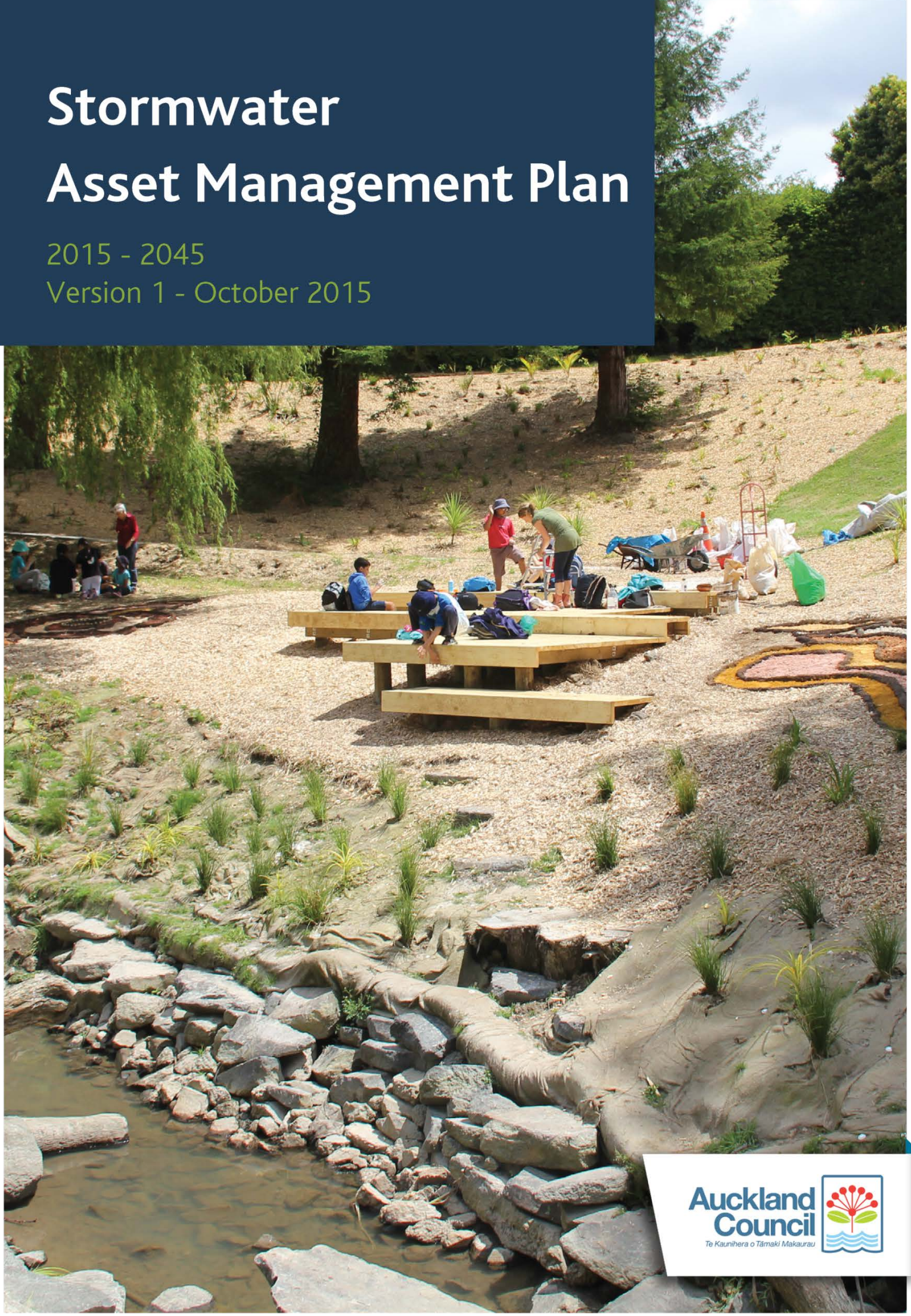
Stormwater Asset Management Plan

2015 - 2045

Version 1 - October 2015



Auckland Council

Te Kaunihera o Tāmaki Makaurau

1.5 **million people** living in the Auckland region

20,000 **kms of streams** in the Auckland region

1.24 **metres** average rainfall in a year

6,000 **kms of pipelines** in the Stormwater network

145,000 **manholes**

$4 **billion** is the current value of the Stormwater assets

Table of Contents

Foreword

Stormwater is an integral part of the three waters (water supply, stormwater and wastewater) that Auckland Council directly and indirectly influences.

For many householders stormwater is largely invisible. In their day-to-day lives people see parks, community facilities and use roads and footpaths but stormwater and stormwater assets are often simply not a part of people's consciousness. Yet stormwater can be a contaminant of streams and harbours - the life blood of Auckland - and can cause much distress in times of flooding. It is arguably the most complex of the waters to manage as there are multiple contributors to its water quality, its volumes and its speed.

As the effects of climate change and global warming intensify, with the accompanying sea level rise and extreme weather events, the management of stormwater is coming more sharply into focus. In addition, the way stormwater is managed is changing – a transformational shift from relying solely on hard engineering solutions (e.g. pipes and culverts) to a greener infrastructure, utilising innovative water sensitive design to achieve optimal environmental social and economic outcomes for Auckland.

This Asset Management Plan 2015-2045, marks a major milestone for the Stormwater Unit setting out the proposed investment on improving customer and environmental levels of service, supporting growth of the city and ensuring the fabric of the stormwater system is maintained in a manner that aligns with the council's vision of *creating the world's most liveable city.*

It focusses on the management of Auckland stormwater assets both natural and built:

- within the challenges of climate change and global warming
- with a significant shift to water sensitive design of stormwater infrastructure
- prioritising the opportunities to develop innovative solutions in growth areas
- starting to reflect an integrated approach to the management of water supply, stormwater and wastewater.
- recognising the need for collaboration with multiple stakeholders
- with a strong commitment to community engagement and education

Craig McIlroy
Manager Stormwater

Executive Summary

Scope

Under the 2010 amendment to the Local Government Act 2002, Auckland Council is responsible for the following two activities:

- Stormwater Management
- Flood Protection and Control

Stormwater management refers to a system that collects and conveys rainwater runoff from private property, public reserves and roads.

Flood protection and control works are physical structures that are owned by local authorities and are designed to protect urban and rural areas from flooding from rivers, and includes ancillary works such as channel realignment or gravel removal.

The Stormwater Unit within the Infrastructure and Environmental Services Department is responsible for the delivery of Auckland Council's stormwater management functions. This includes operating and maintaining an extensive network of built and natural stormwater infrastructure; the planning, design, construction and management of new stormwater networks; the investigation of Auckland's freshwater catchments and receiving waters to better understand and manage flood risk and the effects of stormwater on streams, groundwater and coastal waters in a city that is growing rapidly.

The Stormwater and Civil Defence Units are responsible for many aspects of flood protection and control including dam safety and management in rural areas, coastal inundation, coastal structures and stop bank protection.

This Asset Management Plan includes all aspects of stormwater management across the Auckland region and each section is split, as required into the relevant parts of stormwater management and flood protection and control. Managing stormwater in the Auckland region is complex, closely connected with growth and land use, and freshwater management, and requires integrated infrastructure provision. The Stormwater Unit plays a vital role across both the whole of Auckland Council (including Council Controlled Organisations (CCO)) and externally with the many parties that have ownership and other interests in stormwater management, to ensure that good stormwater outcomes are achieved. The Stormwater Unit is committed to delivering on these complex functions using best practice asset management to efficiently and prudently ensure our public receives the best value for money possible.

Our vision is long term and will take time to achieve. Given the scope and complexity of work and the demand on Council expenditure, prioritisation is essential. Given the exciting opportunities to demonstrate innovative stormwater practice with new growth in Auckland our priorities (in order of priority) are:

1. **Asset operation/renewals:** effective operation, maintenance and renewal of the assets we already have to ensure optimum performance
2. **Growth:** supporting and servicing the Auckland Plan's growth strategy demonstrating innovation and best practice
3. **Flooding:** progressively reducing existing flood risk across the region; and
4. **Environmental Improvement:** reducing existing negative effects on the environment, particularly streams and coastal areas.

This Asset Management Plan has been developed in conjunction with the 2015 Council Long Term Plan and the Auckland Plan. In this way, we consistently align our work to assist in achieving the vision for Auckland.

Key issues

Servicing growth
Some level of certainty around the location, size and timing of development is required because of the cost and complexity of infrastructure and land purchases for treatment facilities. The Stormwater Unit needs clear direction from the council and planning needs to be carried out in conjunction with other Council departments and CCOs to ensure that investment and strategies are aligned.

Linkages with Auckland Transport, Parks and Watercare
Stormwater management is closely linked to Auckland Transport's (AT) activities and assets followed by Watercare (WSL) and Parks. AT's assets include the roads and associated drainage which both carry stormwater and feed to the stormwater system. In addition the roads are one of the highest sources of stormwater contaminants. Many of our treatment and detention facilities and overland flow paths are in shared open spaces. Our main linkages with WSL is through our combined systems, which accounts for approximately less than 10% of the former Auckland City area, and WSL's controlled overflows into the stormwater system.

A common regional stormwater approach and closer linkages are crucial to ensure better management of stormwater and its effects on the receiving environment.

Capital constraints
The Stormwater Unit's expenditure is constrained by a tight funding envelope because of the Mayor's proposal to cap rates at an affordable level. Prudence and prioritisation of operational and capital works in line with risks will be required to deliver the promised Auckland Plan outcomes. Resilience through education and perception management will be promoted as part of the expenditure control suite of measures because not all issues will be fixed.

Sustainability
Sustainability means that the decisions and actions of an entity effectively balance the needs of present and future communities. Moving towards a water sensitive community is important to not only to improving the environmental effects from stormwater discharges but also for the fiscal outcome for Auckland ratepayers. Treatment at source rather than at the end of the pipe means

that more devices can be privately owned and maintained by the actual polluter thus reducing the operational and renewal costs to the council. Effective monitoring, enforcement and education will be required to ensure that private devices and infrastructure are maintained.

Asset information
Accurate and comprehensive asset condition data is critical to the development of robust renewal programmes. Currently the use of seven different legacy databases with varying asset information reliability makes it difficult to extricate and analyse data consistently. Planning for growth and overall efficient business is impacted by the lack of accurate information in one transparent repository. To overcome this, the Stormwater Unit is working on a common SAP database and updating the asset register.

Managing performance

The council recognises that there is a wide range of customers and stakeholders with an interest in how stormwater is managed; the resident community, specific interest groups within the community and regulators are just some of these stakeholders. The LTP process is the primary mechanism for determining and agreeing levels of service and costs with the community and stakeholders.

The proposed levels of service for stormwater management are outlined in section 3.1 of this AMP and key performance measures summarised in Table ES1.

Objective	Service Level Statements	Key Performance Measures and Targets (2015/16)
Safe Communities	Manage the stormwater network and flood protection schemes to minimise the risks of flooding to Aucklanders	• The number of flooding events and the associated number of habitable floors affected per 1000 properties (less than 1 in 1,000 properties in Auckland per annum) • The median response time to attend a flooding event, measured from the time that Auckland Council receives notification to the time that service personnel reach the site. (Less than 2 hours) • Stormwater manholes that pop open in flood events are made safe within 2 hours. (100%) • The number of complaints received about the performance of the stormwater network per 1000 properties connected to Auckland Council's stormwater network. (Less than 3 per 1,000)
Supporting Growth	Develop the stormwater network in a cost effective manner to enable growth in accordance with Auckland Councils growth priorities.	• The annual Capital works programme to enable growth is delivered (95% of the planned Capital Works Programme is delivered each year)

Objective	Service Level Statements	Key Performance Measures and Targets (2014/15)
Healthy Waterways	Enhance and protect the stormwater receiving environments for the people of Auckland through sustainable management of the stormwater network.	• Auckland Council Stormwater compliance with resource consents for discharge from its stormwater system, measured by the number of abatement notices, infringement notices, enforcement orders and successful prosecutions received in relation those resource consents. (0 for all) • The ratio of the length of watercourse consented to be physically improved versus physically degraded in each year (3 or more).

Table ES1: Levels of Service Statement for Stormwater

Managing growth and demand

Managing stormwater in the Auckland region is a complex process which is shared amongst different departments within council and other agencies. It involves integrated planning, regulatory measures and educational initiatives along with management of public and privately owned assets and natural systems.

The key strategy to managing growth and demand and ensuring we meet the council's vision of Auckland being the world's most liveable city is by becoming a water sensitive community. This means a shift in the focus of stormwater management from removing or disposing of water as fast as possible via built infrastructure, to recognising the value of stormwater, its close relationship with natural freshwater systems, and how it can enhance the liveability of our cities.

The future demand on the stormwater network is mainly driven by the creation of imperviousness or paved areas. The growth and timeframe predictions used now are that recommended by the Auckland Regional Transport model to ensure that key transport objectives are delivered. The link between the increase in population to the creation of additional impervious or paved surfaces is when people form households which require new buildings and paved areas. However, this is not a linear linkage as it is dependent on whether the new dwellings go up, as in multi storey apartment blocks with supporting infrastructure ready in place, or spread out, as in other types of housing in undeveloped areas. Other factors which influence demand are rainfall intensity patterns (eg. climate change), building materials and human activities.

The Auckland Plan has outlined the principle of future development as a balance between greenfield and compact development. It is anticipated that the urban area will increase from the current 42% to 62% imperviousness in 2045. The maximum imperviousness was based on Proposed Auckland Unitary Plan (PAUP) rules and our assumptions.

The identification of growth priority areas for infrastructure planning and investment in the region has been informed by the Forward Land and Infrastructure Programme. In addition, the Government and the council entered into an accord targeted at increasing housing supply and improving housing affordability in Auckland to tackle a housing supply shortage. To date many Special Housing Areas (SHAs), associated dwellings and sections have been approved and we

have exceeded planned first year targets. Figure 3.6 in section 3 shows the growth priority areas and SHAs in the region.

Our assets

Auckland Council owns and manages most of the region's stormwater assets. A safe and efficient stormwater network is essential for protecting communities from flooding and protecting the environment. The stormwater system consists of built and natural assets, and pipes and culverts account for about 71% of the total value of stormwater assets. Figure ES1 at the end of this section shows the distribution of the reticulated network in the region.

The built public stormwater network of approximately $4 billion (as at 30 June 2015) includes:

- 6,000 km of pipelines (pipes and culverts)
- 145,000 manholes
- 377 km of lined and unlined channels (not including roadside drains)
- 6,700 catchpits
- 25,000 outlets and inlet structures
- Over 900 detention and treatment facilities

Natural assets which cover streams, overland flow paths and groundwater aquifers are an important part of the stormwater network. The role of overland flow paths is to convey excess flows when the reticulated system is overloaded; the major part of the peak flows in a storm event is conveyed via overland flow paths. Streams are part of the receiving environment but they also play an important role in the stormwater network. We have approximately 20,000 km of streams in the region.

Understanding asset condition is key to optimised renewal programmes and prudent asset management. The overall condition of the stormwater network is good which means there is no immediate cause for concern. The majority of our piped network has remaining lives between 80 to 110 years.

Financial information

The optimised capex baseline expenditure forecast shown in ES1 has been developed on the basis that renewals and growth are prioritised and level of service expenditure in flood control and environmental programmes is kept to a risk based minimum. Growth investment increases until 2027 and then gradually declines. After 2027 it has been assumed that investment in flood control and environmental programmes will increase as growth investment declines.

CAPEX Programme		2015/16	2016/17	2017/18	10 Year Total 15/16 to 24/25	30 Year Total 15/16 to 44/45
1	Catchment and asset planning	$11,181,084	$8,300,000	$8,300,000	$80,281,084	$230,281,084
2	Asset Renewal	$20,024,412	$26,504,000	$20,793,500	$208,068,503	$617,612,201
3	Growth	$16,659,998	$36,759,373	$34,840,615	$354,030,379	$927,015,735
4	Flood protection and control	$17,847,094	$2,600,000	$8,157,900	$90,918,494	$434,102,055
5	Environmental protection	$6,434,174	$2,209,000	$6,362,200	$29,157,851	$180,059,789
Total CAPEX Forecast		**$72,146,762**	**$76,372,373**	**$78,454,215**	**$762,456,311**	**$2,389,070,864**

Table ES2: Summary of capital expenditure forecasts

Major projects form a significant proportion of our capex expenditure for the next five years and the top five ones are listed in Table ES3.

Major Projects	Description	Driver	Indicative Cost	Anticipated Timetable
Artillery Tunnel	A 2.5m diameter, 1 kilometre long tunnel From McLennan Park to Pahurehure Inlet to service the Takanini Growth Areas.	Growth	$25 mil	2015-2017
Takanini Conveyance Cascades (Including Land Purchase)	A new open channel incorporating cascading weirs and associated green space to convey the 100year flood, to service the Takanini 2a and 2b Growth Areas.	Growth Level of Service	$39.7 mil	2015-2019
Ports Of Auckland Outfall	The design and installation of a 3.3m diameter stormwater pipe from the south side of Quay Street across Ports of Auckland to the Waitemata Harbour. To replace a pipeline in poor condition that has previously collapsed and remains in service with a temporary repair.	Critical Asset Renewals	$21 mil	2015-2019

Oakley Creek Conveyance	Upgrading culverts and widening of Oakley Creek through Walmsley Park to convey flood flows to enable intensification and redevelopment in the upper catchment.	Growth Level of Service	$28 mil	2015-2019
Freemans Bay Outfall	Frequent surface flooding occurs in Daldy Street, Fanshawe Street, parts of Victoria Street and Victoria Park. Two significant combined sewer overflows are also connected to the existing pipeline and the route needs to integrate with the second harbour crossing. A collaborative project with NZTA), AT and WSL to resolve flooding and contamination.	Level of Service Collaboration Projects	$19.5 mil	2017 -2020

Table ES3: Key infrastructure projects

The optimised opex expenditure forecast shown is ES4 assumes 2% year on year end efficiencies on maintenance activities. However, dominating the increasing trend is consequential opex due to new growth infrastructure; both vested and constructed by the stormwater unit.

OPEX Programme		2015/16	2016/17	2017/18	10 Year Total 15/16 to 24/25	30 Year Total 15/16 to 44/45
6	Management, Strategy and Resilience	$1,831,535	$1,573,535	$1,373,535	$14,393,350	$41,856,050
7	Operational Catchment and Asset Planning	$950,000	$950,000	$950,000	$9,487,500	$30,487,500
8	Stormwater Operational Planning	$550,000	$550,000	$550,000	$5,500,000	$18,500,000
9	SW Operations and Maintenance Delivery	$15,285,812	$15,740,315	$15,934,591	$165,944,814	$633,595,844
10	SW Septic tank management	$759,376	$762,672	$765,969	$7,919,471	$24,919,471
11	Maintenance AT assets	$4,167,749 -$4,167,749	$4,209,427 -$4,209,427	$4,251,521 -$4,251,521	$43,603,878 -$43,603,878	$144,974,705 -$144,974,705
12	Staff Costs Total Staff Costs CAPEX	$13,135,450 $8,266,569	$13,148,585 $8,274,836	$13,161,734 $8,283,110	$131,947,174 $83,038,679	$399,831,113 -$235,639,980
13	Rates	$17,335,730	$25,496,850	$25,685,718	$252,153,630	$913,557,997
14	Depreciation	$55,433,556	$56,072,976	$56,808,236	$588,785,478	$2,009,209,940
Total OPEX Forecast		**$97,014,890**	**$106,020,103**	**$106,946,681**	**$1,095,747,071**	**$3,746,959,414**

Table ES4: Summary of operational expenditure Forecasts

Improvement plan and monitoring

A key feature in the Stormwater Unit's asset management framework is to continue to improve asset management practices, processes and tools to deliver the most appropriate level of service commensurate with affordability and good industry practice. Continuous improvement is an essential part of effective asset management and to ensure that the improvements identified in this AMP are aligned with the principles and directives of the Auckland Plan.

In August 2012 and May 2013 the Stormwater Unit completed a gap analyses of its business practices which were then reviewed externally (detailed in section 6.5.3). An internal business systems review and a NZWWA National Performance Benchmarking were also carried out. The improvement programme was developed from these reviews and benchmarking, and summarised in section 8, Table 8.1.

The draft 2015 Stormwater Asset Management Plan was externally reviewed by PwC in September 2014 and by Morrison Low at various stages up to October 2014. A letter from Morrison Low is included in appendix E.

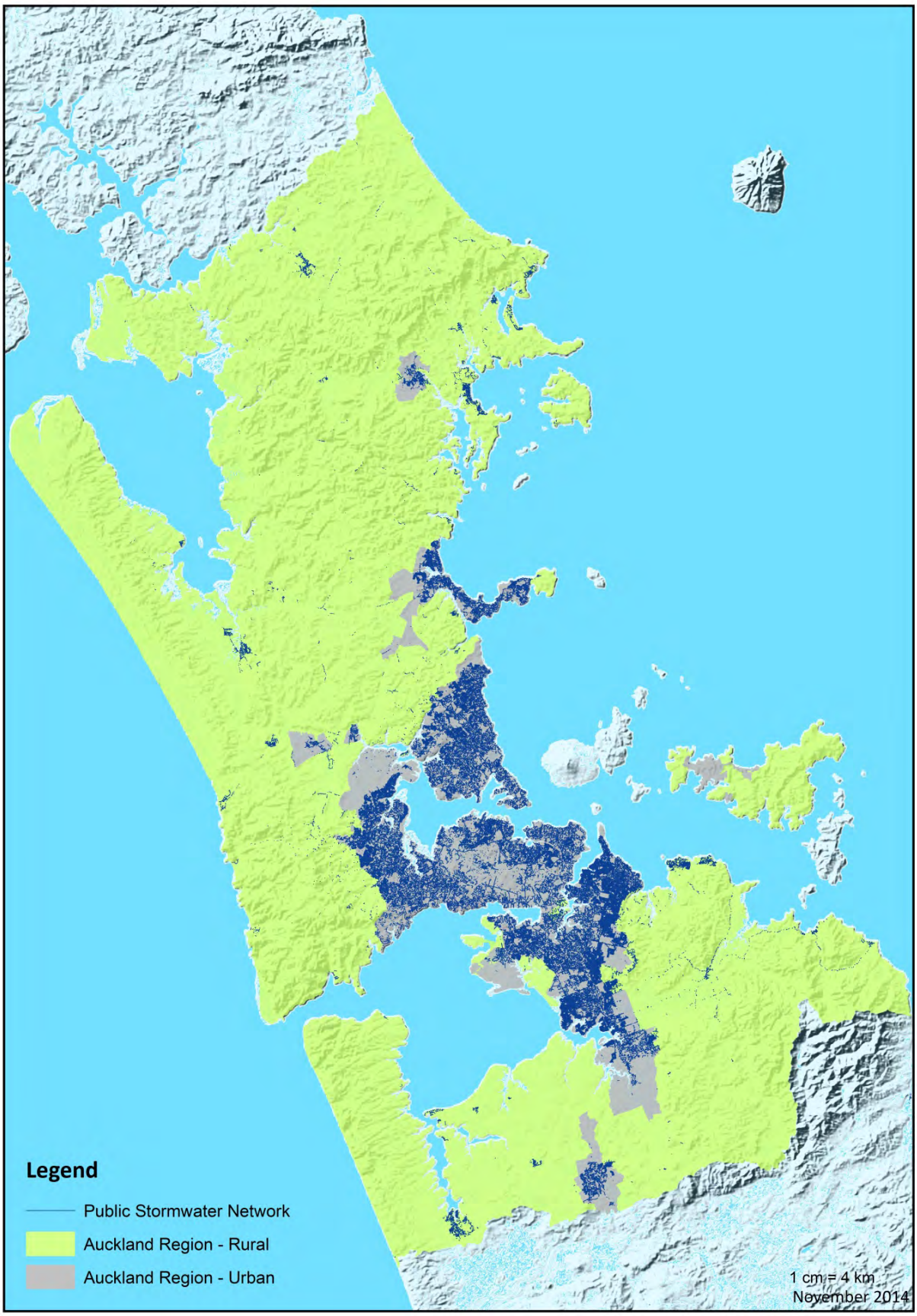


Figure ES1: Current extent of public stormwater reticulation within and outside the proposed Rural Urban Boundary (PAUP)
Source: Auckland Council, November 2014

1.0 Asset Management Approach

Our asset management approach is to provide clear direction for the management of Auckland Council controlled assets to ensure that the council is able to deal with changes to meet community needs, and to be in accordance with the Local Government Act (LGA) 2002 and amendments.

The approach refers to all fixed assets owned or managed by the council, regardless of their purpose or source of acquisition

In conjunction with the council's Long Term Plan (LTP) this approach provides specific asset management objectives to ensure the council's asset stewardship is met by:

- Managing assets through the development of Asset Management Plans in accordance with relevant legislation and recognised best practice for each major asset group.
- Through our 10 year LTP and financial model ensure that future funding needs are identified, affordable, agreed upon, and allocated, so that assets can meet their defined levels of service in consultation with the community.
- Ensuring that the impact of the council's decisions on both our existing assets and new assets is understood.
- Developing and reporting annually on established sustainability indicators relevant to asset management.
- Recording assets in accordance with the requirements of the appropriate accounting standards and financial reporting requirements.
- Maintaining a management information system with comprehensive knowledge of all physical assets.
- Creating asset management awareness throughout the council, supported at an organisational level.

1.1 Asset Management Compliance

A primary function of the council is to provide services to the community. Many of these services are supported and provided by infrastructure assets. The provision of assets maintained to meet community needs and expectations is fundamental to the economic, environmental, social and cultural vibrancy of the region.

The management of infrastructure assets is a key function of the council. The council's overall goal in managing infrastructure assets is to provide the required level of service in a sustainable manner for present and future consumers.

This Asset Management Plan addresses legislative requirements under the Schedule 10 of the LGA 2002 and amendments; and will be revised in accordance with any future changes to The Office of the Auditor General for Asset Management Plans, 2006 and the International Infrastructure Management Manual (IIMM) 2006 and 2011, published by New Zealand Asset Management Support (NAMS).

2.0 Introduction

2.1 Our purpose

The LGA 2002 and amendments requires all organisations which own and/or operate publicly owned infrastructure to prepare an asset management plan. The asset management plan secures on-going expenditure on essential services which help communities take a sustainable approach to promoting their social, economic, environmental and cultural well-being.

Under the 2010 amendment to the LGA 2002, the council's Stormwater Unit is responsible for the following two activities:

- Stormwater management
- Flood protection and control

The purpose of these activities is to minimise the nuisance of flooding, to protect people and property from the adverse effects of extreme storm events, to protect the environment and public health by reducing stormwater pollutants and managing stormwater volumes and flows that are discharged into the natural environment.

This Asset Management Plan identifies how stormwater drainage assets and flood protection and control will be managed in a manner which balances financial, environmental and social costs, opportunities and risks to deliver the desired levels of service to the community across the asset lifecycle. This includes the planning, creation, operation, maintenance, renewal or disposal of assets while contributing to the achievement of the council's strategic objectives.

2.2 The services we provide

Auckland is the home of one third of New Zealand's population; about 1.53 million people live in the region in 2014. It is also the fastest growing region in the country. The population is expected to reach between 1.9 million and 2.8 million people by 2051.

The Auckland region has a unique natural environment with volcanic cones, hundreds of kilometres of coastline and an extensive marine environment. It contains a wealth of beaches, harbours, estuaries, wetlands, lakes and streams that provide many benefits to the people of the region and beyond. Water is of special value to tangata whenua.

Waterways and their margins provide habitat for much native wildlife. There are a number of rivers within the region including the Whau, Mahurangi, Kaipara and Wairoa rivers as shown in Figure 2.1. The total length of streams in the Auckland region is estimated to be 20,000 km (Auckland Regional Council Technical Report 2009/028).

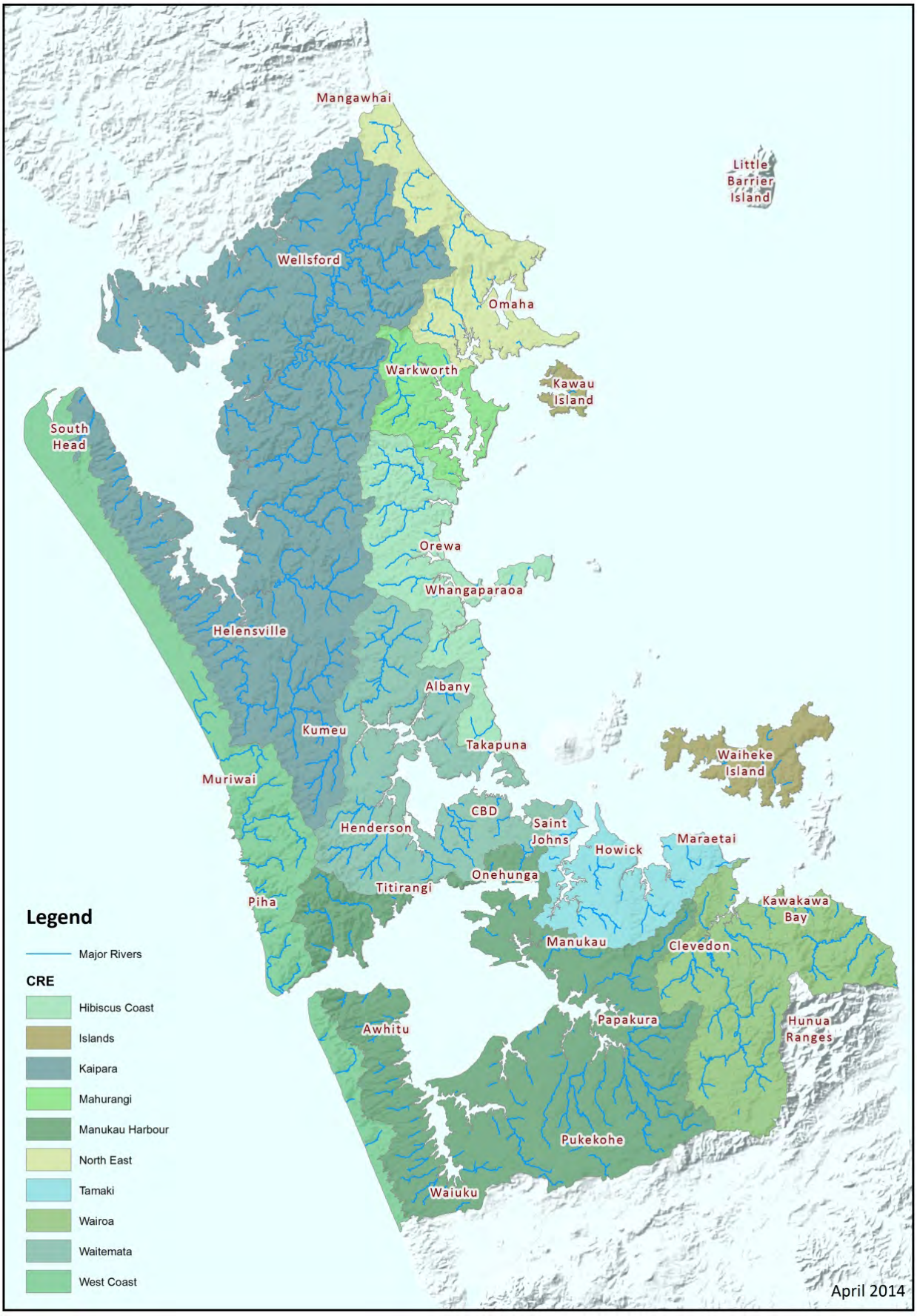


Figure 2.1 Auckland's Major streams and catchments

The region varies from the highly urbanised areas in Central Auckland, North Shore, Waitakere and Manukau to rural settings with townships as far north as Wellsford, south as far as Pukekohe, and includes the Hauraki Gulf Islands.

Stormwater runoff from urban and rural areas, properties and the regions 7,302 km of roads is captured through a mixture of public and private assets and conveyed by a stormwater system comprising a formal built network of pipes, channels, culverts and a natural network of ponds, wetlands, swales and overland flow paths. The resulting stormwater flows are managed and discharged into streams, harbours and groundwater aquifers. Figure 2.1 shows the regional consolidated receiving environment (CRE) catchments and major stream systems.

Some older parts of central Auckland area operate on a combined system where stormwater and wastewater are collected in one pipe. Parts of the central and southern Auckland isthmus area are volcanic rock and stormwater in this area is discharged to aquifers through soakage. In the Southern areas, peat soils are prevalent and controlled soakage or recharge to them is required to prevent significant settlement which would damage infrastructure.

The purpose of these activities is to minimise, as far as practicable, the nuisance of flooding, to protect people and property from the adverse effects of extreme storm events, to protect the environment and public health by reducing stormwater pollution and managing stormwater volumes and peak flows in streams, rivers and other receiving environments.

This is achieved by:

- providing best practice guidelines and standards
- managing the effects of stormwater through education and engagement of the community and industry capacity building
- achieving sustainability through proactive asset and catchment management planning
- carrying out effective operation and maintenance of the stormwater system
- undertaking maintenance of stormwater assets, such as catchpits and soakholes located in the road corridor and owned by AT
- building new assets and implementing non asset solutions
- identifying flood hazards across the region
- providing information and advice to ensure that stormwater and flood risk is adequately managed in new developments
- monitoring compliance to stormwater resource consents
- engaging in constructive dialogue with council departments, CCO and external agencies that are involved in stormwater management
- advising planning units to ensure fit for purpose stormwater provisions are considered and included in land use planning
- advising the regulatory departments on third party consent applications to meet stormwater objectives and requirements and minimise future unnecessary liabilities for the council

Stormwater management and flood protection and control are managed in more ways than simply building assets and utilising natural systems. Development control and integrated land use planning are key mechanisms for improving stormwater management. It is more effective to incorporate stormwater management principles into a development from the start than to retrofit

solutions after the development has taken place. Prevention of adverse stormwater effects is our highest priority for stormwater management planning.

2.3 Planning Context

2.3.1 Our contribution to Auckland Plan Outcomes

Community outcome	Healthy	Prosperous	Green	Connected	Loved	Creative	Māori identity
Group of activities							
Stormwater management			✓				✓
Flood protection and control			✓				

Table 2.1 Stormwater activities and Auckland Plan Outcomes

The seven Auckland Plan outcomes in Table 2.1 explain what the vision means in 2040. Our key contributions are to a Green Auckland and a Maori identity. The groups of activities within this theme are listed below showing how they contribute to delivering these outcomes.

Our stormwater network conveys, holds and treats rainfall runoff, reduces the hazards of minor flooding and is a core part of our infrastructure to support the growth of our city. This drives the following Auckland Plan Outcomes of:

- A green Auckland – By ensuring the effects of runoff to the environment are managed and our stormwater network is robust to cater for urban growth and changing environmental conditions
- Te hau o te whenua, te hau o te tangata – Enabling tangata whenua to participate in the co-management of natural resources

Flood Protection and Control safeguard our communities, economy and day-to-day lives from major flooding events and environmental changes particularly in coastal and low lying areas. This drives the following Auckland Plan Outcome of:

- A green Auckland – Through building resilience to natural hazards by protecting people, property and the environment. Mitigating risks associated with sea-level rise and climate change and adapting to changing environmental conditions.

The Auckland Plan targets which our activities contribute to include:

- Increase residential dwelling construction consents from 3,800 to at least 10,000 on average per annum from 2020
- Reduce the proportion of households which spend more than 30% of their income on housing costs from the average of 27% in 2011 to 29% in 2030
- Increase the number of reciprocal decision-making processes and arrangements which promote shared governance over matters of significance to iwi from 1 to 16 by 2040

- Increase the number of papakainga (form of housing development which occurs on multiple-owned Maori or ancestral land) in the Auckland region from 3 to 10 by 2040
- Reduce the overall yield of suspended sediment to priority marine receiving environments from 2012 levels by 15% by 2040
- Increase the proportion of residents who understand their risk from natural hazards and are undertaking measures to mitigate or reduce their risk from 2011 levels to 80% by 2040

2.3.2 Sustainability

Sustainable development means that the decisions and actions of an entity effectively balance the needs of present and future communities. A sustainable approach to business practices is about considering the interrelated components of environmental, economic, social and cultural well-being when making short and long term decisions.

From an asset management perspective, sustainability is critical, as many assets have a long lifespan and the asset itself, and any externalities, must be 'future-proofed' in order to meet the needs and expectations of future generations. This is particularly pertinent with the challenges of climate change and the need for prevention and adaptation approaches.
A set of seven principles were developed as part of the Auckland Plan. These seven principles reflect the strong commitment to generating a sustainable approach which will ensure the council's decision-making processes and actions to contribute to a successful and sustainable Auckland.

Following each of the principles (in italics) is an explanation of how the Stormwater Unit will give effect to each principle.

Work together

Work collaboratively on the priorities identified in the Auckland Plan. Recognise the interdependence of projects, programmes and initiatives

Stormwater management is a partnership. There are a number of stakeholders with an interest in the outcomes of stormwater management and more again with management functions that contribute to delivering those outcomes. We commit to working with other Council departments, Local Boards, CCO, central government, mana whenua, the community, developers and other key stakeholders to achieve better stormwater outcomes, integrated with other social, economic, cultural and environmental outcomes sought by the Auckland Plan.

We recognise that land use and development has the largest influence on achieving our stormwater outcomes and early involvement in land use planning and development is essential.

Value te Ao Maori

Acknowledge the special place of mana whenua and enable their participation in decision-making. Build lasting, reciprocal relationships with Auckland's Maori.

Water, and restoring the Mauri of water, is of high cultural and spiritual significance and interest to Maori.

We will work with council's Maori Strategy and Relations department (Te Waka Angamua) to engage appropriately with mana whenua regarding stormwater management priorities, directions, stormwater management plans and major projects. We will build our understanding of the relationship Maori have with the environment and how it relates to stormwater management. Our objectives include concepts of working with natural water systems, reducing impacts on the environment, and restoring significant values, which we believe align with related Maori values.

Be sustainable

Ensure that our short-term decisions enhance our long-term prospects, and build our resilience to changing local and global conditions that may impact on the economic, environmental, social and cultural well-being of Auckland.

We focus on preventing adverse effects through integrated land use and stormwater planning, water sensitive development, and ensuring good quality infrastructure. We think long term by ensuring that new stormwater networks incorporate provision for growth and climate change, and consider whole of life costs.

We target our efforts to address existing problems where they are most required, are cost effective and can make a difference.

Act fairly

Consider the needs of all groups in the community, to ensure that all Aucklanders can participate equally

We have prioritised our planning and investment across the region, taking into account environmental, social, cultural and economic values.
We will consult with key stakeholders and the community to help set the direction of our major resource consent applications and catchment plans and provide input into policies and key projects.
As a large purchaser of professional and contractor services and infrastructure we will follow Council policies and requirements to ensure fair procurement and contract management.

Make the best use of every dollar spent

Act prudently and commit to projects and initiatives that achieve the best value result without compromising quality, or stifling creativity and innovation. Focus on achieving long-term benefits and intergenerational equity.

We will work with other stakeholders, run an efficient business and prioritise our investment to achieve the best stormwater management outcomes possible in the most cost effective way.

Be affordable

Make Auckland both a quality and affordable place, including housing, transport and other costs of living, and doing business, so that people have the choice to live, work and invest here.

The Unit will deliver the best services possible, ensuring we take into account future as well as current affordability of our decisions.

Check progress and adapt to improve

Monitor and evaluate every initiative to ensure we move in the right direction. Adapt to continually improve the way we are working to achieve Auckland's vision.

We expect continuous improvement and will monitor our performance against identified targets and measures and wider Council outcomes. We are establishing a planning framework which will focus our activities, programmes and reporting to achieve our objectives.

Figure 2.2 Auckland Plan Principles

2.3.3 Climate Change

The Auckland region has a temperate climate with rainfall occurring in all months. Rainfall is not distributed evenly throughout the year, with mean annual rainfall varying between 1,200 to 1,600 millimetres as illustrated in Figure 2.2.

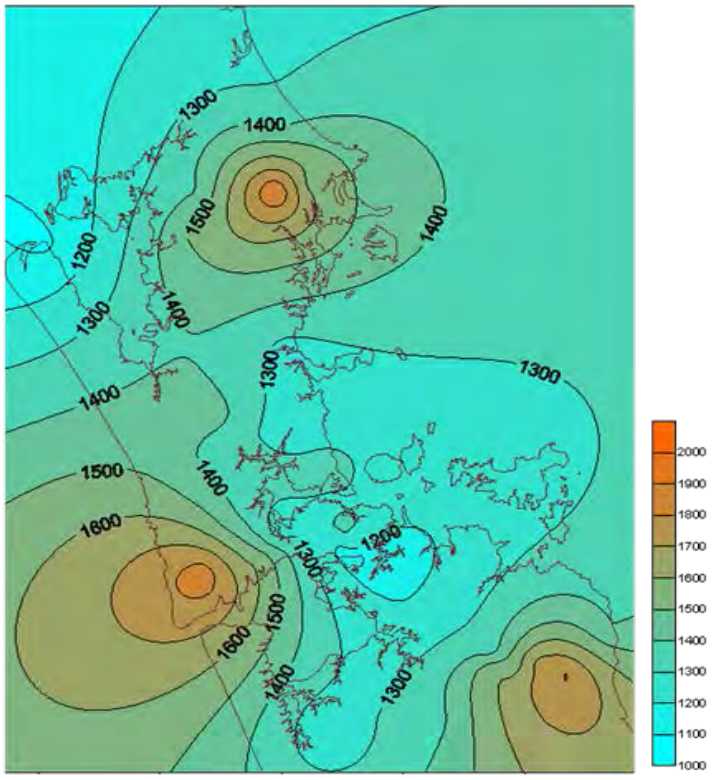


Figure 2.3 Mean annual rainfall
Source: Auckland Council May 2011

Rainfall is monitored through a network of rainfall gauges throughout the region. There are 94 auto- intensity gauges and 14 manual gauges. Most gauges have 10 to 20 years of records. The rainfall data is captured and transferred for storage, data management/analysis and quality assurance purposes.

The rainfall data is incorporated into TP108, the current guide for estimating rainfall and runoff for stormwater design for the Auckland region.

Based on current knowledge, and under moderate projections, it is likely that over the next century Auckland could experience (Auckland Plan, March 2012):

- hotter average temperatures increasing between: 0.2°C and 2.5°C by 2040, and 0.6°C and 5.8°C by 2090.
- an additional 40 to 60 days per year where maximum temperatures exceed 25°C, and more evaporation
- lower average annual rainfall patterns (decreasing between -1% and -3% by 2040, to -3% and -5% by 2090)
- more drought conditions: By 2080, drought with a severity that is currently only encountered on average every 20 years, could occur as often as every 5 years
- more extreme weather events with more frequent heavy rainfall events and more frequent westerly winds
- a rise in sea level of 0.18-0.59m between 1990 and 2100 and higher storm surge and waves. A recent study for Auckland suggests a range of possible sea-level rise of 0.5-1.5m by 2100

Guidelines issued by the Ministry of Environment (MfE) in 2009 set out baseline sea-level rise recommendations for local government to guide a risk assessment process the Ministry's guidelines state:

> 'We recommend that for planning and decision timeframes out to 2099:
> 1. a base value sea-level rise of 0.5m relative to the 1980-1999 average be used, along with
> 2. an assessment of potential consequences from a range of possible sea-level rise values. At the very least, all assessments should consider the consequences of a mean sea-level rise of at least 0.8m relative to the 1980-1999 average.'

Chapter 8 of the Auckland Plan identified three priorities and a number of supporting directives, which represent Auckland's Response to Climate Change:

Priority 1 - Mitigate climate change

Target set to achieve a 40% reduction in greenhouse gases by 2040 (based on 1990 levels).

Directive 8.1: Progress towards the Auckland Plan's emission reduction target and take a coordinated approach to transitioning, through green growth, to a sustainable Auckland.

Directive 8.2: Protect, enhance and increase Auckland's green infrastructure networks.

Priority 2 - Improve energy efficiency, security and resilience

Directive 8.3: Improve energy efficiency and conservation in both supply and use.

Directive 8.4: Increase energy resilience by diversifying the location, type and scale of energy sources and fostering greater use of renewable energy resources available in the region.

Priority 3 - Adapt to a changing climate

Directive 8.5: Identify the opportunities and risks associated with climate change. Increase the resilience of Auckland's communities, natural resources and built environments and their ability to adapt to the impacts of climate change. Take a cautious, risk-based approach where there is uncertainty on the effects of climate change, and monitor and adapt to environmental change over time.

Directive 8.6: Recognise, promote and strengthen the value and contribution of local urban and rural food systems to improve resilience, resource use efficiency and community food security.

The Stormwater Unit is playing its part in contributing to each priority area, in particular Priority 3 where the necessary changes in rainfall volumes and intensity and rise in sea levels have been incorporated into hydraulic modelling specifications, developed for use when assessing the existing and future performance of the stormwater network. This ensures that these factors are taken into account when all new development and upgraded infrastructure is being considered.

Changes to rainfall patterns are expected, these combined with the effect of increased impervious surfaces and greater stakeholder expectations for improvements in quality of stormwater runoff are the key drivers for stormwater planning.

2.3.4 Resilience

Auckland's quality of life, health and economic wellbeing are reliant on infrastructure. The concept of resilience has taken on renewed importance recently with the two recent major Canterbury earthquakes and is a significant test of New Zealand's infrastructure resilience.

The National Infrastructure Plan lays out the Government's vision for New Zealand's infrastructure by 2030; the vision is that "New Zealand's infrastructure is resilient and coordinated and contributes to economic growth and increased quality of life".

Within the Auckland Region, there are a number of natural hazards such as flooding, inundation, land erosion and tropical storms which are expected to increase in frequency and intensity due to climate change. Auckland is also subject to geological hazards as a result of our city's location in a known volcanic area. To ensure community safety, continuity of services and rapid recovery from hazard related events, the council has a responsibility to plan for and invest in the resilience of its infrastructure and communities.
However, the concept of resilience is wider than natural disasters and covers the capacity of public, private and civic sectors to withstand disruption, absorb disturbance, act effectively in a crisis, adapt to changing conditions (including climate change) and grow over time. It is also important to build resilient and safe communities who are able to cope with, and adapt to, the effects of hazards and events.

Chapter 7 of the Auckland Plan identified four priorities and a number of supporting directives for Auckland's Environment. Priority 4 is of particular interest to the Stormwater Unit when considering resilience.

Priority 4 – Build Resilience to Natural Hazards

Directive 7.14: Take account of environmental constraints when considering the location and nature of any future development.

Directive 7.15: Avoid placing communities and critical infrastructure and lifeline utilities in locations at risk from natural hazards, unless the risks are manageable and acceptable.

The Stormwater Unit has identified the critical parts of the stormwater system, which are vital to providing service continuity and have unacceptable consequences should they fail. The criticality is taken into account when the asset renewal, maintenance strategies and condition monitoring programmes are developed. Stormwater infrastructure, however, is not considered a lifeline utility in the context of other infrastructure providers, disruptions to which can have immediate serious consequences for businesses and communities.

Figure 2.3 shows an example of flash flooding in Portland Road which was caused by a combination of a storm event and a king tide.

Figure 2.4 Stormwater flooding: Portland Road, Remuera, January 2011

The Stormwater Unit intends to manage risks by:

- Educating the community to increase resilience because not all flooding and climate change impacts will be resolved

- Encouraging future development to locate above floodplains and low lying coastal land vulnerable to some of these hazards, in particular tidal storm surges, tsunamis and flooding associated with major rainfall events
- Promoting the use of water sensitive design and source control which moves away from relying heavily on traditional large communal hard infrastructure
- Relying more on overland flow paths and natural assets than hard infrastructure which is more susceptible to damage in disasters
- Preparing and adopting a stormwater resilience strategy which will provide the unit with a framework for incorporating resilience in business decisions

2.3.5 The Treaty of Waitangi

The principles of the Treaty of Waitangi are inherently embedded into the Auckland Plan Principles which guide the approach that has been adopted for the management of stormwater services. Mana whenua in Tamaki Makarau (Auckland) have always maintained a keen interest in the three waters (water, sewerage and stormwater) and have a particular focus on the mauri of the water which flows through the streams and harbours. Stormwater, therefore, which often picks up pollutants and transfers them to natural waterways is a focus of attention. The Stormwater Unit therefore commits to take special account of mana whenua views in policy, regulation and special project engagements.

Māori culture and identity highlights New Zealand's point of difference in the world and offers up significant design opportunities that can benefit us all. Auckland Council has worked with mana whenua to develop a draft set of Te Aranga Maori Design Principles. These are a set of outcome-based principles founded on intrinsic Maori cultural values and designed to provide practical guidance for enhancing outcomes for the design environment. The principles are:

- **Rangatiratanga:** The right to exercise authority and self-determination within one's own iwi / hapū realm
- **Kaitiakitanga:** managing and conserving the environment as part of a reciprocal relationship, based on the Māori world view that we as humans are part of the natural world
- **Manaakitanga:** the ethic of holistic hospitality whereby mana whenua have inherited obligations to be the best hosts they can be
- **Wairuatanga:** the immutable spiritual connection between people and their environments
- **Kotahitanga:** unity, cohesion and collaboration
- **Whanaungatanga:** a relationship through shared experiences and working together which provides people with a sense of belonging
- **Mātauranga:** Māori / mana whenua knowledge and understanding

The Principles have started being applied through meaningful engagement with mana whenua on major Council projects. It was used in iwi consultation on the Oakley Creek Conveyance project.

The Stormwater Unit is in the process of developing a Māori Model tool which will be used to evaluate project options.

2.4 Key relationships

Managing stormwater drainage, flood protection and water quality in the Auckland region is complex, with numerous internal and external stakeholders. Strong collaboration is needed to achieve integrated outcomes. More recently, we have formed closer relationships with the Ministry of Business, Innovation and Employment (MIBE), the council's Housing Project Office (HPO), and a mix of developers to ensure that in the fast tracking of any land for future growth, the stormwater issues are well understood and we are poised to assist. AT and WSL are also seen as key stakeholders in stormwater management. This complex stakeholder relationship is shown in Figure 2.5

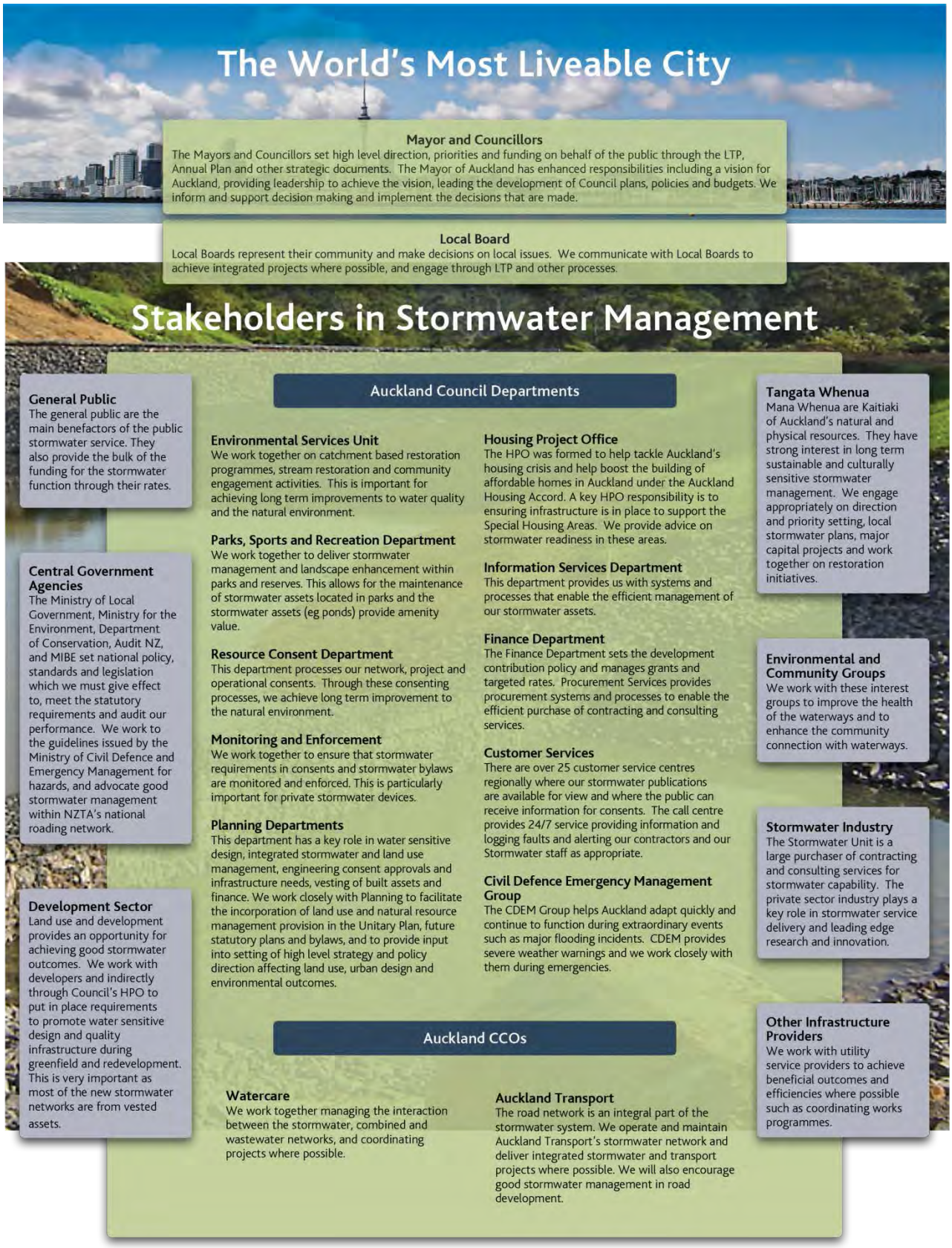


Figure 2.5 Stakeholder relationships

2.5 Our operating environment

2.5.1 The legislative environment

The management of stormwater drainage and flood protection services are directed by national, regional and local legislative and policy requirements, and also by Auckland Council strategic, planning and financial frameworks, particularly the Auckland Plan and LTP.

The key legislation and associated statutory instruments that enable and govern the management of stormwater drainage and flood protection services are the:

- LGA 2002 & Amendments
- LGA (Auckland Council) 2009
- Local Government (Financial Reporting and Prudence) Regulations 2014
- Resource Management Act 1991 & Amendments (RMA)
    - New Zealand Coastal Policy Statement 2010
    - National Policy Statement – Freshwater Management 2011
    - Auckland's Regional Policy Statement, Regional Plans and District Plans
- Land Drainage Act 1908
- Health Act 1956
- Building Act 2004, Building Amendment Act 2013 and New Zealand Building Code
- Utilities Act 2010
- Hauraki Gulf Marine Park Act 2000
- Civil Defence and Emergency Management Act 2002 (CDEM)
- Dam Safety Regulations 2015
- Public Works Act 1981
- Health and Safety in Employment Act 1992

2.5.2 Industry standards, guidelines and bylaw

The primary documents that guide standards for stormwater drainage management and flood protection services are shown in Table 2.2.

Standard/Guideline/Bylaw	Description
Engineering standards	• Auckland Council Stormwater Code of Practice for Land Development and Subdivision Version 1 Oct 2013 • AT Code of Practice • National Code of Practice for Utilities • Auckland Code of Practice for Working on the Road • NZWWA Pipeline Inspection Manual Third Edition • NZTA Spec TNZ C16:1992 • Australian and NZ Guidelines for Fresh and Marine Water Quality ANZECC, 2000 • MfE Climate Change Guidelines • Auckland Design Manual

Technical publications	Relating to stormwater management including: • TP10 Stormwater Management Design • TP108 Stormwater Runoff Modelling • TP124 Low Impact Design Manual • TP90 Erosion and sediment control guidelines for earthworks.
Best Practice documents on low impact design	There are many best practice documents on low impact design including draft Permeable Pavement Design Guidelines, Bio-retention Guidelines, Long Bay Practice Notes, and green roofs. It is expected that these will be consolidated over time.
Standards Association of New Zealand	Provides a range of standards covering required or recommended practice which may impact directly on assets or management of contracts, e.g. the NZS4404 Code of Practice for Urban Subdivision provides a range of stormwater standards. The revised NZS4404:2010 now includes formal provision for low impact design for stormwater, stormwater treatment, and now requires climate change impacts to be taken into account.

Table 2.2 Standards and guidelines

2.5.3 Council policies and bylaws

The existing bylaws of legacy councils continue to be used for their respective areas. Auckland Council is carrying out a bylaw review programme of the 158 existing bylaws to enable Auckland bylaws to be integrated and rationalised. The consultation stage of the new stormwater bylaw is complete and it is now at the regulatory hearings stage.

2.6 Stormwater strategic overview

2.6.1 Where stormwater fits within Council

The Auckland Plan vision is to become '*the world's most liveable city*' and sets Auckland's direction for the next 30 years including a growth and development strategy. The LTP and Annual Plan set funding and expenditure priorities to support the implementation of our core functions and the Auckland Plan. Internally, the council has operational policies and procedures to follow and a set of core values to work by - innovation, respect, teamwork, pride, service and accountability.

Figure 2.5 shows the linkages between the Mayor's vision, which is expressed in the Auckland Plan, and the various strategies and plans which make up Auckland Council.

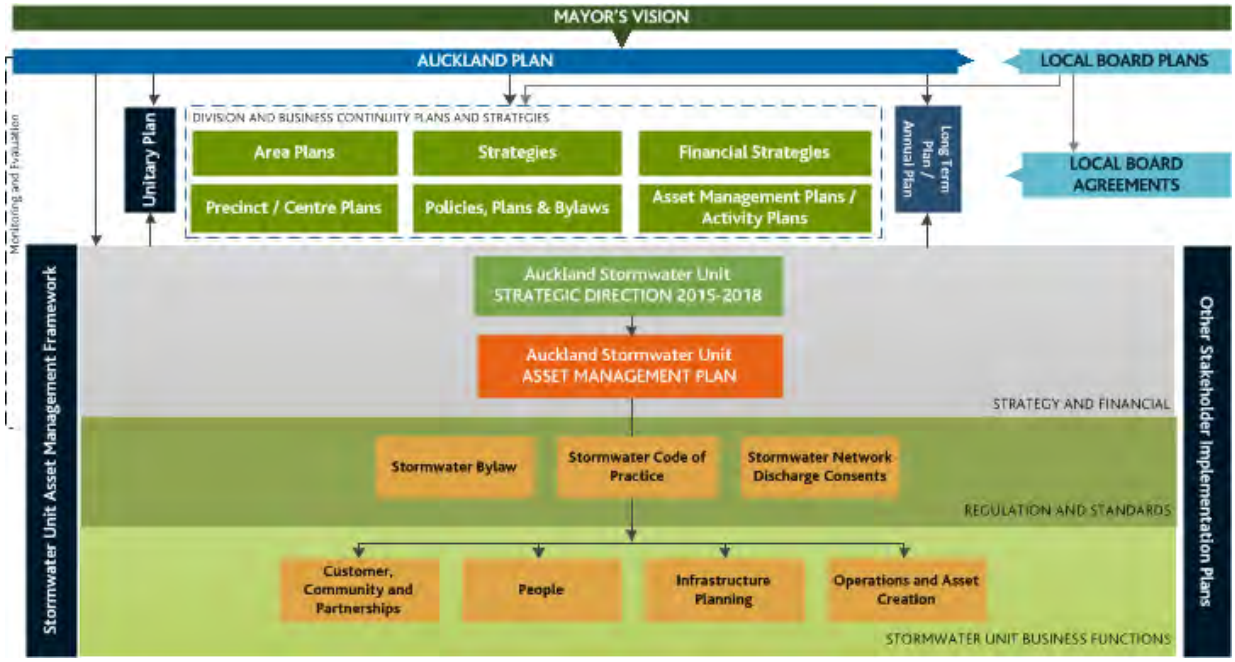


Figure 2.6 Plan linkages and the Stormwater Unit Business Functions

2.6.2 Infrastructure Strategy

This strategy is being developed under the requirements of section 101B of the Local Government Act, which states:

> *"The purpose of the infrastructure strategy is to —*
> *a) identify significant infrastructure issues for the local authority over the period covered by the strategy; and*
> *b) identify the principal options for managing those issues and the implications of those options"*

For Auckland Council the Infrastructure Strategy is a tool to achieve more effective and efficient management of Council's infrastructure assets, integrates plans for individual assets, providing a coherent perspective across assets. It also provides a long-term perspective required to assess whether there are hidden investment gaps or affordability issues beyond the ten year horizon.

The Stormwater Unit works closely with the Strategy and Policy Department and other infrastructure providers to ensure that the infrastructure strategy and stormwater infrastructure decisions are aligned.

2.6.3 Issues

The issues Auckland faces in stormwater have been grouped into three core categories which reflect the management of stormwater as an integral aspect of a liveable city. These categories which are listed below reflect the community outcomes which result from the effective management of the stormwater assets and are consistent with the Auckland Plan principles.

2.6.3.1 Safe Communities

The main challenges we need to consider are:

- Approximately 8,000 buildings located in floodplains, 7,000 in overland flow paths and 1000 in flood prone areas are at risk of inundation in a 1 in 100 year flood event.
- Resolving flooding issues after development has occurred is difficult and costly to the point where it may be unaffordable to address flood problems across the city to the same level – the more easily achieved measures have been already been implemented.
- Continuing the past approach to development and a reliance on built infrastructure and development in flood plains, overland flow paths and flood prone areas will worsen flood risks.
- Flood risk to critical infrastructure (hospitals, power substations, emergency roadways, etc.) needs to be better understood and a higher level of protection may be required.
- Ageing stormwater infrastructure and deteriorating asset condition can result in the unexpected asset failures.
- The community risks and consequences as a result of failing stormwater infrastructure needs to be better understood and managed.
- Flood waters are often contaminated with wastewater, particularly where there are combined wastewater and stormwater networks, which compounds health risks.
- Climate change will exacerbate flood risks by increasing the frequency of higher intensity storms and raising sea level, putting more pressure on existing systems, especially in low-lying areas. This means that the number of houses at risk will increase.
- Poorly managed stormwater flows can result in erosion and land stability problems that can affect property and buildings.

2.6.3.2 Supporting growth

The way the region grows and develops will determine our ability to meet the stormwater needs of the community and achieve healthy waterways. In particular:

- As the city intensifies, the blue and green environments and groundwater aquifers will come under more pressure and stress, while at the same time becoming a more valuable community and natural resource.
- Headwater streams are often piped or removed during development, but play an essential role in minimising stream erosion and enhancing wider stream and ecological health. Otherwise expensive assets may be required to replace their natural functions.
- Preventing adverse stormwater effects through water sensitive planning and low impact design is significantly more cost effective than trying to retrofit later.
- As the majority of new public stormwater infrastructure is built by private developers and vested in the council – robust standards and processes are required to ensure good quality and effective infrastructure.
- It will take time to embrace green growth and the use of green infrastructure and opportunities need to be taken as they arise.
- Auckland’s stormwater network continues to grow. This places considerable stress on affordability for Aucklanders.

2.6.3.3 Healthy and connected waterways

Stormwater runoff from current and future land use development has, and will continue to have, a major influence on the state and health of our freshwater, groundwater and near shore marine environments. Management of stormwater runoff is complex and involves many stakeholders. This requires a significant collaborative effort. Key challenges include:

- Significantly degraded waterways affect our community's perception of, and their interaction with them.
- Stormwater runoff and structures can adversely affect urban streams and can cause stream erosion and sediment discharge, a loss of aquatic habitat and biodiversity and a reduction in community and cultural values.
- Streams form an essential component of the stormwater system but at the same time are an integral component of our natural environment, creating a potential conflict between their use and their health and other natural, cultural and amenity values.
- Each year it is estimated that approximately 5 to 10 kms of stream are lost by piping for land development, resulting in the significant and on-going loss of Auckland's aquatic biodiversity and natural stormwater conveyance.
- Contaminants originating from land use and transport activities accumulate in streams and sensitive coastal environments and often occur at levels that adversely affect aquatic life.
- Discharges of sediment primarily from stream erosion, land erosion and earthworks can smother benthic organisms and cause colonisation of coastal areas by mangroves.
- Groundwater aquifers underlying urban areas can be adversely affected by land development and stormwater infiltration.
- Large areas of impervious surfaces can significantly reduce infiltration, reducing groundwater availability and baseflow to streams.
- Increased stormwater runoff can increase combined stormwater /sewer overflows in the central city and wastewater overflows elsewhere, adversely affecting beaches and harbour areas.

2.6.4 Our strategic direction

2.6.4.1 Our Vision

We are fully committed to the Auckland Plan vision to become '*the world's most liveable city*'. The appropriate management of stormwater and freshwater is integral to a liveable city and ensuring we meet Council's statutory obligations and objectives. To be a liveable city we need to achieve a:

Water Sensitive Community

The concept "Water Sensitivity" is a shift in the focus of stormwater management from removing or disposing of stormwater as fast as possible via built infrastructure, to recognising the value of stormwater, its close interrelationship with natural freshwater systems, and how it can enhance the liveability of our cities.

A water sensitive community will:

- Value stormwater as an essential part of our built environment and our freshwater system.
- Commit to water sensitive and low impact design during new development and redevelopment of land which promote at source treatment and mimic predevelopment hydrology.

- Maintain and enhance the health of streams, groundwater and coastal waters.
- Manage and build resilience to flood hazards with a risk based approach to flood protection and control through the retention of flood plains, overland flow paths, and appropriate land use.
- Embrace the Maori cultural and spiritual significance of water and value the mauri of water, as well as the amenity, open space and community values.
- Contribute to the integration and interaction of communities with their streams and coastal areas.
- Explore use and reuse of stormwater as part of total water cycle management, including harvesting, cleaning and reusing stormwater in public open spaces.
- Contribute to biodiversity, carbon footprint reduction and reduction of urban heat island effects through use of green infrastructure and natural systems.

The move to a water sensitive community is a significant change in approach and will take time. Built infrastructure has always been a primary component of our network and its on-going efficient and effective operation and renewal is fundamental to sustainable stormwater management but, increasingly, given our strategic approach, built and natural assets need to be managed in an integrated way.

2.6.3.2 Objectives

To focus our business on achieving the vision, we have established three core and four supporting objectives which are strongly connected to the Auckland Plan's transformational shifts and strategic directions.

Our objectives will:

- support the vision of the Stormwater Unit
- guide expenditure over the short, medium and long term
- contribute to the delivery of the regional outcomes
- ensure good quality built and green infrastructure for present and future generations.

In achieving these objectives we will give effect to the principles of the Auckland Plan.

Figure 2.6 defines each of the objectives and illustrates how the Stormwater Unit's vision and three core and four supporting objectives are encompassed within the Auckland Plan vision and principles.

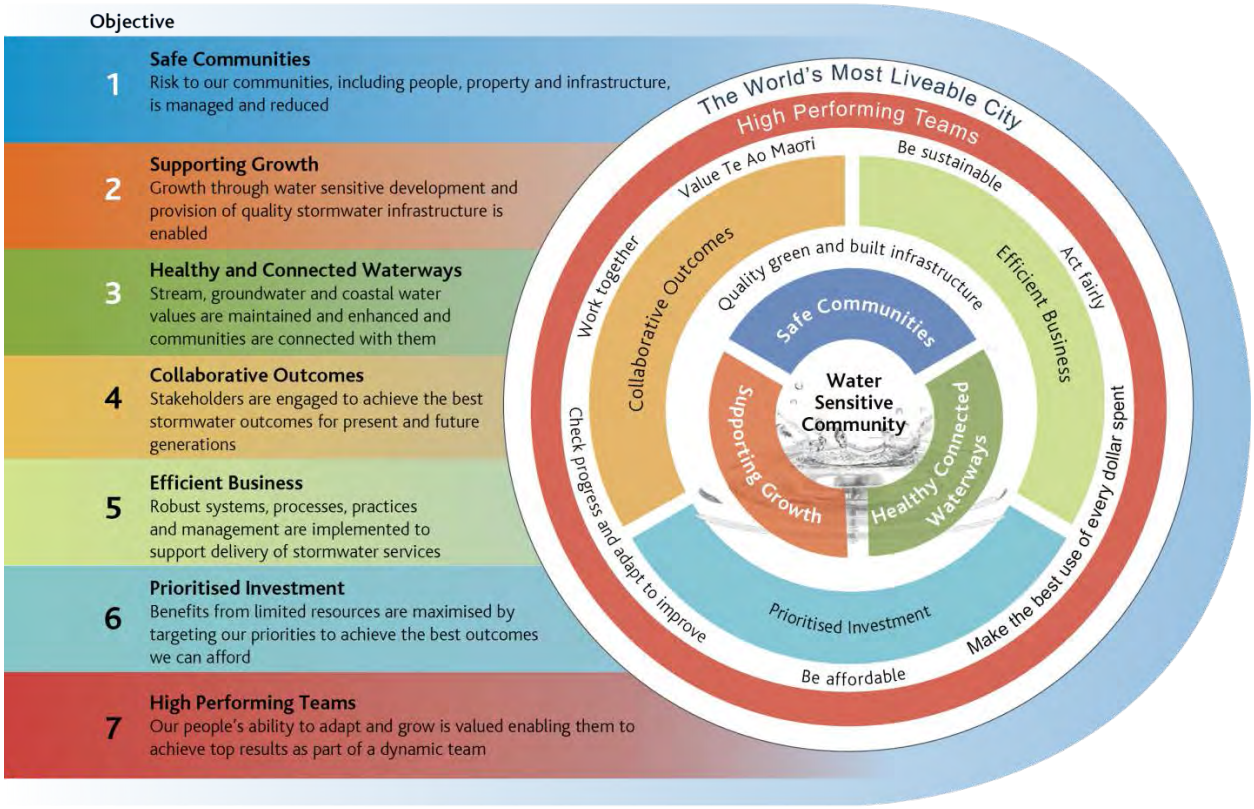


Figure 2.7 Stormwater Unit's Objectives

	Stormwater Unit Objectives	Safe Communities	Supporting Growth	Healthy & Connected Waterways	Collaborative Outcomes	Efficient Business	Prioritised Investment	High Performing Team
Auckland Plan Outcomes	A fair, safe and healthy Auckland	✓		✓	✓		✓	✓
	A green Auckland			✓	✓		✓	✓
	An Auckland of prosperity and opportunity	✓	✓		✓	✓	✓	✓
	A well connected and accessible Auckland	✓		✓	✓			✓
	A beautiful Auckland that is loved by its people	✓	✓	✓	✓			✓
	A culturally rich and creative Auckland	✓			✓	✓		✓
	A Māori identity that is Auckland's point of difference in the world			✓	✓			✓
Transformational Shifts	Dramatically accelerate the prospects of Auckland's children and young people	✓	✓	✓	✓			✓
	Strongly commit to environmental action and green growth		✓	✓	✓			✓
	Move to outstanding public transport within one network				✓			✓
	Radically improve the quality of urban living	✓	✓	✓	✓			✓
	Substantially raise living standards for all Aucklanders and focus on those most in need	✓	✓	✓			✓	✓
	Significantly lift Māori social and economic well-being			✓	✓		✓	✓
Auckland Plan Strategic Directions	Create a strong, inclusive and equitable society that ensures opportunity for all Aucklanders				✓		✓	✓
	Enable Māori aspirations through recognition of the TeTiriti o Waitangi / The Treaty of Waitangi and Customary Rights			✓	✓			✓
	Integrate Arts and Culture into our everyday lives			✓	✓			✓
	Protect and conserve Auckland's Historic Heritage for the benefit and enjoyment of present and future generations	✓			✓			✓
	Promote individual and community wellbeing through participation and excellence in recreation and sport	✓		✓	✓			✓
	Develop an economy that delivers opportunity and prosperity for all Aucklanders and New Zealand		✓			✓	✓	✓
	Acknowledge that nature and people are inseparable	✓	✓	✓	✓		✓	✓
	Contribute to tackling climate change and increasing energy resilience	✓	✓	✓		✓	✓	✓
	Keep rural Auckland productive, protected and environmentally sound			✓	✓			✓
	Create a stunning city centre, with well-connected quality towns, villages and neighbourhoods	✓	✓	✓	✓	✓	✓	✓
	House all Aucklanders in secure, healthy homes they can afford	✓	✓				✓	✓
	Plan, deliver and maintain quality infrastructure to make Auckland liveable and resilient	✓	✓	✓	✓	✓	✓	✓
	Create better connections and accessibility within Auckland, across New Zealand and to the world	✓	✓	✓				✓

✓ Stormwater Unit objective **strongly** contributes to Auckland Plan priority actions ✓ Stormwater Unit objective **moderately** contributes to Auckland Plan priority actions

Table 2.3 How the Stormwater Unit's Objectives contribute to the Auckland Plan

2.6.3.3 What we need to achieve

Objective 1 – Safe Communities

Risk to our communities, including people, property and infrastructure is reduced.

Our objective is to ensure that risk to people and property is managed to levels that have been established in consultation with the community, and reduce existing flood risk where they are above these levels.

To achieve this we need to ensure:

- Flood risk from new development is minimised:
  - Protect the 1 in 100 year flood plain and overland flow paths in greenfield and redevelopment areas from inappropriate development
  - Manage stormwater runoff so it does not increase existing flood risk in downstream areas
  - Apply water sensitive and low impact design to new and redeveloped areas
  - Ensure good quality green and built stormwater infrastructure to support growth
- Existing flood risk is progressively reduced to meet agreed levels of service, at a rate and order of priority, determined in consultation with the community:
  - Take the opportunity provided by redevelopment to reduce existing flood risks including reducing flood hazards and remove vulnerable activities from flood prone areas
  - Invest in flood reduction where it achieves the greatest benefit and can be integrated with other initiatives
  - Recognise that some flooding problems cannot be practically or economically resolved and have to be adapted to and managed
  - Improved design of stormwater devices, inlets, outlets and major overland flow paths to minimise risks to communities
- A higher level of flood protection is adopted for critical lifeline infrastructure
- Improving community understanding of, and resilience to, flood hazards
- Effective and efficient operation and maintenance and renewal of the stormwater network and prompt response to customer service requests
- Working with WSL to:
  - reduce stormwater ingress into wastewater systems where beneficial by providing improved stormwater services in combined sewer areas
  - consider the ways that water demand management can impact on stormwater velocity and quantity.
- Identify areas of high potential for erosion and land stability and design for safety

Objective 2 – Supporting Growth

Growth through water sensitive development and provision of quality stormwater infrastructure is enabled

Our objective is that new and re-developed areas are supported by effective stormwater management and good quality infrastructure and development is undertaken in a way that meets the needs of our communities and maintains and enhances natural water systems.

Achieving this means:

- Future growth avoids development in areas where stormwater effects cannot be adequately managed
- Stormwater infrastructure planning and provision is aligned to Auckland Plan development and intensification priorities and processes including land use plans and plan changes
- Water sensitive/low impact design is integrated into urban design and major transport projects for both new and major re-development
- Strong encouragement and role-modelling by the Stormwater Unit to achieve green infrastructure by both public infrastructure providers and developers
- Effective land use planning and co-operation between developers and infrastructure providers to enable the opportunities provided by intensification and redevelopment to reduce the adverse effects from existing urban areas
- Standards, processes and collaborative practices are in place for the planning, development and vesting of good quality public stormwater infrastructure and to ensure there is an effective interface between private and public infrastructure
- Ongoing council investment supports the development of both green and built infrastructure.

Objective 3 – Healthy and Connected Waterways

Stream, groundwater and coastal water values are maintained and enhanced and communities are connected with them.

Our objective is to utilise streams, aquifers and harbours as integral natural components of Auckland's stormwater system while reducing the adverse effects of stormwater runoff on, and enhancing our community's connection with, its waterways.

To achieve this we need to:

- Improve the community's opportunities to interact with, understand and appreciate our waterways
- At a minimum, maintain current stream values and take opportunities to enhance them where they are degraded including:
    - Managing entire stream systems (including headwaters and riparian margins) through statutory and other mechanisms
    - Identifying and protecting high value streams/reaches
    - Taking opportunities to enhance streams where they arise
    - Target restoration efforts to those streams that have the greatest potential for improvement and multiple benefits
    - Developing and maintaining the council's stormwater assets in a way that is consistent with maintaining stream values
- Manage soakage systems and infiltration to minimise the discharge of contaminants to aquifers and maintain sufficient stream base flows
- Progressively reduce the load of stormwater contaminants from urban catchments to estuarine and other sensitive areas to a level required to arrest increasing contaminant levels:
    - Reduce contaminant loads from new/redevelopment

Target public/communal treatment options in areas where the greatest benefit will accrue

3.0 Stormwater services – achieving collaborative outcomes

3.1 The standards we aim to achieve

3.1.1 Customer standards

A clear definition of the community's needs and expectations is required to ensure that this Asset Management Plan satisfies the community's needs for the delivery of services both now and in the future. The levels of service set out in this section define the key outputs we intend to deliver which either demonstrate value to the community, or are key to the way the public use or experience the activity. Our key customers and our relationship to them are listed in Figure 2.5.

The council ensures that all interested customers and stakeholders have an opportunity to influence the level of service decisions by:

- making this stormwater Asset Management Plan publicly available
- providing the public an opportunity to make submissions on strategic targets through the council's LTP consultation process
- consulting with affected persons on specific projects (as required by the RMA Act 1991)
- monitoring and analysing requests for service from customer records within council's Customer Service Request System
- ensuring that the Memorandum of Understanding (MoU) with AT and WSL is up to date and relevant

3.1.2 Levels of Service

The 'Stormwater Management' and 'Flood Protection and Control' groups of activities sit within the Environment and Regulation Theme of Auckland Council's LTP. The stormwater levels of service statements have been developed around three core strategic objectives:

- Safe Communities
- Supporting Growth
- Healthy and Connected Waterways

The levels of service and performance measures are detailed in Tables 3.1 to 3.3. The performance measures are a mixture of mandatory national measures (defined by the Department of Internal Affairs) and measures which are specific for the Auckland region. The targets for performance measures will be achieved through the delivery of the capital and operational works programmes. The Essential Services benchmark (Local Government Financial and Prudence Regulations 2014) will be reported at an Auckland Council Organisational level.

There are two reporting levels of performance measures, one for the LTP and the other for the Business Plan. , The Asset Management Plan performance measures are the same as Business Plan performance measures for the Stormwater Unit.

Group of Activity	Stormwater management, and Flood protection and control							
Level of service statement	1.0 Manage the stormwater network and flood protection schemes to minimise the risks of flooding to Aucklanders							
Performance measures	Reporting level	Actual 2014/15	Targets					
			2015/16	2016/17	2017/18	2018/19	19/20-24/25	25/26-39/40
1.01 The number of flooding events and the associated number of habitable floors affected per 1,000 properties. ***Habitable floor*** *refers to a floor of a building (including a basement) but does not include ancillary structures such as stand-alone garden sheds or garages.* *A* ***flooding event*** *means an overflow of stormwater from the stormwater system that enters a habitable floor.*	LTP New mandatory national measure	3 Flood Events 0.015 flooded habitable floors per 1000 properties	< 1 per 1,000	< 1 per 1,000	< 1 per 1000	< 1 per 1000	< 1 per 1000	< 1 per 1000
1.02 The proportion of habitable floors that are predicted to flood in a 10year event. (Excluding basements and attached garages)	AMP new measure	1% of 457,000= 4570	< 1%	< 1%	< 1%	< 1%	< 1%	< 1%
1.03 The proportion of habitable floors that are predicted to flood in a 100yr event. (Excluding basements and attached garages)	AMP new measure	2.5% of 457,000= 11425	<2.5%	<2.5%	<2.5%	<2.5%	<2.5%	<2.5%
1.04 The proportions of habitable floors that are found to be unfeasible to protect from flooding that have flood resilience strategies in place. *Flood resilience strategies include measures such as flood warning systems, education initiatives and flood readiness plans.*	AMP new measure	0%	5%	10%	15%	20%	25%-50%	50%-100%

Group of Activity	Stormwater management, and Flood protection and control							
Level of service statement	1.0 Manage the stormwater network and flood protection schemes to minimise the risks of flooding to Aucklanders							
Performance measures	Reporting level	Actual 2014/15	Targets					
			2015/16	2016/17	2017/18	2018/19	19/20-24/25	25/26-39/40
1.05 The median response time to attend a flooding event, measured from the time that Auckland Council receives notification to the time that service personnel reach the site.	LTP New mandatory national measure	1hr 7min	<2hrs	<2hrs	<2hrs	<2hrs	<2hrs	<2hrs
1.06 Number of blockages in the stormwater network per 100km	AMP	4.86	<20	<20	<20	<20	<20/ annum	<20/ annum
1.07 Stormwater manholes that pop open in flood events are made safe within 2 hours.	AMP	100%	100%	100%	100%	100%	100%	100%
1.08 The number of complaints received about the performance of the stormwater network per 1000 properties connected to Auckland Council's stormwater network.	LTP New mandatory national measure	0.632 per 1000 properties	<3 per 1000	<3 per 1000	<3 per 1000	<3 per 1000	<3 per 1000/ annum	<3 per 1000/ annum
1.09 The major flood protection and control works are maintained, repaired and renewed to a safe operating standard. ***Major flood protection and control works**' are those works that meet two or more of the following four criteria:* *a) Operating expenditure of more than $250,000 in any one year;* *b) Capital expenditure of more than $1 million in any one year;* *c) Scheme asset replacement value of more than $10 million; and* *d) Directly benefitting a population of 5,000 or over*	LTP New mandatory national measure	There are currently no Major Flood Protection and Control Schemes in Auckland that meet the definition.	100%	100%	100%	100%	100%	100%

Group of Activity	Stormwater management, and Flood protection and control							
Level of service statement	1.0 Manage the stormwater network and flood protection schemes to minimise the risks of flooding to Aucklanders							
Performance measures	Reporting level	Actual 2014/15	Targets					
			2015/16	2016/17	2017/18	2018/19	19/20-24/25	25/26-39/40
1.10 Critical assets with identified structural condition grade 4 (poor) are renewed or repaired within 5 years of identification	AMP new measure	data to be compiled	100%	100%	100%	100%	100%	100%
1.11 Critical assets with identified structural condition grade 5 (fail) are repaired or renewed within 24 months of identification.	AMP new measure	data to be compiled	100%	100%	100%	100%	100%	100%
1.12 Critical assets are surveyed at least once every 5 years to assess their condition.	AMP new measure	100%	95%	95%	95%	95%	95%	95%

Table 3.1 Level of service and performance measures for the stormwater strategic objective: Safe Communities

Group of Activity	Stormwater management							
Level of service statement	2.0 Develop the stormwater network in a cost effective manner to enable growth in accordance with Auckland Councils growth priorities.							
Performance measures	Reporting level	Actual 2014/15	Targets					
			2015/16	2016/17	2017/18	2018/19	19/20-24/25	25/26-39/40
2.01 The annual capital works programme to enable growth is delivered	AMP New measure	100%	95%	95%	95%	95%	95%	95%
2.02 Formal enquiries to the stormwater development inbox are responded to within 5 working days.	AMP New measure	78.68%	90%	90%	90%	90%	90%	90%
2.03 Other council departments and CCO projects are supported by the Stormwater Unit capital investment each year	AMP New measure	100%	> $100k	> $100k	> $100k	> $100k	> $100k /annum	> $100k /annum

Table 3.2 Level of service and performance measures for the stormwater strategic objective: Supporting Growth

Group of Activity	Stormwater management							
Level of service statement	3.0 Enhance and protect the stormwater receiving environments for the people of Auckland through sustainable management of the stormwater network.							
Performance measures	Reporting level	Actual 2014/15	Targets					
			2015/16	2016/17	2017/18	2018/19	19/20-24/25	25/26-39/40
3.01 Auckland Council Stormwater compliance with resource consents for discharge from its stormwater system, measured by the number of: a) abatement notices; and b) infringement notices; and c) enforcement orders; and d) successful prosecutions received in relation those resource consents.	LTP New mandatory national measure	a)0 b)0 c)0 d)0	a)0 b)0 c)0 d)0	a)0 b)0 c)0 d)0	a)0 b)0 c)0 d)0	a)0 b)0 c)0 d)0	a)0 b)0 c)0 d)0	a)0 b)0 c)0 d)0
3.02 The ratio of the length of watercourse consented to be physically improved versus physically degraded in each year. (kms improved ÷ kms degraded = 3 or more) ***Physically Improved*** *- includes daylighting, naturalisation, artificial lining removal, riparian protection and enhancement, and addition of structures that contribute positively to the environment (such as fish ladders).* ***Physically Degraded*** *- includes piping, lining and other structures that contribute negatively to the environment.* ***Excludes****: Water quality aspects of watercourse improvement and degradation such as contaminants and temperature change*.	LTP New measure	1.33	>3	>3	>3	>3	>3	>3

Group of Activity	Stormwater management							
Level of service statement	3.0 Enhance and protect the stormwater receiving environments for the people of Auckland through sustainable management of the stormwater network.							
Performance measures	Reporting level	Actual 2014/15	Targets					
			2015/16	2016/17	2017/18	2018/19	19/20-24/25	25/26-39/40
3.03 Contaminants are removed from : a. Cess pits and proprietary devices, and b. Wetlands and ponds via Auckland Councils maintenance and renewal programmes.	AMP New measure	a) 8,193 tonnes b) 6,672 tonnes	a) 5,000 tonnes b) 10,000 tonnes	a) 5,000 tonnes b) 10,000 tonnes	a) 5,000 tonnes b) 10,000 tonnes	a) 5,000 tonnes b) 10,000 tonnes	a) 5,000 tonnes /annum b) 10,000 tonnes /annum	a) 5,000 tonnes /annum b) 10,000 tonnes /annum
3.04 Number of mana whenua satisfied with Auckland Council's engagement with iwi in relation to stormwater projects	LTP New measure (19 mana whenua to be surveyed)	7.14 % (from customer surveys)	10/19	10/19	10/19	10/19	10/19	10/19
3.05 Identified projects that contribute to Maori outcomes are delivered to programme.	AMP New measure	100%	95%	95%	95%	95%	95%	95%

Table 3.3 Level of service and performance measures for the stormwater strategic objective: Healthy and Connected Waterways

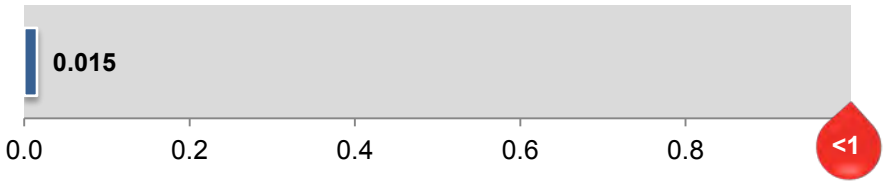
3.1.3 Service Performance

Regular measurement and reporting of service performance, and monitoring the progress against various targets are required to enable us to determine whether we have achieved our levels of service and identify areas for improvement. The Stormwater Unit is committed to delivering the most appropriate level of service commensurate with affordability and good industry practice.

The Stormwater Unit's 2015 LTP levels of service performance are as follows. Previous years have been reported through the Annual Plan process. It should be noted that not all the new LTP performance measures were measured in the 2014/2015 year, i.e. performance measures 1.10, 1.11 and 3.04 (which was the previous measure), but they will be going forward.

1.01 The number of flooding events and the associated number of habitable floors affected per 1,000 properties

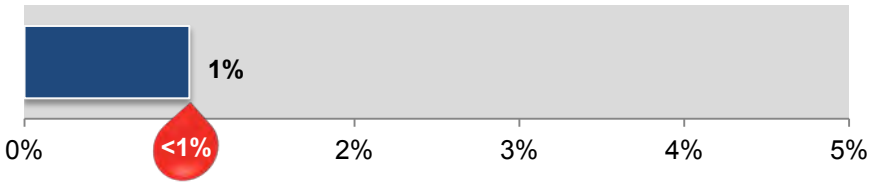
The number of flooding events for the largest rain event per 1000 properties



Note, the definition of habitable floor has been extended to include basements and attached garages

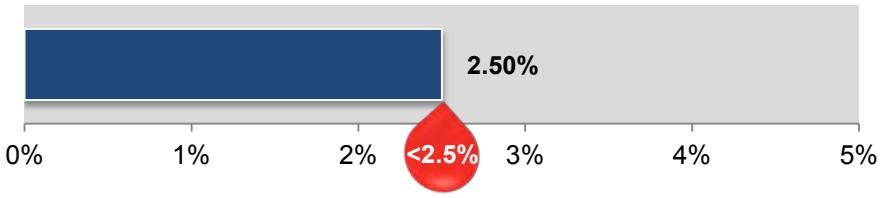
1.02 The proportion of habitable floors that are predicted to flood in a 10 year event

Proportion of habitable floors that are predicted to flood in a 10 year event



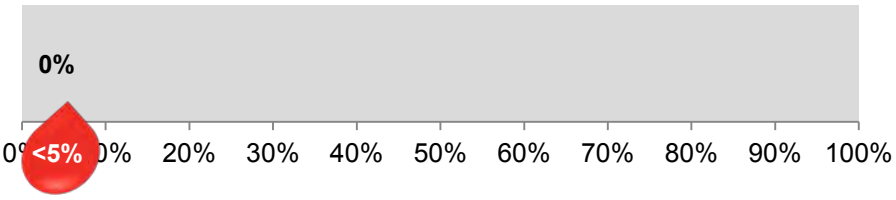
1.03 The proportion of habitable floors that are predicted to flood in a 100 year event

Proportion of habitable floors that are predicted to flood in a 100 year event.

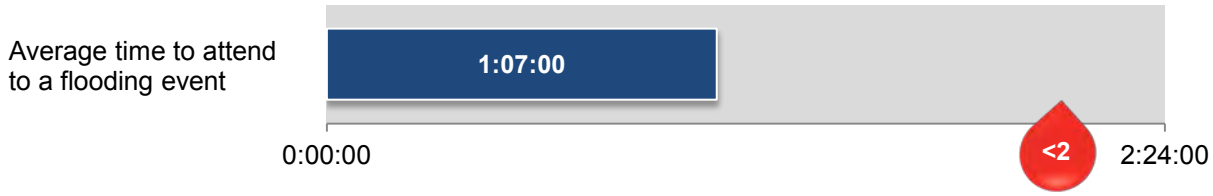


1.04 The proportions of habitable floors that are found to be unfeasible to protect from flooding that have flood resilience strategies in place

Proportion of habitable floors with flood resilience strategies that are unfeasible to protect

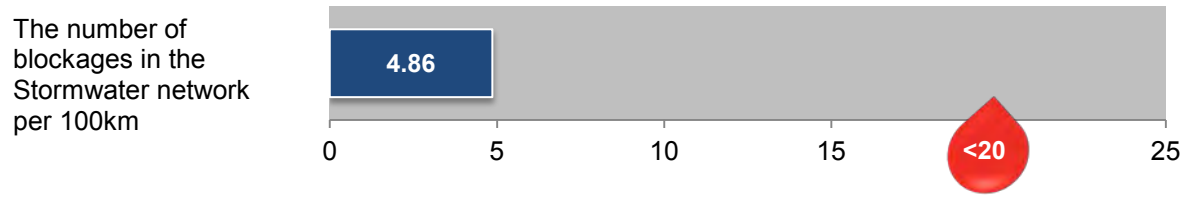


1.05 The median response time to attend to a flooding event, measure from the time that Auckland Council receives notification to the time that service personnel reach the site



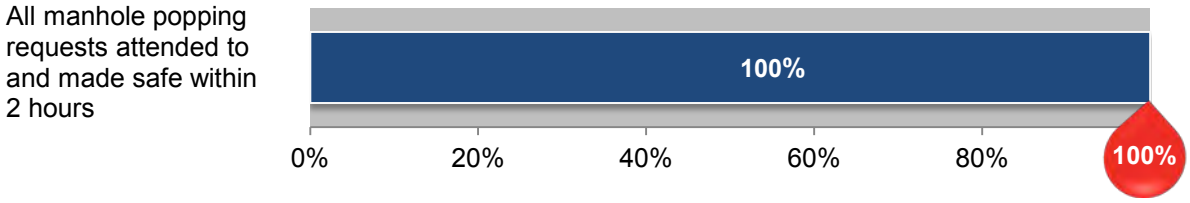
Median response time target has been achieved. Target expected to be met subject to no extreme events.

1.06 Number of blockages in the stormwater network per 100km



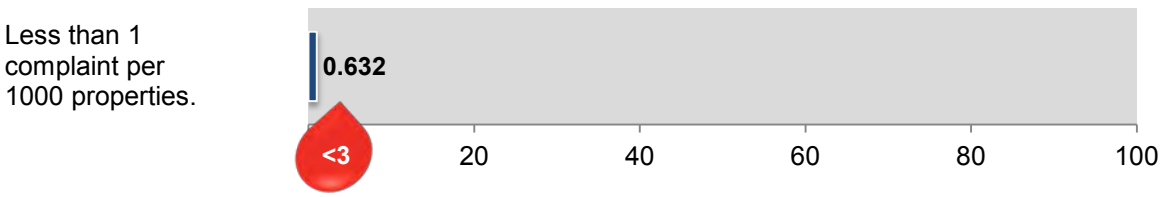
It is noted in the LTP that this activity can fluctuate from year to year. The number of blockages reported can be dependent on the number of storm events, proactive surveys or programmes in any given year.

1.07 Stormwater manholes that pop open in flood events are made safe within 2 hours

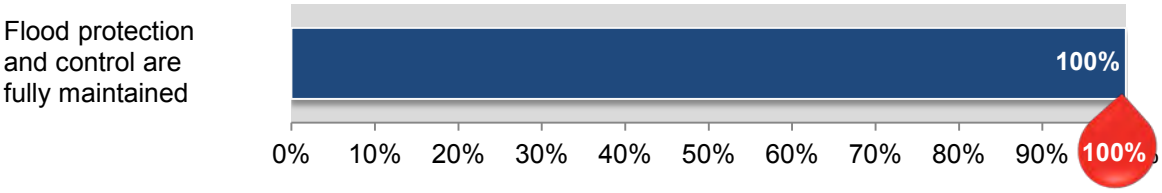


Target expected to be met subject to no extreme events.

1.08 The number of complaints received about the performance of the stormwater network per 1000 properties connected to Auckland Council's stormwater network

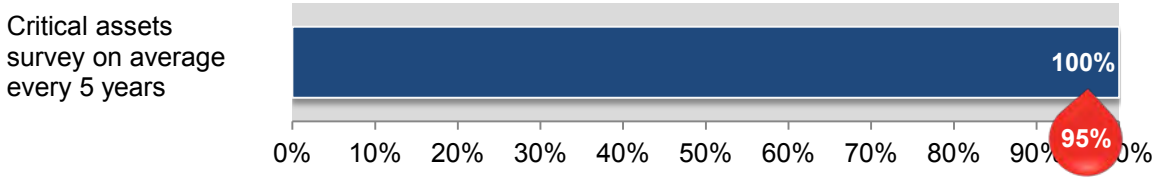


1.09 The major flood protection and control works are maintained, repaired and renewed to a safe operating standard

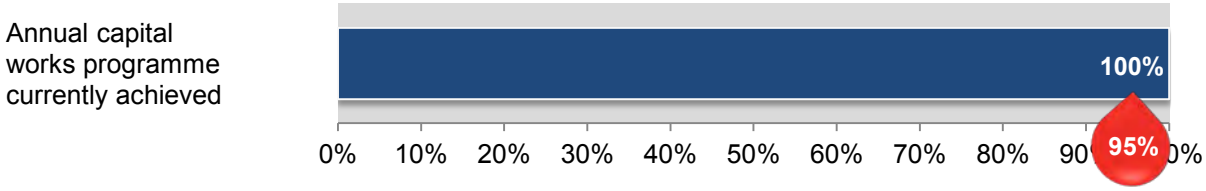


We do not have any major flood protection and control works as per the DIA definition so this target has been met.

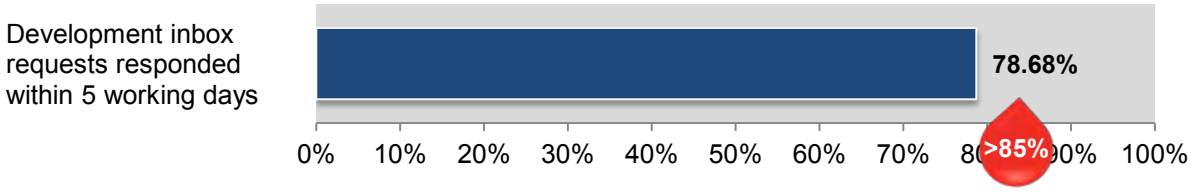
1.12 Critical Assets are surveyed at least once every 5 years to check their condition



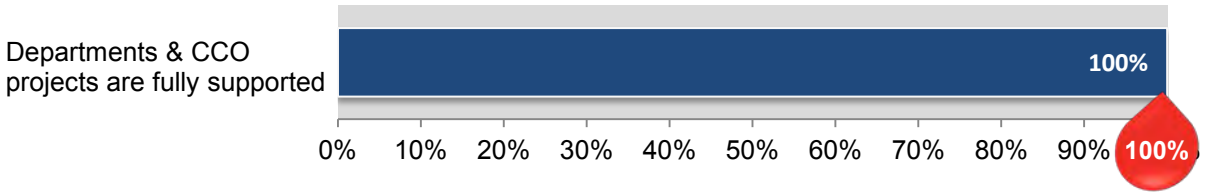
2.01 The annual Capital works programme to enable growth is delivered



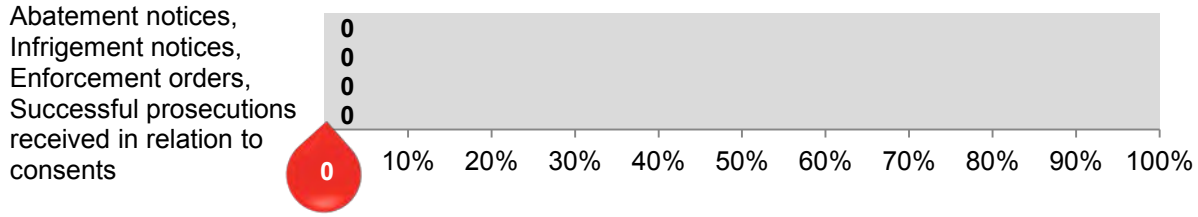
2.02 Formal enquiries to the stormwater development inbox are responded to within 5 working days.



2.03 Other Council departments and CCO projects are supported by stormwater unit Capital Investment each year

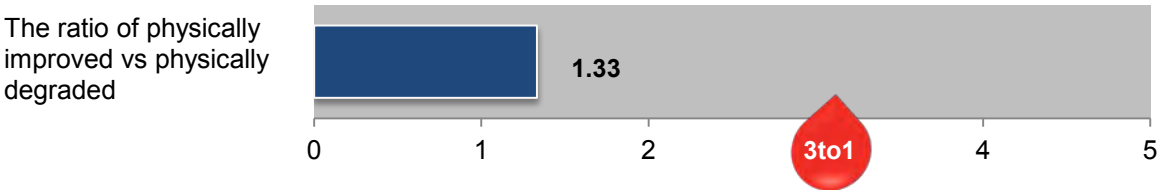


3.01 Auckland Council Stormwater compliance with resource consents for discharge from its stormwater system, measured by the number of:



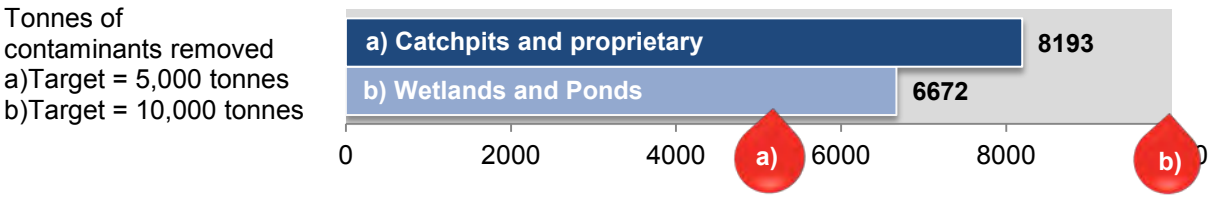
No abatement notices or enforcement orders were received in 2015. It is anticipated that no notices or orders will be issued with the continuation of the current management of the Stormwater network

3.02 The ratio of the length of watercourse consented to be physically improved versus physically degraded in each year.

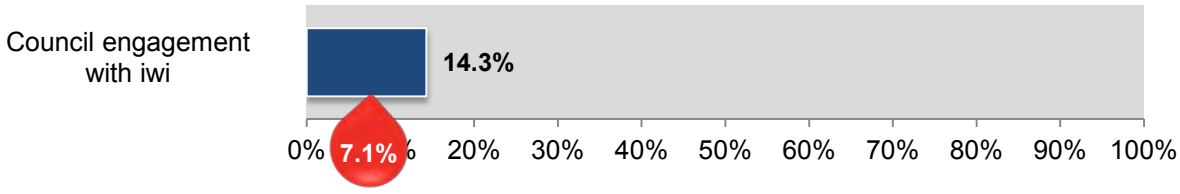


It should be noted that the ratio given above is only for permanent streams because to date offset improvements were not required for most of the consented physical degradation of intermittent streams. Going forward, however, with the PAUP coming into force we will be including both permanent and intermittent streams for this LOS measure.

3.03 Contaminants removed via AC maintenance & renewal programmes in:



3.04 Percentage of mana whenua satisfied with stormwater management



The result shown is the previous measure of mana whenua satisfaction. This previous target to maintain or improve was achieved, but the result is too low. This is due to the small sample size, 19 mana whenua, and their concerns towards the compartmentalised approach taken by the council towards the management of three waters. They see this approach as unhelpful and any response to stormwater management questions are taken into context with the management of fresh and wastewaters, the performance of WSL and to some extent AT.

A new measure is proposed to enable a more accurate measurement of mana whenua satisfaction with our stormwater management performance. (Refer to LOS 3.04 in Table 3.3). The Mauri Model assessment tool will be used as part of the survey methodology that could more specifically measure the council's progress and engagement with iwi in relation to stormwater projects.

3.2 Communicating with our customers

In seeking to achieve its vision of "A Water-Sensitive Community", the Stormwater Unit requires partnerships with a wide range of internal and external stakeholders. Establishing and managing effective partnerships means that consultation takes place within the context of a relationship built through ongoing engagement via provision of built stormwater services and work related to natural water infrastructure.

We work at four differing scales of planning and implementation:

- regional scale, across the whole of Auckland, through vehicles such as the LTP, Annual Plan and Stormwater Asset Management Plan
- sub-regional, corresponding to the CREs and their network discharge consents
- local, at the scale of sub-catchment and issues areas, and
- site-specific, involving the design, construction and maintenance of stormwater projects.

A tailored consultation approach for each level is being followed based on the council recommended engagement policy.

Figure 3.1 Community engagement

3.2.1 Engagement with mana whenua

Our approach to consultation with mana whenua is based on the council's commitment to meeting its responsibilities under TeTiriti o Waitangi/ Treaty of Waitangi and its broader legal obligations to Maori. Consultation with mana whenua is carried out through the council Maori Strategy and Relations Department, Te Waka Angamua, which facilitates liaison with relevant iwi. The types of consultation are summarised below.

Project level
This engagement happens when specific infrastructure projects have reached an advanced level of design, including when consents are being sought. Processes at this level focus on the activities that trigger Cultural Impact Assessments, such as potential effects from excavation works on areas of cultural importance such as waahi tapu, and how these are managed, for instance through the use of the accidental discovery protocols and cultural monitoring. The iwi groups consulted are based on the location of the project and their geographic areas of interest as identified through Te Waka Angamua.

Auckland Council has worked with mana whenua to develop a draft set of Te Aranga Maori Design Principles which have been incorporated into our consultation on major projects; refer to Section 2.3.5 for further details.

Engagement on the responsibilities of the Stormwater Unit and how we work
This engagement is a mechanism for engaging iwi on the specific activities the Stormwater Unit undertakes, and outlining the other parts of the council we work with. The aim of this consultation is also to present specific processes we have in place to identify, prioritise and implement works or programmes aimed at managing the issues that are of concern to iwi, such as stream health and contamination to waterways. This level of consultation has just been initiated, with the current aim of continuing it regularly through the council's Te Waka Angamua Information Hui.

Regular one-to-one meetings with each iwi group
We meet with each of the 19 iwi groups individually, approximately 2 to 3 times a year. Matters discussed include administrative issues such as financial reimbursement, to specific issues that may be a concern for that iwi. As an example, some individual iwi have raised concerns about the accidental discovery protocols used by us, or how confidentiality is managed through their Cultural Impact Assessments. It also provides a forum to identify projects for potential collaboration or areas of specific concern to that iwi. These meetings are aimed at maintaining an ongoing korero with each iwi group individually, to foster an increased understanding of the priorities and requirements between each individual group and us.

Stormwater Customer Surveys
The Te Waka Angamua survey is held annually as part of the Annual Report research programme. This survey explores mana whenua's perceptions of their relationship, engagement and collaboration with the council using the kaupapa Maori research model.

As water is of particular cultural significance to iwi the three waters (fresh water, waste water and storm water) are all interconnected. The challenge that we face is that the compartmentalised approach to water management taken by the council is seen as unhelpful by participants.

3.2.2 Online survey of residents

We organised an online survey of 1,500 residents, to understand how Aucklanders feel and understand about stormwater as part of a three year education programme. The survey was completed in 2014. Overall, enjoying the many benefits of clean waterways is central to the lives of Aucklanders. They care a lot (67% of respondents) about the way stormwater is managed in the city. Whilst it is not top of the mind for most, there is a desire to understand more about it and ways to help.

3.2.3 Network Discharge Consent (NDC)

Consultation was carried out based on CREs and the two prioritised CREs which were consulted on were the Waitemata and Tamaki CREs, with the aim of understanding the high-level Stormwater priorities in each area. Stakeholders were asked to provide feedback on two key questions:

1. From the stormwater issues identified, what do you think are the priorities for this specific CRE and what must be most urgently addressed?
2. From the Stormwater Unit's responsibilities, what do you think are the criteria that Auckland Council should use for selecting stormwater management priorities?

Feedback obtained from these two consultation questions assisted in developing and informing the selection of the best practicable options for managing stormwater effects from the council's public network. It is neither practically possible nor affordable to address all the negative effects of stormwater discharges, including existing effects, within the next 35 years (the duration of a stormwater NDC). Effort and resources therefore need to be directed to where the unit can make the most difference, in accordance with identified priorities.

Table 3.4 shows the range of stakeholders who have been consulted as part of the NDC process and the level of engagement.

Level of consultation commitment	Goal	Approach	Potential Stakeholders
Inform	To provide stakeholders with sufficient information to make them aware of the issue and decide if they would like to be further involved.	Stakeholders informed of issues and self-identify their degree of engagement up to the point of 'involve'. Stakeholders submit written submission and/or attend drop-in day. Stakeholders self-identify if they would like meeting with staff at the 'involve' stage.	• Independent Maori Statutory Board • Statutory Panels • Advisory Panels • NZTA • Central government • Environment and recreation interests • Community interests • Business interests Auckland Infrastructure Forum • General public
Consult	To obtain stakeholder feedback on analysis, alternatives and/or decisions		
Involve	To work directly with stakeholders throughout the process to ensure that their concerns and aspirations are consistently understood and considered.		
collaborate	To partner with stakeholders in each aspect of the decision including the development of alternatives and the identification of the preferred solution	Stakeholders previously identified collaborate with Stormwater Unit's staff to advise and help formulate solutions	• Iwi Maori • Mayor's Office • Deputy Mayor's Office • Local Boards • Council units and departments outside the Stormwater Unit • CCOs • Hauraki Gulf Forum

Table 3.4 Summary of consultation levels, consultation approach and potential stakeholders

The consultation results show that all issues identified for stormwater management are important. Consulted stakeholders felt that clean harbours and estuaries were one of the most important goals to be achieved and that groundwater was of least concern. As an example there are numerous community groups who are actively engaged in improving their environment and waterways.

Major Stormwater Projects

We consult the community on all major projects as part of the resource consenting process. Major projects have communication plans prepared specific to the project to ensure that the community is kept informed during the construction process to minimise disruption.

3.3 Collaborating with other service providers

Stormwater Unit works collaboratively with other service providers to ensure that stormwater is managed effectively regardless of asset ownership as shown in Figure 3.2. A large number of stormwater assets are located within areas controlled by AT and the council's Parks Department. These assets are managed by these entities and do not form part of this plan. The older areas of the Auckland area have a combined system (stormwater and wastewater) which is operated by WSL.

There are Memorandum of Understandings between Auckland Council and WSL, AT, Regulatory and Parks to ensure clear roles and responsibilities as follows:

- for professional relationship agreements with the Stormwater Unit
- for water and wastewater related information with Council's GIS Unit
- for developments with Council's Regulatory Unit

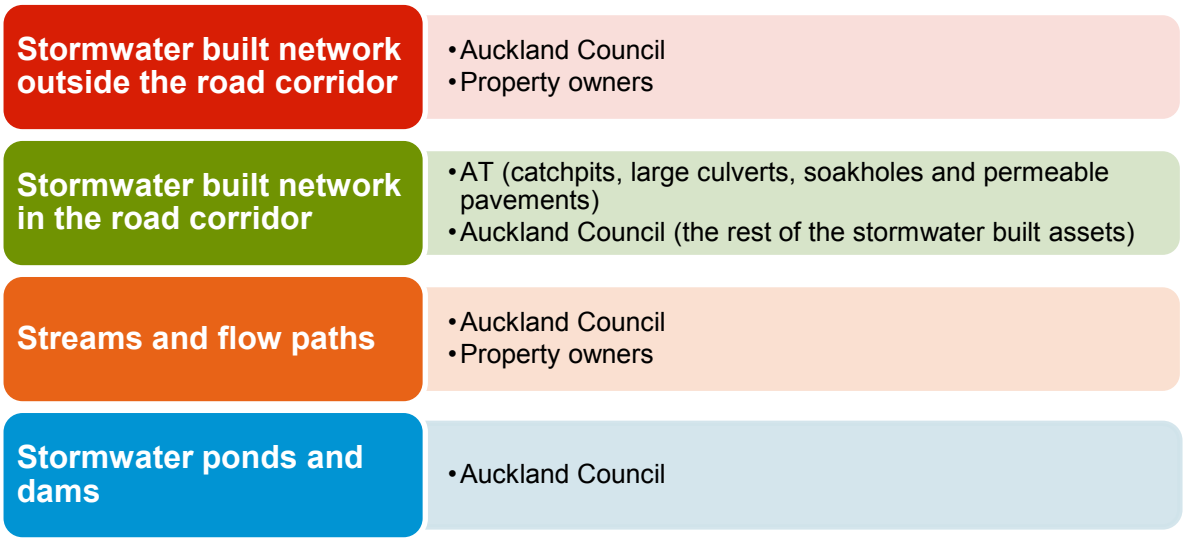


Figure 3.2 Stormwater asset ownership overview

Catchpits and soakholes in the road corridor are owned by AT but are maintained by us; this arrangement covers the urban areas and is supported by a high level agreement. The agreement's aim is to optimise the operation of stormwater assets.

There are some assets that are not part of the public stormwater system as follows:

- providing and maintaining subsoil drainage is the responsibility of the property owner; there are some existing subsoil drains in the Rodney area that are maintained by us.
- The responsibility for stormwater assets will be addressed with the development and implementation of a regional stormwater ownership policy (the work on this project is in progress).

AT's Asset Management Plan would have the most interdependencies and linkages to the Stormwater Unit's Asset Management Plan compared to the other infrastructure providers. AT's stormwater assets, with a replacement value of $2.3 billion, form 20% of its total assets. These assets include channels, manholes, catchpits, minor culverts and soakholes.

At the time of writing this SAMP, AT's road network stormwater management strategy section in their draft AMP (June 2015 version) has yet to be drafted. In their strategy we would like to see AT consider wider council lifecycle costs and benefits rather than focusing purely on the road corridor and linkages to the Stormwater Unit's water sensitive strategy. This includes having green infrastructure to treat high contaminant generating areas like roads, maintenance of these devices, and increasing the frequency of catchpit cleaning. The goal is to have the most cost effective stormwater management system regardless of whether the assets are Transport or Stormwater owned and operated.

Identifying clearer linkages and interdependencies between the different infrastructure providers has been noted as a future improvement in section 8.

3.4 How Auckland is growing

3.4.1 Growth and demand factors

Auckland is the largest and fastest growing city in New Zealand with most of the growth occurring through urbanisation of some of the rural areas of the city and intensification of specified growth areas. The population of Auckland has grown steadily over the last twenty seven years reaching approximately 1.5 million in 2013 and projected to reach 2.3 million by 2051. Understanding where and how Auckland will grow is a critical factor in the effective management of infrastructure and community assets.

The growth predictions used now are that recommended by the Auckland Regional Transport model (ART Model Scenario 1 Version 8b) to ensure that key transport objectives are delivered. The Integrated Transport Programme identifies and articulates the investment response to transport growth and demand identified in the Auckland Plan and the Proposed Auckland Unitary Plan (PAUP). We liaise with AT and other major infrastructure providers to ensure that

infrastructure is delivered in a meaningful and sustainable manner, and is aligned with the Auckland Plan and Infrastructure Strategy. Figure 3.3 shows the population growth projections by local board area to 2045.

The Auckland Regional Transport Model is used as a proxy for location and timing of imperviousness or demand assumptions whilst the PAUP imperviousness and assumptions are used to estimate maximum demand in 2045. The PAUP is the next step in delivering the vision of the Auckland Plan.

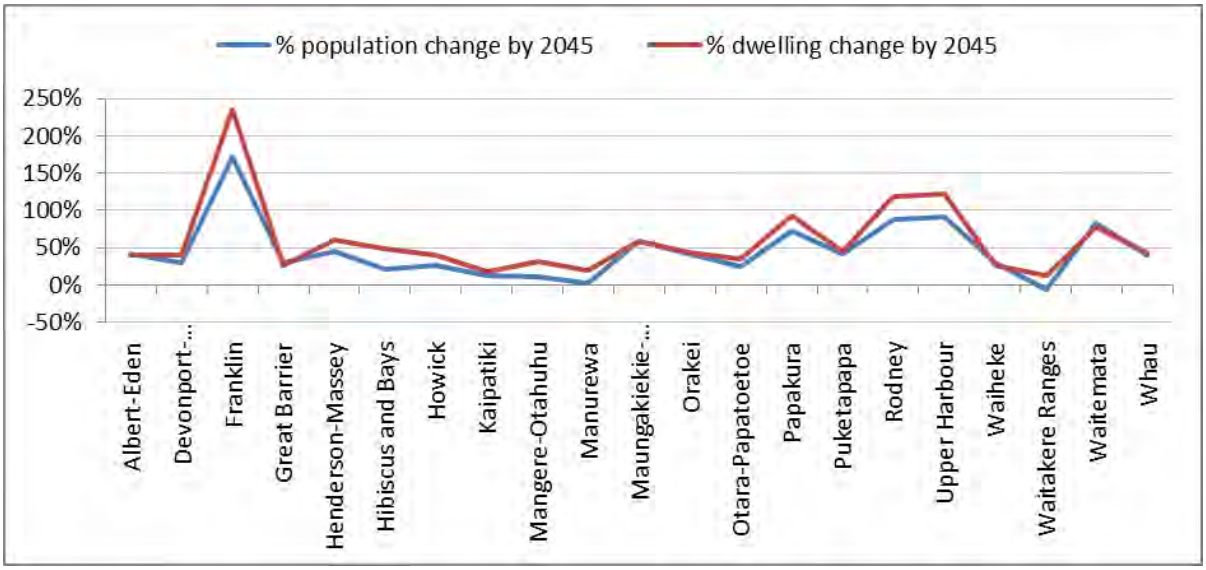


Figure 3.3 Population growth per local board area
Source: Auckland Regional Transport Model Scn I 8b, 2006

The link between the increases in population to the creation of additional impervious or paved surfaces is when new buildings are constructed to accommodate more people in both housing and employment. However, this is not a linear linkage as it is dependent on whether the new buildings go up, as in multi storey apartment blocks with supporting infrastructure already in place, or spread out, as in greenfield areas. Demand on stormwater infrastructure is directly linked to the creation of imperviousness. To a lesser extent other factors influencing stormwater demand are rainfall intensity patterns, building materials and human activities.

Forecasting stormwater demand is important because it addresses the negative effects of the discharge of stormwater on the receiving environment. It allows an assessment of the impact of future demand on current levels of service and in turn determines the affordability of addressing impacts of changing demand.

3.4.1.1 Change in imperviousness or land use

Land development increases imperviousness (paving and houses), alters the natural terrain, changes natural overland flow paths and affects soil permeability (compacted fill). The maximum permitted impervious surface is limited by the District Plan. This limitation has its challenges due to

the short (ten year) life span of these plans and the limited ability of regulation to manage the adverse effect of some aspects of landuse.

The type of landuse, residential, commercial and industrial, often indicates contaminant levels in stormwater runoff. Industrial and commercial growth in particular, without treatment, can significantly affect the quality and quantity of stormwater runoff directly, through increased imperviousness and industry driven pollution, and indirectly, through larger traffic volumes in the vicinity of sites.

However, it should be noted that there is not a direct relationship between predicted increases in impervious area and the future investment in stormwater infrastructure required to support that growth. There are several reasons for this, including:

- Existing or already planned infrastructure may already have adequate capacity based on Maximum Probable Development (MPD) assumptions
- Not all land is developed to the maximum potential imperviousness
- The level of investment required in stormwater infrastructure depends on the location of the development and the provisions which are applicable through the PAUP

The Auckland Plan, through its Development Strategy, has outlined the principle of future development as a balance between greenfield and compact redevelopment. The establishment of a Rural Urban Boundary places the emphasis on intensification in urban centres. Comprehensive redevelopment may present good opportunities to implement modern stormwater solutions; vertical developments (typical for business use) can create more open space and facilitate good stormwater management, provided that appropriate planning tools are available to aid the process or enforce the outcomes being sought. Patchy infill, on the other hand, creates more imperviousness and does not have the scale to trigger stormwater improvements.

3.4.1.2 Rainfall Patterns

Rainfall is monitored through a network of rainfall gauges throughout the region as described in section 2.3.3. Global climate change is likely to bring more intensive rainfall events with longer dry periods between them and annual rainfall volume is also expected to increase. Changes in rainfall intensity and frequency will have an impact on the performance of the stormwater network.

While changes to rainfall patterns are expected, these are likely to be less pronounced than the effect of increased impervious surfaces and greater stakeholder expectations for improvements in quality of stormwater runoff.

3.4.1.3 Building materials and human activity

Stormwater runoff is often affected by factors that are outside Auckland Council's control. The choice of construction materials, roofing materials in particular, like galvanised roofing and copper spouting leach trace elements that have negative effects on stream and marine ecosystems. Changes in technology and increased understanding of emerging or new contaminants will also influence demand.

Traffic on roads is one of the largest contributors to the pollution of stormwater runoff with contaminants like copper, zinc, hydrocarbons and sediment. With the roading network being an active element of the stormwater system, traffic intensification will result in a greater amount of pollutants being washed off roads and finding its way into the streams and harbours. We recognise the impact of road runoff and work closely with AT to achieve the most optimal and cost effective outcomes for the environment and the community.

Treatment of stormwater runoff is not always practical or possible as treatment facilities have limited efficiency. This is an example of when prevention is the best answer to stormwater issues. There is a need for Central Government to regulate the use of materials (product stewardship).

3.4.2 Demand projection

The Auckland Plan identifies how Auckland will develop to accommodate an additional one million people and 400,000 new homes by 2040. At the same time, the Auckland Plan provides flexibility so that up to 40% of new homes can be built outside the current metropolitan urban limit (MUL). The boundary which defines the maximum extent of urban development to 2040 in the form of a permanent rural urban interface is called the Rural Urban Boundary (RUB). The RUB is a tool to help ensure that at all times there is sufficient land coming on stream over the next 30 years to meet Auckland's housing needs while providing certainty over which rural areas will stay rural.

The Auckland Plan Development Strategy is based on 'Quality Compact City' approach. This approach has following benefits:

- denser cities have greater productivity and economic growth
- makes better use of existing infrastructure
- improved public transport is more viable
- rural character and productivity can be maintained
- negative environmental effects can be reduced
- creates greater social and cultural vitality

Urban development (or re-development) creates increased stormwater run-off due to increases in impervious land area. This results in increased demand for stormwater services such as drainage and treatment capacity, flood protection, and stormwater effects mitigation in waterways. Figure 3.5 shows the potential increase in impervious area across the region, based on the maximum development permissible under the PAUP. Table 3.5 provides a high level indication of the quantum of urban development, and hence demand for stormwater management responses, which could be expected across the region over the next 30 years. Re-development provides opportunities to enhance environmental outcomes and improve amenity features.

The greatest increase in imperviousness, 59%, will be where the MUL has been shifted to the RUB boundary i.e. urbanisation of greenfield areas. This is followed by intensification of current urban areas within the MUL where the imperviousness increases by 19%.

Catchment	Area (ha)	Year 2008 Aerial (Existing Imperviousness)		Maximum impervious area allowed in PAUP	
Auckland Region	483,374	27,351	**5.7%**	80,590	**16.7%**
Within MUL	57,099	23,689	**41.5%**	34,794	**60.9%**
Within RUB but outside of current MUL area	14,071	1,169	**8.3%**	9,431	**67.0%**

Table 3.5 Existing and Future Imperviousness
Source: Auckland Council, April 2014

It is expected that the increase in imperviousness will lag a little before there is a sharper increase when development picks up and areas are paved before it tails off again towards the end of this 30 year horizon. Essentially it will follow an S curve over time but the timing of it is very difficult to predict based on current knowledge. In all likelihood the ultimate PAUP imperviousness might not be reached regionally but rather an imperviousness that's slightly lower. A small number of sub-catchments have already exceeded maximum probable development (MPD). The following figures show spatially the existing imperviousness or existing development (ED) and MPD and is summarised in Table 3.5.

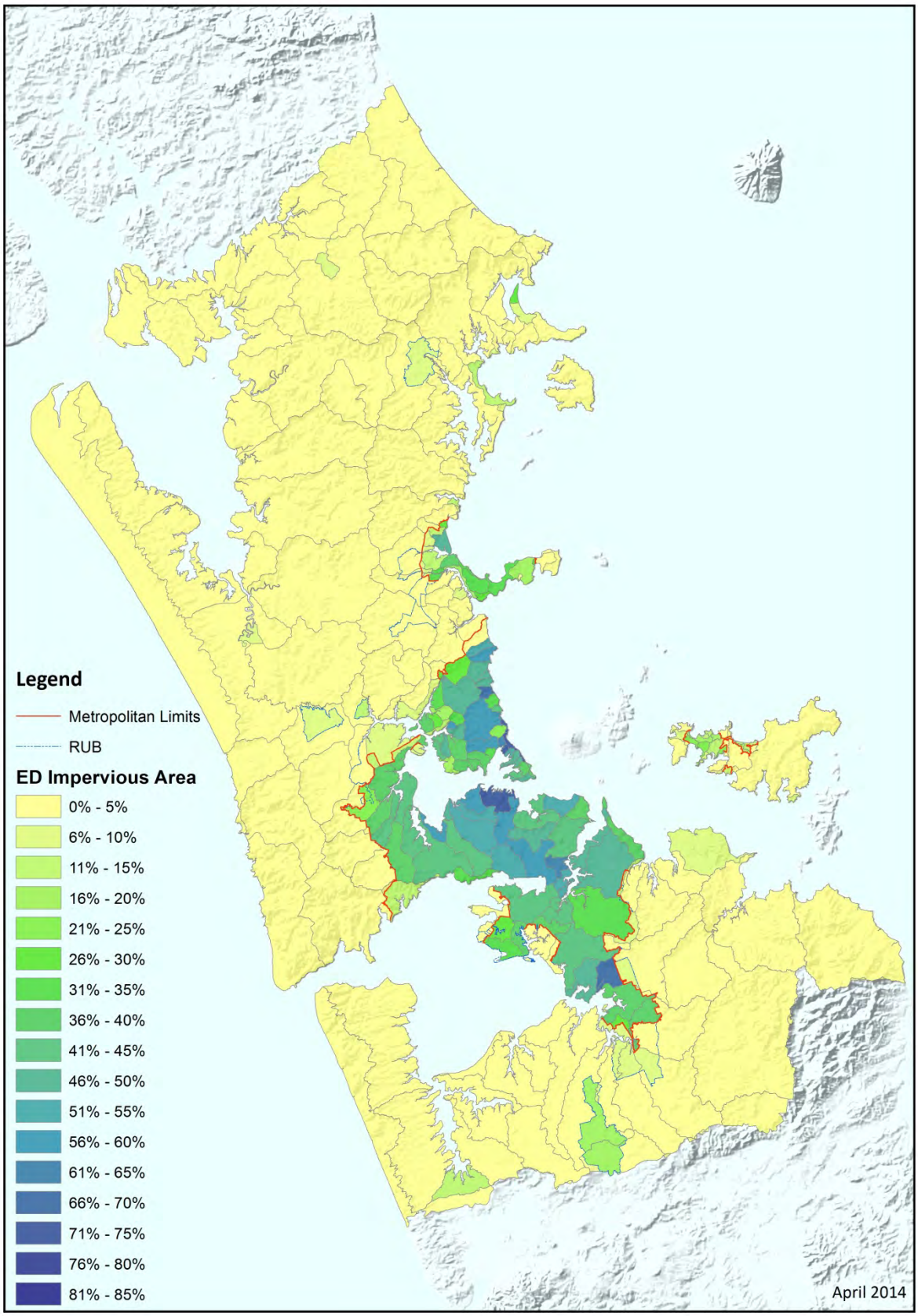


Figure 3.4 Existing Development Imperviousness (Source 2008 Aerials)
Source: Auckland Council, April 2014

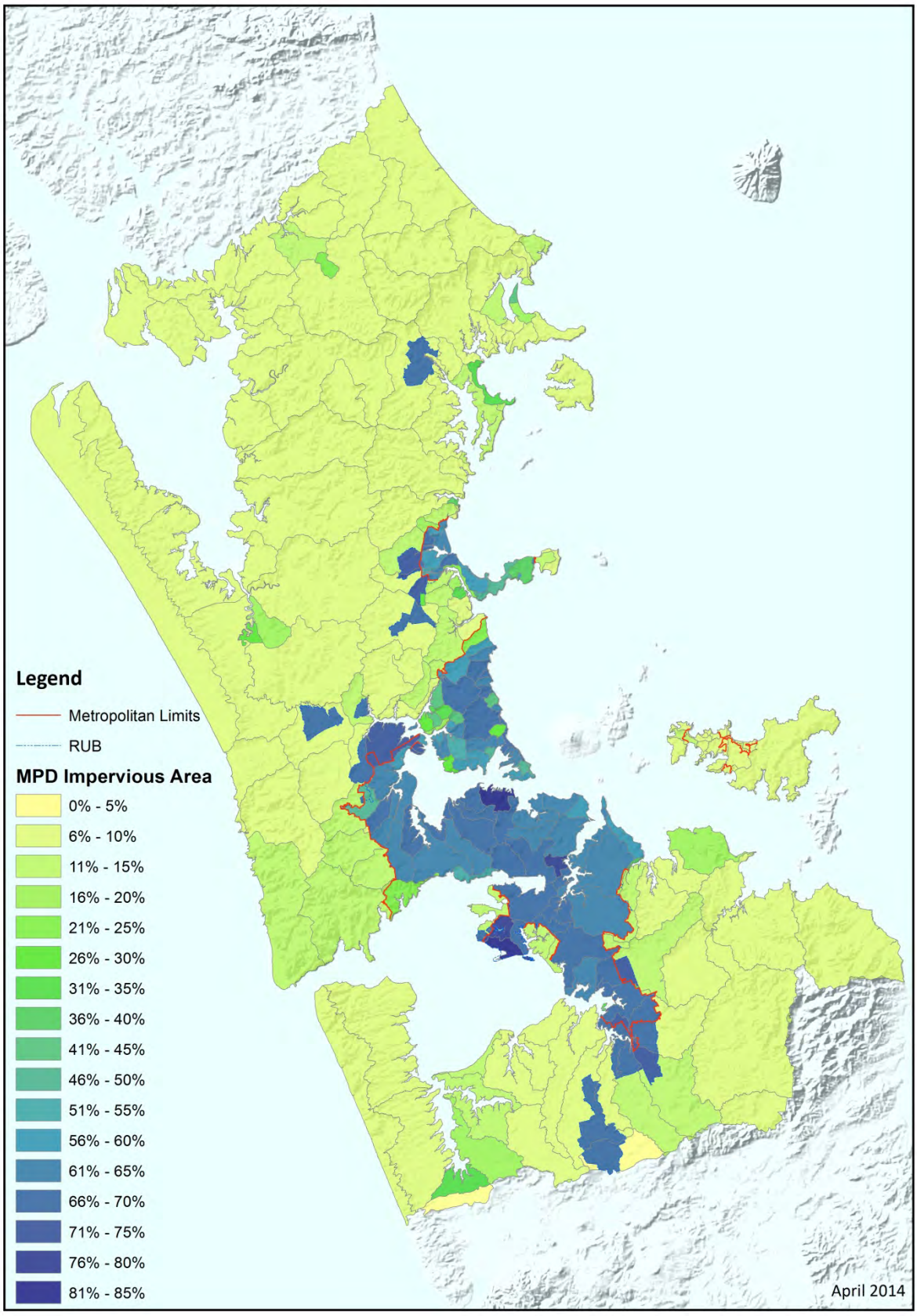


Figure 3.5 Maximum Probable Development (PAUP and Stormwater Unit Assumptions)
Source: Auckland Council, April 2014

Special Housing Areas

The Government and Auckland Council are concerned about the lack of affordable housing in Auckland and escalation of housing prices in the last five years which would be exacerbated by population growth predictions. As part of the plan to combat Auckland's housing crisis, the Government and the council set up the Housing Accord, with aims to accelerate delivery of housing across the city until the Unitary Plan is operative in three years' time.

Through the accord, SHAs are currently being identified for fast-track development. To date, 80 SHAs have been created which will enable the creation of over 10,000 new residential dwellings or sections within the period of Housing Accord, and over 29,000 new dwellings to sections over the longer term (Auckland Housing Accord Monitoring Report #2, Oct 2013 – Mar 2014).

SHAs are brownfield and greenfield areas inside the proposed RUB, identified for the purpose of urban development, mainly for housing, but with provision for business and community services and amenities as well. SHAs are where accelerated growth can occur in the interim period until Auckland's new PAUP becomes operative in about 2016. SHAs are enabled through a more flexible process for development approvals and consenting.

The Stormwater Unit provides specialist input to the HPO and growth priority is given to SHA areas. There has been a moratorium on new plan changes for the next five years to enable SHA areas to be adequately resourced.

Growth Priority Areas

The Forward Land and Infrastructure Programme (FLIP) informed the identification of the Growth Priority Areas (GPAs) for infrastructure planning and investment in the region. These are developed by considering the timing of anticipated brownfield and greenfield development and the infrastructure investments which are required to support that development. The GPAs are identified with input from regional infrastructure providers including AT (WSL and the Stormwater Unit

Since the transport, water supply, and wastewater infrastructure investments required to support growth are much larger than associated investments in stormwater infrastructure, the former have the greatest impact with respect to determination of GPAs.

Table 3.6 lists the GPAs which have been identified. These areas have been delineated based on transport sector and sub-sector boundaries, and therefore do not necessarily align directly with the boundaries of stormwater catchments. Figure 3.6 shows the locations of these areas within the region.

Future Urban Land Supply Strategy (FULSS)

This Strategy identifies a programme to sequence this land over 30 years and will assist with the ongoing supply of greenfield land for development. It is a strategic and proactive approach to delivering land that is 'ready to go' in these Future Urban areas, i.e. areas beyond the current MUL but within the RUB, see Figures 3.4 and 3.5. This programme will help to provide greater clarity and certainty to landowners, iwi, developers, infrastructure providers and Council about when Future Urban land will have bulk infrastructure in place and be ready for urban development. The programme will specifically:

- help to inform Auckland Council infrastructure asset planning and management and its infrastructure funding priorities and sequencing. It will feed directly into the Council's future Long-term Plans and the Annual Plans
- help to inform central government, such as the Ministry of Education, with medium to long-terms projections, location and investment decisions
- help to inform private sector infrastructure providers with forward planning and investment decisions.

The infrastructure investment required in these areas is of such magnitude that any ad-hoc or out of sequence approach to development will have major funding implications for all providers, affect the ability to coordinate delivery, and is likely to have major implications on the ability to service other areas. This in turn may have significant consequences on the ability to provide sufficient development capacity across the region.

The draft programme of future land area sequencing and maps can be found in Appendix C.

Growth Priority Area	Transport Sectors	Stormwater CRE(s)
City Centre	Auckland Central Freemans Bay Parnell / Newmarket	Waitemata
Inner West Triangle	Avondale / New Lynn Point Chevalier Mt Albert Mt Roskill	Waitemata
Greater Tamaki	Glen Innes	Greater Tamaki
NORSGA Stage 1	Westgate/Hobsonville / Scott's Point	Waitemata
Greater Takapuna	Takapuna	Waitemata
Otahuhu / Middlemore	Otahuhu	Manukau
Pukekohe - Wesley	Wesley Pukekohe	Manukau/ Waikato
Manurewa – Papakura Corridor	Maurewa / Weymouth Papakura Takanini / Redhill	Manukau
Manukau Metro	Wiri	Manukau
Flat Bush	Flat Bush	Manukau

Table 3.6 Growth Priority Areas identified through FLIP
Source: Auckland Council, June 2014

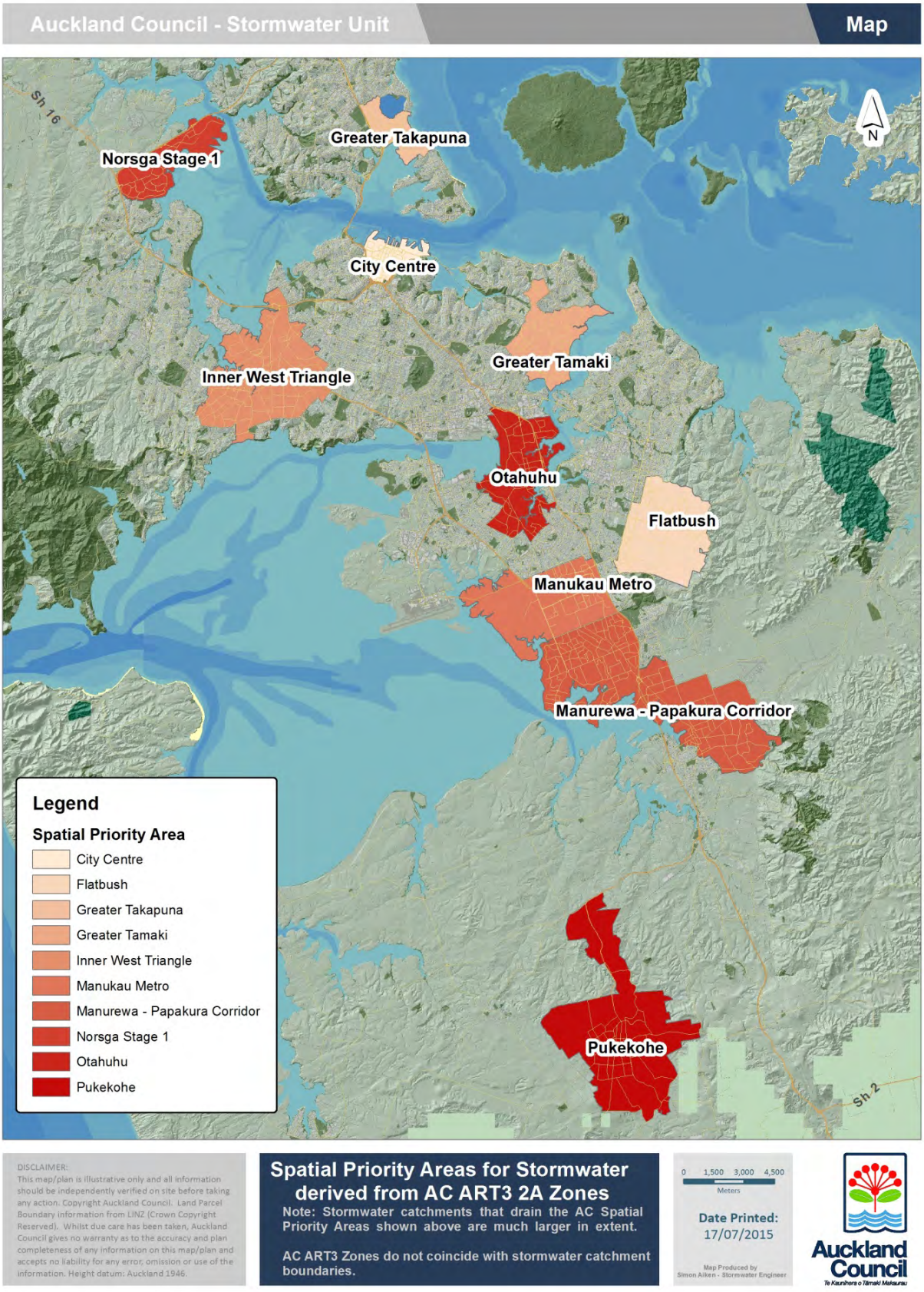


Figure 3.6 Growth Priority Areas
Source: Auckland Council, July 2015

3.4.3 Growth and Demand Assumptions

It is expected that development or growth will occur as per the PAUP, GPAs and Housing Accord. Stormwater investment will be coordinated with the other infrastructure providers and delivered in a co-ordinated manner.

Key areas where the PAUP does not specify impervious values are Future Urban, which has 70% assumed imperviousness, and rural ones which have a uniform 5% assumed imperviousness. These assumptions were based on existing urban and rural imperviousness trends and shown in Figure 3.5.

3.4.4 Demand Management Plan

Managing stormwater demand is not only about managing increasing future needs and expectations but also about change in behaviours and philosophy. Stormwater management is moving away from lined channels, big pipes and concrete outfalls, to a dispersed system of restored streams with riparian planting, fish passages, rain gardens, floating wetlands, protected overland flow paths and treating stormwater at source. This is aligned to our stormwater vision of a Water Sensitive Community.

Integrating landuse and stormwater management is a key to managing stormwater demands and achieving multiple and wider benefits. Our current demand management programme and future needs are summarised in Table 3.7. This programme will be continually refined when regional priorities have been determined.

Programme	Description
PAUP	The District Plan (DP) is the legal framework that Auckland Council uses for landuse planning. The management of impervious area is promoted along with hydraulic controls and treatment train approaches. Current development except for SHA areas are based on the various legacy DPs. The PAUP is being implemented for SHA areas and is starting to have weight in resource consent considerations for other areas. The Stormwater Unit actively participates in the development process.
Regulatory control - consents	It is better to prevent rather than mitigate by integrating the stormwater management objectives in all new developments from the initial planning and design stage. This means implementing/ enforcing rules and standards at consent stage.
Regulatory control monitoring	Monitoring compliance to discharge consents is essential element of stormwater management. The Stormwater Bylaw is very close to being adopted and will enable the council to monitor private devices and enforce maintenance.
WSD / Sustainable development	Sustainable development is vital for allowing intensification in built up areas. This includes water sensitive considerations such as rainwater tanks, bioretention, roof gardens, porous paving.
Catchment Management Planning	Catchment management planning is a key tool for facilitating the integrated approach to stormwater management to achieve the desired environmental outcomes.
Education and community	Auckland Council's website provides public education and information on sustainable practices including water sensitive development, stream erosion, stormwater initiatives

Programme	Description
engagement	and solutions. There are also stormwater education and community programmes that are designed to work in partnership with individuals, businesses, industry partners, schools and local communities to support stormwater outcomes. The Stormwater Unit is working on a three year education programme which started with an online survey (refer to Section 3.2.2). Education is important so that property owners understand their role and responsibility for managing their private stormwater systems. Resilience through education is planned because Auckland Council is unable to resolve all flooding and to help the community handle natural disasters
Pricing and financial incentives	Targeted stormwater tariffs such as charges for piping of minor streams to enable daylighting and enhancement of other streams, charges for stormwater improvements and impervious charges need to be considered. Impervious surface charges have been investigated in the past, but had little support due to the high establishment costs with little benefits in cost recovery. Discounts for implementing sustainable solutions with high regional uptake may have significant impact on stormwater costs and revenues (similar to the legacy Waitakere City Council development contribution policy for rebates if a certain Tool for Urban Sustainability rating is achieved).
Coordinating with other council departments	Coordinating efforts with other council departments and CCOs such as Parks, AT and WSL ensures infrastructure is built that has multiple benefits which include improved open spaces and amenity values. Auckland Council actively seeks opportunities when there is redevelopment or asset replacement to improve stormwater management.

Table 3.7 Demand management programme

4.0 Delivering the stormwater service

4.1 The governance and management of stormwater

4.1.1 Our governance structure

Good corporate governance is essential for prudent management and to create trust and engagement between various stakeholders. The Auckland Council governance structure provides the direction, oversight and checks and balances necessary to retain high performance, manage risks and maximise opportunities.

The Governing Body is made up of 20 Councillors representing 13 Wards across the region as well as the Mayor elected at large. Their responsibilities are:

- Approval of a draft LTP or draft Annual Plan prior to community consultation
- Approval of a draft bylaw prior to community consultation
- Approval of the Unitary Plan
  Overviewing the implementation of the Auckland Plan through setting direction on key strategic projects

This is implemented through a number of Committees and Advisory Panels. The Stormwater Unit, as part of the Infrastructure and Environmental Services (I&ES) Department, reports to the Auckland Development Committee through the Infrastructure Committee and through the Environment, Climate Change and Natural Heritage Committee to the Regional Strategy and Policy Committee, as shown in Figure 4.1 below.

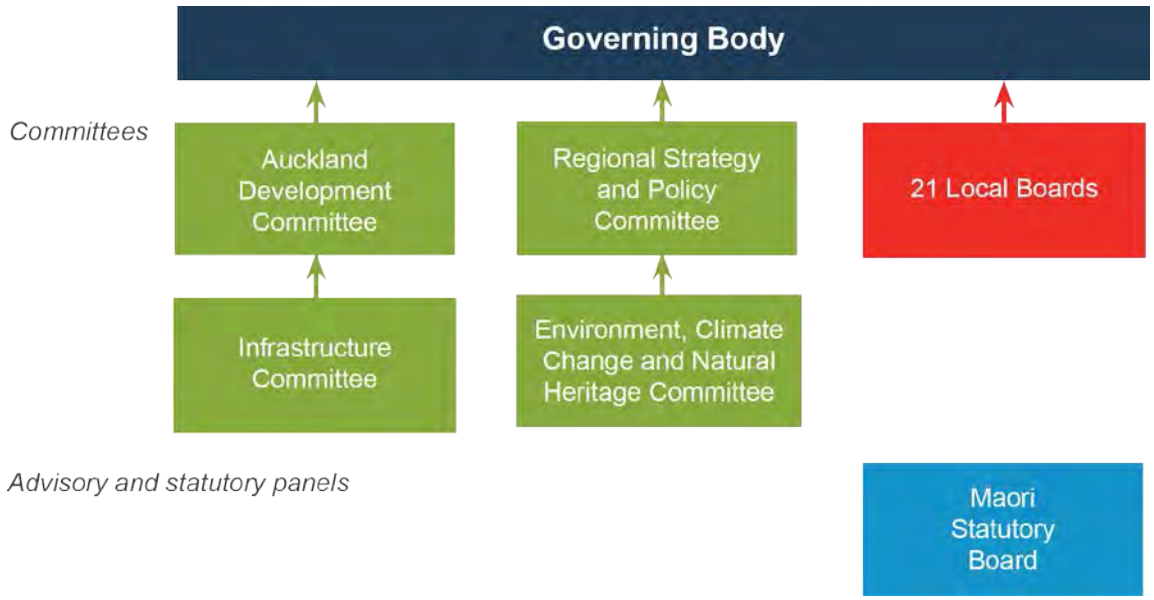


Figure 4.1 Stormwater governance structure, July 2015

Key council committees that the Stormwater Unit reports to are described as follows.

Infrastructure Committee
The Infrastructure Committee exercises the council's responsibilities with respect to infrastructure planning and projects, including stormwater infrastructure. The Committee considers and makes recommendations to the Auckland Development Committee to ensure alignment between the infrastructure sector, the Auckland Plan and the Unitary Plan to manage Auckland's growth, as well as alignment of stormwater strategies with other relevant Council strategies and plans.

Strategy and Finance Committee
The Strategy and Finance Committee exercises the council's responsibilities with respect to planning, decision making, and financial accountability as required under Part 6 of the LGA Act.

The Committee has responsibility for agreeing local board plans, oversees the development of the LTP and Annual Plan, and recommends these plans to the council for adoption. The Committee also has responsibility for the council's financial performance, treasury and funding functions, and rating policy. The Stormwater Unit reports to the Strategy and Finance Committee as required, to support financial planning and decision making.

Environment, Climate Change and Natural Heritage Committee
The Environment, Climate Change and Natural Heritage Committee is responsible for the management and monitoring of Auckland's biodiversity and ecosystems, and environmental initiatives, including freshwater management. The Stormwater Unit reports to this Committee with regards to the stormwater activity as it affects the management of freshwater resources.

Independent Maori Statutory Board
The Independent Māori Statutory Board advocates for issues of significance for Mana Whenua and Mataawaka in Tamaki Makaurau in the cultural, economic, social and environmental areas. The Board gives advice to the council about issues that affect Māori in Auckland, and works with council to create suitable documents and processes to help the council meet its statutory obligations to Māori in Auckland. We work closely with the Board to ensure that a Matauranga Maori aspect is incorporated into projects as necessary.

Local Boards
There are 21 local boards across the Auckland region with responsibility for local stormwater projects and catchment management initiatives within regional programmes. The Stormwater Unit provides an update on stormwater activity to each local board as part of the quarterly report from the I&ES Department, as well as reporting specific items for information and decision as required.

Environment and Sustainability Forum
The Environment and Sustainability Forum considers and makes recommendations to the council's Regional Development and Operations Committee on policies, plans and initiatives to achieve the integrated and sustainable development of natural and physical resources of the Auckland region.

The Stormwater Unit reports achievements and its current focus monthly via the I&ES Department Manager's report as well as reporting specific items for information and decision as required.

4.1.2 Our management structure

Overall responsibility for stormwater management lies with the Stormwater Unit, which is an integral part of the I&ES Department. The I&ES Department reports to the Chief Operating Officer and the Chief Executive Officer of Auckland Council, as shown in Figure 4.2.

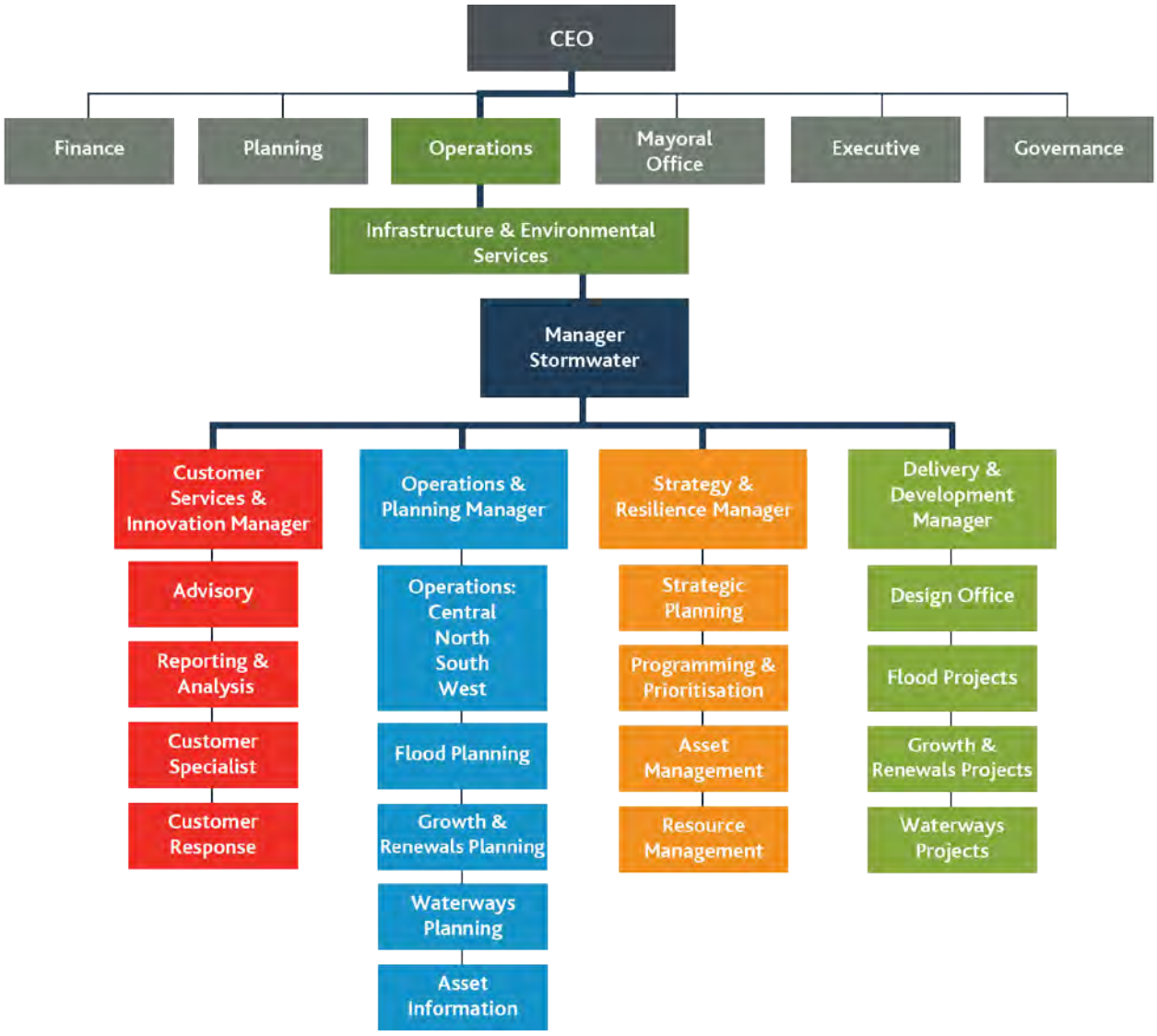


Figure 4.2 Stormwater management structure, July 2015

The main roles and responsibilities for each team are:

- **Customer Services and Innovation**
  Responsible for receiving and tracking customer queries, supporting operational and maintenance contracts, responding to complaints, driving business improvement initiatives and providing meaningful analysis and recommendations to drive business outcomes.

- **Operations and Planning**
  The Operations teams are responsible for the day to day operation of the network, responding to service requests, ensuring business continuity, monitoring system performance and asset sustainability.

  The Planning teams are responsible for the preparation of stormwater management plans for greenfield growth areas and areas of concern, preparing project briefs, maintaining hydraulic and contaminant models, floodplain mapping, providing catchment planning advice and managing stream walks.

  The Asset Information team is responsible for the management of GIS, asset information and business intelligence tools.

- **Strategy & Resilience:**
  Responsible for long term strategic planning, development of policies and strategies, asset management and preparation of the Asset Management Plan, inputs into the LTP, capital investment prioritisation and programming, and network, operations and project related resource consent applications.

- **Delivery & Development:**
  Responsible for the design and construction of all Council stormwater projects, providing development advice and ensuring that vested assets are fit for purpose.

Other teams under the General Manager I&ES which have significant interaction with the Stormwater Unit's activities include the Engineering and Technical Services Unit and the Environmental Services Unit.

4.2 Risk management

Risk management is an inherent part of the council's overall management philosophy and is incorporated in all of our stormwater practices. Risk is managed through development and ongoing review of activity risk assessments, as well as through emergency response planning, routine inspections and maintenance response. Uncertainty over asset knowledge and asset ownership such as green asset ownership is acknowledged to be a risk.

4.2.1 The risk management process

The enterprise risk management policy is to provide guidance and direction to the council and its participating CCOs. Enterprise risks are top risks which have the potential to significantly affect the organisation. Auckland Council recognises that risks are present in everything it does. Effective risk management is an integral component of good governance. The successful management of risk is essential to enable the council to lead the Auckland region and fulfil its objectives.

Policy Statement

Auckland Council will manage risks in an intelligent way to deliver the best outcomes for the people of Auckland and the organisation

The Audit and Risk Committee will review the Enterprise Risk Management Policy annually (or earlier as required) to reflect changes in legislation, good practice and the experience gained by Auckland Council.

The council has adopted the Joint Australian New Zealand International Standard: Risk Management – Principles and Guidelines (AS/NZS ISO 31000:2009) - an integrated risk management approach that provides a systematic and consistent methodology to risk identification, assessment and treatment as reflected in the risk management process.

The top risks, known as enterprise risks, will be monitored monthly with key risk exposures, issues and trends being the focus. Risks relating to strategic, operational and projects will be included. The reporting will comment on the risks, mitigations and the resources committed to mitigating the risks.

An illustration and description of the ISO 31000 framework and process follows.

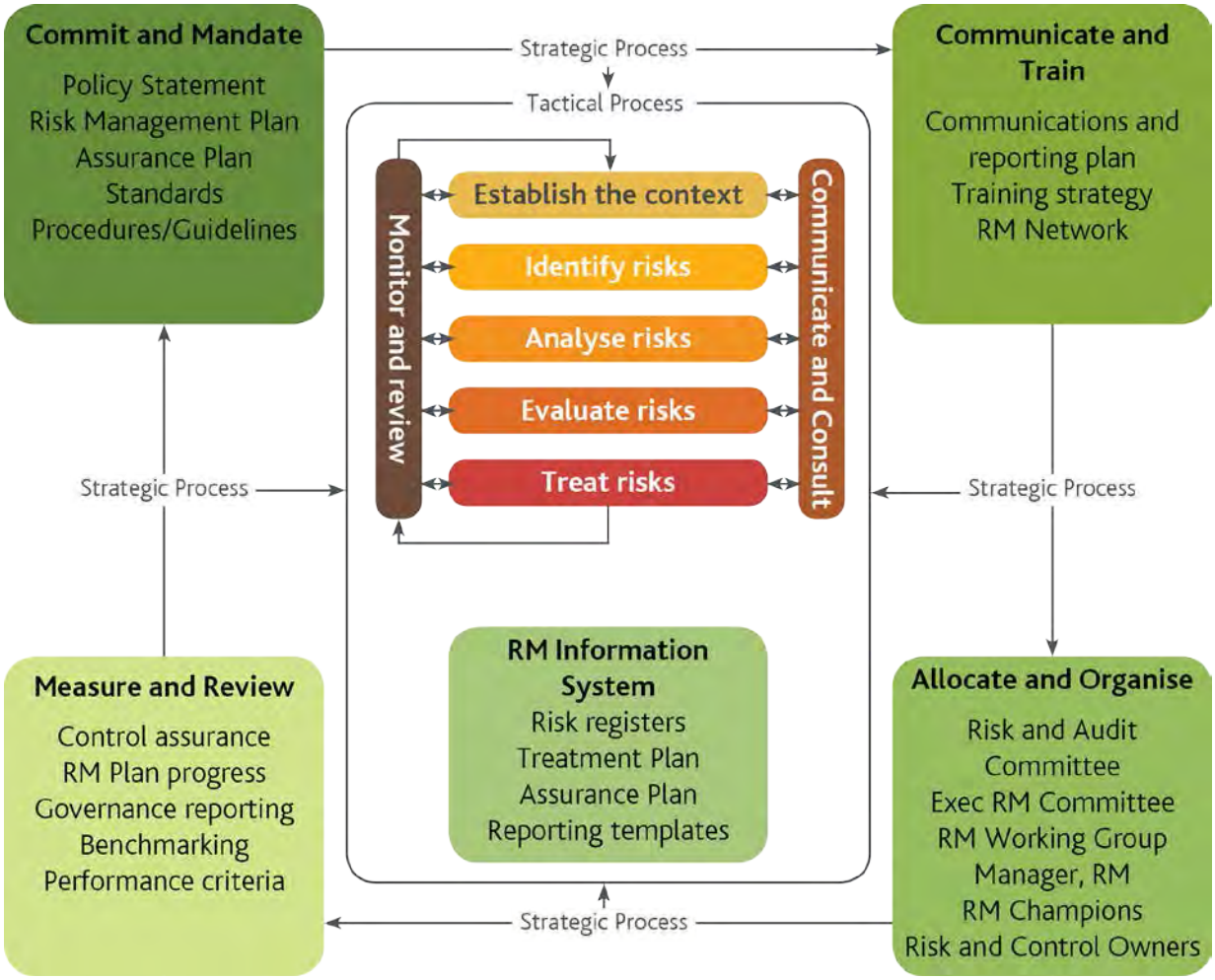


Figure 4.3 ISO 31000 Framework

The risk management process is designed to ensure that:

- all significant risks to the community, landowners, the environment and the council are identified and understood
- the highest risks that should be addressed in the short to medium term are identified
- risk reduction treatments which best meet business needs are applied
- responsibilities for managing risk are allocated to specific staff.

The risk management process adopted by the council is shown in Figure 4.4, which defines the generally accepted process for risk assessment and management.

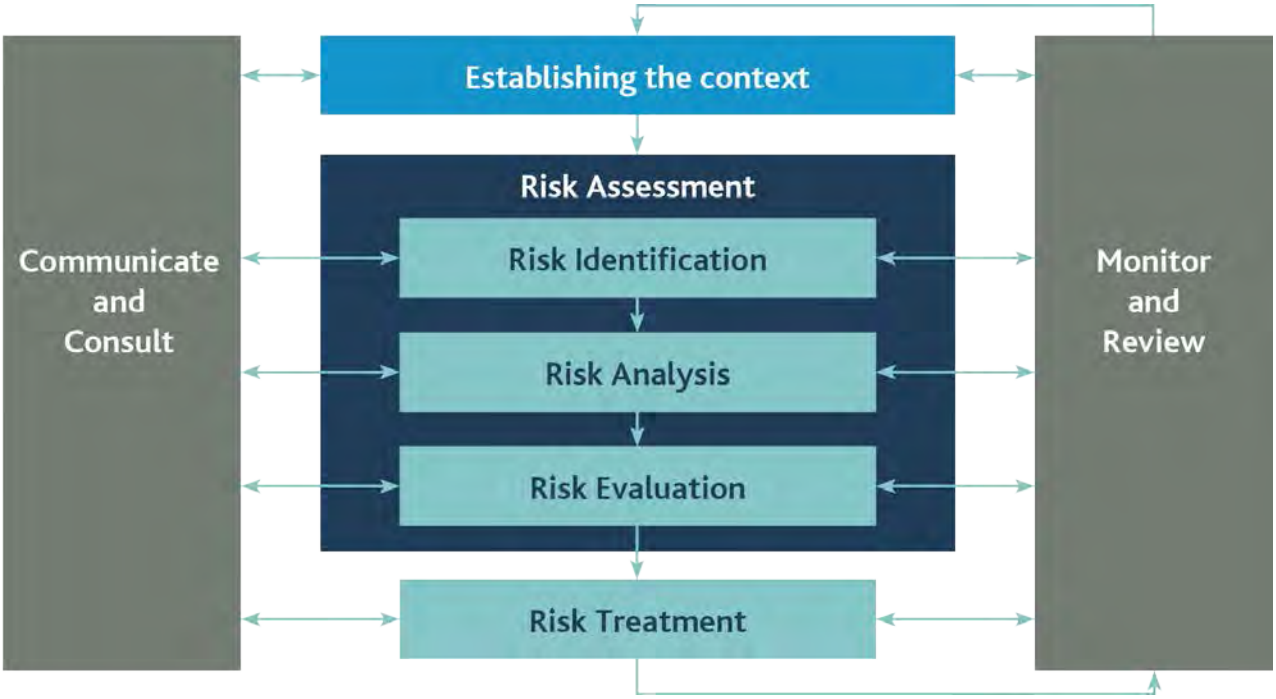


Figure 4.4 Risk Management Process

Risk context

The following steps were undertaken to establish the context:

- the relationship between the organisation and the environment has been defined, and the organisation's strengths, weaknesses, opportunities and threats identified to provide an understanding of the 'big picture' potential risk areas and opportunities to manage these risks
- internal and external stakeholders were considered to identify the extent of consequence to be included
- the organisation's capabilities to meet the levels of service and community outcomes were identified
- broad categories for sources of risk of not achieving the levels of service and community outcomes and areas of impact were identified

Risk identification

Events leading to failure to achieve defined levels of service, and therefore compromising achievement of strategic goals and community outcomes have been identified as activity risks.

Risk analysis

Risk severity has been assessed as the product of consequence and likelihood.

Risk evaluation

The matrix of consequence of failure and likelihood ratings is used to assess the level of risk, ranking events as low, moderate, high or extreme risk. Asset risks have then been compared, ranked and mitigation options assessed for all high and extreme risks identified. Auckland Council has adopted a broad treatment strategy for stormwater activity risks, as presented in Table 4.1.

Risk mitigation

Risk mitigation options seek to reduce the cause, probability or impact of failure, as outlined in Table 4.2.

Risk Severity		Treatment Strategy
Level 1	Low	Tolerate risk
Level 2	Moderate	Tolerate if the cost of risk elimination, transfer or reduction is greater than the improvement gained.
Level 3	High	Intolerable (active management by Operational Leaders)

Table 4.1 Risk severity and treatment strategy

Do nothing	accept the risk
Management strategies	implement enhanced strategies for demand management, contingency planning, quality processes, staff training, data analysis and reporting, reduce the target service standard, etc.
Operational strategies	actions to reduce peak demand or stresses on the asset, operator training, documentation of operational procedures, etc.
Maintenance strategies	modify the maintenance regime to make the asset more reliable or to extend its life
Asset renewal strategies	rehabilitation or replace assets to maintain service levels
Development strategies	investment to create a new asset or augment an existing asset
Asset disposal /rationalisation	divestment of assets surplus to needs because a service is determined to be a non-core activity or assets can be reconfigured to better meets business needs

Table 4.2 Mitigation options

4.2.2 Our key risks

The Stormwater Unit has identified the following high level risks through its risk management framework. They are:

- Popping stormwater manholes
- Development occurring in floodplains
- Inability to fund agreed service levels
- Asset information including condition and performance data not available or inaccurate
- Inadequate management of contaminant sources (other than sediment) that originate from sources beyond Council's control

- Failure to deliver sound stormwater projects with benefits directly aligned to Stormwater Unit's objectives.
- A group of risks which are essentially failure and lack of resilience of critical infrastructure to an earthquake, volcanic eruption, tsunami and/or climate change. These, however, have yet to be debated and accepted but are included in the appendices.

The Risk Register in appendix D details all the activities' risks, the current controls and the additional controls which will be implemented to result in the mitigated risk rating. This risk register is dynamic and subject to change. It should be noted that for natural disasters, the financial provisions for risk is embedded within the flood protection programmes and the council does not specifically insure stormwater assets.

Further discussion on operational risks can be found in section 6.4.2 Operational Risk Management.

5.0 The assets we own

5.1 Summary of assets and value

Auckland Council owns and manages most of the region's stormwater assets. A safe and efficient stormwater network is essential for protecting communities from flooding and protecting the environment. The stormwater system consists of built and natural assets as shown in Figure 5.1.

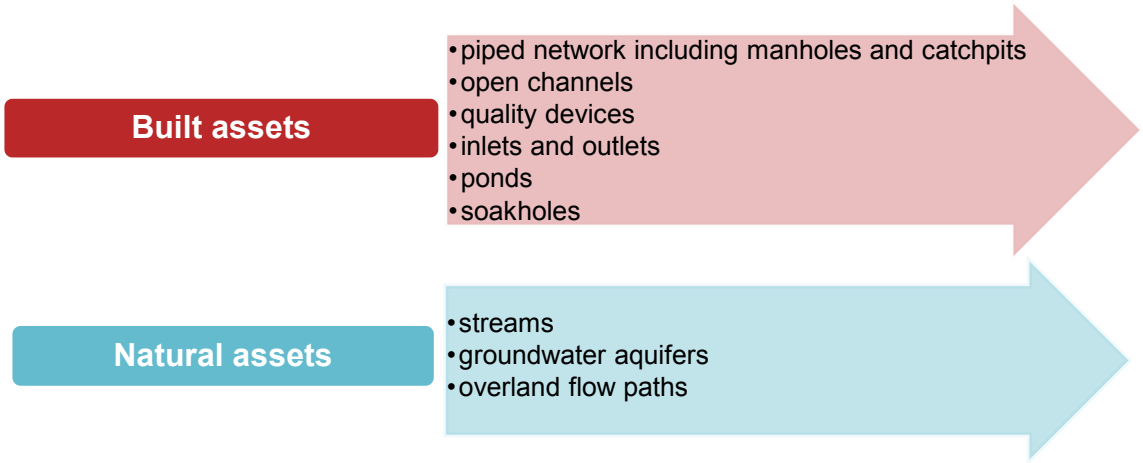


Figure 5.1 Stormwater assets

The built public stormwater network includes approximately:

- 6,000 km of pipelines and culverts
- 145,000 manholes
- 377 km of lined and unlined channels (not including roadside drains)
- 6,700 catchpits
- 25,000 outlets and inlet structures
- Over 900 detention and treatment facilities

Source: Auckland Council, June 2015

Natural assets which cover streams, overland flow paths and groundwater aquifers are an important part of the stormwater network. The role of overland flow paths is to convey excess flows when the reticulated system is overloaded; the major part of the peak flows in a storm event is conveyed via overland flow paths. Streams play an important role in the stormwater network because they have multiple functions beyond the conveyance of stormwater. This includes amenity and ecological benefits with ecosystems which can change when inflow pollutants and flow regimes change.

Our hard infrastructure assets such as pipes and manholes whilst performing a crucial function, however, are typically designed to serve a single function and have limited adaptability.
The council's stormwater network services most of the Auckland urban areas and rural townships. Some areas that are not provided with a reticulated stormwater system such as Waiheke Island are serviced by assets built as part of the roading network. Parts of central Auckland are serviced

by a combined sewer system which is managed by WSL. The reticulated stormwater system discharges into streams and rivers, aquifers or directly into the marine environment.

The Stormwater Unit works collaboratively with other council departments and agencies to ensure the stormwater is managed effectively regardless of asset ownership. The responsibility for all public stormwater assets will be addressed with the development and implementation of a regional stormwater ownership policy (the work on this project is in progress). Refer to section 3.3 for an overview on our collaboration with other service providers and stormwater asset ownership.

It should be acknowledged that the lack of one common asset management system and data gaps make it difficult for this Stormwater Asset Management Plan to optimise patterns of renewals, maintenance and relationship with growth.

Stormwater assets owned by the council and managed by the Stormwater Unit have been revalued in 2015. The current value (optimised depreciated replacement cost - ODRC) of stormwater assets as at 26 June 2015 is $4 billion as summarised in Table 5.1.

Asset Class	Quantity	Unit	ORC	ODRC (Current Value)	Annual Depreciation
Pipes and culverts	6,070,885	m	$3,781,399,419	$2,766,170,394	$30,838,807
Manholes	145,238	No	$776,895,700	$608,013,876	$6,522,524
Ponds and wetlands	492	No	$272,198,832	$238,425,347	$2,041,491
Inlets and outlets	25,019	No.	$162,602,893	$120,508,504	$1,467,730
Service connections	127,235	No.	$161,521,659	$128,017,322	$1,644,862
Channels	376,665	m	$110,711,972	$77,161,926	$693,565
Erosion protection and flood control	6,220	m	$65,823,326	$53,190,410	$648,219
Water quality devices	436	No.	$19,690,557	$16,976,216	$365,049
Catchpits	6,673	No.	$12,298,938	$9,846,430	$121,420
Soakage systems	361	No.	$7,068,762	$4,648,714	$110,489
Pump stations	3	No.	$1,347,039	$923,043	$23,327
Total 2015			**$5,408,564,092**	**$4,060,437,418**	**$44,702,363**
Total 2012 (for comparison)			$4,747,392,031	$3,517,319,901	$41,185,498
Variance $			$661,172,061	$543,117,517	$3,516,865

Table 5.1 Stormwater asset summary
Source: Stormwater Asset Revaluation 2015

ORC – Optimised Replacement Cost
ODRC – Optimised Depreciated Replacement Cost

Since 2012 the overall value of the stormwater assets has increased by 15.4% with annual depreciation rising by 8.5% over the same period. Pipes, Manholes and Ponds make up 90% of the ORC of the assets. The main difference to the 2012 valuation comes mostly from the change in asset base for pipes and ponds, and an increase in ponds and manhole replacement rates.

Natural assets such as streams, rivers and overland flow paths were not included in the valuation although without doubt they are of enormous value to communities and the natural environment.

5.1.1 The formal built network

The provision of a stormwater network has occurred since Auckland's earliest development. Auckland's urban areas are predominantly serviced by a piped or channelled stormwater network, although in some areas where development intensities are low, the public stormwater system may comprise predominantly of roadside drains. In the rural areas there is very little built network to manage stormwater and a greater reliance on natural systems. The stormwater network includes a range of natural components such as streams, groundwater aquifers, wetlands, floodplains and overland flow paths that play an essential role in storing and conveying stormwater.

Stormwater management in the Auckland region has evolved over the last 20 years. Protection of streams and contaminant removal has much more prominence today, in comparison to 10 years ago. The evolution also includes the recognition of the importance of managing land use activities and addressing issues at source. This is essential to meet the aspirations of the Auckland Plan for green growth and sustainability and revive degraded receiving environments.

Stormwater is organised into 235 stormwater catchments and 10 CREs to facilitate stormwater management as shown in Figure 2.1. Catchments are general terms which refer to a watershed area which drains to the same receiving environment. They range from small to very large areas. The key elements of the built stormwater network are introduced below.

Pipes
Stormwater pipes (along with culverts) form the backbone of the built stormwater network. Pipes vary in size between 150 mm and over 4 m in diameter. However, the network comprises predominantly of small pipes; 89 % of all pipes are less than 600 mm in size. Waitemata is the oldest developed CRE in the region and as expected has the most lengths of pipes in the region as shown in Figure 5.3, with Manukau Harbour and Tamaki close behind.

Figure 5.2 shows the spread of pipe diameters, lengths and materials in the region and the unknown proportion is mainly in the smaller diameters. The predominant pipe material is concrete, with pockets of old asbestos cement (AC) and brick. Polyethylene (PE) and polyvinyl chloride (PVC) are typical for new installations of smaller diameter pipes. The replacement cost of pipes with diameters of 600 mm or less is over $1.7 billion or 43 % of the estimated pipe replacement cost and their length. This is due to the relatively close proximity of receiving streams and the coast, and perhaps due to upgrading by the method of least disturbance in the urban situation, e.g. existing pipes are duplicated to increase capacity instead of replacing the existing pipe with a larger pipe.

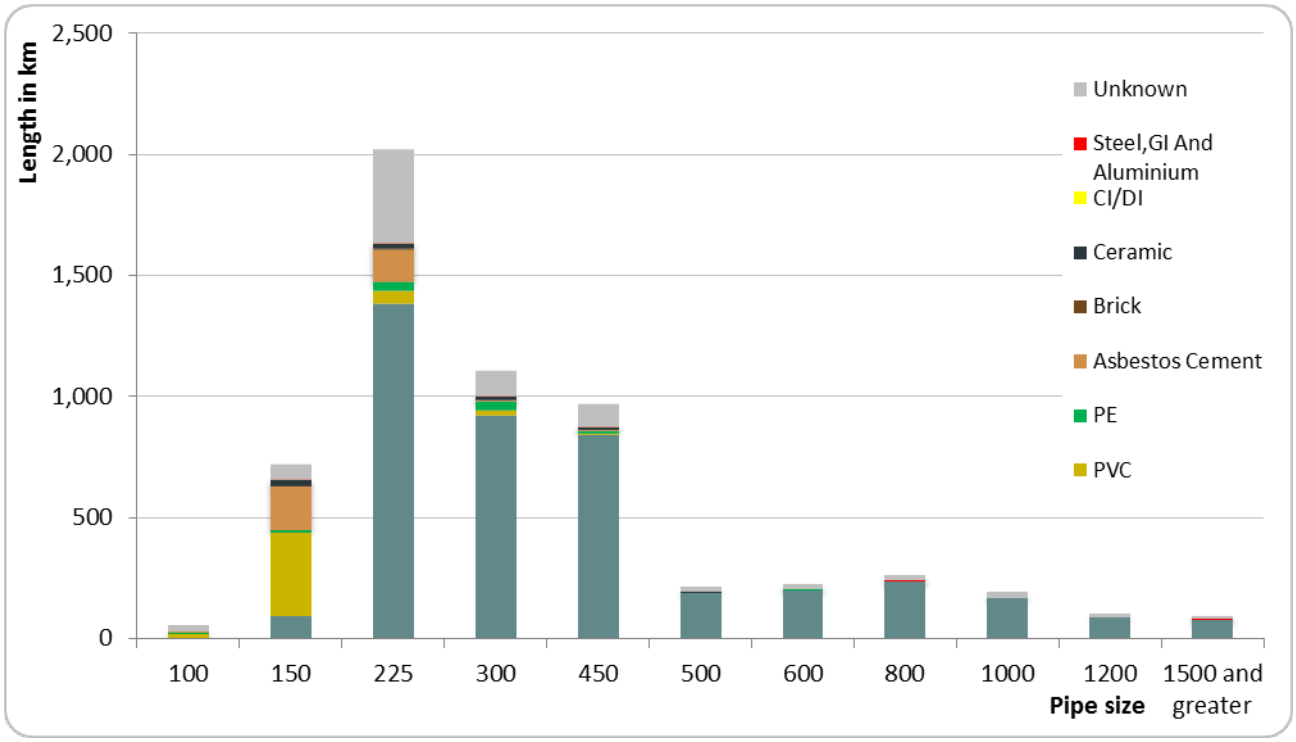


Figure 5.2 Pipe diameters, lengths and material
Source: Auckland Council, June 2015

Approximately 13% of pipes are of unknown material and the estimated replacement value is estimated to be over $480 million as at 26 June 2015 (the assumptions in relation to the valuation of unknown materials are outlined in the Stormwater Asset Valuation Report 2015).The age of unknown pipes has been been estimated based on factors which include existing documentation held by others, surrounding development patterns and structure plan age, pipe materials and local knowledge.

Determining pipe age is a difficult and expensive task as asset installation years were only captured consistently in the last 20 to 30 years. In the 1980s councils in the Auckland region undertook large projects to complete missing asset installation data to meet the requirement of LGA 1974 for completing asset revaluations. These projects mainly captured dimensions and condition, and to a lesser degree, age.

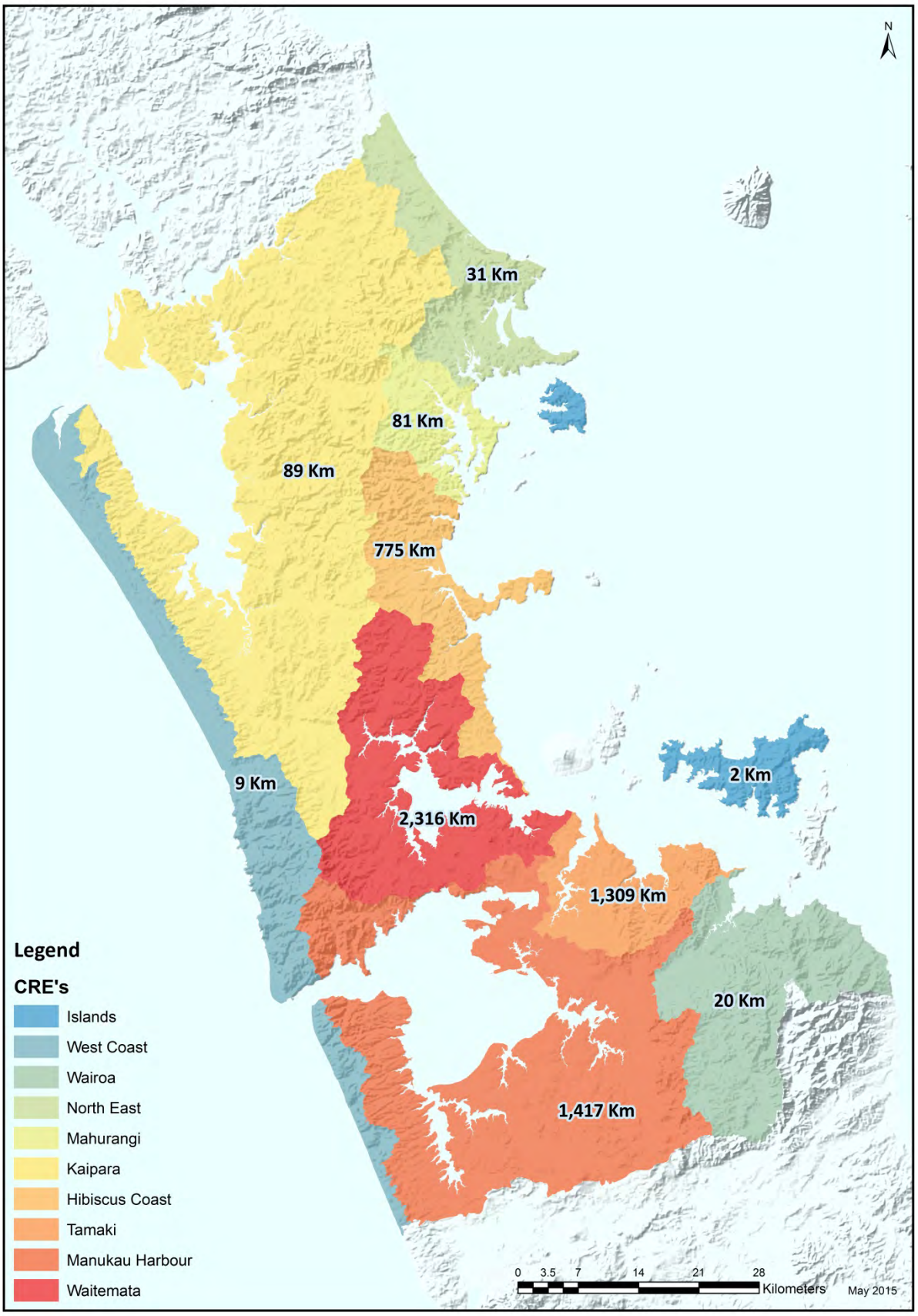


Figure 5.3 Lengths of pipes per CRE catchment
Source: Auckland Council, June 2015

The implications of low confidence assumptions on stormwater pipe installation age accuracy are not significant as the regional stormwater systems are fairly young. About 60% of the pipes were installed in the last 35 years. The oldest pipes, installed before 1940, are found in CBD, Motions, Meola, Grey Lynn, Epsom, Newmarket, Onehunga and the Eastern Bays Catchments. The newest pipes were installed after 1990 and are in Pakuranga, Oteha Valley, Puhinui Creek, Wairau Valley, Otara Creek and Hobsonville Catchments. In addition, some old brick pipes are performing satisfactorily as structural capacity and condition are the main drivers for renewal rather than age alone.

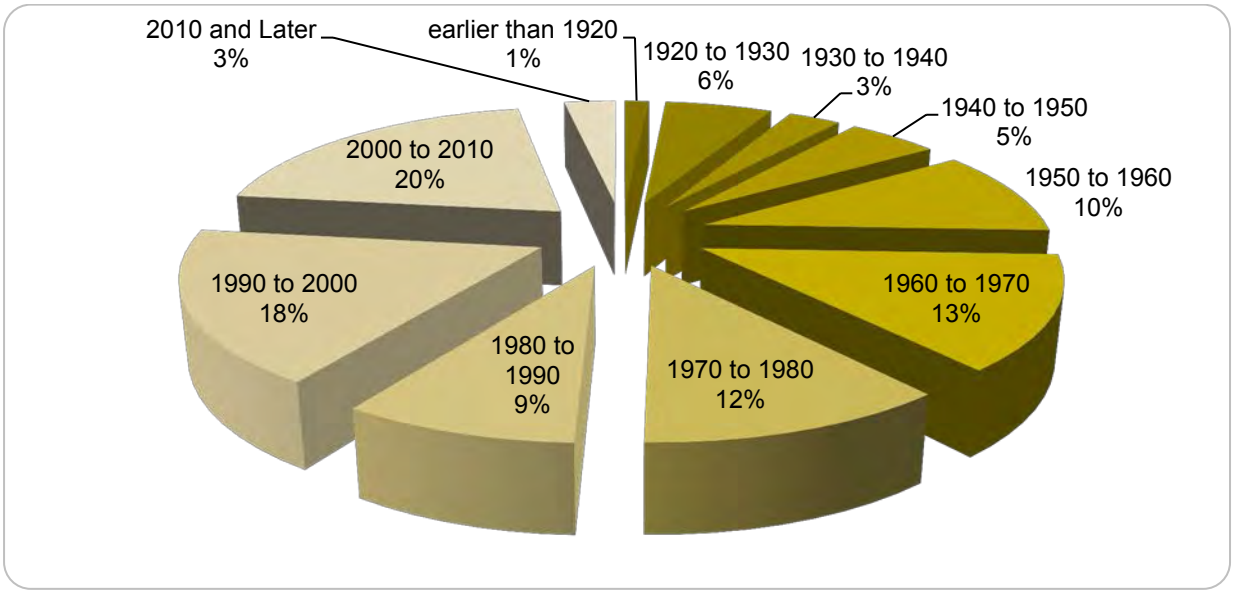


Figure 5.4 Stormwater pipe age
Source: Auckland Council, June 2015

Problematic pipe materials like AC and ARMCO play a part in renewals. AC pipe was a popular choice of engineers for during the 1940s to 1960s because of its light weight and ease of handling, low friction and corrosion resistant properties. However, over time health issues with handling asbestos and AC pipes becoming brittle with vertical loads meant that it is no longer being used and existing ones are being progressively replaced. Likewise, the ease of installation and low cost of large ARMCO or corrugated steel pipes meant they were a popular choice for culverts in the past but the majority are now heavily corroded, and many have failed structurally before the anticipated end of pipe life. ARMCO culverts were targeted in the criticality assessment and are either monitored or proactively replaced.

The key purpose of determining an asset's age is to help us determine its remaining life. We compensate for the inaccurate asset age information with robust targeted condition surveys and comprehensive understanding of the asset condition.

Manholes

Council owns approximately 145,238 manholes and chambers. Manholes and chambers provide maintenance access to pipelines and are located where there is a change of diameter, direction or grade. Most manholes are constructed from precast reinforced concrete with cast iron covers and frames. Generally the ages of the manholes are similar to their adjoining pipes. Manhole depth

varies widely; the majority of the manholes are less than 3m deep, however it has to be noted that depth and diameter data is not available for approximately 30 per cent of all manholes.

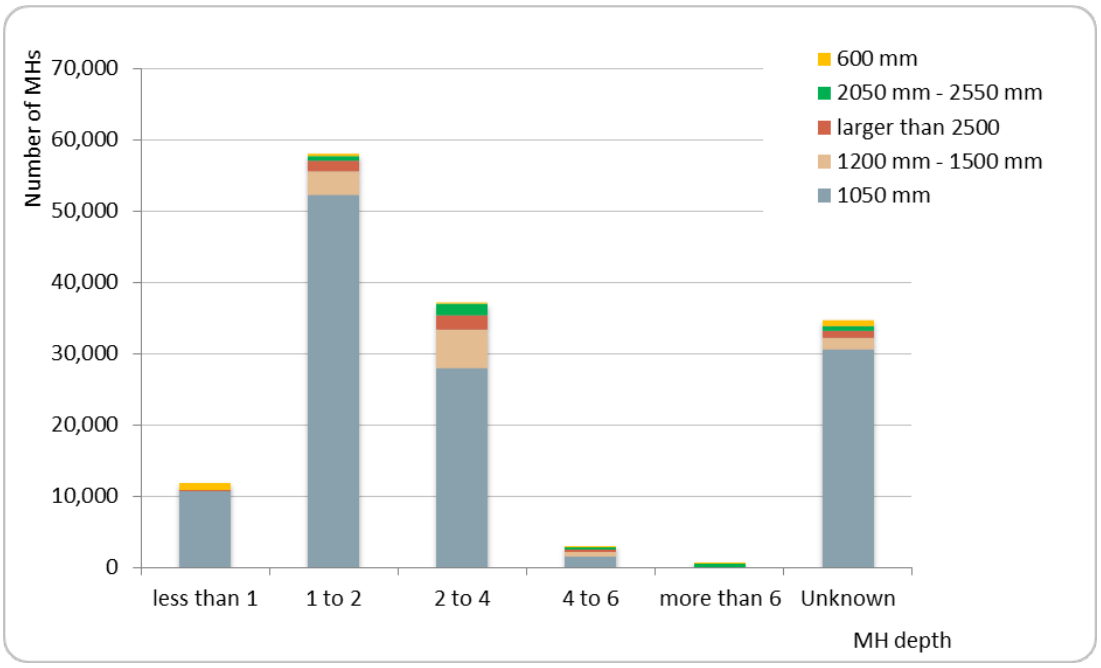


Figure 5.5 Manhole size and depth distribution
Source: Auckland Council, June 2015

Most of the manholes are the standard 1050mm diameter size and newly installed manholes are precast concrete, but some are also old brick and cast in situ. Manholes are fitted with covers to suit their function and location and to protect public safety known surcharging manholes are fitted with grated or lockable covers.

Catchpits

Catchpits are small grated chambers which capture stormwater runoff and send it into the piped stormwater network. There are around 95,000 catchpits across the region and Auckland Council owns around 6,700 of these catchpits. Over 80,000 catchpits provide drainage to roads and the majority are owned by AT. The Stormwater Unit through a Service Level Agreement provides operations and maintenance functions for AT's catchpits. Half of all catchpits are located in the Waitemata CRE.

Catchpits vary widely by size and design; the location and size of catchpits as well as the way water enters the unit depends on its location, purpose and topography. They are designed to collect surface run off and prevent obstructive material from entering and blocking the reticulation. Catchpits are generally located at low points of sealed areas and provide limited treatment. For some catchments, catchpits are the only treatment device before stormwater is discharged into the receiving environment.

Megapits are devices that are designed to reduce the discharge of large flows from overland flow paths on the road carriageway. Many have been installed to minimise habitable floor flooding caused by inlet capacity restrictions.

Culverts

Stormwater culverts are generally structures that facilitate a stream crossing under a road or large embankment. Culverts were defined differently by legacy councils as stormwater or road related. Culverts were often not adequately identified in the legacy asset registers, or at times captured as a different asset class (pipes), or not captured at all for smaller sized culverts. The data completeness of stormwater culverts has been identified as a future improvement initiative and needs to be resolved together with AT.

There are about 50 km of culverts of various sizes under the council's ownership. They are mostly in the smaller diameters of up to 400 mm. Most of the large culverts are owned and managed by AT. Like pipes, concrete is the predominant material but there are also small lengths of ARMCO and other high risk materials across the region as shown in Figure 5.6. The total replacement cost of our culverts is about $110 million. Over 50 per cent of culverts were installed after 1990.

NZTA and KiwiRail own the culverts under the motorways and rail corridor respectively. These culverts can have a significant impact on our network because these transport corridors often bisect a catchment.

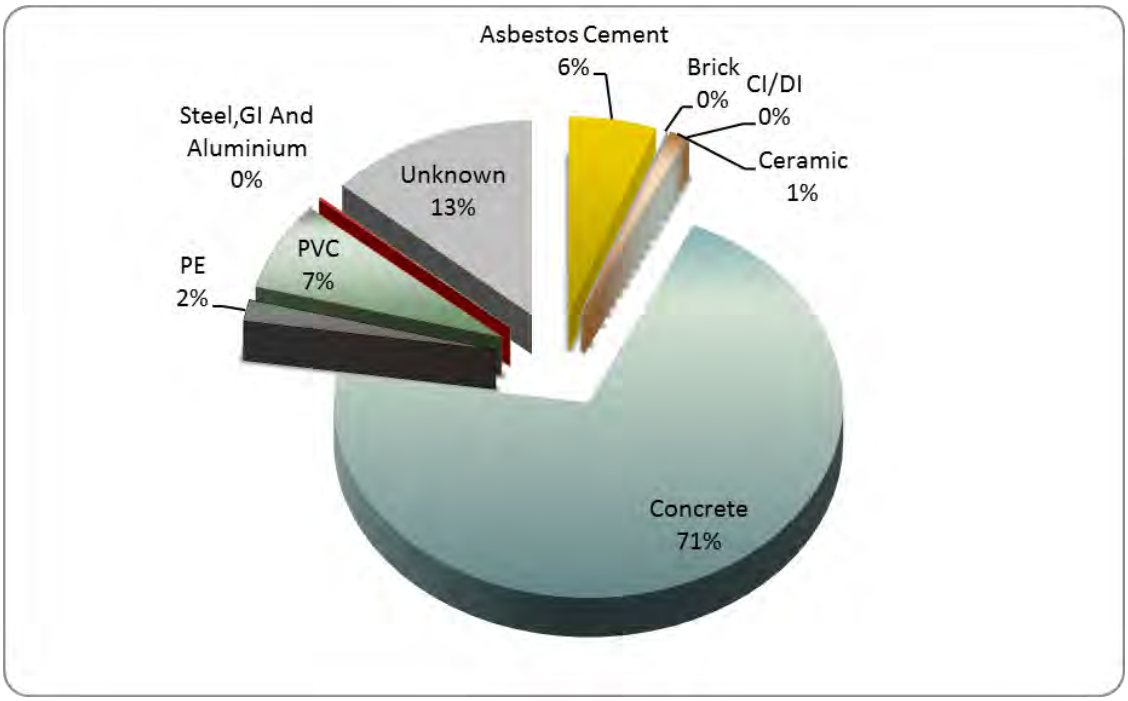


Figure 5.6 Pipes and Culvert Material
Source: Auckland Council, June 2015

Lined and unlined channels

Channels are used as an alternative to pipes where terrain allows. They are natural formations that sometimes are further shaped and modified to accommodate the required flows. The channel banks can be lined or planted subject to ground condition, location and capacity. Some of the channels were once streams but this practice is now unacceptable. Council owns 370 km of channels; the majority of those are located in Rodney and North Shore areas. Channels are located on both public and private property and alongside roadways.

Ponds and dams

There is currently no clear distinction between ponds and dams in the asset register although they have slightly different functions with the main difference being size. On our asset register there are 145 dry ponds and 347 wet ponds and wetlands, and 28 detention tanks in the region owned by the council, as shown in Figure 5.7. It is estimated that approximately 30 out of the 342 are wetlands. Ponds and wetlands are constructed to provide treatment, flood attenuation and/or minimise erosion and maintain stream hydrology as closely as possible to predevelopment levels. Dry ponds only provide attenuation but not treatment.

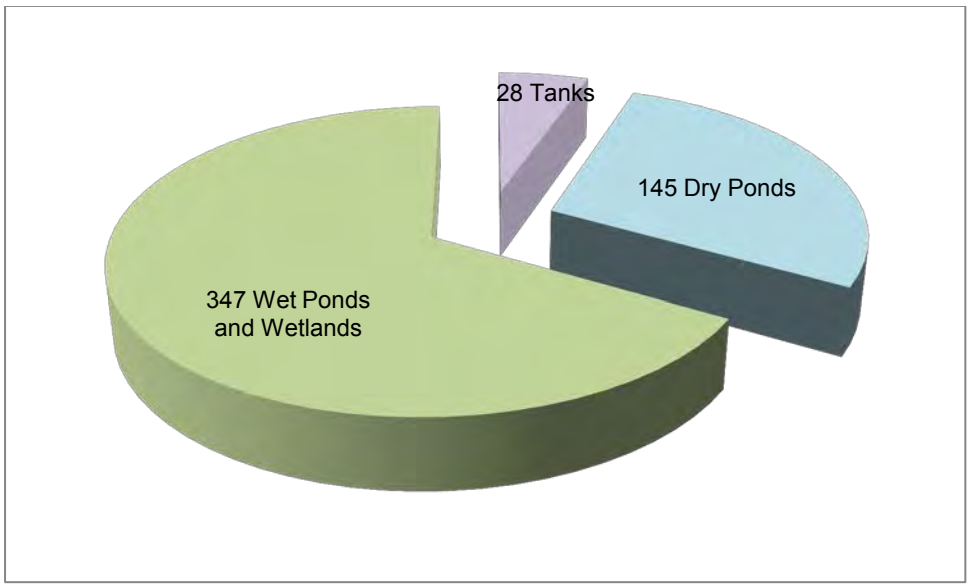


Figure 5.7 Percentages of ponds, wetlands and tanks
Source: Auckland Council, June 2015

Most ponds were constructed in the last ten years as a result of tightening environmental standards for new developments. A substantial number of stormwater quality ponds and wetlands are expected to be vested to the council in the future through development. It is recognised that this situation is not sustainable and on-site bio-retention treatment, retention and attenuation should be encouraged rather than ponds where practicable. Industrial and commercial areas are different as they are high pollutant generators and the council is currently investigating the possibility of downstream treatment wetlands or ponds to provide polishing treatment in case on-site treatment is not as effective, fails or is non-existent.

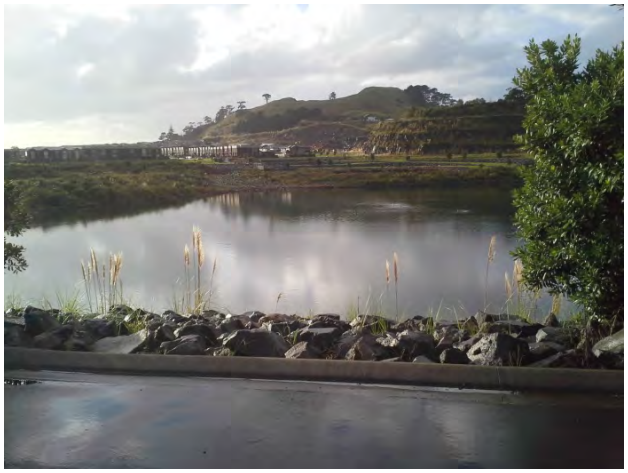


Figure 5.8 Stonefields Pond

Figure 5.9 Flat Bush Pond

Large ponds which have certain volume and embankment thresholds are classified as dams and are now covered under the Building Amendment 2013 Act. There are new changes to the dam safety scheme and these come into effect on 1 July 2015. The implications of the new regulations on Auckland's stormwater assets will be assessed as part of the regional dam and pond structures identification project. This programme was started to confirm the number of all dams and required inspection regimes to enable the council to fulfil its obligation as a dam owner. It is understood that most are located in the Manukau and Waitakere areas.

Wetlands

The main difference between a stormwater wetland to a pond is that the depth of water in a wetland is shallower and it has much more characteristic vegetation that is adapted to its unique soil conditions. Wetlands provide many important benefits including the attenuation of flood flows, maintenance of water quality, and support for aquatic life and wildlife. Natural filters such as vegetation are placed in the wetland to retain pollutants, treating the waters prior to them entering the receiving environment. Over time, unique ecosystems develop in wetlands.

Figure 5.10 Waiatarua Wetland, Remuera

Figure 5.11 McLennan Wetland, Papakura

Water quality devices

Water quality devices include rain gardens, swales, bioretention trenches, gross pollutant traps and proprietary devices (e.g. Stormwater 360, Upflow, CDS, Ecosols units). They treat water through different mechanisms such as filtration, plant uptake, sedimentation and centrifugal action. There are a large number of different types of devices which makes maintenance complex as some proprietary devices require specialist contractors.

According to current records, the council owns about 436 water quality devices and 7 km of swales. The actual number of such assets may be higher as data had not been captured consistently in the past.

It is expected that through the PAUP requirements more emphasis will be placed in future on green water quality devices like swales, raingardens and bioretention trenches to provide treatment as they support the vision of being a water sensitive city. In addition, these natural treatment devices provide other intangible benefits from amenity to biodiversity. Proprietary devices will cease to function without adequate maintenance but natural assets will continue to provide some treatment as there will be a whole ecosystem contributing to the treatment.

Figure 5.12 Raingarden, Council's Henderson Office

Figure 5.13 Swale, Roland Road, Greenhithe

Inlets, outlets and coastal outfall structures

Inlets and outlets link stormwater pipes with open channels and ponds. These are designed to allow stormwater flows to enter and exit the piped system and discharge into the receiving environment. Inlet grills are provided in some locations to prevent large objects from entering and blocking the pipe system. They also act as a safety mechanism to prevent unauthorised human entry to the stormwater system. Most of the known outfalls are in Waitemata, Hibiscus Coast and Kaipara CREs.

Council's stormwater reticulation system has over 25,000 inlets, outlets and coastal outfalls across the region, but there may be more coastal outfalls than have been formally identified in the past. The inventory will be significantly improved at the completion of the ongoing coastal outfall inspection programme. Coastal outfalls are an important part of the stormwater network as they have the potential to cause erosion. This is particularly true for outfalls on coastal cliffs and potential landslips or rock falls as some pose a risk in relation to public safety.

Figure 5.14 Stream outfall

Figure 5.15 Coastal outfalls with erosion, Takapuna

Stormwater soakage assets

The council's stormwater network consists of about 361 soakage systems which allow the localised draining of stormwater into the groundwater aquifers. The soakage systems consist of soakholes and natural or modified tunnels that convey stormwater to the aquifer.

Large soakhole systems dispose stormwater from properties and are interlinked with the stormwater system which may take road runoff as well. Sometimes there is a gross pollutant trap before large soakholes which trap sediment to reduce clogging of the soakhole.

The soakholes owned and maintained by AT are primarily for disposing of the road carriageway surface water and kerbside discharges from properties. These soakholes are covered separately in AT's Asset Management Plan.

Pump stations

The stormwater unit owns and operates three stormwater pump stations, the other pump stations we operate are owned by AT. These are located in central Auckland and North Shore areas. As each of these is designed to pump stormwater the short distance into a nearby watercourse, any rising main is included within the pump station asset grouping and replacement cost. The pump stations and their functions are summarised in Table 5.2.

Legacy council	Pump station name	Function	Operation
Auckland City Council	Western Springs	Pumps contaminated stormwater from part of the Motions Catchment to the wastewater system only during low flow for treatment. At high flows the diluted stormwater flows directly to the creek and does not overload the wastewater system.	Yes
	Stonefields	Services the Stonefields development in Mt Wellington. Pumps the pond from the Mt Wellington quarry to replenish the Waiatarua wetlands and prevent flooding.	Yes
North Shore City Council	Alison Park, Seabreeze/Lake Road	Reduces the incidence of flooding over the adjacent land, including the Waitemata Golf course and the Vauxhall Tennis Court and permanently lowers the ground water table to allow development of a large area of swamp (now incorporated into the Waitemata Golf course and the adjacent Alison Park).	Yes

Table 5.2 Pump station summary

Other stormwater assets

The council's stormwater network also includes numerous floodwalls, erosion protection structures, tide gates, some legacy subsoil drainage, flood alarms and telemetry and other structures to assist with its operation.

Other stormwater assets can be classified as:

- Flood protection structures including floodgates, flood alarms, tide gates and stop banks such as the College Rifles' flood wall. Tide gates prevent the intrusion of tidal water into the network. There are 94 tide gates in total and the majority are located in Parakai, Helensville and Orewa. These, however, are not major flood protection works as defined by the DIA.
- Erosion protection structures protect stream banks and beds; these vary between traditional concrete and timber structures through to gabions, rock formations and riparian planting in recent years.

5.1.2 The natural stormwater assets

Streams and overland flow paths are integral parts of the management of stormwater runoff. Together they form the secondary network which conveys far more volumes of water than the built pipe network. Water which does not go into pipes follows the natural paths of the ground and topography of the catchments. These routes are called overland flow paths. Both streams and overland flow paths can flow through private and public property.

Streams are defined in the PAUP as continually or intermittently flowing bodies of fresh water, excluding ephemeral reaches, and include a stream or modified watercourse, but does not include any artificial watercourse.

Depending on the character of the stream channel and flow regime, streams may be categorised as:

- **Permanent streams**: streams which carry continuous flow all year round. There is estimated to be 16,650 km of permanently flowing streams in the Auckland Region.
- **Intermittent streams**: stream reaches that cease to flow for some periods of the year, including reaches with stable natural pools having a depth at their deepest point of not less than 150mm and a total pool surface area that is 10 m^2 or more per 100m of river or stream bed length, and reaches without stable natural pools. These exclude ephemeral reaches. We have an estimated 4,480km of intermittent streams.
- **Ephemeral streams**: streams which flow for short periods of time following rain events. We have an estimated 7,100km of ephemeral streams. Ephemeral stream lengths have not been included in the total regional stream length because of their temporary nature and they include overland flow paths.

The majority of streams are small (less than two metres wide) with a few tributaries reflecting the nature of the small and short urban catchments, especially in the Auckland isthmus. The urban streams tend to be quite slow flowing as the land is relatively flat near coastal areas. Inland stream flows can be faster due to steeper topography. Most streams are in private ownership except for five public watercourses in the central area and where streams pass through public land. Ownership of streams or rather implications of different ownership types are discussed further in section 6.4.1.4 Stream Maintenance.

In newer subdivisions easements are taken for overland flow paths but there is, at present no regular monitoring of overland flow paths to prevent obstructions or earthwork alteration. The older areas of the city lack formalised overland flow paths; many flooding complaints are due to lack of or obstructed overland flow paths.

Figure 5.16 Typical urban stream, Browns Bay

Figure 5.17 Semi rural Opanuku Stream

In addition to streams and overland flow paths, the Auckland Region is host to a number of groundwater aquifers which provide water for our use and also important base flows to streams during dry periods, helping to sustain aquatic life. In some areas, stormwater is discharged by soakage to volcanic aquifers, and unless effectively managed, can degrade the quality of the groundwater with contaminants. These aquifers are shallow and unconfined and therefore susceptible to pollution from surface. The main urban aquifers are the Auckland isthmus volcanos, including the Onehunga and Mt Wellington aquifers. About 20 percent of the stormwater runoff in central Auckland is discharged into aquifer systems and about 50 percent of this is through private soakage.

5.1.3 Intellectual property assets

Intellectual property assets or intangible assets include the base information about the stormwater system and the knowledge which has been developed about it. It is an identifiable non-monetary asset that has no physical existence and is identifiable as a separate asset. This would include:

- Catchment management plans – catchment management plans are electronic documents which set out the catchment characteristics, objectives, issues, options for mitigation, recommendations and monitoring measures associated with stormwater management for a catchment. A catchment management plan is made up of the output from 5 models: the asset economic model, the asset risk model, the flood hazard model, the growth/demand model and the contaminant model.
- Right to acquire asset – this is the right to acquire physical assets owned, managed and operated by a third party.
- Computer Software – Computer software licences and development are capitalised based on the costs incurred to acquire, install and develop the specific software.
- Community rights – community rights are contracted rights of access to facilities not owned by Auckland Council.

5.2 Asset condition

Pipe (and culvert) assets account for approximately 71 percent of the total value of assets, hence considerable emphasis has been placed on understanding the condition of these assets. The entire piped network has been condition rated either based on actual inspections or based on analyses and extrapolation of actual pipe conditions. Planned CCTV surveys are undertaken to obtain pipe condition data to derive the condition grading of assets. Approximately 97 percent of our pipe assets are in 1 to 3 condition grades which mean that there is no immediate cause for concern.

It is assumed that the overall length of pipes in condition 4 and 5 condition grades across the region would be about 171 km or 3 percent of the entire stormwater network. Out of this percentage, approximately 85 km of inspected pipes will need intervention in the next 10 years and another 85 km of inspected pipes are estimated be in need of some work in the next 20 years. The distribution of pipe condition is shown in Figure 5.18 and is represented by condition grades 1 (excellent), 2 (very good), 3 (good), 4 (poor) and 5 (very poor).

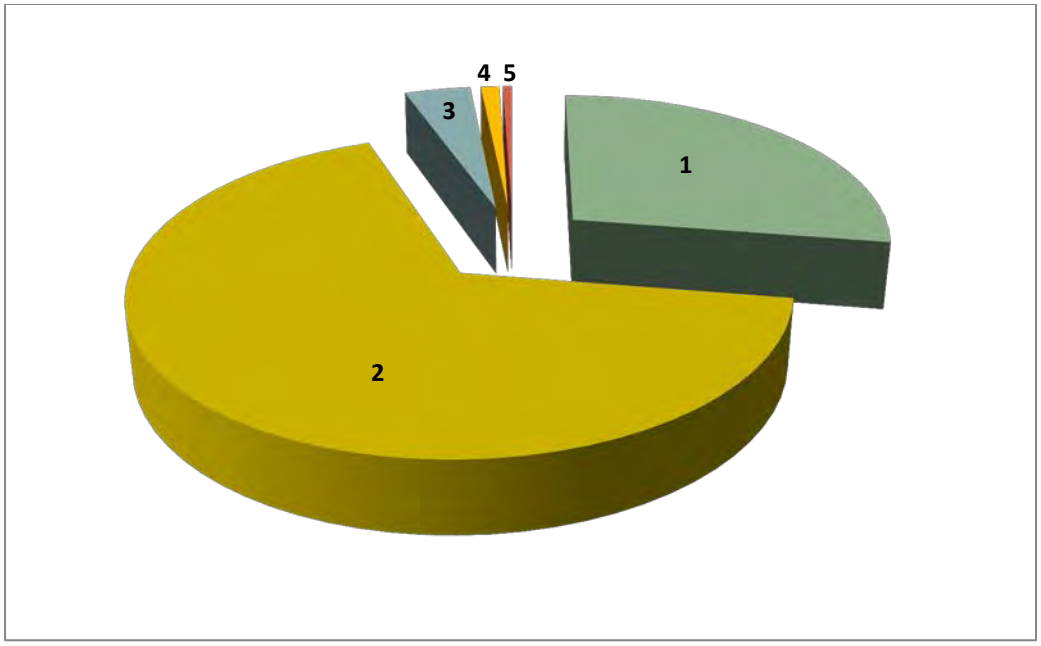


Figure 5.18 Overall pipe condition
Source: Auckland Council, June 2015

The majority of pipes have extrapolated conditions as can be seen in Figure 5.19. Effects of pipe material, diameter, age and locality (catchment) on pipe deterioration were considered for extrapolation and the detailed methodology and assumptions are in the Asset Condition Study 2012.

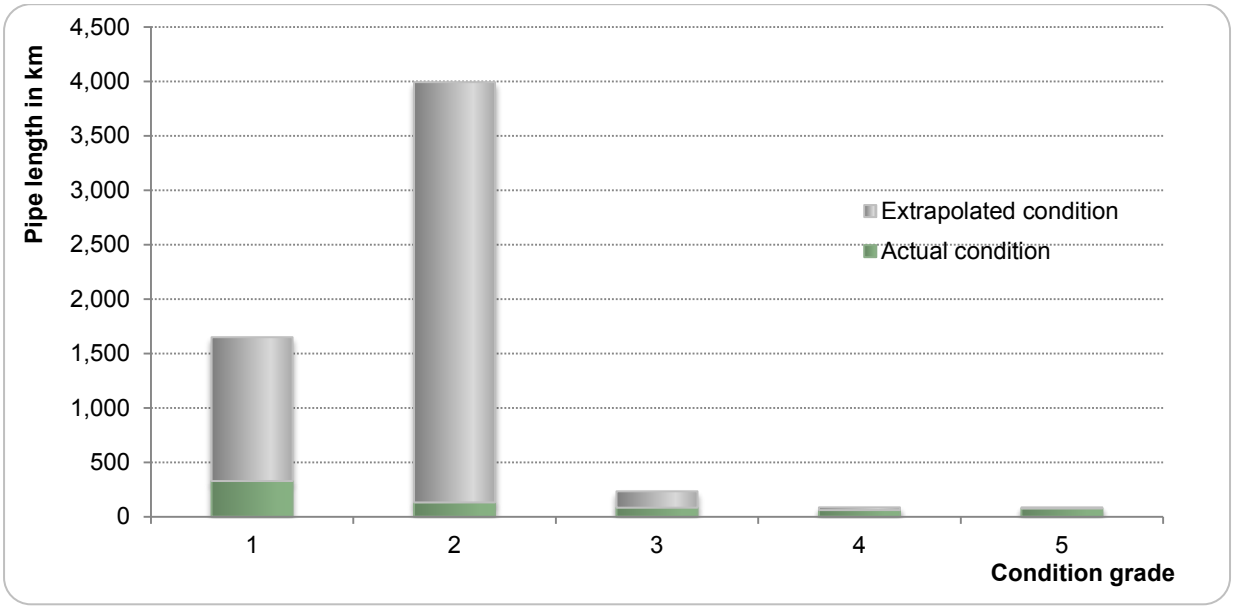


Figure 5.19 Actual and extrapolated conditions
Source: Auckland Council, June 2015

Monitoring pipe condition is very important for sustainable network performance and to optimise the balance between asset maintenance and asset renewal. Stormwater is a “quiet” activity and performance issues may not be apparent, except during rain events.
Our long term condition monitoring programme will cover approximately 250km of inspections per year and 700km of medium high to high critical assets over the next 5 years. This programme covers the surveys of:

- critical assets
- high risk material
- catchment wide surveys (part of catchment planning)/ asset validation
- capturing condition for analytical purpose – randomisation and data improvements

It should be noted that the condition grading methodology that we use at present is not indicative of the type of treatment required, so not all pipes that are in poor condition will need to be replaced. Stormwater pipes can still operate when leaking badly if the overland flow path is sufficient and there’s no nuisance flooding or hazards from the failure. We are investigating other condition grading standards, such as WRC and NASCO to develop a more reliable deterioration grading system to support robust long term renewal planning.

Currently we only capture condition data for pipes, outfalls and some ponds. Inspection of outfall structures in the Coastal Marine Area has recently been completed. This assesses the asset condition at component level (wing wall, headwall, screen/grill, etc.) using visual inspection. Inspection of the region’s ponds is ongoing along with the rest of our assets.

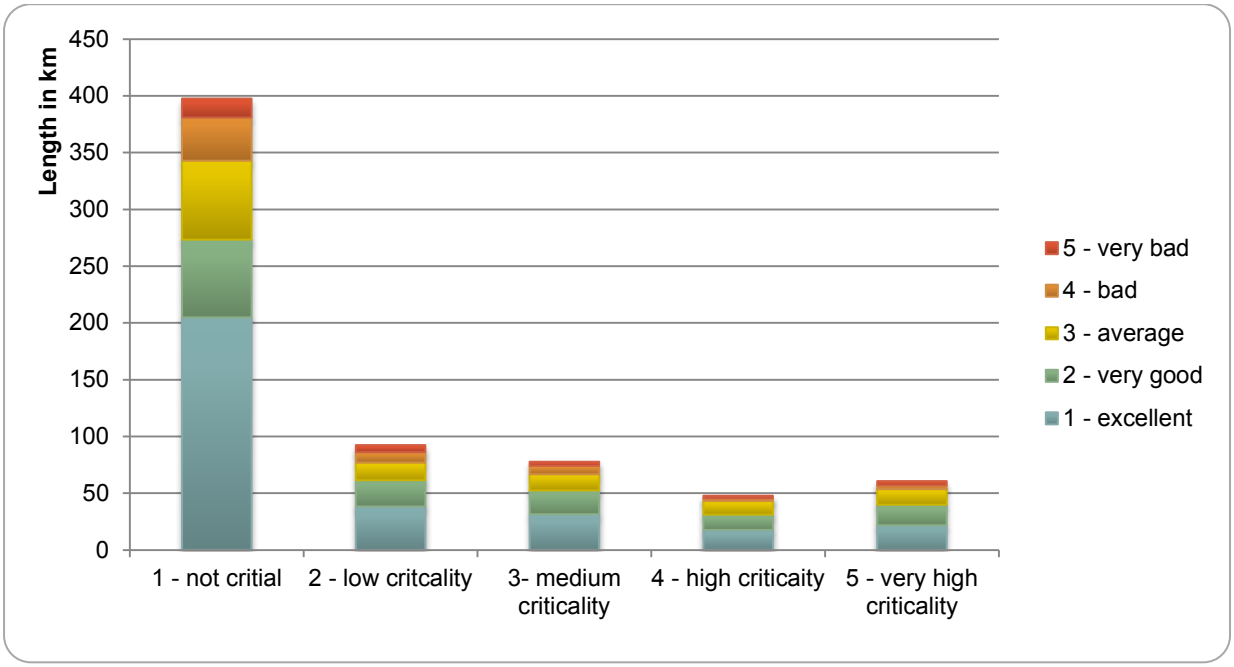


Figure 5.20 Condition by pipe asset criticality
Source: Auckland Council, June 2015

Approximately 23 km or 0.4% of the medium to very high criticality pipes are in poor to very poor condition as shown in Figure 5.20. These are inspected and included in the Critical Asset Renewal Programme if appropriate.

The Stormwater Unit is developing a Stormwater Asset Condition Strategy which will cover all our asset classes and will provide reference and guidelines to a more risk based condition survey approach. This strategy will provide guidelines for condition data assessment to improve reliability, consistency and efficiency, and it covers:

- when to assess condition
- data collection methods
- what data to collect
- how to analyse condition assessment data, and
- where to store and how to share condition information.

In general, condition assessments are normally undertaken:

- when all new assets are constructed or vested to the council, to confirm that the assets comply with the Stormwater Code of Practice and relevant technical guidelines
- when developers seek permission to build over stormwater assets
- when assets of criticality classification Medium, Medium High or High are repaired, to confirm the acceptability of the repair and to determine the remaining life of the asset, and
- risk based condition assessment for all other assets as described below

A risk based condition survey concept is outlined as follows. It is neither practicable nor cost effective to collect all condition data on all assets. Condition assessment efforts are therefore prioritised so that higher-risk assets are inspected more frequently and at a more granular level. An asset is considered as failed when it no longer performs as originally designed. There are a

number of asset failure modes such as structural failure, capacity failure, pipe hydraulic performance failure (blockage), economic failure, etc. While asset criticality indicates the consequences of asset failure, asset condition helps to determine the likelihood of structural asset failure.

The Stormwater Asset Condition Strategy recommends CCTV inspections as the primary assessment method for pipes with diameter less than 1.8m and walk through inspections for larger pipes. The condition surveys are carried out according to the guidelines in the New Zealand Pipe Inspection Manual (Third Edition) by experienced operators. Secondary assessment methods include laser profiling to collect internal cross-sectional dimensions and integrity of some pipe materials, sonar for pipe sections that are under water and, exhuming and testing samples for AC pipes. Other asset types such as manholes, inlets, outlets and water quality devices will be assessed based on mainly visual inspections. CCTV surveys are also carried out for operational purposes such as identification of pipe blockages, however, these reactive surveys do not provide sufficient information to derive the condition grading of the pipe.

Pipe condition has been assessed in a planned manner since 2000. In some areas, such as North Shore, it was an integral part of developing catchment management plans; in others like Waitakere mainly the condition of critical assets was monitored.

5.3 Critical assets

Asset criticality is a component of overall ‘asset risk’ which is an assessment of different consequences or impacts and what their respective likelihood or probability of occurring is. Asset criticality represents the consequences of asset failure. Figure 5.21 shows the components of risks and their relationship in relation to stormwater management.

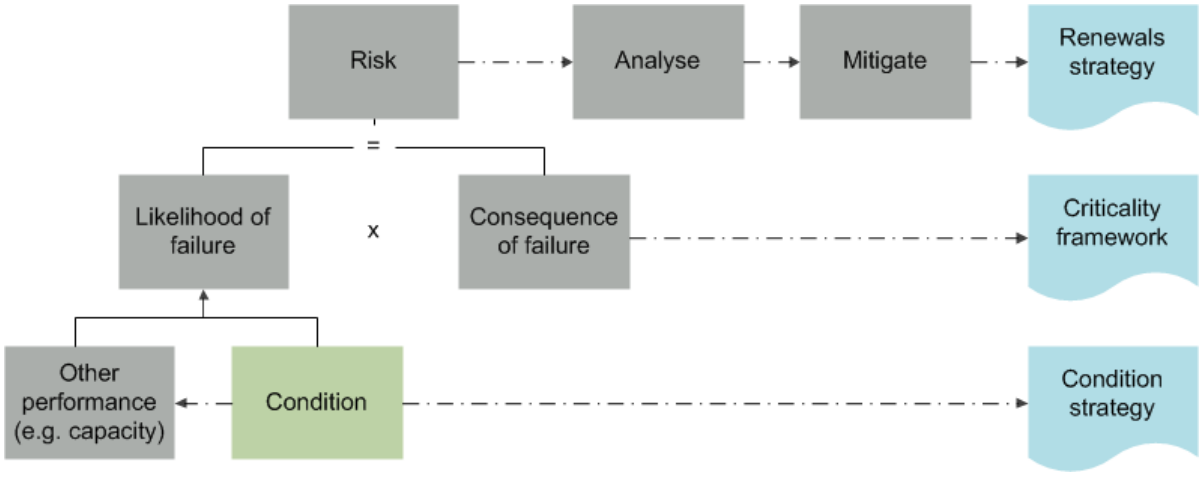


Figure 5.21 Components of asset risk

The council uses a GIS based tool to assess the criticality of each stormwater pipe. This model (Stormwater Asset Criticality Model 2014) takes into account social, economic and environmental

impacts to the council business as well as the wider community. These impacts include property damage, safety risk, environmental degradation and economic impacts. The assessment factors used in the model to encompass all the consequences are described below and in Table 5.3.

Pipes

Assessment Factor	Reason for Inclusion
Asset diameter	As a proxy for likely extent of ponding / overland flow resulting from asset failure, as well as the asset value
Near a critical facility	Reflecting the extent of social and economic effects from their operation – includes critical health, emergency services, banking, fast moving consumer goods and lifeline utility facilities
In a closed landfill	Reflects the difficulties in repairing the asset and difficult ground conditions
Land use	Representing the likely extent of property damage in more built up areas
Drains a depression	Representing the potential for flooding if blocked / broken
Under a road	Representing the social and economic impacts of access disruption
Under a building footprint	Representing the difficulties in repair and the potential for building damage
Depth of pipe	Representing the higher cost of repair for deeper pipes

Table 5.3 Asset Criticality Assessment Factors and Reasons

A scoring system to scale the degree of impact and a weighting factor to indicate the degree of importance (relative to the other assessment factors) are applied to each assessment factor and these are used to derive the overall criticality score of the asset. The assets are grouped into five criticality bands according to their overall criticality score with 1 being not critical to 5 being highly critical.

Figure 5.22 shows the critical pipeline length inspected (by percentage) for condition. The planned inspection and assessments for inclusion into the renewals programme is focused on the higher critical pipes.

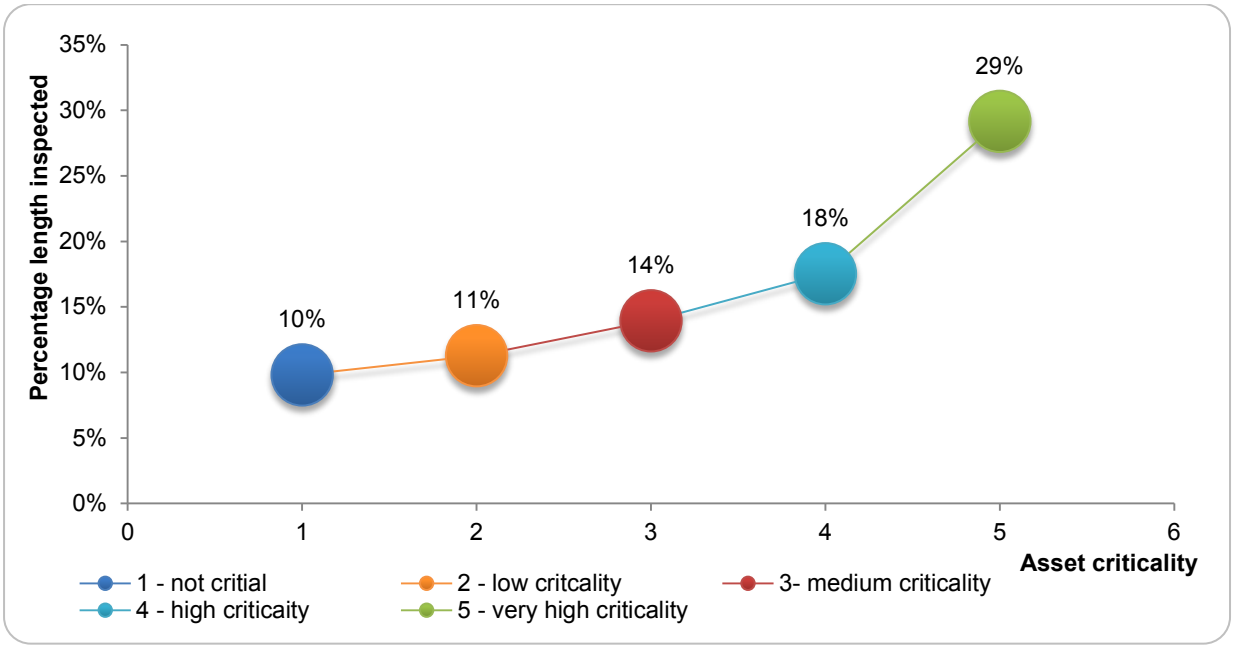


Figure 5.22 Available condition data
Auckland Council, May 2014

It is estimated that about 480km or 8 per cent of the public stormwater network is critical or highly critical and its failure will have significant impact on the stormwater service as well as other activities. Figure.5.23 shows the asset criticality assessment findings for the region by CRE. This data is utilised in determining asset condition and inspection monitoring requirements, maintenance schedules and renewal priorities.

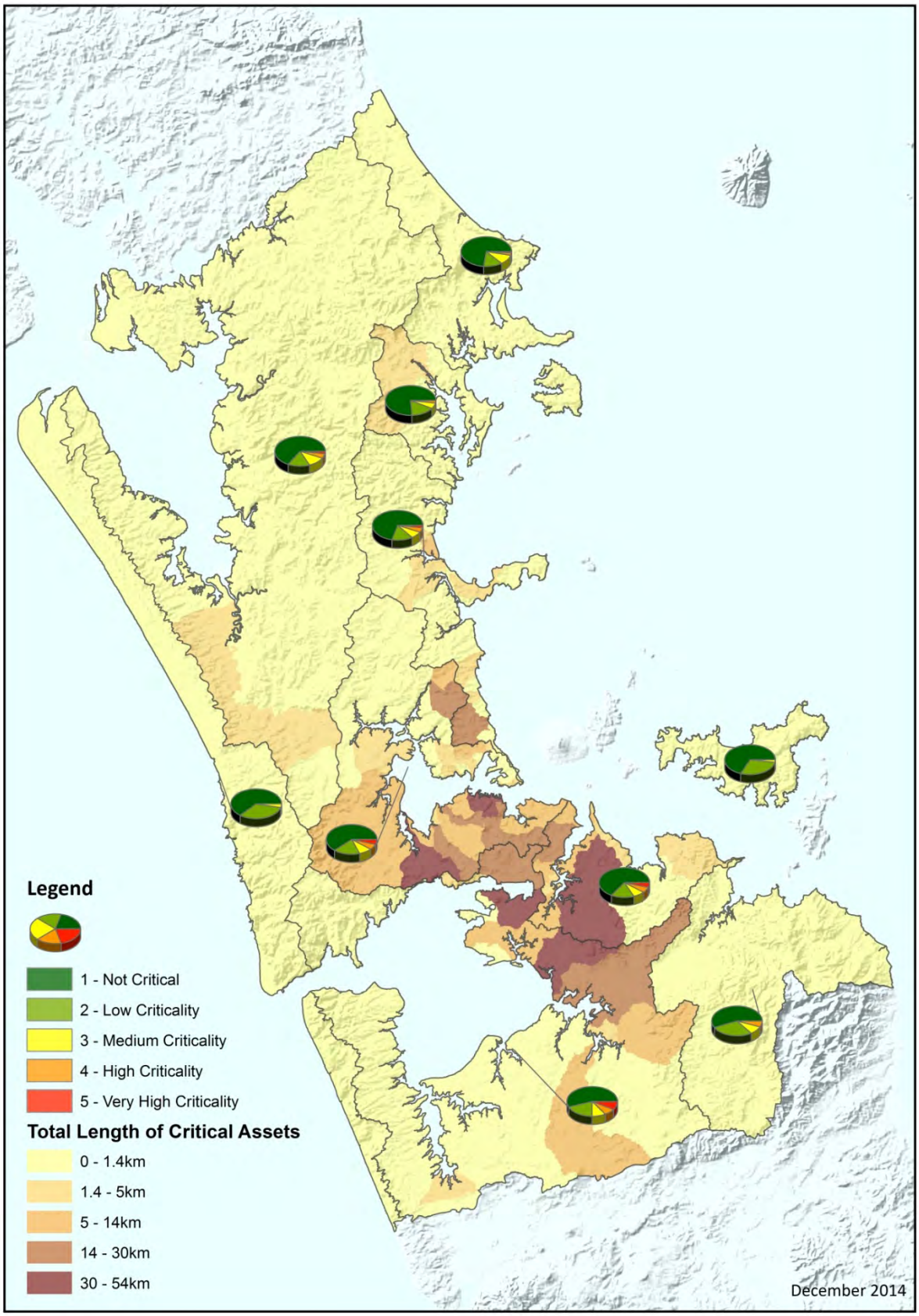


Figure 5.23 Result of Pipe Criticality Assessment
Source: Auckland Council, December 2014

Overland Flow Path Risk Model

A GIS-based model to assess the risk associated with overland flow paths is almost complete; the draft is currently being reviewed. The risk rating calculated by the model will be used to prioritise which overland flow paths will be inspected to verify the level of risk. Depending on the outcome of that inspection, risk mitigation works may be programmed and / or operational inspections may be scheduled to ensure the overland flow path remains unimpeded. The criteria used to calculate the risk rating includes:

- Whether the overland flow path intersects or is adjacent to a building (taking into account the number and type of buildings impacted).
- The area of contributing catchment
- The type of contributing catchment (eg: Council land versus other)
- The slope of overland flow path (as a proxy for higher velocity of flow with increased safety and damage risk)

5.4 Asset capacity and performance

The operational performance of the stormwater network is hugely dependent on the weather patterns; hence monitoring the level of requests for service (RFS) gives an indication of the issues and deficiencies in the stormwater networks but will not be the complete picture of the actual performance for a given year. There will be more RFS or complaints when it's wetter and fewer when it's drier.

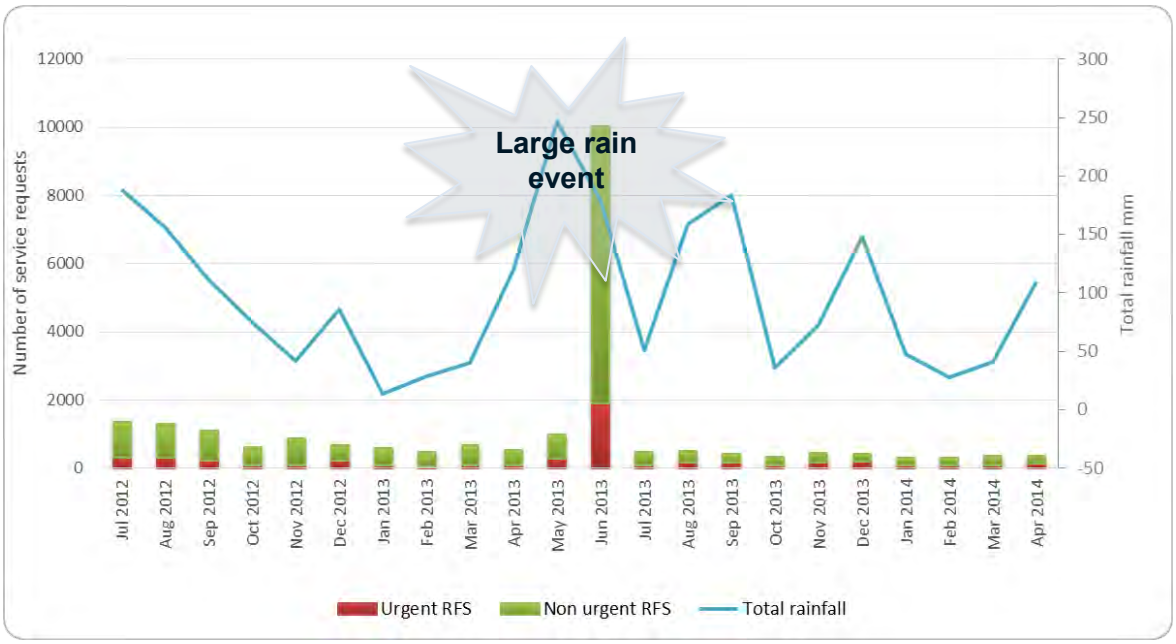


Figure 5.24 Number of service requests
Auckland Council, May 2014

Figure 5.24 shows the level of RFS from customers. The average number of service requests jumped from 1,000 in May 2012 to 10,000 in June 2013, when a large storm event registered. The low level of service requests from July 2013 to date corresponds to relatively dry weather. Localised flooding occurs when rainfall is beyond the capacity of the network, the overland flow paths are blocked and/or the catchpit's location and configuration is inadequate. A more comprehensive way to identify or predict system performance is by modelling the network to

determine capacity and floodplains for designed rain events. To this end the Stormwater Unit has a programme of building and maintaining hydraulic models for the region to ensure a relatively accurate understanding of floodplains and system performance, and risks can better be assessed.

5.4.1 Flood protection performance

Flooding is the result of accumulation of stormwater runoff during heavy rainfall events. Flooding which results from network capacity issues occur when pipes are blocked from debris, roots or siltation, there are inadequate pipe sizes or blocked overland flow paths. Table 5.4 shows the number of reported habitable floor flooding in the region for the last two years as an indication of how our operational flood protection performance.

Year	2012/13	2013/14
Habitable floors	56	5*
Road flooding	129	260**
Total	**185**	**266**

**Reporting of habitable floor flooding is inconsistent across the region due to limitations in asset and customer management systems*
***Flooding in 2013/14 is for areas 70% larger than the one covered in 2012/13 as data is progressively collected*

Table 5.4 Reported flooding
Source: Auckland Council, May 2014

We monitor the level of pipe blockages as they are frequently symptoms of pipe capacity or condition issues. Frequent clearing of a particular pipe is an indication that a renewal or upgrade may be warranted. Our LOS statement in Section 3.1.2, no.1.06, is to have less than 20 blockages per 100km per year and Section 3.1.3 shows that we have been meeting our targets.

Year	2012/13	2013/14
Blockages per 100 km	19.0	9.5

Table 5.5 Pipe blockages
Source: Auckland Council, May 2014

Figure 5.25 Flooding 18 May 2011, Buckland's Beach

Figure 5.26 Surcharging Manhole, Northcote

Popping manhole covers present a significant public safety issue, but are also an indication of surcharges due to capacity issues in the stormwater network. We have a programme to report, monitor and secure surcharging manholes. They are fitted with hinged covers or grills to prevent incidents.

Year	2011/12	2012/13	2013/14
Surcharging manholes fixed	61	196	34

Table 5.6 Number of surcharging manholes fixed
Source: Auckland Council, May 2014

Public complaints and RFS result in operational action in accordance with the urgency and risk of the issue, but they also frequently trigger further investigations to uncover underlying problems. For example, the pipe network in the vicinity of reported blockages is investigated and CCTV surveyed to establish overall condition and identify any partial failures. Subject to the severity of the observed defects and the criticality of the asset, a decision to replace the asset may be made. Symptoms of inadequate capacity are investigated by the Stormwater Planning teams.

5.4.2 Modelling system performance

The Stormwater Unit's modelling programme is undertaken to understand flood risks and issues associated with streams and overland flow paths. These cover:

- river modelling for major streams
- combined pipe network, stream and overland flow path modelling for the serviced areas
- overland flow path and floodplain mapping
- all models are produced to create predicted floodplains to control development (and avoid future risk)
- predict existing and future issues
- create options to mitigate against current and future predicted issues
- assess development proposals/alternatives

Decisions based on poor modelling have the potential to expose council to financial liability. The types of liability include direct liability where the council has not met contractual agreements, and liability (additional expense) with regard to options which fail to solve the issue they were designed to address. To ensure best practice and mitigate the risk of liability, the Stormwater Unit has created and maintained modelling specifications to define minimum modelling standards/procedures, and models are peer reviewed internally by suitably qualified staff. Catchments to be modelled are prioritised based on whether growth is imminent and the number of flooding problems in that catchment.

Regionally it is estimated that approximately 16, 000 dwellings may be at risk of flooding in a 1 in 100 year event. This includes approximately 8,000 buildings located in flood plains, 7,000 in overland flow paths, and 1,000 in flood prone areas. The estimated numbers of buildings located in floodplains per CRE are shown in Table 5.7.

CRE	Number of buildings at risk in the 100 year flood plain only
Hibiscus Coast	796
Islands	76
Kaipara	168
Mahurangi	42
Manukau Harbour	1,459
North East	92
Tamaki	1221
Wairoa	16
Waitemata	3924
West Coast	54
Total	**7,848**

Table 5.7 Estimated numbers of properties in 1 in 100 year floodplains
Auckland Council, September 2014

5.4.3 Soakage Capability and Performance

Auckland's aquifers are an important part of the stormwater network. Stormwater disposal contributes to the recharge of aquifer systems and are primarily located in the basalt areas of the Auckland isthmus where approximately 20% of the central area discharges into aquifers. Past studies by Metrowater have indicated that the aquifer systems have the capacity to accommodate increased stormwater discharges in most areas, however flooding can be expected in the areas where the groundwater aquifers are saturated.

Epsom, Mt Eden, Avondale and Onehunga soakage areas have been identified as problematic. They will be further investigated to understand aquifer soakage potential, effect on stormwater flood mitigation and possible soakage location options. Soakage in the rest of the region is generally not encouraged because of poor permeability clays and high groundwater levels.

5.4.4 Treatment devices performance

There have been many different types of treatment devices installed regionally in the past ten years. It is assumed that these devices, including pond and wetlands, would provide the required treatment and/or detention functions when designed and constructed to best management practices prescribed in Council's TP No.10.

Treatment devices tend to be heavily silted during the construction phase and ponds and wetlands in particular suffer the most as developers will construct them prior to builders taking over the site. There is more scope for smaller devices such as raingardens, proprietary devices, swales etc. to not be constructed or fully commissioned until the site is paved or stabilised.

Pond and wetland treatment capacity is monitored through the level of sedimentation. A de-silting programme has been developed to maintain the treatment efficiency of ponds and wetlands. Ponds and wetlands are scheduled for desilting when their treatment volume drops below 75%

design capacity. Proprietary devices generally have regular maintenance regimes according to their respective Operations and Maintenance manuals.

The standardisation of treatment device performance will be addressed with the development of a regional engineering standard and database.

5.4.5 The impacts of climate change

Our stormwater modelling specifications incorporate the estimated changes in rainfall intensities based on the recommendations of the MfE climate change guidelines (2008) and the Auckland Plan. In addition a rise in tide level of 0.5 metres is to be used to take into account future climate change sea level rise.

It is anticipated that more intense rainfall and larger annual rainfall volumes will impact on system performance. It will lead to more flooding whilst the longer dry periods in between may cause more streams to dry out. In peat areas in the South this may have an implication in terms of the structural integrity of buried infrastructure, as the peat contracts or swells beyond structural tolerances.

Concerns for stormwater assets relating to climate change include:

Issue	Description of Issue	Actions to Address Issues
Flooding - overland flow paths	Increased rain intensity may increase the incidence of these events. Most overland flow paths are roadways.	Identify all overland flow paths and the relevant buildings and infrastructure at risk. The worst or critical areas have been assessed but the whole urban area should be assessed.
	Overland flows of more than 200mm depth (current design standard) on a road may impact the driveability of these roads and may have safety related issue such as drowning.	Review stormwater design parameters. Renewal and upgrade projects may need to be designed slightly differently.
	Older areas are at greatest risk because of insufficient overland flow paths being provided or these flow paths being obstructed.	Review rain tank standards as these attenuate stormwater flows; the behaviour of the tanks, reuse and drying out of streams is not well understood. The engineering and technical services unit will be updating these standards.
Infrastructure-stormwater outlets	With increased rain intensity leading to more flooding may lead to greater frequency of stormwater outlets being submerged. This may require changing the design of outlets and this is assessed on a case by case basis.	

Table 5.8 Climate change issues and actions

5.4.6 Service delivery decisions

The magnitude of the council's capital investment in stormwater new works requires sound management practices. Through the catchment planning process various options are considered based on strategic objectives and quadruple bottom lines.

It is also important that our capital projects are aligned with the development priorities of the Auckland Plan and investment initiatives by other CCOs such as AT and WSL. To this end the Stormwater Unit has participated in workshops with the key infrastructure providers.

The need for new capital investments to meet service levels is identified through the LTP. Identified capital projects result from detailed option analyses and are further prioritised and approved through council's Annual Plan and LTP processes. The 2015 - 2045 LTP budget has been a constrained budget to meet the Mayor' rates proposal and priorities and is described in Section 7.6.

6.0 Stormwater expenditure programmes

Managing stormwater in the Auckland region is complex and integrally connected with growth and land use, freshwater management, and integrated infrastructure provision. The Stormwater Unit is committed to delivering on these complex functions using best practice asset management to efficiently and prudently ensure the public receives the best value for money possible.

Our vision is long term and will take time to achieve. The reality is that, given the demands on council expenditure for the foreseeable future, we will need to prioritise. The priorities (in order of priority) are:

1. **Asset operation/renewals:** effective operation, maintenance and renewal of the assets we already have to ensure optimum performance
2. **Growth:** supporting and servicing the Auckland Plan's growth strategy
3. **Flooding:** progressively reducing existing flood risk across the region; and
4. **Environmental Improvement:** reducing existing negative effects on the environment, particularly streams and coastal areas

6.1 Supporting Growth

6.1.1 The impact of growth

The Auckland Plan has adopted a bold vision for the future growth of the region. Auckland's Development Strategy includes significant residential and commercial growth and a move to a quality compact city

This growth has the potential to impact on communities, the natural environment and Auckland's stormwater networks through:

- New greenfield development can degrade receiving environments and increase flooding risks;
- New development increases the size and extent of Auckland's stormwater networks, increasing operation and maintenance costs;
- Intensification of existing urban areas can places additional stress on the capacity of existing infrastructure and exacerbate existing adverse effects

6.1.2 Strategies for the management of growth

Effective stormwater management requires an integrated water sensitive design approach that occurs from the start of the land use planning process, combined with the provision of good quality green and built infrastructure. Our key areas of focus are:

- Working across the council to identify areas that are unsuitable for new growth or intensification or which are subject to stormwater management constraints that must be resolved before development can occur

- Aligning work programmes and investment priorities with Auckland Plan growth priorities and the Infrastructure Strategy
- Active involvement in plan changes and other major consents/development processes to ensure effective stormwater outcomes
- Developing PAUP provisions that encourage sustainable stormwater management and networks
- Developing and communicating guidelines, including for urban design, that enable communities and developers to give effect to water sensitive/low impact design principles and techniques
- Developing robust and integrated quality assurance, subdivision and development standards and vesting processes for new public stormwater infrastructure
- Supporting and enabling growth by obtaining stormwater network discharge consents aligned to priority intensification and future urban areas
- Working with other infrastructure providers to identify opportunities for collaboration and sequencing of infrastructure
- Engaging the community to raise consciousness of stormwater issues and their ability to influence them

Water sensitive design promotes water reuse tanks as part of the stormwater management suite and WSL in its role of providing potable water for Auckland has a major role in water demand management. Holistic consideration of the three waters is good practice and is ongoing in collaboration with WSL.

6.1.3 The cost of growth

Growth has the most significant impact on capital and operational costs. Central to achieving more cost effective stormwater outcomes is water sensitive development. This is development that avoids or minimises stormwater related effects by considering stormwater at the initial land use planning and design stages and not as an expensive and inefficient add-on at the end of the process.

Growth related capital investment cost would be recovered through development contributions. Consequential operations and maintenance costs should be planned when planning capital costs as they too are linked to growth. The more assets, especially high maintenance assets, means more operational costs will be required which are rates funded. Stormwater growth related projects and contributions will respond to the needs of the priority development areas identified in section 3.4.2.

Clearer linkages between growth projections, imperviousness and costs should be investigated to enable costs and contributions to be better quantified and projected. The need for infrastructure is very catchment specific; eg. Greenfield development which is not upstream of a brownfields area tends to have lower costs to the council than brownfields development. This is because in a greenfields situation most of the infrastructure is built by the developer and vested to the council and the majority of these greenfield developments are either close to the coast or a stream. However, generally, the overall private and public costs to develop in greenfields are higher than brownfields because of the new infrastructure costs. It should be noted that for strategic and fragmented property ownership reasons the council may decide to act as a banker in some cases

to enable or fast track development in a particular area. Refer to Figure 7.6 in section 7 for the projected cost of growth.

6.1.4 Future improvements

In addition to regionwide development contributions for growth capital investment costs, financial contributions for flood protection and environmental works to enable growth should be investigated as a means to more equitably support the work programmes and target those who are directly benefiting from it. Along the same lines, betterment (the concept of where property values directly increase significantly because of infrastructure being laid to reticulate it) could potentially have this increase shared with the council to help pay for the infrastructure works. This is particularly relevant for growth areas which have yet to be serviced.

Large areas of former urban land identified in the FULSS will require significant investment in bulk stormwater that is not forecast in this AMP. Alternative funding mechanisms are a specific area of focus for Auckland Council, not just for stormwater but for all infrastructure providers.

Environmental awareness is increasing as the community realises the need to protect the environment, but at the same time property owners expect to be able to develop their property without restrictions. Pricing and financial incentives discounts for implementing sustainable solutions with high regional uptake may have significant impact on stormwater costs and revenues, and should be investigated further.

6.2 Ensuring safe communities

6.2.1 Renewing assets

Assets are generally renewed when they are no longer able to perform their duty due to structural defects and performance failures. Renewals are works to replace existing assets or facilities with assets or facilities of equivalent capacity or performance capability and include replacement and rehabilitation.

The levels of service provide set strategic targets to which the asset should contribute. All stormwater assets, built and natural assets, together with non-asset solutions, contribute to achieve these set performance levels. Assets renewals are not targeted at increasing the level of service or to increase the capacity of an asset to serve a growing demand. However, integrating renewal planning with improvement works (new capital works) planning provides cost optimisation opportunities. Regardless we have levels of service targets for the renewal of critical assets in condition grades 4 and 5; refer to Table 3.3 levels of service statements 1.10 and 1.11.

Figure 6.1 Cartwright Road flooding due to part of the culvert collapsing, 17 December 2012

6.2.1.1 Renewal strategies

The pipe renewal programme aims to maximise the economic life of the asset. Replacing a pipe before the end of its useful life increases the cost of providing a given level of service. Stormwater assets tend to be renewed or rehabilitated right at the end of their economic life as they are typically able to perform to an adequate level even when they are in a poor condition.

Our renewal strategies are to:

- shift the focus to more planned renewals focused on optimised management of performance risks
- manage at all times high consequence risks such as public safety
- monitor or inspect periodically critical assets with low probability of failure
- mitigate the risks of critical asset failure with business plans
- prioritise timing of asset renewals which are driven by the overall risk of failure of the asset. The risk is determined by asset criticality, and the failure probability
- renew assets of high criticality before the end of their effective life, and run to failure non-critical assets and replace reactively investigate different condition grading standards which may affect deterioration curves and renewal profiles. This is discussed further in section 5.2 Asset Condition
- place greater reliance on natural assets like overland flow paths and streams which convey most of the stormwater as this would reduce the need for hard infrastructure and large detention devices, which in turn would reduce renewal costs.

- improve our education programme to bridge the gap in community understanding and engagement with our natural stormwater management direction.

Figure 6.2 shows the different renewal strategies based on asset criticality.

Figure 6.2 Types of renewals based on criticality

Reactive renewals cover assets that can be utilised until failure without major consequences. This can also be true where monitoring asset behaviour and planning renewals are difficult and inaccurate, e.g. replacement of stormwater connections, non-critical manholes, etc.

Planned renewals aim to restore the assets before their service potential reaches the minimum service level requirement. Assets with high failure consequences (critical assets) are scheduled for planned renewals. All condition 5 assets will be renewed within 2 years and condition 4 assets within 5 years, refer to levels of service statements 1.10 and 1.11 in Table 3.3. It is recognised that sometimes non critical assets may also need to be included under planned renewals due a variety of factors, e.g. high replacement costs, construction complexities, problematic materials etc.

Urgent renewals are required to replace the assets which have failed due to unforeseen reasons and public safety may be compromised.

6.2.2 Protecting the community from flooding

For the Stormwater Unit, achieving a high quality of life for communities, a strong sense of identity and place, and a safe well-functioning city and region means:

- People and property are safe from significant harm from flooding;
- Communities are able to cope with and adapt to flood risks where they can't be entirely avoided;
- Flooding causes minimal disruption to critical social and infrastructure connections across the region;

- Stormwater-caused erosion and effects on land stability are minimised; and
- Communities can interact safely with our urban waterways

Flooding is a natural and inevitable component of any natural or built water system. However, in some cases the way in which land has traditionally been used and developed has increased flood hazards and placed people and property at greater risk. Development changes include introducing large areas of hard surfaces that dramatically increase stormwater runoff, concentrating runoff, increasing flow velocities, and allowing development of land that is naturally prone to flooding. As a result, flooding is New Zealand's primary natural hazard in terms of frequency, losses and declared civil defence emergencies.

Auckland's past development has primarily relied on built stormwater infrastructure, such as pipe networks, and modified streams to accommodate and transport stormwater flows. However, such an approach does not always solve stormwater management issues and can transport the problem elsewhere. There is also a practical limitation to the flows that stormwater networks can accommodate as they are generally sized for a one in ten year rain event. Flows in larger rain events are managed by allowing them to flow overland.

A high reliance on built infrastructure has also resulted in the loss of many natural stream systems, including stream channels, headwaters, riparian margins and flood plains. Not only do these areas provide important connections to our natural environment and contribute to the region's biodiversity, but they provide important overland flow paths and management of flood flows. The loss of these areas necessitates the redirection of overland flow, with associated risks and costs. Large, unmanaged stormwater flows can also lead to the increased erosion and land stability, including the potential for significant failure that can put people and property at risk.

With the 2015 Asset Management Plan development, all projects were reviewed through a rigorous bottom up approach to ensure that there were sound benefits and costs for each project. This has resulted in much fewer flood driven projects than in the past and most are now associated with enabling growth areas. It is far more cost effective to ensure that development is planned and provided for adequately than retrofitting to fix a problem.

To achieve the vision of a water sensitive community we must develop and manage our built infrastructure and natural systems together. We need to reduce the risk to communities from the adverse impacts of stormwater flows and flooding in a way that enables better connection with the water environment that makes Auckland special.

6.2.2.1 Flood risk standards

The Stormwater Unit applies a range of standards to its planning activities to ensure that issues are identified and quantified on a consistent basis, and that the solutions to those issues meet agreed levels of service. External developers are also required to apply established standards for the design of stormwater infrastructure. The council has adopted a 100-year ARI flood protection standard. For planning purposes, this standard is defined by the criteria shown in Table 6.1.

Criteria	Description
Time horizon	100 years (i.e. current year + 100 years)
Rainfall scenario	Future 24-hour rainfall depth for the 100 year design standard storm, estimated in accordance with TP 108 and the 2008 MfE Guideline, *Climate Change Effects and Impacts Assessment: A Guidance Manual for Local Government in New Zealand.*
Sea level scenario	Mean High Water Spring + 0.5m (former Auckland City catchments) Mean Sea Level + 0.5m (catchments outside former Auckland City)
Land development scenario	MPD permitted under the PAUP

Table 6.1 Definition of Auckland Council's 100-year ARI Flood Protection Standard

6.2.2.2 Flood risk reduction strategies

The Stormwater Unit's flood risk reduction strategies are:

- to progressively reduce existing flood risk to meet agreed levels of service, at a rate and order of priority, determined in consultation with the community.
- to improve community understanding of, and resilience to flood hazards where flooding problems cannot be practically or economically resolved through physical solutions.
- to minimise the flood risk from new greenfield developments or brownfield intensification
- to maintain the ongoing performance of existing stormwater infrastructure

To meet the strategic objectives, a holistic and prioritised approach is required when undertaking options analysis to ensure that effort is directed to where it achieves the greatest benefit. When analysing a particular flooding issue and solution, the factors considered are:

- size and seriousness of the issue to be dealt with which is commonly represented by the number of predicted habitable floors flooded
- other criteria considered include health and safety, complaints, frequency and flood damage
- projects which deliver multiple outcomes are given higher weighting than projects with a single purpose. This principle means many parties, including other sections of the council, work together to ensure that when a stormwater project is implemented any necessary Parks, WSL and AT projects are done at the same time

6.2.3 Future improvements

Reducing the number of new buildings being built in floodplains or have access ways which flood would be a good start and to do so we should collaborate more closely with the regulatory team who are responsible for approving new developments. We should also raise the consciousness across the council as to the effects of added imperviousness and the impact on flooding if the imperviousness assumptions are not aligned or consistent with ours.

6.3 Healthy and connected waterways

6.3.1 Understanding the environment

Aucklanders have a strong connection to their waterways. Freshwater streams, groundwater aquifers, estuaries, harbours, and beaches are valued for the resources they provide, their landscape and amenity and as important recreational areas.

6.3.1.1 Streams

Streams play a particularly important role. They are home to a large number of the region's aquatic biodiversity, link the land to the sea and together with wetlands, riparian margins and flood plains, play an essential role in conveying runoff, filtering contaminants, slowing down and storing runoff, and providing essential organic material to sustain downstream environments. All streams are subject to a range of effects, including degraded ecological values, reduced natural character, amenity values, and modified hydrology. Streams were traditionally modified or piped to increase development potential as an acceptable practice.

Restoring streams to a more natural state is a key objective of the the council (Mayoral report on the LTP 2013). Project Twin Streams in Waitakere is an excellent example of the significance of stream restoration projects where the council worked with the community to achieve enhanced environmental, social, cultural and economic outcomes. This is also demonstrated with the recent restoration of the Martyn Wilson reserve project which was a $1.5 million project to restore and revitalise a wetland habitat and construct a stormwater treatment pond close to residential housing and an estuary. The following two pictures showcase the improvements that were provided by the project.

Figure 6.3 Martyn Wilson Wetland – Before

Figure 6.4 Martyn Wilson Wetland - After

One of the main focuses of our growth activity planning is water sensitive design and ways of getting the development community to implement it. This is primarily driven by the need for healthy waterways. Although our environmental capital expenditure programme forecast is of the lowest priority, we seek to integrate environmental outcomes in all our projects. Oakley Creek Conveyance and Takanini Conveyance Cascades, two of our three major growth projects

identified to be delivered in the next 5 years, include the creation and enhancement of waterways to carry more stormwater flows which in turn will enable more upstream development. These waterways will be planted to provide amenity and in the fullness of time will support flora and fauna as well as provide relief from flooding. As part of our commitment towards enhancing waterways we have a level of service that states that we will try to physically improve watercourses to those that are consented to be physically degraded in a length ratio of 3 or more, refer to Table 3.3, level of service statement 3.02.

6.3.1.2 Groundwater

Groundwater systems provide water for our use and also important base flows to streams during dry periods, helping sustain aquatic life. In some areas, stormwater is discharged by soakage to volcanic aquifers, and unless effectively managed, groundwater quality may be degraded. The Onehunga aquifer is a source of municipal water supply for the Auckland isthmus and hence discharge of contaminants which will have a significant adverse effect should be avoided.

Soakage areas have limited stormwater reticulation, and are primarily located in the Auckland Isthmus areas of Ellerslie, Penrose, Onehunga, Mt Eden, Epsom, Mt Roskill and Mt Albert. In the rest of the region's urban areas soakage is only used in older areas and is not encouraged because of clays and failure of soakage devices.

Public soakage devices are provided for runoff from roadways in these areas, but individual property owners must construct and maintain their own soakage devices for runoff from private properties. The soakage devices allow stormwater to percolate into the ground, and generally consist of either boreholes into fractured rock or large holes filled with scoria.

6.3.1.3 Coastal waters and harbours

The marine environment is a defining feature of Auckland. Communities want beaches and other marine areas to be pollution free and safe for fishing and swimming. Estuaries are essential in maintaining the health and resources of marine environments. They retain sediment and are important nursery and feeding areas for fish but they are susceptible to urban stormwater runoff. Contaminants from everyday urban activities are transported in stormwater and are deposited in these low energy areas, where they can accumulate to levels that affect aquatic life.

Wind and tide conditions vary around Auckland's coast. The effect they have on the land depends on the geology and orientation of the coast as well as physical processes such as wind, rain, waves and currents. All coastal areas, such as beaches, dunes, cliffs and estuaries, can also be subject to erosion or other natural coastal hazards. Residential houses, parks and businesses all like to be located on and interact with the coast.

6.3.1.4 Consolidated receiving environments

The Stormwater Unit is required under the RMA (1991) to obtain NDCs to discharge stormwater from the region's stormwater network into the natural environment. It is the intention to seek a NDC at the regional level.

The Auckland region has also been divided into ten CREs based on areas of land draining to a distinct marine receiving environment or coastal catchment as shown in Figure 2.1.

Internal processes to identify the location of NDC issues principally begin at two scales within the unit: Regional and CRE. Once high risk issues are identified at these scales, location- specific data and characteristics are then used to further assess and truth the issues and determine the best practicable option for their mitigation.

The majority of issues are identified and managed at the regional level, as the effects of these issues are not unique to any particular area, but rather occur across the region at varying degrees.

The CRE level begins to take a more prominent role relating to contaminants to harbour and estuaries. This enables a more integrated and prioritised approach to contaminant management, allowing a more strategic approach to be taken. As an example, modelling for the Waitemata Harbour indicated that the Henderson Creek Catchment contributes to contaminants across the harbour, and is not only localised at the Henderson Creek estuary. This will allow interventions to be targeted at areas where they are needed most, or where they will produce the best outcomes.

It must also be recognised that in terms of contamination of the coastal areas, the region's stormwater infrastructure is one of many contributors. As a result consultation and collaboration with key stakeholders is also taken at a CRE level to provide a focal point for the discussion and evaluation of issues, as well as providing the basis for any resulting multi-party mitigation programmes to address the health of the coast.

6.3.2 The impact of stormwater discharges

The stormwater contaminants of most concern in Auckland's urban areas have been identified as: sediment, zinc, copper, PAH and micro-organisms, although the last is primarily an issue associated with wastewater overflows. The adverse effects of these contaminants vary and depend on the type, nature and concentration of the contaminant, and the sensitivity of receiving environments to that contaminant. Areas generating the highest stormwater pollutants tend to be higher trafficked roads, landfills, and industrial and commercial areas. Other sources of contaminants are harbours themselves where boating and mooring activities occur. Antifoulants and other materials associated with boating are known to be significant sources of copper, zinc and a range of other toxic substances. These pollutants (including sediment) impact heavily on shellfish and fish spawning habitats, and can accumulate in stream and marine sediments to levels that do not support healthy ecosystems.

The alteration of land use from rural to urban is also associated with major changes to the physical characteristics of streams and rivers. The change in hydraulic regime has been shown to increase

erosion in streams, increase flooding events, increase stream temperature and cause streams to become drier in summer. Vegetation loss due to urbanisation exacerbates the run off effects, with a loss of riparian shading, the temperature effects in streams are increased, directly affecting fish.

Groundwater aquifers are affected too as increased imperviousness reduces flow into the soil layer and aquifers. However, the effect of stormwater pollutants on the aquifers do not currently appear to be significant as aquifer studies indicate that, in general, the water quality in the aquifers is good, with isolated exceptions such as those near old landfills, where land has been contaminated by past activities, or in industrial areas. Overlaying soils and unsaturated aquifer zones appear to provide natural filtering of normal contaminants that are carried by the stormwater runoff.

Environmental capital expenditure will be spent on priority CREs including Waitemata, Tamaki and Manukau where there will be the biggest benefit for the investment.

6.3.3 Enhancing our environment

6.3.3.1 Environmental standards

The most relevant national and regional policy and strategic environmental direction is delivered through the National Policy Statement (NPS) for Freshwater Management 2011, the New Zealand Coastal Policy Statement 2010, the Auckland Plan 2012 and the PAUP 2013. In addition, the council has a raft of technical guidelines which are used to guide the implementation of the above policies and requirements.

The Minister for the Environment and the Minister for Primary Industries has on 3 July 2014 announced the release of the NPS for Freshwater Management 2014 which gives clear, robust national standards for freshwater that will make a significant improvement to the way freshwater is managed. This means, for the first time, New Zealand's rivers and lakes will have minimum requirements that must be achieved so that water quality is suitable for ecosystem and human health.

The PAUP (which is scheduled to be adopted in 2016) sets the guidance and rules to manage the growth and development of Auckland into the future and will give effect to the vision of the Auckland Plan. The importance of freshwater and marine environments is recognised in the PAUP, which sets objectives to protect, maintain and enhance our freshwater and coastal waters and restore their interconnection. To contribute to these objectives, the PAUP contains provisions that manage stormwater quality and runoff, with an emphasis on minimising the adverse effects of new development as far as possible and, taking the opportunities provided by land use change and redevelopment, to reduce existing adverse effects. This is achieved through the management of land use activities and discharges.

6.3.3.2 Environmental improvement strategies

One of the principles of stormwater management is that prevention is better than cure. Our environmental improvement strategies are to:

- have a key stormwater management focus on the land use design and planning stage to reduce the generation of effects and the need to subsequently mitigate them
- continue to develop CRE CMPs and Stormwater Management Plans (SMPs) as a primary tool to determine the best practicable options to enable wise investment decisions
- consider water sensitive design which delivers not just treatment and hydrology improvements, but also benefits which include biodiversity, amenity and enhanced community outcomes
- target industrial and commercial areas when considering downstream polishing treatment wetlands or devices as these are areas of highest land pollutant discharges and upstream measures if any may not be sufficient
- seek environmental improvement opportunities when projects which deliver other benefits are implemented
- encourage environmental improvement projects, such as construction of bio-retention devices and wetlands, stream day lighting, wetland enhancements, riparian planting which involve the community and deliver multiple benefits. Typical Stormwater Unit projects include:
  - daylighting streams
  - improving fish passages and stream bank stabilising works
  - enhancing wetlands and ponds when being desilted
  - constructing quality devices

However, the extent of environmental work and investment that can be undertaken is constrained by the level of investment available and the priorities assigned to other council activities such as renewals, growth and flooding.

Sustainable Catchments Programme – Weaving Science and Community into Action

The key objective of the Sustainable Catchments Programme (SCP) is to contribute to the achievement of the council's stormwater, water quality and stream restoration outcomes by integrated planning and implementation through iwi and community based interventions in priority catchments. Iwi and community are integral to the delivery of the SCP, involved from the planning through to the implementation stages. This results in restored riparian and wetland margins, enhanced community facilities, contributions to water quality improvement and communities reconnecting to their local streams and harbours.

Figure 6.5 Community enjoying the cycleway amenity which was constructed as part of Project Twin Streams enhancement

6.3.4 Key environmental initiatives

A variety of environmental monitoring programmes is carried out by the council's Research and Investigation Unit to obtain information on water quality, water quantity and ecological quality. The monitoring programmes outlined in Table 6.3 aim to assess the physical, chemical, ecological, and biological properties of the environment in order to understand the changes that urbanisation has on receiving environments.

Monitoring type	Description	Locations
Freshwater quality	The stream water quality programme measures the water quality of streams and monitors some of the physical, chemical and microbiological properties to assess the life supporting capacity and the microbiological quality of that river.	Stream and river water quality monitoring occurs at 31 sites across the region at monthly intervals.
Freshwater ecology	Freshwater ecology in the region is monitored to assess the ecological health of streams to support a wide range of functions and uses.	The sampling network comprises up to 66 sites, with the number of sites sampled each year varying.
Freshwater quantity	River levels and flows at different streams are measured and monitored to aid in the understanding of long-term hydrological trends. Monitoring the regions climatic and weather patterns runs in parallel with this and both sets of data are used to help predict the extent and probability of river flooding, future climatic and weather patterns, and the impacts of droughts.	The stream quantity monitoring occurs at 52 sites and hydrological data is collected automatically to the council via a telemetry network. This data is accompanied by a network of 98 rainfall stations.

Monitoring type	Description	Locations
Coastal water quality	The coastal water quality monitoring programme monitors parameters associated with erosion, nutrients and biological wastes. The primary purpose is to determine whether land based or human impacts are adversely affecting coastal water quality and influence the types of organisms that can survive there.	Water samples are collected on a monthly basis from 27 sites
Coastal Benthic Health	Marine benthic health is monitored in an effort to gain an understanding of current ecosystem conditions and helps in the identification of adverse effects on benthic ecology, in particular the effects of land-based activities upon near shore marine ecosystems.	The monitoring occurs at 85 sites across the region.
Coastal sediment quality	Marine sediments are monitored through a sampling network.	This is comprised of 27 sites in estuaries and coastal zones.
Groundwater	The groundwater quality monitoring programme monitors the physical, chemical and microbiological properties of groundwater.	The sampling network is comprised of 24 bores located throughout the region
Recreational beach monitoring	Safeswim monitoring programme which is designed to provide regular assessments of water quality.	Range of beaches in the region, in an effort to keep them safe for the public.

Table 6.3 Receiving environment monitoring in the Auckland Region

6.3.5 Future improvements

Achieving healthy and connected waterways requires a focus on both minimising the effects of new urban development while taking the opportunity to revive degraded waterways and improve public access to and interaction with them. Our primary areas of focus are:

- Finalise the Green Infrastructure Policy
- Complete the revisions to technical publications on the design of treatment devices (GD01)
- Develop sustainability Key Performance Indicators

6.4 Efficient business

This section outlines the Stormwater Unit's lifecycle strategies at agreed levels of service and priorities while optimising the whole of lifecycle cost. Lifecycle planning is a key asset management tool that takes into account the whole of-life implications of acquiring, operating, maintaining and disposing of an asset. It establishes a sound basis on which decisions are made by evaluating the total costs of an investment or operational decision, rather than only considering the short-term gains or initial capital costs.

The Stormwater Unit intends to use best practice for stormwater management and appropriate monitoring of the performance of its assets to inform decision-making for asset renewal, replacement, upgrade and disposal.

6.4.1 Operating and maintaining our assets

Operational activity is the daily operation of the network to deliver the required service. Operational activity also includes routine inspections and monitoring of asset condition to identify the need for maintenance work or renewal. Maintenance is the ongoing work carried out to ensure the reliable performance of the assets.

The service delivery of the operations and maintenance of maintenance in the Auckland region has been outsourced since 1993. The main maintenance contracts are long term performance based and is built on the principle of sharing risk between the contracting parties. There are four maintenance contracts for the Auckland Region, one each for North, South, Central and West areas. All contracts were awarded following public tenders and represented the best value at the time.

Operational area	Maintenance contract status
North	A single maintenance contract was awarded in 2014
Central	A single maintenance contract was awarded in 2013
West	A single maintenance contract was awarded in 2013
South	A single maintenance contract was awarded in 2012

Table 6.4 Maintenance contract status
Source: Auckland Council, 3 June 2014

The main maintenance contracts cover the following:

- Emergency response and repairs to the stormwater network including waterways
- Periodical inspections, cleaning, repairs, identifying remedial works, programming and implementation of programmes
- Un-programmed works as identified by the council
- Reporting and providing ‘As Built’ information

Condition surveys and some inspections are carried out by specialised contractors. For example, the Stormwater Unit has separate contracts covering the execution of pipe condition surveys and pond silt level surveys.

The Stormwater Unit carries out operation and maintenance of stormwater assets that are owned by AT through a service level agreement. These assets include catchpits, pipes and treatment devices in the road corridor. The cost of services provided to AT is over $4 million per annum. This covers maintenance contractors’ costs but not staff time. The operation and maintenance activities associated with these assets cover:

- Response to RFS, such as road flooding or reactive repairs of assets
- Cleaning of over 80,000 road catchpits at various frequencies

- Cleaning of soakholes and culverts

The implementation of a single standard for asset and maintenance data as well as exchange of asset information between contractors and the council is subject to developing a comprehensive asset information management solution for stormwater. The work to develop this solution is in progress and is expected to be completed in 2015. Meanwhile transitional solutions have been implemented to ensure that core asset and maintenance data is captured.

6.4.1.1 Operations and maintenance strategies

The main objective of the stormwater operation and maintenance strategy is to operate and maintain the public stormwater system efficiently, in a good and safe operational order and at least cost.

The Stormwater Unit is currently working on a comprehensive Maintenance Strategy that will be completed in 2015. Together with the Operation and Maintenance Manuals for treatment devices it will outline key maintenance techniques and operation practices for the different asset types to reduce the detrimental environmental effects of stormwater, protect public safety and keep assets in a good operational state.

Routine maintenance falls into two broad categories which are planned maintenance and reactive maintenance. A summary of the draft Maintenance Strategy is outlined in Table 6.5.

Key points	Description
Emphasis on preventative maintenance	Optimising the extent and scope of maintenance activities for all asset classes. At present preventive maintenance covers inspection and cleaning of treatment devices, known hot spots, catchpits and inlets and outlets
	Aligning preventive maintenance frequency to asset operational regimes and asset criticality
	Monitoring the efficiency and cost effectiveness of preventive maintenance
Optimised response to service request	Working with call centres and contractors to ensure that requests for service are responded to in relation to their urgency and importance
	One standard of response to service request is applied across the region, while recognising local specifics
	Understanding and optimising the cost of responding to service requests
Monitoring asset risk	Condition inspection techniques and frequencies are fit for purpose. We are working on a risk based condition monitoring framework – expected to be completed in 2015; that will provide guidance on condition inspections frequencies in accordance with asset criticality and failure probability.
	Periodical review of asset risk profiles and the threat to public safety to update maintenance regimes (review, and update hot spot list)
	Continuous rainfall monitoring at gauges to provide data for planning purposes and determine the return period for significant rainfall events
	Improvement of asset knowledge through field validation of asset data and condition surveys
Effective contracting of operation and maintenance work	performance based maintenance contracts and appropriate performance indicators to ensure that stormwater levels of service are met in a cost effective way

Key points	Description
Capturing and analyses of maintenance and operation data	Extended reporting on maintenance activities and asset failures to enable asset analysis
	Timely, accurate and cost effective capture of asset data from various maintenance activities in formats suitable for further analysis
	Review, utilisation and further development of intelligent business tools for data capture and work management
	Integration of information management systems and customer service tools

Table 6.5 Summary of the draft Operation and Maintenance Strategy 2015

6.4.1.2 Operations and maintenance of the stormwater network

Operation and maintenance of the stormwater network is combination of reactive and planned activities, as outlined below:

Reactive maintenance

Reactive maintenance is response to service requests and public complaints. The urgency of the response required depends on the risk associated with the request or complaint and is defined through the Levels of Service. Response time for urgent and routine requests is specified in maintenance contract specifications.

Reactive maintenance activities include timely response, safeguarding the site and restoring the service where possible (maintenance actions cannot resolve flooding incidents due to capacity constraints in the stormwater system).

Examples of reactive maintenance activities are:

- Clearing blockages to restore the free flow of rainwater through the network
- Fixing missing/ loose manhole covers
- Cleaning debris from catchpits and racks and barriers to enable entry into the stormwater system
- Post response investigations to establish the extent of the problem following service restoration

Urgent response to service request is required when public health and safety may be endangered, for example:

- Hazard to public safety when there is flooding, unsafe or missing manhole covers and catchpit grates
- Hazard response – road pollution incidents

Preventive maintenance

Preventive maintenance activities include:

- High risk asset inspection and clearing at specified frequencies, such as culvert inlets and outlets including litter traps, culverts under roads and catchpits in flood prone areas
- Critical hot spot inspection before heavy rain, when heavy rain warnings are received from the meteorological service. Hot spots include critical culverts, catchpits, inlets and outlets and

known areas of flooding and surcharging. After heavy rain these critical hot spots are reinspected and cleared
- Annual inspection of coastal outfalls
- Cleaning of catchpits sumps. Critical catchpits monthly and others at least yearly
- Pump stations with monthly routine inspection and cleaning, annual detail inspections
- Inspect and clean soakholes in the central isthmus area at specified frequencies based on specific features of the soakhole
- Manhole repairs which include replacement of missing or damaged manhole frames and covers and adjustment of manhole lid levels

The Stormwater Unit also provides assessment and advice on occasions where flooding incidents are caused by failure of the private stormwater system or unauthorised altering of overland flow paths.

The council has adopted a risk based maintenance approach as illustrated in Figure 6.6 and described in Section 5.3. Risk events which have low consequence and without health and safety consequences are generally managed reactively, such as the failure of non-critical pipelines.

A key element of asset management planning is determining the most cost-effective blend of preventive and reactive maintenance. This balance will be achieved through analysis of asset performance and maintenance costs which depend heavily on the availability and quality of asset maintenance data.

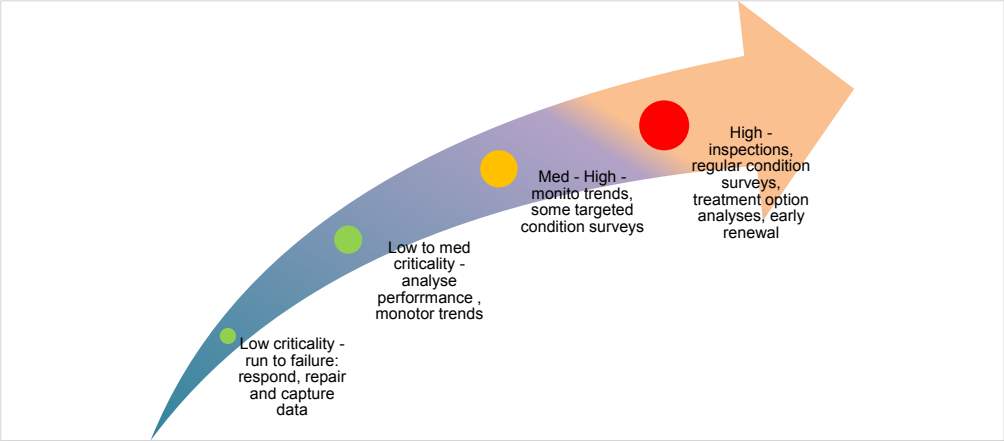


Figure 6.6 Risk based maintenance approach

It is recognised that high consequence risks, such as public safety, need to be managed at all times. Critical assets with low probability of failure are monitored or inspected periodically; there are also contingencies and business continuity plans to mitigate the risks of critical asset failure. The concept of criticality is discussed further in Section 5.3 Critical Assets

6.4.1.3 Operations and maintenance of treatment devices

The choice of device depends on the design objectives to be met i.e. whether detention, retention and/or high contaminant generating areas need water quality treatment. In an ideal situation there should be a range of treatment devices for a catchment to reduce over dependence on any one device.

Operation and maintenance activities for treatment devices, which are mostly preventive, include:

- Stormwater pond monthly inspections where debris is removed from inlets, outlets, grilles and the pond itself, structures and state of vegetation inspected, and remedial work programmes prepared.
- Floating litter traps are visually inspected and cleaned monthly
- Spraying or physical removal of aquatic weed infestation
- Six monthly inspections of other quality devices to desilt renew soakage media where required, clear blockages, replenish planting, minor repairs attended to and remedial work programmes prepared.
- Sediment testing programme for ponds is developed based on attributes of each pond to measure volatile organic carbon, lead, zinc and copper levels.
- Collection of dead ducks especially during the botulism season
- Safety check of structures

There is a large number of existing stormwater quality ponds in the treatment facilities and devices category and it is expected that more will be vested to council in the next few years. The need to manage the number, location and type of ponds is recognised and included in the Improvement Plan. These ponds were traditionally end of the catchment solutions and the current rate of increase in ponds will not be economically sustainable in the longer term.

Under the PAUP the move is away from traditional end of the catchment solutions to water sensitive urban design solutions. Treatment and retention requirements have changed from the current ALWP requirements. What this means is that at source treatment, retention, attenuation and treatment trains should reduce the number of bottom of the catchment ponds. Maintenance and renewal responsibilities of at-source devices will fall more into the private realm; those who benefit directly will be responsible for the upkeep and maintenance of these devices or measures. De-silting requirements of polishing wetlands where required would also be reduced as the runoff would already be pre-treated through various bioretention devices before reaching the polishing wetland.

6.4.1.4 Stream maintenance

The Stormwater Unit undertakes work in private streams where it is determined that council has a responsibility to act or where there is wider benefit in doing so. This includes where an issue is caused by public stormwater infrastructure, or where there is a wider benefit to do so, or when the magnitude of stream degradation endangers stream conveyance or the safety of the properties around it. Whether a stream or stream reach is in public or private ownership is a consideration with respect to undertaking remediation or enhancement works in streams.

Streams (or stream reaches) may be classified as Public, Publicly Managed, or Private, as follows:

- **Public Streams:** Streams or stream reaches located within public property, including local and regional reserves, and managed by council or other government agencies.
- **Publicly Managed Streams:** Streams or stream reaches located within private property but which are publicly managed due to the impact of overflows from combined sewers. There are five streams in this category and they are in the Central isthmus. They are the Meola, Oakley, Remuera, Motions and Newmarket streams.
- **Private Streams:** Streams or stream reaches located within private property boundaries.

Maintenance activities include erosion remediation, stream channel cleaning and collecting dead ducks to protect public health.

6.4.2 Operational risk management

6.4.2.1 Health and safety

Auckland Council has a health and safety policy and safety management systems in place to protect staff, contractors and members of the public from the hazards associated with operating and maintaining the stormwater network.

All contractors working on physical works must pre-qualify and be on the council's approved Health and Safety list. The requirements are varied and contractors are assessed and scored according to the nature of the works they intend to carry out. In addition, contractors are required to prepare, and operate under, specific health and safety plans and procedures for every project.

Safety is also an important issue for community groups and volunteers. The council is currently working on a Health and Safety Policy which will take into account new Health and Safety legislation requirements for volunteers.

6.4.2.2 Emergency management

Emergency management deals with the response to severe events. Stormwater manages emergency incidents using an incident escalation system, which defines roles, responsibilities and processes for responding to incidents. These unusual events or natural disasters require more attention than responding to normal faults, and cause operational strategies to change to a different mode. Emergency management strategies aim to minimise the disruption to services from events such as key staff absences, critical asset failures or widespread disasters. The different plans and their current status are summarised in Table 6.6.

Plan type	Purpose	Current status and description
Business Continuity Plans (BCP)	Developed to coordinate efforts for keeping the council business operating through high risk events such as pandemics, staff death and	The Stormwater BCP has been tested during the annual council wide BCP tests. During the first exercise (Exercise Tahi) several areas of improvement were identified and the BCP was updated and placed on the I&ES Intranet page following this exercise.

Plan type	Purpose	Current status and description
	terrorism.	The majority of the improvements have been implemented. The areas not implemented were reviewed in August 2014 (Exercise Toru) and the BCP was aligned to the 2014 corporate business continuity format.
Incident Response Plans (IRP)	Covers the processes that an organisation will use to respond and recover from an incident. IRP defines roles and responsibilities, communication and interfaces with other organisations and council departments.	Regional IRP completed in 2010 The new regional approach allows the maintenance contractors to be reallocated to different areas during significant storm events as they are generally localised. The IRP is based on a three level alert system where levels one to three are covered by IRP with level three as a civil defence emergency. Level one is business as usual and covered by the normal maintenance contracts.
Contractors' contingency plans	This demonstrates the adequate backup and support in the event of an emergency, including staff, plant and materials.	This should be be updated as required but not less than six monthly.

Table 6.6 Emergency plans
Source: Auckland Council, June 2015

6.4.2.3 Civil Defence – Lifelines

The CDEM Act 2002 stipulates that Lifeline Utilities must plan for continuity of service, be capable of managing its own response to emergencies, and establish CDEM groups across regions consistently. The Auckland Lifelines Group (ALG) is a voluntary group made up of lifeline organisations in the Auckland region and operates under the auspices of the council, which takes on the role as funds administrator and enters into contracts for services on behalf of the group. Since 2004 the ALG has also been the coordinator for lifeline utilities for Auckland CDEM Group planning. However, the ALG itself does not take an operational role in an emergency; its role is primarily focussed on risk reduction and readiness.

The Stormwater Unit is a member of ALG steering committee which meets quarterly to discuss and report on actions. In addition to non-operational planning, the unit does take an appropriate operational role in an emergency when directed by Civil Defence.

6.4.3 Creating new assets

This section describes the council driven new works to accommodate levels of service or changes in demand or customer expectations or growth. Asset creation involves the design and construction of new assets which increase the capacity or performance of the system. It is also an excellent opportunity for us to showcase to the wider industry good project examples.

Issues and solutions are identified primarily through the operations and planning teams. At the project definition stage business triggers, feasibility studies and concept designs are carried out. In some cases SMPs will be prepared to consider the issues and solution holistically. When a solution is defined conceptually, it will be briefed, prioritised and passed through the Gateway process (council's project management tool) to enable optimised decision making. Projects which

satisfy all the necessary Gateway requirements to proceed will be delivered by Stormwater's Delivery and Development team.

Design will be carried out in house or outsourced whilst construction will be outsourced. All outsourced work will be tendered and procured according to council's Procurement Manual. Project managers aim to complete work to required quality standards, within budget and in a timely manner. At the completion of the project, asset data and asbuilts will be handed to the Asset Information team by project managers to update the asset register. Regulatory will hand over vested asset data and asbuilts to the Asset Information team before the assets are taken over.

6.4.4 Decommissioning / Disposal of assets

Where underground pipelines are renewed or upgraded on a different alignment, the old pipe is usually decommissioned. The existing pipe is normally plugged at either end with a cubic metre of concrete and left in the ground or completely filled with flowable fill. These decommissioned pipelines represent a potential liability if not filled completely as they can collapse in future. For this reason they remain recorded on the service records as abandoned pipelines. To date there have been no major costs associated with these abandoned pipelines.

Installation by thrusting and pipe bursting of the existing pipeline also "expires" the existing pipeline for the purpose of the new renewal. In this case the old pipe is destroyed by the trenchless methodology and its remnant pieces are left in situ. Where underground pipelines are renewed or upgraded on a different alignment, the old manholes are required to be decommissioned.

The disposal of manholes generally involve the capping of all the pipes connected to the manhole, concrete filled up to 1.0m above the soffit of the main inlet pipe, backfilled to 1.5m below the existing ground level and the remaining section is completely removed. In some cases the manholes may be removed completely, depending on site conditions or conditions of consents. Decommissioned inlet or outlet structures are removed from site when the asset is renewed or replaced.

The council has a range of Health and Safety policies in terms of handling of hazardous material, for example asbestos concrete pipe removal. These relate to requirements set out by the MIBE. The council staff and our contractors follow these policies to protect themselves and the public. The health and safety requirements are covered in all the maintenance and capital contract documents. There is generally no income forecast for asset disposal.

There is only expenditure involved in asset disposal for the activities as described above. Asset disposal is usually carried out when the asset is renewed or replaced, therefore the cost for disposal will be included in the budget for the renewal or upgrading programme. The formal asset disposal process is part of the project completion process and any abandoned assets are recorded as part of the completion of new assets.

6.4.5 Vested assets

Approximately 70% of new stormwater assets are created by third parties, mainly developers, and handed over or vested to the Stormwater Unit to manage. Generally public stormwater assets outside the road corridor are vested with us while those in the road corridor remain with AT. Some are partly funded through Infrastructure Funding Agreements especially when the infrastructure services a wider catchment than the development site or for strategic reasons.

There are two processes:

- Asset creation by developers, administered through council's Regulatory, with our input depending on the nature of the works
- Asset creation by other council departments or organisations outside the formal regulatory process. Our input is managed through Service Level Agreements with these departments

We also have indirect input to both processes through the preparation of stormwater design standards, Best Management Practice guidelines, and construction, operations and maintenance guides for stormwater devices.

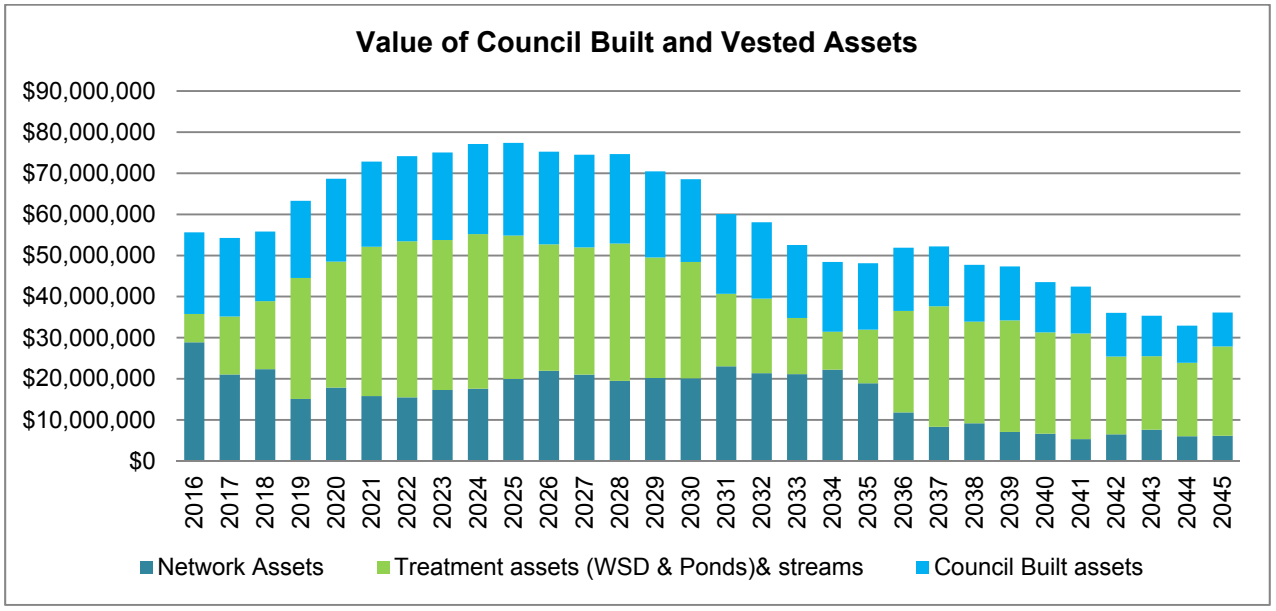


Figure 6.7 Growth assets – Council built and vested

Figure 6.7 shows the forecast of new growth assets and the comparison between our built assets and vested assets in terms of value. The difference between the council funded growth values shown in section 7, Table 7.1 is primarily in land costs which once purchased is not considered a Stormwater Unit asset. The shape of the graph is because growth is cyclical and the smaller amount of spending for the next three years is the expected lag time before actual construction picks up.

With the expected higher percentage of vested assets handed over to us to operate and maintain particular care should be taken to ensure that maintenance costs are sustainable. Developers

may favour catchment wide infrastructure with the lowest capital investment which conversely tend to have higher maintenance costs over the life of the asset.

It will be our Delivery and Development team's responsibility either directly or through Service Level Agreements with Regulatory to ensure that vested assets are fit for purpose, sustainable and that appropriate asset data is provided to the Asset and Information team to update the asset register.

6.4.6 Data and information management

Data is captured and stored to enable monitoring of performance against service levels, support optimisation of asset management practices and plan for future growth, as outlined in Table 6.7.

Data type	Purpose
Asset data- changes to asset geometry and attributes	Instrumental to all aspects of stormwater management
Asset valuation data	Determines asset depreciation
Asset renewal data	Determines renewal profiles and expenditures
Maintenance data including cost	Supports cost monitoring and optimising asset management practices, informs operational planning, support consent compliance
Condition data	Informs renewal profiles, support managing asset risk
Customer requests and complaints	Drive response maintenance, measures Loss, informs operational planning and capture operational issues
Capacity data	Informs land use, supports growth
Rainfall data	Supports hydraulic modelling and determining capacity issues
Terrain specifics	Terrain data is critical for understanding overland flow and flooding hazards
Financial data	Instrumental all aspects of stormwater management
Project and contract data	Adds to data register

Table 6.7 Data management

6.4.6.1 Key data / information standards

Data standards improve the value, usability and integrity of data. Over the last decade standards have been developed and applied to a varying degree to all types of data.
Auckland Council, thought its legacy organisations has a long history in developing data standards dating back to 1995. We have been working on unifying data standards across the regions since the formation of the council. Work is essentially completed and standards are implemented for key data pertaining to:

- Customer complaints and service request
- Asset valuations
- Capacity and rainfall

- Project and contract management
- Financial information
- Asset condition monitoring (CCTV and deterioration in pipes)

Data standards development and implementation is in progress for:

- Condition and renewal data
- Maintenance and inspection data
- Asset risk and criticality
- Asset registers

The data standards listed above are essentially completed and their implementation is a subject to the availability and suitability of asset management systems and repositories as well as publications and deployment options. The asset data standards pertaining to asset registers are consistent with the current A Spec, and more specifically with its DSpec component (ASpec was recently adopted by Auckland Transport and many local government organisations in Australia).

We will participate in the latest central government initiative on developing national metadata standards and will contribute knowledge and experience in this area. It is possible that the national metadata standards may have an impact on our current standards and systems that support these standards.

6.4.6.2 Information management systems

The transformation of data to information is supported by technology; the scale of the council asset base and activities require smart, effective and integrated systems and tools. Business information systems are the means of implementing data standards and business processes. The current lack of an integrated system and gaps in functionality limit our business analytical capability and affect adversely the consistency of data across the region. In addition, there are also information gaps which we are filling through ongoing data capture programmes, according to priorities and resources.

.

Current state

With respect to its information management systems and tools Auckland Council is still in transition state – moving from seven legacy environments into one considered. An overview of key systems and tools used for stormwater management is given below:

- SAP is Auckland Council's ERP system; it is used for financial and human resource management across the organisation, some limitation in reporting and integration with other systems.
- Sentient is a project management tool that is procured as a managed service and is used for project and contract management of the delivery of capital projects– some limitations in configuration, not meeting all requirements
- Horizon is a capital portfolio management tool that is procured as a managed service and is used for planning capital solutions – temporary use until the council develops a comprehensive portfolio management solution

- Two instances of Hansen 7 AMS and four GIS applications are used for capturing asset data and maintenance history across the region. There are major limitations in functionality and reporting, and a lot of manual data entry.
- Pathways systems are used for capturing customer call and service request data
- A variety of specialised applications like Mouse, Info works, etc. are used for hydraulic modelling and capacity data
- SPM Network is an analytical tool procured as a service and is used for renewal modelling and asset valuations
- H2Know is a data portal that is procured as a managed service and is used for storing and managing asset condition data, for planning condition surveys and asset renewals
- Auckland Council GIS viewer is a data portal that provides a consolidated view of most council data; the latest GeoMaps have improved functionality as well as some analytical capabilities. Data can be exported for further analyses.
- ArcGIS is the council's choice of geospatial platform
- Council systems have low level of integration in general, which leads to multiple handling of data and manual data entries

Future state

Auckland Council, though its Project One Plus initiative is working on developing a complete solution to meet core asset management needs. The project started in 2012 and has a value of over $4 million. The implementation of the first phase of the new asset management solution is expected to start in later 2015 and be completed by the end of 2016. Outlined below are the key elements and functionality of the new asset management solution:

- SAP Plant Maintenance module will be utilised for consolidating asset registers; it will be configured to the unified stormwater asset data standard. It will also enable management of work orders, capturing maintenance and asset failure data as well as maintenance cost at asset component level
- SAP Plant maintenance will be deployed to the contractors via the web or though business to business integration models.
- SAP (and later CLICK) will ensure integrated management of request for service.
- GeoMap will be used as GIS viewer and its functionality will continue to be improved. Interim viewers such as H2KnowHow will be used until full functionality is available in GeoMaps.
- ArcGIS will be integrated with SAP and will be used a start point for asset register updates
- Geo.E is an internal SAP GIS viewer and will be used for assigning assets to work orders and visualisation of maintenance data within SAP
- Specialised analytical tools, such as hydraulic models, asset deterioration models, risk and criticality assessment tools and similar will continue to be used along the enterprise systems. These models will consume data from asset registers and will return specific outputs to the asset register, for example – asset value at year of valuation.
- Project and portfolio management tools will continue to be used until a unified solution is developed – perhaps utilising SAP Project and Portfolio Management modules.
- TRIM is council's document management system and will be used as repository for documents.
- Business Intelligence tools will provide analytical environments and dashboards to support various aspects of stormwater management.

6.4.6.3 Data quality and integrity

Data and information used have different levels of quality, completeness and confidence. We manage data quality and integrity through:

- Business processes and training (financial and project management)
- Targeted internal audits asset and maintenance data)
- External audits (CCTV data, asset valuations)

Overall data quality assessment is summarised in the Table 6.8, 1 is very good to 5 very poor.

Data type	Purpose	Quality	Comments
Asset data-changes to asset geometry and attributes	Instrumental to all aspects of stormwater management	3	Assumption based on last audit report and observations as well as the work done to date on the AC Project One
Asset valuation data	Determines asset depreciation	2	Last revaluation completed in May June 2015, based on improved condition and asset data, cost from AC capital projects and and robust methodology
Asset renewal data	Determines renewal profiles and expenditures	3	Renewal profiles based on actual condition data and some deterioration analyses
Maintenance data, including cost	Supports LoS monitoring and optimising asset management practices, informs operational planning, support consent compliance	2	Multiple standards, failure and cost data captured erratically
Condition data (CCTV)	Informs renewal profiles, support managing asset risk	2	Legacy quality varies by area and time of capture; now proper tools and processes to support data integrity
Customer requests and complaints	Drive response maintenance, measures LoS, informs operational planning and capture operational issues	4	Data standardised across the region
Capacity data	Informs land use, supports growth,	3	Some issue with hydraulic modelling data in the South
Rainfall data	Supports hydraulic modelling and determining capacity issues	4	The use of rainfall data is improving but more work is required
Terrain specifics	Terrain data is critical for understanding overland flow and flooding hazards.	4	Major improvements with capturing terrain data and building footprints
Financial data	Instrumental all aspects of stormwater management	2	We have good financial models and controls, consistent long term and annual planning
Project and contract data	Adds to data register, input to asset valuation, CAPEX planning and prioritisation	3	Project data now captured in a consistent way through project and programme management tools

Table 6.8 Data quality assessment

	AUCKLAND COUNCIL - OVERALL ASSSET GRADE OR CONFIDENCE LEVELS RATING (CLR)					
Asset Class	**ATTRIBUTE**	**5**	**4**	**3**	**2**	**1**
Pipes	Type					
	Material					
	Diameter					
	Length					
	Install date					
	Coordinates					
	Overall grade			Grade 3		
Open Drains	Type					
	Material					
	Diameter					
	Length					
	Install date					
	Coordinates					
	Overall grade			Grade 3		
Manholes	Type					
	Depth					
	Diameter					
	Quantity					
	Install date					
	Coordinates					
	Overall grade			Grade 3		

Figure 6.9 Overall Asset Grade

6.5 Asset Management Practices

The regionalisation of the stormwater management requires that processes, tools and data be consolidated, harmonised and optimised. The delivery of stormwater services by the legacy councils was supported by different business processes and tools of varying maturity. Many asset management and business processes were broken when the legacy organisations were amalgamated to form Auckland Council. The most affected areas are Auckland Central and Manukau where there is the least accurate data in the region.

The gaps in asset management practices that have been identified during the development of the draft AMP and a previous GHD led gap assessment review has been consolidated and prioritised into the asset management improvement plan in section 8.

6.5.1 Asset management objectives

The objective of asset management is to meet the required level of service in the most cost effective manner through the management of assets for present and future customers.

6.5.2 Asset management processes

The asset management planning process in the council is outlined in the Asset Management Planning Framework and is managed at three levels as shown in Figure 6.8. The roles and responsibilities of each group are outlined in the Framework.

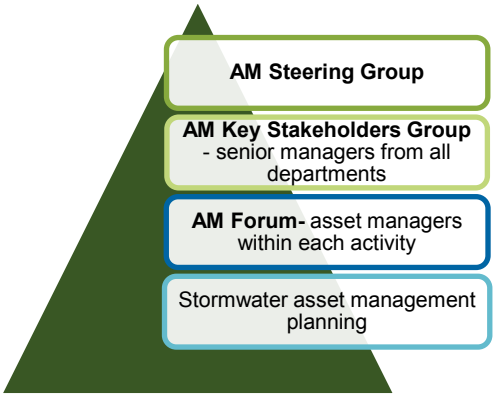


Figure 6.8 Asset Management Planning Framework

The Stormwater Unit needs to transform the various legacy management processes into regionally appropriate practices while providing maintaining the agreed service levels.
Current stormwater management processes are listed in Table 6.10

AM Process Area	Current Status
Asset Information Management	A mix of legacy and new processes, many not documented. Significant technology constraints are preventing harmonisation of asset information management. Moving towards one data management system in SAP.
Procurement of Services	Clearly outlined at corporate level, properly documented (council's Procurement Manual).
Levels of Service and Performance Measurement Framework	Formal performance management framework and implementation at unit level. Levels of Service measured and reported annually.
Operations and Maintenance Management	Legacy processes apply; a regional O&M manual is in place. .
Capital works planning	A regional catchment planning process is broadly mapped; work in place to refine roles and responsibilities.
Asset Acquisition and Creation	Legacy processes apply for asset created by capital projects; asset vesting processes scoped but needs refinement
Risk management framework	Auckland Council risk framework completed; department risk management processes being worked on.
Population growth predictions	The Stormwater Unit is using the AT growth model and the provisions of the Auckland Plan. Growth considerations are inseparable part of the catchment and asset planning process.
Climate change impacts	Climate change models will be used at a corporate level to predict effects of climate change. The impact on stormwater assets is incorporated in hydraulic modelling.
Optimised decision making and renewal forecasting	Legacy processes apply, but work on a consolidated approach to asset renewal is almost complete. Renewal forecasting processes was developed as part of the comprehensive renewal strategy.
Managing RFS	Processes around managing service request is owned by multiple parties (Auckland call centre, legacy call centres and stormwater response coordinators); major improvement needed to minimise business risk of call "handshaking".
Financial forecasting	Business planning processes are being developed.
Asset data collection	Local processes still apply; there is no consolidated process in place currently. The process is heavily dependent on the asset information system solutions. This is identified as a key improvement objective.
Condition surveys	The processes around condition data are under review; a harmonised citywide approach will be covered by the Condition Strategy.
Asset valuations	Asset valuations are coordinated by Council's Finance Department and are carried out by the Stormwater Unit. Stormwater asset revaluation was completed in June 2015.
Asset Management Plan Development	The Asset Management Plan development is coordinated by Finance Department. The relation between the AMP process and other planning processes (LTP, AP) needs improvement is an ongoing process.

AM Process Area	Current Status
Audit, Review and Continuous Improvement	Internal and external reviews of the stormwater AMP as well as key processes and activities will be carried out periodically.

Table 6.10 Asset management processes

6.5.3 Asset management maturity and gap analysis

The Stormwater Unit wishes to move towards advanced asset management status in the next three to five years and has recognised that a high standard of asset management practice will be necessary to achieve this. As part of its commitment to improve its business we commissioned two independent external reviewers to assess its business practices and gaps to enable it to improve its performance.

First was a gap analysis review by AECOM in August 2012 and second was an Asset Management Framework Review in May 2013.

6.5.3.1 Gap Analysis Review by AECOM

This review compared the Stormwater Unit's current asset management capability and practices predominantly against a tool based on elements of the PAS 55 Assessment Methodology. PAS 55 is an internationally accepted specification for asset management that is widely used by the United Kingdom electricity supply industry. This was supported with a best practice framework developed by the IIMM and used widely in New Zealand by local authorities. The PAS 55 has now been replaced by ISO 55000, the international standard for asset management.

The overall results from the Stormwater Asset Management Practices Review using the PAS 55 framework indicate was assessed as 1.7 (out of a maximum rating of 4) using the PAS 55 framework. This indicates that the Stormwater Unit has not yet matured against the requirements of this framework but has plans in place to improve its stormwater management. This was not atypical of a new organisation.

The overall average score using the IIMM framework (across three categories only) was about 46%. This reflected a systematic approach and a desire (and sometimes plans in place) to become competent as practices are harmonised, supported by suitable systems. The Asset Knowledge and Management areas scored the highest at 57% and 49% respectively, reflecting the good practices still in place for many of the core asset management functions, such as asset physical attributes and performance data. The Information Systems area scored the lowest at 32% reflecting the disparate legacy systems in place and the limited access to Council's GIS.

6.5.3.2 Asset Management Framework Review by GHD

The assessment was structured around a model for asset management that considered the management system in place for asset management (processes), the enablers to support it

(people, information and technology) and how the organisation monitors asset performance and management system performance (assurance).

In reviewing an appropriate base level of maturity GHD considered the Stormwater Unit's crucial role and services provided to the community and its wider industry influence as a lead provider of stormwater activities in New Zealand. In considering the above, a minimum base level target of Enterprising (above 60) is desired, to ensure the Stormwater Unit's activities are fully effective and integrated throughout the business.

The Stormwater Unit demonstrated Competent practices (>41) in most areas and achieved Enterprising levels of maturity in the "Implementation" group of activities. The Implementation group considers the lifecycle activities, including scheduling and implementation work plans, and projects to deliver the asset management plans.

Improvement opportunities identified were prioritised and those yet to be carried out were summarised in section 8.

7.0 Financial summary

7.1 Optimised Baseline Expenditure Forecasts

The optimised baseline expenditure forecast has been developed on the basis that renewals and growth are prioritised and level of service expenditure in flood control and environmental programmes is kept to a risk based minimum. Growth investment increases until 2027 and then gradually declines. After 2027 it has been assumed that investment in flood control and environmental programmes will increase as growth investment declines. These figures do not include some of the stormwater expenditure in the Flat Bush, NORSGA and Crown Lynn growth areas that is to be delivered by the City Transformation Unit. The expenditure forecast in Figure 7.1 is detailed in Tables 7.1 and 7.2.

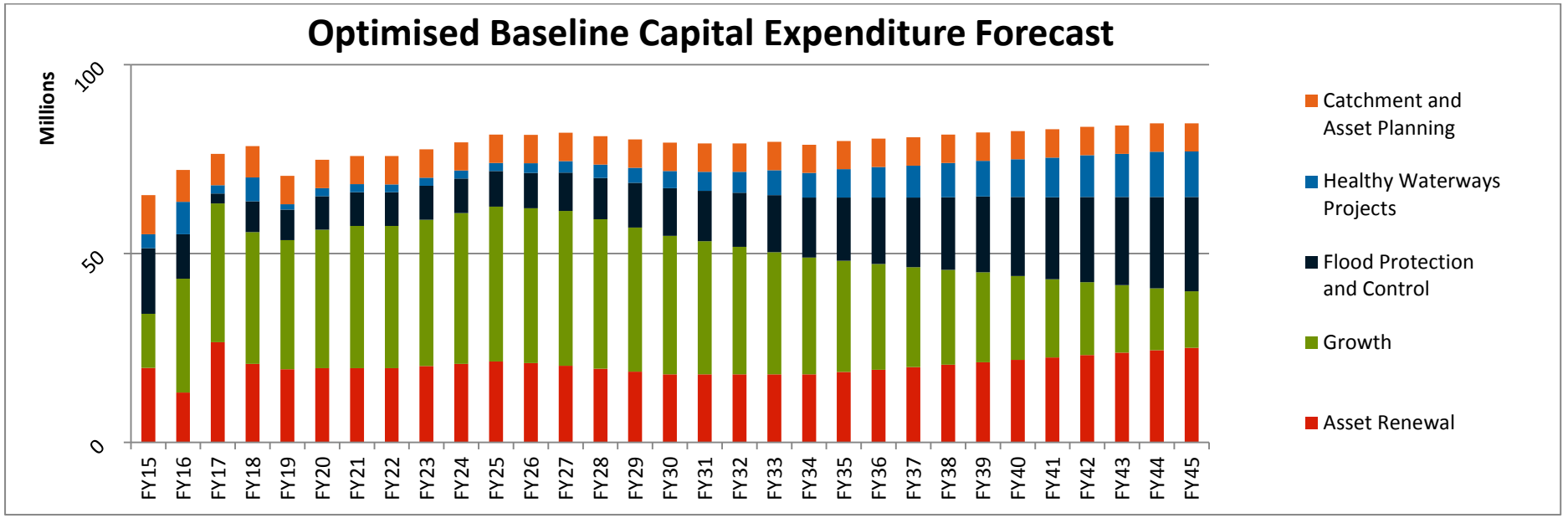


Figure 7.1 Capital expenditure forecast (as at 28July 2015?)

Stormwater operational expenditure reflects mature maintenance contracts where procurement efficiencies from consolidating legacy maintenance practices, operational standards and competitive tendering have been already been achieved through the efforts of Project

Genesis. Operational expenditure increases as the stormwater network grows because maintenance costs are proportional to the catchment area serviced, the Consequential OPEX costs are included in the Maintenance and Delivery Programme as shown in Figure 7.2.

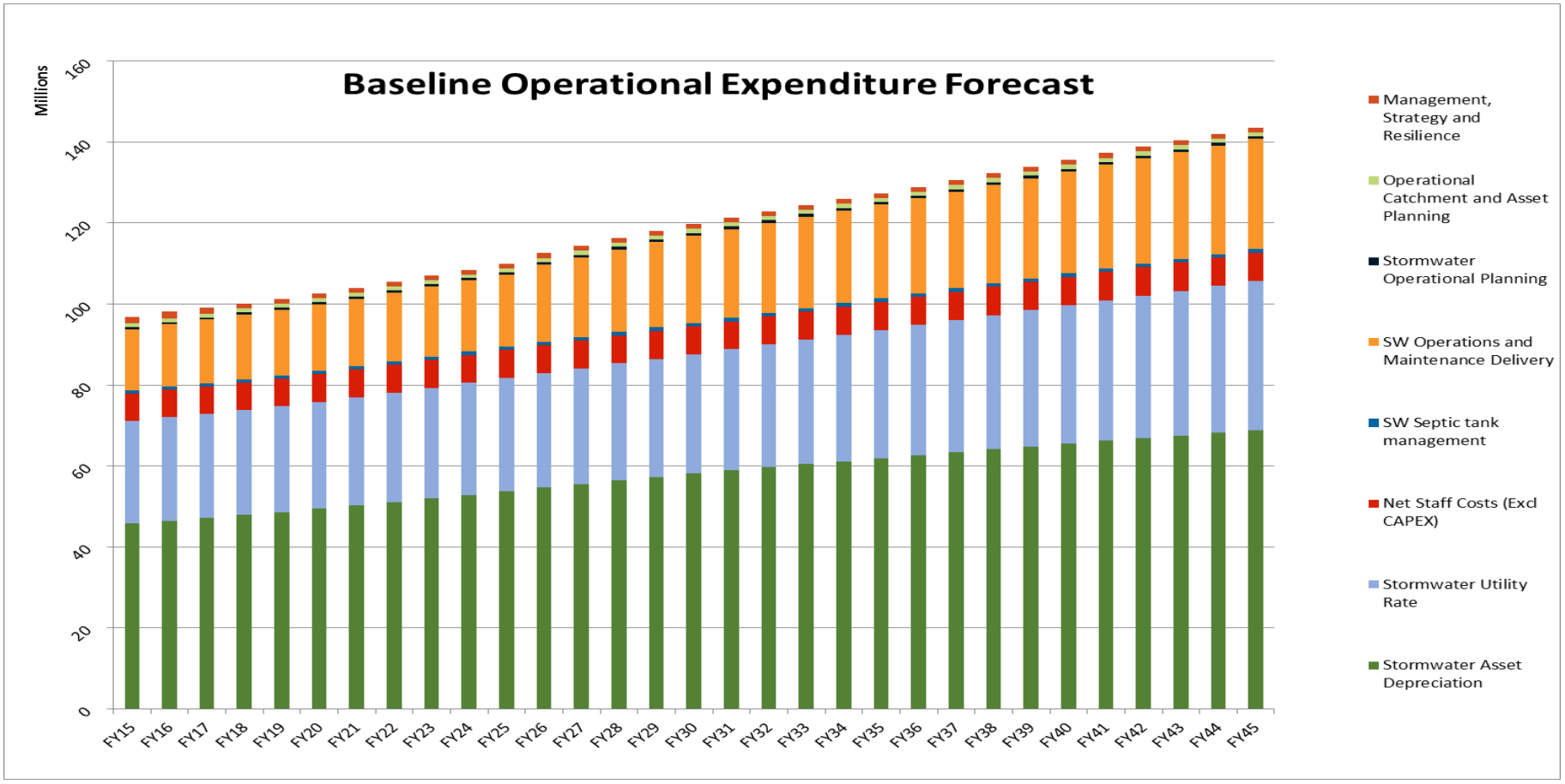


Figure 7.2 Operational Expenditure Forecast

	CAPEX Programme name	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	10 YEAR 15/16 to 24/25	25/26-29/30	30/31-34/35	35/36 – 39/40	40/41-44/45	30 YEAR 15/16 to 44/45
1	Catchment and asset planning	11,181	8,300	8,300	7,500	7,500	7,500	7,500	7,500	7,500	7,500	**80,281**	37,500	37,500	37,500	37,500	**230,281**
2	Asset Renewal	20,024	26,504	20,794	19,394	19,652	19,656	19,662	20,206	20,790	21,386	**208,070**	97,524	90,683	102,700	118,636	**617,612**
3	Growth	16,660	36,759	34,841	34,142	36,675	37,644	37,647	38,745	39,875	41,042	**354,030**	196,303	161,674	125,642	89,367	**927,016**
4	Flood protection and control	17,847	2,600	8,158	8,056	8,873	8,923	8,903	9,006	9,166	9,386	**90,918**	54,928	75,409	96,107	116,740	**434,102**
5	Healthy Waterways Programme	6,434	2,209	6,362	1,458	2,113	2,102	2,105	2,114	2,124	2,137	**29,158**	17,669	31,118	45,101	57,015	**182,226**
	Total CAPEX Forecast	**72,147**	**76,372**	**78,454**	**70,550**	**74,814**	**75,825**	**75,817**	**77,572**	**79,454**	**81,451**	**762,456**	**403,924**	**396,383**	**407,049**	**419,258**	**2,389,071**

Table 7.1 CAPEX Optimised baseline expenditure forecast ($000)

	OPEX Programme name	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	10 YEAR 15/16 to 24/25	25/26-29/30	30/31-34/35	35/36 – 39/40	40/41-44/45	30 YEARS 15/16 to 44/45
6	Management, Strategy & Resilience	$1,831	$1,573	$1,373	$1,373	$1,373	$1,373	$1,373	$1,373	$1,373	$1,373	**14,393**	6,868	6,868	6,868	6,868	**41,864**
7	Operational Catchment Planning	950	950	950	950	950	950	950	950	938	950	**9,488**	5,250	5,250	5,250	5,250	**30,488**
8	SW Operational Planning	550	550	550	550	550	550	550	550	550	550	**5,500**	3,250	3,250	3,250	3,250	**18,500**
9	SW Operations and Maintenance	15,286	15,740	15,935	16,210	16,401	16,701	17,031	17,268	17,544	17,830	**165,945**	101,453	112,599	121,488	132,111	**633,596**
10	SW Septic tank management	759	763	766	770	770	770	770	850	850	850	**7,919**	4,250	4,250	4,250	4,250	**24,919**
11	Maintenance AT assets (contractor)	4,168 -4,168	4,209 -4,209	4,252 -4,252	4,294 -4,294	4,337 -4,337	4,380 -4,380	4,424 -4,424	4,468 -4,468	4,513 -4,513	4,558 -4,558	**43,604** **-43,604**	23,484 -23,484	24,682 -24,682	25,941 -25,941	27,264 -27,264	**144,975** **-144,975**
2	Staff Costs Total Staff Cost CAPEX	13,135 -8,267	13,149 -8,275	13,162 -8,283	13,175 -8,291	13,188 -8,300	13,201 -8,308	13,214 -8,306	13,228 -8,325	13,241 -8,333	13,254 -8,341	**131,947** **-83,039**	65,656 -31,092	65,985 -31,248	66,316 -31,405	66,648 -31,562	**399,831** **-235,640**
13	Utility Rates	17,335	25,496	25,685	25,869	26,097	26,347	26,600	26,857	27,125	27,394	252,154	140,644	142,913	142,913	142,913	**824,181**
14	Asset Depreciation	55,434	56,073	56,808	57,543	58,344	59,184	60,035	60,899	61,785	62,680	588,785	326,589	346,629	364,992	382,214	**2,009,210**
	Total OPEX Forecast	**97,015**	**106,020**	**106,947**	**108,150**	**109,375**	**110,769**	**112,208**	**113,650**	**115,073**	**116,540**	**1,095,765**	**616,909**	**650,507**	**677,904**	**705,892**	**3,746,959**

Table 7.2 OPEX Optimised baseline expenditure forecast ($000)

7.2 Expenditure categories

The expenditure programmes that cover the 30 years of this AMP are split into six operational expenditure programmes and five capital expenditure programmes. The programme structure is illustrated in Figures 7.3 and 7.4 and detailed in the corresponding tables. The projects are allocated to each sub programme by their primary driver. The programme structures are also aligned to our strategic direction and management structure.

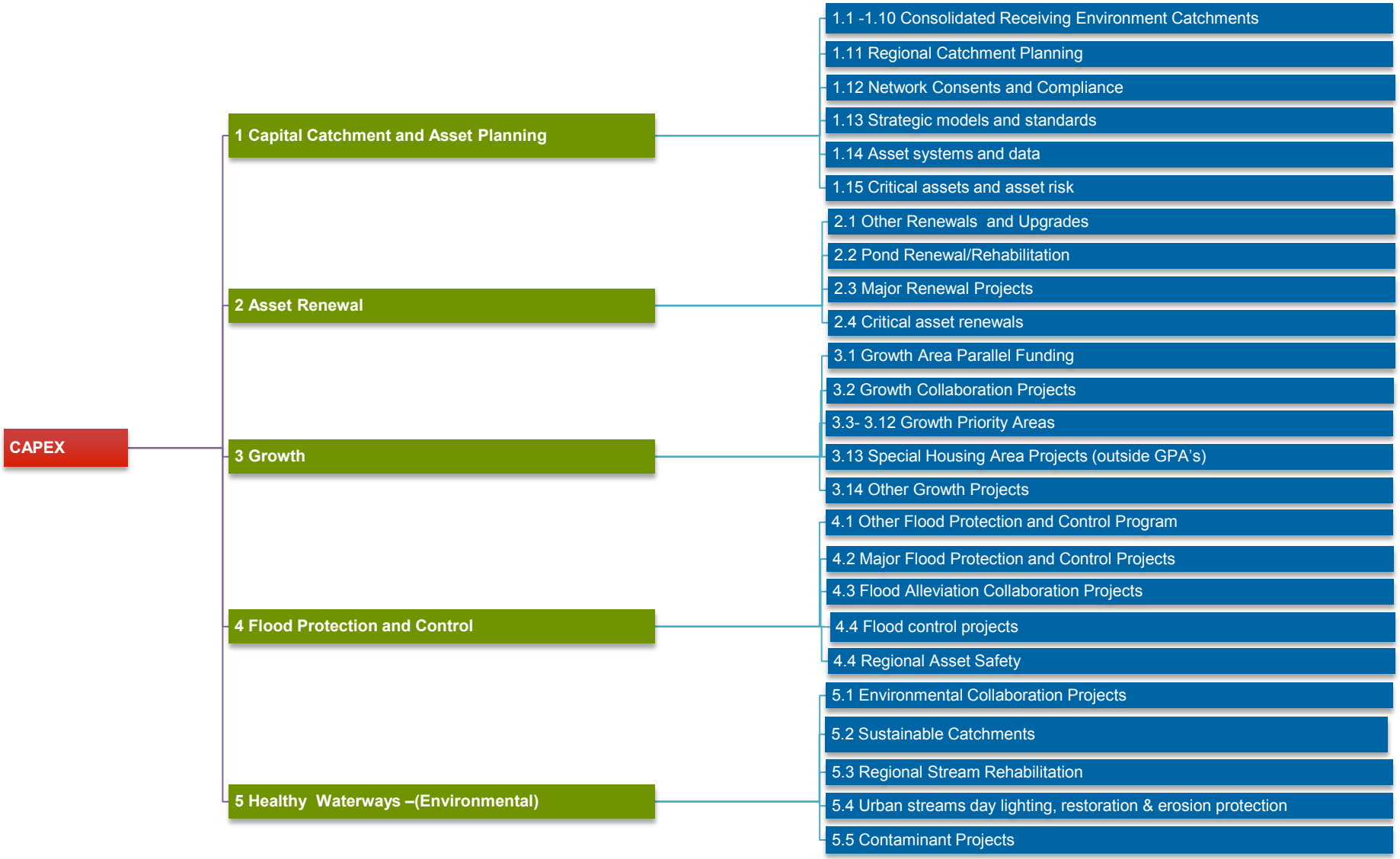


Figure 7.3 CAPEX Programme structure

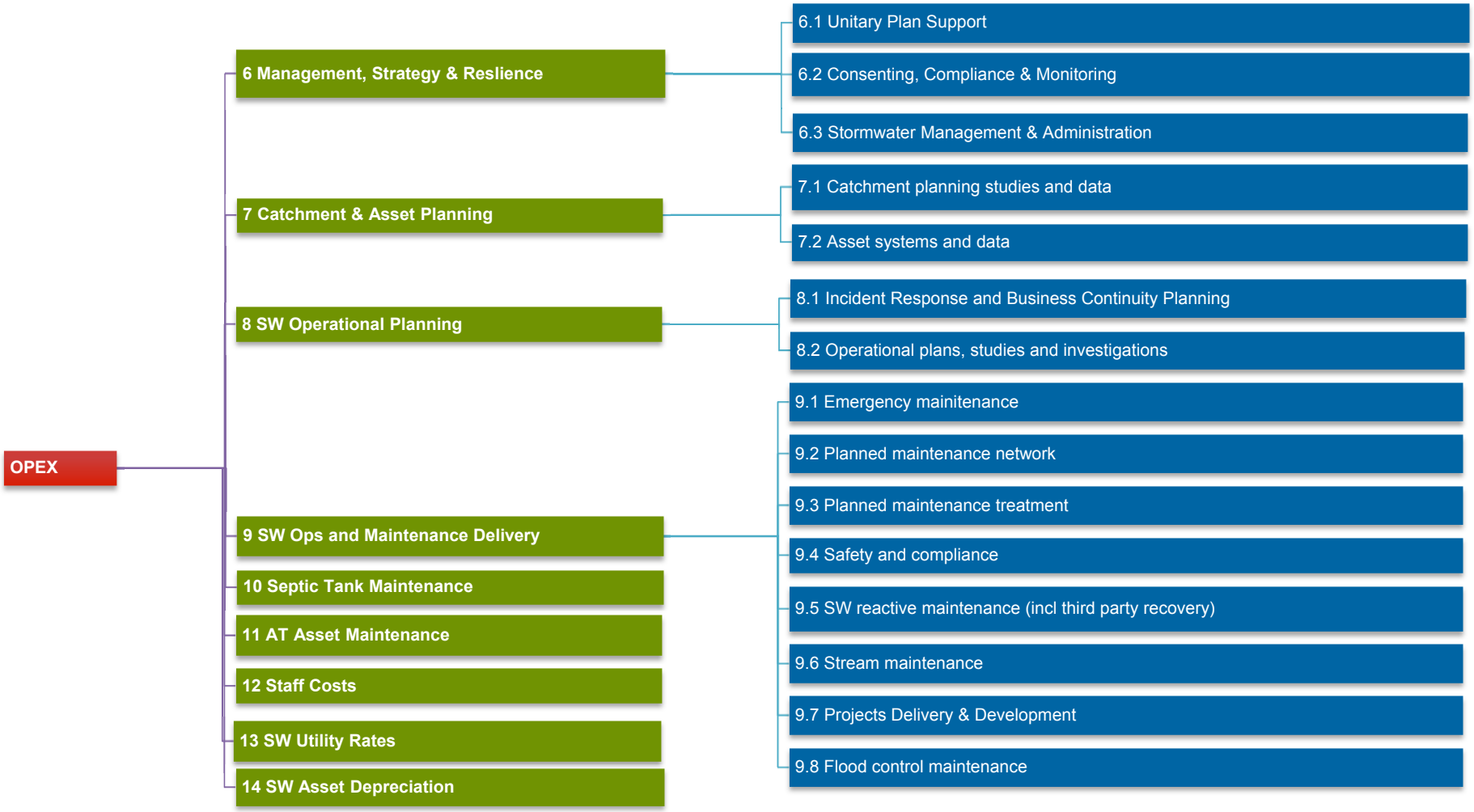


Figure 7.4 OPEX Programme structure

ID	CAPITAL EXPENDITURE PROGRAMMES	
1	Capital Catchment and Asset Planning	Includes the development of catchment models, asset surveys, stream surveys, consenting for capital projects and discharges. This is the capital investment in intellectual property that we use to develop and renew our stormwater infrastructure.
2	Asset Renewal	The programme of projects where renewal of an asset is the main driver and includes the renewal of Ponds and wetlands
3	Growth	The programme of projects where growth is the main driver and includes network extensions, purchase of land for stormwater management, and projects to resolve flooding to enable growth.
4	Flood Protection and Control	The programme of projects where resolving existing flooding is the main driver.
5	Healthy Waterways Programme	The programme of projects where environmental outcomes are the main driver, it includes contaminant removal devices, stream day lighting and fish passage projects.
ID	**OPERATIONAL EXPENDITURE PROGRAMMES**	
6	Management, Strategy and Resilience	Covers the operational activities of management, strategy and resilience within stormwater, such as policy development, financial planning, software licences, office expenses and strategy development.
7	Operational Catchment and Asset Planning	Covers the operational activities of Catchment Planning, such as system performance analysis and issue identification and asset data and system analysis and improvements to existing data
8	Stormwater Operational Planning	This programme includes the operational planning initiatives, incident response and business continuity planning
9	SW Operations and Maintenance Delivery	This is the main operational programme that includes; planned and reactive maintenance and investigations, flooding response and safety and emergency maintenance. Our expenditure in this programme is proportional to the frequency and severity of rainfall over the year. More rain results in more callouts, more damage to assets and more repairs.
10	SW Septic tank management	The Stormwater Unit manages the septic tank cleaning programme in the legacy Waitakere area; costs of this programme are recovered from the property owners. There are no sub programmes under this programme.
11	Maintenance AT assets	The Stormwater Unit undertakes the maintenance of AT's stormwater assets; it covers flooding response as well as reactive and planned maintenance, such as catch pit cleaning by our contractors. Costs of his programme are recovered from AT. There are no sub programmes under this programme. Staff costs are not included.
12	Staff Costs	This programme is for all part and full time staff of the Stormwater Unit, currently 128 full time equivalents; it does not include contractor costs. This programme includes Kiwi Saver and super contributions, training costs and personal protective equipment costs. Staff costs that are capitalised are included in the summary tables as a negative value so overall staffing costs are clearly visible.
13	Stormwater Utility Rates	Rates charges for stormwater assets.
14	Depreciation	Annual estimates depreciation and amortisation of stormwater assets.

Table 7.3 Stormwater expenditure programmes

There are a number of sub programmes under each of the main programmes, the sub programmes provide more detailed grouping of projects that align then to areas within the region and to our organisational structure. The details of the sub programmes are described in the following sections. The forecast expenditure in each sub programme is detailed in Appendix B.

7.2.1 Capital expenditure sub programmes

1.0	Catchment and Asset Planning	
1.1	Greater Tamaki CRE	Catchment planning activities have been divided into 10 sub programmes based on the CRE catchments. Each CRE catchment contains multiple stream catchments for which plans and models are developed to identify issues and provide baseline statistics for hazards and environmental quality. A map of the CRE catchments can be seen in Figure 32.1. These sub programmes cover the costs for developing the Intellectual Property (IP) assets such as network models and baseline stream survey reports for catchments that discharge into the CRE.
1.2	Hauraki Gulf Islands CRE	
1.3	Hibiscus Coast CRE	
1.4	Kaipara Harbour CRE	
1.5	Mahurangi Harbour CRE	
1.6	Manukau Harbour CRE	
1.7	Northeast CRE	
1.8	Wairoa CRE	
1.9	Waitemata CRE	
1.10	West Coast CRE	
1.11	Regional	There is a number of catchment planning activities that are regionally focused; this sub programme covers the development of Regional IP assets such as the regional overland flow path mapping, procuring LIDAR datasets and depression mapping.
1.12	Network Consents and Compliance	This programme covers the consenting costs required for the discharges and new assets we create.
1.13	Strategic models and standards	This programme covers the development strategic IP such as contaminant load models and technical standards.
1.14	Asset systems and data	Development of new asset management system and tools, migration of data between tools, capture of data for newly installed assets.
1.15	Critical assets and asset risk	Monitoring the condition of assets through planned condition surveys such as CCTV, observations, testing to support short and long term asset renewal programmes. Also covers monitoring of pond silt levels to support the pond rehabilitation programme.

2.0	Asset Renewal	
2.1	Other Renewals and Upgrades	Renewal or lining of assets that we have chosen to run to failure. These are assets of low criticality, such as connections and small diameter pipes with small catchment areas, or asset classes where there is no particular benefit in forward planning, such as manholes.
2.2	Pond Renewal/Rehabilitation	This is programme to renew the treatment capacity of water quality ponds by the periodic reduction of silt to agreed levels – this is known as pond rehabilitation. Also covers renewal of pond components. Note the routine removal of silt from pond forebays is an operational expense and is not included in this sub-programme.
2.3	Major Renewal Projects	Planned renewal projects to address the need to renew/ rehabilitate assets of poor or very poor condition.
2.4	Critical asset renewals	Planned renewal projects to address the need to renew/ rehabilitate critical assets or assets of high risk materials, such as ARMCO, iron based materials, etc.
3.0	**Growth**	
3.1	Growth Area Parallel Funding	This programme is for Infrastructure Funding Agreements (IFA) and Parallel Funding Agreements (PFA) with private developers. If a developer is building new stormwater infrastructure that services a catchment greater than their development, IFAs and PFAs are used to to fund the difference and are based on the relative catchment areas serviced. This programme is reactive to demand and is proportional to the development activity.
3.2	Growth Collaboration Projects	There are a number of growth projects where we are able to deliver efficiencies with by working with other infrastructure providers such as WSL and AT. Separation of combined sewers to improve wastewater capacity and receiving environment water quality is an example of the type of project in this sub-programme.
3.3	GPA -CBD	The GPAs is an initiative led by the council's Development Committee and Regional and Local Planning. A separate sub programme has been established for each growth priority area so proposed capital investment in the areas is clearly visible. The GPAs have been based on transportation sectors and are shown on the regional map in Figure 3.6. *The NORSGA and Flatbush Growth Priority Area stormwater budgets are held by City Transformation Unit.
3.4	GPA - Otahuhu Middlemore	
3.5	GPA -Inner West Triangle	
3.6	*GPA - NORSGA	
3.7	GPA - Pukekohe Wesley	
3.8	GPA -Tamaki	
3.9	GPA - Manurewa Papakura	
3.10	GPA - Takapuna	
3.11	GPA - Manukau	
3.12	*GPA -Flatbush	
3.13	SHA Projects (outside GPA)	SHAs have fast tracked consenting processes and limited notification, projects that enable SHAs that are not within one of the GPA above are in this sub programme
3.14	Other Growth Projects	Projects where growth is the primary driver and are not with a GPA or SHAs are in this sub programme.

4.0	Flood Protection and Control	
4.1	Other Flood Protection and Control Program	This covers minor extensions and upgrades of the network to mitigate localised risk of flooding to properties
4.2	Major Flood Protection and Control Projects	This sub programme is for the Major Flood Protection and Control Projects as defined by the DIA. There are currently no structures in the Auckland Region that meet the criteria because of the relatively short river and stream catchments in the region. This programme currently has nil value and therefore has not been separated into a separate Flood Protection and Control Asset Management Plan. This line item has been kept as a placeholder to allow for potential future schemes or grouping of existing flood protection structures into a scheme that could fit the Major Flood Protection and Control Criteria.
4.3	Flood Alleviation Collaboration Projects	This sub programme covers collaboration projects such as working with AT to modify dangerous overland flows or upsizing culverts to reduce flooding.
4.4	Flood control projects	This programme is the main flood control programme; it covers flood control projects that are smaller than the DIA criteria for Major Flood Control projects.
4.5	Regional Asset Safety	This covers identification and remediation of unsafe assets – where the location, dimension and configuration of the asset can pose a threat to public safety and health, such as steep banks of ponds and channels.

5.0	Healthy Waterways Projects	
5.1	Environmental Collaboration Projects	This sub programme also includes collaborative environmental projects where we are able to deliver efficiencies by working with other infrastructure providers or council departments such as WSL, AT and Parks. New treatment devices that service both new roads and existing catchment areas are an example of the projects in this sub programme.
5.2	Sustainable Catchments	This sub programme includes the projects undertaken by the sustainable catchments team such as riparian planting of streams in public land.
5.3	Regional Stream Rehabilitation	This sub programme covers projects to improve stream health, such as fish passage improvements and riparian planting.
5.4	Urban streams day lighting, restoration and erosion protection	This sub programme is for projects in public streams such as revetments and retaining walls to manage erosion and removal of pipes to daylight watercourses.
5.5	Contaminant Projects	This sub programme is for new stormwater treatment in existing developed areas such as building new wetlands or the installation of storm filters. Public stormwater treatment in new developments is within the growth programme.

Table 7.4 Capital expenditure sub programmes

7.2.2 Operational Expenditure Sub Programmes

6.0	Management, Strategy and Resilience	
6.1	Unitary Plan Support	There are a number of new provisions in the PAUP for stormwater management and flood protection and control. This sub programme covers the support from the Stormwater Unit in order to respond to submissions, inform the hearings and provide technical evidence.
6.2	Consenting & Compliance & Monitoring	This sub-programme includes the consenting fees and charges for operational works. A significant proportion of the consenting fees relates to the compliance monitoring charges for the Stormwater NDC.
6.3	Stormwater management and administration	This sub programme includes costs such as office supplies, postage, telecommunications, sponsorships, software licences, equipment hire, mileage and rental.
7.0	**Catchment and Asset Planning**	
7.1	Catchment planning studies	This sub programme is the operational costs of developing catchment management plans, such as analysis of options and flood risk.
7.2	Asset systems and data	This sub programme covers asset data improvement initiatives, minor reconfiguration of existing AMS and tools, development of Business Intelligence reports and analyses
8.0	**SW Operational Planning**	
8.1	SW Incident Response and Business Continuity Planning	Incident response and business continuity planning covers Lifeline activities, critical asset response plans, emergency procedures , etc.
8.2	SW operational responses and investigations	Covers operational strategies and plans, minor operational studies, optimisation of operational and maintenance work, minor studies, operational benchmarking, programme management as well as customer service management initiatives.
9.0	**SW Operations and Maintenance Delivery**	
9.1	Emergency maintenance	This is a provision for managing the consequences of large storm events – over the provision of the long term maintenance contracts.
9.2	Planned maintenance network	Planned maintenance of the network covers investigations of system malfunction, planned repairs of assets, periodical inspections, monitoring and cleaning of assets, management of known problematic areas (also referred to as hot spots).
9.3	Planned maintenance treatment	Planned maintenance of treatment facilities and devices cover periodic inspections, routing maintenance activities like cleaning and vegetation control, planned repair of asset components
9.4	Safety and compliance	Covers investigation and repair work to ensure stormwater assets are safe as well as compliance audits
9.5	SW reactive maintenance (including third party recovery)	Covers response to request for service from general public, work to restore the service and mitigate health and safety issues, advice on private issues

9.6	Stream maintenance and Delivery	Covers erosion stabilisation and cleaning works in streams and waterways; this works are driven by the need to mitigate risk to environment, stream conveyance and public health.
9.7	Projects Delivery & Development	Covers the operational costs of project delivery, such as interim maintenance of treatment devices prior to handover.
9.8	Flood control maintenance	Works to maintain flood protection schemes and keep them in good operational order
10.0		**SW Septic Tank Maintenance**
10.1	Septic Tank Maintenance	Private septic tanks are cleaned in the Waitakere area by contractors under management of the stormwater Unit. The costs of this programme are recovered from the owners by means of a targeted rate.
11.0		**Maintenance of Auckland Transport Assets**
11.1	Maintenance of AT Assets	The Stormwater Unit maintains AT stormwater assets such as catchpits, catchpit leads, soakage devices and proprietary stormwater treatment devices. The cost of the maintenance of these assets is recovered from AT so the net cost shown in the forecast is zero. Estimates of the gross costs have been shown in the forecasts so the consequential OPEX trends are visible.
12.0		**Staff Costs**
12.1	Total Staff Costs	This is the forecast of total staff costs in the Stormwater Unit, it does not include consultant or contractor costs.
12.2	Capitalised Staff Cost	Staff time spent on capital works projects is capitalised.
13.0		**Rates**
13.1	Stormwater Utility Rates	Stormwater assets are rated by council based on the methodology set out in Section 7 of Rating Valuation Rules 2008.
14.0		**Depreciation**
14.1	Depreciation and Amortisation	Depreciation and amortisation are calculated centrally by council's Finance Department. Estimates of the depreciation costs are included in this sub programme.

Table 7.5 Operational expenditure sub programmes

7.3 Capital Expenditure Programmes, Levels of Service, Renewals and Growth

Capital projects have been grouped into programmes by their main driver; however, stormwater projects will typically meet multiple drivers. For example, a new wetland to service a residential development is primarily a growth project but will also meet levels of service drivers for flooding (Safe Communities) and environmental protection (Health and Connected Waterways). Similarly, when a pipeline is renewed the opportunity will normally be taken to upsize it to mitigate flooding or provide capacity for growth (if appropriate).

Each project is assessed to determine the relative proportions of renewals, growth and levels of service drivers that the project meets. Figure 7.5 shows the relative proportions at a programme level and Figure 7.6 shows the relative values of each driver in each forecast financial year.

When the CAPEX programme is broken down between the three drivers, a similar trend is evident to the programme breakdown in Figure 7.1, Level of service investment is initially kept low and growth and renewals are maintained until financial year 2026/2027. After this time growth expenditure begins to reduce and is replaced with increased investment in levels of service. Renewals remain relatively constant over the 30 year period. It is noted that the annual renewal average of $20 million over ten years is lower than the equivalent annual depreciation average of $50 million because depreciation accounts for loss of service potential in pipes and the majority of our pipes are very young. Moreover, the depreciation calculation methodology does not accurately reflect the asset deterioration curve which is a complex parabolic form, and depreciation increases with the expansion of the network. There are no foreseeable implications as renewals are our main priority and we have strategies in place to optimise renewals, refer to Section 6.2.1.1

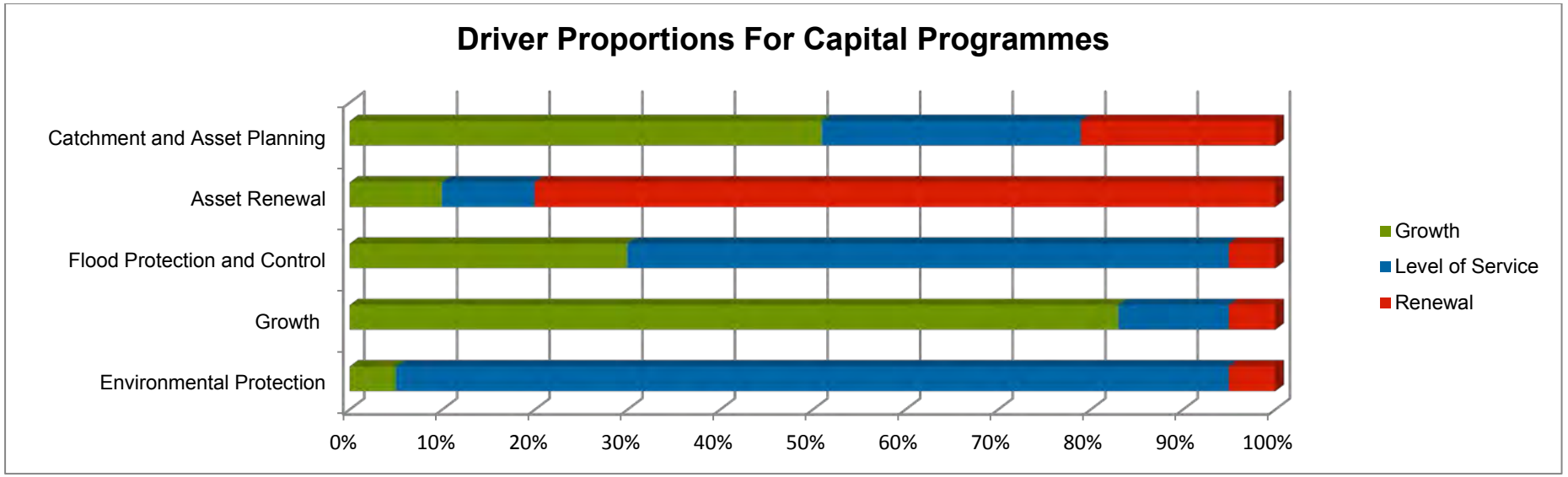


Figure 7.5 Relationship of growth, renewal and level of service for capital programmes

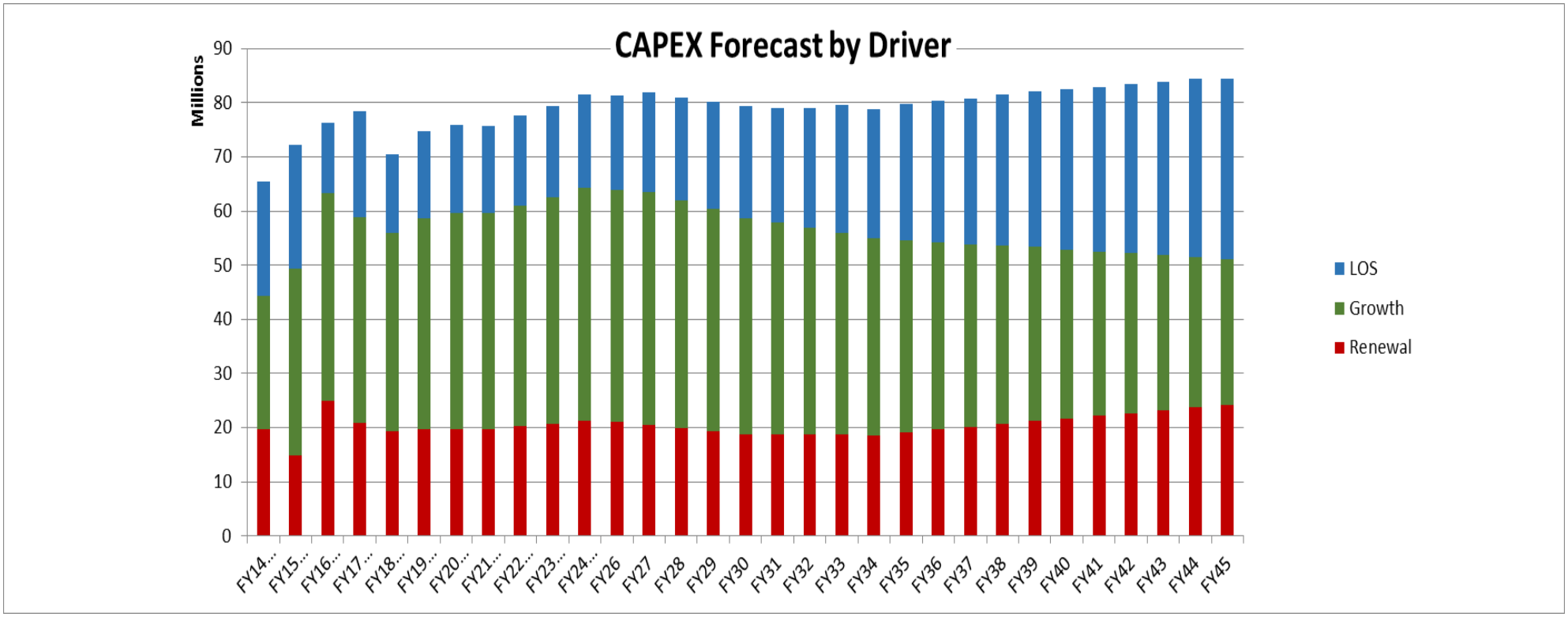


Figure 7.6 Capex forecast by driver

7.3.1 Linking Levels of Services statements to expenditure programmes

The Levels of Service outlined in section 3.1.2 are based around our three core Performance Objectives: Safe Communities, Supporting Growth, and Healthy and Connected Waterways. The stormwater expenditure programmes contribute to all seven of the unit's Performance Objectives targeted toward achieving the goal of a water sensitive city. Table 7.6 illustrates the linkages between the expenditure programmes the levels of service and performance objectives.

SW Strategic Objectives Programme		Safe Communities	Supporting Growth	Healthy and Connected Waterways	Collaborative Outcomes	Efficient Business	Prioritised Investment	High Performing Teams
1	Capital Catchment and Asset Planning	✓✓	✓✓	✓✓	✓	✓	✓✓	
2	Asset Renewal	✓✓	✓	✓✓	✓✓	✓	✓	
3	Growth	✓	✓✓	✓✓	✓	✓	✓	
4	Flood Protection and Control	✓✓	✓	✓	✓	✓	✓	
5	Environmental Protection	✓	✓	✓✓	✓	✓	✓	
6	Management, Strategy and Resilience	✓	✓	✓	✓✓	✓✓	✓✓	✓✓
7	Operational Catchment and Asset Planning	✓✓	✓✓	✓✓	✓	✓	✓✓	✓
8	Stormwater Operational Planning	✓		✓	✓✓	✓✓	✓	✓
9	SW Operations and Maintenance Delivery	✓		✓	✓	✓		✓
10	SW Septic tank management	✓		✓✓				
11	Maintenance of AT's assets	✓✓		✓✓	✓	✓		
12	Staff Costs	✓	✓	✓	✓✓	✓✓	✓✓	✓✓

✓✓ = primary Linkage, ✓=secondary linkage

Table 7.6 Links between levels of service, Performance Objectives and expenditure programmes

7.4 Major Projects

There are a number of major projects within the Capital Expenditure Programme that represent a significant proportion of the expenditure. Table 7.7 highlights the five highest value projects within the Capital Programme planned for delivery within the next five years.

Major Projects	Description	Programme	Sub Programme	Indicative Cost	Anticipated Timetable
Artillery Tunnel	A 2.5m diameter, 1 kilometre long tunnel from McLennan Park to Pahurehure Inlet to service the Takanini Growth Areas.	Growth	GPA - Manurewa Papakura	$22 mil	2015-2017
Takanini Conveyance Cascades (including Land Purchase)	A new open channel incorporating cascading weirs and associated green space to convey the 100year flood, to service the Takanini 2a and 2b Growth Areas.	Growth	GPA - Manurewa Papakura	$20.5 mil	2015-2019
Ports of Auckland Outfall	The design and installation of a 3.3m diameter stormwater pipe from the south side of Quay Street across Ports of Auckland to the Waitemata Harbour. To replace a pipeline in poor condition that has previously collapsed and remains in service with a temporary repair.	Renewal	Critical Asset Renewals	$21 mil	2015-2019
Oakley Creek Conveyance	Upgrading culverts and widening of Oakley Creek through Walmsley Park to convey flood flows to enable intensification and redevelopment in the upper catchment.	Growth	GPA -Inner West Triangle	$28 mil	2015-2019
Freemans Bay Outfall	Frequent surface flooding occurs in Daldy Street, Fanshawe Street, parts of Victoria Street and Victoria Park. Two significant combined sewer overflows are also connected to the existing pipeline and the route needs to integrate with the second harbour crossing. A collaborative project with NZTA, AT and WSL to resolve flooding and contamination.	Flooding	Flood Alleviation Collaboration Projects	$19.5 mil	2017 -2020

Table 7.7 Major capital projects in the first five years

7.5 Capital Expenditure Prioritisation

Stormwater projects are assessed and selected using multi-criteria analysis that includes factors such as cost, benefits, risk and alignment with or strategic direction, Maori outcomes and the Auckland Plan. A prioritisation tool is currently being developed to standardise the way we rank projects across the region. The prioritisation tool has not been used for the development of this Asset Management Plan; however, it will be implemented in the future to rank the capital projects across the region.

For this Asset Management Plan projects have been ranked based on the drivers and objective outcomes, and we have developed a relative weighting shown in Figure 7.7. The weighting can change as a result of changes in business strategy and Council directed initiatives. These weightings are one aspect of the capital prioritisation process and give an indication of the relative importance we place on the different aspects of a project.

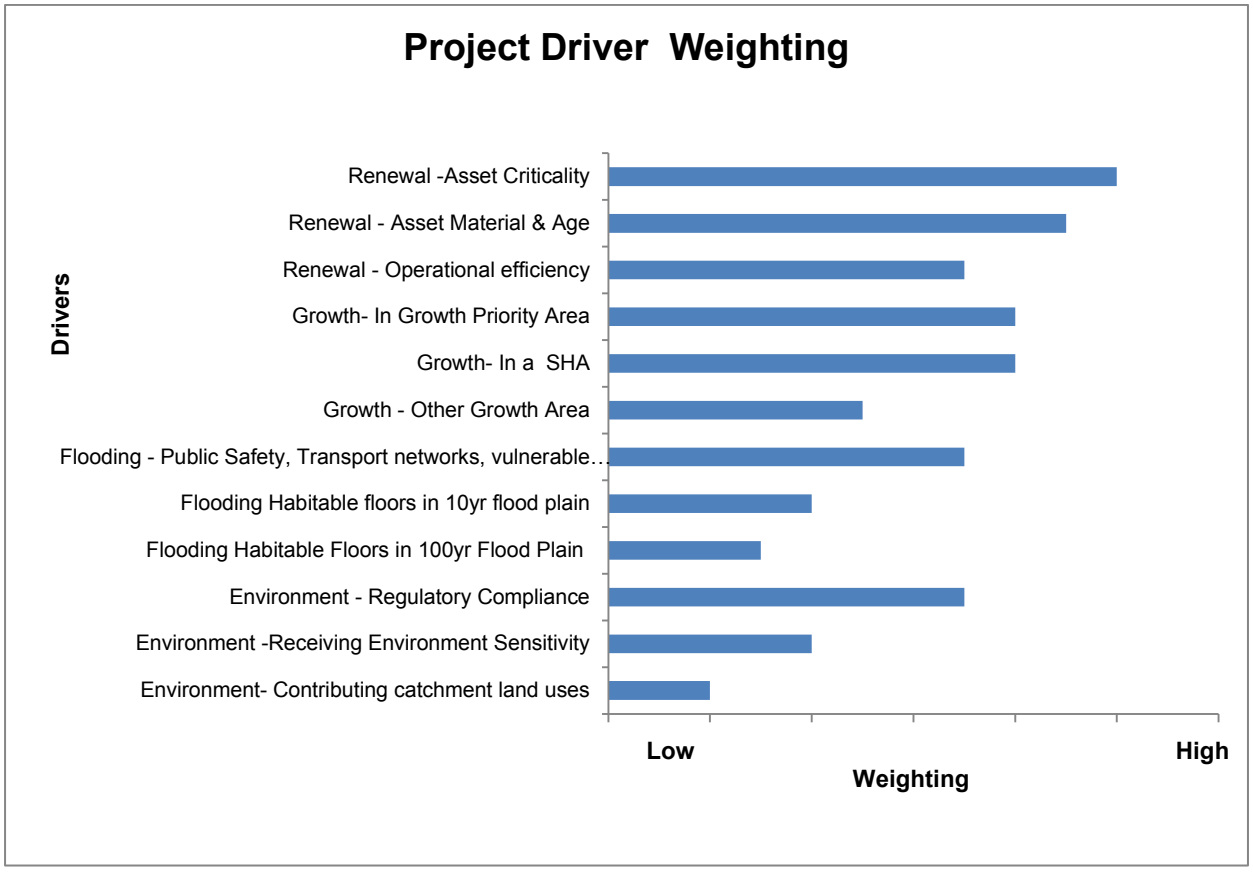


Figure 7.7 Capital project driver weightings

A typical stormwater project will meet multiple drivers to varying degrees, for example fixing a flooding road will improve operational efficiency through reduced call outs. Catchment planning expenditure occurs prior to the inception of projects and the prioritisation above. The catchments that are prioritised for planning studies are selected on the basis of where the most significant land use changes are likely to occur.

7.6 The Long Term Plan 2015-2025

The mayor presented his proposal for the draft LTP on 28 August 2014. The mayor's proposal was the first step of the LTP process - it was the starting point for discussion and debate. The proposal outlined activities and investments that should be prioritised and how expenditure could be kept within ranges that Aucklanders will find acceptable, affordable and sustainable.

The 2014 Local Board Plans have also informed the development of the budget. On the 5 and 6 of November 2014, Auckland Council's Budget Committee made decisions regarding what would be included in the draft 10-year budget.

All Aucklanders were encouraged to have their say during the public LTP consultation period of 23 January to 16 March 2015. There were several ways through which the consultation was carried out; completing the feedback form which all households received, attending 'have your say' community events, or providing feedback though online channels such as blogs and forums. The final LTP was adopted by Governing Body on 25 June 2015.

Financial Policies and Funding

In response to consultation feedback the council produced a final budget which delivers an average general rates rise of 2.5 per cent for 2015/2016, down from the average 4.9 per cent raise that was set in the 2012 – 2022 budget. This will be followed by an average general rates rise of 3.2 per cent in 2016/2017 and 3.5 per cent for each of the remaining years in the 10-year budget. This will enable an investment programme of $18.2 billion over the next 10 years, as well as allowing the council to maintain core services.

However, additional funding tools and legislative change will be required to deliver the increased investment that Aucklanders wanted to see in transport. In the meantime, a transport levy will be charged for three years while discussions continue with government about a longer term solution. The LTP seeks to achieve the right balance between affordability and progress for Auckland and is well aligned to the Stormwater Unit's strategic objectives of efficient business and prioritised investment.

Stormwater activities will be funded in accordance with the financial policies of council. Rates provide approximately 34 % of the council's funding with the rest coming from grants, subsidies, development and financial contributions, user charges and fees and borrowings.

Targeted rates that directly fund stormwater operational expenditure include the Rural on-site wastewater charge for the septic tank pump out service that operates in the Waitakere area and the Glorit flood gate restoration targeted rate; these, however, only account for less than 1% of our operational budget.

It should also be noted that a major portion of funding that the Stormwater Unit receives from the council does not directly fund the Stormwater Unit's activities. Approximately 48% of our total operational budget is paid back to the council for depreciation of our assets. A further

25% is paid back to the council as rates; this is worked out as a percentage of our total asset value. This leaves the Stormwater Unit with approximately 27% for its operational activities.

Depreciation vs Renewal

We are often asked about the difference between the level of renewal and the level of depreciation, the latter being higher. This is because over 65% of annual depreciation is attributable to pipes less than 40 years old i.e. our network is relatively young. Figure 7.8 shows that we collect depreciation for assets that are at the beginning of their life. This money will not be required now but will be needed in 50 or more years' time.

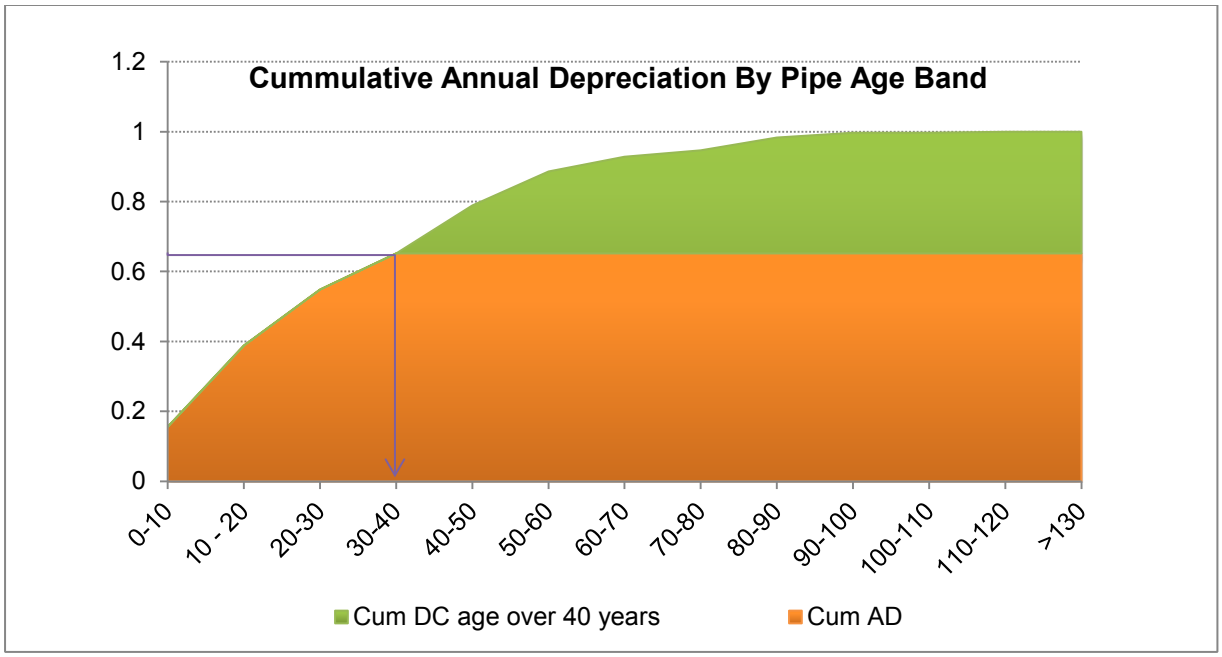


Figure 7.8 Cumulative Annual Depreciation by Pipe Age Band, October 2015

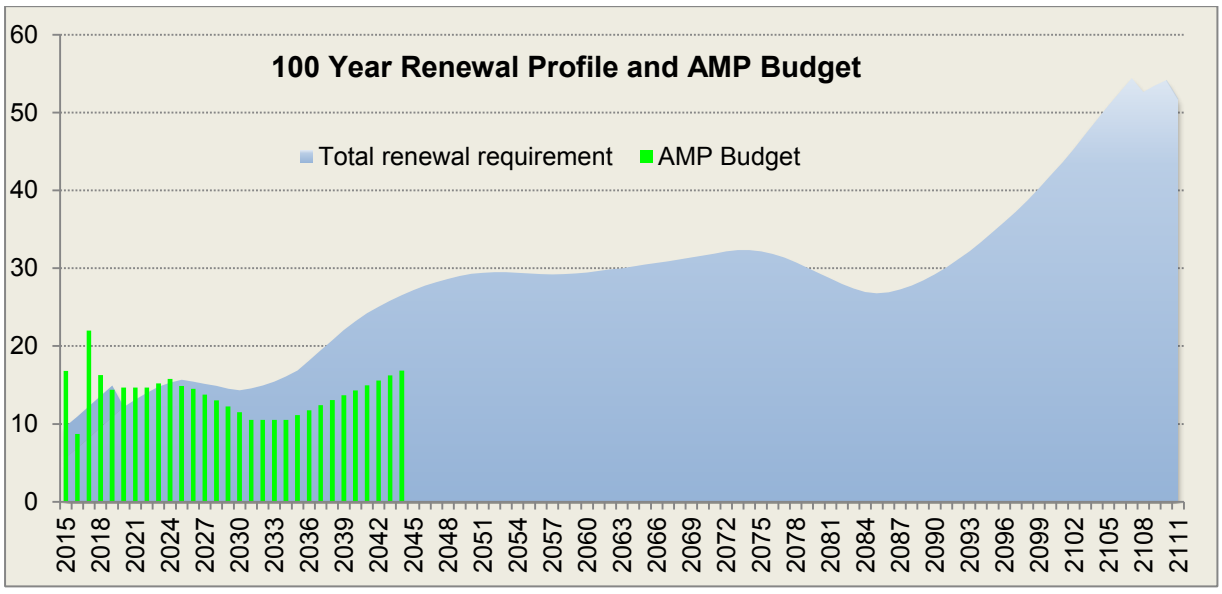


Figure 7.9 100 year renewal profile, October 2015

Figure 7.9 show the modelled long term renewal profile and our AMP budgets. It is still uncertain as to whether the long term trend highlights potential major issues as our model needs refining and the budgets are readjusted every 3 years. Our renewal profile currently uses pipe condition information only. This is based on actual condition data and an extrapolation of a mixture of pipe failure information and old grading data. Further work is required to improve the data and assumptions.

Water Sensitive Approach

The use of more natural approaches to stormwater management referred to in the mayor's Proposal is enabled through the Stormwater Unit's Core strategic objectives to create a Water Sensitive Community. The water sensitive design approach within the PAUP is important not only for improving the environmental effects from stormwater discharges but also for the fiscal outcomes for Auckland ratepayers. Treating more stormwater at source instead of at the end of pipe will mean more treatment assets are privately owned thus reducing the long term operation and maintenance costs to the council. An effective monitoring and enforcement programme is necessary to maintain the discharge quality from private devices.

The source treatment of stormwater from public roads in devices such as rain gardens, swales and tree pits allows the partial funding for the on-going operation and maintenance of those transport assets from NZTA subsidies. This is in effect a demonstration of the polluter pays principle where the main source of stormwater contamination (vehicles) contribute to the costs of stormwater treatment from fuel tax via the NZTA subsidies for local road maintenance and operation. These measures will give effect to the strategies in the mayor's Proposal of maximising non rate revenue, leveraging private sector investment and challenging Government to play its part in Auckland's development.

7.7 Asset Values and Depreciation

The Stormwater Unit's assets are revalued every three years in accordance with the requirements of the LGA. Asset value and depreciation between valuations is calculated at asset class level from capitalised projects. Natural assets such as streams, rivers and overland flow paths; land under pipes and water quality devices were excluded from this valuation.

The latest valuation was completed on 26 May 2015 in accordance with the New Zealand International Accounting Standard 16 (NZIAS16) "Accounting for Property, Plants and Equipment" and the New Zealand Infrastructure Asset and Depreciation Guidelines. The asset revaluation for pipes and culverts were condition based i.e. asset remaining lives are driven by asset condition rather than by age. Condition based remaining lives reflect the true behaviour of the asset with age based based assessments being conservative. We have pipes which have reached the end of their theoretical life limit (life the manufacturer is willing to commit to) but still function adequately.

Where asset condition was not available this was determined analytically through extrapolation of appropriate data. Figure 7.10 shows that concrete pipe replacement costs for the same remaining life is a few times higher if based on age and not on condition. All other assets did not have sufficient condition data so straight line depreciation was used. For all assets, regionalised unit rates have been derived and were based on the Stormwater asset information contained within the council's asset registers at 31 March 2015.

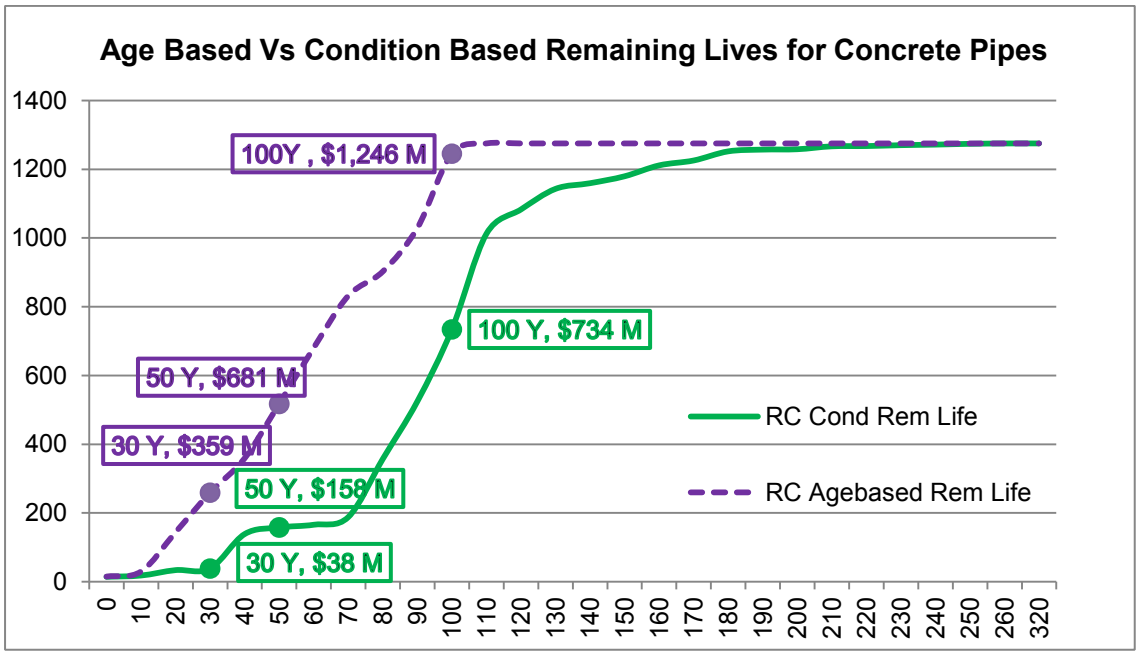


Figure 7.10 Comparison between age based and condition based remaining lives in concrete pipes

The asset base lives used in the valuation are summarised in Table 7.9.

Asset class	Average Effective Life	Average Remaining Life
Pipes and culverts	128	95
Channels	148	108
Manholes	128	95
Catchpits	104	81
Pump stations	90	81
Inlets and outlets	114	82
Soakholes	80	57
Ponds	100	81
Water quality devices	55	47
Service connections	128	95

Table 7.9 Stormwater asset base lives, July 2015

Asset valuation was supported by SPM Network which is an online tool for developing renewal profiles and valuation analyses. Moderate depreciation factors (1.75 to 2.25) were used for all asset classes. Valuation unit rates were based on consolidated historical valuation rates with factors for difficulties and complexity to differentiate between assets in rural, suburban and central business areas. Gaps in asset attributes were filled by defaulting to a default value – the predominant or most common value of the missing attribute; eg. manholes with missing depths were defaulted to depth less than 1.5m. Table 5.1 in Section 5.1 shows the annual depreciation against each asset type and the total annual depreciation.

Intangible or IP assets have different asset lives compared to infrastructure assets. Asset attribute data should have the same asset life as the asset it represents. We have developed capitalisation guidelines but they have yet to be approved and adopted.

7.8 Financial Performance

Stormwater Budgets	2013 Actual	2013 Budget	2014 Actual	2014 Budget	2015 Actual	2015 Budget
Capex	$56,036,026	$53,224,767	$49,401,630	$64,070,006	$66,122,315	$65,455,347
Opex	$16,935,406	$20,583,922	$23,324,846	$21,802,587	$24,219,000	$25,705,035

Nb. Opex budgets do not include rates and depreciation.
Table 7.11 Financial Performance, November 2014

Table 7.11 shows the actual performance against Annual Plan Budgets for the stormwater capital programme. The capital expenditure for 2013/2014 was approximately $15 million below the forecast because:

- acquisition of land for stormwater pond construction in Hobsonville and Flat Bush development has been delayed by difficult negotiations
- the pond rehabilitation work programme was delayed
- major physical works programme and Parallel Development Program were below forecast due to delays in resource consenting, and timing of third party claims
- IP assets were written off from capex because of the change in interpretation of the Intangible Assets accounting statement (such as system performance analysis in Catchment Planning considered OPEX instead of CAPEX)

7.9 Assumptions and Confidence Levels

There are some information gaps which are impeding the development of robust work programmes. The financial forecasts in this Asset Management Plan are based on the best available information, staff knowledge and multiple legacy information systems.

7.9.1 Key assumptions

The following key assumptions have been used in preparing the 30-year financial summary.

Key assumption	Level of uncertainty	Impact of uncertainty
All expenditure is stated in 2014/2015 dollar values with no allowance for inflation, or future asset revaluation.	n/a	All values presented exclude inflation adjustments and are based on available data as at June 2015. Corporate inflation assumptions will be applied to all relevant revenue and expenditure for the purpose of compiling the LTP.
The OPEX forecast excludes interest on loans and corporate overhead costs that are attributable to the Stormwater Unit.	n/a	These are managed and reported organisationally by council's Finance Department.
The expenditure programmes are based on the stated priorities of renewals, then growth followed by level of service improvement in flooding and environmental protection.	Moderate	Growth projections are inherently uncertain, as they are highly dependent on the wider economy. Investment may not be required when predicted and interest paid prematurely. In a worst case scenario it may sometimes not even be required at all or required much sooner than anticipated.
The planned capital expenditure programme can be fully delivered in the timeframes shown.	Significant	Under-delivery of capex may adversely affect the achievement of performance targets and levels of service
Maintenance and delivery expenditure includes full Consequential OPEX from growth.	Moderate	Operating expenditure will be affected if growth does not occur at the rate predicted; vested assets from development (growth) have a major influence on the level of Consequential OPEX.
The book value of assets as at 30 June 2015 provides a reasonable basis for understanding the value of assets under management.	Moderate	Asset revaluations could reveal a material change in asset values.
Capital expenditure that will ultimately be funded from general rates or depreciation is stated as funded by "Borrowings" in the year the expenditure is incurred. Similarly, development contribution funding is shown based on when the capital expenditure is incurred.	n/a	The financial summary provides an indication of the relative proportion of capital expenditure that we will ultimately be funded from each funding source. It does not present a GAAP compliant view of income and expenditure. That view is shown in the prospective financial statements of the LTP.
The Stormwater utility rate is based on the 2015 asset value of $4 billion and the additional Capital Value each year,	Moderate	This is managed and reported organisationally by council's Finance Department, the figures are subject to change upon review once the council

Rated against the "Rural Business Fully-Rateable rate" 0.00601058 (excl GST) plus UAGC of: $317.35 (excl GST).		wide financial forecasting is complete.
Stormwater asset depreciation is based on the 2015 asset value of $4 billion and the additional Capital Value each year (vested assets plus stormwater CAPEX excluding catchment planning and renewals) and average asset life.	Moderate	This is managed and reported organisationally by council's Finance Department, the figures are subject to change upon review once the council wide financial forecasting is complete.

Table 7.12 Key financial assumptions

7.9.2 Confidence of information

All LTP financial data other than asset values has been extracted from the council's core planning and budgeting system, Hyperion Planning. The underlying revenue and expenditure data is the same as that used for the draft LTP and internal management budgets.

The IIMM contains several rating scales to assess the level of confidence and accuracy/reliability of asset data and therefore the financial forecasts based on that data. These scales are set out in Table 7.13.

Data Confidence		
Grade	Description	Accuracy
1	Accurate	100%
2	Minor inaccuracies	+/- 5%
3	50% estimated	+/- 20%
4	Significant data estimated	+/- 30%
5	All data estimated	+/- 40%
Forecast confidence rating		
Confidence Grade	General meaning	
A Highly reliable	Data based on sound records, procedure, investigations and analysis, documented properly and recognised as the best method of assessment.	
B Reliable	Data based on sound records, procedures, investigations and analysis, documented properly but has minor shortcomings, for example the data are old, some documentation is missing, and reliance is placed on unconfirmed reports or some extrapolation.	
C Uncertain	Data based on sound records, procedures, investigations and analysis which is incomplete or unsupported, or extrapolated from a limited sample for which grade A or B data is available.	
D Very uncertain	Data based on unconfirmed verbal reports and/or cursory inspection and analysis.	

Table 7.13 IIMM Rating Scales

The confidence levels in our financial data based on the IIMM rating scales in Table 7.12 above has been assessed and is presented in Table 7.14.

Asset data confidence rating	Financial forecast confidence rating	Method of completing the rating assessment
• 10% - 1	• Years 1 to 3: A	• Continual prioritised data improvement programme
• 45% - 2	• Years 3 to 7: B	• Improvement Plans identified in Table 8.1
• 40% - 3	• Years 7 to 30: C	
• 5% - 4		

Table 7.14 Confidence rating
Assessed internally, Auckland Council, November 2014

8.0 Continuous improvement

A key feature in the Stormwater Unit's asset management framework is to continue to improve asset management practices, processes and tools. This is essential to ensure the asset system and services are effectively managed. Through the initiatives presented in this section, the council is committed to moving towards appropriate advanced asset management practices. This practice is being developed in keeping with the NAMS practice as presented in their suite of asset management publications. We are committed to delivering the most appropriate level of service commensurate with affordability and good industry practice

8.1 Asset management plan preparation and review

The Asset Management Plan was prepared collaboratively after a large number of internal workshops and has been reviewed both internally and externally. Experienced stormwater staff who prepared the Asset Management Plan will be responsible for periodically taking stock of stormwater issues and programmes and identifying opportunities for improvement. It is intended that this will be undertaken annually to enable the Asset Management Plan to be live and relevant. Continuous improvement is an essential part of effective asset management and to ensure that the improvements in this Asset Management Plan are aligned with the principles and directives of the Auckland Plan.

This approach demonstrates a continuous commitment to prevent under-utilisation of resources and unacceptable exposure of risks for the council. It has to be noted that the regionalisation of stormwater management that commenced on 1 November 2010 is still on-going, with many business processes and support mechanisms still in development. In this light, the purpose of this section is to outline the improvement opportunities that have been identified during the development of this AMP and the formal AM practices reviews (refer to section 6.5.3).

We arranged for AECOM to review its asset management capability in August 2012 and completed a gap analysis of its asset management framework in May 2013 which was reviewed externally by GHD. An internal business systems review and a NZWWA National Performance Benchmarking were also carried out. The improvement programme was developed based on these reviews and benchmarking.

8.2 Improvement programme

Gaps were found in the Lifecycle Asset Management and Asset Risk Management areas with respect to planning, data and systems. It has to be noted, however, that some of the business critical asset management improvements in the area of systems and data cannot be achieved before substantially completing the implementation of the key enterprise

management system of the council. The stormwater component will be addressed by project 'One Plus' which is expected to be completed in 2016 (indicative date).

The main improvement objectives to be achieved in the next three years due to their priority and importance for achieving advanced asset management and for the stormwater business include:

- develop clear business processes and keep them in a visible place for all staff
- develop and implement a comprehensive stormwater renewal strategy
- develop green infrastructure policy as it will be needed as guidance for the growth areas)
- develop decision making strategies and tools; e.g. cost benefit analysis and prioritisation tool
- improve practices around managing critical assets
- work with the Information Service Department to select and implement the regional asset information management system based on SAP and ArcGIS

The three year Improvement Programme is summarised in Table 8.1 as follows.

Improvement programme	Action	Indicative timeframe				Priority A,B,C,D
		2014/15	2015/16	2016/17	2017/18	
Asset Systems Improvement	Develop a consolidated asset management solution for stormwater	√	√	√		A
	Capture missing attributes and missing assets	√	√	√	√	B
	Develop stormwater green assets register	√	√			B
Asset Valuation and Support	Develop regional unit rates database	√	√			A
Regional Asset Ownership Policy	Develop consistent regional ownership policy	√	√	√		B
Maintenance Strategy	Provide guidelines for delivering an optimised maintenance plan	√	√			B
Renewal Strategy and Implementation	Develop Renewal Strategy	√				A
	Develop Renewal Programme (including critical assets)	√	√	√	√	A
Condition Strategy and Implementation	Develop condition strategy and data plan.	√				B
	Investigate other condition standards		√	√		C
Asset Investment Programme	Develop an investment - prioritisation framework			√		E
Critical Asset Management	Develop critical asset strategy and implementation	√	√			C
	Implement critical asset inspections	√	√	√	√	A
	Develop critical asset response plans	√	√			A

Improvement programme	Action	Indicative timeframe				Priority A,B,C,D
		2014/15	2015/16	2016/17	2017/18	
Organisational improvement	Business Processes - clearly mapped out and kept current	√	√	√	√	A
	Organisational improvement –risk assessment	√	√			A
	Identify clearer linkages and interdependencies between AT, WSL, Parks asset management practices	√	√	√	√	A
Sustainable management practices	Develop Sustainability - framework	√	√	√		B
	Develop Green Infrastructure Policy	√	√	√		B
	Develop suitable Sustainability - KPIs	√	√	√		B
	Complete technical publications (treatment devices)	√	√			A
	Develop a Stormwater Resilience Strategy		√	√		B

Table 8.1 Improvement Programme (Priority A being the highest and D being the lowest)

8.3 Improvement monitoring

The AMP is a living document and needs to be kept current and relevant. It is recognised that priorities will change which makes review activities even more important to ensure this plan is a live document. The following review activities will be undertaken:

Frequency	Review task	Action	KPI	Report name	Audience
Three yearly	AMP Development	Formal adoption of the plan by council.	100% achievement	Council AMP report	Council and Audit NZ
Annually	AMP Peer Review	Revise plan annually to incorporate new knowledge from the AM improvement programme.	100% achievement	Internal report	AMP steering group and SW Unit management
Three yearly		The plan will be formally reviewed three yearly to assess adequacy and effectiveness.	100% achievement	External consultant report	AMP steering group, SW Unit management, and Audit NZ
Annually	Monitoring and Reporting	The KPIs identified in this table will be monitored and reported on annually through Business Plans.	100% achievement	Business Plan report	AMP steering group and SW Unit management

Frequency	Review task	Action	KPI	Report name	Audience
Quarterly	Implementation of the Improvement Programme	Tracking the progress of implementing the improvement programme quarterly particularly projects in the short term improvement programme.	100% achievement	Quarterly reports	AMP steering group and SW Unit management

Table 8.2 Review activities

Sensitivity Analysis

Our work programme has been optimised based on a constrained budget, priority drivers and objective outcomes. The flooding and environmental budgets will be the most sensitive to capital expenditure budget reductions. In the operational expenditure area any reductions would mean that planned maintenance would be the first to be affected. A consequence of reductions in planned maintenance and the flooding budget would be more flooding and complaints and reactive maintenance will increase.

Project briefs and scoping for the projects identified in the work programme identified in Table 8.1, and actions arising from the review activities identified in Table 8.2 will include sensitivity analysis of the extent of risks to enable further prioritisation of the various improvement work packages.

Appendices

List of Appendices

A Glossary
B Stormwater LTP Forecasts
C FULSS Programme and Maps
D Stormwater Unit's Risk Register
E SWAMP Peer Review Letter from Morrison Low and Associates

Appendix A: Glossary

Glossary	
ALG	Auckland Lifelines Group
AMP	Asset Management Plan
ART	Auckland Regional Transport
AT	Auckland Transport
CAPEX	Capital Expenditure
CCO	Council Controlled Organisation
CCTV	Closed Circuit Television
CDEM	Civil Defence Emergency Management
CRE	Consolidated Receiving Environment
DIA	Department of Internal Affairs
DRC	Depreciated replacement cost
ED	Existing development
FLIP	Forward Land and Infrastructure Programme
FULSS	Forward Urban Land Supply Strategy
GIS	Geographical Information System
GPA	Growth Priority Area
HPO	Housing Project Office
I&ES	Infrastructure and Environmental Services
IIMM	International Infrastructure Management Manual
ISO	International Organisation for Standardisation
KPI	Key Performance Indicator
LGA	Local Government Act 2002
LOS	Levels Of Service
LTP	Long Term Plan
MfE	Ministry of the Environment

MUL	Metropolitan Urban Limit
MIBE	Ministry of Business, Innovation and Employment
MoU	Memorandum of Understanding
MPD	Maximum Probable Development
NAMS	New Zealand Asset Management Support
NDC	Network Discharge Consent
NORSGA	Northern Strategic Growth Area
NPS	National Policy Statement
NZTA	New Zealand Transport Agency
NZWWA	New Zealand Water and Wastes Association
O&M	Operations & Maintenance
OPEX	Operating Expenditure
ORC	Optimised Replacement Cost
PAUP	Proposed Auckland Unitary Plan
RFS	Request for service
RMA	Resource Management Act 1991
RUB	Rural Urban Boundary
SAP	Financial System
SCP	Sustainable Catchments Programme
SHA	Special Housing Area
TP	Technical Publications
WSL	Watercare Services Limited

Appendix B: Stormwater Long Term Plan Forecasts

Stormwater CAPEX Forecast

		1	2	3	4	5	6	7	8	9	10	11-15	16-20	21-25	26-30	
Programme	**Sub Programme**	**FY16**	**FY17**	**FY18**	**FY19**	**FY20**	**FY21**	**FY22**	**FY23**	**FY24**	**FY25**	**FY26-FY30**	**FY31-FY35**	**FY36-FY40**	**FY41-FY45**	**Grand Total**
1 CATCHMENT AND ASSET PLANNING																
	CATCHMENT AND ASSET PLANNING	**$11,181,084**	**$8,300,000**	**$8,300,000**	**$7,500,000**	**$7,500,000**	**$7,500,000**	**$7,500,000**	**$7,500,000**	**$7,500,000**	**$7,500,000**	**$37,500,000**	**$37,500,000**	**$37,500,000**	**$37,500,000**	**$230,281,084**
2 RENEWAL																
	RENEWAL Total	**$20,024,412**	**$26,504,000**	**$20,793,500**	**$19,394,289**	**$19,652,347**	**$19,655,966**	**$19,661,997**	**$20,206,453**	**$20,789,634**	**$21,385,905**	**$97,524,483**	**$90,682,685**	**$102,700,165**	**$118,636,364**	**$617,612,201**
3 GROWTH																
3.1	Growth Area Parallel Funding	$1,000,000	$3,400,000	$3,400,000	$3,400,000	$3,400,000	$3,500,000	$3,500,000	$3,500,000	$3,500,000	$3,500,000	$17,500,000	$17,500,000	$17,500,000	$17,500,000	**$102,100,000**
3.2	Growth Collaboration Projects	$139,600	$100,000	$100,000	$100,000	$100,000	$1,000,000	$1,000,000	$2,000,000	$2,000,000	$3,000,000	$25,000,000	$25,000,000	$7,500,000	$0	**$67,039,600**
3.3	Growth Priority Area -CBD	$15,000	$550,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$565,000**
3.4	Growth Priority Area -Otahuhu Middlemore	$165,000	$0	$0		$0	$3,100,000	$2,050,000	$2,765,000	$2,765,000	$0	$0	$0	$0	$0	**$10,845,000**
	City Transformations Crown Lynn	$3,682,734	$1,477,050	$1,800,000												
	CAPEX Handover City Transformation Crown Lynn	3,682,734	1,477,050	1,800,000	$0	$0	$0	$0	0	0	$0					
3.5	Growth Priority Area -Inner West Triangle	$925,600	$11,110,773	$13,769,758	$2,000,000	$13,513,750	$6,995,000	$683,750	$1,933,750	$11,696,250	$11,696,250	$0	$0	$0	$0	**$74,324,881**
	City Transformations NORSGA	$8,282,882	$3,276,490	$3,000,000	$0	$0	$2,621,000	$0	$0	$0	$0					
	CAPEX Handover City Transformation NORSGA	8,282,882	3,276,490	3,000,000	$0	0	2,621,000	0	0	0	0					
3.6	Growth Priority Area - NORSGA	$0	$0	$0	$2,500,000	$1,000,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$3,500,000**
3.7	Growth Priority Area -Pukekohe Wesley	$0	$0	$0	$0	$5,500,000			$5,000,000			$33,782,409	$3,037,105	$1,646,050	$1,792,099	**$50,757,662**
3.8	Growth Priority Area -Tamaki	$1,880,000	$5,000,000	$5,000,000	$0	$3,900,000	$6,900,000	$0	$0	$0	$1,400,000	$12,039,594	$4,013,198	$0	$0	**$40,132,792**
3.9	Growth Priority Area - Manurewa Papakura	$7,356,663	$14,000,000	$8,000,000	$7,000,000	$0	$0	$10,000,000	$2,500,000	$0	$0	$0	$0	$0	$0	**$48,856,663**
3.10	Growth Priority Area -Takapuna	$1,795,000	$0	$1,500,000	$4,500,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$7,795,000**
3.11	Growth Priority Area -Manukau	$851,000	$0	$710,457	$500,000	$0	$0	$5,000,000	$5,000,000	$5,000,000	$5,000,000	$0	$0	$0	$0	**$22,061,457**
	City Transformations Flatbush	$7,800,529	$3,779,257	$3,957,666	$3,780,304	$1,304,000	$2,782,000	$0	$0	$0	$0					
	CAPEX Handover City Transformation Flatbush	7,800,529	3,779,257	3,957,666	3,780,304	1,304,000	2,782,000	$0	$0	$0	$0					
3.12	Growth Priority Area -Flatbush	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
3.13	Special Housing Area Projects	$2,431,835	$1,750,000	$1,000,000	$1,371,255	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$6,553,090**
3.14	Other Growth Projects	$100,300	$848,600	$1,360,400	$12,770,507	$9,261,355	$16,149,395	$15,413,408	$16,046,471	$14,913,802	$16,445,450	$107,981,058	$112,123,377	$98,995,718	$70,074,748	**$492,484,590**
	GROWTH Total	**$16,659,998**	**$36,759,373**	**$34,840,615**	**$34,141,762**	**$36,675,105**	**$37,644,395**	**$37,647,158**	**$38,745,221**	**$39,875,052**	**$41,041,700**	**$196,303,061**	**$161,673,680**	**$125,641,767**	**$89,366,848**	**$927,015,735**
4 FLOOD PROTECTION & CONTROL																
4.1	Other Flood Protection and Control Program	$373,248		$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$5,100,000	$5,000,000	$5,000,000	$5,000,000	**$28,473,248**
4.2	Major Flood Protection and Control Projects	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$13,120	$118,080	$17,780,000	$7,620,000	**$25,531,200**
4.3	Flood Alleviation Collaboration Projects	$2,222,808	$0	$0	$1,225,000	$821,500	$2,021,500	$0	$1,000,000	$2,786,000	$3,286,000	$23,836,500	$0	$0	$0	**$37,199,308**
4.4	Flood Control Projects	$14,960,817	$2,450,000	$7,007,900	$5,681,000	$6,901,800	$5,751,300	$7,753,000	$6,856,400	$5,230,000	$4,950,000	$25,228,207	$69,541,085	$72,576,720	$103,369,849	**$338,258,078**
4.5	Regional Asset Safety	$290,221	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$750,000	$750,000	$750,000	$750,000	**$4,640,221**
	FLOOD PROTECTION & CONTROL Total	**$17,847,094**	**$2,600,000**	**$8,157,900**	**$8,056,000**	**$8,873,300**	**$8,922,800**	**$8,903,000**	**$9,006,400**	**$9,166,000**	**$9,386,000**	**$54,927,827**	**$75,409,165**	**$96,106,720**	**$116,739,849**	**$434,102,055**
5 HEALTHY WATERWAYS PROGRAMME																
5.1	Environmental Collaboration Projects	$424,674	$0	$116,700	$454,999	$100,000	$250,000	$250,000	$250,000	$250,000	$250,000	$1,250,000	$1,250,000	$1,250,000	$1,250,000	**$7,346,373**
5.2	Sustainable Catchments (Rural Focus)	$750,000	$750,000	$750,000	$750,000	$750,000	$750,000	$750,000	$750,000	$750,000	$750,000	$3,750,000	$3,750,000	$3,750,000	$3,750,000	**$22,500,000**
5.3	Regional Stream Rehabilitation	$70,000	$90,000	$90,000	$0	$0	$1,101,823	$155,000	$478,760	$649,000	$1,137,095	$10,169,054	$20,993,171	$28,998,451	$48,600,000	**$112,532,355**
5.4	Urban Stream Day lighting and/or Restoration	$1,585,000	$669,000	$405,500	$70,000	$263,000	$0	$0	$0	$0	$0	$1,250,000	$1,250,000	$1,250,000	$1,250,000	**$7,992,500**
5.5	Contaminant Projects	$3,604,500	$700,000	$5,000,000	$182,800	$1,000,000	$0	$950,000	$635,500	$474,500	$0	$1,250,000	$3,874,459	$9,852,243	$2,164,559	**$29,688,561**
	Chief Engineer Coastal & Landfill Environment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0					
	CAPEX Handover Chief Engineer	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0					
	ENVIRONMENTAL PROTECTION Total	**$6,434,174**	**$2,209,000**	**$6,362,200**	**$1,457,799**	**$2,113,000**	**$2,101,823**	**$2,105,000**	**$2,114,260**	**$2,123,500**	**$2,137,095**	**$17,669,054**	**$31,117,630**	**$45,100,695**	**$57,014,559**	**$180,059,789**
	Optimised CAPEX Baseline -Grand Total	**$72,146,762**	**$76,372,373**	**$78,454,215**	**$70,549,849**	**$74,813,752**	**$75,824,985**	**$75,817,155**	**$77,572,334**	**$79,454,186**	**$81,450,700**	**$403,924,426**	**$396,383,160**	**$407,049,347**	**$419,257,618**	**$2,389,070,863**

Stormwater OPEX Forecast

		1	2	3	4	5	6	7	8	9	10	11-15	16-20	21-25	26-30	
Programme	**Sub Programme**	**FY16**	**FY17**	**FY18**	**FY19**	**FY20**	**FY21**	**FY22**	**FY23**	**FY24**	**FY25**	**FY26-FY30**	**FY31-FY35**	**FY36-FY40**	**FY41-FY45**	**Grand Total**
6 Management, Strategy and Resilience																
6.1	Consenting & Compliance & Monitoring	$860,000	$860,000	$860,000	$860,000	$860,000	$860,000	$860,000	$860,000	$860,000	$860,000	$4,300,000	$4,300,000	$4,300,000	$4,300,000	$25,800,000
6.2	Stormwater management and administration	$275,000	$275,000	$275,000	$275,000	$275,000	$275,000	$275,000	$275,000	$275,000	$275,000	$1,375,000	$1,375,000	$1,375,000	$1,375,000	$8,250,000
6.3	Strategies and Unitary Plan support	$508,000	$250,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$250,000	$250,000	$250,000	$250,000	$2,158,000
6.4	Training and Development	$188,535	$188,535	$188,535	$188,535	$188,535	$188,535	$188,535	$188,535	$188,535	$188,535	$942,675	$942,675	$942,675	$942,675	$5,656,050
	Strategy and Resilience Total	**$1,831,535**	**$1,573,535**	**$1,373,535**	**$1,373,535**	**$1,373,535**	**$1,373,535**	**$1,373,535**	**$1,373,535**	**$1,373,535**	**$1,373,535**	**$6,867,675**	**$6,867,675**	**$6,867,675**	**$6,867,675**	**$41,864,050**
7 Catchment and Asset Planning																
7.1	Catchment planning studies and data	$700,000	$700,000	$700,000	$700,000	$700,000	$700,000	$700,000	$700,000	$700,000	$700,000	$3,750,000	$3,750,000	$3,750,000	$3,750,000	$22,000,000
7.2	Asset systems and data	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$237,500	$250,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$8,487,500
	Catchment and Asset Planning Total	**$950,000**	**$950,000**	**$950,000**	**$950,000**	**$950,000**	**$950,000**	**$950,000**	**$950,000**	**$937,500**	**$950,000**	**$5,250,000**	**$5,250,000**	**$5,250,000**	**$5,250,000**	**$30,487,500**
8 SW Operational Planning																
8.1	SW Incident Response and Business Continuity Planning	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$750,000	$750,000	$750,000	$750,000	$3,500,000
8.2	SW operational plans, studies and investigations	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$2,500,000	$2,500,000	$2,500,000	$2,500,000	$15,000,000
	SW Operational Planning Total	**$550,000**	**$550,000**	**$550,000**	**$550,000**	**$550,000**	**$550,000**	**$550,000**	**$550,000**	**$550,000**	**$550,000**	**$3,250,000**	**$3,250,000**	**$3,250,000**	**$3,250,000**	**$18,500,000**
9 SW Ops and Maintenance Delivery																
9.1	Emergency maintenance	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,200,000	$2,500,000	$2,500,000	$2,500,000	$9,700,000
9.2	Planned maintenance network	$7,222,770	$7,467,553	$7,753,131	$7,983,918	$8,227,326	$8,603,435	$8,845,374	$8,280,122	$8,055,947	$7,888,068	$42,409,751	$44,555,978	$46,752,771	$48,889,902	$262,936,047
9.3	Planned maintenance treatment	$3,034,073	$3,164,739	$3,143,266	$3,143,165	$3,414,915	$3,716,478	$4,070,739	$4,440,352	$4,796,155	$5,162,740	$30,650,643	$37,191,828	$42,760,454	$50,110,888	$198,800,434
9.4	Safety and compliance	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$150,000	$125,000	$125,000	$125,000	$775,000
9.5	SW reactive maintenance (incl third party recovery)	$3,206,016	$3,162,330	$3,133,726	$3,146,572	$3,178,563	$3,337,567	$3,379,787	$3,522,323	$3,566,217	$3,604,024	$18,640,704	$19,723,962	$20,847,886	$21,982,703	$114,432,379
9.6	Stream maintenance	$1,597,525	$1,720,265	$1,679,040	$1,710,430	$1,354,441	$817,764	$509,679	$800,000	$900,000	$950,000	$6,400,000	$7,500,000	$7,500,000	$7,500,000	$40,939,144
9.7	Project delivery and development	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$750,000	$750,000	$750,000	$750,000	$4,500,000
9.8	Flood control maintenance	$50,428	$50,428	$50,428	$50,428	$50,428	$50,428	$50,428	$50,428	$50,428	$50,428	$252,140	$252,140	$252,140	$252,140	$1,512,840
	SW Ops and Maintenance Delivery Total	**$15,285,812**	**$15,740,315**	**$15,934,591**	**$16,209,512**	**$16,400,673**	**$16,700,673**	**$17,031,006**	**$17,268,225**	**$17,543,747**	**$17,830,260**	**$101,453,238**	**$112,598,907**	**$121,488,251**	**$132,110,634**	**$633,595,844**
10 SW Septic Tank Management [#1]																
10.1	Septic Tank MGT	$759,376	$762,672	$765,969	$770,364	$770,364	$770,364	$770,364	$850,000	$850,000	$850,000	$4,250,000	$4,250,000	$4,250,000	$4,250,000	$24,919,471
	SW Septic Tank Management	**$759,376**	**$762,672**	**$765,969**	**$770,364**	**$770,364**	**$770,364**	**$770,364**	**$850,000**	**$850,000**	**$850,000**	**$4,250,000**	**$4,250,000**	**$4,250,000**	**$4,250,000**	**$24,919,471**
11 Maintenance Auckland Transport Assets [#2]																
11.1	Maintenance Auckland Transport Assets	$4,167,749	$4,209,427	$4,251,521	$4,294,036	$4,336,977	$4,380,346	$4,424,150	$4,468,391	$4,513,075	$4,558,206	$23,483,946	$24,681,863	$25,940,886	$27,264,132	$144,974,705
11.2	Auckland Transport Reimbursement	4,167,749	4,209,427	4,251,521	4,294,036	4,336,977	4,380,346	4,424,150	4,468,391	4,513,075	4,558,206	23,483,946	24,681,863	25,940,886	27,264,132	-$144,974,705
	Maintenance Auckland Transport Assets (Net)	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
12 Staff Costs																
12.1	Total Staff Costs	$13,135,450	$13,148,585	$13,161,734	$13,174,896	$13,188,071	$13,201,259	$13,214,460	$13,227,674	$13,240,902	$13,254,143	$66,469,793	$66,802,807	$67,137,490	$67,473,849	$399,831,113
12.2	Capitalized Staff Cost	8,266,569	8,274,836	8,283,110	8,291,394	8,299,685	8,307,985	8,316,293	8,324,609	8,332,933	8,341,266	37,864,819	38,054,522	38,245,176	38,436,784	-$235,639,980
	Total (Net) Staff OPEX Costs	**$4,868,881**	**$4,873,750**	**$4,878,624**	**$4,883,502**	**$4,888,386**	**$4,893,274**	**$4,898,167**	**$4,903,066**	**$4,907,969**	**$4,912,877**	**$28,604,974**	**$28,748,285**	**$28,892,314**	**$29,037,065**	**$164,191,133**
	SUB TOTAL (Excluding Rates & Depreciation)	**$24,245,604**	**$24,450,272**	**$24,452,719**	**$24,736,913**	**$24,932,957**	**$25,237,845**	**$25,573,072**	**$25,894,826**	**$26,162,750**	**$26,466,672**	**$149,675,886**	**$160,964,867**	**$169,998,240**	**$180,765,374**	**$913,557,997**
13 Rates [#3]																
13.1	Estimated Rates for Stormwater Utility Assets	$17,335,730	$25,496,856	$25,685,726	$25,869,849	$26,097,158	$26,347,236	$26,600,083	$26,856,884	$27,124,812	$27,393,630	$140,644,106	$142,913,136	$142,913,136	$142,913,136	$824,191,477
	Stormwater Utility Rates	**$17,335,730**	**$25,496,856**	**$25,685,726**	**$25,869,849**	**$26,097,158**	**$26,347,236**	**$26,600,083**	**$26,856,884**	**$27,124,812**	**$27,393,630**	**$140,644,106**	**$142,913,136**	**$142,913,136**	**$142,913,136**	**$824,191,477**
14 Depreciation [#4]																
14.1	Estimated Depreciation and Amortisation of SW Assets	$55,433,556.00	$56,072,975.78	$56,808,235.86	$57,543,037.23	$58,344,391.89	$59,184,313.33	$60,035,164.60	$60,898,694.68	$61,785,036.65	$62,680,072.44	$326,588,809	$346,629,272	$364,992,454	$382,213,926	$2,009,209,940
	Stormwater Asset Depreciation	**$55,433,556**	**$56,072,976**	**$56,808,236**	**$57,543,037**	**$58,344,392**	**$59,184,313**	**$60,035,165**	**$60,898,695**	**$61,785,037**	**$62,680,072**	**$326,588,809**	**$346,629,272**	**$364,992,454**	**$382,213,926**	**$2,009,209,940**
	GRAND TOTAL	**$97,014,890**	**$106,020,103**	**$106,946,681**	**$108,149,799**	**$109,374,507**	**$110,769,394**	**$112,208,320**	**$113,650,404**	**$115,072,599**	**$116,540,374**	**$616,908,801**	**$650,507,276**	**$677,903,831**	**$705,892,436**	**$3,746,959,414**

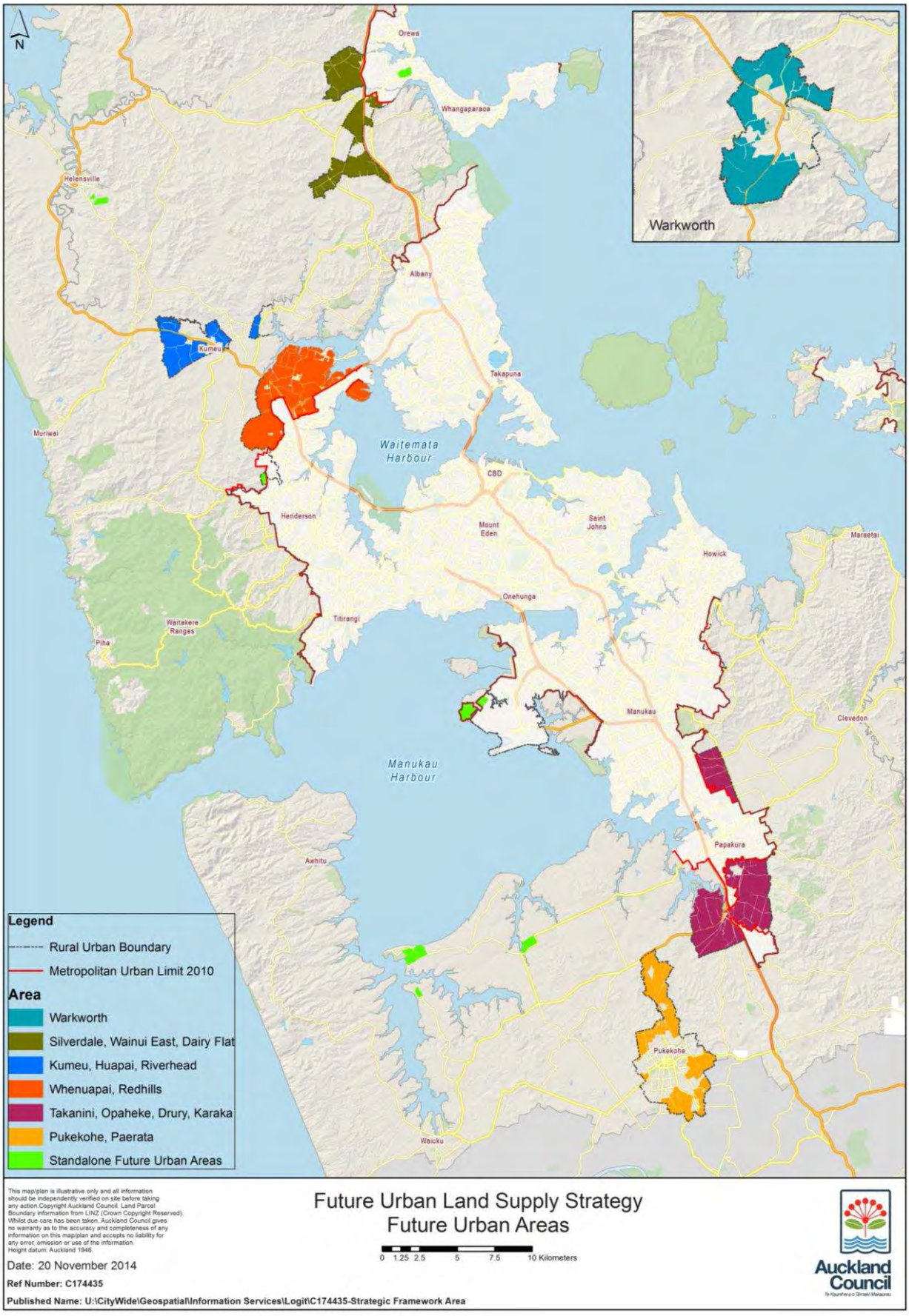
Notes : 1. Costs of septic tank management are recovered from a targeted rate

2. Costs of maintenance of Auckland Transport stormwater assets (catchpits, soakholes etc.) are recovered from Auckland Transport

3. The Stormwater Utility Rate from 2016/17 onward is based on the 2015 asset value of $4.2 Billion and the additional Capital Value each year, Rated against the "Rural Business Fully-Rateable rate" 0.00601058 (excl GST) plus UAGC of: $317.35 (excl GST), these figures are subject to change upon review from central finance.

4. The Stormwater Asset Depreciation is based on the 2015 asset value of $4.2 Billion and the additional Capital Value each year (vested assets plus stormwater CAPEX excluding catchment planning and renewals) and average asset life of 120 yrs., these figures are subject to change upon review from central finance.

Appendix C: FULSS Programme and Maps



Map 1: Location of Future Urban Areas

2. The Programme - Sequencing of the Future Urban Areas

The programme of sequencing the future urban areas spans over 30 years from 2012 – 2041. The timeframe is split into three decades and each decade into five year intervals. Distributing the greenfield areas over this timeframe enables them to be proactively planned in an orderly and cost efficient way, ensuring the areas are 'ready to go' with the required bulk infrastructure and able to deliver the quality urban outcomes anticipated in the Auckland Plan. The sequencing also accounts for the development capacity needed to accommodate greenfield growth. A suite of principles (Appendix 2) underpins the sequencing rationale.

The following table identifies the sequencing of the future urban areas:

Proposed timing – Development Ready	Area
Decade One 1st half 2012-2016	SHAs - NorthWest
	SHAs - South
Decade One 2nd half 2017 - 2021	Paerata
	Whenuapai*
Decade Two 1st half 2022 - 2026	Pukekohe
	Kumeu-Huapai Riverhead
	Redhills
	Warkworth North
Decade Two 2nd half 2027 - 2031	Opaheke - Drury
	Takanini
	Warkworth South
Decade Three 1st half 2032 - 2036	Karaka
	Silverdale-Dairy Flat
	Wainui
Decade Three 2nd half 2036-2041	Yet to be determined - new growth areas

*Limited supply during this period

Decade One – 31,000 to 36,100 dwelling capacity anticipated

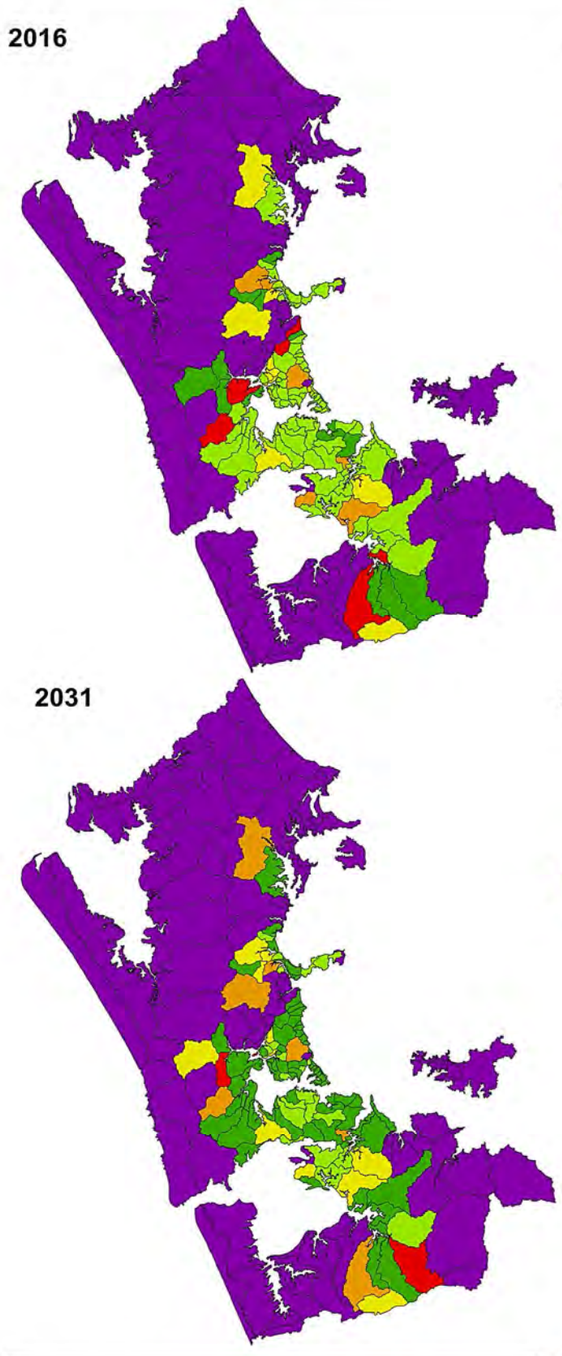
Special Housing Areas (SHAs) feature strongly in the first decade as the short term response to the immediate housing demand and supply challenge. Investment in these areas is currently planned or underway. These areas are within the Future Urban Areas in the north-west and the south. Some in the south are also outside the Future Urban Areas (e.g., Kingseat, Flat Bush and Hingaia). An anticipated range of 20,000 to 23,000 houses could be delivered in these areas. Later on in the decade, Paerata and Whenuapai will come on stream. Significant planning has already been advanced for these areas largely due to planning work undertaken by the former Councils and recent approval of SHAs. Whenuapai and Paerata have water and wastewater provision and fewer physical constraints than some of the other Future Urban Areas. These two areas could provide a dwelling capacity of between 11,000 and 13,100.

Decade Two – 30,000 to 39,700 dwelling capacity anticipated

The second decade transitions into a proactive approach, aligning structure planning with infrastructure planning and delivery. In the first half of the decade Pukekohe, Kumeu-Huapai, Riverhead, Redhills, and Warkworth North will come on stream. Pukekohe has recently undergone planning, is relatively free of constraints and apart from wastewater upgrades, the water and wastewater infrastructure is able to support the anticipated level of growth. Investment will be required to improve transport in the area. The remaining areas in the first half of the decade will require further investment in water, wastewater and transport infrastructure – which will need time to be planned and constructed. In the north-west, SH16 is constrained and will require upgrading in the future to service the planned growth. Warkworth's growth is constrained by water and wastewater. However, some growth could occur in the north of Warkworth in the shorter term. The extension of the Ara Tuhono – Puhoi to Wellsford Road of National Significance will be completed to Warkworth by 2022 making this area attractive for development. The second half of the decade will see Opaheke-Drury, Takanini and Warkworth South come on stream. These areas require longer lead in times to plan and construct significant new water, wastewater and transport infrastructure. Takanini requires significant investment in an appropriate stormwater solution prior to any development. The area is also heavily constrained by geotech issues which will require appropriate engineering solutions.

Decade Three – 31,600 to 40,800 dwelling capacity anticipated

By the third decade, the areas identified in decades one and two will be significantly urbanised (or will be development ready depending on the rate of uptake). The remaining areas of Karaka, Silverdale-Dairy Flat and Wainui will come on stream in the early part of the third decade. These are large rural areas with no urban infrastructure in place. They however have significant potential to deliver quality urban outcomes but all require long lead in times to build water, wastewater and transport infrastructure.



1. Local Infrastructure readiness is an indicator of the development cost and complexity at the local scale. Infrastructure at the local level is largely the responsibility of property developers. Stormwater investment is largely reactive based on site specific conditions that are not apparent until plan variations are prepared. Local readiness assumes that developers are mitigating their stormwater effects, avoiding both developing in floodplains and undertaking major stream modifications.

2. The degree of infrastructure readiness at a Local Level is proportional to the change in imperviousness, the greater the change possible the more costly and complex the mitigations will be. For example the CBD is already predominantly impervious therefore there is a relatively small change possible, conversely in a greenfield are a significant change is possible and will result in more significant costs.

3. Local stormwater infrastructure will be delivered predominately by developers as it is the most efficient way to do so.

4. The rate of change in Imperviousness is proportional in the predicted increase in households in each stormwater catchment

5. Special Housing Areas and the Future Urban Land Supply Strategy will take precedence over the forecast population increase above.

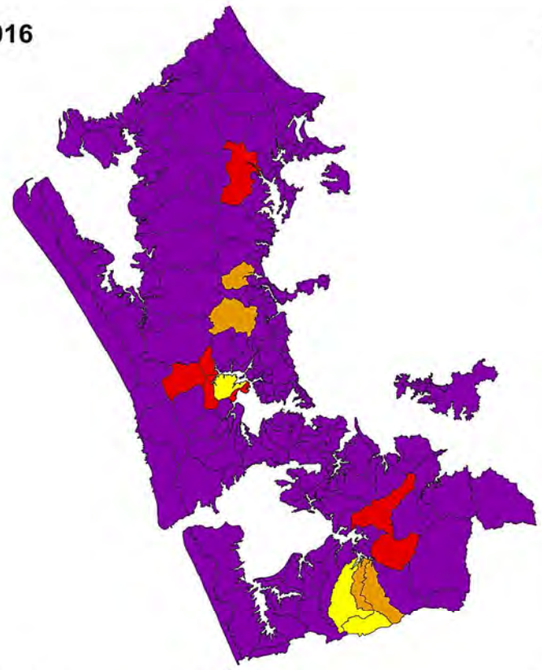
No Activity	Poor	Good
Very Poor	Tolerable	Very Good

Document Path:

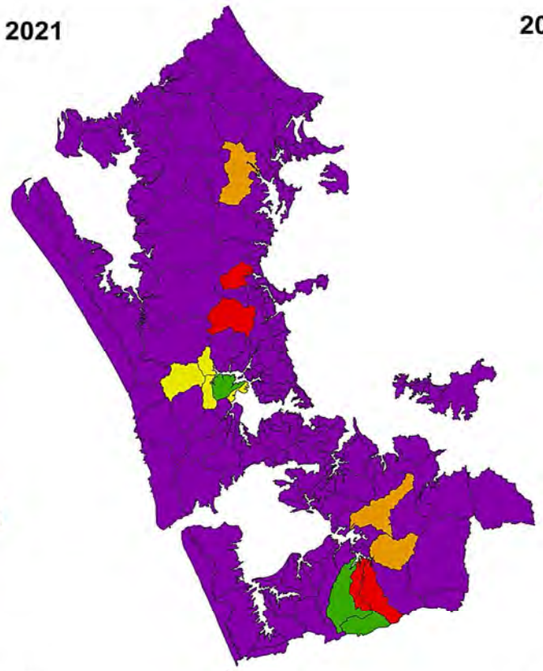
Local Stormwater Infrastructure Readiness

Auckland Council
Te Kaunihera o Tāmaki Makaurau

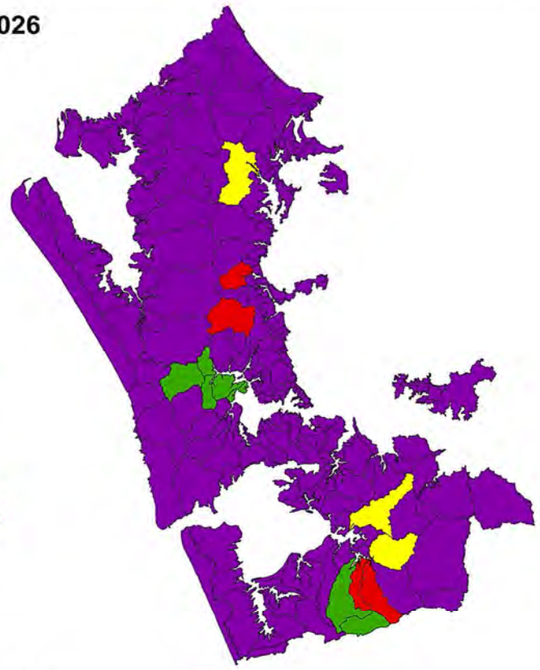
2016



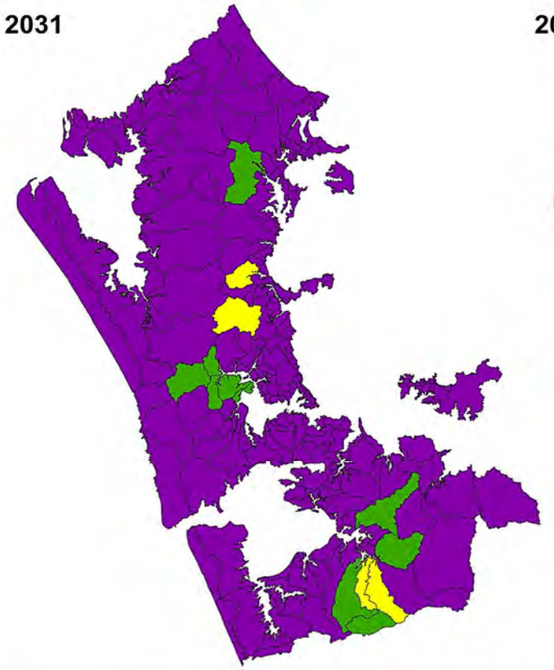
2021



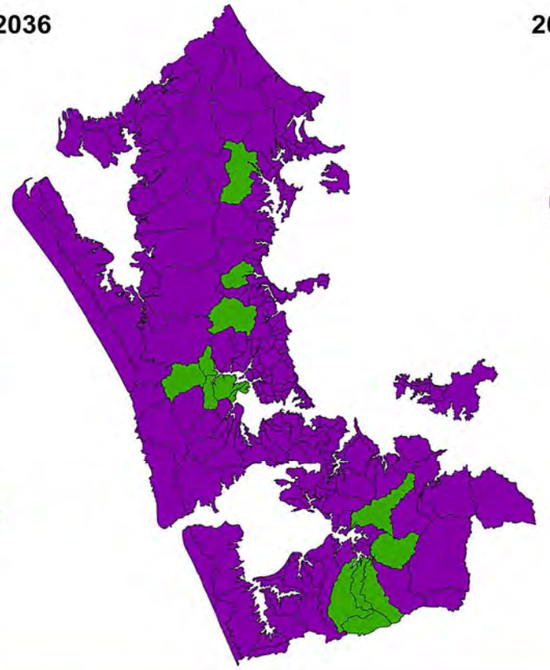
2026



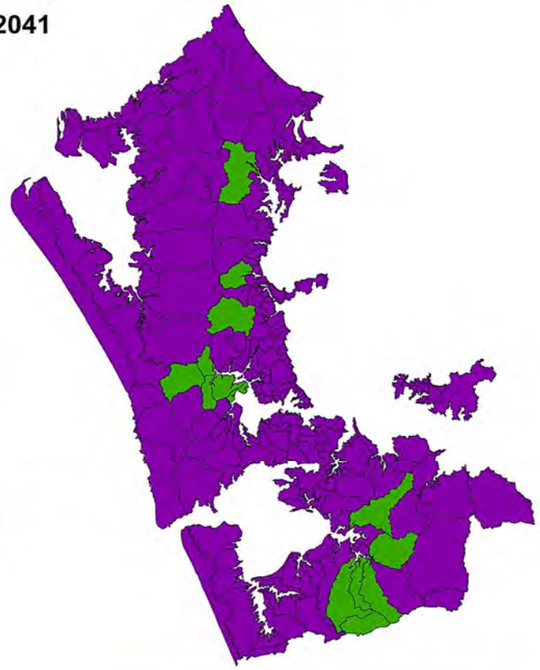
2031



2036



2041



1. Bulk Stormwater Readiness refers to areas where catchment scale interventions by Auckland Council are necessary to enable development to occur, typically in catchments with significant flooding issues.

2. Bulk Stormwater Readiness catchments been identified from the Stormwater Unit asset management plan, Future Urban Land Supply Strategy and catchment management plans. Further bulk infrastructure may be identified as detailed hydraulic models and Catchment Management Plans are completed for the region.

No Activity	Poor	Good
Very Poor	Tolerable	Very Good

Document Path:

Bulk Stormwater Infrastructure Readiness

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Appendix D: Stormwater Unit's Risk Register

RISK REGISTER Stormwater Activity Draft July 2015

Prepared by: Uys de Wet and Helen Chin
Senior Stormwater Specialists

Signed off by:

Date: _____

Ref ID #	Risk Description	Impact	Risk Category	Risk Assessment						Existing Control(s)	Additional Control(s) required	Risk Treatment Plan Summary	Risk Status (After treatment)						Risk Owner	Review Date	Open / Closed
				Likelihood		Consequence		Risk Score	Risk rating (RAG)				Likelihood		Consequence		Risk Score	Revised Risk rating (RAG)			
SW1	Unclear ownership, identfication, responsbility, and access for culverts under KiwiRail and NZTA networks. Ownership can change if any connection or stream to the culvert.	Culverts may be maintained unnecessarily or conversely not managed. Potential asset failure. Potentially liability and political issues if affects rail or state highway networks. Unclear ownership that can change easily.	Assets	3	Possible	4	Major	12		Review of potential culverts affected. Develop MOU with agencies for handling these culverts including clear responsibilties.	Review critical assets list for possible inclusion.	Continue to work with agencies. Develop MOU for better transparency and management.	3	Possible	3	Moderate	9		Manager Stormwater (Stormwater Strategy and Resilience)	Dec-14	Open
SW2	Historical and assumed maintenance practices for private stormwater assets.	Additional O& M costs and staff time unnecessarily. Potential future liabilities for Council.	Assets	3	Possible	2	Minor	6		Response to customer complaint letter. Existing Stormwater Bylaws.	Adopt and implement new regional Stormwater Bylaw.	Continue to respond to customer complaint letters. Implement new regional Stormwater Bylaw.	2	Unlikely	2	Minor	4		Manager Stormwater (Stormwater Strategy and Resilience)	Dec-15	Open
SW3	Popping stormwater manhole.	Public safety compromised such as person falling in causing injury or death.	Health and Safety	4	Likely	5	Catastrophic	20		Urgent priority to respond to request. Identified repeatedly popping manholes fitted with safety device.	Undertake root cause analysis of sites with repeatedly popping manholes. Find long term solution rather than short term fix (ie symptom).	Continue with good responsiveness levels of service. Start undertaking root cause analysis.	3	Possible	5	Catastrophic	15		Manager Stormwater (Stormwater Operations and Planning)	Dec-14	Open
SW4	Overland flowpaths blocked or built over.	Flooding of habitable floors, damage to property, road flooding, increased erosion.	Operational Capability	4	Likely	3	Moderate	12		SW Unit inputs to Council planning processes and consent applications. Good practice guides for stormwater management and industry training sessions. Stormwater Code of Practice.	Ensure approriate controls/rules are included in the Unitary Plan. Increase awareness and training of Council's regulatory unit to reduce non-compliance. Increase public education to improve awareness and impacts.	Continue with good practice guidelines and training. Ensure approriate rules are included in the Unitary Plan. Increase public education.	3	Possible	3	Moderate	9		Manager Stormwater (Stormwater Operations and Planning)	Dec-15	Open
SW5	Poor investment decisions as multiple and not fit for purpose legacy systems (AMS) available for asset planning.	Major constraint in achieving sound long term asset planning and advanced asset management goal	Technology	5	Almost Certain	3	Moderate	15		Business case developed. Proof of concept underway for new SAP based solution.	Ensure keeps to timetable and meets SW Unit's requirements.	Manage careful development of single asset depository for SW assets.	2	Unlikely	3	Moderate	6		Manager Stormwater (Stormwater Operations and Planning)	Dec-16	Open
SW6	Development still occurring in floodplains.	Potential increased flood vulnerability for Council to resolve and costly and complex to rectify	Operational Capability	4	Likely	4	Major	16		SW Unit inputs to Council planning processes and consent applications. Good practice guides for stormwater management and industry training sessions. Stormwater Code of Practice. Working with Housing Project Office to identify issues in growth areas.	Tolerate	Continue with inputs to planning processes, and working with HPO to fast track areas for development.	3	Possible	4	Major	12		Manager Stormwater (Stormwater Strategy and Resilience)	Dec-15	Closed
SW7	Inconsistent interpretation of planning rules for imperviousness.	Specific developments may increase catchment runoff through reduced green areas; may cause adverse environmental effects and outcomes sought for that catchment; may cause increased flooding downstream	Environment (Natural and Built)	3	Possible	3	Moderate	9		SW Unit inputs to Council planning processes and consent applications. Inconsistencies raised and addressed through senior management and training.	Tolerate	Continue with inputs to planning processes, and raising issues.	3	Possible	3	Moderate	9		Manager Stormwater (Stormwater Strategy and Resilience)	Jun-15	Closed
SW8	Maximum Probable Development (MPD) values in Unitary Plan have flood planning implications.	This affects calculations for infrastructure capacity sizing used by developers; Council then needs to manage these assets once vested	Assets	4	Likely	3	Moderate	12		SW Unit inputs to Council Unitary Plan processes. Undersized assets identified through catchment modelling.	Increase influence and decision making for MPD values in Unitary Plan.	Increase influence and decision making for MPD values in Unitary Plan.	3	Possible	3	Moderate	9		Manager Stormwater (Stormwater Strategy and Resilience)	Jun-15	Open
SW9	Increased flood vulnerability caused by change in land topography due to earthquake/volcanic eruption/tsunami *(lifeline category)*	Increased flooding impacts to previously unaffected areas; increased tidal inundation; change in channel physical dimensions and overland flow path routes.	Cultural/Community	1	Rare	5	Catastrophic	5		Industry learnings from Canterbury earthquakes, volcanic eruptions North & South America /Europe etc, recent tsunamis in Indian Ocean, Samoa and Japan. Catchments modelled and available for scenario analysis.	Tolerate	Major modelling would be required as part of the recovery plan and rebuild.	1	Rare	5	Catastrophic	5		Manager Stormwater (Stormwater Strategy and Resilience)	Dec-15	Closed

SW 10	Unclear ownership and responsibility for complex assets (such as rain gardens, swales and tanks), especially in road corridors and reserves. Ownership may change if any connection to complex asset at a later date.	Complex assets may be maintained unnecessarily or conversely not managed. Potential asset failure. Unclear ownership that can change easily. Increased operational costs for Council. Environmental outcomes not achieved.	Assets	4	Likely	3	Moderate	12		Existing Stormwater Bylaws. Public education on website.	Complete and adopt regional Stormwater Bylaw. Increase monitoring and enforcement. Increase public education.	Adopt regional Stormwater Bylaw.	3	Possible	3	Moderate	9		Manager Stormwater (Stormwater Strategy and Resilience)	Jun-15	Open
SW11	Unclear ownership and maintenance responsibilities for green/natural assets including streams and overland flow paths. Unclear liabilities when green/natural asset fails such as bank erosion causing house movement/defects.	Increased flooding impacts due to unmaintained stream. Additional O& M costs and staff time unnecessarily, and liability for third party damage.	Assets	3	Possible	3	Moderate	9		Response to incidences and compliants. Public education on website. Overland flow data and related education. Current bylaws. Air, Land, Water Plan and future Unitary Plan.	Complete and adopt regional Stormwater Bylaw. Increase public education. Develop green/natural asset policy.	Adopt regional Stormwater Bylaw. Develop green/natural asset policy.	2	Unlikely	3	Moderate	6		Manager Stormwater (Stormwater Strategy and Resilience)	Dec-15	Open
SW12	Stormwater Bylaw (regional) not formally adopted.	Potentially many private devices not maintained or renewed. Environmental outcomes for catchment not (or partially) achieved.	Environment (Natural and Built)	3	Possible	3	Moderate	9		Existing stormwater bylaws in place. Public education on website.	Complete and adopt regional Stormwater Bylaw. Increase monitoring and enforcement. Increase public education.	Adopt regional Stormwater Bylaw.	2	Unlikely	3	Moderate	6		Manager Stormwater (Stormwater Strategy and Resilience)	Dec-15	Open
SW13	Impacts of regional Stormwater Bylaw once adopted.	Poor public perception. Lack of maintenance by some private green asset owners may cause unacceptable risks.	Environment (Natural and Built)	3	Possible	2	Minor	6		Public education on website.	Increase general stormwater awareness through the multimedia approach. Investigate separate funding arrangements for private maintenance/renewals.	Increase general stormwater awareness. What about specific engagement to help people maintain them?Investigate separate funding arrangements.	2	Unlikely	2	Minor	4		Manager Stormwater (Stormwater Strategy and Resilience)	Dec-15	Open
SW14	Stormwater manhole or pump station lid left off by contractor staff.	Public safety compromised such as person falling in causing injury or death.	Health and Safety	2	Unlikely	5	Catastrophic	10		Contract Quality Plan and Work Procedures. Urgent priority to respond to request. Good processes for dealing with open manholes.	Reinforce health and safety requirements and consequences.	Continue with good responsiveness levels of service, education and performance monitoring.	1	Rare	5	Catastrophic	5		Manager Stormwater (Stormwater Operations and Planning)	Jun-15	Open
SW15	Person (public) falls into stormwater inlet/outlet as dark, slippery or no safety rail.	Public safety compromised such as person falling in causing injury or death.	Health and Safety	2	Unlikely	5	Catastrophic	10		Urgent priority to respond to request.	Review safety in design for inherently high risk stormwater assets including inlets and outlets.	Continue to inspect high risk assets and assess as necessary. Case by case basis approach.	1	Rare	5	Catastrophic	5		Manager Stormwater (Stormwater Operations and Planning)	Jun-15	Open
SW16	Person falls into stream/pond with no fencing resulting in death.	Accident - Public safety compromised such as person falling in causing injury or death.	Health and Safety	2	Unlikely	5	Catastrophic	10		Urgent priority to respond to request. Fencing provided for some deep ponds. Perimeter planting and benching to reduce risk. Policy on fencing. H&S review of SW ponds Education for public.	Review safety in design for inherently high risk stormwater assets including ponds.	Continue to inspect high risk assets and assess as necessary. Case by case basis approach.	1	Rare	5	Catastrophic	5		Manager Stormwater (Stormwater Operations and Planning)	Jun-15	Open
SW17	Serious injury or death of staff during normal stormwater operations.	Accident - Serious injury or death of staff.	Health and Safety	2	Unlikely	5	Catastrophic	10		H&S procedures and training. Confined space training. Staff communication. Council insurance.	Tolerate	Continue to reinforce strong H&S requirements. Always a risk with operations.	1	Rare	5	Catastrophic	5		I&ES	Jun-15	Closed
SW18	Stormwater dam failure due to inaccurate or missing asset information and therefore poor or no proactive maintenance.	Potentially Council prosecuted for not meeting dam safety regulations. Serious injury or death. . Potentially significant property damage for properties downstream of dam. Negative Council image	Legal	2	Unlikely	5	Catastrophic	10		Some legacy asset information available. Asset knowledge in some operational staff.	Complete large dam data capture and sufficient management to meet legislative existing and future (July 2015) requirements.	Start large dam data capture and better management.	1	Rare	5	Catastrophic	5		Manager Stormwater (Stormwater Operations and Planning)	Dec-14	Open
SW19	An critical asset fails to deliver the required level of service.	LOS affected for more than 1 day. Potentially serious injury. Inability to deliver service. Legal implications. Property damage. Increased costs. Negative impact on natural environment. Poor public image.	Operational Capability	3	Possible	4	Major	12		Proactive and reactive maintenance. Identification of critical assets. Targeted renewal strategy for critical assets. Stormwater Code of Practice for all assets. Proactive management of vested asset process.	Identification of critical assets. Develop increased maintenance and renewal program. Formation of proper overland flow paths.	Continue with proactive critical asset management. Proactive management will reduce impact	2	Unlikely	3	Moderate	6		Manager Stormwater (Stormwater Operations and Planning)	Dec-15	Open
SW20	Inability to fund agreed service levels.	Reduced level of service. Increased long term costs of asset maintenance. Increased long term capital expenditure to address backlog. Adverse environmental effects. Customer dissatisfaction. Inefficient use of resources (internal and external). Negative Council image. Unfavourable Audit NZ report for asset management and LTP.	Customers	4	Likely	4	Major	16		Forecasting. Plans adjusted for inflation. Well established LTP and AM planning processes. LOS reviewed through AMP preparation and Business Plan monitoring. LOS achievement reported in Annual Reports. Regular Audit NZ monitoring of performance (financial and non-financial). Governance providing oversight with SW Unit management team, IES, and COO senior mgt.	Investigate robust LOS options and financial implications and service consequences.	Continue with sound AM and LTP planning processes. Investigate robust LOS options.	3	Possible	3	Moderate	9		Manager Stormwater (Stormwater Strategy and Resilience)	Dec-15	Open

SW21	Poor land stability as a direct result of stormwater flows from the public system, potentially leading to landslips	Damage to buildings and property. . Injury or loss of life. Council liable for damages. Unplanned remedial costs to Council. Loss of land. Increased staff resourcing required. Negative Council image	Cultural/Community	3	Possible	3	Moderate	9		Building Act requirements. Consenting process. Stormwater Code of Practice. Council public records through PIR and GIS. Incident response policy/ Landslip response policy. Capital works and renewal programmes. Inspections (reactive only). Staff training and education. Future District Plan changes. Proactive inspection of public pipes for condition assessment	Staff training and education. Unitary Plan requirements. Proactive inspection of public pipes for asset condition identified as potentially causing slips. Catchment management process. Proactive inspection of all outfalls in Coastal Marine Areas.	Continue with regulatory planning processes. Undertake proactive inspection of all outfalls.	2	Unlikely	2	Minor	4		Manager Stormwater (Stormwater Operations and Planning)	Dec-15	Open
SW22	Poor infrastructure handed over after private development and capital works	Increased Council costs for maintenance and/or renewals. Environmental damage if fails (or partially fails). . Future rates impacts with early renewals and/or large and unnecessary maintenance costs to Council. Negative Council image	Assets	3	Possible	4	Major	12		Service level agreements internally between depts. Stormwater Code of Practice. Good practice guidelines and industry training. Formal handover procedures (vested asset process).	Formal SLA between SW Unit and Regulatory Unit in place, ongoing review of SLA. Improved internal auditing. Improved performance from Council depts. Improved as-builts from developers.	Review/update formal SLA as and when required. Continue with handover processes.	2	Unlikely	3	Moderate	6		Manager Stormwater (Stormwater Operations and Planning)	Dec-15	Open
SW23	Erosion of stream banks	Loss of public land. Damage and loss of buildings and properties. Silting downstream. Damage to Council owned land/ parks and/or assets. Reduction in hydraulic capacity. Loss of estuarine habitat/ spawning grounds.	Environment (Natural and Built)	4	Likely	4	Major	16		Source control. Stormwater policies. Detention ponds. Capital works and renewals programmes. Consenting process. District Plan changes. RMA - Air Land Water Plan. Best Practice documents.	Future District Plan changes. Staff training and education (ongoing). Catchment management planning. Monitoring and enforcement. Network consents. Green Asset Policy. Stream bank planting.	Proactive management will reduce impact but will take time to implement	3	Possible	4	Major	12		I&ES	Dec-15	Open
SW24	Stormwater planning and resource controls ineffective (including private devices)	Degraded streams. Flooding causing property damage. Landslips. Pollution of freshwater environment. Public complaints. Negative Council image. Ineffective use of resources. Low staff morale	Environment (Natural and Built)	3	Possible	3	Moderate	9		Consent conditions. Unitary Plan. Current bylaws. Guidelines and Best Practice documents. Internal Processes. Resources (Staff and funding). LTP process. Project team. Public education on website. Overland flow data and related education. Air, Land, Water Plan.	Align legal framework/ District Plan with Air, Land Water Plan and future Unitary Plan. Develop an effective and comprehensive process for monitoring and enforcement. Complete and adopt regional Stormwater Bylaw. Increase monitoring and enforcement. Lobbying/ contributing to RPS. Improved education of community and industry.	Adopt regional Stormwater Bylaw. Increase monitoring and enforcement.	2	Unlikely	2	Minor	4		Manager Stormwater (Stormwater Strategy and Resilience)	Dec-15	Open
	Asset information including condition and performance data not available or inaccurate (including vested assets)	Inaccurate asset information, Inaccurate asset valuation, Drop in performance of asset , Legal implications, Inappropriate funding, Lack of optimised decision-making, Unexpected asset failure, Asset Management, Information Management	Information Management	4	Likely	4	Major	16		Asset management improvement programmes. Asset management tools. Regular inspections and reporting on critical assets. Data availability proactively analysed and reported on. Asset management data exchange process for vested assets and Council's capex projects. Asset data audits. Project review meetings. Ensure CCTV data meets SW Unit requirements. Ensuring maintenance contractors/ consultants capture data required for AMIS.	Tolerate and continuous improvement through the Asset Management Improvement Programme. Ensure Council databases for assett management meet business requirements. Improve Consultants data submission process		2	Unlikely	3	Moderate	6		Manager Stormwater (Stormwater Operations and Planning)	Jun-15	Closed
SW26	Inadequate management of contaminant sources (other than sediment) that originate from sources beyond Council's control	Adverse environmental effects. Increased and unnecessary costs. Inability to control sources of contamination. Non-compliance with network discharge consent conditions.Negative Council image.	Environment (Natural and Built)	4	Likely	4	Major	16		Network Consent process. SLA with Auckland Transport for managing road drainage more seamlessly. Consent conditions by Regulatory Unit. Lobbying to amend requirement on Council. Education on source control including Council's website. Legal and planning advice. NDC consultation process (multi levelled).	Tolerate. Continue with prioritising efforts through NDC consultation process so resources used effectively.	Existing polutants will take time to correct	3	Possible	3	Moderate	9		Manager Stormwater (Stormwater Strategy and Resilience)	Dec-15	Closed
SW27	Inadequate response to extreme weather event (eg 1 in 10 year storm/rainfall event)	Significant flooding.. Clean-up and remedial costs. Litigation for property damage. Diverts Council resources. Insurance claims. Potential injury and loss of life. Property and building damage. Negative Council image	Operational Capability	3	Possible	4	Major	12		IRP procedures for stormwater. Call centres. Capital and renewal works programmes. Selection and management of maintenance contractors. Emergency services response. Stormwater hotspots identified for maintenance & inspection.	Tolerate		3	Possible	4	Major	12		Manager Stormwater (Stormwater Operations and Planning)	Jun-15	Closed

SW28	Flooding of properties due to debris or slip blocking critical inlets/pipelines.	Property flooding. . Clean-up and remedial costs. Litigation for property damage. Insurance claims. Potential property and building damage. Negative Council image	Operational Capability	3	Possible	3	Moderate	9		Fortnightly inspections and clean outs (hot spot programme). Trash fences upstream at some locations. Design management.	Tolerate		3	Possible	3	Moderate	9		Manager Stormwater (Stormwater Operations and Planning)	Jun-15	Closed
SW29	Lack of maintenance of private stormwater infrastructure.	Adverse environmental effects. Environmental outcomes for catchment not achieved. Flooding/ slips. Costs to wider community for providing additional assets.Negative Council image	Environment (Natural and Built)	3	Possible	3	Moderate	9		Requirements documented in consent conditions. Council enforcement. Public education.	Complete and adopt regional Stormwater Bylaw. Increase monitoring and enforcement.	Adopt regional Stormwater Bylaw. Continue with documenting requirements in consent conditions.	3	Possible	3	Moderate	9		Manager Stormwater (Stormwater Strategy and Resilience)	Dec-15	Open
SW30	Poor maintenance of ponds and other treatment devices.	Poor water quality through release of sediments and contaminants. Breach of resource consent conditions. Abatement notices. Flooding through structural failure.	Environment (Natural and Built)	4	Likely	3	Moderate	12		Defined responsibilities and specification for maintenance contractors. Silt level monitoring. Consenting process. Improved maintenance schedules. Development of data improvement programme. Monthly inspection programme. Maintenance improvement programme. Water quality monitoring. Source sediment controls. Education/ training of maintenance contractors. Industry training courses on best practice guidelines.	Update asset data inventory of all Council ponds and treatment devices. Undertake proactive maintenance of complete pond portfolio.	Update asset data inventory for ponds. Undertake proactive maintenance of all ponds.	3	Possible	3	Moderate	9		Manager Stormwater (Stormwater Operations and Planning)	Jun-15	Open
SW31	Runoff, spills and unauthorised waste discharges into stormwater.	Water pollution.. Clean-up costs. Environmental degradation. Negative Council image	Environment (Natural and Built)	4	Likely	2	Minor	8		Pollution control plans for developments. Call centre. Environmental Programmes monitoring. Trade waste bylaws (through Watercare). Consenting process. Public education. Exercising IRP.	Tolerate		4	Likely	2	Minor	8		Manager Stormwater (Stormwater Operations and Planning)	Jun-15	Closed
SW32	Failure to deliver sound stormwater projects with benefits directly aligned to Stormwater Unit's objectives.	Lack of quality outcomes. Delays while resetting capital programme and investigating high benefit and sound projects. Loss of service level. Additional resources required, internally and externally. Over/under spending of budgets. Failure to deliver on commitments. Deferring or rejecting projects. Loss of image and credibility.	Delivery of Commitments	4	Likely	4	Major	16		Project Gateway process. Project management training. AMP development and LTP planning processes for scrutinising projects (and programmes).	Internal project auditing once Gateway process fully implemented. Implement prioritisation framework.	Continue to scrutinise capex projects. Implement prioritisation framework.	3	Possible	4	Major	12		Manager Stormwater (Stormwater Delivery and Development)	Dec-14	Open
SW33	Inappropriate disposal of ash into stormwater system by public because of lack of communication and information from the Council on how to deal with it.	Blockage or loss of capacity of pipes and watercourses leading to flooding of habitable floors and other property.	VOLCANO or VOLCANIC ASH	5	Almost Certain	4	Major	20		There is currently limited information on ash disseminated to the public, however there is information available such as Auckland Engineering Lifelines Group ARC TP:144 Volcanic Ash Review - Part 1 Impacts on Lifelines Services and Collection / Disposal Issues	Educate the public on proper ash disposal after a volcanic eruption. Align catchpit protection programmes with Auckland Transport road cleaning procedures.	Educating the public and liaising with Auckland Transport to protect catchpits may reduce the areas requiring remedial action post-volcanic eruption. Reduction of stormwater blockage after educating the public and liaising with Auckland Transport to protect catchpits will still be difficult to predict in the event of a volcanic eruption.	2	Unlikely	3	Moderate	6		Manager Stormwater [Stormwater Operations & Planning Manager]	By 01/07/2014	Open
SW34	That watercourses become blocked by Tsunami debris and fail, causing widespread flooding.	Blockage by debris swept by tsunami, widespread flooding, property damage, Council liability, compromised public health and safety, and contamination of water bodies due to chemicals and other toxic substances swept off by tsunami.	TSUNAMI	5	Almost Certain	4	Major	20		Controls have not been developed to prevent this risk from occurring.	For major tsunami events, develop recovery plans for outlets to be restored.	Remedial action will still be required for watercourses even after the implementation of recovery plans. This is almost certain and uncontrollable in a tsunami event despite any mitigation plans.	5	Almost Certain	4	Major	20		Manager Stormwater [Stormwater Operations & Planning Manager]	By 01/07/2014	Open
SW35	Council is unable to recover the soakage capacity of the soakage structures following volcanic eruption/ash fall. Insufficient resources for new design opportunities.	Complete loss of some or all soakhole assets, increased cost for the installation of new boreholes or stormwater redesign.	VOLCANO or VOLCANIC ASH	4	Likely	4	Major	16		Variable measures based on soakhole type.	Public awareness and Prevention of ash entering large volume soakholes - measures will be based on soakhole type.	Remedial action will still be required for soakholes after type-specific measures are set in place pre-volcanic eruption. The severity of the effect on the functionality of the soakholes even after the installation of protection measures is difficult to predict and quantify.	3	Possible	4	Major	12		Manager Stormwater [Stormwater Operations & Planning Manager]	By 01/07/2014	Open

SW36	That SW pump stations will incur structural damage during an earthquake that will prevent them remaining in service pumping stormwater from low lying areas.	Flooding in pumping station catchments, property damage, Council liability, compromised public health and safety.	EARTHQUAKE	4	Likely	4	Major	16		Controls will not prevent this risk from occurring.	Identify pump stations requiring inspection. Develop a checklist for the operation of pump stations post-earthquake.	Structural damage to the pump station or discharge main is not reliably predictable so the operation checklist will not remove the need for remedial action. Structural damage to the pump station or downstream network is not reliably predictable so the operation checklist will not reduce the likelihood of this risk from occurring.	4	Likely	4	Major	16		Manager Stormwater [Stormwater Operations & Planning Manager]	By 01/07/2014	Open
SW37	A large scale failure of a large coastal outfall as a result of a large Tsunami event particularly for example in the CBD area and Wairau valley.	Potential loss of access to Port area, flooding of commercial premises, long and costly recovery/ replacement of service.	TSUNAMI	3	Possible	5	Catastrophic	15		Controls have not been developed to address this risk.	For major tsunami events, develop recovery plans for outlets to be restored. Consider identification and strengthening assets in the CBD wharf to reduce likelihood of collapse.	Once recovery plan for the outlets are set in place, the consequences will still require remedial action, but the political and economic consequences will be reduced. Development of recovery plans and strengthening of the CBD outfalls will not reduce the likelihood of collapse.	3	Possible	4	Major	12		Manager Stormwater [Stormwater Operations & Planning Manager]	By 01/07/2014	o
New SW38	Where a dam has a risk of failure that the downstream consequences of failure are not recognised, resulting in lack of mitigation plans and contingency plans for certain areas.	Major flooding, loss of life, and property damage downstream, Council liability, increased cost of operations and need for compromise of other critical areas for previously unidentified ones.	EARTHQUAKE	3	Possible	5	Catastrophic	15		There is a legacy register for dams, but no proper inspection programme for the dams.	Identify dams across Auckland region and identify and model downstream effects.	The consequences of the failure to recognise downstream effects may be reduced with a current model, however remedial action may still be required. The likelihood is based on the model's accuracy.	3	Possible	4	Major	12		Manager Stormwater [Stormwater Operations & Planning Manager]	By 01/07/2014	Open
New SW39	Council fails to identify the locations of those critical pipes most susceptible to collapse or blockage in an earthquake, including those under buildings and major road culverts, and fails to take steps to make them more resilient.	Flooding impacts especially on transport routes and potential loss of access to port area, loss of life and property damage, increased cost of operations and need for compromise of other critical assets for previously unidentified ones, Council liability.	EARTHQUAKE	4	Likely	4	Major	16		The existing critical asset register is based on location.	Produce a critical asset register based on geography.	Identification of critical pipelines will still result in remedial action being required. The likelihood of failing to identify critical assets is reduced once the critical asset register based on geology is produced.	3	Possible	4	Major	12		Manager Stormwater [Stormwater Operations & Planning Manager]	By 01/07/2014	Open
New SW40	Council fails to identify critical watercourses prone to blockage from landslip or loss of capacity due to bank slumping and therefore fails to take mitigation measures to maintain and or recover the capacity of watercourses.	Blockage by landslips or loss of capacity causes flooding, property damage, increased cost for increased capacity required, Council liability, compromised public health and safety.	EARTHQUAKE	4	Likely	4	Major	16		Limited information is available for watercourses prone to landslips.	Yet to be developed or clarified whether or not to include both public and private watercourses in future investigation of landslip effects.	Remedial action will most likely be required. Producing a register for potentially affected watercourses will reduce the likelihood of this risk occurring.	3	Possible	4	Major	12		Manager Stormwater [Stormwater Operations & Planning Manager]	By 01/07/2014	Open
New SW41	Council does not fully identify critical assets that will be vulnerable in earthquake event and plan mitigation works to make them more resilient to earthquake.	Flooding, property damage, additional costs for previously unidentified assets as critical (may compromise other critical areas due to budget, etc.), Council liability, compromised public health and safety and contamination of water bodies due to wastewater leaks into stormwater lines, disruption of road transport.	EARTHQUAKE	4	Likely	4	Major	16		SW Operations provided a list for known high risk assets. The criticality model has been done mainly for pipes and manholes.	The criticality model can also be run for other large asset groups (significant numbers) assets. Identify any new critical assets. Consider what mitigation works could be undertaken to improve resilience.	The existing criticality model will help reduce the need for any remedial action. However, since the critical assets register is not based on scenario, the consequences will still affect the achievement of the objective. The critical assets register is not based on scenario, so the likelihood of the risk occurring remains the same.	3	Possible	3	Moderate	9		Manager Stormwater [Stormwater Operations & Planning Manager]	By 01/07/2014	Open
New SW42	Inadequate Council readiness for Climate Change Too vague needs to be reworded in terms of impact to infrastruture service for community and coastal erosion	Flooding/sea inundation. Large scale erosion, property damage, Liability, under capacity, increased cost due to need to change service levels, compromised public health and safety, negative Council image, impaired operations.	Climate Change	5	Almost Certain	5	Catastrophic	25		Land use controls, flood plain modelling, catchment management programmes, design standards, sea level/flood damage assessments, keeping up to date with national practice	Ensure appropriate controls/rules are included in the Unitary Plan.	Tolerate. Many good studies and controls in place.	3	Possible	4	Major	12		Manager Stormwater [Stormwater Operations & Planning Manager]	To be reviewed when Unitary Plan is notified	Open

Appendix E: Stormwater Asset Management Plan Peer Review Letter from Morrison Low and Associates

17 October 2014

Morrison Low
& Associates Ltd
L1, 8 Lion Place
Epsom
PO Box 9126
Newmarket
Auckland 1149
NEW ZEALAND

Ph: +64 9 523 0122
mail@morrisonlow.com

Phil Jaggard
Stormwater Strategy and Resilience Manager
Auckland Council
Private Bag 92300
Auckland 1142

Dear Phil

Independent Peer Review of the 2015 Stormwater Asset Management Plan

Morrison Low was engaged to provide comments on the draft 2015 Stormwater Asset Management Plan (AMP). The peer review was undertaken progressively as sections of the document were completed with the entire document provided for review on 2 October 2014. The progressive feedback process has allowed Council's Stormwater Asset Management team to make improvements to the document in a more efficient manner.

The review has focussed on the following key requirements:

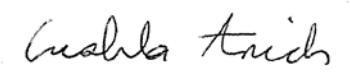
- Compliance with legislation in particular the Local Government Act Schedule 10 and amendments for asset management
- Alignment with the Office of the Auditor General and their criteria for the 2015 Long Term Plan for asset management
- The new legislative changes that are part of the Better Local Government Programme including the Infrastructure Strategy and Essential Services Benchmark as set out in the Local Government (Financial Reporting and Prudence) Regulations 2014
- Alignment with Council's key strategic planning documents
- Following good industry practice for asset management including the 2011 International Infrastructure Management Manual
- Fit for purpose and readable

Overall the draft 2015 Stormwater AMP is a comprehensive document supported by sound underlying information. It has developed significantly from a document that essentially consolidated legacy council AMP information to a cohesive document that has a forward looking regional focus. Significant effort has been undertaken to scrutinise all the planned capital projects for robustness, and alignment with the strategic objectives set out in the Auckland Plan and Stormwater Strategic Direction.

The 2015 Stormwater AMP meets some elements of advanced asset management recognising that the improvement programmes for addressing asset management system constraints need to be implemented.

In conclusion, the draft 2015 SWAMP is a concise and streamlined document supported by sound information and asset management practices. It meets relevant legislative requirements and has made good progress working towards best industry practice.

Yours faithfully
MORRISON LOW & ASSOCIATES



Ewen Skinner
Director

Cushla Anich
Senior Consultant