time. The council has a GIS map of impervious areas throughout Auckland but that map was developed from aerial photos taken in 2008. An updated imperviousness layer has been developed by the Healthy Waters Department, using 2017 imagery for all urban and future urban areas regionwide. The updated impervious layer is undergoing quality assurance prior to release. At the time of writing that verification process is not complete and no analysis of changes in imperviousness since 2008 or updated imperviousness for 2017 are used in this s35 report. Notably, the extent of the 2008 GIS map does not reflect the effectiveness of the AUP provisions, whereas the 2017 imperviousness layer spans all of the region with explicitly-trained (separate) urban and rural models developed to gauge types and extent of impervious surface from remotely sensed imagery. Here, the measures for indicator 2 relate to the consents that have been granted for developments that infringe the impervious area standards.

The measures for Indicator 3 focus on the riparian areas of rivers and streams, as the standards for new buildings within riparian areas and definitions for 'riparian margin' and 'riparian yard' only apply to rivers and streams. Protection for the edges of wetlands is further discussed under Section 11.3 Findings and analysis.

Analysis of subdivision resource consents have also been excluded, as applications for esplanade reserves adjacent to rivers and streams or for infringements to providing a building platform outside of the riparian yard could not be specifically identified in the Plans and Places resource consent database.

11.3 Findings and analysis

11.3.1 Indicator 1: Intensification protects freshwater systems and coastal water

The state of the environment monitoring has shown that Auckland's most degraded streams are in urban areas and that the most degraded coastal waters are adjacent to urban areas (Auckland Council 2021a). There are ammonia toxicity issues in some urban streams, and more than half of the urban streams monitored failed the proposed regional bottom line for zinc contamination[241]. Zinc sources include volcanic soils, roofing, roads and motorways, and paved urban surfaces. *E. coli* and suspended fine sediment are also elevated in many urban streams. The most degraded coastal areas are generally found in estuaries receiving runoff from the older, intensively urbanised and/or industrialised catchments, particularly in the Tāmaki Estuary, and the tidal arms of the Manukau Harbour (particularly Mangere Inlet) and the Waitematā Harbour. These areas have a long history of contaminant sources in their catchments, and are in the more sheltered parts of estuaries and harbours where contaminants settle out and accumulate. The degradation relates to elevated nutrient concentrations, sedimentation, and elevated levels of contaminants (copper, lead and zinc) in some marine sediments. These are resulting in adverse effects on the benthic ecology in the intertidal arms of the region's harbours and estuaries.

Intensification and redevelopment in existing urban areas can affect water quality through earthworks contributing sediment at the time of development, and through on-going inputs of nutrients and contaminants. The increase in impervious surfaces also affects the hydrological regime, leading to stream bank erosion and sediment mobilisation, as well as the reduction of baseflows to streams. As noted in section 2.3.2.1, the FWMT modelling found that bankside erosion is the predominant source of sediment for waterways across the region. It is a significant source of sediment in urban areas as well as in rural areas.

[241] Heavy metals are not listed in NPS-FM appendix 2A and 2B which set out the attributes that must be monitored for the NPS-FM compulsory values. However, the NPS-FM also requires councils to identify, where practicable, attributes for all other applicable values (NPS-FM clause 3.10(1)(c)). Auckland Council has developed proposed attribute limits for zinc and copper as these contaminants are affecting Auckland's urban streams. The proposed limits are set out in Gadd et al. (2019) and further work is underway nationally to understand how other modifiers influence metal toxicity.

11.3.2 Indicator 2: Impervious areas

Urban development often results in increases in impervious area, which prevents infiltration and can result in increases in surface water runoff during storm events. Cumulatively, the increases in stormwater volume and velocity have implications for the stormwater network and fresh and coastal receiving environments. As noted above, the residential zones in Chapter H set a maximum impervious area (as a percentage of the total site area) as a permitted activity standard, with resource consent required for infringements beyond the maximum (for specified development activities (e.g. for one dwelling per site in the Single House zone or for up to three dwellings per site in the MHU and MHS zones)). The standard is also included as a matter of discretion and assessment criteria for restricted discretionary activities.

Indicator 2 relates to this standard and resource consent decisions were analysed to determine the extent of infringements to the maximum impervious area standard and how effects on freshwater systems were managed, particularly through conditions.

Resource consent decisions including an infringement to the maximum impervious area standard were identified using the Plans and Places resource consent database. Findings from Topic B2.3 Quality Built Environment were also utilised as an infringement to the impervious area standard is not consistently recorded in the Plans and Places resource consent database if it is not a core standard to be complied with for the activity proposed (e.g. for developments involving four or more dwellings in the MHS and MHU zones or dwellings in the THAB zone). Topic B2.3 used a different sampling approach based on comprehensively assessing a selection of multi-dwelling consents, and so could assess which of those developments infringed the impervious area standard, even where it was not a consent requirement.

In the Rural and Coastal Settlement, Large Lot, and Single House zones, the construction of more than one dwelling per site is a non-complying activity, and the maximum impervious area standard is not identified as a standard to be complied with. These activities in these zones have been excluded from the resource consent analysis as they represent a small portion of resource consents[242] and are not provisions that were intended to support urban intensification.

Where the Plans and Places resource consent database has been utilised, the extract period, extract results, and sample size of resource consent decisions analysed in detail are summarised in Table 11.6. The relative standard error for this indicator was set to 20[243]. The extract period for 1-3 new dwellings in the Mixed Housing Suburban and Mixed Housing Urban zones covers the period since appeals relating to the number of dwellings permitted per site were resolved[244].

Due to a change in the numbering of the provisions within Chapter H1 subsequent to the plan becoming operative in part, the Plans and Places resource consent database is known to have significant inaccuracies in relation to the total number of consents which are recorded as having triggered the impervious area standards in the Large Lot zone (H1.6.6), with approximately 50% of consents actually relating to building coverage infringements (now

[242] Resource consents to construct more than one dwelling per site the Rural and Coastal Settlement, Large Lot, and Single House zones account for 5%, 1%, and 5% respectively of total resource consents in that zone, as recorded in the Plans and Places resource consent database.
[243] Using the sample size calculator described in section 1.5.2 of this report.
[244] Decision No. [2018] NZEnvC 28.

standard H1.6.7 but previously H1.6.6). The resource consent sample for this zone excluded those consents that were for building coverage and relates only to infringements in maximum impervious area. The methodology and limitations to the Plans and Places resource consent database are set out in greater detail in section 1.5.1 of this report.

Table 11.6: Summary of resource consent decisions extracted from the Plans and Places resource consent database for Indicator 2: Impervious areas.

Zone	Extract period	No. of resource consent decisions extracted from the Plans and Places resource consent database	Sample size and no. of resource consent decisions analysed in detail
Rural and Coastal Settlement	November 2016 – March 2021	31	14
Large Lot	November 2016 – March 2021	27	13
Single House	November 2016 – March 2021	214	23
Mixed Housing Suburban (1-3 new dwellings*)	April 2018 – March 2021	214	23
Mixed Housing Urban (1-3 new dwellings*)	April 2018 – March 2021	119	21
Terraced Housing and Apartment Building (all new dwellings*)	November 2016 – March 2021	35	15

**It is not possible to accurately determine the total number of consents involving 4 or more dwellings in the MHS or MHU zones or dwellings in the THAB zone that exceed the maximum impervious area standard threshold, as the standard is not a matter which triggers consent.*

11.3.2.1 Resource consent analysis

Table 11.7 Resource consent analysis for impervious area infringements in each zone–

Zone	Observations from content analysis

H1 - Large Lot Zone (maximum impervious area 35% or 1400m², whichever is the lesser)	The average exceedance in impervious area across the consents sampled was 4%. For those that exceeded the 1400m² limit (3 consents) the average exceedance was 1028m². [245]
	• 15% of consents did not provide any stormwater mitigation.
	• Of the consents that did provide mitigation:
	  ◦ 27% required the mitigation through a condition of consent only, with the condition more often limited to installation, with no clear requirement for ongoing maintenance.
	  ◦ 9% required the mitigation through either a covenant or consent notice registered on the title with requirements for the ongoing maintenance of the stormwater attenuation device.

[245] The large average exceedance resulted from one large exceedance of 2610m² which was the result of a land use consent preceding subdivision.

Zone	Observations from content analysis
	• 64% of consents did not include a specific condition regarding the stormwater mitigation. • Detention tanks were the most common form of mitigation.

H2 - Rural and Coastal Settlement Zone (maximum impervious area 35% or 1400m², whichever is the lesser)	The average exceedance in impervious area across the consents sampled was 10%.
	• 57% of consents did not provide any stormwater mitigation.
	• Of the consents that did provide mitigation:
	  ◦ 67% required the mitigation through a condition of consent only, with the condition more often limited to installation, with no clear requirement for ongoing maintenance.
	  ◦ 33% of consents did not include a specific condition regarding the stormwater mitigation.
	  ◦ Detention tanks were the most common form of mitigation.

H3 - Single House Zone (maximum impervious area 60%)	The average exceedance in impervious area across the consents sampled was 4.8%.
	• 43% of consents did not provide any stormwater mitigation.
	• Of the consents that did provide mitigation:
	  ◦ 54% required the mitigation through a condition of consent only, with the condition more often limited to installation, with no clear requirement for ongoing maintenance.
	  ◦ 8% required the mitigation through either a covenant or consent notice registered on the title with requirements for the ongoing maintenance of the stormwater attenuation device.
	  ◦ 38% of consents did not include a specific condition regarding the stormwater mitigation.
	  ◦ Detention tanks were the most common form of mitigation.

H4 – Mixed Housing Suburban Zone (maximum impervious area 60%)	**Activities involving up to 3 dwellings:**
	The average exceedance in impervious area across the consents sampled was 2.7%.
	• 19% of consents did not provide any stormwater mitigation.
	• Of the consents that did provide mitigation:
	  ◦ 41% required the mitigation through a condition of consent only, with the condition more often limited to installation, with no clear requirement for ongoing maintenance.
	  ◦ 35% required the mitigation through either a covenant or consent notice registered on the title with requirements for the ongoing maintenance of the stormwater attenuation device.
	  ◦ 18% of consents did not include a specific condition regarding the stormwater mitigation.
	  ◦ Detention tanks were the most common form of mitigation.
	  ◦ 2 consents (9% of the sample) did not trigger the impervious area standard and were for a side yard infringement and SMAF (i.e. the incorrect rule was referenced). These consents were not included

Zone	Observations from content analysis

	in the above analysis. This highlights a known issue with the accuracy of the Plans and Places resource consent spreadsheet.
	
	Activities involving 4+ Dwellings:
	A sample of 9 consents was analysed from those consents noted as infringing the maximum impervious area standard through Topic B2.3 Quality Built Environment.
	The average exceedance in impervious area across the consents sampled was 1.4% (note: it was not possible to determine the % exceedance for 1 of the consents sampled).
	• 11% of consents did not provide any stormwater mitigation.
	• Of the consents that did provide mitigation:
	  • 78% required the mitigation through either a covenant or consent notice registered on the title with requirements for the ongoing maintenance of the stormwater attenuation device.
	  • 11% required the mitigation through a condition of consent only.
	  • 11% of consents did not include a specific condition regarding the stormwater mitigation.
	  • Detention tanks were the most common form of mitigation.

H5 – Mixed Housing Urban Zone (maximum impervious area 60% or 10% in the riparian yard)	**Activities involving up to 3 dwellings:**
	The average exceedance in impervious area across the consents sampled was 4.6%.
	• 25% of consents did not provide any stormwater mitigation.
	• Of the consents that did provide mitigation:
	  • 7% required the mitigation through a condition of consent only, with the condition more often limited to installation, with no clear requirement for ongoing maintenance.
	  • 93% required the mitigation through either a covenant or consent notice registered on the title with requirements for the ongoing maintenance of the stormwater attenuation device.
	  • Detention tanks were the most common form of mitigation.
	  • 1 consent (5% of the sample) did not trigger the impervious standard and was for a side yard infringement. This consent has not been included in the above analysis. This highlights a known issue with the accuracy of the Plans and Places resource consent spreadsheet.
	
	Activities involving 4+ Dwellings:
	A sample of 13 consents was analysed from those consents noted as infringing the maximum impervious area standard through Topic B2.3 Quality Built Environment.
	The average exceedance in impervious area across the consents sampled was 3.8% (note: it was not possible to determine the % exceedance for 3 of the consents sampled).
	• 100% of consents sampled provided stormwater mitigation.

Zone	Observations from content analysis
	• 60% required the mitigation through either a covenant or consent notice registered on the title with requirements for the ongoing maintenance of the stormwater attenuation device. • 23% required the mitigation through a condition of consent only. • 22% of consents did not include a specific condition regarding the stormwater mitigation. • Detention tanks were the most common form of mitigation.

H6 – Terraced Housing and Apartment Building Zone (maximum impervious area 70% or 10% in the riparian yard)	The average exceedance in impervious area across the consents sampled was 6.8%. None of the consents sampled infringed the riparian limit.
	• 40% of consents did not provide any stormwater mitigation.
	• Of the consents that did provide mitigation:
	  ◦ 56% required the mitigation through a condition of consent only, with the condition more often limited to installation, with no clear requirement for ongoing maintenance.
	  ◦ 33% required the mitigation through either a covenant or consent notice registered on the title with requirements for the ongoing maintenance of the stormwater attenuation device.
	  ◦ 11% of consents did not include a specific condition regarding the stormwater mitigation.
	  ◦ Detention tanks were the most common form of mitigation.

11.3.3 Indicator 3: Riparian areas

Riparian areas help maintain water quality and quantity by ensuring that buildings and structures are sufficiently set back from the banks of streams to not obstruct stream flow and support maintenance of streambank integrity. Riparian areas also provide for vegetation that can act as retention and filtration for overland flows and provide shading, temperature control and habitat. Urban development and intensification can create competing interests between accommodating new buildings and protecting riparian areas and riparian vegetation.

Indicator 3 relates to the management of riparian areas across residential zones. The relevant provisions in the AUP are maximum allowable impervious area in the riparian yard, minimum riparian yard setback, and vegetation removal within 10m of an urban stream. Extracted results from the Plans and Places resource consent database against these provisions are outlined in Table 11.8.

Table 11.8: Summary of AUP rules and standards extracted from the Plans and Places resource consent database for Indicator 3: Riparian areas.

Summary of rule or standard	No. of resource consent decisions extracted from the Plans and Places resource consent database[246]
Standard - maximum impervious area in the riparian yard (residential zones)	20
Rule – vegetation alteration or removal within 10m of an urban stream (all applicable zones)	10

The methodology and general limitations of the Plans and Places resource consent database are set out in greater detail in section 1.5.1 of this report.

In terms of limitations for Indicator 3, resource consent decisions associated with the riparian yard setback were not included in the extract. A record for an infringement to the yards standard does not identify the specific yard setback that was infringed (i.e. it could relate to the front yard, side yard, rear yard, coastal protection yard, lakeside yard or riparian yard). Further, the extract results for impervious areas in the riparian yard are unlikely to be complete in terms of relevant resource consents associated with this standard. The maximum impervious area standard consists of two parts, the first part applying to impervious areas across a site (indicator 1 above), and the second part applying to impervious areas within the riparian yard. The extract results are limited to instances where an infringement to the second part of the standard was specifically recorded in the Plans and Places resource consent database.

As part of the detailed analysis, the relevant resource consent requirements were recorded for all 30 extract results. This allowed infringements to the riparian yard setback and additional resource consents for vegetation alteration or removal to be identified. The results of the detailed analysis of resource consent requirements are shown in Figure 11.1.

[246] All of the extracted consents were assessed and so there is no sample size noted for this table.

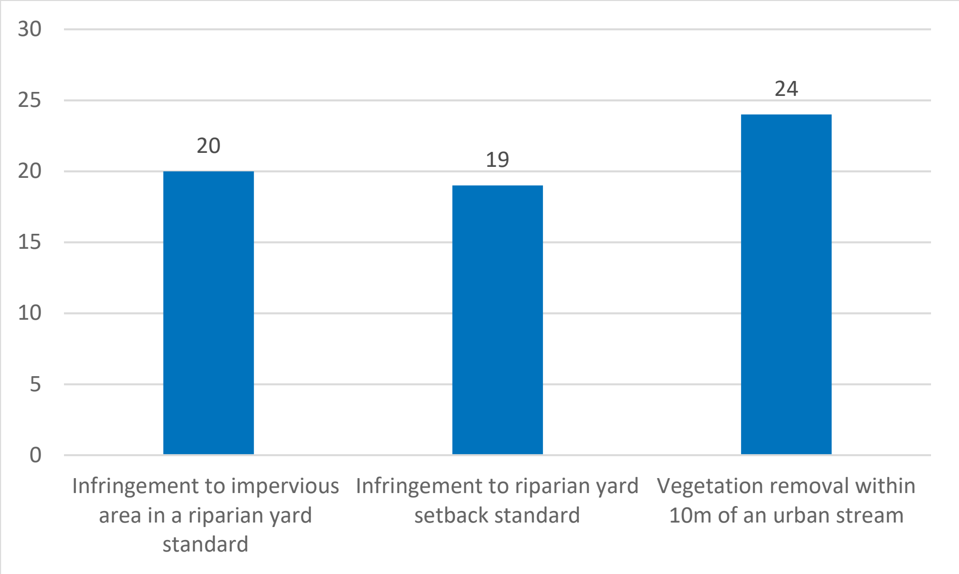

Figure 11.1: Number of resource consent decisions within the extracted results granted against the riparian provisions of the AUP.

Of the 20 resource consent decisions that infringed the maximum impervious area within a riparian yard, the median exceedance to the maximum allowable impervious area of 10% was approximately 16%, resulting in total impervious area of 26% in the riparian yard. The spread of all riparian yard impervious area exceedance is shown in Figure 11.2.

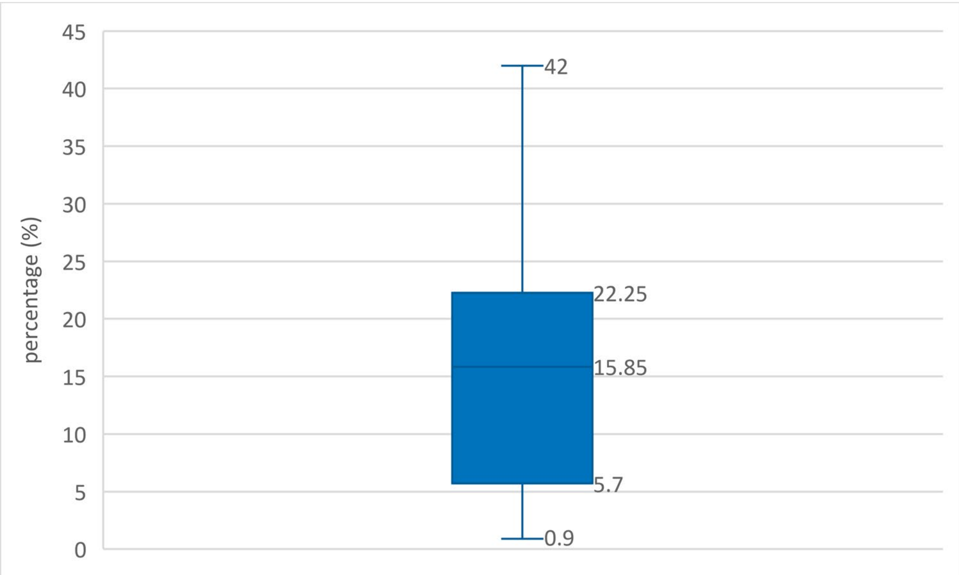

Figure 11.2: Exceedance to the maximum allowable impervious area in a riparian yard (%) in the 20 resource consent decisions analysed. Figures include the minimum and maximum values, median, and lower and upper quartiles (Note that the allowable exceedance is 10% and these figures relate to the additional amount of exceedance over 10% i.e. the lowest exceedance was 10.9%., the median was 25.85 and the highest was 52%).

While infringements to the riparian yard could not be specifically identified within the Plans and Places resource consent database, analysis of the 30 extract results show that the riparian yard standard was infringed in 19 of the 20 resource consents that infringed impervious area in a riparian yard. Of these 19 resource consent decisions, the median shortfall to the minimum required yard setback was approximately 5m (i.e. half of the 10m wide yard). The extent of the shortfall is shown in Figure 11.3.

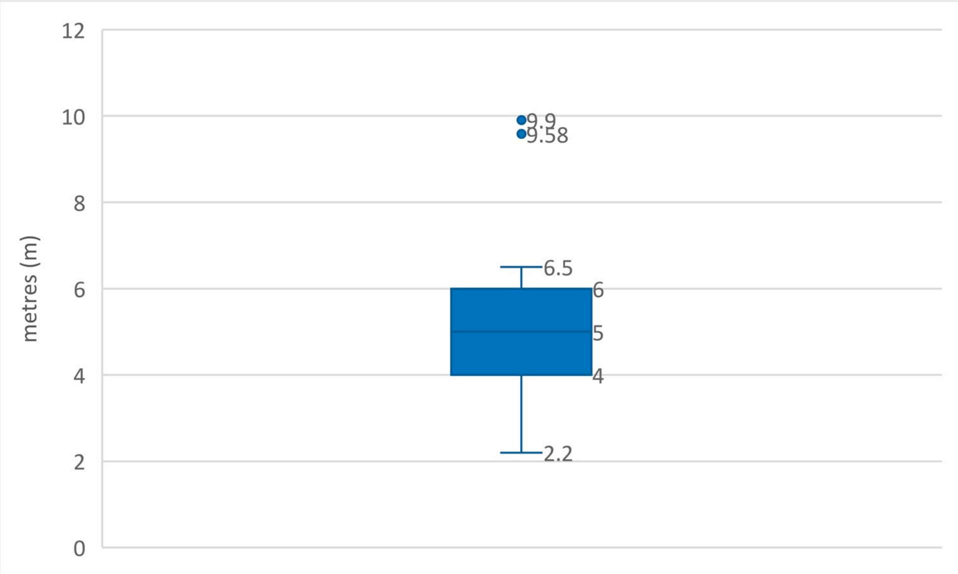

Figure 11.3: Shortfall to the minimum required riparian yard setback for buildings (m) in the 19 relevant resource consent decisions analysed. Figures include the minimum and maximum values, median, lower and upper quartiles.

The purpose statements for the impervious area standard in riparian yards and the riparian yard setback both include reference to supporting or maintaining water quality. The purpose of the impervious area standard also references supporting the function of riparian yards. Of the 20 resource consent decisions relating to an infringement to impervious area in riparian yards, 19 also infringed the riparian yard setback for buildings. It was observed that the effects to both infringements were often jointly considered. Of the 20 resource consent decisions, 15 (75 per cent) addressed water quality, often with reference to managing stormwater runoff or improving stream ecology through replanting. In two instances, the effects on stream function were specifically discussed and considered to be acceptable. While the effects of stormwater runoff on water quality were discussed, none of the decision documents specifically recognised the ongoing function of riparian yards.

Policy E15.3(1) seeks to protect vegetation in sensitive environments, including riparian margins. Resource consent is required for vegetation alteration or removal within 10m of urban streams. This distance is consistent with the riparian yard setback requirements in the urban residential zones. Resource consent matters of discretion include effects on ecological values, water quality, and the hydrological function of the catchment.

Of the 24 resource consent decisions relating to vegetation alteration or removal within urban riparian areas, 20 (83 per cent) discussed effects on ecological values, four (17 per cent) discussed effects on water quality, and two (8 per cent) discussed effects on hydrological functions. Both of those later two applications also required resource consent under SMAF provisions. Of the resource consent decisions that discussed effects on ecological values or water quality, mitigation in the form of planting was provided in 18 instances. In five instances, vegetation to be removed was considered to be exotic, low quality, or of low botanical value. In one instance, the remaining vegetation was considered appropriate to manage effects on the quality and function of the stream. Although planting was specifically referenced when discussing adverse effects in 18 resource consent decisions, conditions for planting and/or ongoing maintenance were required in 21 instances.

For one of the resource consents from the extract results, resource consent was required under all three relevant standards. Council's specialist ecologist noted the level of encroachment into the riparian yard could not be supported due to the significant width of the adjacent stream and given there were opportunities to accommodate the same number of dwellings proposed without infringing the riparian yard. It was also considered that building within the riparian yard precludes the ability for future restoration within riparian areas. Contrary to this advice, the consent was granted on the basis that the proposal was unlikely to adversely affect shading, temperature regulation, instream habitat provisions, surface water filtration, and ecological values within the subject site.

Findings from the consent analysis above are consistent with the issues raised by the council's specialist ecology staff[247] regarding the management of riparian areas, including:

- Lack of recognition in the AUP between the effects of vegetation alteration or removal on riparian values, including ecosystems, habitats, and instream water quality (temperature management instream). Specifically, it has been noted in some consent processes that grass or exotic species are sufficient to maintain the function of riparian areas when tree height is important for temperature management of stormwater.
- The resource consent process providing limited ability to consider the cumulative effects of reducing the riparian yard on a site-by-site basis.

Other issues raised by council staff regarding riparian management include:

- Difficulties protecting riparian areas when the effects of a reduced riparian yard are balanced against providing for new residential dwellings or the need to provide for on-site residential amenity, i.e., where an encroachment is necessary to provide for sufficient space within the site. Anecdotally, staff have experienced that resource consent applications for residential dwellings that also affect riparian areas are likely to be granted.
- The RPS policies that seek restoration or enhancement outcomes (policies B7.3.2(5)(d) and B7.3.2(6)) when use and development occurs are not supported by standards in the relevant zone and urban subdivision chapters. The lack of standards creates issues for including conditions to resource consent decisions under s108AA of the RMA.
- Plan provisions for riparian areas being dispersed across different chapters, with riparian margins under chapter E15, streams under chapter E3, and riparian yards under the relevant zone chapters.
- Inconsistency between the use of the terms 'riparian margin' and 'riparian yard' throughout the AUP. The zone chapters refer to a 'riparian yard' defined as "*the area along the top of a permanent or intermittent river or stream measured horizontally and at right angles from the top of the bank*" while chapter E15 refers to a 'riparian margin',

[247] Issues noted in a workshop with ecologists from the Ecological Advice Team in the Infrastructure and Environmental Services Department of Auckland Council.

defined as "*an area of land immediately adjacent to a permanent or intermittent river or stream*".

- Despite policy B7.3.2(4) seeking to avoid the loss of wetlands and their margins, there is a lack of protection for the edge of wetlands from buildings. The riparian yard standards apply only to streams, and there are no standards that restrict the location of buildings from the edges of wetlands[248].
- The lakeside yard definition does not specify whether it applies to all lakes or only those over a specific size. Technically, the 30m yard could apply around a small stormwater pond when it would be expected to only apply around larger, natural lakes.

11.3.4 Indicator 4: Water sensitive design

In workshops about the AUP water provisions, Healthy Waters staff have raised concerns that the AUP is ineffective in encouraging or requiring water sensitive design and green infrastructure. There is a concern that water sensitive design is a lot less visible in the AUP than it was in the proposed plan, although some elements of water sensitive design are included in the current provisions. Water sensitive design is not seen as 'standard practice' under the AUP and is not being considered sufficiently in the early stages of development proposals.

There is also a concern that the effects on waterways from re-development of brownfield sites are not being addressed as comprehensively as they are for greenfield sites. This is a concern as the Auckland Plan (Auckland Council 2018) and AUP provide for the majority of Auckland's growth to be within the existing urban area. A brownfield site does not require a stormwater management plan or catchment management plan. In contrast, a structure plan for a greenfield site will include a catchment management plan as it is listed in the AUP Appendix 1 Structure plan guidelines. There is also an inconsistency with the stormwater NDC, which requires a stormwater management plan for brownfield developments that are over 5,000 m^2 or more than 20 lots. There is no equivalent requirement in the AUP. A stormwater management plan might be prepared as part of a consent application for a development within a SMAF area that could not meet the permitted activity standards, but it is not a specific requirement in AUP chapter E10 Stormwater management area – Flow 1 and Flow 2.

Brownfield development needs to comply with a range of controls spread across several AUP chapters, including:

- Consent for high contaminant generating activities (E9) – aimed at reducing contaminants
- Consent in SMAF areas (E10) – stormwater hydrology mitigation requirements aimed at protecting stream health and bank stability

[248] Vegetation removal around the edges of wetlands is managed under rules E15.4.1 (A11) and (A18) and earthworks within 50m of wetlands over 1,000m2 are managed under the rules in E11 Land disturbance – Regional through the rules relating to the Sediment Control Protection Area. The National Environmental Standard for Freshwater 2020 includes regulations relating to earthworks and vegetation removal within 10m of wetlands, but no restrictions on the location of buildings.

- A requirement to bring integrated stormwater management into subdivision design (E38) – aimed at achieving good practice for subdivision.

There are concerns that these matters are not being considered in an integrated manner, and that the relevant subdivision policies are not being applied if a land use consent has been granted prior to seeking a subdivision consent. Under AUP rules E38.4.2(A14) and (A15) subdivision in accordance with an approved land use resource consent, or around existing buildings and development (that complies with the relevant standards), is a restricted discretionary activity. If subdivision is applied for at the same time as the land use consent, the subdivision of a vacant lot could be a discretionary or non-complying activity. If the land use consent is applied for first, the matters of discretion for subdivision around existing buildings and development, and subdivision in accordance with an approved land use resource consent, are limited to "the effect of the design and layout of the proposed sites created" (E38.12.1(6)). The assessment criteria include "(ii) whether there is appropriate provision made for infrastructure" and "refer to policies E38.3(1) and (6)[249]" (E38.12.2(6)). There is very limited ability to address matters relating to policy E38.3.1(22) which includes 'applying an integrated stormwater management approach to the planning and design of development in accordance with stormwater management policies in E1 Water quality and integrated management'.

Policy direction supporting water sensitive design

In response to these concerns, a desk-top review has been undertaken to examine the differences between the proposed Unitary Plan and the operative plan, and the record of amendments shown in the council's hearing evidence and the IHP recommendations reports (Independent Hearings Panel 2016d).

In the proposed plan, water sensitive design was referred to under the heading of 'stormwater management' in section C.5.15.1 policy 9 with regard to greenfield development and in policy 10 with regard to intensification:

> *9. Avoid significant adverse effects and remedy or mitigate other adverse effects of stormwater runoff in greenfield areas on freshwater systems and coastal water by:*
>
> *a. the adoption of* ***water-sensitive design*** *as a core development approach; …*
>
> *10. Minimise new, and reduce the existing, adverse effects of stormwater runoff on communities, freshwater systems and coastal waters from new development, intensification and re-development by: …*
>
> *d. adopting* ***water sensitive design principles*** *and encouraging the restoration of freshwater systems and overland flow paths where practicable …*

[249] Policy (6) provides a cross-reference to the Auckland-wide rules but not the policies: "(6) Provide for subdivision around existing development, and where it enables creation of sites for uses that are in accordance with an approved land use resource consent and where there is compliance with Auckland-wide and zone rules."

Several of the other parts of policy 10 reflected water sensitive design principles and so duplicated point d. This policy became the current policy E1.3(9) which replaces 'water sensitive design principles' with 'integrated stormwater management approach':

> *(9) Minimise or mitigate new adverse effects of stormwater runoff, and where practicable progressively reduce existing adverse effects of stormwater runoff, on freshwater systems, freshwater and coastal waters during intensification and redevelopment of existing urban areas by all of the following:*
>
> *(d) taking an **integrated stormwater management approach** for large-scale and comprehensive redevelopment and intensification (refer to Policy E1.3.10 below) and encourage the restoration of freshwater systems where practicable; and …*

Policy E1.3(10) was added through the hearing process to more clearly set out the matters that should be considered in taking an integrated stormwater management approach. Policy E1.3(10) is:

> *(10) In taking an **integrated stormwater management approach** have regard to all of the following:*
>
> *(a) the nature and scale of the development and practical and cost considerations, recognising:*
>
> > *(i) greenfield and comprehensive brownfield development generally offer greater opportunity than intensification and small-scale redevelopment of existing areas;*
> >
> > *(ii) intensive land uses such as high-intensity residential, business, industrial and roads generally have greater constraints; and*
> >
> > *(iii) site operational and use requirements may preclude the use of an integrated stormwater management approach.*
>
> *(b) the location, design, capacity, intensity and integration of sites/development and infrastructure, including roads and reserves, to protect significant site features and hydrology and minimise adverse effects on receiving environments*
>
> *(c) the nature and sensitivity of receiving environments to the adverse effects of development, including fragmentation and loss of connectivity of rivers and streams, hydrological effects and contaminant discharges and how these can be minimised and mitigated, including opportunities to enhance degraded environments;*
>
> *(d) reducing stormwater flows and contaminants at source prior to the consideration of mitigation measures and the optimisation of on-site and larger communal devices where these are required; and*
>
> *(e) the use and enhancement of natural hydrological features and green infrastructure for stormwater management where practicable.*

While the term 'water sensitive design' is no longer used within the AUP, the principles of the approach are included in the AUP to a similar extent as in the proposed plan. However, the removal of the term 'water sensitive design' may have reduced the effectiveness of the policies in terms of linkages to the wider understanding of water sensitive design and the technical guidance on what that means at different scales (e.g. catchment, street or site). It is unlikely that this could be addressed through addition of a definition of 'integrated stormwater management' as it would have the definition issues previously noted by the IHP. It may be more effective to update the water sensitive design guidance for stormwater (Lewis et al. 2015) and to include more explicit references to that document within the plan or to incorporate it by reference.

The IHP found that the aspects of water sensitive design that were included in the proposed plan related principally to stormwater management and so the provisions were re-framed around that. There was less consideration of aspects relating to water supply or water conservation. This emphasis might be different now as there has been more consideration of water supply and droughts in the last few years. There is more integration of stormwater management and water supply design alternatives in the development of the recently adopted Water Strategy (Auckland Council 2022a).

While the general approach of water sensitive design is mandated by the AUP policies, it is also important to consider how the rule framework enables, requires or restricts the elements of water sensitive design. Elements of water sensitive design which have been reviewed elsewhere in this report include retention of streams and wetlands, source control of contaminants (in the stormwater chapter) and stormwater management to minimise changes to the hydrological regime (stormwater chapter). The retention of riparian margins and minimisation of impervious areas are reviewed under the other indicators covered in this chapter. Some other elements of water sensitive design are noted below.

Rainwater tanks

Rainwater tanks are an element of water sensitive design as they are a form of water retention which allows for water re-use and reduces the volume of water flowing from impervious areas, into the stormwater system and waterways. Rainwater tanks can either be plumbed into a house to be used as (or part of) the water supply, or supply only outdoor uses such as garden watering and car washing. There are Building Act requirements if the tank is plumbed into the house.

Plan change 54 was notified in October 2020 in response to a drought resulting in low water levels in Auckland's storage dams. Decisions on the plan change were released on 10 December 2021. The purpose of the plan change was to remove the current resource consenting requirements for rainwater tanks in residential and rural zones. The plan change amends the rules for each residential and rural zone to specify "rainwater tanks" as a permitted activity and to include standards that impose a 1m height limit for tanks being located in front, riparian, lakeside or coastal protection yards, and to restrict the height of tanks to 3m in rear and side yards in some zones. This is supported by amending the definition of 'building' to exclude rainwater tanks when they are in residential and rural zones, and adding a definition of 'rainwater tank' as follows:

> *Rainwater tank A tank used for collecting and storing rainwater.*

The section 32 report for the plan change noted that it was part of a programme of works, aimed to enable voluntary rainwater tank installations by removing overly restrictive barriers, improving guidance and exploring incentivisation options and the mandating of rainwater harvesting on new developments. The common reason for a resource consent being triggered by a rainwater tank was often related to rainwater tanks over 1m in height being defined as a "building", and consequentially needing to follow development standard rules. With urban sites in particular becoming more space constrained, the options on where to place a rainwater tank can be limited, often infringing side and rear yard rules and building coverage thresholds.

The council's governing body has requested that additional work be undertaken to explore options under the current legal framework to enable the council to make rain tanks for water supply mandatory in certain situations e.g. new buildings[250]. Options under investigation include: further changes to the AUP requiring a resource consent or prohibiting certain types of development where a rainwater tank was not proposed; a law change to the Local Government Act or an environmental standard via the RMA (or the forthcoming replacement legislation under the Resource Management Reforms)[251].

Clustering development

Clustering development can enhance water quality and quantity outcomes by retaining a greater level of open space between or around buildings and other impervious areas.

Clustering for water related purposes is not explicitly included in the AUP policies in E1 or E38. The approach is provided for in E38 but only as a means of protecting Significant Ecological Areas. Policy E38.3(5) states:

> *(5) Provide for subdivision of residential zoned sites containing indigenous vegetation scheduled in the D9 Significant Ecological Areas Overlay where the significant ecological area is to be protected, and enable the same or a similar number of sites to be created as would be enabled if the site did not contain a significant ecological area*

If an applicant understood that clustered development can help to achieve water quality improvement and protect streams, they could gain some support from the subdivision policy related to stormwater (policy E38.3(22)):

> *(22) Require subdivision to be designed to manage stormwater:*
>
> *(a) in accordance with any approved stormwater discharge consent or network discharge consent;*
>
> *(b) in a manner consistent with stormwater management policies in E1 Water quality and integrated management;*
>
> *(c) by applying an integrated stormwater management approach to the planning and design of development in accordance with stormwater management policies in E1 Water quality and integrated management;*
>
> *(d) to protect natural streams and maintain the conveyance function of overland flow paths;*
>
> *(e) to maintain, or progressively improve, water quality;*
>
> *(f) to integrate drainage reserves and infrastructure with surrounding development and open space networks; and*

[250] Governing Body resolution GB/2020/56 (25 June 2020).
[251] Plan change 54 Enabling rainwater tank installation in residential and rural zones, s42A hearing report section 9.8 (page 63), July 2021.

(g) in an integrated and cost-effective way.

Due to the way consents are categorised in the Plans and Places resource consent database, it has not been possible to assess subdivision consents in terms of the concerns about brownfield sites not requiring a stormwater management plan and not applying the above policy if a land use consent has been granted prior to a subdivision consent. It is recommended below that further work is investigated regarding the effectiveness of subdivision processes.

Green infrastructure

Green infrastructure includes measures such as rain gardens, rain tanks, green roofs, swales and permeable paving. Such measures complement a water sensitive design (or integrated stormwater design) approach to land use planning by managing runoff on-site and allowing for infiltration and bio-retention. They can be used as part of a 'treatment train' approach of reducing stormwater volume or contaminants at source, followed by capture and treatment of overland flows, and finally the enhancement of receiving environments to enhance their stormwater management function (Lewis et al. 2015).

The AUP does not specifically preclude green infrastructure. However, it has little explicit encouragement or requirement for green infrastructure. AUP E10 allows for green infrastructure to be proposed as a form of stormwater hydrology mitigation. The plan does not specify or mandate particular methods but allows developers to propose a stormwater management device or system that will achieve the relevant hydrology mitigation requirements. Council staff from Healthy Waters have noted issues with green infrastructure being installed but then not maintained. Features such as rain gardens and permeable paving can have issues with infiltration due to the clay soils in parts of Auckland and due to compaction from earthworks. New monitoring approaches may be needed to ensure that green infrastructure retains its effectiveness over time.

11.3.5 Effectiveness and efficiency of the AUP

11.3.5.1 Indicator 1: Intensification protects freshwater systems and coastal water

The on-going degradation of streams and coastal waters in urban areas indicates that urban development is continuing to affect Auckland's waterways. It is not clear how much of the degradation relates to activities managed under the AUP or to other sources. However, intensification of development under the AUP increases the level of contamination sources and generally reduces the amount of open space and vegetation that can filter, shade and slow stormwater before it reaches streams and coastal waters.

The current state of Auckland's urban waterways illustrates the need for comprehensive consideration of the effects on water for all development so that all sources of contaminants, and changes to hydrological regimes, are minimised.

11.3.5.2 Indicator 2: Impervious areas

All of the residential zones (H1 – H6) include the following policy regarding impervious areas:

> "*Restrict the maximum impervious area on a site in order to manage the amount of stormwater runoff generated by a development and ensure that adverse effects on water quality, quantity and amenity values are avoided or mitigated.*"[252]

As noted above, the purpose statement for the maximum impervious area standard for all of the residential zones, includes seeking: *to manage the amount of stormwater runoff generated by a development, particularly in relation to the capacity of the stormwater network and potential flood risks.* For permitted activity development or a restricted discretionary activity that does not comply with the maximum impervious area standard (i.e. 35 per cent, 60 per cent or 70 per cent of the site), the matters of discretion in the applicable residential zone are consistent in requiring an assessment of any policy which is relevant to the standard, the purpose of the standard and the effects of the infringement. The assessment criteria for restricted discretionary activities across all of the residential zones also refer directly to the policy above.

Despite the consistency in the provisions across the zones, and there being clear direction in relation to the need to manage stormwater runoff from increases in impervious area, the resource consent analysis above indicates that requirements for stormwater mitigation are being inconsistently imposed on resource consents across the zones. The following observations were garnered through the resource consent analysis:

- High numbers of consents did not require any stormwater mitigation to account for the increases in impervious area. For example, 57 per cent of consents in the Rural and Coastal Settlement zone did not require mitigation and 19 per cent in the Mixed House Suburban zone.
- Where consents did require stormwater mitigation, there were also significant inconsistencies in the conditions imposed on resource consents to address the installation and ongoing operation and maintenance of devices. 64 per cent of consents sampled in the Large Lot zone (that required stormwater mitigation), did not impose any relevant condition, whereas the vast majority of the consents sampled in the MHS and MHU zones imposed a condition. Within the higher density zones (MHS, MHU, THAB), covenants and consent notices registered on the property title were more frequently used as a means of ensuring ongoing maintenance, with the majority imposed through a bundled subdivision consent. 93 per cent of consents in the MHU that required stormwater mitigation required a consent notice to be registered on the property title. In the larger lot zones (Large Lot, Rural and Coastal Settlement and Single House zones) less than 10 per cent of consents required a covenant or consent notice, including none in the Rural and Coastal Settlement zone.
- Consents in the higher density zones were often part of a bundled subdivision consent and where conditions were imposed regarding stormwater mitigation, they were often split over the two consents, with ongoing operation and maintenance requirements more often imposed through the subdivision consent. Anecdotally, this could lead to issues with interpretation and compliance, particularly in situations where the

[252] Policies: H1.3(5), H2.3(6), H3.3(6), H4.3(7), H5.3(7) and H6.3(8)

subdivision does not proceed. The bundled subdivision consents sampled assessed the maximum impervious area across the parent lot and very few imposed limitations on the future maximum impervious areas of the newly created lots. In theory, the impervious area of these lots could subsequently be increased to 60 per cent or 70 per cent (depending on the zone) as a permitted activity, with no additional requirements to mitigate increases in stormwater runoff.

- For activities involving four or more dwellings in the MHS and MHU zones, the assessment of the standard was very inconsistent. Some incorrectly included the standard in the matters requiring consent (as if it were a core standard); some rightfully included it in the s104 assessment as a matter of discretion and some did not include it at all, incorrectly stating that the council had restricted its discretion to the core standards and matters under C.1.9(3) only. Only one of the consents assessed noted the purpose of the standard in the assessment.
- The level of infringement is generally low, with the average exceedance above the maximum impervious area being less than five per cent in four of the six residential zones. This could indicate that the standard has been set at a level that is commensurate with the level of development anticipated within the zone. Higher levels of infringement were however observed in the Rural and Coastal Settlement zone (10 per cent) and THAB zone (6.8 per cent).

The findings above in relation to the level of exceedance are generally consistent with the analysis undertaken in preparation of a separate s35 plan effectiveness monitoring report: A Quality Built Environment[253]. This report assessed the provisions regarding the management of impervious areas in relation to the impacts of increasing stormwater runoff and responses to climate change. The analysis of resource consents for that report found that greater than one third of a sample of 130 consents for residential development across the higher density zones (MHU, MHS and THAB), infringed the maximum impervious area standard. As with this report, the level of exceedance across the zones (for development of 4+ dwellings) was found to be more often less than 5 per cent.

While both this report and the Quality Built Environment Report found that exceedances above the permitted level of impervious area are, on average, generally low, the cumulative effect of the increases in impervious area within a catchment could be significant. The analysis above indicates that across the six residential zones, an average of 26 per cent of consents did not require onsite stormwater mitigation (e.g. retention/detention tanks) to address increases in stormwater runoff volume and velocity. Unmitigated stormwater runoff can cumulatively have significant effects, not only on the capacity and performance of the public stormwater network, but also on natural receiving environments. There is no specific reference to cumulative effects within the relevant provisions.

It should also be noted that it is a requirement for connection to the Regionwide Stormwater Network Discharge Consent that where stormwater from small brownfield development, discharges to a stream via the network, or where the buildings will be within the 1% AEP (annual exceedance probability) floodplain, that the maximum impervious area standards for

[253] Auckland Council (2022b). Auckland Unitary Plan Section 35 Monitoring: B2.3 A Quality Built Environment.

the AUP be complied with. It was not possible to determine if these scenarios applied to the consents analysed.

The relevant policies, activity standards, matters of discretion and assessment criteria appear comprehensive and the maximum impervious area permitted activity limits appear to be appropriate and efficient, however this is not resulting in consistent management of the increases in stormwater runoff at the resource consent level. This indicates an issue with the effectiveness of the provisions and that greater guidance is required for those implementing them, either within the provisions themselves or through a practice and guidance note.

A practice and guidance note does currently exist for residential development in the mixed housing zones.[254] The document includes guidance on assessing maximum impervious area where it is not listed as a core standard but rather a matter of discretion. The advice states:

> *A key question arises when a development does not meet the metric requirements of one or more of these standards. Although for the activity of 4 or more dwellings this does not constitute an 'infringement' (as these are not standards to be complied with), a 'departure' from the standard could potentially lead to the conclusion that the purpose of a standard is not satisfied. However, it is important to underline that a departure from the standard should not automatically lead to the conclusion that the purpose of the standard has not been satisfied.*
>
> *However, the varied nature of these standards means that it will be harder for the purpose of some standards to be satisfied than others when the metric requirement is not satisfied. For some of these standards, the purpose is fundamentally linked to the metric. In these cases, a significant departure from the metric that is set by the standard is often likely to raise questions in terms of whether the purpose of the standard is satisfied. An example of this is the Daylight standard.*
>
> *In other cases, it may be possible to depart significantly from the metric measurement in the standard and achieve its purpose. An example of this is the maximum impervious area standard, which relates to the management of stormwater discharge. In this case, engineering solutions may be able to ensure the purpose of the standard is satisfied, even if the proposed activity exceeds the standard.*

This statement highlights that there is a difference in the assessment of a standard as a result of it being either a core or non-core standard. This was evident in the analysis of a sample of resource consents for activities involving four or more dwellings in the MHS and MHU, with some assessments giving no or very limited consideration to the standard. The approach to setting core standards was the subject of submission and consideration through the Independent Hearings Panel process. Through this process the AUP residential zone provisions were amended such that the activity tables included less core standards that must be complied with, with some of the standards removed from the table and instead included as matters of discretion. The standards included as matters of discretion were also amended from prescriptive limits requiring compliance to an outcome-led approach. Importantly, going beyond the limits set in the non-core standards is not considered an infringement. The core standards were determined as being those that address key matters that have the potential to

[254] Auckland Unitary Plan Practice and Guidance Note: Residential Development in Mixed Housing Zones. (available under the Regulations tab: Resource Consenting Practice & Notes, at www.aucklanddesignmanual.co.nz)

create adverse effects external to the site, but with a focus on effects on amenity values, while the non-core standards are those which relate to potential effects within the site. [255]

Arguably, the maximum impervious area standard should be included as a core standard for relevant activities (e.g. developments of 4 or more dwellings in the MHU and MHS zones) as it seeks to address adverse stormwater effects that occur beyond the site. While it could also be argued that consideration of amenity values should not take precedence over effects on the environment, the standard also clearly seeks to address adverse effects on amenity values[256]. Including the standard as a core standard for all residential development could lead to greater consistency in its application.

The practice and guidance note quoted above indicates that significant exceedances in the maximum impervious area standard are envisaged in scenarios where activities, for which the standard is a matter of discretion rather than a core standard, provide stormwater mitigation. Far greater guidance in this regard could be included, particularly in relation to what level of exceedance of the standard requires assessment by a Stormwater Technical Specialist (Resource Consents), the conditions to be imposed, and the methods of ensuring ongoing operation and maintenance of any stormwater mitigation device.

11.3.5.3 Indicator 3: Riparian areas

Objective B7.4.1(5)(d) seeks to avoid development where it will significantly increase adverse effects on water, unless those effects can be adequately mitigated. In urban residential areas, rules and standards for riparian areas are part of a suite of provisions which manage the adverse effects of land use intensification and development on water quality.

Where the standards for the maximum impervious area within a riparian yard and minimum riparian yard setback have been infringed, the AUP has generally been effective in managing adverse effects on river water, and 75 per cent of resource consents analysed provided mitigation in the form of stormwater management or planting.

The AUP has been less effective in protecting the function of riparian yards and does not clearly detail the role of riparian yards in the ongoing maintenance of water quality, habitats and water temperature. This is a more significant issue when the degree of infringement to the riparian yard setback standard is high and has been assessed by council's specialist ecologists as being inappropriate. In these instances, the AUP has not been effective at avoiding development that will have adverse cumulative effects on stream water quality. While effects on water quality within the application site are managed, the AUP does not provide opportunities to address how the permanent loss of riparian area may inhibit riparian function, future restoration efforts, or ensuring that there is sufficient space for riparian vegetation. While these matters can be addressed under the purpose statement of the yards standard, which includes "maintaining the function of riparian areas", they are not specifically outlined in detail within the matters of discretion or assessment criteria. The disconnect between the

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[255] Auckland Unitary Plan, Integrated Hearing Panel Report to Auckland Council, Hearing Topics 059 -063, Residential Zones, July 2016

[256] The fourth bullet point of the standard seeks: "*to limit paved areas on a site to improve the site's appearance and cumulatively maintain amenity values in a neighbourhood*".

riparian yard standard and resulting reductions to riparian function, water quality, and vegetation may be attributed to a number of factors within the AUP, including:

- The relevant plan provisions for riparian areas being dispersed across the Auckland-wide and zone chapters. In particular, policy E3.3(15), in chapter E3 seeks to “protect the riparian margins of lakes, rivers, streams, and wetlands from inappropriate use and development and promote their enhancement”. However, the rules and standards which manage riparian areas, including riparian margins, are under the zone chapters and chapter E15;
- The policies of the zone chapters not corresponding to the purpose statement of the riparian yard setback standard; and
- Inconsistency between the use of the terms ‘riparian margin’ and ‘riparian yard’.

It was also observed that it was not often recognised an exceedance to maximum impervious area or the need for vegetation removal were associated with locating a building within the riparian yard setback. Over a third of all resource consent decisions required a resource consent under all three provisions. The effects assessment can be jointly made and has a predominant focus on the management of stormwater runoff from additional impervious areas and amenity effects arising from the setback shortfall. Stream ecological functions were also considered in a limited number of cases. In these instances, the AUP does not provide the ability to consider the appropriateness or need of locating the building within the riparian yard.

For vegetation alteration or removal within riparian areas, the AUP has been effective in managing terrestrial ecological effects and securing mitigation in the form of replanting. Proposed replanting was also consistently supported by resource consent conditions that required the planting to take place and to be maintained for a specific period of time.

Replanting was also referenced as ‘replacement planting’ or being part of a ‘restoration plan’, suggesting that outcomes for restoration in accordance with policies B7.3.2(5)(d) and B7.3.2(6) are being achieved through mitigation actions when a resource consent is required. However, as raised by council’s specialist ecology staff and confirmed following a review of the AUP, the relevant zone and urban subdivision chapters do not require restoration and enhancement when development occurs. This can affect the effectiveness of the AUP in achieving restoration outcomes in accordance with the RPS. While this analysis indicates that restoration and enhancement outcomes are being achieved through mitigation actions, mitigation is only provided where a resource consent is required, rather than when residential intensification occurs

The AUP has been less effective at ensuring vegetation alteration or removal within riparian areas address water quality effects, in-stream temperature management, or the hydrological functions of the catchment. This is despite these matters being part of the matters of discretion under chapter E15 and policy E15.3(2). While replanting was consistently proposed and will address some of the adverse effects on water quality to an extent, by not specifically addressing water quality, there is the risk that effects arising from the permanent removal and reduction of riparian vegetation are not appropriately considered.

There were a limited number of instances where riparian vegetation was considered to be of low quality when assessing the effects of vegetation alteration or removal on ecological values. These cases indicate that there is opportunity for the AUP to provide clarification on the purpose of riparian vegetation in maintaining water quality, as it is unclear if their functions are sufficiently protected through the resource consent process. Irrespective of being of a low botanical quality or exotic species, riparian vegetation can act as retention and filtration for overland flows. Grass or dense ground covers can serve this purpose, but these functions are compromised when vegetation is permanently removed.

The lack of standards supporting the RPS policies regarding restoration outcomes also results in an inability to apply resource consent conditions under section 108AA of the RMA[257]. Being able to include consent conditions would be beneficial in instances where the proposed mitigation actions do not also achieve enhancement or restoration outcomes for water quality or if the extent of restoration work that has been proposed needs to be expanded. In these instances, the positive outcomes achieved should be additional to what is needed to mitigate adverse effects, as the RPS seeks that freshwater systems are restored and enhanced when development occurs. This issue also corresponds to where staff have raised concerns that it can be difficult to protect riparian areas through the resource consent process because the effects are often balanced against wider plan provisions. Where resource consents that infringe the riparian area standards are likely to be granted and, conditions that require restoration work to be provided or expanded may help secure improved outcomes for water quality in instances where it has not been proposed.

11.3.5.4 Indicator 4: Water sensitive design

The AUP includes a water sensitive design approach but refers to it as ‘integrated stormwater management’. Some elements of water sensitive design, such as green infrastructure, are allowed for rather than required or incentivised.

The use of ‘integrated stormwater management’ may be creating an unintended focus on stormwater management (i.e. how to get rainwater across and off a site) rather than a design approach that is focused on maintaining natural hydrological regimes by retaining waterways and minimising changes to quality, quantity and temperature of water leaving a site. There may be benefit in re-examining whether the policies in E1 and E38 could be re-framed as a water sensitive design approach in order to bring greater recognition of the wider understanding of maintaining natural hydrological regimes. This may facilitate stronger linkages to related material such as the water sensitive design guidance document for stormwater (GD04)[258] and to local examples of development design, streetscapes and incorporation of green infrastructure. The Auckland Water Strategy (Auckland Council 2022a: 34) includes a commitment to developing a package of non-regulatory and regulatory interventions to support the uptake of water sensitive design processes and the ongoing management of devices.

The recent plan change relating to enabling rainwater tanks was necessary because the AUP had been found to be a barrier to installing rainwater tanks on urban sites. The size constraints of such sites meant that tanks were often proposed in rear and side yards and required a

[257] Section 108AA states that a condition must not be included in a resource consent unless the application agrees to the condition or the condition is directly connected to adverse effects of the activity on the environment or an applicable district or regional rule or national environmental standard. Rules are referred to as standards under the AUP.
[258] Lewis et al. (2015) Water Sensitive Design for Stormwater, March 2015, Guidance Document 2015/004.

consent because they were within the definition of a 'building'. The plan change will make the AUP more effective by removing these constraints. Widespread adoption of rainwater tanks as part of new buildings may require additional incentives or consenting requirements in the AUP. Further work on the costs and benefits of alternative options is underway.

The AUP is unlikely to be very effective at encouraging clustering of development to achieve better water related outcomes. Clustering is not explicitly referred to in the water quality or subdivision policies. It can be read into the policies relating to 'integrated stormwater management' if the plan user understands it as a means of designing subdivision to achieve the listed purposes such as to 'maintain, or progressively improve, water quality' and to 'integrate drainage reserves and infrastructure with surrounding development and open space networks'. It may be possible to make clustering a more explicit consideration in the policies, or through inclusion of an appendix to the plan, or through a policy reference to GD04. Further work is required to determine the most effective approach.

Similarly, green infrastructure is not explicitly required under the AUP but can be proposed as a means of achieving the hydrological mitigation requirements in E10. The effectiveness of the AUP may be improved by including references to GD04 to illustrate how relevant standards can be met through the use of green infrastructure.

The AUP does not require a major change in policy direction as it already incorporates the key elements of water sensitive design. However, there is scope for refining the plan's provisions to place a greater emphasis on water sensitive design and to have more explicit linkages to related material such as GD04. Such changes could facilitate greater use of water sensitive design at a range of scales and assist with addressing the cumulative impacts of development occurring throughout the urban area.

11.4 Recommendations

It is recommended that the provisions addressing the management of impervious areas, riparian areas and water sensitive design be reviewed and amended, such that:

11.1 The maximum impervious area provisions (i.e. the standard, associated matters of discretion and/or assessment criteria) recognise the need for ongoing operation and maintenance of any stormwater management devices installed to address the increases in stormwater runoff; include a requirement to consider the cumulative effect of increases in stormwater runoff and better reflect the connection requirements of the region-wide stormwater Network Discharge Consent (category: NPS-FM related).

11.2 The maximum impervious area standard be included as a core standard for development involving four or more dwellings in the MHU and MHS zones and for all relevant development in the THAB zone. It is noted that this is also recommended in the s35 plan effectiveness monitoring report: A Quality Built Environment – Theme 3: Responding to Climate Change (category: NPS-FM related (or as part of a response to the Quality Built Environment report).

11.3 That existing practice and guidance notes for practitioners be amended (or new ones developed) to ensure greater consistency in the implementation of the provisions and imposition of resource consent conditions (category: process).

11.4 The purpose statement for the yards standard, being ‘to ensure buildings are adequately set back from lakes, streams and the coastal edge to maintain water quality’ is reinforced within the policies of the relevant zones. This will provide clearer direction to plan users on the role of riparian areas in maintaining water quality (category: NPS-FM related).

11.5 Include a clear link between the ‘riparian yard’ standard and the function and protection of riparian margins. This would help reinforce that the purpose of the riparian yard standard is not limited to protecting amenity values but also includes maintaining water quality/quantity (category: NPS-FM related).

11.6 Include a clear link between the vegetation alteration and removal provisions and water quality. This would provide plan users with a greater understanding of how vegetation within riparian areas maintains water quality. This would help reinforce that the purpose of the vegetation alteration and removal rules are not limited to protecting terrestrial ecology values (category: NPS-FM related).

11.7 Investigate including standards requiring riparian planting or enhancement when subdivision occurs, in accordance with the RPS policies B7.3.2(5)(d) and B7.3.2(6). As the RPS policies seek restoration outcomes, the requirements should be additional to actions that are needed to mitigate or offset adverse effects on waterbodies (category: NPS-FM related).

11.8 That a comprehensive analysis be undertaken to assess the effectiveness and efficiency of the provisions of Chapter E38 – Subdivision, including in relation to achieving integrated stormwater management and the management of riparian areas (category: further investigation).

11.9 That the integrated stormwater management policies be refined so that they explicitly refer to the stormwater related aspects of ‘water sensitive design’ in order to provide a stronger linkage to the wider understanding of that approach (category: NPS-FM related).

11.10 Include references to the guidance document relating to water sensitive design for stormwater (GD04) in the plan so that it is a more clearly mandated example of how to achieve the relevant policies and standards relating to water sensitive design and green infrastructure (category: NPS-FM related).

11.5 Future change under the NPS-FM

Auckland Council is required to make changes to the AUP provisions to give effect to the NPS-FM and these changes must be publicly notified by December 2024. An outline of the NPS-FM requirements is contained in the introduction to this report at 1.3.2.1.

Amongst other things, the NPS-FM requires the council to improve degraded waterbodies and maintain or improve all other waterbodies so that they achieve national bottom lines, including relevant measures for stormwater contaminants such as sediment and heavy metals. As noted in the chapter regarding stormwater discharges, both SoE monitoring and FWMT modelling have clearly shown that this will be a difficult given that the majority of urban streams monitored or modelled are currently degraded by such contaminants, with most showing trends of continuing degradation or only slow rates of improvement.

When managing the effects of intensification on water quality in urban areas, the maximum impervious area standard in the residential zones (AUP Chapters H1 – H6) is complementary to the stormwater management provisions of the AUP, including 'Chapter E8 Stormwater - discharge and diversion' and 'E10 Stormwater management area - Flow 1 and Flow 2'. Riparian areas are also recognised as sensitive environments, with provisions managing impervious areas, building location, and vegetation removal within them. While much of the NPS-FM applies specifically to regional plans, there are also regional policy statement and district plan requirements, and to achieve integrated management, the impervious surface and riparian yard provisions, as district planning provisions, will play a role in achieving the outcomes for watercourses and receiving environments sought by the NPS-FM.

The NPS-FM requires that every regional council must develop long-term visions for freshwater in its region and include those long-term visions as objectives in its regional policy statement[259]. Auckland Council will need to consider whether to also amend other parts of the regional policy statement to give effect to the new objectives. District plans are required to include provisions that promote positive effects and avoid, remedy or mitigate the adverse effects of urban development on water bodies, freshwater ecosystems and receiving environments. The interpretation of any such provisions must be informed by the fundamental concept of the NPS-FM – Te Mana o te Wai.

The new requirement for district plans to include provisions that "promote positive effects" on the health and well-being of water bodies (NPS-FM clause 3.5), rather than only managing the effects of activities, may require a significantly more restrictive use of district plan tools such as impervious area limits and riparian yards. To ensure that future intensification reverses or slows the current degradation trends, such tools may need to be increased in scope (e.g. a higher impervious area percentage applied across all the residential zones) or change from a 'management of effects' approach under a restricted discretionary activity regime to an 'avoid' or 'bottom line' approach with a non-complying or prohibited activity for an infringement of the relevant standards). There may also be a need for conditions that require works that address more than the direct effects of the intensification work. Under the current framework, the effects of infringing a standard can be addressed through measures such as installing a rainwater tank. Achieving a positive effect and long-term improvement of waterways will require additional work such as riparian planting, pest control and control of contaminant sources. If such works cannot be provided on-site for impervious area infringements, there may need to be new tools such as conditions that require funding contributions to programmes that provide positive effects within the same catchment.

> *Clause 3.2 Te Mana o te Wai*
>
> *(4) In addition to subclauses (1) to (3), Te Mana o Te Wai must inform the interpretation of:*
>
> *(a) this National Policy Statement; and*
>
> *(b) the provisions required by this National Policy Statement to be included in regional policy statements and regional and **district plans**.*

[259] NPS-FM clause 3.3(1).

Clause 3.5 Integrated management

*(4) Every territorial authority must include objectives, policies, and methods in its **district plan** to promote positive effects, and avoid, remedy, or mitigate adverse effects (including cumulative effects), of urban development on the health and well-being of water bodies, freshwater ecosystems, and receiving environments.*

The NPS-FM and Freshwater NES also introduce new regulations and frameworks that apply to rivers and natural wetlands. Under the Freshwater NES, new regulations manage vegetation clearance and earthworks within 10m from a natural wetland, and the taking, use, damming, diversion, or discharge of water within 100 m from a natural wetland. By introducing consenting requirements for various activities that affect the edge of natural wetlands, the Freshwater NES will provide more protection to these areas than is currently provided for under the AUP, which relies on the identification of wetlands within the Wetland Management Areas Overlay for activities such as vegetation removal around a wetland.

In relation to the management of adverse effects on natural inland wetlands and natural rivers, the NPS-FM introduces a new effects management hierarchy which requires that any activity first avoid adverse effects (including cumulative effects), prior to consideration of minimisation or remediation. This could lead to greater emphasis on avoiding development within riparian yards with less acceptance of mitigating effects.

The NPS-FM also places greater emphasis on managing cumulative effects, which as noted above, is lacking in the current provisions for maximum impervious area and riparian areas. It is currently difficult to assess cumulative effects on a catchment-wide basis, however the FWMT (see section 2.2.1.3) will likely assist, particularly through the ability to model land cover scenarios and the subsequent impacts of increasing impervious area or reductions in riparian vegetation on receiving environments. This could lead to more stringent requirements for on-site stormwater mitigation, particularly within the catchments of sensitive receiving environments.

12 Land use change in growth areas

This chapter considers how effective and efficient the objectives, policies, rules and other methods of the AUP have been in meeting the outcomes intended by the Regional Policy Statement with respect to the impacts of land use change in growth areas on water and waterbodies. The focus of this chapter is on how land use change has been provided for through structure plans and plan changes, whereas other chapters focus more on resource consent processes.

The AUP aims to provide for growth through a quality compact urban form, with limits on the extent of greenfield development. This report considers the effectiveness of the AUP provisions relating to the effects of greenfield development on freshwater systems and water quality. Other s35 monitoring topic reports will examine the effectiveness of the AUP in terms of how much urban development has occurred since the AUP became operative.

Urban growth in greenfield areas places significant pressure on freshwater systems and water quality. However, large-scale development is also an opportunity for ensuring that new development minimises its impacts on water resources.

The past expansion of Auckland's urban area has typically involved extensive piping and infilling of streams, and large-scale earthworks that can contribute significant amounts of sediment to waterways. Changing from rural to urban land use also brings a new range of potential contaminants. Changes to the hydrological regime from the increase in impervious areas, and less infiltration, can result in greater stream bank erosion which affects freshwater ecosystems and increases sediment supply to receiving environments. It can also reduce the stream base-flow which affects the health and extent of streams.

Large-scale greenfield development allows for integrated consideration of how the location and form of development can be planned to retain and enhance natural waterways and include mitigation measures such as riparian planting and runoff treatment systems. This can address cumulative impacts in ways that are seldom possible with redevelopment in existing urban areas. Within urban areas, redevelopment is often sporadic and dispersed across an area. Redevelopment site size can be a constraint on options as there is less room for new treatment systems, riparian restoration or for retaining the natural extent and form of waterways.

The AUP establishes that greenfield development should be preceded by structure planning and sets out several water-related requirements for structure plans. Under the Unitary Plan, a structure plan is a non-statutory plan that sets out the expected pattern, location and extent of different types of land use. It integrates land use planning with infrastructure provision and includes guidance regarding how development should be staged and how it should be managed to achieve social and environmental objectives. Plan changes then give effect to a structure plan by amending the regulatory planning regime through a public process of submissions and hearings that follows the processes prescribed in the RMA. Generally, a structure plan results in new location-specific provisions in the Precincts chapter of the AUP. There is no legal requirement for a plan change to be consistent with a structure plan. Plan changes can be developed that follow a different form of development or rely on a different sequence of infrastructure provision. Plan changes can also be developed without first preparing a structure plan but the s32 report for such a plan change would need to explain why it did not follow the process directed by the RPS provisions.

The RPS provisions in B7.3 and B7.4 related to greenfield development apply to structure plans and to plan changes. These RPS provisions are complemented by regional plan objectives and policies related to managing the adverse effects of stormwater runoff from greenfield development on freshwater systems, freshwater and coastal water.

This chapter of the report examines structure plans and plan changes in order to determine how effectively the suite of AUP provisions are influencing the scale and form of development in growth areas with respect to the consequent effects on freshwater systems. Resource consents for development activities are not included in this section because they are addressed in other parts of this report relating to streams and wetlands, stormwater discharges, and sediment from land disturbance.

The effectiveness of some existing precinct provisions is also examined in this chapter. When the AUP became operative, various greenfield areas were zoned as appropriate for development, with the form of development subject to comprehensive precinct provisions. In cases such as Long Bay and Flat Bush, these were largely the result of extensive planning processes for legacy district plans. In other cases, the precincts were developed or expanded as part of the AUP development. As the precincts have been implemented, they have demonstrated some issues regarding the provisions relating to water management and freshwater systems.

The effectiveness of the process that was used to identify the areas zoned for immediate development or as Future Urban Zone is not within the scope of this report. Identifying an area as appropriate for development does create a valid expectation that the land will be urbanised and will generally lead to some decrease in the value of freshwater systems and coastal water, even with mitigation measures in place. The decisions on zoning were required to give effect to the whole RPS, including B7.3 and B7.4. This report examines the effectiveness of the relevant precinct provisions in managing the effects of development on waterways, rather than re-visiting the matter of whether all of the relevant areas should have been rezoned.

12.1 Indicators and measures

12.1.1 Outcomes

The outcomes sought in B7.3. and B7.4 for land use change in growth areas are set out principally in policies B7.3.2(1) and B7.4.2(1). The degree of duplication in the two policies demonstrates the interconnectedness in the actions needed to achieve good outcomes for freshwater systems and for water quality. The differences between the policies are shown below in square brackets (the wording of policy B7.3.2(1) is indicated by “B7.3” and policy B7.4.2(1) is indicated by “B7.4”):

(1) Integrate the management of subdivision, use and development and [freshwater systems [B7.3] / coastal water and freshwater [B7.4]] by undertaking all of the following:

(a) ensuring water supply, stormwater and wastewater infrastructure is adequately provided for in areas of new growth [or intensification [B7.3] /intensification is not included in B7.4.2(1)];

(b) [ensuring [B7.3] / requiring [B7.4]] catchment management plans form part of structure planning process;

(c) controlling the use of land and discharges to minimise the adverse effects of runoff on [freshwater systems [B7.3] / water [B7.4]] and progressively reduce existing adverse effects where those [systems or water [B7.3] / water [B7.4]] are degraded; and

(d) avoiding development where it will significantly increase adverse effects on [freshwater systems [B7.3] / water [B7.4]], unless these adverse effects can be adequately mitigated.

Several other RPS policies are also relevant to development of greenfield areas. For example, B7.3.2(4) regarding the loss of waterways and B7.3.2(6) regarding restoring and enhancing freshwater systems when development, change of land use, and subdivision occur.

The outcomes sought by the RPS are reflected in the indicators developed for this chapter as follows:

- water supply, stormwater and wastewater infrastructure is adequately provided for in areas of growth
- catchment planning is being done as part of the structure planning process
- the adverse effects of development on freshwater systems and water are being avoided or minimised.

The relationship between the AUP objectives and policies and the indicators is set out in Appendix C. The measures and information sources for each indicator are shown in Table 12.1.

Table 12.1 Indicators, measures and information sources used for assessing the effectiveness of the AUP provisions relating to land use change in growth areas.

Indicators	Measures	Information Sources
1. Water supply, stormwater and wastewater infrastructure is adequately provided for in areas of growth	Whether infrastructure is adequately provided for in structure plans and plan changes	Desktop ‘traffic light’ assessment of: • structure plans • plan changes in structure plan areas • plan changes in other areas Workshops with council staff
2. Catchment planning is being done as part of the structure planning process	Whether catchment management plans have been developed as part of the development of structure plans Whether catchment management plans have been	

Indicators	Measures	Information Sources
	updated for plan changes (or prepared if there was no structure plan)	
3. The adverse effects of development on freshwater systems and water are being avoided or minimised	Whether structure plans and plan changes include provisions that: • protect streams and wetlands • protect riparian margins • provide for riparian enhancement • protect sensitive and high value areas and enhance degraded areas • minimise the discharge of contaminants • minimise changes in hydrology • promote efficient use of water	
	Identification of issues with existing AUP precincts in managing the effect of urban growth on freshwater systems and water quality	Workshops with council staff

12.1.2 "Traffic light" assessment approach

The indicators above cover several different inter-related matters that could be addressed in a range of ways in a structure plan or plan change. To enable a systematic assessment of the various structure plans and plan changes, the measures were further refined into a set of topics and key questions to enable a "traffic light" approach of classifying plans as green, orange or red for each key question. This output allows for a quick visual comparison of the different plans and also ensures that each policy matter is assessed for each structure plan or plan change.

The topics and key questions directly respond to matters from the B7.3 and B7.4 policies, the requirements for structure plans set out in AUP Appendix 1 (a RPS provision), and the E1 policies relating to stormwater management in greenfield areas, particularly policy E1.3(8):

> *(8) Avoid as far as practicable, or otherwise minimise or mitigate, adverse effects of stormwater runoff from greenfield development on freshwater systems, freshwater and coastal water by:*
>
> *(a) taking an integrated stormwater management approach (refer to Policy E1.3.10);*
>
> *(b) minimising the generation and discharge of contaminants, particularly from high contaminant generating car parks and high use roads and into sensitive receiving environments;*

(c) minimising or mitigating changes in hydrology, including loss of infiltration, to:

(i) minimise erosion and associated effects on stream health and values;

(ii) maintain stream baseflows; and

(iii) support groundwater recharge;

(d) where practicable, minimising or mitigating the effects on freshwater systems arising from changes in water temperature caused by stormwater discharges; and

(e) providing for the management of gross stormwater pollutants, such as litter, in areas where the generation of these may be an issue.

The topics and key questions are set out in Table 12.2. Where a question refers to a structure plan, it also applies to plan changes if that is the document being assessed.

Table 12.2 Key questions for the assessment of land use change in growth areas.

	AUP provision	Topic	Key question
1	B3.2.2(1) B7.3.2(1)(a) B7.4.2(1)(a) B7.4.2(10)(a) App 1.4.4(6)	Infrastructure	Is water supply, stormwater and wastewater infrastructure adequately provided for?
2	B7.3.2(1)(b) B7.4.2(1)(b) App 1.5(2)(a) App 1.5(3)(e)	Catchment management plan	Was a catchment management plan and freshwater assessment prepared as part of the structure plan?
3	B7.3.2(4) E1.3(10)(b)	Stream loss	Are streams, rivers, lakes and wetlands protected from permanent loss or significant modification?
4	B7.3.2(4) B7.3.2(5)(d)(iii)	Riparian margin	Is the riparian margin protected?
5	B7.3.2(3) B7.3.2(5)(d) B7.3.2(6) E1.3(10)(c) App 1.4.2(3)	Enhancement	Is stream and wetland restoration and enhancement provided for?
6	B7.2.2(5) B7.3.2(5)(a) B7.3.2(5)(d)(iv) App 1.4.2(1)	Overlays	Did the location, form and density of development areas have regard to the Significant Ecological Areas Overlay, and the overlays relating to streams, wetlands and aquifers?
7	B7.3.2(3) B7.4.2(6)	Degraded areas	Did the structure plan aim to progressively improve freshwater systems and water quality in areas identified as being degraded?
8	B2.2.2(2)(i) B6.3.2(2) B7.4.2(5)	Mana whenua values	Did the structure plan aim to avoid adverse effects on mana whenua values associated with water and restore areas where they have a particular interest?

	AUP provision	Topic	Key question
	B7.4.2(7)(d) App 1.5(3)(b)		
9	B7.4.2(7) B7.4.2(9)(a) E1.3(8)(b) E1.3(12) App 1.4.2(4)	Contaminants	Does the development minimise the generation and discharge of contaminants, particularly from high contaminant generating car parks and high use roads?
10	B2.2.2(2)(i) B7.4.2(7) B7.4.2(9)(a) E1.3(8)(b) E1.3(12) App 1.4.2(4)	Sensitive receiving environments	Does the development minimise the generation and discharge of contaminants, particularly into sensitive receiving environments?
11	B7.3.2(5)(b) E1.3(8)(c) E1.3(10)(d) App 1.4.7(3)	Hydrology	Does the development minimise or mitigate changes in hydrology, including loss of infiltration?
12	E1.3(8)(d)	Water temperature	Does the development minimise or mitigate the effects on freshwater systems arising from changes in water temperature caused by stormwater discharges?
13	E1.3(8)(e)	Litter	Does the development provide for the management of gross stormwater pollutants, such as litter, in areas where the generation of these may be an issue?
14	B7.4.2(12) B7.4.2(14)	Efficient use	Does the structure plan promote the efficient use of freshwater and geothermal water and enable harvesting and storage of freshwater and rainwater to meet increasing demand?

The key questions were assessed for each of the structure plans that have been prepared by Auckland Council since the AUP became operative, and for a series of plan changes that enable the development of urban growth in greenfield areas or provide for large-scale land use change. The plan changes that were reviewed include private plan changes and council plan changes. The most recent publicly available version of the structure plan or plan change was assessed. In some cases, this is a finalised or operative version. In other cases, it is a proposed version that is yet to go to a hearing or to have a decision released. The plan changes were selected to include those within the same area as a structure plan area and those in other areas. This allows consideration of whether the different requirements set out in the AUP are more effectively addressed through structure plans or plan changes, and allows a comparison of different types of plan change.

Each of the key questions was considered by noting any evidence of the relevant matter in a spreadsheet and then summarising the result as: ‘yes’, ‘no’, or ‘partly or unclear’. This allowed the results to be depicted in summary tables using a traffic light system of green, red and orange. The summary tables are set out below. Appendix G has the more detailed assessment with notes setting out the basis for giving a plan a ‘yes’, ‘no’, or ‘partly or unclear’ for each key question.

The desktop assessment of structure plans and plan changes was augmented by a collation of relevant issues raised by council experts in workshops about the section 35 monitoring programme. The experts were from Regulatory Services, Healthy Waters and the Biodiversity team.

The workshops also identified several issues found in applying the existing AUP precincts that provide for urban growth in greenfield areas. These issues have been collated and assessed with reference to indicator 3.

12.2 Findings and analysis

12.2.1 Structure plan and plan change identification

The council has prepared five structure plans since the AUP became operative[260]. These are all in areas that the AUP identifies as Future Urban Zone (FUZ). The FUZ is a transitional zone which is applied to greenfield land that has been identified as suitable for urbanisation. The five structure plans and their related plan changes are listed in Table 12.3[261]. The dates listed in the table for plan changes relate to the version that was considered for this review. The dates for the structure plans are the dates that the plans were finalised. The dates for plan changes are the date they were notified for submissions or made operative, whichever is most recent. The status of each plan changes is listed in Appendix G. The locations of the structure plan areas are shown in Figure 12.1.

Table 12.3 Structure plans and plan changes within structure plan areas.

Structure Plan		Plan Change	
Whenuapai	Sept 2016	PC 5 Whenuapai (council)	Sept 2017[262]
		Draft variation 1 to PC 5 (council)	April 2021
Warkworth	June 2019	PC 25 Warkworth North (private)	March 2020
		PC 40 Clayden Rd – Warkworth (private)	June 2021
Drury-Opāheke	August 2019	PC 48 Drury Centre Precinct (private)	August 2020[263]
		PC 49 Drury East Precinct (private)	August 2020
		PC 50 Waihoehoe Precinct (private)	August 2020
		PC 51 Drury 2 Precinct (private)	August 2020[264]

[260] The structure plans are available at https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/place-based-plans/structure-plans/Pages/default.aspx
[261] The plan changes are available at https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/unitary-plan/auckland-unitary-plan-modifications/proposed-plan-changes/Pages/default.aspx
[262] The analysis in this report relates to the notified version of Plan Change 5 that was notified in September 2017. Plan Change 5 was withdrawn by the council on 16 June 2022.
[263] Decisions for plan changes 48, 49 and 50 were released on 5 May 2022.
[264] Decisions on Plan Change 51 were released on 24 February 2022.

Structure Plan		Plan Change	
		PC 52 520 Great South Road, Papakura (private)	August 2020[265]
		PC 58 470 and 476 Great South Rd and 2 and 8 Gatland Rd, Papakura (private)	Dec 2020
		PC 61 Waipupuke (private)	Jan 2021[266]
Pukekohe-Paerata	August 2019	No plan change.	
Silverdale West Dairy Flat Industrial Area	April 2020	No plan change.	

[265] Plan Change 52 became operative on 10 December 2021.
[266] The analysis in this report relates to the version of Plan Change 61 that was notified in January 2021. In December 2021, the hearing commissioners issued a decision to decline the plan change. That decision was appealed to the Environment Court in February 2022.

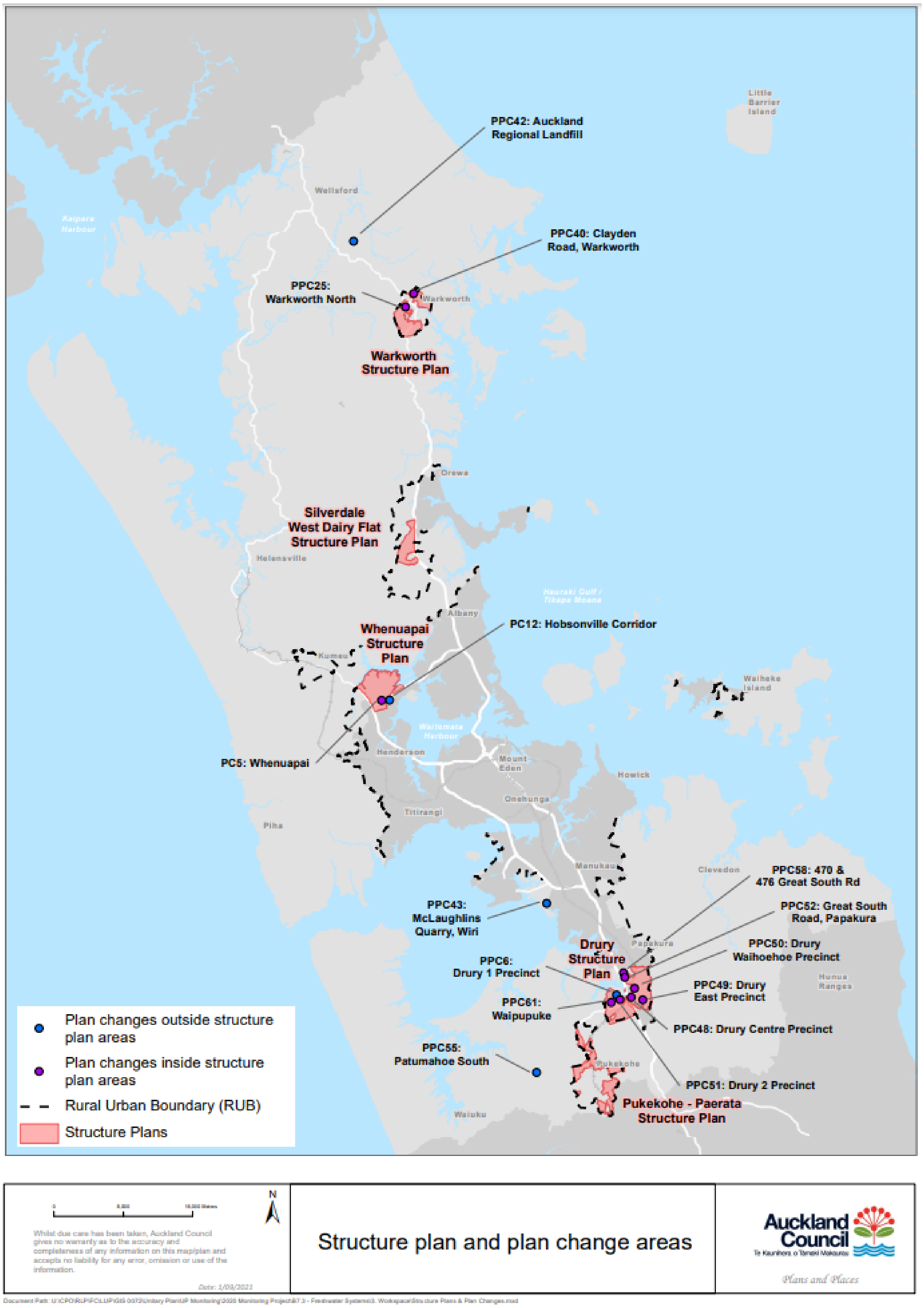

Figure 12.1 Map of structure plan and plan change areas[267].

All of the plan changes are private plan changes with the exception of PC 5 at Whenuapai. The council has produced a draft variation 1 to PC 5 for public feedback prior to formal notification. This document was included in the analysis as it responds to various changes in the planning regime since PC 5 as notified, including changes related to the granting of the stormwater Network Discharge Consent.

There have been seven plan changes notified in the Drury Structure Plan area. Two of these plan changes (PC 48 and PC 61) were assessed as examples. PC 48 was developed as part of an integrated package with PC 49 and 50 which apply to adjacent areas. PC 52 and 58 apply to relatively small areas at the northern part of the structure plan area.

The other plan changes that were assessed are listed in Table 12.4 and are shown on the map in Figure 12.1. These were selected to demonstrate a range of different situations. The purpose of PC 6 was to change Future Urban Zone land to residential zones and is just to the north of the Drury Structure Plan area. PC 55 is outside of the Rural Urban Boundary and seeks to change rural production land adjacent to the Patumahoe township to urban land uses. PC 12 makes amendments for stormwater management on industrial land at Hobsonville. PC 42 provides for a new regional landfill at Wayby Valley (Dome Valley). This is not 'urban growth' but several aspects of the same AUP provisions are relevant as it is a large scale land use change outside of the existing urban area. The request for PC 42 was declined by the commissioners and so the assessment in this report refers to the notified version of the plan change, and not the amendments that were proposed by the applicant through the hearing process. PC 43 'McLaughlin's Quarry' changes the zoning at a former quarry site in Wiri. The zoning was no longer appropriate as the majority of the site has already been developed for industrial activities through resource consent processes. The PC 43 area is within the rural urban boundary and could be considered 'brownfield' rather than 'greenfield' development. It is included in this chapter of the report as it provides for growth of industrial activities and uses a plan change to manage effects on streams and water quality, rather than consent processes. The decisions version of PC 43 was assessed as the plan change request was granted but not operative at the time of the assessment.

Table 12.4 Plan changes included in the assessment that are outside of structure plan areas.

Plan Change		Purpose
PC 6 Auranga B1 Drury West (private)	Feb 2020	FUZ to urban (83.05 ha), applying Drury 1 precinct to the land
PC 12 Hobsonville Corridor Precinct (council)	Sept 2019	Adds a new sub-precinct for Light Industry zoned land. Addresses urban design, transport and stormwater issues.
PC 42 Auckland Regional Landfill – Wayby Valley (private)	March 2020[268]	Rural to landfill, new precinct
PC 43 McLaughlins Quarry, Wiri (private)	July 2021[269]	Quarry zone to industrial and open space, new precinct

267 PPP indicates a private plan change; PC is a plan change prepared by Auckland Council.
268 PC 42 was declined by the hearing commissioners on 30 August 2021.
269 PC 43 was made operative on 12 November 2021.

Plan Change		Purpose
PC 55 Patumahoe South (private)	October 2020[270]	Rural to urban (34.5 ha), applying Patumahoe Precinct to the land

The summary of the desktop assessment of structure plans and plan changes is shown below. The notes that support the relevant assessments are included in Appendix G.

12.2.2 Structure plans

The assessment of the five structure plans found that they generally demonstrated a good response to the key questions. Table 12.5 shows that they have a 'yes' or 'partly or unclear' rating for almost all questions. A catchment management plan was prepared for every structure plan and all of the plans have explicit recognition of the need to avoid stream loss and protect riparian margins. They all take into account mana whenua values, the AUP overlays, and the need to manage contaminant inputs to sensitive receiving environments. The AUP provisions are ensuring that freshwater systems and water quality are considered comprehensively in structure plan processes.

Table 12.5 Structure plan assessment summary.

		Whenuapai Structure Plan	Drury-Opaheke Structure Plan	Pukekohe-Paerata Structure Plan	Warkworth Structure Plan	Silverdale West Dairy Flat Industrial Area Structure Plan
		Sep-16	**Aug-19**	**Aug-19**	**Jun-19**	**Apr-20**
1	Infrastructure provided for	Yes	Yes	Partly or unclear	Yes	Partly or unclear
2	Catchment management plan	Yes	Yes	Yes	Yes	Yes
3	Stream loss	Yes	Yes	Yes	Yes	Yes
4	Riparian margin	Yes	Yes	Yes	Yes	Yes
5	Enhancement	Yes	Yes	Partly or unclear	Partly or unclear	Yes
6	Overlays	Yes	Yes	Yes	Yes	Yes
7	Degraded areas	No	Yes	Yes	Partly or unclear	Yes
8	Mana whenua values	Yes	Yes	Yes	Yes	Yes
9	Contaminants	Yes	Partly or unclear	Partly or unclear	Partly or unclear	Partly or unclear
10	Sensitive receiving environments	Yes	Yes	Yes	Yes	Yes
11	Hydrology	Partly or unclear	Yes	Partly or unclear	Partly or unclear	Partly or unclear
12	Water temperature	Partly or unclear	Partly or unclear	No	No	Yes

[270] PC 55 was granted by the hearing commissioners on 17 June 2022.

		Whenuapai Structure Plan	Drury-Opaheke Structure Plan	Pukekohe-Paerata Structure Plan	Warkworth Structure Plan	Silverdale West Dairy Flat Industrial Area Structure Plan
13	Litter	No	No	No	No	No
14	Efficient use	No	Partly or unclear	No	Yes	No

The nature of structure plans means that while the relevant matters were included, in many cases this was at a very general level. Structure plans have indicative maps and narratives around the type of development and objectives to be obtained. They are not intended to provide the same level of detail and direction as a plan change. For aspects such as stream loss and riparian margins, there was often a brief acknowledgement of the issue with little detail on how it would be achieved. Some examples of this issue include:

- General acknowledgment of the need to 'protect waterways' and 'streams should be retained' (Whenuapai); 'streams are identified as areas unsuitable for development but their extent needs to be confirmed at the plan change and consent stage' (Drury-Opaheke); 'there are opportunities to protect and enhance streams' (Pukekohe-Paerata). The Warkworth Structure Plan is more specific with the 'avoidance of watercourse loss' listed as a constraint on development (page 128).
- The Whenuapai structure plan has a map of indicative riparian margins (page 84) and states that a 10 to 20 minimum yard setback from the edge of permanent and intermittent streams is required (page 55). However, this is in a section noting that the AUP recognises the importance of riparian margins and it appears to be re-stating what the plan requires in the usual zone provisions.
- The Drury-Opaheke Structure Plan notes that it generally proposes a 20 metre riparian restoration margin along streams with the actual width to be determined in plan change and consent stages. The riparian margins will be protected by either esplanade reserves or other methods (page 20). The Silverdale Structure Plan is more specific, stating that a 10m margin will be provided either side of intermittent streams and a 20m margin along permanent streams (page 35).
- The AUP overlays (e.g. Significant Ecological Areas, High-use Aquifer Management Areas, Natural Stream Management Areas, Wetland Management Areas Overlays) were sometimes listed in summaries of relevant AUP matters rather than having separate consideration in proposed management actions or in the structure plan mapping (Whenuapai Structure Plan page 32, Drury-Opaheke Structure Plan page 37).

Some key questions have a lower level of positive response. Four of the five structure plans have 'partly or unclear' for question 9 regarding the generation and discharge of contaminants and for question 11 regarding mitigation of changes in hydrology. Very little evidence was found for a response to questions 12, 13 and 14 regarding water temperature, litter and the efficient use of water. These last three questions relate to specific matters from policies in chapter E1 and B7.4 but are not reflected in the Appendix 1 matters that structure plans must address. Some examples of this issue are:

- The Whenuapai Structure Plan states that "where site specific activities identify the potential for High Contaminant Generating Activities, there will be a requirement for additional targeted treatment to be provided" (page 55) but it is not set out what these requirements would be. The Drury Plan does not mention high contaminant generating activities but has more general support for water sensitive design and notes that the sensitivity of the Manukau Harbour means water management will need to be "exemplary" (page 45).
- The Whenuapai Structure Plan does not refer to minimising changes in hydrology but there are several references to water sensitive design, an approach which includes managing hydrological change as well as stormwater contaminants. The Pukekohe-Paerata Structure plan does not refer to changes in hydrology but does recognise the importance of riparian margins. These can help with retaining infiltration and regulating flows to rivers.
- Regulation of water temperature in streams is noted in the Silverdale Plan as part of the justification for riparian planting. In the other structure plans it is not mentioned or is covered more generally by support for water sensitive design.
- Litter and gross pollutants are not mentioned in any of the structure plans, including the Silverdale Plan which relates to an industrial area and can be expected to have yards with litter that could wash into the stormwater system.
- Efficient use of water resources is only mentioned explicitly in the Warkworth Structure Plan but the Drury Plan has support for rainwater storage and reuse tanks as part of the water sensitive design principles.

12.2.3 Plan changes in structure plan areas

The assessment of plan changes in structure plan areas showed a similar pattern to the structure plan assessment, but with some improvements in the areas that were weak in the structure plans, including hydrology and litter (see Table 12.6). Water temperature and the efficient use of water are still not addressed particularly well.

Table 12.6 Assessment summary for plan changes in structure plan areas.

		Whenuapai Structure Plan		Drury-Opaheke Structure Plan		Warkworth Structure Plan	
		PC 5 Whenuapai	Draft variation 1 to PC 5 Whenuapai	PC 48 Drury Centre Precinct	PC 61 Waipupuke	PC 25 Warkworth North	PC 40 Clayden Road - Warkworth
		21-Sep-17	**19-Apr-21**	**27-Aug-20**	**28-Jan-21**	**26-Mar-20**	**11-Jun-21**
		Council, proposed	Council, draft	Private, proposed	Private, proposed	Private, appealed	Private, operative
1	Infrastructure provided for	Partly or unclear	Partly or unclear	Partly or unclear	Yes	Yes	Yes
2	Catchment management plan	Yes	Yes	Yes	Yes	Yes	Yes

		Whenuapai Structure Plan		Drury-Opaheke Structure Plan		Warkworth Structure Plan	
		PC 5 Whenuapai	Draft variation 1 to PC 5 Whenuapai	PC 48 Drury Centre Precinct	PC 61 Waipupuke	PC 25 Warkworth North	PC 40 Clayden Road - Warkworth
3	Stream loss	Partly or unclear	Partly or unclear	No	Yes	Partly or unclear	Partly or unclear
4	Riparian margin	Yes	Yes	Yes	Yes	Partly or unclear	Yes
5	Enhancement	Yes	Yes	Partly or unclear	Yes	Yes	Yes
6	Overlays	Partly or unclear	Partly or unclear	Yes	Yes	Yes	Yes
7	Degraded areas	Yes	Yes	Partly or unclear	Yes	Partly or unclear	Yes
8	Mana whenua values	Partly or unclear	Partly or unclear	Partly or unclear	Yes	Yes	Yes
9	Contaminants	Partly or unclear	Yes	Yes	Partly or unclear	Yes	Yes
10	Sensitive receiving environments	Yes	Yes	Yes	Yes	Partly or unclear	Yes
11	Hydrology	Yes	Yes	Yes	Yes	Yes	Yes
12	Water temperature	Partly or unclear	Partly or unclear	Partly or unclear	No	No	No
13	Litter	Yes	Yes	Partly or unclear	Yes	No	No
14	Efficient use	No	No	No	Partly or unclear	Yes	No

The response to the 'infrastructure provided for' question is less positive in the plan changes than structure plans for the Whenuapai and Drury Centre Precinct plan changes. This may be because structure plans have a core purpose to integrate land use planning and infrastructure planning, whereas the plan changes are confined to RMA matters. Infrastructure provision is subject to RMA controls but is largely managed under non-RMA council processes. Other monitoring topic reports may include a fuller review of potential issues caused by plan changes in the Future Urban Zone that are out of sequence with the timing expected in structure plans and the council's Future Urban Land Supply Strategy. Staff from Healthy Waters have noted that wastewater infrastructure provision has become very challenging due to the unpredictable location, size and density of growth areas provided for in plan changes. This has the potential to generate effects if development occurs before communal infrastructure service the area and the new development requires on-site treatment systems.

The assessment for 'stream loss', 'overlays' and 'mana whenua values' is also less positive in the plan changes than the structure plans, with several areas changing from a 'yes' to 'partly or unclear'. This is partly related to a greater level of detail being expected at the plan change stage, or to a structure plan having aspirational statements regarding protection or enhancement but the plan change relying on the existing AUP provisions for overlays or mana whenua values. Some examples of this are:

- Whereas the Whenuapai Structure Plan said the ‘retention of permanent and intermittent streams is crucial’, the Whenuapai plan change only protects streams through a policy requiring development to be consistent with the stormwater management plan. That plan includes ‘retain streams as far as possible’. The precinct plan for the plan change shows streams but not wetlands. The wetlands are included in the draft variation to the plan change.
- The Drury-Opaheke Structure Plan refers to the importance of maintaining streams but PC 48 Drury Centre Precinct includes policy (19) which seeks to recognise that there may be no practicable alternative to stream works, including culverting, diversion and/or reclamation, where they are required to construct critical infrastructure. The council submissions to the private plan change have sought changes to that policy.
- The Warkworth Structure Plan noted that the need to avoid watercourse loss was a constraint for development but the Warkworth North Plan Change then included a precinct plan showing ephemeral and intermittent streams to be reclaimed. The hearing commissioners removed this map and determined that the relevant works could be addressed through usual consent processes under AUP chapter E3 (decision report paragraph 204).
- The Whenuapai Plan Change and Drury Centre Precinct Plan Change have no explicit recognition of the mana whenua values of waterways although both plan changes included a cultural values assessment as part of the plan change or stormwater management plan.

The ‘hydrology’, ‘contaminants’ and ‘sensitive receiving environments’ key questions were found to have positive recognition in the plan changes. In some cases, the plan changes go further than the structure plan indicates. For example, the Drury Structure Plan has little mention of contaminants from roads and carparks but PC 48 applies the AUP E9 controls to the precinct as if the reference to ‘high use roads’ was a reference to ‘all roads’ (standard IX6.6). This means that all roads will require stormwater treatment rather than the more limited requirements in E9. However, the PC 48 stormwater management plan (SMP) also includes use of inert building materials or site-specific water quality treatment measures, and these are not included in the AUP E9 standard. The council’s stormwater planning evidence for PC 48 noted that additional precinct controls would be required to achieve the outcomes sought by the SMP, the council’s Network Discharge Consent (NDC) and the AUP (Vincent 2021). The additional precinct provisions that are required relate to: treatment of stormwater runoff from all impervious surfaces (not just roads); use of inert building materials; and the integration and consolidation of stormwater devices. The NDC relates to a discharge consent for the stormwater network and its conditions do not control future land uses and building materials. The SMP was prepared for the plan change is not enforceable unless it is incorporated into plan provisions and consents. If development is a permitted activity in the plan, there is no mechanism at the building consent stage to ensure that materials used are in accordance with a SMP. The only means of managing land uses to limit contaminants and changes to hydrology, is through land use provisions in the precinct and the subsequent consent requirements. Particularly where there are sensitive receiving environments downstream of a plan change area, a comprehensive 'treatment train' approach is required[271].

The plan changes have generally positive responses for the key questions relating to 'riparian margins' and 'enhancement'. However, these could be strengthened further to ensure that streams and wetlands are enhanced through the development process. Several of the plan changes include requirements for riparian planting that provide the implementation clarity that was lacking at the structure plan stage. The Whenuapai Plan Change requires that all activities in the activity table have riparian planting to a width of 10m and states that it cannot be part of a compensation or offset package required in relation to works in a stream (I616.6.4). The Drury Centre Precinct Plan Change requires 10m of planting either side of streams, and also includes a building setback of 20m from rivers and streams. The Clayden Road, Warkworth Plan Change requires 10m of planting along streams and adjacent to wetlands. The Warkworth North Plan Change does not include a specific standard that requires planting but has policy support for riparian planting. These planting requirements are a key difference from the zone and Auckland-wide provisions in ensuring that waterways are enhanced through the development process.

While the plan changes included riparian planting requirements and building setbacks, there appears to have been little regard to opportunities to enhance stream form and aspects such as fish passage. Enhancement should be broader than just ensuring there is a riparian margin retained between the stream and the development. Restoration of the sinuosity of a stream channel, instream habitat, removal of fish passage barriers, and water quality treatment can all enhance degraded stream environments.

Comprehensive development of greenfield land is a key opportunity to achieve the AUP objectives that freshwater systems are enhanced (e.g. objective B7.3.1(1), policy B7.2.2(2), objective E3.2(2) and E3.3(3)). Unless the plan explicitly identifies the need for positive outcomes in a rule, separate from addressing adverse effects, they cannot be sought through the resource consent process, except on a voluntary basis. RMA s108AA[272] establishes that consent conditions must have the agreement of the applicant or be directly connected to an adverse effect of the activity or to an applicable rule. It is not adequate that there is an applicable policy encouraging enhancement works. If a new precinct does not require enhancement works through a rule, consent processes will be dependent on whatever

[271] GD01 describes a treatment train: A stormwater treatment train is the combination of sequential stormwater management responses that collectively deliver stormwater quality and quantity objectives for a site. The treatment train is based on a logical sequence of stormwater flowing through a catchment, beginning with stormwater runoff controls at-source, followed by capture and treatment of overland flows, and finally the enhancement of receiving environments to enhance their stormwater management function.

A treatment train approach enables the capture of a range of predicted contaminants by directing stormwater runoff through a complementary sequence of stormwater management responses. For example, a roadside swale might capture gross contaminants and fine gravels in stormwater runoff, which could then be directed to a raingarden to capture fine sediments and hydrocarbons.

[272] 108AA Requirements for conditions of resource consents
(1) A consent authority must not include a condition in a resource consent for an activity unless—
(a) the applicant for the resource consent agrees to the condition; or
(b) the condition is directly connected to 1 or both of the following:
(i) an adverse effect of the activity on the environment:
(ii) an applicable district or regional rule, or a national environmental standard; or
(c) the condition relates to administrative matters that are essential for the efficient implementation of the relevant resource consent.

enhancement an applicant offers, and on the Auckland-wide provisions which have few explicit requirements for enhancement within rules.

Council staff have noted concerns that plan changes can rely on the Auckland-wide provisions as being sufficient, rather than proposing precinct provisions to implement the E1.3(8) direction to “avoid as far as practicable, or otherwise minimise or mitigate, adverse effects of stormwater runoff from greenfield development on freshwater systems, freshwater and coastal water”. In particular, plan changes rely on contaminant management with respect to E9 which targets high contaminant generating areas. Policy E1.3.(8) refers to ‘minimising the generation and discharge of contaminants, particularly from high contaminant generating areas’ but it also requires an ‘integrated stormwater management approach’ which is described in more detail in policy E1.3(10). That policy notes that the effects of contaminants need to be considered in the context of the sensitivity of the receiving environment. In the greenfields context, the Auckland-wide provisions of the AUP are not sufficient to ensure the relevant SMP is implemented (Vincent 2021). For example, precinct provisions are required to ensure that stormwater treatment devices and stormwater connections are appropriately located and designed for the form of development. If it is left for the engineering plan approval stage required before a device is vested in the council, it can be too late to ensure there is sufficient space and integration with the surrounding land uses, to achieve the integrated planning sought by AUP chapters B7.3, B7.4 and E1.

If the Auckland-wide provisions are relied on, it indicates that the greenfield development will not make a significant change in ‘business as usual’ water management for developed areas. It is a lost opportunity to have a different style of development that implements water sensitive design principles and addresses cumulative effects. This will not achieve the B7.3 objective that ‘degraded freshwater systems are enhanced’ or the B7.4 objective that ‘the quality of freshwater and coastal water is maintained where it is excellent or good and progressively improved over time where it is degraded’. Additional improvements will be expected in future in order to meet the requirements of the NPS-FM.

Some examples of this issue are:

- The Whenuapai Plan Change has no riparian yard (building setback) so is relying on the yards in the underlying zone.
- The Whenuapai and Warkworth North plan changes apply the SMAF-1 control to the plan change area. This is an appropriate change but there does not appear to be any additional controls relating to stormwater detention and retention.
- The Clayden Road, Warkworth Plan Change stormwater management plan refers to AUP chapter E9 for the requirements for stormwater quality treatment and relies on the underlying riparian yards for building setbacks.

The draft variation to PC 5 for Whenuapai shows that the council has recognised where improvements could be made to the stormwater management provisions of the plan change. The plan change has been delayed for several years while issues around aircraft noise are resolved. The draft variation addresses that issue and also includes amendments to improve consistency with the stormwater network discharge consent that was granted since PC 5 was notified. The variation has stronger requirements for contaminant treatment, including treating contaminants at source. There is a new policy requirement for any subdivision or development to be consistent with any relevant network discharge consent and stormwater management plan approved by the network utility operator, and to mitigate existing, and avoid potential, stream bank erosion. The draft also shows amendments which have previously been recommended in response to hearing commissioners' directions. These include an amendment to the standards with a new requirement that any runoff from impervious areas that is not directed to an approved stormwater management device must achieve quality treatment at source or use inert building materials.

12.2.4 Plan changes outside the structure plan areas

The assessment of the plan changes for areas outside the structure plan areas demonstrates that many of the key questions are also relevant for other forms of large-scale land use change. The assessment is shown below in Table 12.7.

Table 12.7 Assessment summary for plan changes outside the structure plan areas.

		PC 6 Auranga B1 Drury West	PC 12 Hobsonville Corridor Precinct	PC 42 Auckland Regional Landfill - Wayby Valley	PC 43 McLaughlin's Quarry	PC 55 Patumahoe South
		14-Feb-20	27-Sep-19	26-Mar-20	9-Jul-21	22-Oct-20
		Private, operative	Council, operative	Private, proposed	Private, decisions	Private, proposed
		FUZ to urban	Amendments for industrial land	Rural to landfill	Quarry to industrial	Rural to urban
1	Infrastructure provided for	Partly or unclear	NA	NA	NA	Partly or unclear
2	Catchment management plan	Yes	NA	NA	Yes	Yes
3	Stream loss	Partly or unclear	Partly or unclear	Partly or unclear	Partly/unclear	Yes
4	Riparian margin	Yes	Partly or unclear	Partly or unclear	Yes	Partly or unclear
5	Enhancement	Partly or unclear	Yes	No	Yes	Partly or unclear
6	Overlays	Partly or unclear	Partly or unclear	Yes	Yes	Partly or unclear
7	Degraded areas	Partly or unclear	No	NA	No	No
8	Mana whenua values	Partly or unclear	No	Partly or unclear	Yes	Yes
9	Contaminants	Partly or unclear	Yes	Partly or unclear	Yes	Yes
10	Sensitive receiving environments	Partly or unclear	Yes	Partly or unclear	Partly/unclear	Yes
11	Hydrology	Yes	Yes	NA	Partly/unclear	Yes
12	Water temperature	Partly or unclear	Partly or unclear	NA	Partly/unclear	Partly or unclear
13	Litter	Partly or unclear	Partly or unclear	No	Partly/unclear	Partly or unclear
14	Efficient use	Partly or unclear	No	NA	No	Yes

PC 6 is a similar situation to the plan changes in Table 12.6 with Future Urban Zone land changing to urban use. That plan change is near the Drury-Opaheke Structure Plan area but was notified before the structure plan was finalised. Many of the relevant matters were assessed to be 'partly or unclear' which is less positive than the structure plan or the two plan changes assessed from the Drury-Opaheke Structure Plan area. The plan change extends the area of the Drury 1 precinct and the riparian margin and stormwater management provisions in the precinct are largely unchanged. The plan change doubles the size of the area that the precinct applies to and so extends those provisions to a new area. The plan change development included a stormwater management plan which supported the approach used in the Drury 1 precinct. There is only very minor consideration of the treatment of stormwater contaminants in the precinct but stronger controls relating to the hydrological effects of development.

In contrast to PC 6, PC 55 Patumahoe South successfully addresses the majority of the key questions. PC 55 proposes to change rural land to urban land uses. The plan change area is adjacent to the Patumahoe township, which is to the west of Pukekohe. A catchment management plan was prepared as part of the assessment of environmental effects and s32 material required for a private plan change. The plan change demonstrates that lack of a structure plan prior to the plan change can be addressed with respect to stormwater management issues[273]. This may be a site-specific conclusion as the waterways within the area of PC 55 are currently farm drains and culverts with low ecological value. Development provides an opportunity for relatively simple enhancement to waterway values in such cases.

PC 12 relates to a light industry area in Hobsonville and introduces a new sub-precinct that addresses urban design, transport and stormwater issues in the area. PC 12 has objectives and policies relating to enhancing riparian margins and stream ecology but there is no precinct-specific riparian yard or vegetation controls. The policy direction is achieved through activities that require consent and so the policies and the restricted discretionary activity assessment criteria apply. The information requirements for the precinct include a planting plan. The plan change has comprehensive direction regarding contaminants and includes regional plan provisions that replace the Auckland-wide E9 provisions. The standards require the use of inert building materials that do not have exposed surfaces made of contaminants of concern (i.e. zinc, coper, lead) and use of treatment devices in accordance with the TP10 design manual. The provisions apply to all impervious areas, not just high contaminant generating areas over a set size limit.

PC 42 for the proposed Auckland regional landfill in the Dome Valley is quite different to the other plan changes in that it provides for one specific activity, but many of the matters assessed were applicable. Some of the key concerns relating to the landfill proposal relate to the potential effects on groundwater and the Hoteo River and then the Kaipara Harbour. The key questions relating to infrastructure and catchment management plans were not applicable as the proposal did not relate to urban development.

Stream loss, riparian margins, mana whenua values, contaminants and effects on the receiving environment were key matters addressed in the assessment of environmental effects and section 32 analysis supporting PC42. The plan change proposed precinct-specific provisions allowing for stream loss, and less offset works than usual, on the basis that the stream loss is

[273] Noting that this assessment relates to the notified version of the plan change. The Hearing Commissioners decision to grant Plan Change 55 was notified on 17 June 2022.

to provide for infrastructure. Reclamation of streams and wetlands was proposed to be a discretionary activity in the Significant Ecological Areas Overlay and Natural Stream Management Area Overlay, whereas it is non-complying under the Auckland-wide provisions in E3. This approach was opposed in submissions and in the council's hearing report. There were no proposals for stream and wetland enhancement apparent in the plan change but there was consideration of the potential effects of the landfill on values recognised in the AUP overlays. The main areas for waste placement avoided the overlays but some stream works were provided for as a discretionary activity in the Natural Stream Management Area Overlay. The proposal minimised the generation and discharge of contaminants through a best practicable option (BPO) approach to stormwater treatment and lining of the landfill.

The proposed plan change appears to have no consideration of the ongoing management of litter that may enter a waterway. It may have been addressed in the concurrent resource consent application but that has not been reviewed as part of this assessment.

The commissioners for PC 42 declined the plan change, noting in their reasons that:

- The plan change includes objectives and policies that conflict, or are inconsistent with those in the AUP, and have the potential to be less effective and efficient in implementing the objectives of the AUP than the existing AUP provisions, meaning that it will not give effect to the relevant national policy statements, in particular the NPS-FM and NZCPS.
- The effects on the environment that the proposed plan change seeks to manage are appropriately dealt with by the current provisions (objectives, policies and methods) in the AUP.
- The proposed plan change may create scope for resource consents to be granted which have materially different effects, compared to the consents that have been granted (and which are subject to appeal proceedings) for a refuse landfill on part of the land.

PC 43 which provides for former quarry land to be rezoned for light industry, has positive responses to most of the key questions. PC 43 shows a strong recognition of mana whenua values relating to waterways through a policy that protects the values and relationships associated with the Māori cultural landscape at Wiri and a policy that encourages provision and enhancement of access for mana whenua to Puhinui Creek and its margins for a range of specified activities. The plan change protects a stream and wetland by zoning them open space and requiring riparian planting upon development.

PC 43 was amended in response to submissions to remove a proposed permitted activity for reclamation of an intermittent stream. There remains a potential issue regarding the inclusion of a note specifying that no offset will be required for the reclamation. This is predetermining the outcome of the usual consent process under chapter E3. Council officers had submitted that offsets should be determined at the time of the consent application. The commissioners considered that to require later offsets would be 'double counting' for the effects of reclaiming the stream because the package of measures proposed by PC 43 represented an appropriate outcome for the site. The stream to be reclaimed would require 82m of riparian planting and the plan change provides for over 400m of planting – significantly more than would be required to offset the loss of the intermittent stream. The applicant noted that "there is in fact no specific requirement in the statutory and planning framework to undertake riparian protection and enhancement as part of urban development, such that it is a necessary requirement for PC 43. In this regard, Chapter E3 has no relevant standards in relation to riparian enhancement. Policies E3.3(3) and E3.3(4) concern restoration but their focus is on “enabling” restoration and enhancement rather than requiring it” (decision paragraph 112). This supportive policy approach may be appropriate for the E3 provisions which apply across the region, but a plan change is an opportunity to introduce more explicit requirements and should not be limited to being consistent with the Auckland-wide approach.

Plan changes 42 and 43 demonstrate the importance of giving effect to RPS B7.3 and B7.4 in plan changes for large-scale land use change, not only urban expansion that is generally associated with structure plans and the requirements in AUP appendix 1. There is potential for amending the plan so that it does have requirements for including restoration and enhancement in plan change processes.

12.2.5 AUP precinct provisions for growth areas

In addition to plan changes, it is important to consider the effectiveness of the existing AUP precincts in managing the effect of urban growth on freshwater systems and water quality. There are extensive greenfield areas within the Rural Urban Boundary that are identified for future development, where the extent and form of development is managed principally through precinct provisions. Discussions with council staff have demonstrated the importance of the precinct provisions and some areas in which they could be improved. This section outlines the issues raised by council staff and is not a comprehensive assessment of all the AUP precincts.

Unlike the plan changes noted above which have been developed since the AUP became operative in part, the existing precincts were developed as part of the AUP process, through legacy district plan processes, or were established as Special Housing Areas (SHAs) under the Housing Accords and Special Housing Areas Act 2013. Precincts enable local differences to be recognised by providing detailed place-based provisions which can vary the outcomes sought by the zone or Auckland-wide provisions[274]. The precincts affect freshwater systems by providing for new land uses that will contribute a different type or volume of contaminants, and will affect the hydrological regime, for example by having more impervious areas and piped streams. In some cases, the precincts include water-specific provisions relating to stream reclamation, riparian restoration, impervious areas and ground soakage requirements. The relevance of precincts is recognised within the Auckland-wide provisions for stormwater discharge and diversion (E8.6.1(1))[275] which require that “the design of the proposed stormwater management device(s) must be consistent with any relevant precinct plan that addresses or addressed stormwater matters”.

Council staff have noted the importance of having permanent and intermittent streams and wetlands marked on precinct plans with rules ensuring their protection and enhancement. This issue was also noted in Quinn and Markham (2018) who highlighted the issues for developers when structure plans and precinct plans are thought to provide a level of certainty but do not

[274] AUP Chapter A1.6.5 Precincts can be more restrictive or more enabling than the zone or Auckland-wide provisions.
[275] Standard E8.6.1(1) applies to all permitted activities other than stormwater runoff from lawfully established impervious areas directed into an authorised stormwater network or a combined sewer network.

include all the relevant ecological features, resulting in issues at the resource consents stage of development. Land use decisions can mean there are few practicable alternatives when it comes to the resource consent processes for earthworks or stream works as the development pattern is based on certain areas having streams or wetlands and the surrounding land is zoned for particular development types (i.e. residential, business or open space). There is little flexibility for incorporating new alternatives later.

The effectiveness of the precincts is highly dependent on having the freshwater values and management options identified at the time the precinct provisions were developed. The Long Bay Precinct (AUP chapter I519) has been noted as an example of a precinct with very good water-related requirements for development. It has extensive stormwater and earthworks management provisions that aim to protect the high ecological and amenity values of the Vaughan Stream catchment and coastal receiving waters of the Long Bay-Okura Marine Reserve. However, the precinct does include a permitted activity rule for the "diversion, disturbance, piping or reclamation of streams (including intermittent streams) in sub-precincts E to K, except for the main channel of the Vaughan and Awaruku Streams and Stream 2" (rule I519.4.10(A102)). Such works are a non-complying activity in the main channel of the Vaughan and Awaruku Streams and Stream 2, and in streams (including intermittent streams) within the Stream Protection A Area shown on Precinct Plan 4 (I519.4.10(A103) and (A104)). There are no standards specifically relating to the permitted activity rule. The Long Bay permitted activity rule no longer applies to reclamation, but it still applies to diversion, disturbance and piping of streams. In the NES-F (2020) regulation 57 specifies that any reclamation of a river is a discretionary activity. A river is defined in the RMA to include a continually or intermittently flowing body of freshwater. A national environmental standard prevails over a regional plan rule.

In a similar case, the Puhinui Precinct has a permitted activity for reclamation of any intermittent or permanent streams not marked on precinct plan 2 (rule I432.4.1(A2)). Streams are only protected if they are already identified in the plan. The precinct includes a map showing numerous ephemeral streams (precinct plan 1). If later on-site investigations determine that some parts of these are intermittent rather than ephemeral, they have no regulatory protection as the precinct rule prevails over the equivalent rule in E3 that makes such reclamation a non-complying activity (E3.4.1(A49)). If reclamation occurs as a permitted activity, there are no standards applying to how the work is done and there is no requirement for any off-set works. This rule no longer applies due to NES-F regulation 57.

The Auckland Airport precinct has a permitted activity rule (I402.4.3(A63)) which applies to reclamation and piping of intermittent and ephemeral streams, upstream of a stream reach which has been consented for reclamation or piping. This rule no longer applies to reclamation due to NES-F regulation 57. However, the rule includes "associated structures, bed disturbance or depositing any substance, diversion of water and incidental temporary damming of water". This may lead to uncertainty regarding whether some parts of any reclamation activity fall outside the 'reclamation' and are permitted activities. It also indicates the type of rule that is sought through submission processes where an area is identified for a particular activity and it can be argued that the importance of the activity outweighs concerns relating to freshwater values.

The concern regarding the identification of waterways on precinct plans also applies to some provisions relating to riparian planting. The Red Hills precinct has a subdivision standard

(I610.6.4.1) that requires riparian planting along either side of the banks of a permanent or intermittent stream to a minimum width of 10m measured from the bank of the stream. The standard states that pedestrian and cycle paths shall be located adjacent to, and not within the 10m planted strip and that the riparian margins must be offered to the council for vesting. There is no equivalent requirement in the Auckland-wide subdivision chapters E38 and E39 so the precinct should result in better cumulative improvements to riparian margins than in some other areas. However, the Red Hills standard only applies to "riparian margins identified on the Red Hills Precinct: Precinct Plan 1" and it does not apply to wetlands. If riparian margins are not marked on the plan, the requirement will not apply. The precinct plan actually does not show any streams or riparian margins so the standard has no legal effect. The standard appears to relate to an earlier version of a precinct plan which showed riparian margins. The information requirements in I610.9 require a riparian planting plan to accompany any applications so there may be some implementation of the more general objectives and policies relating to riparian margins but technically, the planting standard will never apply. The precinct also does not specify whether vesting the 10m margin is an alternative to the RMA requirement for vesting a 20m wide esplanade reserve on subdivision adjacent to streams over 3m wide. If the standard is taken as an indication of the expected width to be vested, it could result in less esplanade reserve than usual.

Two points have been raised with respect to precincts and restoration works done as an offset or compensation for stream works. Firstly, Regulatory Services officers have suggested that more precincts should include direction on where any compensation works should be undertaken. An example of where this is already done in the AUP is policy 14 in the Drury 1 precinct (I6.35 in the SHA precincts chapter):

> *(14) Following assessment under the provisions of E1, E3, E15 and Appendix 8, where offsets or compensation are proposed to address residual adverse effects on natural resources that cannot be avoided, remedied or mitigated, consideration may be given to the local restoration opportunity and the multiple ecosystem benefits which could be achieved by* ***directing the offsets or compensation to the Drury Creek Islands Recreation Reserve****. Where any such offset or compensation is proposed, it should contain an assessment of the ecosystem values lost or degraded within the precinct and gained on the Drury Creek Islands Recreation Reserve.*

Healthy Waters officers have noted that the inclusion of this policy was contentious as there was concern that restoration of the reserve was not 'like for like' with effects on stream systems being offset through works in an estuarine environment. In this case, it was determined that the proposed works had greater ecological benefit than piecemeal stream enhancement offsite. If directive policies such as this are included in precincts, they require a comprehensive assessment of alternatives before determining that they are justified for the relevant location.

Secondly, it was suggested that the precincts should be amended to clarify whether compensation offsets for stream works should be within the riparian restoration areas intended for a precinct, or should be additional to that. The Drury South Industrial Precinct (AUP I410) and Drury South Residential Precinct (AUP SHA precinct I451) provisions clearly state that the enhancement of the riparian margins in the precinct are anticipated to mitigate the impacts of stream reclamation (policies 22 and 6 respectively):

I410.3(22) Mitigate any diversion or piping of existing degraded or modified watercourses by the ecological enhancement and landscape planting of existing natural and diverted watercourses within and immediately adjacent to the precinct.

I451.3(6) Mitigate any diversion or piping of existing degraded or modified watercourses by the ecological enhancement and landscape planting of identified existing natural and diverted watercourses within and immediately adjacent to the Drury South Structure Plan area (comprised of the Drury South Residential precinct and the Drury South Industrial precinct).

The Franklin 2 Precinct (AUP chapter I.6.30) does not have any similar policy and in the consents process for land modification works to enable Phase 2 of the Paerata Rise development, there was an issue relating to whether riparian restoration works should be both mitigation for the urbanisation of the area and an offset for the stream works. The AUP states that stream work offsetting should be demonstrably additional to what would otherwise occur, including that they are additional to any avoidance, remediation or mitigation undertaken in relation to the adverse effects of the activity (AUP Appendix 8). The offset proposals were located in areas identified in the Franklin 2 Precinct Plan as requiring a 10m riparian yard (on each bank) and riparian enhancement planting as part of any subdivision. The expert evidence for the plan change process that resulted in the precinct provisions stated clearly that enhancement of the riparian margins identified on the plan were anticipated as mitigation for the anticipated loss and potential impact to streams as a result of all aspects of the subdivision. The anticipated loss of 622m of intermittent stream was said to be sufficiently offset with no net loss by the enhancement of 7.5km of watercourse within the Open Space Network of the precinct. It appears possible that the commissioners for the Franklin 2 Precinct plan change considered that the restoration of riparian margins required in the plan change did cover the expected loss of intermittent streams. The fact that no wetland areas were identified or anticipated to be reclaimed at the plan change stage, but were later proposed, added to the uncertainty and doubt regarding additionality being demonstrated for the stream work consents.

Conversely, in the decision on the variation that added the Flat Bush sub-precinct C (AUP I6.6 in the SHA precincts), the commissioners made it clear that the provisions requiring riparian planting should be kept separate from any planting required with respect to stream works[276]. The applicant had proposed a new rule that stated the riparian planting could be utilised as part of any environmental compensation requirements associated with works and/or structures in a stream. The commissioners did not add the proposed rule on the basis that it opened up the prospect of double-counting mitigation. It was noted that it conflated two requirements – being that of planting the riparian margins as a matter of course upon proximate subdivision, and the requirement for mitigation where works / structures occur in streams. Instead, the commissioners added to the riparian margins rule (I6.6.5.5) as follows:

[276] Decisions following the hearing of concurrent applications for a variation to the Proposed Auckland Unitary Plan and 2 qualifying developments under the Housing Accords and Special Housing Areas Act 2013 (Approved Plan Variation 8 and Qualifying Developments 1 & 2 – Flat Bush Stage 3). David Hill (Chair), 12 February 2016. Paragraph 84.

4. For the avoidance of doubt, planting required by Rule 11.5.5.1 cannot be utilised as part of any environmental compensation requirements associated with works and/or structures in a stream.

The final issue identified with the existing precincts was raised by Regulatory Services stormwater specialists who noted that there are some inconsistencies between Auckland-wide and precinct rules that should be addressed. The example raised was that the Pukekohe Hill precinct (I433) has a standard relating to ground soakage[277] that has much more specific requirements than the standard in E8.6.1[278] relating to stormwater diversion and discharge to ground soakage. In that case, the Auckland-wide standard in particular appears to need strengthening so that it is clearer what is required, but both the Auckland-wide and precinct rule could be improved by including a requirement for treatment devices and to follow the guidance in the council's technical publication relating to ground soakage[279].

12.2.6 Effectiveness and efficiency of the AUP

12.2.6.1 Indicator 1. Water supply, stormwater and wastewater infrastructure is adequately provided for in areas of growth

The structure plans and plan changes showed a strong response to the B7.3.2(1) and B7.4.2(1) requirements to ensure that water supply, stormwater and wastewater infrastructure is adequately provided for in areas of growth. Integrating land use planning with infrastructure planning is a core role of structure plans, particularly in terms of ensuring that the timing of infrastructure provision aligns with when land is made available for development.

Infrastructure provision was less clearly provided for in the plan changes than the structure plans, but this generally reflects the different purpose of plan changes. The plan change provides a live zoning for the relevant area and at that stage, the infrastructure provision is largely managed under other tools and plans.

The scale at which this question is considered is important. Provision for infrastructure may be adequate for an individual development but not across catchment and/or plan change scale.

The analysis undertaken for this report did not provide a full view of the issues that can occur when plan change timing does not align with infrastructure timing. The potential for timing misalignment is evident in the fact that all but one of the plan changes assessed from a structure plan area were private plan changes. Structure plans are not statutory documents or regulations, and private developers are not constrained to the timing set in a structure plan, if they wish to lodge a private plan change application.

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[277] I433.6.4. Stormwater soakage – pre-treated water must go to a soakage system that includes soak holes, soakage trenches and infiltration ponds.

[278] E8.6.1(6) Where the diversion and discharge is to ground soakage, groundwater recharge or peat soil areas any existing requirements for ground soakage, including devices to manage discharges or soakage, must be complied with.

[279] Strayton, G and Lillis, M (2013). Stormwater disposal via soakage in the Auckland region. Prepared by Pattle Delamore Partners Ltd for Auckland Council. Auckland Council technical report, TR2013/040.

Infrastructure provision in growth areas may be considered more fully in future in other s35 reports.

12.2.6.2 Indicator 2. Catchment planning is being done as part of the structure planning process

All of the structure plans included the preparation of a catchment management plan or stormwater management plan in their development process. The structure plans referred to the catchment management plans and implemented them through the proposed form and location of development.

Stormwater management plans were also revised (or prepared where there was no structure plan) for plan change processes. In some cases there were approaches set out in SMPs that were not fully implemented in the precinct provisions, but generally the SMP played a key role in plan changes including provisions relating to riparian areas and stormwater management.

The plan changes outside of structure plan areas demonstrated that such plans have significant value outside of the structure plan process, and with respect to proposals such as quarry rehabilitation and not just in areas of urban development. It may be appropriate to strengthen the RPS directives regarding catchment planning so that it is more explicitly required wherever there is large-scale land use change.

12.2.6.3 Indicator 3. The adverse effects of development on freshwater systems and water are being avoided or minimised.

12.2.6.3.1 Structure plans and plan changes

The AUP provisions have been very effective in ensuring that waterways, water quality and changes in hydrology are key matters to address in structure plans and plan changes for large-scale land use change in growth areas. However, the lack of detail in structure plans, and the gaps in plan changes, mean they are not always achieving all of the outcomes sought by the AUP with respect to avoiding and minimising the adverse effects of development or improving already impacted waterways.

The AUP provisions relating to hydrology, water temperature, litter and efficient use of water are not being fully effective as they have not been applied in several cases. This may be because the relevant policies have a wording that indicates they are desirable or optional rather than requirements. For example, the litter policy (E1.3(8)(e)) applies 'in areas where the generation of these may be an issue'. Greater certainty would be achieved if the policy included more direction on where it should be applied. The other reason that these matters have not been addressed fully in structure plans and plan changes is that they are not included in the AUP Appendix 1 requirements for structure plans.

The extensive requirements for riparian planting in plan changes indicates that after the areas are developed, they will have extensive riparian networks established within the urban form.

This demonstrates the effectiveness of strategic policy direction in the RPS seeking enhancement and restoration of freshwater systems.

Plan changes can rely on zone and Auckland-wide provisions and so do not make a step forward in introducing targeted place-based rules to address cumulative effects and maintain and enhance local waterways. The draft variation to the Whenuapai Plan Change indicates that stronger provisions may be required in response to the stormwater Network Discharge Consent being granted. There needs to be greater recognition within the AUP that precincts providing for greenfield growth need to include controls relating to contaminants and changes in hydrology in order to achieve a treatment train approach and protect sensitive receiving environments. Such precincts also need to include explicit rules that require enhancements to freshwater systems as part of, and additional to, mitigation and offsetting works.

Several private plan changes have included provisions that seek to enable reclamation of streams or to provide less than the usual offset compensation restoration for stream works. The need for the council to submit in opposition to such policies demonstrates the importance of clear RPS direction that plan changes must give effect to.

12.2.6.3.2 Existing precincts

Existing precincts that enable greenfield development have been found to have a range of issues that indicate they are not fully effective in meeting the outcomes sought by the RPS for freshwater systems and water quality. In particular, there are effectiveness issues where the streams and wetlands are not all marked on precinct plans and so are outside the provisions that would ensure their protection or require riparian enhancement. A precinct can set the pattern of development so that there is little flexibility for improved stormwater treatment systems when the consents for ground works are applied for, which can be years after the precinct plan was prepared. In some cases, precincts have precluded the protection of waterbodies that are not marked on the precinct plan by including permitted activities for reclamation that prevail over the Auckland-wide consent requirements. This is no longer such a significant issue now that the NES-F makes all river reclamation a discretionary activity, but it does show the important role that precincts play within the AUP.

Precincts can be very effective at recognising place-based differences that add to the general Auckland-wide provisions. For example, precincts that guide the location for restoration planting that is an offset or compensation for stream works, and the Pukekohe precinct providing detailed requirements regarding ground soakage systems. The AUP would be more effective if the precincts also included clarification regarding whether riparian planting as mitigation for the effects of the change in land use should be the same riparian planting that is required as offset compensation for stream piping and diversion. To achieve enhancement of degraded freshwater systems, precinct rules would require enhancement works that produce positive outcomes, not only mitigate adverse effects.

12.3 Recommendations

In response to the issues noted in this section of the report, it is recommended[280] that the following matters are investigated further. The recommendations are assigned into the categories outlined in section 1.6.

12.1 Expanding the RPS requirements relating to catchment planning so that it is required for plan change processes relating to large-scale land use change as well as in structure plan processes (category: NPS-FM related).

12.2 Amending AUP Appendix 1 (the structure plan guidelines) so that it includes more detail regarding the matters in chapter E1, particularly in relation to hydrology, water temperature, litter and efficient use of water (category: NPS-FM related).

12.3 Requiring that future plan changes provide for enhancement and restoration of waterways, rather than 'encouraging' it as an optional matter (category: NPS-FM related).

12.4 Ensuring that plan change processes add precinct-specific requirements relating to contaminants and hydrological changes to complement the Auckland-wide and zone provisions (category: process).

12.5 In precincts that provide for greenfield development, specifying whether any riparian restoration works are offsets expected for stream works or in addition to that. Where possible, identifying locations where offsets should be located. To give effects to the outcomes sought by the RPS, the precincts should require works that enhance freshwater systems, rather than only mitigating adverse effects (category: process).

12.4 Future change under the NPS-FM

Structure plans and plan changes providing for land use change in growth areas relate principally to district plan provisions rather than regional plan provisions. Much of the NPS-FM applies specifically to regional plans but there are also regional policy statement and district plan requirements.

The NPS-FM requires that every regional council must develop long-term visions for freshwater in its region and include those long-term visions as objectives in its regional policy statement[281]. Auckland Council will need to consider whether to also amend other parts of the regional policy statement to give effect to the new objectives.

The NPS-FM requires that district plans include provisions that promote positive effects and avoid, remedy or mitigate the adverse effects of urban development on water bodies, freshwater ecosystems and receiving environments. The interpretation of any such provisions must be informed by the fundamental concept of the NPS-FM – Te Mana o te Wai.

[280] These recommendations will need to be tested fully through an RMA Section 32 assessment, be considered alongside other recommendations from other topics and the Plans & Places Department work programme.
[281] NPS-FM clause 3.3(1).

Clause 3.2 Te Mana o te Wai

(4) In addition to subclauses (1) to (3), Te Mana o Te Wai must inform the interpretation of:

(a) this National Policy Statement; and

(b) the provisions required by this National Policy Statement to be included in regional policy statements and regional and ***district plans****.*

Clause 3.5 Integrated management

(4) Every territorial authority must include objectives, policies, and methods in its ***district plan*** *to promote positive effects, and avoid, remedy, or mitigate adverse effects (including cumulative effects), of urban development on the health and well-being of water bodies, freshwater ecosystems, and receiving environments.*

Any private or council initiated plan change needs to give effect to the NPS-FM. This includes plan changes to provide for development in growth areas. The water-related provisions of such a plan change need to be designed to achieve the requirements of the NPS-FM (including promoting positive effects) as well as achieving the objectives of the AUP RPS.

There is also a need for AUP plan changes to give effect to the NPS-FM that include RPS and region-wide district plan provisions. The RPS provisions and AUP Appendix 1 could include directive requirements for structure plans and catchment management plans to ensure that Te Mana o Te Wai is applied. There may need to be consideration of existing district plan provisions (including in the precincts) to ensure that positive effects are achieved as land is developed. Future plan changes to the district plan provisions may need to place a greater emphasis on waterways and receiving environments.

The freshwater planning process set out in RMA section 80A applies only to freshwater planning instruments prepared by a regional council. This includes an RPS and regional plan but not a regional coastal plan or a district plan. Any changes to these plans need to use the usual RMA plan change process set out in schedule 1 and do not need to be notified by 31 December 2024. NPS-FM clause 4.1 states that every local authority must give effect to the NPS as soon as reasonably practicable and must notify any changes to district plans that are necessary to give effect to the NPS.

13 Summary and conclusions

Protecting our streams, rivers, lakes, aquifers and harbours is a top priority for Aucklanders, and a key requirement for mana whenua. Waterways provide spaces for recreation and amenity, connection to the natural environment, drinking water, regulate runoff during storms, receive and filter contaminants, and are home to a diverse range of ecosystems.

Auckland has many different freshwater and coastal environments. Collectively, they are showing the stress of decades of pressure from urban and rural activities.

The AUP manages the impacts of activities on water through a wide range of controls relating to water takes, discharges, works in waterways, and restrictions on how and where development occurs.

All of these controls work together to achieve the outcomes set out in the RPS in Chapter B7.3 Freshwater systems and Chapter B7.4 Coastal water, freshwater and geothermal water:

- Water quality is maintained where it is excellent or good, and improved where it is degraded
- Water is allocated and used efficiently
- Loss of streams and wetlands is minimised
- Discharges are managed to minimise adverse effects
- Adverse effects of land use change on water are avoided, remedied or mitigated
- AUP is amended to include NPS-FM limits and targets

Overall, this monitoring report has found that the AUP has a comprehensive range of provisions that aim to protect Auckland's water resources. Generally, the provisions address all the relevant matters, but there is still degradation of waterways occurring. Given the complexity of the outcomes sought in B7.3 and B7.4, it is difficult to draw definitive conclusions on the AUP's performance. Notwithstanding this, the monitoring has provided a range of observations. These are set out below for each of the eleven topics considered, and then some issues are noted from across the topics. The recommendations from throughout the report are then collated into a summary table.

13.1 Water quality

Water quality is fundamental to a range of uses and values, to ecosystem functions and to the life-supporting capacity of freshwater systems and coastal waters. Numerous parts of the AUP work together to ensure that water quality is maintained and enhanced, meaning this topic reflects the outcome of the whole plan rather than provisions relating to particular discharges or land uses.

The assessment for the water quality topic considered where Auckland's water is degraded, whether it is improving, and how that relates to the AUP.

There is evidence of water quality degradation across Auckland's coastal water, rivers, lakes and groundwater.

All of the mainland harbours and estuaries have elevated levels of sediment, and this is affecting ecological values. Around the established urban areas there are hotspots where heavy metal levels in sediment are high. Some swimming beaches have faecal indicator bacteria (FIB) levels above NZ guideline values at times but there have been general improvements in the percentage of time that monitored beaches were swimmable, and several beaches have had long term warnings removed after monitoring showed they were now generally a safe place to swim. Litter and microplastics are found throughout coastal areas.

The majority of Auckland's rural and urban rivers and streams are degraded for at least one regionally or nationally relevant attribute for ecosystem and or human health, but the streams in native forest areas are still in good health. The contaminants with widespread degradational effects on river water quality include FIB, some nutrients and suspended fine sediment. It is less clear what is happening with water quality in Auckland's lakes (due to limited consistent long term monitoring) but monitoring indicates concerning nutrient availability, impaired clarity and risk of eutrophication (where elevated nutrients result in changes to algal biomass and excessive plant growth).

There are elevated nitrates in monitored aquifers in the rural Franklin area and in the Three Kings urban volcanic aquifer.

In general, areas that are excellent and good are being maintained, and degraded areas are slowly improving. However, where there is improvement, it is very slow and will take a long time to change a degraded area to a 'good' state. There are localised areas where the state is getting worse.

Many of Auckland's water quality issues reflect the history of land use change and contaminant inputs, and cannot be directly attributed to the council's management under the AUP in the last five years. Factors that affect water quality include consents granted before the AUP was operative, climate change, and national regulations. Improved modelling and environmental and consent compliance monitoring in response to the NPS-FM will need to be designed and reported on in ways that enable clear linkages between the data gathered and the limits that will be set in the AUP, along with the outcome of permitted activities and consents, particularly in terms of cumulative effects.

The findings demonstrate the need for comprehensive and extensive action, including in ensuring that each relevant part of the AUP is effective in protecting and enhancing water quality.

13.2 Water allocation

The RPS objective B7.4.1 seeks that freshwater and geothermal water is allocated efficiently to provide for social, economic and cultural purposes. To measure the efficiency and effectiveness of this objective a number of indicators were developed that related to setting limits to protect values, allocating water efficiently and within the established limits, efficient water use and the protection that the relevant overlays provide. The investigation that was undertaken included the analysis of resource consents and the extraction of information from the groundwater accounting tool. There is uncertainty associated with the data that was used to undertake this monitoring work, and while it represents Auckland Council's current understanding of water availability and accounting, the information is not of a high enough quality to draw any firm conclusions. A key recommendation is that data management be improved to ensure that robust decision making is supported by high quality information

While availabilities have been widely established for groundwater and geothermal water bodies, surface water availabilities are determined through consenting on an as needed basis. While a proportion of availabilities are included in the AUP, the intention was that more availabilities would be included in the plan as greater knowledge was acquired. There is an opportunity to follow through on this, or as a minimum make the information more transparent and readily available to the public. There is a need to improve the approach that is used to manage water takes in times of low flow or low water level to ensure that natural values of surface and groundwater are safeguarded year-round.

With 90 per cent of aquifers allocated within established availabilities, the AUP is largely effective in providing a framework through which Auckland's groundwater is allocated. 10 per cent (or 12) aquifers are over-allocated. As there is no established tool that is used to account for surface water availabilities and allocations, level of allocation for streams and rivers could not be assessed for the purpose of this report. There is a need for further work to be undertaken to ensure that further over-allocation does not occur, and that existing over-allocation is phased out in a defined timeframe.

While the plan provides little direction about what is meant by 'efficient allocation', results of this investigation show that decision makers are drawing on a wide range of resources to ensure that water allocations are reasonable and justified. There is an opportunity to develop an approach for 'efficient allocation' for the Auckland region and update the AUP to ensure that the plan is clear and directive and to produce guidance to support decision-making. The current water allocation framework is generally enabling people to provide for their economic, social and cultural needs. The need for further guidance to support the implementation of the AUP is also recognised across many aspects of water allocation and use.

With regard to water being efficiently used, conditions of consent are widely used that require efficient use reports to be submitted to the council at regular intervals, however there is an opportunity for efficient use reporting to be better managed and for the information to be collected and analysed in a manner that can better inform robust decision making.

The AUP utilises several overlays to protect specific values of water bodies. While the High Use Aquifer Management Area Overlay has not been effective in ensuring that high use aquifers do not become over-allocated, the effectiveness of the High Use Stream Management Area Overlay could not be assessed. It is recommended that consideration be given to whether 'High Use' overlays are the most appropriate tool for the management of waterbodies with increasing demand. With regard to the Wetland Management Area Overlay, a full analysis needs to be undertaken to determine whether, in light of the new national regulations, it is necessary for the management of water takes, or fit for purpose.

While the RPS directs that the take and use of groundwater should be promoted over surface water, this needs to be better reflected in Chapters E2 and E7. While the intent of the policy may be being realised, this has not been achieved through strong policy in the regional provisions.

13.3 Streams and wetlands

The RPS seeks that the loss of streams and wetlands are minimised (objective B7.3.1(2)) and that the adverse effects of land use change on freshwater are avoided, remedied, or mitigated (objective B73.1(3)).

Since November 2016 a total of 75 resource consents have been granted that allow for the reclamation of 10,506 m (10.51 km) of permanent streams, 9,609 m (9.61 km) of intermittent streams and 55,295 m^2 (5.53 ha) of wetland. This is a very small proportion of Auckland's freshwater systems (approximately 0.06 per cent of the region's permanent streams, 0.2 per cent of the intermittent streams and 0.09 per cent of the region's wetlands). There was considerable variation in the amount consented in any one year with only a few consents accounting for much of the consented works. Much of the stream and wetland loss was for residential development in greenfield areas. The appropriateness of this extent could not be assessed as part of this analysis, noting that the RPS seeks for loss to be 'minimised' rather than 'avoided'. There was no information available on how much reclamation has occurred that was unconsented and works under the legacy regional plan were reported only for 'stream disturbance' which includes all works in streams, not just reclamation.

The AUP has been effective at ensuring that consent processes for works in streams have addressed the need to manage adverse effects on a site-by-site basis, particularly effects on freshwater values associated with the methodology employed for the streamworks. However, the resource consent process has a limited ability to manage cumulative catchment-wide effects of streamworks as part of consent processes, because it relates to the effects of the activity applied for, not that activity plus all earlier and subsequent potential works in the catchment.

Objective E3.2(3) seeks that "significant residual adverse effects on lakes, rivers, streams or wetlands that cannot be avoided, remedied or mitigated are offset where this will promote the purpose of the Resource Management Act 1991". Policy E3.3(4) sets out the anticipated outcomes for offset actions. While it is recognised in the introduction of chapter E3 that offsetting will not be appropriate in all instances and should only be considered once appropriate avoidance, remediation, prevention and mitigation measures have been taken, the relevant objectives and policies under chapter E3 are not as directive. The objectives and policies use words such as 'preferably' and 'consider' and do not clearly state that avoidance should be the first consideration to avoid permanent loss. Therefore, while offset actions have been secured to address residual adverse effects and the majority were projected to achieve no net loss or net gain in ecological values, it appears that the AUP is not sufficiently directive to ensure that efforts are made to avoid the permanent loss of streams and wetlands. It is considered that the wording of the relevant chapter E3 objective does not reflect recognised industry best practice for offsetting. The AUP uses more directive wording with respect to offsets for biodiversity.

Analysis of the consent decisions indicates there are decision making gaps in assessing relevant policy matters. It appears the AUP is not fully effective in limiting stream and wetland loss to instances where the specified criteria have been met.

The requirement to consider the 'availability of practicable alternatives' and the need to accommodate specific activities were not extensively addressed. In some cases, the protection of streams and wetlands has been de-prioritised when considered alongside other AUP provisions. The most common way this was justified by the decision maker related to the need to give effect to residential zoning or precinct development expectations. In this regard, there are opportunities to provide greater direction and improved consistency within the relevant provisions of the AUP.

There are opportunities to provide greater direction and improved consistency for the relevant provisions, particularly as the AUP is amended to give effect to the NPS-FM with more specific definition of the instream values to be protected. The NPS-FM requires that a priority is placed on the effects on waterways, whereas a more 'overall' assessment of effects is typical under current practices.

A significant number of granted resource consents for reclamation and/or diversion were located within greenfield residential areas. Within these areas, the consent process has limited opportunity to retain any streams and wetlands that have not been identified for protection at the land use change (re-zoning) stage. Because of this, it is important that the AUP provisions for greenfield areas, including any chapters for new precincts, clearly identify the expectations for stream and wetland protection.

While erosion and sediment effects associated with streamworks activities have been effectively managed through the resource consent process on a site-by-site basis, streambank erosion was consistently found to be the highest sediment contaminant source within the region. Modelling under the FWMT shows that streambank erosion has largely been attributed to the incision of streams as a result of increased peak flow velocities following urbanisation or land use change.

When compared to legacy provisions, the AUP provisions relating to permitted activity culverts have not significantly affected the extent that culverts have been constructed. Issues raised on the clarity of the provisions and design challenges affecting publicly vested infrastructure highlight opportunities for further review and investigation.

13.4 Wastewater networks

Objective B7.4.1(4) directs that the effects of point discharges on waterbodies are minimised and that existing adverse effects are progressively reduced. To assess the effectiveness and efficiency of the plan in achieving this objective in relation to wastewater networks, indicators were developed relating to the minimisation of network overflows and their potential effects, and the management of growth, particularly through the provision of supporting infrastructure which uses the best practicable option to minimise adverse effects. Supporting measures and data sources were identified, with a key data source being resource consents granted for wastewater networks identified from the Plans and Places resource consents database. The majority of Auckland's wastewater network overflow discharges are, however, consented under Watercare's network discharge consents which were granted prior to the AUP.

There is an overall alignment between the outcomes sought in the AUP and the network discharge consents granted to Watercare, insofar as the intent of both is to reduce the frequency of wet weather overflow events to an annual average of two events per overflow point, and to prioritise overflow points exceeding that number for improvements, particularly in relation to sensitive environments. The Network Discharge Consent 2020-2021 Annual Report showed that there was a slight improvement in the trend analysis results for the wet weather overflow target from 2019-2020 (76 per cent) to 2020-21 (79 per cent), for overflows at pump stations. Limitations of interpreting this figure, however, include that it does not illustrate the volume of overflows or increases to the number of overflow points that may have been added to the network. A decreasing trend of uncontrolled wet weather overflows was also reported and linked to drier weather (Watercare 2021: 44). This analysis highlights that climate variability may have an increasing impact on overflow trends in the future. An increase in uncontrolled dry weather overflows has been reported under the network discharge consents, and fats and rags have been identified as an increasing cause. These results, despite the network maintenance requirements included in the consents, illustrate the importance of other methods (such as public education) in effectively achieving wastewater overflow reductions.

At present, there are limitations to Watercare's monitoring of Type 2 overflow points and consequently the understanding of the performance of the network. Council staff have also raised concern that the AUP contains limited provisions to manage adverse effects on wastewater overflows from intensification of land use. This is particularly challenging with intensification where new developments may occur as permitted activities, even where there are critical capacity issues.

There have been eight consents granted under Chapter E6 of the AUP for wastewater discharges to land or water, and five consents granted under Chapter F2 for discharges to coastal waters. Four of the consents granted relate to discharges from engineered overflow points, and nine relate to discharges of treated water from wastewater treatment plants. An assessment of these consents shows evidence that there has been relatively effective implementation of the AUP policies from the RPS level through to consenting, however, it must be acknowledged that only a high-level assessment has been undertaken of the decision reports associated with these consents.

Overall, it is difficult to attribute water quality outcomes witnessed today to the effectiveness of the AUP rather than a range of other influencing factors. Of particular significance is the impact that financial investment and technological improvements have on the wastewater network, including the provision of infrastructure and the reduction of wastewater overflows. A key example of this is the Central Interceptor programme in the Western Isthmus, which in conjunction with the western isthmus water quality improvement programme will reduce the annual volume of overflows in the area by up to 80%.

13.5 On-site wastewater systems

Objective B7.4.1(4) directs that the effects of non-point discharges on waterbodies are minimised and that existing adverse effects are progressively reduced. To assess the effectiveness and efficiency of the plan in achieving this objective in relation to on-site wastewater systems, indicators were developed relating to the efficient location, design and operation of such systems. Supporting measures and data sources were identified, with key data sources including resource consents identified from the Plans and Places resource consents database, and discussions with staff from Healthy Waters and the Stormwater and Wastewater regulatory specialist team.

Auckland has approximately 45,000 on-site wastewater systems and 325 were identified to have been established with resource consent under the AUP. The assessment in this report shows that consents for on-site wastewater systems are generally being granted in appropriate locations in relation to AUP zoning, and the associated anticipated future provision of wastewater network infrastructure. Concern was raised by regulatory wastewater specialists, however, that subdivision to create small sites has been enabled in an area awaiting the provision of network infrastructure, that is currently dependent on on-site disposal methods.

An assessment of a consent sample found that consents are being granted on sites constrained by factors such as size. Five consents from the sample were granted without the provision of a sufficient reserve area, however the council's regulatory wastewater specialists were largely satisfied that consent conditions and mitigating design features could capably address the subsequent risk of these proposals. These cases highlight the critical importance of maintenance and monitoring in ensuring environmental outcomes are achieved that will in turn effectively achieve the outcomes sought by the RPS. The assessment in this report also showed that the efficiency of consenting processes is possibly being impacted by some aspects of Chapter E5 of the AUP. This includes issues such as the lack of a rule, and associated standards, specific to the scenario of upgrading an existing on-site wastewater system.

The majority of Auckland's systems operate as permitted activities under the AUP and have historically been subject to little regulatory oversight. In response, the council has launched a compliance programme, funded by the Water Quality Targeted Rate. This programme has established a database of on-site systems across the region as well as a method for monitoring whether owners are having their systems maintained. Implementation of this programme will improve the council's understanding of how systems are performing across the region, and in turn understanding of how effectively the AUP standards are being implemented for the majority of on-site wastewater systems.

13.6 Stormwater

Stormwater runoff is a key contributor to water quality and the health of freshwater and coastal receiving environments throughout the region. Stormwater runoff from impervious surfaces can contain a number of significant water pollutants and result in changes in peak flows and velocities that can have significant adverse effects on the physical structure and habitat within receiving environments. As such, the AUP seeks to manage the adverse effects of stormwater from areas of impervious surfaces, predominantly through the:

- management of diversions and discharges, either to the public stormwater network or to land, water or directly to the CMA, through the provisions of Chapter E8;
- management of the quality of stormwater runoff from high contaminant car parks and high use roads through the provisions of Chapter E9; and
- requirement for hydrology mitigation in the form of retention and detention, in areas with streams identified as being particularly susceptible to the effects of development or that have relatively high values, through the provisions in Chapter E10.

The effectiveness and efficiency of the provisions within these three chapters in achieving the water quality outcomes sought by the RPS, was assessed through discussions with key council staff involved in their implementation and through an assessment of a sample of resource consents granted in accordance with the relevant rules. This assessment concluded that, the stormwater management provisions were generally comprehensive, however, some gaps and issues with interpretation were identified.

The AUP predates the existence of the Auckland Council's regionwide Stormwater Network Discharge Consent and the provisions do not accurately reflect the requirements of connection to the network (i.e. joining the NDC) or maximise opportunities to achieve stormwater management at source prior to connection to the network. This is having implications for achieving the outcomes of the NDC.

Opportunities exist to achieve greater integrated management. This is currently being hindered through having the stormwater provisions split across three chapters, leading to a lack of clarity and inconsistencies in interpretation, particularly in relation to roading and the requirements for hydrology mitigation, which are addressed by rules and standards in multiple chapters.

Amendments to the provisions will likely be required to implement the requirements of the NPS-FM, including extending the requirements for treatment to better address stormwater contaminants and greater emphasis on the need to manage cumulative effects, particularly on a catchment or freshwater management unit basis and in consideration of the nature and sensitivities of the receiving environment.

13.7 Rural production discharges

The AUP manages nutrient discharges by focusing on containing discharges from rural production activities onsite and managing discharges with an emphasis on the use of best industry practices to avoid or reduce potential adverse effects from activities.

Since November 2016 only four resource consents were granted to discharge nutrients from rural production activities. This reflects the reality that most rural production operators can fall under the permitted activity nitrogen leaching maxima. The council does not hold any records on permitted activity discharges except for dairy effluent and combined with the absence of proactive monitoring of permitted activities makes it difficult to observe the effectiveness and efficiency of the AUP nutrient provisions. Further, the lack of guidance in the policies (E35.3) on what is an acceptable level of non-compliance means the processing planner for any resource consent application must determine the maximum nitrate load to avoid more than minor adverse effects of discharges on waterbodies, aquifers and watercourses.

Future review of the AUP should consider amendments such as requiring rural operators to provide nutrient application records and proof of compliance with permitted activity standards; and the investigation of whether formulating guidance on best management practice would be beneficial to achieve improved water quality. Opportunities on reporting and managing synthetic nitrogen use for dairy farm activities will be improved as the AUP is reviewed to give effect to regulations introduced by the Essential Freshwater Package.

13.8 Discharges from boats

The AUP manages discharges from boats through restrictions on the discharge of untreated sewage, requirements for facilities for collection and disposal of litter and sewage from boats, and for managing the discharge of residues from boat maintenance activities.

The AUP restrictions on boat sewage discharges and boat maintenance activities rely on self-regulation and so it is difficult to assess their effectiveness. The council has undertaken a range of work to increase awareness of the AUP restrictions on the discharge of untreated sewage from boats. Awareness raising on the boat cleaning rules is also being done as part of the council's marine biosecurity work. These activities make it more likely that the relevant provisions are having an effect in limiting discharges in inappropriate areas. More targeted research with boat owners is needed to determine whether sewage discharges can be best managed through regular provision of information or whether the AUP should have requirements for sewage holding tanks for anyone staying overnight on a boat.

Works at marinas, ferry terminals and marine servicing facilities are incorporating facilities for the collection and disposal of sewage and litter from boats, and are managing residues from boat maintenance. Marina consents have also included innovative conditions relating to antifouling paints on boats due to the localised effect they can have on coastal sediments. Future reviews of the AUP should consider whether to include more explicit controls relating to antifouling paints to ensure that similar conditions continue to be applied in other areas.

13.9 Land disturbance

Land disturbance is an essential prerequisite for land development and currently Auckland is under unprecedented pressure to provide for significant levels of new housing, infrastructure and development. Sediment is a key pollutant for the region's stormwater network and freshwater and coastal receiving environments, and the effective management of the potential for sediment runoff from areas of land disturbance is critical.

The AUP predominantly manages land disturbance activities through the provisions of Chapter E11 (regional plan provisions) and E12 (district plan provisions). The effectiveness and efficiency of the provisions within these two chapters, in achieving the water quality outcomes sought by the RPS, was assessed through a review of previous reports, discussions with key council staff involved in their implementation and through an assessment of a sample of resource consents granted in accordance with the relevant rules.

This assessment concluded that there are opportunities to provide greater direction in relation to managing the effects of sediment runoff from land disturbance activities, particularly for activities which trigger the E12 district plan provisions. The E12 policies, activity standards, assessment criteria and matters of discretion currently lack guidance in this regard and are not considered effective in achieving the water quality outcomes of the RPS, particularly the outcome seeking that land disturbance activities use industry best practice and standards appropriate to the nature and scale of the activity and the sensitivity of the receiving environment (B7.4.1(b)).

While land disturbance activities, both at the regional and district scale appear to consistently require that erosion and sediment control measures be implemented, this is less comprehensive for those activities granted under E12 and as smaller-scale activities they are low priority for compliance monitoring. Smaller scale activities are also cumulatively significant, accounting for greater than two thirds of land disturbance in the region. Non-regulatory methods such as industry education and targeted monitoring have proven beneficial to assist in reducing sediment runoff from small site development. Amendment of the provisions to provide greater specification in relation to erosion and sediment control and a review of the threshold between the regional and district planning provisions for land disturbance is recommended.

A significant amount of land disturbance is occurring in close proximity to receiving environments. Greater consideration of cumulative effects and the sensitivities of receiving environments and effective limits on land disturbance activities on a catchment or freshwater management unit basis, is likely to be required to implement the requirements of the NPS-FM.

13.10 Land use intensification in existing urban areas

Within existing urban areas, re-development and intensification can lead to increases in adverse effects on waterways but also presents an opportunity for improved management of stormwater. This analysis has focussed on the urban residential zones as these areas were up-zoned under the AUP. Provisions in the AUP that manage the effects of residential development and intensification on waterways include those related to impervious areas and riparian areas. Policies for water quality also recognise integrated stormwater management as a means to manage stormwater runoff.

The state of the environment monitoring has shown that Auckland’s most degraded streams are in urban areas and that the most degraded coastal waters are adjacent to urban areas. Intensification of development under the AUP increases the level of contamination sources and generally reduces the amount of open space and vegetation that can filter and slow stormwater before it reaches streams and coastal waters. A review of the application of the maximum impervious area standard within the residential zones indicated that while the provisions of each of the zones are consistent in applying the standard through policy and either as a core standard and/or assessment criteria and matter of discretion, this is not resulting in stormwater mitigation measures being consistently required through resource consents for activities which exceed the maximum impervious area threshold for the zone. The cumulative effect of small infringements above the maximum impervious area standard are also not adequately addressed by the provisions. It is recommended that the maximum impervious area standard be included as a core standard within each residential zone and that greater guidance be provided to practitioners, including in relation to the requirement for, and on-going maintenance of, on-site stormwater mitigation measures.

For riparian areas, the AUP has generally been effective in managing adverse effects on water when riparian yard standards in the zones are infringed. The AUP has been less effective at protecting the function of riparian yards from permanent loss. In these instances, it is also difficult to address the cumulative effects on water quality and future restoration efforts. It was also found that for vegetation alteration or removal within riparian areas, the effects on water quality and hydrological functions were not commonly discussed. Key opportunities for improvement include creating clearer guidance and direction for riparian activities, particularly regarding the role of riparian areas and riparian vegetation in maintaining and improving water quality.

Council staff have raised concerns that the AUP is ineffective in encouraging or requiring water sensitive design, particularly with respect to re-development of brownfield sites. There is also a concern that when land use consents are sought prior to subdivision consents, there is less comprehensive consideration of the water-related policies. The AUP does not explicitly refer to 'water sensitive design' but the principles of the approach, in terms of stormwater management, are included within several policies relating to 'integrated stormwater management'. Elements of water sensitive design that are allowed for under the AUP, rather than required or incentivised, include rainwater tanks, clustered development and green infrastructure. There is scope for refining the plan's provisions to place a greater emphasis on water sensitive design and to have more explicit linkages to related guidance material such as GD04. Such changes could facilitate greater use of water sensitive design at a range of scales and assist with addressing the cumulative impacts of development occurring throughout the urban area.

13.11 Land use change in growth areas

Urban growth in greenfield areas increases the sources of contaminants, changes the hydrological regime and often involves piping streams. The AUP provisions have ensured that stormwater management, freshwater systems and water quality have been considered comprehensively in structure plan processes. Structure plans have included strong integration with water infrastructure provision and have all included catchment plans or stormwater management plans in their development process in order to direct how the effects of land use change on water are avoided, remedied or mitigated. The strategic nature of structure plans means that some responses are at a very general level. The plans have indicative maps and aspirational statements but the detail of how any particular goals will be achieved is often left for the plan change and consent stages.

Plan changes providing for urban growth have generally addressed the majority of the AUP requirements relating to effects on freshwater systems. However, some plan changes rely on zone and Auckland-wide provisions and so do not make a step forward in introducing targeted place-based rules to address cumulative effects and maintain and enhance local waterways. Most of the greenfield land is being zoned through private plan change applications which are not required to be consistent with structure plans. The structure plans are not statutory RMA plans. Plan changes must give effect to national policy statements and the AUP RPS, but there is no legal requirement to give effect to a structure plan.

The areas of the AUP that were shown to be less effective in directing the content of structure plans and plan changes include provisions relating to contaminants (other than for high contaminant generating areas), hydrology, litter, and efficient use of water. This is partly because the AUP provisions are framed as optional considerations rather than requirements. It appears that there should be greater recognition within the AUP that new precincts providing for greenfield growth need to include controls relating to contaminants and changes in hydrology in order to achieve a multi-stage, treatment train approach and protect sensitive receiving environments.

Some plan changes (and existing AUP provisions) have issues with requiring riparian enhancement only in relation to streams or wetlands that are shown on a particular map, rather than all waterways found on the site. Some maps have subsequently been found to not include all of the streams and wetlands. There is also a lack of clarity regarding whether the riparian enhancement required in relation to subdivision and land use change is the same or additional to the offset works that will be required for stream works in the same area.

13.12 Across-topic issues

Changes under the NPS-FM 2020

Significant change will be needed across almost all of the topics covered in this report in response to the NPS-FM 2020. A plan change to the RPS and regional plan provisions is required by December 2024. The plan change will need to give effect to Te Mana o Te Wai which sets a hierarchy of priorities for water management. The changes will need to be accompanied by a significantly enhanced freshwater accounting system based on extensive monitoring (of the environment directly, and of resource management actions) and modelling of freshwater values and attributes. This report is a key step in understanding the effectiveness of the current management regime, as the council works to develop improvements that meet the new requirements of the NPS-FM.

Cumulative effects

Cumulative effects are difficult to manage through consent processes but are particularly hard to manage where the plan relies on permitted activities.

Resource consent processes have a limited ability to manage cumulative catchment-wide effects because they principally relate to the effects of the activity applied for, not the activity plus all earlier and subsequent potential works in the catchment. Cumulative effects must be considered but are seldom a deciding factor in decision making. Stronger plan provisions and more evidence of the scale of existing effects may assist with this as the NPS-FM is implemented.

The AUP has permitted activities for small-scale activities that individually have only minor effects but can be widespread and numerous Permitted activities rely on people being aware of any relevant standards and best practice approaches, and complying with the requirements. The wide range of permitted activities in the AUP need to be supported by targeted education, monitoring and enforcement. The monitoring identified several examples of education and compliance programmes that are resulting in significant improvements in the council's understanding of water related issues or in rates of compliance with the relevant requirements (for example, with respect to on-site wastewater systems, land disturbance and discharges from boats). Such programmes need to be supported and expanded to support the effective implementation of the AUP. The Parliamentary Commissioner for the Environment's report on estuaries (PCE 2020) highlighted the challenge of managing cumulative effects from numerous different pressures. That report made two recommendations: firstly, that all estuaries should be included in freshwater management units under the NPS-FM; and secondly, that estuaries and the catchments that feed into them need to be robustly monitored so that we know what is going on and can take management decisions that are informed decisions. These recommendations emphasise the need for new approaches and for improved linkages between environmental and compliance monitoring and management decisions. These needs apply to freshwater bodies and to coastal areas, and will be addressed through the work to implement the NPS-FM which includes consideration of the coastal receiving environment affected by freshwater.

Information sources and data management

Several topics investigated for this report found issues with the council's consenting and compliance databases not being set up to facilitate s35 evaluative reporting. At present, individual consents need to be manually examined to determine matters such as the extent of stream loss or area of earthworks, rather than a summary being readily generated from an automated database. There is also a need for improved systems that can integrate monitoring by consent holders and consent compliance monitoring with State of the Environment monitoring to give a fuller picture of the effectiveness of plan provisions and the processes that implement them.

Integrated management

Several topics have noted the need for comprehensive consideration of water-related matters at different stages or aspects of development and water use. For example, the AUP has less direction for stormwater management if a consent is sought for a land use consent prior to a subdivision consent. Consideration of stream loss showed that it needs to be a key consideration in structure plans and in precincts as there are few options or alternatives if consent is sought for reclaiming or culverting streams after a development pattern is laid out in a subdivision consent.

Riparian management, in particular, requires a stronger emphasis in the RPS and Auckland-wide polices. When consent applications are assessed for infringements of the riparian yard, vegetation controls or the riparian impervious area limit, there is little guidance on what the suite of riparian measures are designed to achieve.

Stream bank erosion is an example of how management needs to be integrated across urban and rural areas, and across all the activities that affect stream flow. Stream bank erosion is a major source of sediment for streams and coastal water, and contributes to habitat loss. Causes of stream bank erosion include cumulative change in the hydrological regime and in catchment-wide riparian characteristics. Relevant AUP provisions include restrictions on impervious areas, building setbacks and stormwater controls (including in structure plans), limits on stock access to streams, and wetland protection.

The complexity of the water-related provisions, and the technical nature of some requirements, mean that it can be difficult to understand how the AUP requirements relate to environmental goals. It may be beneficial to include more explanation and advisory notes within the AUP. The AUP has a lot less explanatory material and issue-related information than was included in legacy plans. Some sections also rely on external technical reports and practice notes to set out how permitted activity standards should be met. Such material can be very valuable but references in the plan must be clear and kept up to date.

Mana whenua values

This section 35 report has taken a comprehensive approach to reviewing the water-related provisions of the AUP, but it has a significant gap with respect to mana whenua values. B7.4 includes a specific objective relating to mana whenua values:

> *B7.4.1(6) Mana Whenua values, mātauranga and tikanga associated with coastal water, freshwater and geothermal water are recognised and provided for, including their traditional and cultural uses and values.*

There was insufficient information and time available to assess whether the plan is being effective in achieving this objective. It was understood that relevant analysis would be included in a future s35 report relating to RPS Chapter 6 Mana Whenua. Mana whenua will also be able to provide feedback on the effectiveness of the AUP in achieving water-related outcomes through their involvement in the development of a plan change to give effect to the NPS-FM.

Auckland's Water Strategy (Auckland Council 2022a: 17) identifies that the council and mana whenua must take a partnership approach to the protection, management and enhancement of water. It also sets out a range of actions under the strategic shift of 'Te Tiriti Partnership – the council and mana whenua working together in agreed ways on agreed things' (page 25). The commitment to partnership with mana whenua in monitoring and reporting should lead to enhancements in the knowledge base for future s35 reviews of the AUP water provisions.

13.13 Recommendations collation

To support further work to address the issues identified through this monitoring, the recommendations that are made throughout the report are assigned into the categories described in Table 1.2. The recommendations categories are:

- NPS-FM – relate to issues with the AUP that overlap with the requirements of the NPS-FM
- NPS-FM related - closely related to the topics impacted by NPS-FM but not directly related to a requirement of the NPS-FM
- AUP review process – issues that are most appropriately managed through the next full plan review
- Process – process and implementation issues; may relate to actions that are required by NPS-FM, but do not require changes to the AUP
- NES-F – relate to issues that may be addressed by implementation of the NES-F 2020
- Further investigation – relate to issues that need further investigation before advice can be given about which course of action is most appropriate

There are no recommendations that are deemed significant enough that a water-specific plan change should be developed prior to the NPS-FM plan change.

It is important to note that these recommendations will need to be tested fully through an RMA section 32 assessment, and be considered alongside other recommendations from other section 35 topics and the Plans & Places Department work programme.

Recommendation	Category
General	
1.1 Integrated management is vital for improving the state of Auckland's waterways. Improving the management of Auckland's water will require improved integration across the different stages and aspects of development and water use.	NPS-FM related
1.2 Greater use of catchment-based limits and targets is needed to address cumulative effects in resource consent processes. Without strong policy direction and clear rules, consent processes will focus on the effects of the proposed activity rather than how various different activities contribute to cumulative effects.	NPS-FM
1.3 Cumulative effects from the wide range of permitted activities in the AUP must be supported by targeted education, monitoring and enforcement. There are several examples of education and compliance programmes (for example, with respect to on-site wastewater systems, land disturbance and discharges from boats) that should be continued and built upon.	Process
1.4 Improved riparian management requires a clear common purpose to assist in assessing consent applications. The AUP should be amended to clarify the role of measures relating to building setbacks, impervious areas limits, earthworks and vegetation control so that it is clear what is sought and how any infringements should be managed. This should be clear on the need to retain the natural form and character of waterways, as well as cultural values, water quality and biodiversity, so that a current degraded state is not used to allow further degradation.	NPS-FM related
1.5 The council's consenting and compliance databases should be enhanced to facilitate RMA section 35 evaluative reporting. Ideally, this would provide a simple automated process for determining matters such as the length of stream and wetland reclamation and area of earthworks that is consented each year.	Process
1.6 There is also a need for improved systems that can integrate monitoring by consent holders and consent compliance monitoring with State of the Environment monitoring to give a fuller picture of the effectiveness of plan provisions and the processes that implement them.	Process
1.7 It may be beneficial to include more explanation and advisory notes within the AUP to more clearly show how the provisions relate to environmental goals. Greater understanding of the plan requirements can also be provided through external technical reports and practice notes. References to such material must be clear and kept up to date.	NPS-FM related
1.8 The effectiveness of the AUP in maintaining mana whenua values relating to waterways should be considered as part of the s35 monitoring report for RPS section B6 and as part of the programme to implement the NPS-FM.	Process and NPS-FM
Chapter 2: Water quality	
2.1 Extensive improvement in discharge and land use management is needed to ensure that improvements within waterbodies happen more quickly than they have over the last 10 years.	NPS-FM
2.2 The next plan review should include a review of the identification of degraded coastal areas currently included in the plan to reflect the monitoring data available since the AUP was developed.	AUP review process
2.3 Maintaining and enhancing water quality will need to be a primary consideration across the AUP provisions, including those applying in rural and urban areas, and in district plan provisions as well as those that will be in the NPS-FM plan change.	NPS-FM related

Recommendation	Category
2.4 Issues such as sediment from stream bank erosion require clearer linkages within the AUP to show that multiple parts of the plan are part of a package to address cumulative effects.	NPS-FM related
2.5 Monitoring (both direct environmental and indirect evaluative) and modelling need to be expanded and enhanced so that clearer linkages can be made between the AUP provisions and the state and trends in environmental values.	Process
2.6 Consent related processes need to be improved to enable future section 35 reviews to make greater use of monitoring undertaken by consent holders and the council's consent compliance monitoring.	Process
2.7 Further investigation and support for community initiatives such as Litter Intelligence are required to address litter in waterways and emerging contaminant issues such as microplastics.	Further investigation
Chapter 3: Water allocation	
Indicator 1: Limits are set that protect the values of water bodies	
3.1 The relationship between availabilities and limits should be clearly explained in the AUP to ensure that plan users understand the intention that availabilities function as limits.	NPS-FM
3.2 A practice note should be developed that details the criteria that are used to establish and change availabilities to ensure that that they are reasonably justifiable (methodology and assumptions) and sufficiently peer reviewed.	Process
3.3 Water availabilities should be made more transparent and easily accessible to the public. This could be undertaken by either a) adding further availabilities to the AUP as was intended when the AUP was written or b) by making the availabilities accessible online.	NPS-FM
3.4 The two updated availabilities in the AUP that have been superseded through the consenting process should also be amended	NPS-FM
3.5 The values for Auckland's water as they relate to water quantity should be better defined. That is ecological indicators need to be identified to provide greater direction of the values that are to be maintained and protected through the process of setting limits.	NPS-FM
3.6 There is a need to develop an approach to ensure that in times of low flow the take and use of water is reduced or ceased as per conditions of consent. Specifically: a) The AUP needs to be strengthened to be more directive regarding water availability, limits and the ceasing or reducing of water takes during times of low flow. With regard to the implementation of the plan, water restriction in times of low flow must be better managed, such that instream values are protected year-round (category: NPS-FM). b) There is a need to develop a council approach which establishes clear roles and responsibilities of relevant departments, an approach to data management, record keeping and compliance, a method that will be used to reduce takes and a communication and engagement plan to ensure water users are aware of the approach (category: process).	Process & NPS-FM
Indicator 2: Water is allocated to be taken and used within the limits	
Preventing further — 3.7 Further work should be undertaken to ensure further over-allocation does not occur in the future	NPS-FM

Recommendation		Category
over-allocation	3.8 Data management must be improved, and a freshwater accounting system should be improved.	Process
	3.9 The plan should be strengthened the regional rules to ensure over-allocation by consent cannot occur in the future (consider removing permitted activities and introduce non-complying or prohibited activities for fully allocated water bodies).	NPS-FM
Phase out existing over-allocation	3.10 Phase out existing over-allocation to ensure all water bodies are allocated within limits (category: process). A clear and agreed process/strategy must be developed which includes the following steps: a) improvement of data management to ensure over-allocation information is accurate. b) validation and ground truthing of permitted activity takes and section 14(3(b) takes to ensure that council's accounting of these takes is accurate. c) further investigations into water availabilities to ensure that the current knowledge is the best available, and that phasing out over-allocation is defensible. d) develop a strategy for the approach that will be used to reduce allocations to progressively phase out over-allocation.	NPS-FM & Process
Dewatering and diversion	3.11 The rules as they are relative to dewatering and diversion need to be amended through a plan change so that they are fit for purpose and so that consent is only required when justified.	NPS-FM related
	3.12 Amend the standards for rule E7.4.1(A17) such that permanent dewatering is allowed as a permitted activity. There are several options available to adequately manage this activity: a) Delete standard E7.6.1.6. (3) and the words "or 30 days in other types of soil or rock; and" from E7.6.1.6. (2). This would allow for permanent subsoil drainage as a permitted activity under this rule in all areas other than peat soils, where the current controls would still remain. b) Include a standard that limits the volume of the water that can be taken over any given period of time (again noting the volumes currently permitted under rules E7.4.1 (A14) and (A15) are likely to be substantially greater than those from retaining walls and around basements). c) Include a standard that permits dewatering to a certain depth of drainage, or of a specific volume.	NPS-FM related
	3.13 Provision needs to be made for minor dewatering to take place in the absence of groundwater diversion as a permitted activity.	NPS-FM related
	3.14 Include a definition in the AUP for 'natural groundwater level'. Speight and Wansborne (2021) recommend the definition should be 'The phreatic surface, where the pore pressure in the soil is equal to or greater atmospheric pressure, and below which a hydrostatic pressure profile exists with depth. This includes 'perched groundwater levels' where the geological setting permits the presence of such.	NPS-FM related

Recommendation		Category
	3.15 Include a definition in the AUP for ‘dewatering’.	NPS-FM related
	3.16 Amend the definition in the AUP for ‘groundwater diversion’ so that it is more explicit. Specifically, the definition needs to be clearly state there is no removal of groundwater associated with the activity. For example, in a situation where water is pumped outside of an excavation or discharged to anywhere other than the aquifer where it came from (via any method including gravity), then the activity is no longer a diversion.	NPS-FM related
Indicator 3: Water allocation allows Aucklanders to provide for their social, economic and cultural purposes		
3.17 Consider how information could be collected to better assess whether social, economic and cultural needs are being met, or are being affected, through the allocation of water.		Further Investigation
Indicator 4: Water is allocated efficiently		
3.18 Revise and improve the approach for ‘efficient allocation’ for the Auckland region and update the AUP to ensure the plan is clear and directive.		NPS-FM
3.19 Produce guidance to support allocation decision making. As a minimum, this guidance should address the expectation of the way in which water is to be allocated in the Auckland region, how climatic variability should be considered and incorporated and how water demand could/should be calculated. The Water Allocation Specialist Input teams unpublished best practice guide should be used as a basis.		Process
3.20 Investigate opportunities that would allow metering and reporting data to be better used to support consenting and allocation decision making.		Process
Indicator 5: Water is used efficiently		
3.21 Undertake work to better define, measure and monitor the efficient use of freshwater. Develop guidance for consent holders to ensure that the correct information is being submitted (category: process).		Process
3.22 Develop an approach to encourage and promote the efficient use of geothermal water (consider requiring efficient use reports and the inclusion of conditions of consent requiring consent holders to report steps to improve water conservation) (category: process).		Process
3.23 Develop an improved data management approach for the data collected through efficient use reports. The data submitted to the council has the potential to be very valuable for consent decision making, the development of guidance topics and for the development of the NPS-FM plan change (category: process).		Process
3.24 Compliance with the requirement to meter water takes and report meter readings to the council must be improved (for the period between 1 September - November 2021 only 25 per cent of consent holders returned their quarterly meter returns)		Process
3.25 System improvements should be made such that the council is able to report the level of compliance by water body		Process
Indicator 6: The relevant overlays provide the appropriate level of protection for waterbodies		

Recommendation	Category
3.26 A full analysis of the WMA overlay needs be undertaken to determine whether it still fit for purpose for the management of the take and use of water in wetlands.	NES-F
3.27 Once the surface water accounting tool is developed, an assessment should be undertaken to determine whether all high use streams are captured by the overlay	Process and NPS-FM
3.28 Consideration should be given as to whether overlays are the most appropriate mechanism for the management of high-use water bodies. The overlays are static and do not have the ability to respond to rapid changes in water demand. Alternatives to the current overlays include: a) establishing trigger levels that move a stream or aquifer into the high-use category, e.g. 70% allocation (noting that this (and any other solution) requires fit-for-purpose accounting systems b) non-statutory layer that is more readily updatable. This could be updated five yearly in line with the state of the environment reporting. Regardless of whether the overlays are deemed the most appropriate approach to managing high use waterbodies, further consideration should be given to whether the requirements in relation to efficient allocation and use of water in high use water bodies need to be raised. If the high-use aquifer and stream overlays are deemed to be the most appropriate method to manage high-use waterbodies, there is a need to clearly define 'high-use stream' and 'high-use aquifer' in the AUP.	NPS-FM
Indicator 7: The take and use of groundwater is promoted over surface water	
3.29 The RPS policy relating to this needs to be better reflected in Chapters E2 and E7	NPS-FM related
3.30 Further consideration should be given to whether alternative water sources should be considered more broadly than only where there are significant adverse effects as a result of an application.	Process
Chapter 4: Streams and wetlands	
4.1 Review existing provisions relating to permitted activity culverts to address issues raised regarding their clarity. This work would also need to ensure consistency with regulations under the NES-F.	NPS-FM related
4.2 Investigate the extent that existing provisions relating to permitted activity culverts and internal processes for assessing new culverts are creating unanticipated design outcomes for vested infrastructure. Consideration should be given to whether any changes would create unnecessary regulatory requirements.	Further investigation
4.3 Investigate whether the AUP appropriately facilitates activities with the primary aim of improving the condition of waterbodies, including the processes and methodologies that apply to the assessment of associated effects. Improvement works are also likely to be encouraged by the implementation of the NPS-FM, which contains strong direction that the health and well-being of water bodies is improved[282]. Investigation of the existing AUP framework will likely need to consider the regulatory requirements for activities achieving improvement outcomes.	Further investigation

[282] NPS-FM policy 5, policy 12, clause 3.3(4) and others require that various aspects of freshwater systems or values be improved.

Recommendation	Category
4.4 Introduce new systems for data recording to give effect to monitoring requirements of the NPS-FM[283] and inform future monitoring of the AUP. A limitation to the completeness of this analysis has been the need to manually collect data relating to the extent of permanent stream and wetland loss from granted resource consents only, as a system for data generation and reporting was not available. Data recording should include means to address the extent and location of proposed reclamation, diversion, and any offset actions.	Process
4.5 Finalise resource consent conditions that are being developed for offset sites and implement a programme to ensure that the conditions are consistently monitored. This will ensure that offset sites reach the projected ecological values determined at the time of resource consent application that also formed the basis of resource consent being granted can be achieved. It is likely that this monitoring programme will also support requirements for data recording and reporting, as the NPS-FM will require the council to identify losses to the value of rivers or natural inland wetlands and respond accordingly.	Process
Chapter 5: Wastewater Networks	
5.1 Investigate strengthening growth management measures under the AUP as an interim measure to reduce strain on the network in areas with critical capacity issues.	NPS-FM related
5.2 Investigate how Type 2 overflow points could be better managed under the network discharge consents, including whether any improvements could be prompted under the existing consent conditions or whether these would require review. The NDC annual report currently provides limited monitoring information for these overflow points.	Further investigation
Chapter 6: On-site wastewater systems	
6.1 Address the following issues relating to Chapter E5, through a future plan change: a) replacing references to TP58 to reference GD06, b) improving ambiguous wording in activity table E5.4.1, c) altering permitted activity standards in relation to matters such as maintenance records; and d) clarification of the regulations surrounding upgrades to existing wastewater systems	NPS-FM related
6.2 Continuation of the WQTR on-site wastewater compliance programme as a key method to ensure the effectiveness of the AUP, due to the vast number of systems which are permitted activities.	Process
6.3 Development of further clarification and advice regarding the implementation of the NES-F to support regulatory staff processing consents for on-site wastewater discharges in proximity to wetlands.	NES-F
6.4 Further consideration of whether the relationship between on-site wastewater systems and floodplains and the Quality-sensitive Aquifer Management Areas Overlay are appropriately addressed by the AUP.	NPS-FM related

[283] NPS-FM clause 3.23 'Mapping and monitoring natural inland wetlands' and 3.24(4) 'Every regional council must: (a) develop and undertake a monitoring plan that:(i) monitors the condition of its rivers; and (ii) contains sufficient information to enable the council to assess whether its policies, rules, and methods are ensuring no loss of extent or values of the rivers; and (b) have methods to respond if loss of extent or values is detected.

Recommendation	Category
6.5 Further consideration of whether the provisions within Chapter E38 Subdivision – Urban are appropriate to avoid the installation of on-site wastewater systems on inappropriately sized sites.	NPS-FM related
Chapter 7: Stormwater	
7.1 Review the three chapters of E8, E9 and E10 with consideration of combining the provisions into one comprehensive stormwater chapter, with separate activity tables to address the specific matters currently covered in each of the chapters (including one specific to roading)	NPS-FM
7.2 Review and amend the provisions to: a) Better reflect, and be consistent with the connection requirements of, and outcomes sought by the NDC. b) Provide greater clarity in their interpretation (particularly to address the inaccuracy noted in applying the correct rules to consents) and remove inconsistency of terminology (particularly in relation to the terms: total impervious area and redevelopment of roading). c) Require the use of stormwater management devices to be consistent with relevant technical or guidance documents (e.g. GD01, GD04, TR2013/040 (now updated to GD07[284]) and TR2013/18).	NPS-FM
7.3 The provisions be amended to better reflect that the need for hydrological mitigation is not limited to the SMAF area and that greater mitigation should be achieved in greenfield areas. The rules and/or permitted activity standards for the SMAF also need to be amended to clarify that those discharges that are direct to the coastal marine area are excluded.	NPS-FM
7.4 The inclusion of additional contaminant removal requirements be investigated, consistent with the requirements of the NPS-FM. To achieve the enhancement focus of both the existing water quality objectives of the AUP and the NPS-FM, stormwater discharges should provide a level of treatment commensurate with the nature of contaminants present and address cumulative effects.	NPS-FM
7.5 A Practice and Guidance Note be drafted for stormwater discharges that not only covers the AUP provisions but also the requirements of the Stormwater Bylaw 2015 and Stormwater Code of Compliance (particularly for permitted activities) and also the requirements of the NDC.	Process
7.6 A review of an example of roading consents be undertaken in consultation with Auckland Transport to determine any concerns with excessive consenting fees or associated costs.	Further investigation
7.7 With the heavy reliance on permitted activity standards, that the adequacy of compliance monitoring be assessed.	Process
7.8 A plan change be pursued (either through the AUP review or earlier) to address the matters raised under Section 7.2.5.4 in relation to Chapter E33– Industrial and trade activities, including removing the rules and provisions that are now redundant due to the expiration of specified dates or the revocation of standards referred to and in consideration of including greater guidance through additional definitions or within the provisions (e.g. a definition for unlisted ITAs and greater guidance in relation to assessing large sites of mixed land use).	AUP review

[284] Stormwater Soakage and Groundwater Recharge in the Auckland Region Guideline Document 2021/007 Version 1

Recommendation	Category
7.9 A Practice and Guidance note for Chapter E33 be developed to provide guidance to practitioners and the industry.	Process
7.10 The proposed Industrial and Trade Activities Proactive Programme for industry education and compliance monitoring and enforcement be pursued.	Further investigation
7.11 A comprehensive analysis of Chapter E38 – Subdivision be undertaken that includes assessment of the effectiveness of the provisions in achieving stormwater management outcomes.	AUP review
Chapter 8: Rural production discharges	
8.1 Consider including AUP rules that require rural land users to provide actual fertiliser and effluent application records; and demonstrate their compliance with permitted activity standards to apply fertiliser, effluent, or rural production waste.	NPS-FM
8.2 Consider including rules requiring a nutrient management plan in accordance with the Fertiliser Code of Practice when fertilisers are applied and, managing adverse effects from fertiliser use and application by developing systems and practices in freshwater farm plans to reduce their impact.	NPS-FM
8.3 Consider amending the AUP rules to require greenhouse operators discharging nutrients to provide a nutrient management plan which could be monitored annually similarly to dairy farmers.	NPS-FM
8.4 Investigate how the objectives and policies specific to nutrient water quality can be made practicable, implementable, and enforceable to achieve improved water quality.	Further investigation
8.5 Investigate the impact of cumulative effects of nutrient discharges on fresh and coastal water quality.	Further investigation
8.6 Investigate whether formulating guidance on best management practice (for all rural production activities) is beneficial to achieving the outcomes sought by the AUP.	Further investigation
Chapter 9: Discharges from boats	
9.1 Continue with actions that raise awareness of the sewage discharge restrictions and promote tools that make it easy for boat owners to know where the restrictions apply.	Process
9.2 Investigate whether any surveys being undertaken by the council or other parties can include questions on the sewage discharge rules to track awareness over time.	Further investigation
9.3 Undertake targeted research with boat owners to understand whether they are aware of the sewage discharge rules and whether they comply with them or not.	Further investigation
9.4 When the regional coastal plan part of the AUP is next reviewed, consider including rules that require holding tanks or treatment systems on boats.	AUP review
9.5 When the AUP is next reviewed, consider including provisions relating to antifouling paints to ensure any future marinas have consent conditions similar to those at the Kennedy Pt and Half Moon Bay marina consents.	AUP review
Chapter 10: Land disturbance	
10.1 To address the discrepancies between the two chapters, particularly the weaknesses identified in Chapter E12, that either the two chapters:	NPS-FM related

Recommendation	Category
a) be combined to address all land disturbance activities currently split between E11 and E12 within the one chapter, with the regional and district functions identified through separate activity tables; or b) remain split, but that comprehensive policies, activity standards, assessment criteria and matters of discretion in relation to managing the potential effects of sedimentation (including requiring best practice erosion and sediment control), be added to Chapter E12 so that each of the two chapters can be read as stand-alone chapters.	
10.2 The threshold between the district and regional land disturbance rules be reviewed to ensure it is set at the appropriate level to enable comprehensive management of the potential effects of sedimentation on water quality.	Further investigation
10.3 That the application of the Sediment Control Protection Area be reviewed, including the scale of land disturbance activities to which it applies, development of comprehensive activity standards (e.g. addressing the fundamental principles of erosion and sediment control, including minimising disturbance and staging, as detailed in GD05) and to provide greater direction to regulatory staff assessing applications for land disturbance in close proximity to receiving environments (e.g. policies and assessment criteria).	NPS-FM related
10.4 Erosion and sediment control, implemented in accordance with best practice, be requirement for all land disturbance. GD05 has been specifically prepared in consideration of the geology, topography and receiving environments of the Auckland region, includes measures appropriate for every scale of development and is updated as required.	NPS-FM related
10.5 Additional guidance be included within the assessment criteria and matters of discretion (of both chapters), to further direct imposing seasonal restrictions (winter works) on consented activities. Currently the matters of discretion for restricted discretionary consents E11.8.1(1)I include “timing and duration of works”. This could be expanded on.	NPS-FM related
10.6 Guidance be developed (and direction incorporated in the plan provisions) in relation to: a) the assessment and management of cumulative effects. b) managing land disturbance in response to the effects of climate change, particularly the increased frequency and intensity of storm events. This could potentially be addressed though GD05.	NPS-FM related
10.7 Non-regulatory initiatives, such as the Closing the Gap Project, be identified in the AUP as valuable ‘other methods’ for managing sediment.	NPS-FM related
10.8 Compliance monitoring be adequately resourced and prioritised, particularly for high-risk activities, but also reflective of the potentially significant cumulative effects of sediment from small-site land disturbance, including permitted activities.	Process
10.9 Amendments to the AUP provisions be progressed to address the concerns raised in relation to ancillary farming earthworks and cleanfill.	Further investigation
10.10 The appropriateness of relying on industry guidance over GD05 for horticulture activities be reviewed.	NPS-FM related
10.11 The effectiveness of using overlays (e.g. the Significant Ecological Area Overlay) to manage the effects of land disturbance be assessed in the s35 biodiversity work.	Further investigation

Recommendation	Category
10.12 An assessment of the management of the potential adverse effects of land disturbance on landscape (including the approach to retaining walls and bulk earthworks) be undertaken.	Further investigation
Chapter 11: Land use intensification in existing developed areas	
11.1 The maximum impervious area provisions (i.e. the standard, associated matters of discretion and/or assessment criteria) recognise the need for ongoing operation and maintenance of any stormwater management devices installed to address the increases in stormwater runoff; include a requirement to consider the cumulative effect of increases in stormwater runoff and better reflect the connection requirements of the region-wide stormwater Network Discharge Consent.	NPS-FM related
11.2 The maximum impervious area standard be included as a core standard for development involving four or more dwellings in the MHU and MHS zones and for all relevant development in the THAB zone. It is noted that this is also recommended in the s35 plan effectiveness monitoring report: A Quality Built Environment – Theme 3: Responding to Climate Change.	NPS-FM related
11.3 That existing practice and guidance notes for practitioners be amended (or new ones developed) to ensure greater consistency in the implementation of the provisions and imposition of resource consent conditions.	Process
11.4 The purpose statement for the yards standard, being 'to ensure buildings are adequately set back from lakes, streams and the coastal edge to maintain water quality' is reinforced within the policies of the relevant zones. This will provide clearer direction to plan users on the role of riparian areas in maintaining water quality.	NPS-FM related
11.5 Include a clear link between the 'riparian yard' standard and the function and protection of riparian margins. This would help reinforce that the purpose of the riparian yard standard is not limited to protecting amenity values but also includes maintaining water quality/quantity.	NPS-FM related
11.6 Include a clear link between the vegetation alteration and removal provisions and water quality. This would provide plan users with a greater understanding of how vegetation within riparian areas maintains water quality. This would help reinforce that the purpose of the vegetation alteration and removal rules are not limited to protecting terrestrial ecology values.	NPS-FM related
11.7 Investigate including standards requiring riparian planting or enhancement when subdivision occurs, in accordance with the RPS policies B7.3.2(5)(d) and B7.3.2(6). As the RPS policies seek restoration outcomes, the requirements should be additional to actions that are needed to mitigate or offset adverse effects on waterbodies.	NPS-FM related
11.8 That a comprehensive analysis be undertaken to assess the effectiveness and efficiency of the provisions of Chapter E38 – Subdivision, including in relation to achieving integrated stormwater management and the management of riparian areas.	Further investigation
11.9 That the integrated stormwater management policies be refined so that they explicitly refer to the stormwater related aspects of 'water sensitive design' in order to provide a stronger linkage to the wider understanding of that approach.	NPS-FM related
11.10 Include references to the guidance document relating to water sensitive design for stormwater (GD04) in the plan so that it is a more clearly mandated example of	NPS-FM related

Recommendation	Category
how to achieve the relevant policies and standards relating to water sensitive design and green infrastructure.	
Chapter 12: Land use change in growth areas	
12.1 Expanding the RPS requirements relating to catchment planning so that it is required for plan change processes relating to large-scale land use change as well as in structure plan processes.	NPS-FM related
12.2 Amending AUP Appendix 1 (the structure plan guidelines) so that it includes more detail regarding the matters in chapter E1, particularly in relation to hydrology, water temperature, litter and efficient use of water.	NPS-FM related
12.3 Requiring that future plan changes provide for enhancement and restoration of waterways, rather than 'encouraging' it as an optional matter.	NPS-FM related
12.4 Ensuring that plan change processes add precinct-specific requirements relating to contaminants and hydrological changes to complement the Auckland-wide and zone provisions.	Process
12.5 In precincts that provide for greenfield development, specifying whether any riparian restoration works are offsets expected for stream works or in addition to that. Where possible, identifying locations where offsets should be located. To give effects to the outcomes sought by the RPS, the precincts should require works that enhance freshwater systems, rather than only mitigating adverse effects.	Process

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Appendix A Copy of AUP RPS B7.3 and B7.4

B7.3. Freshwater systems

B7.3.1. Objectives

(1) Degraded freshwater systems are enhanced.

(2) Loss of freshwater systems is minimised.

(3) The adverse effects of changes in land use on freshwater are avoided, remedied or mitigated.

B7.3.2. Policies

Integrated management of land use and freshwater systems

(1) Integrate the management of subdivision, use and development and freshwater systems by undertaking all of the following:

(a) ensuring water supply, stormwater and wastewater infrastructure is adequately provided for in areas of new growth or intensification;

(b) ensuring catchment management plans form part of the structure planning process;

(c) controlling the use of land and discharges to minimise the adverse effects of runoff on freshwater systems and progressively reduce existing adverse effects where those systems or water are degraded; and

(d) avoiding development where it will significantly increase adverse effects on freshwater systems, unless these adverse effects can be adequately mitigated.

Management of freshwater systems

(2) Identify degraded freshwater systems.

(3) Promote the enhancement of freshwater systems identified as being degraded to progressively reduce adverse effects.

(4) Avoid the permanent loss and significant modification or diversion of lakes, rivers, streams (excluding ephemeral streams), and wetlands and their margins, unless all of the following apply:

(a) it is necessary to provide for:

(i) the health and safety of communities; or

(ii) the enhancement and restoration of freshwater systems and values; or

(iii) the sustainable use of land and resources to provide for growth and development; or

(iv) infrastructure;

(b) no practicable alternative exists;

(c) mitigation measures are implemented to address the adverse effects arising from the loss in freshwater system functions and values; and

(d) where adverse effects cannot be adequately mitigated, environmental benefits including on-site or off-site works are provided.

(5) Manage subdivision, use, development, including discharges and activities in the beds of lakes, rivers streams, and in wetlands, to do all of the following:

(a) protect identified Natural Lake Management Areas, Natural Stream Management Areas, and Wetland Management Areas;

(b) minimise erosion and modification of beds and banks of lakes, rivers, streams and wetlands;

(c) limit the establishment of structures within the beds of lakes, rivers and streams and in wetlands to those that have a functional need or operational requirement to be located there; and

(d) maintain or where appropriate enhance:

(i) freshwater systems not protected under Policy B7.3.2(5)(a);

(ii) navigation along rivers and public access to and along lakes, rivers and streams;

(iii) existing riparian vegetation located on the margins of lakes, rivers, streams and wetlands; and

(iv) areas of significant indigenous biodiversity.

(6) Restore and enhance freshwater systems where practicable when development, change of land use, and subdivision occur.

B7.4. Coastal water, freshwater and geothermal water

B7.4.1. Objectives

(1) Coastal water, freshwater and geothermal water are used within identified limits while safeguarding the life-supporting capacity and the natural, social and cultural values of the waters.

(2) The quality of freshwater and coastal water is maintained where it is excellent or good and progressively improved over time where it is degraded.

(3) Freshwater and geothermal water is allocated efficiently to provide for social, economic and cultural purposes.

(4) The adverse effects of point and non-point discharges, in particular stormwater runoff and wastewater discharges, on coastal waters, freshwater and geothermal water are minimised and existing adverse effects are progressively reduced.

(5) The adverse effects from changes in or intensification of land use on coastal water and freshwater quality are avoided, remedied or mitigated.

(6) Mana Whenua values, mātauranga and tikanga associated with coastal water, freshwater and geothermal water are recognised and provided for, including their traditional and cultural uses and values.

B7.4.2. Policies

Integrated management

(1) Integrate the management of subdivision, use, development and coastal water and freshwater, by:

(a) ensuring water supply, stormwater and wastewater infrastructure is adequately provided for in areas of growth; and

(b) requiring catchment management planning as part of structure planning;

(c) controlling the use of land and discharges to minimise the adverse effects of runoff on water and progressively reduce existing adverse effects where those water are degraded; and

(d) avoiding development where it will significantly increase adverse effects on water, unless these adverse effects can be adequately mitigated.

National Policy Statement for Freshwater Management

(2) Give effect to the National Policy Statement for Freshwater Management 2014 by establishing all of the following:

(a) freshwater objectives;

(b) freshwater management units and, for each unit:

(i) values;

(ii) water quality limits;

(iii) environmental flows and/or levels; and

(c) targets and implementation methods where freshwater units do not meet freshwater objectives.

(3) Integrate Mana Whenua values, mātauranga and tikanga when giving effect to the National Policy Statement for Freshwater Management 2014 in establishing all of the following:

(a) water quality limits for freshwater, including groundwater;

(b) the allocation and use of freshwater resources, including groundwater; and

(c) measures to improve the integrated management of the effects of the use and development of land and freshwater on coastal water and the coastal environment.

Water quality

(4) Identify areas of coastal water and freshwater bodies that have been degraded by human activities.

(5) Engage with Mana Whenua to:

(a) identify areas of degraded coastal water where they have a particular interest; and

(b) remedy or, where remediation is not practicable, mitigate adverse effects on these degraded areas and values.

(6) Progressively improve water quality in areas identified as having degraded water quality through managing subdivision, use, development and discharges.

(7) Manage the discharges of contaminants into water from subdivision, use and development to avoid where practicable, and otherwise minimise, all of the following:

(a) significant bacterial contamination of freshwater and coastal water;

(b) adverse effects on the quality of freshwater and coastal water;

(c) adverse effects from contaminants, including nutrients generated on or applied to land, and the potential for these to enter freshwater and coastal water from both point and non-point sources;

(d) adverse effects on Mana Whenua values associated with coastal water, freshwater and geothermal water, including wāhi tapu, wāhi taonga and mahinga kai; and

(e) adverse effects on the water quality of catchments and aquifers that provide water for domestic and municipal supply.

Sediment runoff

(8) Minimise the loss of sediment from subdivision, use and development, and manage the discharge of sediment into freshwater and coastal water, by:

(a) promoting the use of soil conservation and management measures to retain soil and sediment on land; and

(b) requiring land disturbing activities to use industry best practice and standards appropriate to the nature and scale of the land disturbing activity and the sensitivity of the receiving environment.

Stormwater management

(9) Manage stormwater by all of the following:

(a) requiring subdivision, use and development to:

(i) minimise the generation and discharge of contaminants; and

(ii) minimise adverse effects on freshwater and coastal water and the capacity of the stormwater network;

(b) adopting the best practicable option for every stormwater diversion and discharge; and

(c) controlling the diversion and discharge of stormwater outside of areas serviced by a public stormwater network.

Wastewater

(10) Manage the adverse effects of wastewater discharges to freshwater and coastal water by all of the following:

(a) ensuring that new development is supported by wastewater infrastructure with sufficient capacity to serve the development;

(b) progressively reducing existing network overflows and associated adverse effects by all of the following:

(i) making receiving environments that are sensitive to the adverse effects of wastewater discharges a priority;

(ii) adopting the best practicable option for preventing or minimising the adverse effects of discharges from wastewater networks including works to reduce overflow frequencies and volumes;

(iii) ensuring plans are in place for the effective operation and maintenance of the wastewater network and to minimise dry weather overflow discharges;

(iv) ensuring processes are in place to mitigate the adverse effects of overflows on public health and safety and the environment where the overflows occur;

(c) adopting the best practicable option for minimising the adverse effects of discharges from wastewater treatment plants; and

(d) ensuring on-site wastewater systems avoid significant adverse effects on freshwater and coastal water.

Freshwater and geothermal water quantity, allocation and use

(11) Promote the efficient allocation of freshwater and geothermal water by all of the following:

(a) establishing clear limits for water allocation;

(b) avoiding over-allocation of water, including phasing out any existing over-allocation;

(c) safeguarding spring flows, surface waterbody base flows, ecosystem processes, life-supporting capacity, the recharge of adjacent aquifers, and geothermal temperature and amenity; and

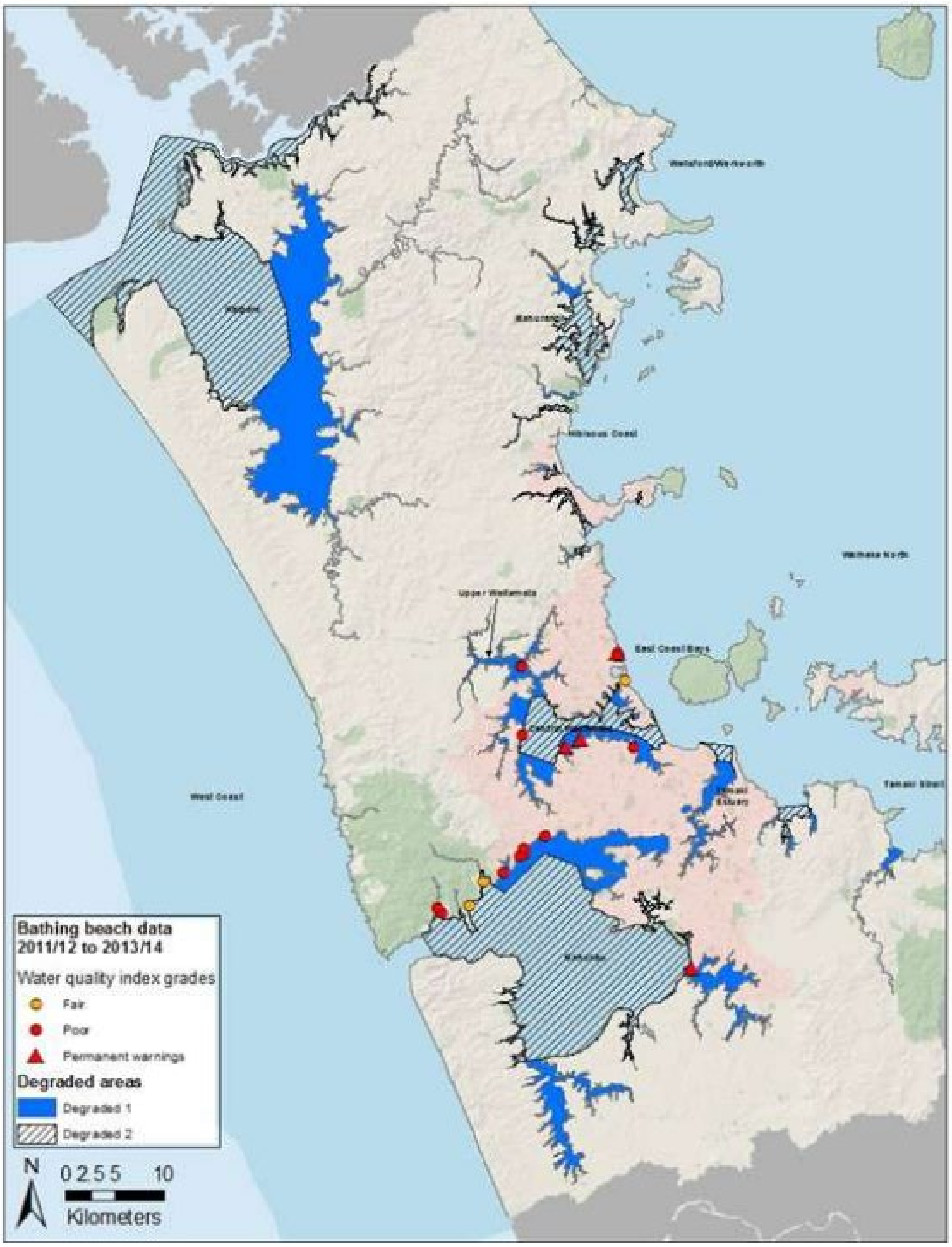
(d) providing for the reasonable requirements of domestic and municipal water supplies.

(12) Promote the efficient use of freshwater and geothermal water.

(13) Promote the taking of groundwater rather than the taking of water from rivers and streams in areas where groundwater is available for allocation.

(14) Enable the harvesting and storage of freshwater and rainwater to meet increasing demand for water and to manage water scarcity conditions, including those made worse by climate change.

Figure B7.4.2.1: Areas of coastal water that have been degraded by human activities



Appendix B List of AUP chapters that give effect to B7.3 and B7.4

The following chapters of the AUP include provisions that give effect to RPS chapters B7.3 and B7.4:

Chapter D Overlays

- D1 High-use Aquifer Management Areas Overlay
- D2 Quality-sensitive Aquifer Management Areas Overlay
- D3 High-use Stream Management Areas Overlay
- D4 Natural Stream Management Areas Overlay
- D5 Natural Lake Management Areas Overlay
- D6 Urban Lake Management Areas Overlay
- D7 Water Supply Management Areas Overlay
- D8 Wetland Management Areas Overlay
- D9 Significant Ecological Areas Overlay

Chapter E Auckland-wide

- E1 Water quality and integrated management
- E2 Water quantity, allocation and use
- E3 Lakes, rivers, streams and wetlands
- E4 Other discharges of contaminants
- E5 On-site and small scale wastewater treatment and disposal
- E6 Wastewater network management
- E7 Taking, using, damming and diversion of water and drilling
- E8 Stormwater – Discharge and diversion
- E9 Stormwater quality – High contaminant generating car parks and high use roads
- E10 Stormwater management area - Flow 1 and Flow 2
- E11 Land disturbance – Regional
- E12 Land disturbance – District
- E13 Cleanfills, managed fills and landfills
- E26 Infrastructure
- E32 Biosolids
- E33 Industrial and trade activities
- E34 Agrichemicals and vertebrate toxic agents

E35 Rural production discharges

E38 Subdivision – Urban

E39 Subdivision – Rural

Chapter F Coastal

F2 Coastal – General Coastal Marine Zone

F3 Coastal – Marina Zone

F2 Coastal – General Coastal Marine Zone

F5 Coastal – Minor Port Zone

F6 Coastal – Ferry Terminal Zone

Chapter G Rural Urban Boundary

G1 Rural Urban Boundary

Chapter H Zones

H1 Residential – Large Lot Zone

H2 Residential – Rural and Coastal Settlement Zone

[… All the other zones]

Chapter I Precincts

Various different precincts

Chapter L Schedules

Schedule 1 Wetland Management Areas Schedule

Schedule 2 Natural Lake Management Areas Schedule

Schedule 3 Significant Ecological Areas - Terrestrial Schedule

Schedule 4 Significant Ecological Areas - Marine Schedule

Chapter M Appendices

Appendix 1 Structure plan guidelines

Appendix 2 River and stream minimum flow and availability

Appendix 3 Aquifer water availabilities and levels

Appendix C Correlation between the s35 report indicators and measures and the AUP objectives and policies

Chapter 2 Water quality

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
B7.3 Freshwater systems **B7.3.1(1)** Degraded freshwater systems are enhanced **B7.3.2(1)** Integrate the management of subdivision, use and development and freshwater systems by undertaking all of the following: (c) controlling the use of land and discharges to minimise the adverse effects of runoff on freshwater systems and progressively reduce existing adverse effects where those systems or water are degraded; and **B7.3.2(2)** Identify degraded freshwater systems. **B7.3.2(3)** Promote the enhancement of freshwater systems identified as being degraded to progressively reduce adverse effects **B7.3.2(6)** Restore and enhance freshwater systems where practicable when development, change of land use, and subdivision occur. **B7.4 Coastal water, freshwater and geothermal water** **B7.4.1(2)** The quality of freshwater and coastal water is maintained where it is excellent or good and progressively improved over time where it is degraded.	**E1 Water quality and integrated management** **E1.2(1)** Freshwater and sediment quality is maintained where it is excellent or good and progressively improved over time in degraded areas. **E1.2(2)** The mauri of freshwater is maintained or progressively improved over time to enable traditional and cultural use of this resource by Mana Whenua. **E1.3(2)** Manage discharges, subdivision, use, and development that affect freshwater systems to: (a) maintain or enhance water quality, flows, stream channels and their margins and other freshwater values, where the current condition is above National Policy Statement for Freshwater Management National Bottom Lines and the relevant Macroinvertebrate Community Index guideline in Table E1.3.1 below; or (b) enhance water quality, flows, stream channels and their margins and other freshwater values where the current condition is below national bottom lines or the relevant Macroinvertebrate Community Index guideline in Table E1.3.1 below	Degraded areas are identified	‘Current state’ assessments for: **Coastal waters** Benthic ecological health Heavy metals – copper, zinc, lead Faecal indicator bacteria – Enterococci Litter and microplastics **Rivers** Nitrogen (N) – total and dissolved forms, Phosphorus (P) – total and dissolved forms, Copper (Cu) and zinc (Zn) – total and dissolved forms, Sediment – total suspended solids (TSS) or turbidity Faecal indicator bacteria –E. coli **Lakes** Total nitrogen Total phosphorus Dissolved reactive phosphorus

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
B7.4.2(1) Integrate the management of subdivision, use, development and coastal water and freshwater, by: (c) controlling the use of land and discharges to minimise the adverse effects of runoff on water and progressively reduce existing adverse effects where those water are degraded; and **B7.4.2(4)** Identify areas of coastal water and freshwater bodies that have been degraded by human activities. **B7.4.2(5)** Engage with Mana Whenua to: (a) identify areas of degraded coastal water where they have a particular interest; and (b) remedy or, where remediation is not practicable, mitigate adverse effects on these degraded areas and values. **B7.4.2(6)** Progressively improve water quality in areas identified as having degraded water quality through managing subdivision, use, development and discharges.	**E1.3(10)** In taking an integrated stormwater management approach have regard to all of the following: (c) the nature and sensitivity of receiving environments to the adverse effects of development, including fragmentation and loss of connectivity of rivers and streams, hydrological effects and contaminant discharges and how these can be minimised and mitigated, including opportunities to enhance degraded environments; **F2.11 Coastal – General Coastal Marine Zone, Discharges** **F2.11.2(1)** Water and sediment quality in the coastal marine area is maintained where it is excellent or good and progressively improved over time in degraded areas. **F2.11.2(2)** The life-supporting capacity and resources of the Hauraki Gulf are protected and, where appropriate, enhanced. **F2.11.3(2)** Require any proposal to discharge contaminants or water into the coastal marine area to adopt the best practicable option to prevent or minimise adverse effects on the environment, having regard to all of the following: (c) whether the receiving environment has the capacity to assimilate the discharged contaminants after reasonable mixing, particularly within areas identified as degraded or as having significant ecological value;		Ammonia (toxicity) Chlorophyll a Suspended sediment Water clarity Annual Trophic Level Index Lake Submerged Plant Index (ecological assessment) **Groundwater** Ammonia Nitrate Dissolved reactive phosphorus Metals – zinc, copper, iron, manganese, sodium Faecal indicator bacteria – *E. coli*
		Good or excellent areas are being maintained and degraded areas are improving over time	Trends in the measures above.

Chapter 3 Water allocation

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
B7.4 Coastal water, freshwater and geothermal water **B7.4.1(1)** Coastal water, freshwater and geothermal water are used within identified limits while safeguarding the life-supporting capacity and the natural, social and cultural values of the waters. **B7.4.2(11)** Promote the efficient allocation of freshwater and geothermal water by all of the following: (a) establishing clear limits for water allocation; (c) safeguarding spring flows, surface waterbody base flows, ecosystem processes, life-supporting capacity, the recharge of adjacent aquifers, and geothermal temperature and amenity; and	**E2 Water quantity, allocation and use** **E2.2(1)** Water in surface rivers and groundwater aquifers is available for use provided the natural values of water are maintained and established limits are not exceeded. **E2.2(2)** Water resources are managed within limits to meet current and future water needs for social, cultural and economic purposes. *Water allocation and availability guidelines* **E2.3(5)** Manage the taking and use of surface water from rivers, streams and springs and taking and use of groundwater from aquifers to meet all of the following except where water allocation exceeds or is close to exceeding the guidelines (refer to Policy E2.3(10)): (a) the minimum flow and availability guidelines in Table 1 River and stream minimum flow and availability in Appendix 2 River and stream minimum flow and availability are not exceeded; and (b) the aquifer availability and groundwater levels in Table 1 Aquifer water availabilities and Table 2 Interim aquifer groundwater levels in Appendix 3 Aquifer water availabilities and levels are not exceeded.	Clear limits are set that safeguard the values of waterbodies	The number of water bodies that have clear limits that protect the values of water the water body An assessment of how the limit has been determined An assessment of how limits protect values in times of low flow or water level
B7.4.2(11) Promote the efficient allocation of freshwater and geothermal water by all of the following: (b) avoiding over-allocation of water, including phasing out any existing over-allocation;	**E2.2(1)** Water in surface rivers and groundwater aquifers is available for use provided the natural values of water are maintained and established limits are not exceeded.	Water is allocated to be taken and used within the limits	The number of water bodies which are allocated within the limits An assessment of whether consents are granted within limits

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	E2.2(2) Water resources are managed within limits to meet current and future water needs for social, cultural and economic purposes. **E2.2(3)** Freshwater resources available for use are managed and allocated in order of priority to provide for domestic and municipal water supplies, animals, and economic development. **E2.3(6)** Require proposals to take and use water from lakes, rivers, streams, springs or wetlands to demonstrate all of the following: (a) the taking of surface water from any river or stream is within the guideline in Table 1 River and stream minimum flow and availability in Appendix 2 River and stream minimum flow and availability, except in accordance with Policy E2.3(11); (b) appropriate water levels and downstream flow regimes will be maintained, including: (i) low flows in rivers and streams to protect in-stream values; (ii) flow variability in rivers, streams and springs; (iii) water levels and flows in wetlands ensure vegetation and habitat values of the wetland are protected throughout the year; (iv) water levels in lakes maintain the ecological values and water quality of the lake and its shoreline stability, and enable recreational use; and (v) existing lawfully established taking of water is not adversely affected; (c) the taking of water will be at times of the day or year that will safeguard the identified freshwater values of the water body; (d) intake structures will be designed, constructed, operated and maintained to avoid adverse effects on biota, including the entrainment and impingement of fish; and		An assessment of the way that over-allocation is being phased out

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	(e) there are options for implementing water conservation measures in times of water shortage. *Priority of water use* **E2.3 (1)** Manage the allocation of fresh water within the guidelines provided by Appendix 2 River and stream minimum flow and availability and Appendix 3 Aquifer water availabilities and levels and give priority to making freshwater available for the following uses (in descending order of priority): (a) existing and reasonably foreseeable domestic and municipal water supply and animal drinking water requirements; (b) existing lawfully established water users; (c) uses of water for which alternative water sources are unavailable or unsuitable; and (d) all other use **E2.3(3)** Manage the allocation of geothermal water, heat or energy within the guidelines provided by Appendix 3 Aquifer water availabilities and levels and give priority to making water, heat or energy available for (in descending order of priority): (a) in accordance with tikanga Māori for the communal benefit of Mana Whenua of the area; (b) existing lawfully established water uses; (c) heating public pools; or (d) all other uses. **E2.3(7)** Require all proposals to take and use groundwater from any aquifer to demonstrate that: (a) the taking is within the water availabilities and levels for the aquifer in Table 1 Aquifer water availabilities and Table 2 Interim aquifer		

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	groundwater levels in Appendix 3 Aquifer water availabilities and levels, except in accordance with Policy E2.3(11), and meeting all of the following: (i) recharge to other aquifers is maintained; and (ii) aquifer consolidation and surface subsidence is avoided. (b) the taking will avoid, remedy or mitigate adverse effects on surface water flows, including the following: (i) base flow of rivers, streams and springs; and (ii) any river or stream flow requirements and in particular the minimum stream flow and availability in Appendix 2 River and stream minimum flow and availability. (c) the taking will avoid, remedy or mitigate adverse effects on terrestrial and freshwater ecosystem habitat; (d) the taking will not cause saltwater intrusion or any other contamination; (e) the taking will not cause adverse interference effects on neighbouring bores to the extent their owners are prevented from exercising their lawfully established water takes; (f) Policy E2.3(7)(e) above will not apply in the following circumstances: (i) where it is practicably possible to locate the pump intake at a greater depth within the affected bore; or (ii) where it can be demonstrated that the affected bore accesses, or could access, groundwater at a deeper level within the same aquifer, if drilled or cased to a greater depth. (g) the proposed bore is capable of extracting the quantity of groundwater applied for; and the proposal avoids, remedies or mitigates any ground		

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	settlement that may cause distress, including reducing the ability of an existing building or structure to meet the relevant requirements of the Building Act 2004 or the New Zealand Building Code, to any existing: (i) buildings; (ii) structures; or (iii) services including roads, pavements, power, gas, electricity, water and wastewater networks and fibre-optic cables. **E2.3(8)** Consider mitigation options, where there are significant adverse effects on the matters identified in policies E2.3(6) and (7) above, including any of the following: (a) consideration of alternative locations, rates and timing of takes for both surface water and groundwater; use of (b) alternative water supplies; (c) use of water conservation methods when water shortage conditions apply; (d) provision for fish passage in rivers and streams; (e) wetland creation or enhancement of existing wetlands; (f) riparian planting; or (g) consideration of alternative designs for groundwater dewatering proposals. **E2.3(9)** Require proposals to take and use surface water and groundwater to monitor the effects of the take on the quality and quantity of the water resource and to: (a) measure and record water use and rate of take;		

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	(b) measure and record water flows and levels; (c) sample and assess water quality and freshwater ecology; (d) measure and record the movement of ground, buildings and other structures; and (e) monitoring should be of a type and scale appropriate for the activity. **E2.3(10)** Manage water availability, where water allocation exceeds or is close to exceeding the guidelines in Table 1 River and stream minimum flow and availability in Appendix 2 River and stream minimum flow and availability and Table 1 Aquifer water availabilities and Table 2 Interim aquifer groundwater levels in Appendix 3 Aquifer water availabilities and levels by: (a) not granting new consent applications to take water except where provided for by Policy E2.3(11); (b)reducing existing takes over time and phasing out any over-allocation by: (i) encouraging voluntary reductions in water allocations; and (ii) reviewing existing consents to align water allocations to the actual historical use of water, for horticultural operators this will be averaged across the full rotational cycle of the crops grown. (c) exempting existing allocations for municipal water supply under Policy E2.3(10)(b)(ii) above from review where a water management plan demonstrates a necessary increase in abstraction to cater for planned urban growth; (d) reviewing existing consents to require the efficient use of water; and		

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	(e) accounting for takes expressly permitted in this Plan, or allowed under section 14(3)(b) of the Resource Management Act 1991. **E2.3(11)** Allow takes that exceed the guidelines in Table 1 River and stream minimum flow and availability in Appendix 2 River and stream minimum flow and availability and Table 1 Aquifer water availabilities and Table 2 Interim aquifer groundwater levels in Appendix 3 Aquifer water availabilities and levels in the following circumstances: (a) For guidelines in Table 1 River and stream minimum flow and availability in Appendix 2 River and stream minimum flow and availability, when the river or stream flow is greater than the median flow, provided the total take does not exceed 10 per cent of the flow in the river or stream at the time of abstraction, and natural flow variability is maintained; or (b) For all guidelines, where it is appropriately demonstrated in terms of the requirements of Policy of E2.3(6)(b) or Policy E2.3(7), that additional water is available for allocation **E2.3(17)** Comprehensive reviews of consents Require resource consents granted to take, use or dam water and to discharge contaminants to land or freshwater to be for a duration and to include a condition setting the review date(s) of the consent, that will enable the concurrent processing or review of all consents/replacement applications, as a basis for a comprehensive and integrated assessment of water quality and water quantity issues in a specific catchment and/or aquifer system.		

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
B7.4.1(3) Freshwater and geothermal water is allocated efficiently to provide for social, economic and cultural purposes.	**E2.2(2)** Water resources are managed within limits to meet current and future water needs for social, cultural and economic purposes. *Priority of water use* **E2.3 (1)** Manage the allocation of fresh water within the guidelines provided by Appendix 2 River and stream minimum flow and availability and Appendix 3 Aquifer water availabilities and levels and give priority to making freshwater available for the following uses (in descending order of priority): (a)existing and reasonably foreseeable domestic and municipal water supply and animal drinking water requirements; (b) existing lawfully established water users; (c)uses of water for which alternative water sources are unavailable or unsuitable; and (d)all other use **E2.3(3)** Manage the allocation of geothermal water, heat or energy within the guidelines provided by Appendix 3 Aquifer water availabilities and levels and give priority to making water, heat or energy available for (in descending order of priority): (a) in accordance with tikanga Māori for the communal benefit of Mana Whenua of the area; (b) existing lawfully established water uses; (c) heating public pools; or (d) all other uses. **E2.2(5)** Mana Whenua values including the mauri of water, are acknowledged in the allocation and use of water	Water allocation allows Aucklanders to provide for their social, economic and cultural purposes	An assessment of how water allocation provides for social, cultural and economic purposes

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
B7.4.2(11) Promote the efficient allocation of freshwater and geothermal water by all of the following: (a) establishing clear limits for water allocation; (b) avoiding over-allocation of water, including phasing out any existing over-allocation; (c) safeguarding spring flows, surface waterbody base flows, ecosystem processes, life-supporting capacity, the recharge of adjacent aquifers, and geothermal temperature and amenity; and	**E2.2(4)** Water resources are managed to maximise the efficient allocation and efficient use of available water. **E2.3(4)** Promote the efficient allocation and use of freshwater and geothermal water by: (a) requiring the amount of water taken and used to be reasonable and justifiable with regard to the intended use, and where appropriate: (i) municipal water supplies are supported by a water management plan; (ii) industrial and irrigation supplies implement best practice, in respect of the efficient use of water for that particular activity or industry; or (iii) all takes (other than municipal water supplies from a dam) are limited to a maximum annual allocation based on estimated water requirements; (b) requiring consideration of water conservation and thermal efficiency methods; (c) facilitating the transfer of surface water take permits, provided the transfer is within the same surface water catchment and does not result in site-specific adverse effects; (d) encouraging the shared use and management of water through water user groups or other arrangements where it results in an increased efficiency in the use and allocation of water; and (e) providing for storage and harvesting of fresh water. **E2.2(5)** Mana Whenua values including the mauri of water, are acknowledged in the allocation and use of water	Water is efficiently allocated	An assessment of how efficient allocation is undertaken and how a 'reasonable and justifiable' volume of water is determined.

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
B7.4.2(12) Promote the efficient use of freshwater and geothermal water	**E2.2(4)** Water resources are managed to maximise the efficient allocation and efficient use of available water. **E2.3(4)** Promote the efficient allocation and use of freshwater and geothermal water by: (a) requiring the amount of water taken and used to be reasonable and justifiable with regard to the intended use, and where appropriate: (i) municipal water supplies are supported by a water management plan; (ii) industrial and irrigation supplies implement best practice, in respect of the efficient use of water for that particular activity or industry; or (iii) all takes (other than municipal water supplies from a dam) are limited to a maximum annual allocation based on estimated water requirements; (b) requiring consideration of water conservation and thermal efficiency methods; (c) facilitating the transfer of surface water take permits, provided the transfer is within the same surface water catchment and does not result in site-specific adverse effects; (d) encouraging the shared use and management of water through water user groups or other arrangements where it results in an increased efficiency in the use and allocation of water; and (e) providing for storage and harvesting of fresh water. **E2.2(5)** Mana Whenua values including the mauri of water, are acknowledged in the allocation and use of water	Water that is allocated is efficiently used	The number of consents that have a condition to require consent holders to provide efficient use reports
	D1 High-use Aquifer Management Areas Overlay **D1.2(1)** Aquifers identified in the High-use Aquifer Management Areas Overlay are managed so they	The overlays provide the appropriate level of	An assessment of whether the HUAMA overlay is achieving the outcomes sought.

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	can continue to meet existing and future water take demands and provide base flow for surface streams. **D1.3(1)** Manage proposals to take and use water from High-use Aquifer Management Areas in Table D1.3.1 to prevent groundwater allocation exceeding availability, also having regard to Table 1 Aquifer water availabilities in Appendix 3 Aquifer water availabilities and levels. **D1.3(2)** Require resource consents for all proposals to take and use water from the High-use Aquifer Management Areas in Table D1.3.1 (other than takes permitted by section 14(3)(b) of the Resource Management Act 1991) to assess the impacts of the proposal on water availability levels and to take account of new information on water availability as it becomes available. **D3. High-use Stream Management Areas Overlay** **D3.2(1)** Water continues to be available from high-use streams within limits while safeguarding the life-supporting capacity and amenity values of the stream. **D3.3(1)** Manage streams within the following catchments and sub-catchments as part of the High-use Stream Management Areas Overlay: (a) Whangaripo Stream, a sub-catchment of the Hōteo River catchment; (b) Mahurangi River; (c) Waitoki, Waikahikatea and Waipapakura streams, sub-catchments of the Kaukapakapa River catchment; (d) Waimauku Stream and Kumeū River, sub-catchments of the Kaipara River catchment; (e) Puhinui Stream in the Manukau area; (f) Taitaia Stream, a sub-catchment of the Wairoa River catchment;	protection for waterbodies	An assessment of the level of allocation of the HUAMA and whether all 'high use' or fully allocated aquifers are captured by the overlay An assessment of whether the HUSMA and WMA overlays are achieving the outcomes sought.

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	(g) Hays Creek in the Papakura area; and (h) Ngakoroa, Mauku and Waitangi streams in the Franklin area. **D3.3(2)** Require the take or use water from an area in the High-use Stream Management Areas Overlay to: (a) ensure that other water takes can continue to operate; (b) maintain in-stream ecological values; (c) maintain Mana Whenua values; and (d) maintain the stream's amenity values. **D8. Wetland Management Areas Overlay** **D8.2(1)** High natural character and ecological values of wetland management areas are maintained or enhanced. **D8.3(1)** Maintain or enhance wetland management areas by: (b) maintaining water levels to ensure ecosystem functionality and significant variations in water levels occur only through natural fluctuations;		
B7.4.2(13) Promote the taking of groundwater rather than the taking of water from rivers and streams in areas where groundwater is available for allocation.		The take and use of groundwater is promoted over surface water	More consents are granted to take and use ground water than surface water. Assessment of whether surface water applications have considered taking water from ground water

Chapter 4 Streams and wetlands

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
B7.3 Freshwater systems **B7.3.1(2)** Loss of freshwater systems is minimised.	**E3 Lakes, rivers, streams and wetlands** **E3.2(1)** Auckland's lakes, rivers, streams and wetlands with high natural values are protected from degradation and permanent loss. **E3.2(2)** Auckland's lakes, rivers, streams and wetlands are restored, maintained or enhanced.	Extent of stream and wetland lost over time	Consented extent of stream and wetland loss The number of resource consents affecting streams and wetlands that have been granted under Chapter E3
B7.3.1(2) Loss of freshwater systems is minimised. **B7.3.1(3)** The adverse effects of changes in land use on freshwater are avoided, remedied or mitigated. **B7.3.2(3)** Promote the enhancement of freshwater systems identified as being degraded to progressively reduce adverse effects. **B7.3.2(4)** Avoid the permanent loss and significant modification or diversion of lakes, rivers, streams (excluding ephemeral streams), and wetlands and their margins, unless all of the following apply: (a) it is necessary to provide for: (i) the health and safety of communities; or (ii) the enhancement and restoration of freshwater systems and values; or (iii) the sustainable use of land and resources to provide for growth and development; or	**E3.2(3)** Significant residual adverse effects on lakes, rivers, streams or wetlands that cannot be avoided, remedied or mitigated are offset where this will promote the purpose of the Resource Management Act 1991. **E3.2(4)** Structures in, on, under or over the bed of a lake, river, stream or wetland are provided for where there are functional or operational needs for the structure to be in that location, or traverse that area. **E3.2(5)** Activities in, on, under or over the bed of a lake, river, stream and wetland are managed to minimise adverse effects on the lake, river, stream or wetland. **E3.2(6)** Reclamation and drainage of the bed of a lake, river, stream and wetland is avoided, unless there is no practicable alternative.	Resource consent processes for works in, on, and over streams and wetlands protect the values of the waterways	Whether resource consents granted under Chapter E3 demonstrate consideration of the relevant matters outlined in the AUP
		Development is designed to retain streams and wetlands	The number of resource consents affecting streams and wetlands in greenfield areas

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
(iv) infrastructure; (b) no practicable alternative exists; (c) mitigation measures are implemented to address the adverse effects arising from the loss in freshwater system functions and values; and (d) where adverse effects cannot be adequately mitigated, environmental benefits including on-site or off-site works are provided. **B7.3.2(5)** Manage subdivision, use, development, including discharges and activities in the beds of lakes, rivers streams, and in wetlands, to do all of the following: (a) protect identified Natural Lake Management Areas, Natural Stream Management Areas, and Wetland Management Areas; (b) minimise erosion and modification of beds and banks of lakes, rivers, streams and wetlands; (c) limit the establishment of structures within the beds of lakes, rivers and streams and in wetlands to those that have a functional need or operational requirement to be located there; and (d) maintain or where appropriate enhance: (i) freshwater systems not protected under Policy B7.3.2(5)(a); (ii) navigation along rivers and public access to and along lakes, rivers and streams; (iii) existing riparian vegetation located on the margins of lakes, rivers, streams and wetlands; and (iv) areas of significant indigenous biodiversity.	**E3.3(1)** Avoid significant adverse effects, and avoid where practicable or otherwise remedy or mitigate other adverse effects of activities in, on, under or over the beds of lakes, rivers, streams or wetlands within the following overlays: (a) D4 Natural Stream Management Areas Overlay; (b) D5 Natural Lake Management Areas Overlay; (c) D6 Urban Lake Management Areas Overlay; (d) D9 Significant Ecological Areas Overlay; and (e) D8 Wetland Management Areas Overlay. **E3.3(2)** Manage the effects of activities in, on, under or over the beds of lakes, rivers, streams or wetlands outside the overlays identified in Policy E3.3(1) by: (a) avoiding where practicable or otherwise remedying or mitigating any adverse effects on lakes, rivers, streams or wetlands; and (b) where appropriate, restoring and enhancing the lake, river, stream or wetland. **E3.3(4)** Restoration and enhancement actions, which may form part of an offsetting proposal, for a specific activity should: (a) be located as close as possible to the subject site; (b) be 'like-for-like' in terms of the type of freshwater system affected; (c) preferably achieve no net loss or a net gain in the natural values including ecological function of lakes, rivers, streams or wetlands; and (d) consider the use of biodiversity offsetting as outlined in Appendix 8 Biodiversity offsetting. **E3.2(5)** Activities in, on, under or over the bed of a lake, river, stream and wetlands are managed to	Sediment is retained in stream banks and beds	Whether resource consents granted under Chapter E3 demonstrate consideration of erosion and sediment effects Trends for erosion scarring and the extent that stream bank erosion contributes to total sediment sources

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	minimise adverse effects on the lake, river, stream, or wetland. **E3.3(13)** Avoid the reclamation and drainage of the bed of lakes, rivers, streams and wetlands, including any extension to existing reclamations or drained areas unless all of the following apply: (a) there is no practicable alternative method for undertaking the activity outside the lake, river, stream or wetland; (b) for lakes, permanent rivers and streams, and wetlands the activity is required for any of the following: (i) as part of an activity designed to restore or enhance the natural values of any lake, river, stream or wetland, any adjacent area of indigenous vegetation or habitats of indigenous fauna; (ii) for the operation, use, maintenance, repair, development or upgrade of infrastructure; or (iii) to undertake mineral extraction activities; and (c) the activity avoids significant adverse effects and avoids, remedies or mitigates other adverse effects on Mana Whenua values associated with freshwater resources, including wāhi tapu, wāhi taonga and mahinga kai.		
B7.3.1(2) Loss of freshwater systems is minimised.	**E3.3(7)** Provide for the operation, use, maintenance, repair, erection, reconstruction, placement, alteration or extension, of any structure or part of any structure in, on, under, or over the bed of a lake, river, stream or wetland, and any associated diversion of water, where the structure complies with all of the following: (a) there is no practicable alternative method or location for undertaking the activity outside the bed of the lake, river, stream or wetland;	Loss of streams resulting from permitted culvert activities	Extent that permitted culvert activities are being undertaken

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	(b) the structure is designed to be the minimum size necessary for its purpose to minimise modification to the bed of a lake, river, stream or wetland; (c) the structure is designed to avoid creating or increasing a hazard; (d) the structure is for any of the following: (i) required as part of an activity designed to restore or enhance the natural values of any lakes, rivers, streams or wetlands and their margins, or any adjacent area of indigenous vegetation or habitat of indigenous fauna; (ii) designed to maintain and/or enhance public access to, over and along any lake, river, stream or wetland and their margins; (iii) necessary to provide access across a lake, river, stream or wetland; (iv) associated with infrastructure; (v) necessary for flood protection and the safeguarding of public health and safety; or (vi) required for the reasonable use of production land. (e) the structure avoids significant adverse effects and avoids, remedies or mitigates other adverse effects on Mana Whenua values associated with freshwater resources, including wāhi tapu, wāhi taonga and mahinga kai.		

Chapter 5 Wastewater networks

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
B7.4 Coastal water, freshwater and geothermal water **B7.4.1(4)** The adverse effects of point and non-point discharges, in particular stormwater runoff and wastewater discharges, on coastal waters, freshwater and geothermal water are minimised and existing adverse effects are progressively reduced. **B7.4.2 (6)** Progressively improve water quality in areas identified as having degraded water quality through managing subdivision, use, development and discharges. **B7.4.2(7)** Manage the discharges of contaminants into water from subdivision, use and development to avoid where practicable, and otherwise minimise, all of the following: (a) significant bacterial contamination of freshwater and coastal water; (b) adverse effects on the quality of freshwater and coastal water; (c) adverse effects from contaminants, including nutrients generated on or applied to land, and the potential for these to enter freshwater and coastal water from both point and non-point sources; (d) adverse effects on Mana Whenua values associated with coastal water, freshwater and geothermal water, including wāhi tapu, wāhi taonga and mahinga kai; and (e) adverse effects on the water quality of catchments and aquifers that provide water for domestic and municipal supply.	**E1 Water quality and integrated management** **E1.2(3)** Stormwater and wastewater networks are managed to protect public health and safety and to prevent or minimise adverse effects of contaminants on freshwater and coastal water quality. **E1.3(19)** Ensure wastewater networks are designed and operated to minimise wet weather overflows by: (b) requiring the management of connections to the wastewater network; (c) requiring wastewater networks to be managed in accordance with a network operations plan including an overflow mitigation plan with clear requirements and timeframes; and (d) designing and locating overflow points to minimise nuisance, damage, public health risk and adverse ecological effects. **E1.3(21)** Progressively minimise the adverse effects of wet weather overflows from wastewater networks by: (a) adopting the best practicable option to reduce wet weather overflows to an average of no more than two events per discharge location per year in areas serviced by a separated wastewater network with priority for: (i) receiving environments that are used for public and contact recreation activities;	Point-source wastewater overflows and their potential adverse effects are minimised by: • adopting the Best Practicable Option (BPO) for preventing or minimising the adverse effects of discharges; including by reducing overflows, • preparing plans for wastewater network operations and maintenance, • prioritising areas sensitive to wastewater overflows; and • ensuring processes are in place to manage the effects of	A review of the NDC, including: • number of dry weather overflows; and • number of wet weather overflows. • Number of treatment plants that operate within the number of anticipated overflows identified in their consent conditions. Number of human health incidents attributed to a particular overflow point (not assessed due to limitations in sourcing data)[285]

[285] Data was not available for this report which could identify the number of Safeswim alerts linked to particular overflow points. The Water Quality discussion contained in section 2.3.1.3.4, however, provides further information on Safeswim data.

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
B7.4.2(10) Manage the adverse effects of wastewater discharges to freshwater and coastal water by all of the following: (b) progressively reducing existing network overflows and associated adverse effects by all of the following: (i) making receiving environments that are sensitive to the adverse effects of wastewater discharges a priority; (ii) adopting the best practicable option for preventing or minimising the adverse effects of discharges from wastewater networks including works to reduce overflow frequencies and volumes; (iii) ensuring plans are in place for the effective operation and maintenance of the wastewater network and to minimise dry weather overflow discharges; (iv) ensuring processes are in place to mitigate the adverse effects of overflows on public health and safety and the environment where the overflows occur;	(ii) receiving environments that are sensitive to the adverse effects of wastewater overflows; (iii) areas significant to Mana Whenua; or (iv) adopting the best practicable option to reduce wet weather overflows from the combined sewer network. (b) requiring the development and implementation of a network operations plan; as part of any network discharge consent; and (c) adopting wastewater overflow response procedures. **E1.3(22)** Minimise the adverse effects of dry weather overflows by: (a) ensuring wastewater networks and combined sewer networks are operated and maintained to minimise the likelihood of dry weather overflows occurring; and (b) adopting wastewater overflow response procedures to minimise adverse effects and risks to public health and safety and the environment. **F2.11 Coastal – General Coastal Marine Zone, Discharges** **F2.11.2(3)** Stormwater and wastewater networks protect public health and safety by preventing or minimising the adverse effects of contaminants on the coastal water quality. **F2.11.3(2)** Require any proposal to discharge contaminants or water into the coastal marine area to adopt the best practicable option to prevent or minimise adverse effects on the environment, having regard to all of the following: (a) whether it is practicable or appropriate to discharge to land above mean high water springs;	overflows on human health and the environment.	

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	(c) whether the receiving environment has the capacity to assimilate the discharged contaminants after reasonable mixing, particularly within areas identified as degraded or as having significant ecological value; **F2.11.3(8)** Avoid the discharge of wastewater to the coastal marine area, unless: (a) alternative methods, sites and routes for the discharge have been considered and are not the best practicable option;		
B7.4 Coastal water, freshwater and geothermal water **B7.4.1(4)** The adverse effects of point and non-point discharges, in particular stormwater runoff and wastewater discharges, on coastal waters, freshwater and geothermal water are minimised and existing adverse effects are progressively reduced. **B7.4.2(1)** Integrate the management of subdivision, use, development and coastal water and freshwater, by: (a) ensuring water supply, stormwater and wastewater infrastructure is adequately provided for in areas of growth; and **B7.4.2 (6)** Progressively improve water quality in areas identified as having degraded water quality through managing subdivision, use, development and discharges. **B7.4.2(7)** Manage the discharges of contaminants into water from subdivision, use and development to avoid where practicable, and otherwise minimise, all of the following: (a) significant bacterial contamination of freshwater and coastal water;	**E1 Water quality and integrated management** **E1.2(3)** Stormwater and wastewater networks are managed to protect public health and safety and to prevent or minimise adverse effects of contaminants on freshwater and coastal water quality. **E1.3(17)** Avoid the discharge of wastewater to the coastal marine area and to freshwater, unless: (a) alternative methods, sites and routes for the discharge have been considered and are not the best practicable option; **E1.3(18)** Avoid the discharge of wastewater from wastewater treatment plants and associated structures to freshwater, unless: (a) alternative methods, sites and routes for the discharge have been considered and are not the best practicable option; **E1.3(19)** Ensure wastewater networks are designed and operated to minimise wet weather overflows by: (a) requiring wastewater networks to be designed and constructed in accordance with recognised industry standards, including being sized to cater	Growth is supported by infrastructure provision which uses the best practicable option to minimise adverse effects.	A review of consents granted under the AUP for wastewater overflows. A review of consents granted under the AUP for wastewater treatment plant discharges and upgrades to the network.

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
(b) adverse effects on the quality of freshwater and coastal water; (c) adverse effects from contaminants, including nutrients generated on or applied to land, and the potential for these to enter freshwater and coastal water from both point and non-point sources; (d) adverse effects on Mana Whenua values associated with coastal water, freshwater and geothermal water, including wāhi tapu, wāhi taonga and mahinga kai; and (e) adverse effects on the water quality of catchments and aquifers that provide water for domestic and municipal supply. **B7.4.2(10)** Manage the adverse effects of wastewater discharges to freshwater and coastal water by all of the following: (a) ensuring that new development is supported by wastewater infrastructure with sufficient capacity to serve the development; (b) progressively reducing existing network overflows and associated adverse effects by all of the following: (i) making receiving environments that are sensitive to the adverse effects of wastewater discharges a priority; (ii) adopting the best practicable option for preventing or minimising the adverse effects of discharges from wastewater networks including works to reduce overflow frequencies and volumes; (iii) ensuring plans are in place for the effective operation and maintenance of the wastewater network and to minimise dry weather overflow discharges; (iv) ensuring processes are in place to mitigate the adverse effects of overflows on public health and	for the maximum probable development level of the area to be serviced; (b) requiring the management of connections to the wastewater network; (c) requiring wastewater networks to be managed in accordance with a network operations plan including an overflow mitigation plan with clear requirements and timeframes; and (d) designing and locating overflow points to minimise nuisance, damage, public health risk and adverse ecological effects. **E1.3(21)** Progressively minimise the adverse effects of wet weather overflows from wastewater networks by: (a) adopting the best practicable option to reduce wet weather overflows to an average of no more than two events per discharge location per year in areas serviced by a separated wastewater network with priority for: (i) receiving environments that are used for public and contact recreation activities; (ii) receiving environments that are sensitive to the adverse effects of wastewater overflows; (iii) areas significant to Mana Whenua; or (iv) adopting the best practicable option to reduce wet weather overflows from the combined sewer network. (b) requiring the development and implementation of a network operations plan; as part of any network discharge consent; and (c) adopting wastewater overflow response procedures. **E1.3(22)** Minimise the adverse effects of dry weather overflows by:		

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
safety and the environment where the overflows occur; (c) adopting the best practicable option for minimising the adverse effects of discharges from wastewater treatment plants; and	(a) ensuring wastewater networks and combined sewer networks are operated and maintained to minimise the likelihood of dry weather overflows occurring; and (b) adopting wastewater overflow response procedures to minimise adverse effects and risks to public health and safety and the environment. **F2.11 Coastal – General Coastal Marine Zone, Discharges** **F2.11.2(3)** Stormwater and wastewater networks protect public health and safety by preventing or minimising the adverse effects of contaminants on the coastal water quality. **F2.11.3(2)** Require any proposal to discharge contaminants or water into the coastal marine area to adopt the best practicable option to prevent or minimise adverse effects on the environment, having regard to all of the following: (a) whether it is practicable or appropriate to discharge to land above mean high water springs; (c) whether the receiving environment has the capacity to assimilate the discharged contaminants after reasonable mixing, particularly within areas identified as degraded or as having significant ecological value; (d) the extent to which present or foreseeable future adverse effects have been avoided, remedied or mitigated on: (i) areas of high recreational use; (ii) relevant initiatives by Mana Whenua established under regulations relating to the conservation or management of fisheries; (iii) the collection of fish and shellfish for consumption; and		

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	(iv) areas associated with maintenance dredging; (e) high ecological values; (g) the discharge after reasonable mixing, does not either by itself or in combination with other discharges results in any or all of the following effects: (i) oil or grease films, scums or foams, or floatable or suspended materials; (ii) conspicuous change in the colour or visual clarity; (iii) any emission of objectionable odour; (iv) any significant adverse effects on aquatic life; or (v) any significant effects of aesthetic or amenity values. **F2.11.3(7)** Enable discharges associated with new or redevelopment of infrastructure to meet the economic and social needs of people and communities, taking into account all of the following: (a) the practicability of upgrading the part of the infrastructure at issue, the state of the infrastructure and the costs of upgrading it; (b) public health priorities; (c) the nature of both the receiving environment and the discharge; (d) priorities for flooding and inundation protection; (e) the operational need for stormwater or wastewater infrastructure and associated discharges to be located in the coastal marine area; and (f) Policies E1.3(8) – (14), (17) – (21) of E1 Water quality and integrated management;		

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	F2.11.3(8) Avoid the discharge of wastewater to the coastal marine area, unless: (a) alternative methods, sites and routes for the discharge have been considered and are not the best practicable option; (d) the extent to which adverse effects have been avoided, remedied or mitigated on areas of: (i) high recreational use, or areas that are used for fishing or shellfish gathering; (ii) maintenance dredging; (iii) commercial or residential waterfront development; (iv) high ecological value; and (v) marine farms.		

Chapter 6 On-site wastewater systems

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
B7.4 Coastal water, freshwater and geothermal water **B7.4.1(4)** The adverse effects of point and non-point discharges, in particular stormwater runoff and wastewater discharges, on coastal waters, freshwater and geothermal water are minimised and existing adverse effects are progressively reduced. **B7.4.2(7)** Manage the discharges of contaminants into water from subdivision, use and development to avoid where practicable, and otherwise minimise, all of the following: (a) significant bacterial contamination of freshwater and coastal water; (b) adverse effects on the quality of freshwater and coastal water; (c) adverse effects from contaminants, including nutrients generated on or applied to land, and the potential for these to enter freshwater and coastal water from both point and non-point sources; (d) adverse effects on Mana Whenua values associated with coastal water, freshwater and geothermal water, including wāhi tapu, wāhi taonga and mahinga kai; and (e) adverse effects on the water quality of catchments and aquifers that provide water for domestic and municipal supply. **B7.4.2(10)** Manage the adverse effects of wastewater discharges to freshwater and coastal water by all of the following: …	**E1 Water quality and integrated management** **E1.3(23)** Enable on-site domestic-type wastewater treatment and disposal where: (a) there is no wastewater network available, or it is not practicable to connect into one of the network, or any existing network does not have capacity and it is not practicable to upgrade it; and (b) the on-site wastewater treatment results in a discharge that is of a quality and volume that avoids significant adverse effects on groundwater, surface and coastal water quality, public health and amenity. **E1.3(24)** Require proposals for on-site wastewater treatment and disposal to land or water to demonstrate all of the following: (a) there is no practicable alternative land based disposal option; (b) significant adverse effects on public and environmental health, water quality and amenity values are avoided and other adverse effects are remedied or mitigated; (c) an assessment of the site conditions has been undertaken and the proposed system and its design are appropriate for these conditions; (d) the design of the on-site wastewater system and the proposed volume of discharge will minimise the level of contaminants to the greatest extent practicable; (e) that adverse effects on Mana Whenua values will be avoided; and	On-site wastewater systems are approved in appropriate locations and are suitably designed to minimise adverse effects of discharges on water bodies.	Numbers of on-site wastewater consents granted in the Future Urban Zone and urban zones. Assessment of whether on-site wastewater consents were approved after technical review and a review of some key characteristics of the systems (such as site area and reserve disposal area). Assessment of whether granted consents were consistent with the policy approach and whether there are issues in the policy implementation.

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
(d) ensuring on-site wastewater systems avoid significant adverse effects on freshwater and coastal water.	**E1.3(25)** Only allow the discharge of treated wastewater to water where all the following are addressed: (a) there is no practicable alternative land-based disposal option; (b) the effects on Mana Whenua values; and (c) the discharge quality is of a standard appropriate for discharge to a waterbody and does not affect all of the following: (i) the use of that waterbody for other purposes; (ii) public health and amenity; and (iii) ecosystem health and functioning.		
	E1 Water quality and integrated management **E1.3(23)** Enable on-site domestic-type wastewater treatment and disposal where: … (b) the on-site wastewater treatment results in a discharge that is of a quality and volume that avoids significant adverse effects on groundwater, surface and coastal water quality, public health and amenity. **E1.3(24)** Require proposals for on-site wastewater treatment and disposal to land or water to demonstrate all of the following: … (b) significant adverse effects on public and environmental health, water quality and amenity values are avoided and other adverse effects are remedied or mitigated; … (f) that operations, management and response procedures are in place to ensure the on-going performance of the system and where systems	On-site wastewater systems are operated effectively to minimise adverse effects and progressively reduce existing adverse effects on water bodies.	Numbers of on-site wastewater systems that are complying with consent conditions or permitted activity standards.

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	service more than one site, responsibilities for these functions are clearly identified. **E1.3(25)** Only allow the discharge of treated wastewater to water where all the following are addressed: ... (c) the discharge quality is of a standard appropriate for discharge to a waterbody and does not affect all of the following: (i) the use of that waterbody for other purposes; (ii) public health and amenity; and (iii) ecosystem health and functioning.		

Chapter 7 Stormwater discharges

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
B7.4 Coastal water, freshwater and geothermal water **B7.4.1(4)** The adverse effects of point and non-point discharges, in particular stormwater runoff and wastewater discharges, on coastal waters, freshwater and geothermal water are minimised and existing adverse effects are progressively reduced. **B7.4.2(1)** Integrate the management of subdivision, use, development and coastal water and freshwater, by: (c) controlling the use of land and discharges to minimise the adverse effects of runoff on water and progressively reduce existing adverse effects where those water are degraded; and **B7.4.2 (6)** Progressively improve water quality in areas identified as having degraded water quality through managing subdivision, use, development and discharges. **B7.4.2(7)** Manage the discharges of contaminants into water from subdivision, use and development to avoid where practicable, and otherwise minimise, all of the following: (a) significant bacterial contamination of freshwater and coastal water; (b) adverse effects on the quality of freshwater and coastal water; (c) adverse effects from contaminants, including nutrients generated on or applied to land, and the potential for these to enter freshwater and coastal water from both point and non-point sources; (d) adverse effects on Mana Whenua values associated with coastal water, freshwater and geothermal water, including wāhi tapu, wāhi taonga and mahinga kai; and	**E1 Water quality and integrated management** **E1.2(3)** Stormwater and wastewater networks are managed to protect public health and safety and to prevent or minimise adverse effects of contaminants on freshwater and coastal water quality. **E1.3(8)** Avoid as far as practicable, or otherwise minimise or mitigate, adverse effects of stormwater runoff from greenfield development on freshwater systems, freshwater and coastal water by: (a) taking an integrated stormwater management approach (refer to Policy E1.3.10); (b) minimising the generation and discharge of contaminants, particularly from high contaminant generating car parks and high use roads and into sensitive receiving environments; (c) minimising or mitigating changes in hydrology, including loss of infiltration, to: (i) minimise erosion and associated effects on stream health and values; (ii) maintain stream baseflows; and (iii) support groundwater recharge; (d) where practicable, minimising or mitigating the effects on freshwater systems arising from changes in water temperature caused by stormwater discharges; and (e) providing for the management of gross stormwater pollutants, such as litter, in areas where the generation of these may be an issue. **E1.3(9)** Minimise or mitigate new adverse effects of stormwater runoff, and where practicable progressively reduce existing adverse effects of	Adverse effects of stormwater discharges on coastal, freshwater and geothermal water is being minimised, and existing adverse effects (including on degraded receiving environments) are being progressively reduced. Subdivision, use and development is being controlled to minimise the adverse effects of stormwater runoff (including quantity and quality) on freshwater, and coastal receiving environments. [Note: subdivision is not addressed in this report.] The best practicable option is being adopted. The discharge of contaminants is minimised, particularly from high contaminant generating carparks and high use roads The E10 Stormwater management area	The measures for the water quality indicators as detailed and assessed in Chapter 2. The discharge of stormwater from the public network is compliant with the conditions of the Network Discharge Consent Number of new independent stormwater discharge consents (i.e. not to the network) and an assessment of conditions imposed in relation to policy outcomes. The number of stormwater discharge and diversion consents granted under E8 rules and assessment of the conditions imposed in relation to policy outcomes. The number of consents granted under the E9 rules and assessment of the conditions imposed in relation to policy outcomes. The number of consents that are being granted under the RD or D rules in E10 and assessment of the conditions imposed in relation to policy outcomes. Review of the relevant AUP provisions and identification of any implementation issues.

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
(e) adverse effects on the water quality of catchments and aquifers that provide water for domestic and municipal supply. **B7.4.2(9)** Manage stormwater by all of the following: (a) requiring subdivision, use and development to: (i) minimise the generation and discharge of contaminants; and (ii) minimise adverse effects on freshwater and coastal water and the capacity of the stormwater network; (b) adopting the best practicable option for every stormwater diversion and discharge; and (c) controlling the diversion and discharge of stormwater outside of areas serviced by a public stormwater network.	stormwater runoff, on freshwater systems, freshwater and coastal waters during intensification and redevelopment of existing urban areas by all of the following: (a) requiring measures to reduce contaminants, particularly from high contaminant-generating car parks and high-use roads; (b) requiring measures to reduce the discharge of gross stormwater pollutants; (c) requiring measures to be adopted to reduce the peak flow rate and the volume of stormwater flows: (i) within sites identified in the Stormwater Management Area – Flow 1 and Flow 2 Control (as shown on the planning maps); (ii) where development exceeds the maximum impervious area for the relevant zone; or iii) from areas of impervious surface where discharges may give rise to flooding or adversely affect rivers and streams; (d) taking an integrated stormwater management approach for large-scale and comprehensive redevelopment and intensification (refer to Policy E1.3.10 below) and encourage the restoration of freshwater systems where practicable; and (e) ensuring intensification is supported by appropriate stormwater infrastructure, including natural assets that are utilised for stormwater conveyance and overland flow paths. **E1.3(10)** In taking an integrated stormwater management approach have regard to all of the following: (a) the nature and scale of the development and practical and cost considerations, recognising: (i) greenfield and comprehensive brownfield development generally offer greater opportunity	control – Flow 1 and Flow 2 is effective with hydrology mitigation required where the maximum impervious area is exceeded.	

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	than intensification and small-scale redevelopment of existing areas; (ii) intensive land uses such as high-intensity residential, business, industrial and roads generally have greater constraints; and (iii) site operational and use requirements may preclude the use of an integrated stormwater management approach. (b) the location, design, capacity, intensity and integration of sites/development and infrastructure, including roads and reserves, to protect significant site features and hydrology and minimise adverse effects on receiving environments; (c) the nature and sensitivity of receiving environments to the adverse effects of development, including fragmentation and loss of connectivity of rivers and streams, hydrological effects and contaminant discharges and how these can be minimised and mitigated, including opportunities to enhance degraded environments; (d) reducing stormwater flows and contaminants at source prior to the consideration of mitigation measures and the optimisation of on-site and larger communal devices where these are required; and (e) the use and enhancement of natural hydrological features and green infrastructure for stormwater management where practicable. **E1.3(11)** Avoid as far as practicable, or otherwise minimise or mitigate adverse effects of stormwater diversions and discharges, having particular regard to: (a) the nature, quality, volume and peak flow of the stormwater runoff;		

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	(b) the sensitivity of freshwater systems and coastal waters, including the Hauraki Gulf Marine Park; (c) the potential for the diversion and discharge to create or exacerbate flood risks; (d) options to manage stormwater on-site or the use of communal stormwater management measures; (e) practical limitations in respect of the measures that can be applied; and (f) the current state of receiving environments. **E1.3(12)** Manage contaminants in stormwater runoff from high contaminant generating car parks and high use roads to minimise new adverse effects and progressively reduce existing adverse effects on water and sediment quality in freshwater systems, freshwater and coastal waters. **E1.3(13)** Require stormwater quality or flow management to be achieved on-site unless there is a downstream communal device or facility designed to cater for the site's stormwater runoff. **E1.3(14)** Adopt the best practicable option to minimise the adverse effects of stormwater discharges from stormwater network and infrastructure including road, and rail having regard to all of the following: (a) the best practicable option criteria as set out in section 2 of the Resource Management Act 1991; (b) the reasonable timeframes over which adverse effects can be avoided as far as practicable, or otherwise minimised or mitigated; (c) the scale and significance of the adverse effects; (d) infrastructure investment priorities and the consequences of delaying infrastructural improvements in other areas;		

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	(e) the ability to prevent or minimise existing adverse effects having regard to the effectiveness and timeframes of other feasible methods, including land use controls; (f) opportunities to integrate with other major infrastructure projects or works; (g) the need to maintain and optimise existing stormwater networks and provide for planned land use and development; and (h) operational requirements and space limitations. **E.1.3(11)** Utilise stormwater discharge to ground soakage in areas underlain by shallow or highly permeable aquifers provided that: (a) ground soakage is available; (b) any risk to people and property from land instability or flooding is avoided; (c) stormwater quality treatment is implemented to minimise effects on the capacity and water quality of the underlying aquifer system; and (d) Discharge to ground soakage is the most effective and sustainable option. **E10.2(1)** High value rivers, streams and aquatic biodiversity in identified urbanised catchments are protected from further adverse effects of stormwater runoff associated with urban development and where possible enhanced. **E10.3(1)** Manage stormwater runoff from impervious areas in Stormwater management area – Flow 1 and Flow 2 areas to minimise the adverse effects of stormwater runoff on rivers and streams to retain, and where possible enhance, stream naturalness, biodiversity, bank stability and other values. **E10.3(2)** Require stormwater hydrology mitigation in Stormwater management area control – Flow 1 and Flow 2 areas where there are:		

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	(a) new impervious areas; (b) redeveloped impervious areas; or (c) entire sites where the area of development or redevelopment comprises more than 50 per cent of the site area. **E10.3(3)** Recognise that there may be limitations to the hydrology mitigation that can practicably be achieved in some circumstances, particularly in association with redevelopment, including: (a) space limitations; (b) requirements to provide for other utility services; and (c) the function of roads as overland flow paths conveying stormwater runoff from surrounding land uses which the road controlling authority has limited ability to control.		

Chapter 8 Rural production discharges

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
B7.4 Coastal water, freshwater and geothermal water **B7.4.1(4)** The adverse effects of point and non-point discharges, in particular stormwater runoff and wastewater discharges, on coastal waters, freshwater and geothermal water are minimised and existing adverse effects are progressively reduced. **B7.4.2(7)** Manage the discharges of contaminants into water from subdivision, use and development to avoid where practicable, and otherwise minimise, all of the following: (a) significant bacterial contamination of freshwater and coastal water; (b) adverse effects on the quality of freshwater and coastal water; (c) adverse effects from contaminants, including nutrients generated on or applied to land, and the potential for these to enter freshwater and coastal water from both point and non-point sources; (d) adverse effects on Mana Whenua values associated with coastal water, freshwater and geothermal water, including wāhi tapu, wāhi taonga and mahinga kai; and (e) adverse effects on the water quality of catchments and aquifers that provide water for domestic and municipal supply.	**E35 Rural production discharges** **E35.2(1)** Discharges from rural production activities are managed to protect the life supporting capacity of land and water resources. **E35.3(1)** Avoid more than minor adverse effects of discharges from rural production activities on water bodies, aquifers and artificial watercourses. **E35.3(2)** Enable dairy effluent discharges to land provided that discharge systems are designed and operated to minimise overland flow to surface water bodies and leaching of nutrients and other contaminants to groundwater. **E35.3(3)** Enable discharges of fertilisers to land where: (a) its application is in accordance with best industry practice; and (b) the rate of application does not exceed the assimilative capacity of the soil and its vegetative cover; and (c) the vulnerability of the south Auckland volcanic aquifer to potential groundwater contamination has been considered and any effects are avoided or minimised. **E35.3(4)** Avoid the discharge of contaminants generated from rural production activities directly into surface water, intermittent streams and artificial watercourses that connect to surface water. **E35.3(5)** Manage discharges from rural production activities to land that could run overland into water where:	Degraded freshwater systems decrease over time. Freshwater systems are maintained and enhanced over time	Monitoring of four identified lakes water quality data to show comparison with NPS-FM NOF values. Assessment of whether granted consents demonstrate evidence of undertaking best practice to manage the actual or potential adverse effects on the environment and to operate within identified environmental limits e.g., nutrient budgets. Identification of operational issues of implementing the AUP provisions. Annual monitoring of dairy farm storage systems.

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	(a) best industry practice will be used to avoid more than minor effects on land, water bodies and groundwater; and (b) adverse effects on Mana Whenua values associated with freshwater resources, including wāhi tapu, wāhi taonga and mahinga kai are avoided where practicable, or otherwise minimised; and (c) there are no hazardous substances or human waste/sewage in the discharge; and (d) offal holes, silage storage facilities, and stockpiled and composted vegetative material or animal waste are appropriately sited and constructed; and (e) silage storage facilities are sealed and silage stacks covered; and (f) leachate is collected, stored and appropriately disposed of to land or off-site; and (g) there is no offensive or objectionable odour or dust beyond the boundary of the property where the contaminants are being discharged.		

Chapter 9 Discharges from boats

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
B7.4 Coastal water, freshwater and geothermal water **B7.4.1(4)** The adverse effects of point and non-point discharges, in particular stormwater runoff and wastewater discharges, on coastal waters, freshwater and geothermal water are minimised and existing adverse effects are progressively reduced. **B7.4.2(7)** Manage the discharges of contaminants into water from subdivision, use and development to avoid where practicable, and otherwise minimise, all of the following: (a) significant bacterial contamination of freshwater and coastal water; (b) adverse effects on the quality of freshwater and coastal water; (c) adverse effects from contaminants, including nutrients generated on or applied to land, and the potential for these to enter freshwater and coastal water from both point and non-point sources; (d) adverse effects on Mana Whenua values associated with coastal water, freshwater and geothermal water, including wāhi tapu, wāhi taonga and mahinga kai; and	**F2.12 Coastal – General Coastal Marine Zone, Untreated sewage discharge from vessels** **F2.12.2(1)** The values of the coastal marine area, and the activities that rely on high water quality, are protected from the adverse effects from the discharge of untreated sewage from vessels, while providing for the health and safety of vessels and their occupants. **F2.12.2(2)** The high recreation and amenity values of the inner Hauraki Gulf are maintained. **F2.12.3(1)** Avoid the discharge of untreated sewage from vessels within areas that have been identified as inappropriate due to the proximity to shore, marine farms, marine reserves, or shallow water depth while providing for the health and safety of vessels and their occupants.	Untreated sewage is not being discharged from boats in areas that have been identified as inappropriate	Identification of actions taken to ensure that boat owners are aware of the boat sewage discharge restriction areas
	F2.11 Coastal – General Coastal Marine Zone, Discharges **F2.11.3(6)** Reduce the amount of litter entering coastal waters, and mitigate the effects of litter disposal, by encouraging design, maintenance and management initiatives, for discharge structures, road cleaning and other activities, that will help minimise the amount of litter discharged into the coastal marine area. **F2.11.3(9)** Require operators of ports, marinas, ferry terminals and other marine facilities to take all practicable steps to prevent contamination of coastal waters, substrate, ecosystems and habitats that is more than minor. **F2.11.3(10)** Require adequate and convenient facilities in ports, marinas, ferry terminals and other	Consents for new developments (or upgrades of facilities) at ports, marinas and ferry terminals have provision for collection and disposal of: sewage from vessels litter residues from vessel maintenance and repair	An assessment of whether consents have been granted with conditions that require facilities relating to vessel sewage collection, litter and vessel maintenance and repair.

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	marine facilities for the containment, collection and appropriate disposal of: (a) sewage, bilge water and litter from vessels; (b) recyclable material including waste oils; (c) residues from vessel servicing, construction, maintenance and repair; (d) spills from refuelling operations and refuelling equipment; (e) spills, residues and debris from cargo operations; and (f) the discharge of stormwater generated from the port facilities, including facilities located above mean high water springs. **F2.12 Coastal – General Coastal Marine Zone, Untreated sewage discharge from vessels** **F2.12.3(2)** Require provision of sewage collection and disposal facilities for vessels at ports, marinas and other allied facilities, or at the time of significant upgrading of these facilities. **F3 Coastal – Marina Zone** **F3.3(4)** Provide for adequate and convenient facilities in marinas for the containment, collection and appropriate disposal of all of the following: (a) rubbish from vessels; (b) sewage from vessels; (c) recyclable material including waste oils; (d) residues from vessel construction and maintenance; (e) spills from refuelling operations and refuelling equipment; and (f) stormwater generated from the marina complex. **F5 Coastal – Minor Port Zone**		

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	F5.3(6) Require port operators to take all practicable steps to avoid contamination of coastal waters, substrate, ecosystems and habitats that is more than minor. **F5.3(7)** Require the provision of adequate and convenient facilities for: (a) the collection of rubbish from vessels; (b) sewage from vessels; and (c) the containment and disposal of residues from vessel maintenance. **F6 Coastal – Ferry Terminal Zone** **F6.3(7)** Require the provision of adequate and convenient facilities for the containment, collection and appropriate disposal of: (a) rubbish from the public, passengers and vessels; (b) sewage and bilge water from vessels; (c) recyclable material including waste oils; (d) residues from vessel construction and maintenance; (e) spills from refuelling operations and refuelling equipment; (f) spills, residues and debris from cargo operations; and (g) the discharge of stormwater generated from the ferry terminal complex.		

Chapter 10 Land disturbance

<table>
<tr><th>RPS objectives and policies</th><th>Regional / district plan objectives and policies</th><th>Indicators</th><th>Measures</th></tr>
<tr><td rowspan="2">B7.4 Coastal water, freshwater and geothermal water
B7.4.1(5) The adverse effects from changes in or intensification of land use on coastal water and freshwater quality are avoided, remedied or mitigated.
B7.4.2(1) Integrate the management of subdivision, use, development and coastal water and freshwater, by:
(c) controlling the use of land and discharges to minimise the adverse effects of runoff on water and progressively reduce existing adverse effects where those water are degraded; and
(d) avoiding development where it will significantly increase adverse effects on water, unless these adverse effects can be adequately mitigated.
B7.4.2(8) Minimise the loss of sediment from subdivision, use and development, and manage the discharge of sediment into freshwater and coastal water, by:
(a) promoting the use of soil conservation and management measures to retain soil and sediment on land; and
(b) requiring land disturbing activities to use industry best practice and standards appropriate to the nature and scale of the land disturbing activity and the sensitivity of the receiving environment.</td><td rowspan="2">E11 Land disturbance – Regional
E11.2(1) Land disturbance is undertaken in a manner that protects the safety of people and avoids, remedies or mitigates adverse effects on the environment.
E11.2(2) Sediment generation from land disturbance is minimised.
E11.2(3) Land disturbance is controlled to achieve soil conservation.
E11.3(1) Avoid where practicable, and otherwise mitigate, or where appropriate, remedy adverse effects on areas where there are natural and physical resources that have been scheduled in the Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character.
E11.3(2) Manage land disturbance to:
(a) retain soil and sediment on the land by the use of best practicable options for sediment and erosion control appropriate to the nature and scale of the activity;
(b) manage the amount of land being disturbed at any one time, particularly where the soil type, topography and location is likely to result in increased sediment runoff or discharge;
(c) avoid, remedy or mitigate adverse effects on accidentally discovered sensitive material; and
(d) maintain the cultural and spiritual values of Mana Whenua in terms of land and water quality, preservation of wāhi tapu, and kaimoana gathering.</td><td>Freshwater systems and coastal water degraded by sediment discharges (from anthropogenic sources) are progressively enhanced.</td><td>The water quality measures detailed and assessed in Chapter 2.
Changes in sediment discharge and deposition rates.</td></tr>
<tr><td>Subdivision, use and development minimise the loss of sediment. [Note: this report does not assess subdivision]
Soil conservation management measures are being promoted and implemented.
Land disturbance activities use best practice appropriate to the activity and sensitivity of the receiving environment.</td><td>The number of land disturbance consents and assessment of the conditions imposed in relation to policy outcomes.
Assessment of compliance monitoring data.
Assessment of permitted activity compliance monitoring data.
Assessment of the use of non-regulatory initiatives to promote erosion and sediment control best practice.
Review of the relevant provisions and identification of any implementation issues.</td></tr>
</table>

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	E11.3(3) Manage the impact on Mana Whenua cultural heritage that is discovered undertaking land disturbance by: (a) requiring a protocol for the accidental discovery of kōiwi, archaeology and artefacts of Māori origin; (b) undertaking appropriate actions in accordance with mātauranga and tikanga Māori; and (c) undertaking appropriate measures to avoid adverse effects. Where adverse effects cannot be avoided, effects are remedied or mitigated. **E11.3(4)** Enable land disturbance necessary for a range of activities undertaken to provide for people and communities social, economic and cultural well-being, and their health and safety. **E11.3(5)** Design and implement earthworks with recognition of existing environmental site constraints and opportunities, specific engineering requirements, and implementation of integrated water principles. **E11.3(6)** Require that earthworks are designed and undertaken in a manner that ensures the stability and safety of surrounding land, buildings and structures. **E11.3(6A)** Recognise and provide for the management and control of kauri dieback disease as a means of maintaining indigenous biodiversity. **E11.3(7)** Require any land disturbance that will likely result in the discharge of sediment laden water to a surface water body or to coastal water to demonstrate that sediment discharge has been minimised to the extent practicable, having regard to the quality of the environment; with: (a) any significant adverse effects avoided, and other effects avoided, remedied or mitigated, particularly in areas where there is:		

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	(i) high recreational use; (ii) relevant initiatives by Mana Whenua, established under regulations relating to the conservation or management of fisheries, including taiāpure, rāhui or whakatupu areas; (iii) the collection of fish and shellfish for consumption; (iv) maintenance dredging; or (v) a downstream receiving environment that is sensitive to sediment accumulation; (b) adverse effects avoided as far as practicable within areas identified as sensitive because of their ecological values, including terrestrial, freshwater and coastal ecological values; and (c) the receiving environments ability to assimilate the discharged sediment being taken into account. **E11.3(8)** Monitor the quality of fresh and coastal water bodies across the region and the effects of land disturbance on water quality and receiving environments. **E12.2(1)** Land disturbance is undertaken in a manner that protects the safety of people and avoids, remedies or mitigates adverse effects on the environment. **E12.3(1)** Avoid where practicable, and otherwise, mitigate, or where appropriate, remedy adverse effects of land disturbance on areas where there are natural and physical resources that have been scheduled in the Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character. **E12.3(2)** Manage the amount of land being disturbed at any one time, to:		

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	(a) avoid, remedy or mitigate adverse construction noise, vibration, odour, dust, lighting and traffic effects; (b) avoid, remedy or mitigate adverse effects on accidentally discovered sensitive material; and (c) maintain the cultural and spiritual values of Mana Whenua in terms of land and water quality, preservation of wāhi tapu, and kaimoana gathering. **E12.3(3)** Enable land disturbance necessary for a range of activities undertaken to provide for people and communities social, economic and cultural well-being, and their health and safety. **E12.3(4)** Manage the impact on Mana Whenua cultural heritage that is discovered undertaking land disturbance by: (a) requiring a protocol for the accidental discovery of kōiwi, archaeology and artefacts of Māori origin; E12 Land disturbance – District Auckland Unitary Plan Operative in part 2 (b) undertaking appropriate actions in accordance with mātauranga and tikanga Māori; and (c) undertaking appropriate measures to avoid adverse effects, or where adverse effects cannot be avoided, effects are remedied or mitigated. **E12.3(5)** Design and implement earthworks with recognition of existing environmental site constraints and opportunities, specific engineering requirements, and implementation of integrated water principles. **E12.3(6)** Require that earthworks are designed and undertaken in a manner that ensures the stability and safety of surrounding land, buildings and structures.		

Chapter 11 Intensification in existing areas

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
B7.3 Freshwater systems **B7.3.1(3)** The adverse effects of changes in land use on freshwater are avoided, remedied or mitigated. **B7.3.2(1)** Integrate the management of subdivision, use and development and freshwater systems by undertaking all of the following: (c) controlling the use of land and discharges to minimise the adverse effects of runoff on freshwater systems and progressively reduce existing adverse effects where those systems or water are degraded; and **B7.3.2(3)** Promote the enhancement of freshwater systems identified as being degraded to progressively reduce adverse effects **B7.4 Coastal water, freshwater and geothermal water** **B7.4.1(5)** The adverse effects from changes in or intensification of land use on coastal water and freshwater quality are avoided, remedied or mitigated. **B7.4.2(1)** Integrate the management of subdivision, use, development and coastal water and freshwater, by: ... (c) controlling the use of land and discharges to minimise the adverse effects of runoff on water and progressively reduce existing adverse effects where those water are degraded; and (d) avoiding development where it will significantly increase adverse effects on water, unless these adverse effects can be adequately mitigated.	**E1 Water quality and integrated management** **E1.2(1)** Freshwater and sediment quality is maintained where it is excellent or good and progressively improved over time in degraded areas. **E1.3(2)** Manage discharges, subdivision, use, and development that affect freshwater systems to: (a) maintain or enhance water quality, flows, stream channels and their margins and other freshwater values, where the current condition is above National Policy Statement for Freshwater Management National Bottom Lines and the relevant Macroinvertebrate Community Index guideline in Table E1.3.1 below; or (b) enhance water quality, flows, stream channels and their margins and other freshwater values where the current condition is below national bottom lines or the relevant Macroinvertebrate Community Index guideline in Table E1.3.1 below **E1.3(9)** Minimise or mitigate new adverse effects of stormwater runoff, and where practicable progressively reduce existing adverse effects of stormwater runoff, on freshwater systems, freshwater and coastal waters during intensification and redevelopment of existing urban areas by all of the following: (a) requiring measures to reduce contaminants, particularly from high contaminant-generating car parks and high-use roads; (b) requiring measures to reduce the discharge of gross stormwater pollutants; (c) requiring measures to be adopted to reduce the peak flow rate and the volume of stormwater flows:	Residential intensification in urban areas protects freshwater systems and coastal water	Trends for water quality within urban areas

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
B7.4.2(6) Progressively improve water quality in areas identified as having degraded water quality through managing subdivision, use, development and discharges.	(i) within sites identified in the Stormwater Management Area – Flow 1 and Flow 2 Control (as shown on the planning maps); (ii) where development exceeds the maximum impervious area for the relevant zone; or (iii) from areas of impervious surface where discharges may give rise to flooding or adversely affect rivers and streams; (d) taking an integrated stormwater management approach for large-scale and comprehensive redevelopment and intensification (refer to Policy E1.3.10 below) and encourage the restoration of freshwater systems where practicable; and (e) ensuring intensification is supported by appropriate stormwater infrastructure, including natural assets that are utilised for stormwater conveyance and overland flow paths. **E1.3(10)** In taking an integrated stormwater management approach have regard to all of the following: (c) the nature and sensitivity of receiving environments to the adverse effects of development, including fragmentation and loss of connectivity of rivers and streams, hydrological effects and contaminant discharges and how these can be minimised and mitigated, including opportunities to enhance degraded environments; **F2.11 Coastal – General Coastal Marine Zone, Discharges** **F2.11.2(1)** Water and sediment quality in the coastal marine area is maintained where it is excellent or good and progressively improved over time in degraded areas.		

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	H1.3(5), H2.3(6), H3.3(6), H4.3(7), H5.3(7) and H6.3(8) Restrict the maximum impervious area on a site in order to manage the amount of stormwater runoff generated by a development and ensure that adverse effects on water quality, quantity and amenity values are avoided or mitigated.	Impervious area extent is managed to minimise adverse effects on freshwater systems	Number of new dwellings infringing the impervious area standard How adverse effects on freshwater systems are managed where the impervious area standard is infringed
B7.2 Indigenous biodiversity **B7.2.1(1)** Areas of significant indigenous biodiversity value in terrestrial, freshwater, and coastal marine areas are protected from the adverse effects of subdivision use and development. **B7.3 Freshwater systems** **B7.3.2(5)** Manage subdivision, use, development, including discharges and activities in the beds of lakes, rivers, streams, and in wetlands, to do all of the following: ... (d) maintain or where appropriate enhance: (i) freshwater systems not protected under Policy B7.3.2(5)(a); (ii) navigation along rivers and public access to and along lakes, rivers and streams; (iii) existing riparian vegetation located on the margins of lakes, rivers, streams and wetlands; and (iv) areas of significant indigenous biodiversity. **B7.3.2(6)** Restore and enhance freshwater systems were practicable when development, change of land use, and subdivision occur.	**E3 Lakes, rivers, streams and wetlands** **E3.3(15)** Protect the riparian margins of lakes, rivers, streams, and wetlands from inappropriate use and development and promote their enhancement to through all of the following: (a) safeguard habitats for fish, plant and other aquatic species, particularly in rivers and streams with high ecological values; (b) safeguard their aesthetic, landscape and natural character values; (c) safeguard the contribution of natural freshwater systems to the biodiversity, resilience and integrity of ecosystems; and (d) avoid or mitigate the effects of flooding, surface erosion, stormwater contamination, bank erosion and increased surface water temperature. **E15 Vegetation management and biodiversity** **E15.3(1)** Protect areas of contiguous indigenous vegetation cover and vegetation in sensitive environments including the coastal environment, riparian margins, wetlands, and areas prone to natural hazards.	The functioning of riparian areas is supported	Number of resource consents granted for vegetation removal and new buildings within urban riparian areas Whether resource consent processes protect the functioning of riparian areas
B7.3 Freshwater systems **B7.3.2(1)** Integrate the management of subdivision, use and development and freshwater systems by	**E1.3(10)** In taking an integrated stormwater management approach have regard to all of the following:	Water sensitive design is enabled	Assessment of whether the AUP has barriers to water sensitive design and green infrastructure

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
undertaking all of the following: (c) controlling the use of land and discharges to minimise the adverse effects of runoff on freshwater systems and progressively reduce existing adverse effects where those systems or water are degraded; and **B7.4 Coastal water, freshwater and geothermal water** **B7.4.1(5)** The adverse effects from changes in or intensification of land use on coastal water and freshwater quality are avoided, remedied or mitigated. **B7.4.2(1)** Integrate the management of subdivision, use, development and coastal water and freshwater, by: (c) controlling the use of land and discharges to minimise the adverse effects of runoff on water and progressively reduce existing adverse effects where those water are degraded; and	(a) the nature and scale of the development and practical and cost considerations, recognising: (i) greenfield and comprehensive brownfield development generally offer greater opportunity than intensification and small-scale redevelopment of existing areas; (ii) intensive land uses such as high-intensity residential, business, industrial and roads generally have greater constraints; and (iii) site operational and use requirements may preclude the use of an integrated stormwater management approach. (b) the location, design, capacity, intensity and integration of sites/development and infrastructure, including roads and reserves, to protect significant site features and hydrology and minimise adverse effects on receiving environments; (c) the nature and sensitivity of receiving environments to the adverse effects of development, including fragmentation and loss of connectivity of rivers and streams, hydrological effects and contaminant discharges and how these can be minimised and mitigated, including opportunities to enhance degraded environments; (d) reducing stormwater flows and contaminants at source prior to the consideration of mitigation measures and the optimisation of on-site and larger communal devices where these are required; and (e) the use and enhancement of natural hydrological features and green infrastructure for stormwater management where practicable. **E1.3(13)** Require stormwater quality or flow management to be achieved on-site unless there is a downstream communal device or facility designed to cater for the site's stormwater runoff.		(e.g. swales, rain gardens, green roofs, etc.)

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	Measures
	E38. Subdivision – Urban **E38.3(21)** Require sites capable of containing a building, in areas with no reticulated water supply, stormwater or wastewater network, to be of a size and shape that provides for: (a) the treatment and disposal of stormwater in a way that does not lead to significant adverse off-site effects including degraded water quality, erosion, land instability, creation or exacerbation of flooding; **E38.3(22)** Require subdivision to be designed to manage stormwater: (a) in accordance with any approved stormwater discharge consent or network discharge consent; (b) in a manner consistent with stormwater management policies in E1 Water quality and integrated management; (c) by applying an integrated stormwater management approach to the planning and design of development in accordance with stormwater management policies in E1 Water quality and integrated management; (d) to protect natural streams and maintain the conveyance function of overland flow paths; (e) to maintain, or progressively improve, water quality; (f) to integrate drainage reserves and infrastructure with surrounding development and open space networks; and (g) in an integrated and cost-effective way.		

Chapter 12 Land use change in growth areas

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	**Measures**
B7.2 Indigenous biodiversity **B7.2.1(1)** Areas of significant indigenous biodiversity value in terrestrial, freshwater, and coastal marine areas are protected from the adverse effects of subdivision use and development. **B7.2.1(2)** Indigenous biodiversity is maintained through protection, restoration and enhancement in areas where ecological values are degraded, or where development is occurring. **B7.2.2(5)** Avoid adverse effects on areas listed in the Schedule 3 of Significant Ecological Areas – Terrestrial Schedule and Schedule 4 Significant Ecological Areas – Marine Schedule. **B7.3 Freshwater systems** **B7.3.1(3)** The adverse effects of changes in land use on freshwater are avoided, remedied or mitigated. **B7.3.2(1)** Integrate the management of subdivision, use and development and freshwater systems by undertaking all of the following: (a) ensuring water supply, stormwater and wastewater infrastructure is adequately provided for in areas of new growth or intensification; (b) ensuring catchment management plans form part of the structure planning process; (c) controlling the use of land and discharges to minimise the adverse effects of runoff on freshwater systems and progressively reduce existing adverse effects where those systems or water are degraded; and (d) avoiding development where it will significantly increase adverse effects on freshwater systems,	**E1 Water quality and integrated management** **E1.3(2)** Manage discharges, subdivision, use, and development that affect freshwater systems to: (a) maintain or enhance water quality, flows, stream channels and their margins and other freshwater values, where the current condition is above National Policy Statement for Freshwater Management National Bottom Lines and the relevant Macroinvertebrate Community Index guideline in Table E1.3.1 below; or (b) enhance water quality, flows, stream channels and their margins and other freshwater values where the current condition is below national bottom lines or the relevant Macroinvertebrate Community Index guideline in Table E1.3.1 below **E1.3(8)** Avoid as far as practicable, or otherwise minimise or mitigate, adverse effects of stormwater runoff from greenfield development on freshwater systems, freshwater and coastal water by: (a) taking an integrated stormwater management approach (refer to Policy E1.3.10); (b) minimising the generation and discharge of contaminants, particularly from high contaminant generating car parks and high use roads and into sensitive receiving environments; (c) minimising or mitigating changes in hydrology, including loss of infiltration, to: (i) minimise erosion and associated effects on stream health and values; (ii) maintain stream baseflows; and (iii) support groundwater recharge;	Water supply, stormwater and wastewater infrastructure is adequately provided for in areas of growth	Whether infrastructure is adequately provided for in structure plans and plan changes
		Catchment planning is being done as part of the structure planning process	Whether catchment management plans have been developed as part of the development of structure plans Whether catchment management plans have been updated for plan changes (or prepared if there was no structure plan)
		The adverse effects of development on freshwater systems and water are being avoided or minimised	Whether structure plans and plan changes include provisions that: protect streams and wetlands protect riparian margins provide for riparian enhancement protect sensitive and high value areas and enhance degraded areas

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	**Measures**
unless these adverse effects can be adequately mitigated. **B7.3.2(5)** Manage subdivision, use, development, including discharges and activities in the beds of lakes, rivers streams, and in wetlands, to do all of the following: (a) protect identified Natural Lake Management Areas, Natural Stream Management Areas, and Wetland Management Areas; (b) minimise erosion and modification of beds and banks of lakes, rivers, streams and wetlands; (c) limit the establishment of structures within the beds of lakes, rivers and streams and in wetlands to those that have a functional need or operational requirement to be located there; and (d) maintain or where appropriate enhance: (i) freshwater systems not protected under Policy B7.3.2(5)(a); (ii) navigation along rivers and public access to and along lakes, rivers and streams; (iii) existing riparian vegetation located on the margins of lakes, rivers, streams and wetlands; and (iv) areas of significant indigenous biodiversity. **B7.3.2(6)** Restore and enhance freshwater systems where practicable when development, change of land use, and subdivision occur. **B7.4 Coastal water, freshwater and geothermal water** **B7.4.1(5)** The adverse effects from changes in or intensification of land use on coastal water and freshwater quality are avoided, remedied or mitigated.	(d) where practicable, minimising or mitigating the effects on freshwater systems arising from changes in water temperature caused by stormwater discharges; and (e) providing for the management of gross stormwater pollutants, such as litter, in areas where the generation of these may be an issue. **E1.3(10)** In taking an integrated stormwater management approach have regard to all of the following: (a) the nature and scale of the development and practical and cost considerations, recognising: (i) greenfield and comprehensive brownfield development generally offer greater opportunity than intensification and small-scale redevelopment of existing areas; (ii) intensive land uses such as high-intensity residential, business, industrial and roads generally have greater constraints; and (iii) site operational and use requirements may preclude the use of an integrated stormwater management approach. (b) the location, design, capacity, intensity and integration of sites/development and infrastructure, including roads and reserves, to protect significant site features and hydrology and minimise adverse effects on receiving environments; (c) the nature and sensitivity of receiving environments to the adverse effects of development, including fragmentation and loss of connectivity of rivers and streams, hydrological effects and contaminant discharges and how these can be minimised and mitigated, including opportunities to enhance degraded environments;		minimise the discharge of contaminants minimise changes in hydrology promote efficient use of water Identification of issues with existing AUP precincts in managing the effect of urban growth on freshwater systems and water quality

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	**Measures**
B7.4.2(1) Integrate the management of subdivision, use, development and coastal water and freshwater, by: (a) ensuring water supply, stormwater and wastewater infrastructure is adequately provided for in areas of growth; and (b) requiring catchment management planning as part of structure planning; (c) controlling the use of land and discharges to minimise the adverse effects of runoff on water and progressively reduce existing adverse effects where those water are degraded; and (d) avoiding development where it will significantly increase adverse effects on water, unless these adverse effects can be adequately mitigated. **B7.4.2(8)** Minimise the loss of sediment from subdivision, use and development, and manage the discharge of sediment into freshwater and coastal water, by: (a) promoting the use of soil conservation and management measures to retain soil and sediment on land; and (b) requiring land disturbing activities to use industry best practice and standards appropriate to the nature and scale of the land disturbing activity and the sensitivity of the receiving environment. **B7.4.2(10)** Manage the adverse effects of wastewater discharges to freshwater and coastal water by all of the following: (a) ensuring that new development is supported by wastewater infrastructure with sufficient capacity to serve the development; **B7.4.2(12)** Promote the efficient use of freshwater and geothermal water.	(d) reducing stormwater flows and contaminants at source prior to the consideration of mitigation measures and the optimisation of on-site and larger communal devices where these are required; and (e) the use and enhancement of natural hydrological features and green infrastructure for stormwater management where practicable.		

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	**Measures**
B7.4.2(14) Enable the harvesting and storage of freshwater and rainwater to meet increasing demand for water and to manage water scarcity conditions, including those made worse by climate change. **Appendix 1 Structure plan guidelines** **1.4.2.** Natural resources (1) The protection, maintenance and enhancement of natural resources, particularly those that have been scheduled in the Unitary Plan in relation to Mana Whenua, natural resources, and the coastal environment. (2) Demonstrate how proposed subdivision, use, and development will protect, maintain and enhance the values of the resources identified in 1.4.2(1) above (3) The integration of green networks (such as freshwater and coastal water systems, and ecological corridors) with open space and pedestrian and cycle networks, showing how they reflect the underlying natural character values and provide opportunities for environmental restoration and biodiversity. (4) Measures to manage natural hazards and contamination **1.4.4(6)** The location and protection of infrastructure and management of reverse sensitivity effects on infrastructure from subdivision, use and development. **1.4.7** Infrastructure **(3)** The location, scale and function of stormwater management facilities based on the principles of an integrated stormwater management approach, including the retention of natural water systems and the primary use of onsite flow and quality controls (and related impervious area limits) to manage stormwater runoff from proposed sites and roads. **1.5(2)** Infrastructure:			

RPS objectives and policies	Regional / district plan objectives and policies	Indicators	**Measures**
(a) integrated catchment management plan – stormwater management plan, including network plans, updates to catchment or zone management plans and variations to existing or new network discharge consents, where relevant; **1.5(3)** Impact on natural and cultural values: (b) assessment of effects on the cultural well-being of people and communities who have relationships with the area, including where appropriate mapping of local history and whakapapa; (e) freshwater and ecological assessment.			

Appendix D Safeswim summary

		% Water quality compliance (model)			
Site	Status	2018-19	2019-20	2020-21	Average
Anchor Bay	Very Good - permanent green	100	100	100	100
Devonport	Very Good - permanent green	100	100	100	100
Goat Island	Very Good - permanent green	100	100	100	100
Omaha	Very Good - permanent green	100	100	100	100
Tawharanui	Very Good - permanent green	100	100	100	100
Armour Bay	Full Safeswim site	92	97	92	94
Army Bay	Full Safeswim site	93	98	94	95
Beach Haven	Full Safeswim site	96	100	96	97
Bethell's Beach	Full Safeswim site	100	100	100	100
Big Bucklands	Full Safeswim site	87	97	91	92
Big Manly	Full Safeswim site	91	96	89	92
Blockhouse Bay	Full Safeswim site	92	98	91	93
Browns Bay	Full Safeswim site	94	97	93	95
Castor Bay	Full Safeswim site	95	96	93	95
Cheltenham	Full Safeswim site	96	100	96	97
Christmas Beach	Full Safeswim site	80	90	81	84
Clarks	Full Safeswim site	91	93	91	92
Cockle Bay	Full Safeswim site	92	99	93	95
Cornwallis	Full Safeswim site	99	99	99	99
Duders	Full Safeswim site	81	92	78	84
Eastern Beach	Full Safeswim site	88	99	90	92
French Bay	Full Safeswim site	81	86	80	82
Hatfields	Full Safeswim site	97	100	99	99
Herne Bay	Full Safeswim site	89	88	79	85
Home Bay	Full Safeswim site	93	93	82	89
Howick	Full Safeswim site	82	96	84	88
Huia	Full Safeswim site	79	83	72	78
Judges Bay	Full Safeswim site	77	90	80	82
Karekare Beach	Full Safeswim site	100	100	100	100
Kawakawa	Full Safeswim site	82	97	82	87
Kendall Bay	Full Safeswim site	89	95	89	91
Kohimarama	Full Safeswim site	94	97	83	91
Little Bucklands	Full Safeswim site	81	93	82	85
Little Manly	Full Safeswim site	78	81	69	76
Little Oneroa	Full Safeswim site	93	99	96	96

		% Water quality compliance (model)			
Site	**Status**	**2018-19**	**2019-20**	**2020-21**	**Average**
Long Bay	Full Safeswim site	96	98	93	95
Mairangi Bay	Full Safeswim site	94	99	94	96
Mangere Bridge	Full Safeswim site	97	100	98	98
Maraetai	Full Safeswim site	89	99	89	92
Matakatia Bay	Full Safeswim site	90	98	91	93
Mellons Bay	Full Safeswim site	92	98	92	94
Milford	Full Safeswim site	93	98	93	94
Milford South	Full Safeswim site	86	94	85	89
Mission Bay	Full Safeswim site	96	98	87	93
Mulberry Grove	Full Safeswim site	91	96	90	92
Narrow Neck	Full Safeswim site	92	98	95	95
Okahu Bay	Full Safeswim site	90	92	78	87
Okupu	Full Safeswim site	99	100	99	99
Omana Beach	Full Safeswim site	98	98	99	98
Oneroa	Full Safeswim site	93	99	97	96
Onetangi	Full Safeswim site	95	100	100	98
Orere Point	Full Safeswim site	95	99	98	97
Orewa	Full Safeswim site	93	99	95	96
Oruarangi Creek	Full Safeswim site	94	99	97	96
Pah Beach	Full Safeswim site	82	84	83	83
Palm Beach	Full Safeswim site	99	100	100	99
Piha Beach (north)	Full Safeswim site	100	100	100	100
Piha Beach (south)	Full Safeswim site	99	100	100	100
Point Chevalier	Full Safeswim site	96	98	94	96
Pt England	Full Safeswim site	77	88	99	88
Red Beach	Full Safeswim site	91	96	89	92
Sandspit (Franklin)	Full Safeswim site	93	96	94	94
Sandy Bay	Full Safeswim site	90	98	95	94
St Heliers	Full Safeswim site	86	89	69	81
St Marys Bay	Full Safeswim site	87	90	87	88
Stanmore Bay	Full Safeswim site	94	99	94	95
Takapuna North	Full Safeswim site	86	99	96	93
Taumanu Central	Full Safeswim site	93	97	94	95
Taumanu East	Full Safeswim site	94	97	95	95
Taumanu West	Full Safeswim site	97	100	97	98
Te Atatu	Full Safeswim site	80	88	79	82
Waiake Bay	Full Safeswim site	94	97	93	95
Waikowhai Bay	Full Safeswim site	94	98	95	96
Waiwera	Full Safeswim site	97	99	97	97

		% Water quality compliance (model)			
Site	Status	2018-19	2019-20	2020-21	Average
Wenderholm	Full Safeswim site	97	100	99	99
Weymouth South (Keith Park)	Full Safeswim site	76	86	80	81
Bayswater	Full Safeswim site (added in 2018)	96	100	97	98
Farm Cove	Full Safeswim site (added in 2018)	92	99	92	94
Grannys Bay	Full Safeswim site (added in 2018)	77	88	78	81
Little Shoal Bay	Full Safeswim site (added in 2018)	91	96	90	92
Magazine Bay	Full Safeswim site (added in 2018)	99	100	100	100
Murrays Bay	Full Safeswim site (added in 2018)	92	97	91	94
Onehunga Lagoon	Full Safeswim site (added in 2018)	97	99	96	97
Rothesay Bay	Full Safeswim site (added in 2018)	85	92	87	88
Soldiers Bay	Full Safeswim site (added in 2018)	89	96	90	92
St Leonards Beach	Full Safeswim site (added in 2018)	99	100	100	100
Sunkist Bay	Full Safeswim site (added in 2018)	83	95	80	86
Surfdale	Full Safeswim site (added in 2018)	94	99	97	97
Takapuna South	Full Safeswim site (added in 2018)	94	97	95	96
Thorne Bay	Full Safeswim site (added in 2018)	93	97	92	94
Weymouth West (Roys Road)	Full Safeswim site (added in 2018)	92	96	95	95
Torkar Bay	Full Safeswim site (added in 2019)	n/a	84	80	82
Glenbrook Beach	Full Safeswim site (added in 2020)	n/a	n/a	77	n/a
Masefield Beach	Full Safeswim site (added in 2020)	n/a	n/a	91	n/a
Okoromai Bay	Full Safeswim site (added in 2020)	n/a	n/a	78	n/a
Sentinel Road Beach	Full Safeswim site (added in 2020)	n/a	n/a	89	n/a
Snells Beach	Full Safeswim site (added in 2020)	n/a	n/a	94	n/a
Laingholm	Full Safeswim site (long term warning removed in 2019)	0	98	95	97
Coxs Bay	Long term warning - permanent red	0	0	0	0
Fosters Bay	Long term warning - permanent red	0	0	0	0
Green Bay	Long term warning - permanent red	0	0	0	0
Meola Reef	Long term warning - permanent red	0	0	0	0
Titirangi Beach	Long term warning - permanent red	0	0	0	0
Wairau Outlet	Long term warning - permanent red	0	0	0	0
Wood Bay	Long term warning - permanent red	0	0	0	0
Kariotahi	No water quality information	n/a	n/a	n/a	n/a
Muriwai	No water quality information	n/a	n/a	n/a	n/a
Pakiri Beach	No water quality information	n/a	n/a	n/a	n/a

Appendix E Water allocation raw data

This appendix contains tables and figures of raw data.

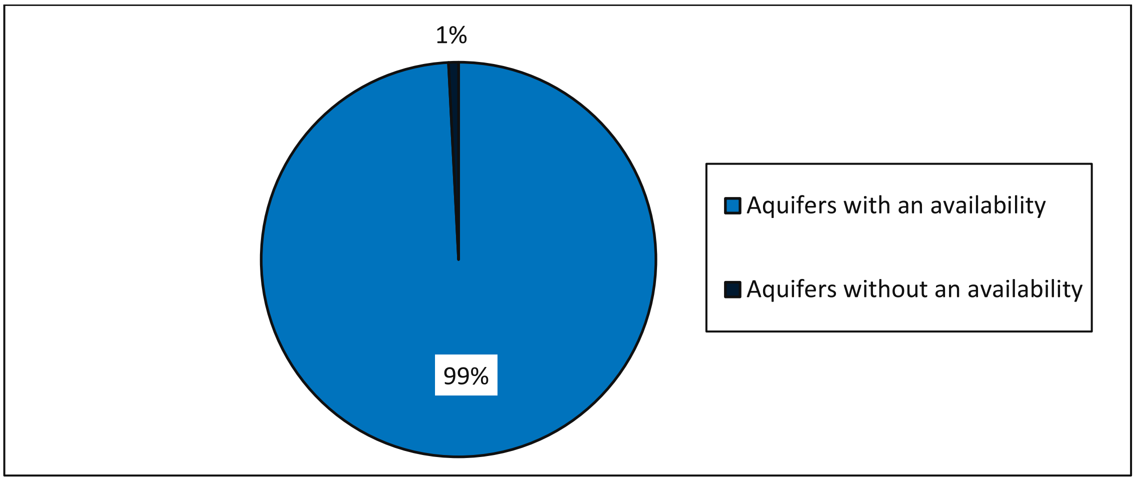


Figure E 1: Chart showing the number of groundwater aquifers with an identified availability in the groundwater allocation framework

Table E 1: Data showing the number and percentage of groundwater and geothermal aquifers which have availabilities established

	Groundwater		Geothermal water	
	Number	Percentage	Number	Percentage
Aquifers with an availability	122	99%	2	50%
Aquifers without an availability	1	1%	2	50%
Total	123	100%	4	100%

Table E 2: Data showing where the availability for groundwater and geothermal aquifers has come from

	Groundwater		Geothermal water	
	Number	Percentage	Number	Percentage
Consenting process	29	24%	0	0%
Desktop recharge estimates	67	54%	0	0%
Technical Publication	14	11%	0	0%
AUP	12	10%	2	50%
No limit	1	1%	2	50%
Total	123	100%	4	100%

Table E 3: Data showing the number of numeric availabilities that have been superseded by availabilities established in the consenting process

	Number	Percentage
AUP availability up to date	20	91%
AUP availability superseded by consenting process	2	9%
Total	22	100%

Table E 4: Data showing the number and percentage of aquifers that are allocated within the availabilities, over-allocated and without an availability

	Groundwater		Geothermal water	
	Number	Percentage	Number	Percentage
Aquifers allocated within limits	101	82%	2	50%
Aquifers fully allocated	9	7%	0	0%
Aquifers over-allocated	12	10%	2	50%
Aquifers with no availability identified and water takes	1	1%	0	0%
Total	123	100%	4	100%

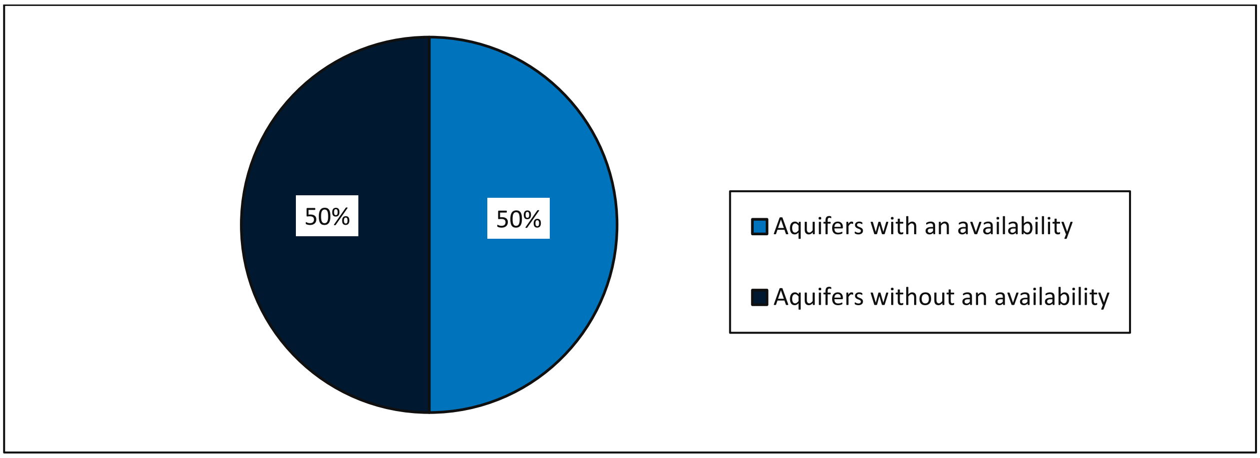


Figure E 2: Chart showing the number of geothermal aquifers with an identified availability in the groundwater allocation framework

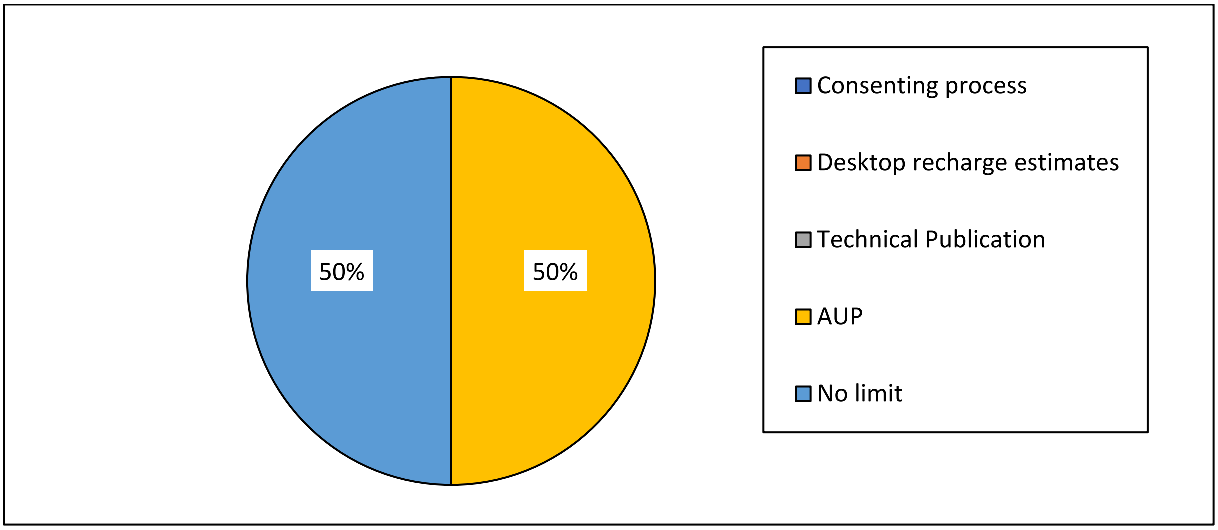


Figure E 3: Chart showing the number of geothermal aquifers with an identified availability in the groundwater allocation framework

Table E 5: Data showing where the availability for the over-allocated waterbodies has come from

	Number	Percentage
Desktop recharge estimates	2	17%
Consent	3	25%
Technical Publication	4	33%
AUP	3	25%
Total	12	100%

Table E 6: Data showing the percentage of allocation for each of the over-allocated groundwater aquifers. Also shows the proportion of the allocation by consented allocation, permitted activity and S14(3)(b)

Aquifer management area	Section 14 Model	Permitted Activity	Consented Allocation	Level of allocation
Mahurangi Waitematā	11%	1%	96%	108%
Orewa Waitematā	59%	2%	74%	135%
Helensville Waitematā	28%	2%	91%	122%
Kumeu East Waitematā	67%	8%	79%	154%
Bombay West Waitematā	18%	0%	89%	107%
Karaka Waitematā	12%	4%	91%	106%
Hunua West Greywacke	37%	2%	133%	172%
Onehunga Volcanic	0%	0%	102%	102%

Pukekohe South Volcanic	7%	0%	118%	125%
Pukekohe West Volcanic	2%	1%	101%	104%
Otuataua Volcanic	0%	0%	161%	161%

Table E 7:The number and percentage of groundwater, surface water and geothermal water consents from the sample that have a review condition included in the consent

	Groundwater		Surface water		Geothermal water	
	Number	Percentage	Number	Percentage	Number	Percentage
Review condition included	21	91%	6	86%	47	100%
Review condition not included	2	9%	1	14%	0	0%
Total	23	100%	7	100%	47	100%

Table E 8:The purpose of water use as described by the consent description for ground water and surface water takes

Purpose of water take	Number	Percentage
Community Facilities	4	2%
Community Water Supply	5	3%
Beverage Manufacturing / Water Bottling	10	5%
Water Tankers	9	5%
Dewatering	9	5%
Sports Facilities	10	5%
Dairy	11	6%
Earthworks/Construction	12	6%
Not Stated / docs not available	17	9%
Other	20	10%
Horticulture	89	45%
Total	196	100%

Table E 9: Number and percentage of the sample of groundwater, surface water and geothermal water take consents that had an assessment of whether the amount of water consented was reasonable and justifiable.

	Groundwater		Surface water		Geothermal water	
	Number	Percentage	Number	Percentage	Number	Percentage
Assessment of reasonable and justifiable water use undertaken	22	96%	6	86%	47	100%

Assessment of reasonable and justifiable water use not undertaken	1	4%	1	14%	0	0%
Total	23	100%	7	100%	47	100%

Table E 10: Data showing the purpose of water use, the way in which the consented volume of water was determined and how climatic variability was considered in determining the volume of water for the sample of 23 groundwater consents assessed.

	Activity	Number	Percentage
Purpose of water use	Earthworks	2	9%
	Dairy shed wash down	2	9%
	Horticulture - Glasshouse Garden	4	17%
	Horticulture - Market Garden	6	26%
	Horticulture - Orchard	4	17%
	Other	5	22%
Method of calculating volume	Volume by area	17	74%
	Volume per year	3	13%
	Volume per cow	2	9%
	Volume per tree	1	4%
Drought or normal year	Volume based on requirements in a dry year	7	30%
	Volume based on requirements in a regular year	7	30%
	Climatic variability not relevant to volume required	4	17%
	Not clear how climatic variability is considered	5	22%

Table E 11: Data showing the number and percentage of consent decisions for surface water takes, a sample of groundwater takes and geothermal takes that have a condition requiring efficient use reporting

	Groundwater		Surface water		Geothermal water	
	Number	Percentage	Number	Percentage	Number	Percentage
Condition requiring efficient use reporting included	20	87%	3	43%	0	0%
Condition requiring efficient use reporting not included	3	13%	4	57%	47	100%
Total	23	100%	7	100%	47	100%

Table E 12: Data showing the number and percentage of consent decisions for surface water takes, a sample of groundwater takes and geothermal takes that have a condition requiring water conservation measures to be reported to the council

	Groundwater		Surface water		Geothermal water	
	Number	Percentage	Number	Percentage	Number	Percentage
Water conservation condition included in consent	20	87%	2	29%	0	0%
Water conservation condition not included in consent	3	13%	5	71%	47	100%
Total	23	100%	7	100%	47	100%

Table E 13:High-Use Aquifer Management Areas, the remaining allocation available the proportion of the allocation by consented allocation, permitted activity and Section 14(3)(b)Section 14(3)(b) and the level of allocation

Aquifer management area		Takes			Allocation status		
Aquifer	Sub aquifer	Section 14(3)(b)	Permitted Activity	Consented Allocation	Allocation Remaining	Level of allocation	Level of allocation
Kumeū Waitematā	Kumeu East Waitematā	67%	8%	79%	-54%	154%	Over
	Kumeu West Waitematā	5%	2%	55%	40%	61%	50-80%
Ōmaha Waitematā	-	10%	0%	43%	50%	53%	50%
Tomarata Waitematā	-	20%	0%	30%	49%	51%	50-80%
Mahurangi Waitematā	Mahurangi East Waitematā	19%	5%	73%	1%	97%	50-80%
	Mahurangi Waitematā	11%	1%	96%	-11%	108%	Over
	Mahurangi West Waitematā	13%	2%	3%	82%	18%	50%
Ōnehunga Volcanic	-	0%	0%	102%	-2%	102%	Over

Aquifer management area		Takes			Allocation status		
Aquifer	Sub aquifer	Section 14(3)(b)	Permitted Activity	Consented Allocation	Allocation Remaining	Level of allocation	Level of allocation
Mt Wellington Volcanic	-	0%	0%	27%	74%	27%	50%
Waiheke	Waheke Island Greywacke	20%	19%	26%	35%	65%	50-80%
		17%	16%	49%	18%	82%	80-100%
		10%	2%	3%	85%	15%	50%
		11%	0%	0%	89%	11%	50%
Manukau Waitematā	Manukau City Waitematā	5%	2%	84%	9%	91%	80-100%
	Manukau North Waitematā	0%	2%	0%	98%	2%	50%
Manukau Southeast Kaawa	-	11%	0%	0%	89%	11%	50%
Clevedon East Waitematā	-	7%	2%	86%	-1%	96%	Over
Clevedon West Waitematā	-	5%	0%	79%	14%	84%	80-100%
Franklin Volcanic	Bombay Volcanic	8%	3%	84%	9%	94%	80-100%
	Glenbrook Volcanic	2%	0%	10%	88%	12%	50%
	Pukekohe Central Volcanic	1%	0%	99%	0%	100%	80-100%
	Pukekohe North Volcanic	2%	0%	72%	26%	74%	50-80%
	Pukekohe South Volcanic	7%	0%	118%	-25%	125%	Over
	Pukekohe West Volcanic	2%	1%	101%	-4%	104%	Over

Aquifer management area		Takes			Allocation status		
Aquifer	Sub aquifer	Section 14(3)(b)	Permitted Activity	Consented Allocation	Allocation Remaining	Level of allocation	Level of allocation
	Bombay - Drury Kaawa	1%	1%	59%	15%	61%	80-100%
	Pukekohe Kaawa	28%	0%	37%	62%	65%	50%
Franklin Kaawa	Glenbrook Kaawa	19%	1%	85%	15%	104%	80-100%
	Waiuku Kaawa	1%	2%	11%	-20%	13%	Over
Drury Sand	-	0%	0%	11%	89%	11%	50%
Waiwera Geothermal	-	0%	0%	92%	9%	92%	80-100%
Parakai Geothermal	-	0%	0%	91%	8%	91%	80-100%

Table E 14: Over-allocated aquifers in the Auckland Region, level of allocation and where they are identified as HUAMA

Aquifer management area	Remaining Allocation	In the HUAMA Overlay?
Mahurangi Waitematā	-11%	Yes
Kumeu East Waitematā	-54%	Yes
Clevedon East Waitematā	-1%	Yes
Waiuku Kaawa	-20%	Yes
Pukekohe South Volcanic	-25%	Yes
Pukekohe West Volcanic	-4%	Yes
Onehunga Volcanic	-2%	Yes
Otuataua Volcanic	-61%	No
Karaka Waitematā	-6%	No
Hunua West Greywacke	-72%	No
Bombay West Waitematā	-7%	No
Orewa Waitematā	-35%	No
Helensville Waitematā	-22%	No

Appendix F Streams and wetlands – Activities sourced from the Plans and Places resource consents database

E3. Lakes, rivers, streams and wetlands

Table E3.4.1 Activity table

Activities in, on, under or over the bed of lakes, rivers, streams (including intermittent stream) and wetlands		Activity status- outside overlays	Activity status - within overlays
General			
(A9)	Any activities in, on, under or over the bed of lakes, rivers, streams and wetlands not otherwise provided for	D	NC
…			
Activities involving the diversion of a river or stream to a new course including any associated disturbance and sediment discharge			
(A10)	Diversion of a river or stream to a new course and associated disturbance and sediment discharge	D	NC
(A11)	Diversion of a river or stream associated with mineral extraction activities within the H28 Special Purpose - Quarry Zone	RD	RD
…			
New structures and the associated bed disturbance or depositing any substance, reclamation, diversion of water and incidental temporary damming of water			
…			
(A12)	Structures associated with the enhancement and restoration of lakes, rivers, streams or wetlands not otherwise provided for	RD	RD
(A13)	Bridges or pipe bridges complying with the standards in E3.6.1.16	P	D
…			
(A14)	New cables or lines that cross over a river or stream which do not require-support structures in the watercourse complying with the standards in E3.6.1.17	P	RD
(A15)	Culverts or fords less than 30m in length when measured parallel to the direction of water flow complying with the standards in E3.6.1.18	P	D
(A16)	Culverts or fords more than 30m in length when measured parallel to the direction of water flow	D	NC
…			

Activities in, on, under or over the bed of lakes, rivers, streams (including intermittent stream) and wetlands		Activity status- outside overlays	Activity status - within overlays
(A17)	Jetties, wharves, pontoons	D	D
…			
(A18)	Stormwater or wastewater outfall complying with the standards in E3.6.1.14	P	D
…			
(A19)	Surface water intake structure	P	D
(A20)	Swing or pile mooring complying with the standards in E3.6.1.22	P	D
…			
(A21)	Any activities not complying with the general permitted activity standards in E3.6.1.1 or the specific activity standards in E3.6.1.14 to E3.6.1.23	D	NC
Reclamation and drainage and associated structures, bed disturbance or depositing any substance, diversion of water, incidental temporary damming of water, and discharges arising from the piping of a reclaimed waterbody associated with the following			
…			
(A22)	Removal or demolition of an existing reclamation or drained area that does not complying with the standards in E3.6.1.24	RD	RD
…			
(A23)	Extension of an existing lawful reclamation or drained area	NC	NC
(A24)	New reclamation or drainage, including filling over a piped stream	NC	NC
(A25)	Any activities not complying with the general permitted activity standards in E3.6.1.1 or the specific activity standards in E3.6.1.24	D	NC
…			

Appendix G Assessment of structure plans and plan changes in growth areas

Table 1 – Whenuapai, Drury-Opaheke and Pukekohe-Perata structure plans

			Whenuapai Structure Plan		**Drury-Opaheke Structure Plan**		**Pukekohe-Paerata Structure Plan**
			Sep-16		**Aug-19**		**Aug-19**
			Council, finalised		Council, finalised		Council, finalised
1	Infrastructure	Yes	Key objectives include timely water and wastewater infrastructure (p 20). Water and wastewater servicing described page 57. Stormwater covered by stormwater management plan.	Yes	Watercare has prepared a Water and Wastewater and Servicing Plan for the area. A new watermain is required to improve resilience. The structure plan area will largely be serviced by connecting to the existing wastewater network at Hingaia pump station and the southern interceptor. These assets will be upgraded in stages to meet growth expected in the area (page 57).	Partly/ Unclear	A funding plan for bulk infrastructure will need to be finalised as more information becomes available, prior to any decision on plan change timings. Map 6: Pukekohe-Paerata Structure Plan 2019: Water, Electricity and Gas Infrastructure Map (Page 7) Feedback stressed the importance of co-ordinating growth timing with infrastructure timing and provision (page 9) Vision: 3.2.6 Servicing our future community (c) infrastructure delivery and land development are coordinated with funding and provide networks that are cost effective. (page 18) 3.3.8. Other Infrastructure (page 31)
2	Catchment management plan	Yes	Biodiversity assessment and stormwater management plan commissioned (page 18)	Yes	Stormwater Management Plan (page 34, 47). A watercourse assessment report was completed for each catchment. These reports contain a detailed assessment of stream health and identify stream health enhancement opportunities. (page 47).	Yes	4.2.2. Stormwater, flooding and management of freshwater environments. Identification of the three stream catchments within the SP area. Key stormwater characteristics and constraints summarised. Opportunities identified (page 57-58) Management approach (SMP outcomes outlined (page 58-60)
3	Stream loss	Yes	Retention of permanent and intermittent streams is crucial and will help determine location of roads, open space and development (page 6). Maps of permanent and intermittent streams (page 7). Design principles - protect waterways (p 76). Structure plan summary 8.2.3 - streams should be retained (page 83).	Yes	Streams are identified as areas that are generally unsuitable for development (page 5). The blue-green networks include streams and riparian margins (page 19). The extent of streams is indicative and will need to be determined in plan change and consent stages. Maintenance and enhancement of streams and their margins is particularly important (page 20).	yes	* section 4.2.2 Stormwater, flooding and management of freshwater environments suggest protection of streams from permanent loss. Page 58 outlines opportunities to protect and enhance stream catchment in the SP area, which include pro
4	Riparian margin	Yes	A 10 to 20 metre minimum yard setback from the edge of permanent and intermittent streams is required (page 56). Natural environment and heritage map shows indicative riparian margins (p 84).	Yes	Key outcomes include 'the freshwater management functions of riparian margins are improved" (page 11). The structure plan generally proposes a 20m riparian restoration margin along streams. The actual width will be subject to more detailed investigations at the plan change stage. Riparian margins will be protected	Yes	20m riparian buffer on each side of all permanent and intermittent streams to provide opportunities for stream protection and ecological linkages…. The buffer will enable flood water conveyance and management approaches including stream works and riparian planting.- page 24

			Whenuapai Structure Plan		Drury-Opaheke Structure Plan		Pukekohe-Paerata Structure Plan
					by either esplanade reserves or other methods (page 20).		
5	Enhancement	Yes	SEA and riparian margins are to be enhanced (page 6). Key objective 6 freshwater quality throughout the catchment is enhanced over time (page 21). Areas for ecological enhancement have been identified primarily in relation to riparian margins, state highways, SEA and Brigham Creek in relation to Northwest wildlink (page 83). Enhancement of streams through riparian planting will provide ecological linkages (page 88).	Yes	Maintenance and enhancement of streams and their margins is particularly important. Stream connectivity is an issue and presents an opportunity during development to daylight and restore stream connectivity. Opportunities exist for riparian enhancement to improve water quality and ecological values (page 20). Environmental restoration of stream habitats will need to be funded and implemented (page 24). The SMP seeks to achieve the following outcomes: stream health is maintained or enhanced through improved baseflow (page 48).	Partly/ Unclear	Riparian buffer of 20m and 10m, could include planting of indigenous vegetation-page 58 and page 40 (mana whenua)
6	Overlays	Yes	AUP summary notes SEA, high-use aquifer overlays and SMAF and MCI controls (page 32).	Yes	SEA, High-use stream, High Use aquifer, quality sensitive aquifer overlays noted (page 37).	Yes	Yes- page 58/59
7	Degraded areas	No		Yes	Pahurehure Inlet is already degraded and is at significant risk of major environmental effects due to continued sedimentation. Additional controls are needed to ensure sedimentation is minimised to protect our marine and freshwater environments (page 47).	Yes	The Pahurehure Inlet (where most of the structure plan area drains to) is degraded and is at significant risk of major environmental effects due to continued sedimentation. Additional controls are needed to minimise sedimentation and protect our marine and freshwater environments.- page 24
8	Mana whenua values	Yes	Cultural values assessment (page 63). Development and design principles include 'provide for the sustainable management of taonga (e.g. the importance of protecting the mauri of waterways' (page 77).	Yes	Mana whenua section (page 24) notes that maintaining and enhancing the life supporting capacity and mauri of lands and waters is very important. In response to feedback from mana whenua the structure plan proposes riparian restoration margins along all streams in recognition of the multiple cultural and environmental values these streams and their riparian margins have.	Yes	Riparian buffers - page 26/27 for MW activities adjacent to waterways/water bodies are managed. e.g. access, orientation of site and siting and orientation of building platforms, impervious surfaces etc. Pukekohe-Paerata Structure Plan 2019 41 • stormwater is managed and treated • the health of ecosystems can be enhanced e.g. eco-sourced riparian plantings within the riparian buffers • new development can be required to use Te Aranga Māori Design Principles • kaitiaki can be enabled to carry out their responsibilities including cultural monitoring • mana whenua physical and cultural landscapes and sites of significance can be identified and protected e.g. additions to various Auckland Unitary Plan overlays • the natural functions of wetlands and floodplains can be restored • to ensure best practice for erosion and sediment control.
9	Contaminants	Yes	Key objective - water sensitive design (page 20). Where site specific activities identify the potential for High Contaminant Generating Activities, there will be a	Partly/ Unclear	No mention of high contaminant generating carparks and roads. The structure plan promotes water sensitive design (page 34).	Unclear/ Partly	Not expressly considered, but elements are considered through water sensitive design. - page 58/59

			Whenuapai Structure Plan		Drury-Opaheke Structure Plan		Pukekohe-Paerata Structure Plan
			requirement for additional targeted treatment to be provided (page 55).				
10	Sensitive receiving environments	Yes	Ecology section notes the need to protect SEA and the Upper Waitematā Harbour (page 59).	Yes	The sensitivity of the Manukau Harbour means that water quality, hydrological, watercourse management and sediment and erosion control measures will need to be exemplary (page 45)	Yes	page 58-59 outlines the actions taken to manage run off on receiving environments • Protecting and enhancing permanent and intermittent streams, including (but not limited to) the use of greenways, stream bed and bank shaping and grading, riparian buffers and controls to manage runoff. • Apply hydrological mitigation to minimise hydrological impacts on streams within and downstream of the Pukekohe-Paerata area • Require on-site or communal treatment train approach to ensure water quality of the sensitive receiving environments is not impacted.
11	Hydrology	Partly/ Unclear	Not explicitly but there are several references to water sensitive design.	Yes	Stream erosion is a significant issue because the resulting sediment is major contaminant. Integrated stormwater management approach includes implementing retention and detention hydrology mitigation measures and additional stream management measure to reduce erosion hotspots and requiring exemplar sediment and erosion control guidelines during construction. (page 47). The plan generally proposes lower density development near the major streams (page 21).	Partly/ Unclear	Should do from the identification and protection of streams, including through riparian planting. But not expressly considered other than in point above regarding receiving environment.
12	Water temperature	Partly/ Unclear	Not explicitly but there are several references to water sensitive design and protection of riparian margins.	Partly/ Unclear	Not explicitly but there are several references to water sensitive design and protection of riparian margins.	No	No reference to the interventions having an impact on water temperature
13	Litter	No	Not mentioned.	No	Not mentioned.	No	Litter from stormwater runoff is not expressly considered in the S.P. It is considered as part of the stormwater management plan to minimise the effects of development and run off on streams and water catchment areas- page 58. Page 59 talks about water sensitive design that informs the location, patterns and form of the S.P area
14	Efficient use	No	7.7.1 water supply section relates only to network infrastructure (page 57).	Partly/ Unclear	There are several references to water sensitive design. Appendix 4 Water sensitive design principles includes hydrological mitigation - retention and detention: options - above ground rainwater storage/re-use tanks; underground storage tanks, structural cells	No	Aside from water sensitive design for stormwater run off, water supply and wastewater is considered in terms of infrastructure provision and improvements to trunk and local network pipelines, not greywater usage. - page 65/66

Table 2 – Warkworth and Silverdale West Dairy Flat Industrial Area Structure Plans

			Warkworth Structure Plan		**Silverdale West Dairy Flat Industrial Area Structure Plan**
			Jun-19		**Apr-20**
			Council, finalised		Council, finalised
1	Infrastructure	Yes	Infrastructure providers plans underway to service the planned growth of Warkworth (page 4) Infrastructure is being actively investigated or constructed by the infrastructure providers to service the planned growth of Warkworth (page 20)	Partly/ Unclear	Assessed adequately and provision of infrastructure is planned but not funded. Water will be provided initially from the existing Orewa 1 watermain and then from a new connection that is part of the Orewa 3 watermain. Several upgrades are needed. New wastewater collector pipes are needed, which will connect to the Milldale wastewater system (page 7). Total costs for transport, stormwater, wastewater and bulk water infrastructure are $730M to $890M. Few if any projects and services have funding allocated (page 51).
2	Catchment management plan	Yes	Existing integrated catchment management plans and associated network discharge consents. The application of an integrated stormwater management approach within developments to reduce impacts on the environment while enhancing urban amenity. SMP, including network plans, updates to catchment or zone management plans and variations to existing or new network discharge consents, where relevant. Waste and wastewater servicing plan. The location, scale and function of stormwater management facilities based on the principles of an integrated stormwater management approach, including the retention of natural water systems and the primary use of onsite flow and quality controls (and related impervious area limits) to manage stormwater runoff from proposed sites and roads. Appendix 4(4.3.8) page 130-132 Appendix 3(3.3.9.1) page 65-66 Land use zonings in structure plan area closely aligned or consistent with the key recommendations of the Landscape Topic Report. The areas of congruence are around protecting streams/river courses and significant vegetation and the matters outlined on page 72	Yes	Catchment management plan prepared by Opus and Healthy Waters (page 99). Watercourse assessments conducted (page 77).
3	Stream loss	Yes	If given appropriate statutory protection the Green Network will afford protection of existing freshwater ecological values as well as improve the long-term life supporting capacity of the freshwater systems in the area, of which sections are currently degraded and lacking suitable riparian cover. Restoration also supports delivery of objectives in NPS-FM 2014. (page 69) Avoidance of watercourse loss (i.e. no permanent loss with reclamation or culverting) and avoidance of native vegetation loss (especially SEAs) are listed as ecological constraints for development,. Retaining and enhancing vegetation and natural watercourses plus reintroducing riverine wetlands to natural floodplains are listed as key ecological opportunities (page 128)	Yes	Greenways and riparian margins proposed along streams (page 33). Removal of farm ponds and culverts will reinstate drainage patterns to a natural state (page 34).Retain and enhance permanent and intermittent streams (page 35).
4	Riparian margin	Yes	3.3.9.1 enhance the receiving environment by preserving and restoring riparian vegetation along banks (page 65-66) Permanent and intermittent streams will need to be protected. **Riparian buffer area** around streams needs to be included. In some areas existing	Yes	Include provision of riparian buffers along watercourses (revegetation allowing stormwater runoff to be filtered and slowed). A minimum 10m riparian margin will be provided either side of intermittent streams and a minimum 20m margin will be provided either side of permanent streams. (page 35)

			Warkworth Structure Plan		Silverdale West Dairy Flat Industrial Area Structure Plan
			riparian vegetation has been classified as a terrestrial SEA and must be protected. (page 131)		
5	Enhancement	Partly/Unclear	Wetlands and streams with a 10m buffer are identified as 'protected areas' in the SP. The SP acknowledges differing levels of protection and protection and enhancements of these areas through a future plan change is essential as the protection of these areas is the foundation on which the Warkworth Structure Plan is built. (page 22) The structure plan seeks to avoid development in floodplains and restore riparian areas (page 66)	Yes	Page 34 - fish passage provision, removal of barriers to fish passage, removal of farm ponds, drains and culverts to reinstate the natural drainage, restoration planting, raingardens.
6	Overlays	Yes	SEAs are listed under the protected areas. SP identified all overlays that apply to the study area (page 114) Structure plan map (page 6 and 7) identified all protected areas (not for development) and these include floodplains, SEAs, covenanted bush, stream buffer (10m), historic heritage extent of place, wetlands)	Yes	SEA overlay in upper Weiti stream, Weiti Estuary, Karepiro Bay and at Okura Long Bay Marine Reserve (page 34, 60, 83, 84)
7	Degraded areas	Partly/Unclear	the catchment currently has a low extent of impervious surfaces, a low degree of channel modification, and comparatively low pollution from stormwater and wastewater discharge, the water quality overall for the catchment is rated "good" in council's 2016 freshwater report card. (page 130) opportunities to enhance freshwater systems are identified on page 131. water quality in the water bodies within SP area relatively good - use of integrated stormwater management is an opportunity to maintain or enhance water quality. Use riparian margins as part of water conveyance and to provide connections to other freshwater systems and other habitat types. The change in land use from rural land to urban is an opportunity to reduce sedimentation loading in freshwater systems and in the harbour. (page 132)	Yes	The stream network overall has been degraded and riparian vegetation is mostly absent (page 79)
8	Mana whenua values	Yes	Feedback from mana whenua highlighted that the Green Network areas also have cultural values (page 21) Appendix 3 (3.3.10.6) Cultural - key feedback raised - seeking proactive environmental monitoring and sedimentation control to restore and protect the Mahurangi River. Providing opportunities to revegetate the area with native vegetation. Protecting wahi tapu and taonga with new development. Supporting buffer planting next to streams for protection and to encourage biodiversity. Reducing car dependence and supporting the provision of cycling and walking networks.	Yes	Cultural values assessment (page 37, 90) notes values relating to water and biodiversity.
9	Contaminants	Partly/Unclear	Minimising and managing runoff and contaminants are listed in the stormwater management plan but these do not specify car parks or high use roads	Partly/Unclear	Notes the benefits of removing stock from waterways. Sediments, impervious surface runoff and workplace toxins, such as heavy metals, will need to be managed with a view to creating and the maintaining a healthy natural stream environment and aquatic habitat (page 34). Water sensitive design includes minimising generation and discharge of contaminants (robust runoff management required, including control on roofing materials) (page 35). Change in land use to industrial will generate different stormwater contaminants. This is due to additional roads and other impervious surfaces as well as potential discharges from industrial activities (page 78). No specific mention of carparks and high use roads.
10	Sensitive receiving environments	Yes	Page 68 - provision of buffer zones between industrial land and sensitive receiving environments reduce likelihood of potential contaminant discharges reaching receptors.	Yes	Sensitivity of Long Bay and Weiti Estuary and the Rangitopuni Stream noted (page 34, 35, 37, 60)

			Warkworth Structure Plan		Silverdale West Dairy Flat Industrial Area Structure Plan
11	Hydrology	Partly/Unclear	Hydrological mitigation lists constraints and opportunities (page 131)	Partly/Unclear	Water sensitive design includes specific watercourse management responses (e.g. Weiti Stream) and hydrology mitigation at development stage (e.g. retention and detention of stormwater) (page 35). No specific mention of infiltration.
12	Water temperature	No		Yes	Part of the justification for riparian planting is to address 'low shading and poor temperature regulation of watercourses due to clearance of riparian vegetation (page 78).
13	Litter	No		No	
14	Efficient use	Yes	Page 61 - additional reservoir storage may be required to enable the water treatment plant to operate at a consistent throughput and to provide security of supply to customers. The location of additional reservoir storage is yet to be determined. A future water source will need to be found to provide water beyond the current abstraction consent limit, Watercare is confident that such a source will be found prior to this population trigger being reached (2028 onwards)	No	At the plan change stage there will be the opportunity to address some of these issues further as well as those such as the opportunities for the efficient use of water and wastewater (page 58).

Table 3 Plan changes in structure plan areas – PC 5, variation 1 to PC 5, PC 48

			Plan Change 5 Whenuapai		Draft variation 1 to Plan Change 5 Whenuapai		Plan Change 48 Drury Centre Precinct
			21-Sep-17		**19-Apr-21**		**27-Aug-20**
			Council, proposed		Council, draft		Private, proposed
1	Infrastructure	Partly/ Unclear	I616.1 Precinct 3 description notes that "The primary responsibility for funding of local infrastructure lies with the applicant for subdivision and/or development. The council may work with developers to agree development funding agreements for the provision of infrastructure, known as Infrastructure Funding Agreements". Objectives relate to adverse effects of development on infrastructure and compromising the ability to provide infrastructure, not that it is sequenced to integrate with infrastructure provision.	Partly/ unclear	No relevant change to PC5.	Partly/ unclear	The assessment criteria include consideration of whether there is adequate capacity in the existing or proposed public reticulated water supply wastewater and stormwater network.
2	Catchment management plan	Yes	Plan change was notified with a technical document Whenuapai 3 precinct stormwater management plan 2017. It is included in appendix 17 of the AUP 'documents incorporated by reference'. PC provisions regarding riparian margins and SMAF etc reflect the stormwater management plan.	Yes	Policy 12 is amended from 'require subdivision and development to be consistent with the requirements of the Whenuapai 3 precinct stormwater management plan and any relevant stormwater discharge consent' to 'be consistent with any relevant stormwater discharge consent and stormwater management plan approved by the network utility operator'. This allows future SMPs to be implemented.	Yes	Stormwater management plan is appendix 12 to the plan change. The SMP will either be certified under the council's network discharge consent and the discharges from the site authorised under that, or a separate stormwater discharge consent will need to be obtained. Ecological assessment included assessment of the streams in the plan change area (appendix 11).
3	Stream loss	Partly/ Unclear	Precinct plan 1 shows permanent and intermittent streams. Policy (12) requires that development is consistent with the stormwater management plan (which includes 'retain streams as far as possible') (page 13). Policy (18) avoid stream crossings where practicable. Special information requirements require a plan identifying all streams and wetlands on the application site. Giving this a 'partly' as the strongest requirement to retain streams is the reference to the SMP.	Partly/ unclear	Precinct plan 1 now shows natural wetlands as well as streams.	No	Policy (19) is to recognise there may be no practicable alternative to stream works including reclamation where required for critical infrastructure allow for reclamation. In hearing report, ecological peer review for council as regulator states that the precinct plan should show all the streams and wetlands and that the stream works policy is too prescriptive. Opposes the need for the proposed policy as E3 contains sufficient provision to address relevant issues through normal resource consenting.
4	Riparian margin	Yes	Nothing about riparian yards, earthworks controls or vegetation controls so the usual zone standards apply. There is a stronger requirement for riparian planting than in the rest of the AUP.	Yes	No relevant change to PC5.	Yes	Policy (20) is to support improvements to water quality and habitat, including by planting on riparian margins.

			Plan Change 5 Whenuapai		Draft variation 1 to Plan Change 5 Whenuapai		Plan Change 48 Drury Centre Precinct
			Policy (17) 'recognise the role of riparian planting to support Northwest wildlink'. Policy (19) "Require at the time of subdivision and development riparian planting …". Standard I616.6.4 requires all activities in activity table to have riparian planting to a minimum width of 10m. Riparian margins must be offered to council for vesting. Planting cannot be part of any environmental compensation or offset package required in relation to works in a stream.				
5	Enhancement	Yes	See notes above about riparian planting. Objective (10) Subdivision, use and development **enhance** the coastal environment, biodiversity, water quality, and ecosystem services of the precinct, the Waiarohia and the Wallace Inlets, and their tributaries. Enhancing quality of freshwater systems and coastal waters is included in policy (12). Riparian planting requirements relate to enhancement of freshwater systems.	Yes	Objective (8) re stormwater management now includes 'enhance' as well as 'protect' ecological values of the receiving environment.	Partly/ unclear	Precinct objective (7) is that freshwater and sediment quality is progressively improved over time in the precinct. Policies (18) and (19) appear to encourage stream degradation. They promote instream works to mitigate effects of development and support culverting diversion and reclamation where required for critical infrastructure. Standards require that riparian margins be planted to a minimum width of 10m either side of permanent or intermittent streams and buildings must be set back 20m from a river or stream. the information requirement require a riparian planting plan. Ecological peer review for council as regulator recommends that planting be 20m wide not 10m and that the riparian planting rules apply to wetlands as well as streams. Council ecologists as submitter sought that the riparian yard be 20m from permanent streams and 10m from all intermittent streams (rather than applying to streams over 3m wide).
6	Overlays	Partly/ Unclear	Not mentioned within plan change. Must be relying on overlay provisions already in the plan. There is a High Use Aquifer Management Areas overlay on the whole precinct. This is described in the SMP (page 4). Several parts of the SMP refer to the need to manage impervious areas due to effects on aquifer recharge (page 8, 9, 10) and encourages use of retention devices that promote infiltration rather than re-use (page 13). Retention required by SMAF control should be achieved by infiltration where possible (page 14).	Partly/ unclear	No relevant change to PC5.	Yes	High Use aquifers and quality sensitive aquifer noted in the stormwater management plan (page 20).
7	Degraded areas	Yes	Introduction notes that the SMP has identified that the streams and	Yes	No relevant change to PC5.	Partly/ unclear	Degraded areas in Manukau Harbour noted in the stormwater management plan (page 20). Not clear

			Plan Change 5 Whenuapai		Draft variation 1 to Plan Change 5 Whenuapai		Plan Change 48 Drury Centre Precinct
			coastal waters within the precinct are degraded and sensitive to changes in land use and stormwater flows. Enhancement of water quality noted in several places as noted above. SMP notes that the Upper Waitematā is identified as degraded 1 in the AUP RPS.				how the plan change will achieve improvements but there is an objective seeking improvement over time.
8	Mana whenua values	Partly/ Unclear	Not mentioned in the plan change. The SMP includes a section on mana whenua values (page 9) that notes that a cultural values assessment was completed in May 2017 by Ngati Whatua o Kaipara. It identified that development provides opportunities for values to be recognised and enhanced. Te Kawarau a Maki provided input to the structure plan with a focus on sustainable management of taonga such as waterbodies.	Partly/ unclear	No relevant change to PC5.	Partly/ unclear	Mana whenua consultation and concerns outlined in the SMP (page 38). Not clear how they are addressed in water related provisions in the plan change. Cultural values assessments done by four iwi for the plan change.
9	Contaminants	Partly/ Unclear	No mention of carparks or road contaminants. Standard I616.6.3(3) requires that stormwater runoff from impervious areas totalling more than 1000m2 associated with a subdivision or development proposal must be treated by a device or system designed in accordance with TP10 or device with equivalent level of contaminant or sediment removal performance. The SMP notes the need to control contaminant generation and have stormwater quality treatment, particularly for high contaminant generating land use activities (page 13, 14, 16).	Yes	Policy (12) amended to require treating stormwater runoff at source rather than being 'managed'. Standard I616.6.3(3) requires that runoff from impervious areas over 1000m2 be treated at source by stormwater management device. (5) requires that all runoff not directed at a device must achieve quality treatment at source or use inert building materials	Yes	Standard IX.6.6 states that the rules and standards in E9 apply to the precinct as if the reference to 'high use roads' was a reference to 'all roads'. The SMP states that runoff from high contaminant generating areas will be treated in accordance the GD01 (page 31). SMP stormwater approach includes use of inert building materials or site-specific water quality treatment measures (page 59). Paula Vincent's evidence for council (as submitter) seeks that the policies and standard are more explicit about treating contaminants at source and with appropriate devices, and inert building materials used.
10	Sensitive receiving environments	Yes	See above re contaminant management. Several mentions of sensitive receiving environment of the Upper Waitematā and streams. E.g. objective (8) is to implement a stormwater management approach that … protects ecological values of the receiving environment.	Yes	See changes above.	Yes	See above. Inlets noted in SMP as having SEA-M.
11	Hydrology	Yes	Applies the SMAF-1 control to the whole precinct.	Yes	Standard (5) now clearer that treatment devices relate to volume reduction as well as contaminant treatment.	Yes	SMAF 1 is applied to the whole precinct. This requires hydrological mitigation measures for the effects of

			Plan Change 5 Whenuapai		Draft variation 1 to Plan Change 5 Whenuapai		Plan Change 48 Drury Centre Precinct
							stormwater runoff generated by increased impervious areas.
12	Water temperature	Partly/ Unclear	The requirements for riparian planting would assist with water temperature regulation.	Partly/ unclear	No relevant change to PC5.	Partly/ unclear	Changes in temperature noted in the SMP (page 53)
13	Litter	yes	Standard I616.6.3(4) requires that all stormwater runoff from commercial and industrial waste storage areas and waste storage areas in apartments and multi-unit developments must be directed to a device that removes gross stormwater pollutants prior to entry to the stormwater network or discharge to water.	Yes	Variation clarifies the standard (4) reference to devices to note the devices are one of the treatment options in (3).	Partly/ unclear	Gross pollutant traps discussed in the SMP in response to mana whenua concerns (page 38). Not clear in the plan change how they would be provided.
14	Efficient use	No	Not mentioned in plan change.	No	No relevant change to PC5.	No	Not mentioned.

Table 4 Plan changes in structure plan areas – PC 61, PC 25, PC 40

			Plan Change 61 (Private) : Waipupuke		Plan Change 25: Warkworth North		Plan change 40 Clayden Road - Warkworth
			28-Jan-21		26-Mar-20		11-Jun-21
			Private, proposed		Private, appealed		Private, operative
1	Infrastructure	Yes	8.7.1 Infrastructure Effects - report prepared by Maven to provide an assessment of the infrastructure associated with the plan change request. Matters addressed: earthworks and associated site works, surface water and flooding, stormwater disposal, wastewater disposal, water supply reticulation and firefighting, other services (page 137)	Yes	Stormwater management relies on Chapter E9 and SMAF rules (9.7.2.1 and 9.7.2.2) see page 41. Water supply from existing water treatment plant is sufficient for plan change area (Page 43) Watercare agreed to preferred approach. Creation of new wastewater pump station southeast corner of PC area. Interim solution is to convey wastewater to the existing Warkworth wastewater treatment plan - this may require upgrade (page 43)	Yes	Development will be staged to align with the SP upgrade to the wastewater network (page 29 s32 report) Watercare have confirmed that their upgrade to the wastewater treatment network for Warkworth and Mahurangi takes account of the anticipated growth within the Warkworth North area. Stormwater does not rely on any major off site infrastructure works. Stormwater is managed through a 'treatment train' process, on site detention and retention and management of water entering the streams within the land. Watercare have confirmed that their infrastructure rollout of potable water for Warkworth takes account of the level of development in Warkworth North envisaged within the masterplan.
2	Catchment management plan	Yes	Stormwater management plan prepared follows the structure of the SMP prepared in support of Drury SP - Page 103 of s32 Ecological report prepared by Boffa Miskell outlines overall low values within the site with regard to freshwater ecology reflective of its upper catchment location. (page 19) Four watercourses across the site within the plan change area including two intermittent streams which have been afforded a greater level of potential. Areas have been degraded over time through the grazing of stock and horticultural activities across the site, a programme of riparian planting (10m wide on each stream bank) is proposed which will enhance and improve these watercourses. (page 19)	Yes	The proposed Stormwater Catchment Management Plan is included at Section C of Appendix 14 - given the absence of an Integrated Catchment Management Plan for the wider area (9.7 Page 41) Appendix 14 - page 35	Yes	The stormwater catchment management plan sets out a treatment train process for stormwater to ensure that discharge of contaminants are appropriately controlled. (Attachment H - prepared by Maven) Ecological assessment including streams by Freshwater Solutions Limited (Attachment F) this included a watercourse assessment The implementation of the SMP prepared by Maven, and the destocking of the streams will significantly improve water quality. (page 81)
3	Stream loss	Yes	Detailed analysis of existing streams located across the site. A riparian planting programme is proposed to be undertaken across the two watercourses to be protected across the site. The analysis provides a recommendation that a 10m riparian	Partly/un clear	2.3 Areas identified for protection and enhancement - figures extracted from Bioresearchers report (SEAs, a number of permanent watercourse, some intermittent watercourse, recommended areas for vegetation riparian restoration/protection within catchment)(Appendix 14 - page 26	Partly/U nclear	Most of the permanent streams are protected. Other streams are subject to the normal plan controls. (page 11) This plan change responds to the SP visions through…the protection of identified streams and areas of vegetation. These areas provide

			Plan Change 61 (Private) : Waipupuke		Plan Change 25: Warkworth North		Plan change 40 Clayden Road - Warkworth
4			margin on each stream bank is appropriate. (page 56) Providing wetland habitats and planted margins as part of the development and restoring identified protected riparian margins is listed as one of the key mana whenua outcomes agreed to by mana whenua and these form part of the PPC application (page 115) 9.1.2 Assessment of the Objectives Against Part 2 - Objectives 7 and 9 - Wetlands will be developed over the site to receive and treat stormwater and contribute to the pass forward approach for 1 in 100-year stormwater management. The proposal will also be subject to an approved SMP which will manage stormwater within the site and seek retention/detention to enable on site storage and re-use as appropriate.		and 27) 5.3.1 Stream protection - some streams of high value identified which are suited for preservation and enhancement. Given the quality and opportunity for enhancement hydrologic mitigation targeting stream protection was considered appropriate. (Appendix 14 - page 40) Commissioners decision para 204 - Removed precinct plan 2 as it showed ephemeral and intermittent streams to be reclaimed (beyond necessary culverting). This has been deferred to AUP chapter E3 consent processes.		environmental protection whilst also providing amenity for residents of the neighbourhood. (page 12)
4	Riparian margin	Yes	See above	Partly	There is a figure identifying recommended areas for vegetation riparian restoration/protection within the catchment (Appendix 14 page 40) Protection and fencing of native vegetation and riparian areas will ensure that key areas of native vegetation and their riparian connections to the Mahurangi river are protected (page 40) The SEA overlay provisions are relied upon to protect riparian vegetation along the Mahurangi river and tributary stream (page 40)	Yes	The proposed precinct provisions apply policies which protect the riparian margin through planting. Primary streams and the riparian areas are protected and enhanced (page 79 s32 report) The plan change does not alter the AUP provisions as they relate to streams on site - this includes riparian margins and setbacks (page 126)
5	Enhancement	Yes	The PC adopts a number of the NPS-FM recommendations regarding the retention and enhancement of streams, and implementation of riparian planting programmes and the creation of stormwater reserves to function as wetlands which are considered to enhance the life-supporting capacity of freshwater resources across the site in comparison to the existing environment (page 67)	Yes	Plan change proposes a sub-precinct to provide guidance on development…guide mitigation for stream loss that includes a range of ecological and engineering best practice measures as well as riparian enhancement and protection (5.1.1. Page 12 of s32)	Yes	the open space network provides for the enhancement of some streams within the site for core open space purposes, as well as their ecological benefit (page 33) Objective A2 deals with the overall quality of freshwater being maintained or improved while protecting the values of the wetland. (page 80) Standard I552.6.5A subdivision and development standard - riparian yard for streams and wetlands - riparian yards must be planted to a minimum width of 10m from stream or wetlands
6	Overlays	Yes	There are no SEAs recognised by the AUP within the site, and no	Yes	Plan change identifies controls and overlays proposed to apply to the plan	Yes	There are no stormwater management overlays including SMAF within the plan change area. The site

			Plan Change 61 (Private) : Waipupuke		Plan Change 25: Warkworth North		Plan change 40 Clayden Road - Warkworth
			areas of native vegetation that would qualify as significant according to Schedule 3 of the AUP (page 18) A high-use stream management area overlay applies across a large part of the Waipupuke subject site. the PC does not amend this overlay (page 36)		change area - this includes overlays (such as SEAs) and others (5.1.2 other unitary plan controls page 10)		is located within the High-Use Aquifer Management Area overlay (Mahurangi Waitematā). The development is not dependence on aquifers (with all water to be supplied via public network), and thus these overlays are not considered to be of immediate concern to this SMP (page 24 Attachment H SMP)
7	Degraded areas	Yes	The PC adopts a number of the NPS-FM recommendations regarding the retention and enhancement of streams, and implementation of riparian planting programmes and the creation of stormwater reserves to function as wetlands which are considered to enhance the life-supporting capacity of freshwater resources across the site in comparison to the existing environment (page 67)	Partly/Unclear	It wasn't very clear about current state of water bodies - I believe because Mahurangi is "good". It does reference the NPS-FM 2017 amendments. Plan change didn't identify any opportunities to enhance/improve freshwater systems - again I think this is because the Mahurangi status was classified as "good" at the time the SP and PC were published.	Yes	Methods to improve water quality as well as minimising and mitigating hydrological change are proposed (page 28 Attachment H SMP) One pillar for which the Mahurangi SMP is derived: fish passage improvements where obstructions are present (page 38 Attachment H SMP) Yes for this criteria but not specifically for areas identified as being degraded - I think for the Mahurangi it is good in general
8	Mana whenua values	Yes	The land and stream systems have been identified as being of significant cultural importance to mana whenua. Over time, many of the waterways have been modified to suit the various uses and activities in the area. 5.1.1 Mana whenua provisions - this section outlines specific provisions included in the PPC relating to mana whenua stormwater management, stream and wetland management, indigenous vegetation enhancement and restrictions on the use of high contaminant yielding materials. (page 26)	Yes	CIA provided by Te Kawerau A Maki states there are values for mana whenua associated with the Mahurangi River and the various tributaries which feed into the awa (page 13 of appendix 7.1) Ngati Manuhiri outline their concerns with the plan change as it relates to water. Particularly degradation or destruction of the mauri of natural waterbodies. (list of concerns outlined page 22 of Appendix 7.2) Page 48 of the s32 report states that these matters have been considered and addressed in the SP and PC process, particularly with respect to the development layout and zoning pattern, the methods for ensuring that the intrinsic values of the Mahurangi river and its tributaries are respected and ensuring that significant areas of native vegetation within the PC area are maintained and enhanced to the greatest extent practicable.	Yes	The plan change is consistent with the relevant Te Aranga principles (as explained in paragraph 5.3) and highlights the cultural focus of this plan change (page 78)
9	Contaminants	Unclear/Partly	The integrated SMP approach emphasises a water sensitive design that manages the impact of land use change from rural to urban, protects and enhances stream	Yes	5.4.1 (page 43) High Contaminant Generating Car Parks and High Use Roads - stormwater quality treatment is proposed on high contaminant generating car parks and high use roads in	Yes	The stormwater catchment management plan sets out a treatment train process for stormwater to ensure that discharge of contaminants are appropriately controlled. (Attachment H - prepared by Maven) Stormwater quality treatment is required for certain

			Plan Change 61 (Private) : Waipupuke		Plan Change 25: Warkworth North		Plan change 40 Clayden Road - Warkworth
			systems and mitigates for changes and manages flooding effects in a manner that aims to eliminate and minimise the generation and discharge of contaminants/sediments into the sensitive receiving environment. (page 56) Does not specify car parks and high use roads		accordance with GD001 Discusses stormwater run off management in the SMP (section 9 and 10 of s32 report) Page 42 Table 11 - Indicative Stormwater Management lists high use road and quality treatment measures also retention and detention		land uses as set out in Chapter E9 (high contaminant generating car parks and high use roads) page 126 of s32 report sets out consideration of treatments
10	Sensitive receiving environments	Yes	See above	Partly/ Unclear	9.7.2.2 Stormwater Management - Flow applies the SMAF 1 controls to the PC area to mitigate the risk of scour and erosion on the receiving waterways and streams.	Yes	See note above - water sensitive design parameters incorporated into the design for future development of the plan change area (page 126)
11	Hydrology	Yes	The SMAF 1 overlay results in the requirement to comply with the hydrology mitigation measures set out in the activity tables in the PPC. Further, the rules proposed within the PPC establish a rule framework that supports SMP satisfying the requirements of the NDC (page 38)	Yes	Relies on SMAF 1 and the proposed hydrologic mitigation and stormwater quality treatment is in accordance with E9 and E10 of the AUP (page 42)	Yes	SMP identifies known flooding issues downstream of the site, and as a result, stormwater attenuation will be required to restrict post-development runoff flow rates to pre-development levels in accordance with SMAF controls of the AUP. This requires hydrology mitigation in the form of retention and detention. Maven (specialists) confirms that "in our opinion, urbanisation of the site can occur without creating any downstream flooding effects, subject to the maintenance of the pre-development runoff levels". All future building platforms will be located outside the 100-year ARI modified floodplain. (page 125)
12	Water temperature	No		No		No	
13	Litter	Yes	SMP outlines that the proposed SMP approach adopted includes water quality treatment to treat runoff for all contaminant generating impervious surfaces to 80% TSS removal and target sediment, metals and gross pollutants. (page 139) One Mana whenua agreed outcome includes requirement for stormwater cess-pit litter traps to ensure above minimum requirements are met. (page 116)	No		No	
14	Efficient use	Unclear/ Partly	9.1.2 Assessment of the Objectives Against Part 2 - Objectives 7 and 9 - The proposal will also be subject to an approved SMP which will manage stormwater within the site and seek retention/detention to enable on site storage and re-use as appropriate.	Yes		No	

Table 5 Plan changes outside the structure plan areas – PC 6, PC 12, PC 42

			Plan Change 6 Auranga B1 Drury West		PC12 Hobsonville Corridor Precinct		PC 42 Auckland Regional Landfill - Wayby Valley
			14-Feb-20		27-Sep-19		26-Mar-20
			Private, operative		Council, operative		Private, proposed / declined
1	Infrastructure	Partly/ Unclear	Precinct objective includes the staging of subdivision and development with infrastructure required to service the precinct, including waste, storm and water supply services (page 2)	NA	Not applicable to this plan change. Existing business zoning.	NA	Not applicable to this plan change.
2	Catchment management plan	Yes	On-site stormwater management, riparian planting and adverse effects on natural resources are considered. A stormwater management plan was attachment 7 to the notified plan change. SMP summary notes that the preferred approaches match those of the Drury 1 precinct. This is reflected in the plan change making little change to the stormwater provisions of the existing precinct.	NA	Not applicable to this plan change. Existing business zoning.	NA	Not applicable to this plan change.
3	Stream loss	Partly/ unclear	Shows permanent and intermittent streams in Precinct Plan 1 and 2, but does not contain explicit provisions that recognise these. Although precinct rules do not disturb the streams either. Policy 14 specifies that offset compensation for stream works should be directed to the Drury Creek Islands Recreation Reserve.	Partly/ unclear	Objectives and policies refer to enhancing riparian margins and instream ecology. Relying on Auckland-wide provisions regarding stream loss.	Partly/ unclear	Plan change request page 36 - Stream reclamation is an almost inevitable consequence of developing a landfill in the Auckland Region. Proposed policy 5 requires that adverse effects be avoided, remedied or mitigated generally and provides for the use of offsetting or compensation to manage significant residual adverse effects ... but in recognition of other RPS objectives and policies relating to infrastructure, do not require full compensation or offsetting. Objective 4 limits offsets to 'the extent reasonably practicable, and as offered by the applicant'. Reclamation of streams and wetlands is D unless in SEA or NSMA overlay (would be NC under E3). More than 200m² of encroachment into a Natural Stream Management Area is a non-complying activity. Stream reclamation activity status opposed by council's ecologist and planner in the hearing report (page 98). Some proposed wetlands activity status no longer possible under NES-F.
4	Riparian margin	Yes	Precinct yards (5.3.1) include 10m riparian yards. 6.6 Riparian margins must be planted either side to a minimum of 10m from bank of stream. (In existing precinct, not plan change)	Partly/ unclear	Strong objectives and policies on riparian margins but there is no yard standard or vegetation controls.	Partly/ unclear	Underlying Auckland-wide and zone controls apply.
5	Enhancement	Partly/ unclear	Objective 3 'ecology is maintained and enhanced through riparian margin replanting at the time of	Yes	There is a new objective relating to enhancing Rawiri Stream. The RD assessment criteria refer to enhancing	No	No apparent stream enhancement works proposed.

			Plan Change 6 Auranga B1 Drury West		PC12 Hobsonville Corridor Precinct		PC 42 Auckland Regional Landfill - Wayby Valley
			development, set backs and development'. The precinct already had a policy (9) requiring riparian planting - not amended by plan change. Standards require 10m of riparian planting along streams. No other restoration or works promoted.		riparian margins through setbacks and replanting. The information requirements require a planting plan.		
6	Overlays	Partly/ unclear	These matters are not specifically raised in the content of the PC. Although it is a precinct plan, and overlay rules will apply as well	Partly/unclear	Not mentioned in plan change provisions. There is a High Use Aquifer Management Area Overlay under the area. The plan change amends the precinct and notes that the relevant provisions for the overlays apply in the precinct.	Yes	Private plan change request (page 8). Sub-precinct A for placement of waste does not include any SEA or Natural Stream Management Area overlay. Some stream works in sub-precinct B NSMA for access as Discretionary.
7	Degraded areas	Partly/ unclear	PC does not identify freshwater systems that are degraded, neither does it explicitly seek to improve them. The SMP identifies that the existing streams are degraded from past farming access, lack of riparian vegetation and stock access (page 22).	No	Not mentioned in the plan change provisions. Have not checked the s32 report.	NA	Not relevant to this plan change.
8	Mana whenua values	Partly/ unclear	Mana whenua consultation and desired outcomes are listed in the stormwater management plan. Not explicitly provided for in the plan change.	No	Not mentioned in the plan change provisions. Have not checked the s32 report.	Partly/ unclear	Plan change request (page 12) notes the Hoteo River as a significant cultural taonga for mana whenua and subject to statutory acknowledgement. Page 15 notes the iwi groups with mana whenua interests in the area. Ngati Manuhiri prepared a cultural values assessment. Policies 2 and 3 include consideration of mana whenua values. Several iwi have submitted in opposition.
9	Contaminants	Partly/ Unclear	The on-site and road stormwater management requirements relate to retention and detention, not water quality treatment. The road provision requires treatment for catchments draining to the coast but not streams.	Yes	Policy 24 amendment requiring stormwater treatment at source. New regional plan provisions relating to impervious areas require at-source quality treatment of stormwater runoff (and replace E9 stormwater quality high contaminant generating carparks and high use roads). RD or D consent needed if standards not met. Standards require use of inert building materials that do not have exposed surface made of contaminants of concern (i.e. zinc, copper lead) and use treatment devices in accordance with TP10 design manual for stormwater treatment devices. Apply to all impervious areas, not just high contaminant generating areas over a size limit.	Partly/ unclear	Policies and matters of discretion relate to landfill management using BPO for stormwater treatment and discharge and use of best practice lining system to minimise contamination. The Auckland-wide provisions for stormwater and earthworks apply.
10	Sensitive receiving environments	Partly/ Unclear	Not mentioned in plan change. Noted in SMP. The treatment requirement for coastal catchments	Yes	See above.	Partly/ unclear	See above.

			Plan Change 6 Auranga B1 Drury West		PC12 Hobsonville Corridor Precinct		PC 42 Auckland Regional Landfill - Wayby Valley
			must be related to the receiving environment.				
11	Hydrology	Yes	Development controls 3.1 (in standards) On-site stormwater management for dwellings and impervious areas (excluding roads) . Mitigate effects of impervious surfaces through stormwater devices and hydrology mitigation rules. Already applies in the precinct. the plan change extends the area of the precinct so these provisions apply to the new area. 6.7 Stormwater management - runoff from impervious surfaces within roads of 50m2 must be directed to a stormwater device to achieve hydrology mitigation. Roads in catchments draining to the coast must have water quality treatment.	Yes	New requirements to use treatment devices in accordance with TP10 design manual would address hydrology as well as contaminants.	NA	
12	Water temperature	Partly/ unclear	Riparian planting will help but it is not specifically mentioned for this purpose.	Partly/ unclear	Not mentioned but would be addressed in part by the stricter requirement for treatment devices. Retention can allow water to lower temperature before it is discharged.	NA	
13	Litter	Partly/ unclear	Focus is on landscaping and management of stormwater run off. Any other benefits are incidental	Partly/ unclear	Not mentioned but would be addressed in part by the stricter requirement for treatment devices and the need to follow TP10.	No	Not mentioned other than in Appendix E (assessment of precinct provisions against AUP) listing E1.3(8) and E1.3(9) which refer to gross stormwater pollutants. The assessment states that the policy is addressed by the proposed objective 3 which is that the landfill is designed and operated so that the adverse effects of discharges ... are avoided, remedied or mitigated.
14	Efficient use	Partly/ unclear	Stormwater management provisions include consideration of whether rain tank water can be used.	No	Possibly not relevant to this plan change.	NA	

Table 6 Plan changes outside the structure plan areas – PC 43, PC 55

			PC 43 McLaughlin's Quarry		**PC 55 Patumahoe South**
			9-Jul-21		**22-Oct-20**
			Private, decisions		Private, proposed
1	Infrastructure	NA	Not applicable to this plan change.	Partly/ unclear	Policy (6) requires that all lots in the new sub-precinct are connected efficiently to the existing public sewerage and water supply networks. New standard (I430.6.14) requires that before subdivision certificates or building consents are issued a stormwater management pond is constructed and stormwater management system is implemented in accordance with stormwater network consent. The private plan change request notes that the subject land is currently serviced by public stormwater, wastewater and water supply networks. It is proposed to extend the networks and install new infrastructure to service the plan change area (page 17). Watercare have submitted in opposition due to network capacity issues.
2	Catchment management plan	Yes	A stormwater management plan, hydrological assessment and updated ecological assessment were produced in response to a request from council.	Yes	In the material prepared for the private plan change. SMP has a biodiversity section which notes the farm drainage channels have little ecological value (p14). Growth offers opportunity for improving riparian and aquatic habitat. The plan change includes requirements for a stormwater pond as is recommended in the SMP.
3	Stream loss	Partly/ unclear	Plan change as notified allowed for reclamation of one intermittent stream as a PA. Applicant proposed to delete Policy 8 which enabled reclamation, and delete the corresponding Permitted Activity rule, and made reclamation a Discretionary Activity to be consistent with the NPS-FM (page 5). Council officers considered the AUP provisions should apply (page 24). PC included Note 1 stating that no offset would be required for the reclamation as this is deemed to be part of the revegetation of the Riparian Margin Areas and Wetland Margin Areas shown in Precinct Plan 1. Commissioners agreed with applicant that to require offsets would be 'double counting' for the effects of reclaiming the stream because the package of measures proposed by PC 43 represents an appropriate outcome for the site (para 110). Under council's methodology for calculating offsets, 82m of riparian planting would be required. PC 43 provides for over 400m of planting – more than 10 times more than would be required to offset the loss of the intermittent stream (para 112).	Yes	Existing hydrological features are farm and road drainage channels that have been previously engineered.
4	Riparian margin	Yes	The stream and wetland are zoned Open Space - Informal Recreation. Riparian margin is 10m from stream and 20m from wetland (see planting requirements below).	Partly/ unclear	Relies on the underlying zoning for any riparian yard s or planting requirements.
5	Enhancement	Yes	There are positive ecological outcomes as PC 43 offers the opportunity to protect the wetland from further degradation and to enhance its ecological value by removing grass and weeds, replanting with native vegetation and establishing large planted buffer areas. Precinct policies: (2) Require planting of native vegetation along the riparian margins of Puhinui Creek. (3) Require planting of appropriate vegetation within the wetland margin areas (of SEA_T_8443) having regard to the wetland's hydrological and ecological functions, and the status of the wetland as an Outstanding Natural Feature. Standard I4.6.5. Planting of Riparian margin areas and I4.6.6. Planting of Wetland margin areas - As part of the first stage of development within sub-precinct B, areas identified as Riparian Margin Areas in Precinct Plan 1 must be planted	Partly/ unclear	A new wetland will be created as part of the stormwater treatment.

			PC 43 McLaughlin's Quarry		PC 55 Patumahoe South
6	Overlays	Yes	High-Use Stream Management Areas Overlay and High-Use Aquifer Management Areas Overlay are retained. Boundaries of the ONF and SEA are amended.	Partly/ unclear	The SMP notes the Mauku Stream is in the High Use Stream Management Area overlay. The stormwater management design aims to water levels are maintained in the stream. The site is also over three High Use Aquifer Management Areas Overlays and a Quality Sensitive Aquifer Management Area Overlay. These are not mentioned. The Quality sensitive aquifer is at risk of contamination from stormwater or sewage so could be relevant to the proposed change in land use.
7	Degraded areas	No	Not specifically addressed in plan change.	No	Not mentioned.
8	Mana whenua values	Yes	Policy (9) Recognise, protect and enhance the cultural, spiritual and historical values and relationships associated with the Māori cultural landscape at Wiri. These values include but are not limited to: a) Important sites, places and areas, waahi tapu and other taonga. b) Views and connections between Maunga Matukutūrei, Puhinui Stream and Manukau Harbour. c) Coastal edge and waterways. d) Freshwater quality. e) Mauri, particularly in relation to freshwater and coastal resources. (10) Encourage the provision and enhancement of access for Mana Whenua to Puhinui Creek and its margins, particularly access to scheduled sites or features for the purposes of Karakia, monitoring, customary purposes and ahi kaa roa.	Yes	Ngati Tamaoho and Ngati Te Ata prepared cultural assessments that support the plan change with support for the proposed stormwater detention and treatment systems.
9	Contaminants	Yes	A standard requires stormwater treatment of impermeable surfaces in Sub Precinct B. I4.6.8. Stormwater treatment devices (1) Stormwater runoff from all impervious areas in sub-precinct B must be treated by stormwater management device(s) that meets the following standards: (a) the device or system must be sized and designed in accordance with "Guidance Document 2017/001 Stormwater Devices in the Auckland Region (GD01)"	Yes	The proposed stormwater wetland and pond will remove contaminants from runoff. Devices will be designed in accordance with council guidelines. High contaminant generating areas not mentioned but may not be relevant to the site.
10	Sensitive receiving environments	Partly/ unclear	The purpose of the impervious area standard notes that it is to ensure that the effects of stormwater runoff on the high value receiving environments are mitigated.	Yes	See above. No mention of sensitive receiving environments.
11	Hydrology	Partly/ unclear	The standard requiring that all runoff be treated partly addresses the changes to hydrology.	Yes	Stormwater pond and wetland includes a detention reservoir and attenuate flows. Standard I430.6.5 requires that all stormwater from impervious area be mitigated to achieve flow attenuation by soakage pits or rain tanks.
12	Water temperature	Partly/ unclear	The standard requiring that all runoff be treated partly addresses the changes to water temperature. It is not mentioned specifically.	Partly/ unclear	Not mentioned but the wetland system will help with this.
13	Litter	Partly/ unclear	Not mentioned but partly addressed by requiring all runoff to be treated.	Partly/ unclear	SMP notes that maintenance of the wetland will be required and should include routine removal of rubbish.
14	Efficient use	No	Not mentioned.	Yes	Policy (7) requires the use of water harvesting (roof collection tanks) in the precinct to promote water conservation and efficiency.

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