



Stormwater Asset Management Plan 2024



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1.0: EXECUTIVE SUMMARY

All councils in Australia own assets, which include infrastructure, property, plant and equipment. At PAE we manage our assets to provide a suitable level of service to current and future generations in the most cost-effective manner. Our approach is strategic and aligned with industry standards to ensure that we manage our assets effectively and sustainably.

Effective asset management for our stormwater assets is a key contributor to our City Vision, in which we envision PAE as 'a welcoming, liveable city: made by people'.

Asset Types Covered at PAE are:

- 522.7 km of pipes and culverts
- 16,471 pits
- 400 gross pollutant traps, trash racks and soakage pits
- 11km of open channels

Asset Types Excluded at PAE:

- Pump stations (covered in the Pump Station AMP)
- Wetlands (covered in the Open Space AMP)

Stormwater Network

- Condition: average (based on the age/remaining life of the network)
- Total replacement value: \$545.8 million
- Annual depreciation: \$5.5 million

How Critical are PAE's Stormwater Assets?

We assessed our stormwater assets to have the highest level of criticality in comparison to our other major asset classes. The potential damage that floods can cause to people, infrastructure, transport, homes or the environment means that the critical nature of our stormwater infrastructure service delivery is higher than it is for other kinds of assets like footpaths and open space.

Levels of Service

Criteria	What Level of Service Do We Aim For?
Function	We design the minor and major systems to convey or hold water (depending on the size of the storm event) and we maintain open channels to ensure that stormwater can flow effectively and safely through the channels
Condition	Our stormwater pits and pipes provide suitable conditions for water capture and flow during all rain events
Safety	We design the drainage network to reduce flooding, prevent pollution, and protect water quality
Environmental Sustainability	We install trash racks and gross pollutant traps to capture waste before entering our waterways
Renewal Capacity/Financially Sustainable	We manage renewing our network in a financially sustainable way

Future Demand

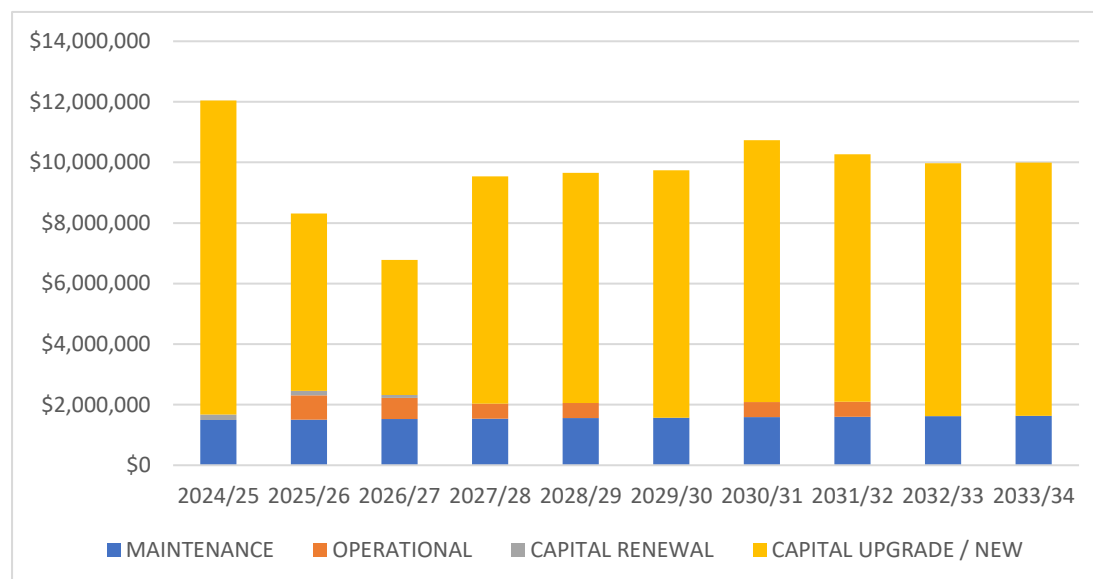
Population and demographics	- Based on the last Census undertaken in 2021, our population will have grown by approximately 22% from 134,000 to 164,000 over a projected 25 year period - There will be less permeable land due to increased housing on smaller land parcels. This generates a higher amount of stormwater flow reducing the capacity of the existing stormwater network
Environment and Climate Change	- Rainfall intensity will increase, along with storm events, causing the potential for increased flooding - Rising sea levels will impact peak tide events, which may coincide with storm events, causing a greater risk of flooding - As infill development increases, along with more traffic in urban areas, there will be an increase in the rubbish and pollution that enters open channels and stormwater drainage systems
Technology	- We will continue to improve our technology to understand the condition of our stormwater network - We will use data to assist in making decisions and delivering services

Financial Summary

We will invest an average of \$7.8 million per year of capital expenditure into our network and we will prioritise upgrading existing infrastructure to enable greater capacity across the system.

YEAR	MAINTENANCE	OPERATIONAL	CAPITAL RENEWAL	CAPITAL UPGRADE / NEW	TOTAL
2024/25	\$1,493,800		\$180,000	\$10,370,000	\$12,043,800
2025/26	\$1,508,700	\$800,000	\$150,000	\$5,854,000	\$8,312,700
2026/27	\$1,523,800	\$700,000	\$100,000	\$4,460,000	\$6,783,800
2027/28	\$1,539,100	\$500,000	\$100,000	\$7,500,000	\$9,639,000
2028/29	\$1,554,500	\$500,000		\$7,600,000	\$9,654,500
2029/30	\$1,570,000			\$8,170,000	\$9,740,000
2030/31	\$1,585,700	\$500,000		\$8,645,000	\$10,730,700
2031/32	\$1,601,600	\$500,000		\$8,170,000	\$10,271,600
2032/33	\$1,617,600			\$8,360,000	\$9,977,600
2033/34	\$1,633,700			\$8,360,000	\$9,993,700
Total	\$15,628,500	\$3,500,000	\$530,000	\$77,489,000	\$97,147,400

The above table of figures is in present value and is subject to CPI increase each year.



2.0: INTRODUCTION

Councils face challenges in managing their infrastructure and other assets due to factors such as development growth, climate change, ageing infrastructure, new legislative requirements, increasing community expectations and the growing demands of a changing population.

The City of PAE has a suite of strategic documents that together:

- set the long-term strategic direction for Council (City Vision);
- describe the strategic emphasis that Council will apply to achieve the City Vision goals and objectives;
- consider the impact on Council resources (including on our finances, our infrastructure and assets, and our employees);
- identify specific activities to deliver each year; and
- identify key performance measures.

Council's Strategic Management Framework (SMF), illustrated in the diagram below, demonstrates how these documents work together to deliver on our City Vision.



PAE manages and maintains a significant quantity of assets and infrastructure, including roads, footpaths, stormwater, buildings and open space. Collectively, these assets and infrastructure are valued at around \$2 billion. These assets and infrastructure are vital for delivering services and programs, and there are significant risks to both Council and the community if assets fail or cannot deliver to the desired level of service. Sound asset management is therefore a key contributor to the long-term financial, environmental and social sustainability of the City of PAE.

Under the *Local Government Act 1999*, PAE is required to develop and adopt an infrastructure and asset management plan (AMP) for relevant major assets and infrastructure covering a period of at least 10 years. Council is also required to produce a long-term financial plan (LTFP) covering a period of at least 10 years. These two plans must be aligned in their development and implementation.

The purpose of this Stormwater AMP is to plan the use of existing assets to deliver services, to predict asset maintenance and renewal requirements, and to anticipate the need for new/additional assets to meet future community expectations.

In summary, this AMP aims to consider and define:

- how Council's assets will enable the implementation of the City Vision (and other relevant strategies and plans);
- the condition of key assets;
- acceptable levels of service; and
- a plan to manage assets including when and how Council will renew, update, maintain or dispose of existing assets and provide new assets to meet current and future community needs.

This AMP aligns with the IPWEA International Infrastructure Management Manual. It is a living document and will be reviewed and revised where necessary over the next four years, continuing to comply with all legislative requirements. This AMP also integrates results from stormwater management plans, ensuring that works are aligned and prioritized effectively to address the most critical needs and optimize resource allocation.

1.1: KEY STAKEHOLDERS

The key stakeholders associated with the management of our stormwater assets are presented in the following table.

Stakeholder	Role	Responsible (R)	Accountable (A)	Supportive (S)	Consulted (C)	Informed (I)
Residents / Ratepayers	Provide input and feedback on the development and review of the AMPs Report issues associated with the asset				C	I
Council	Represent needs of community Endorses AM policy, strategy, and plans; allocate resources to meet objectives		A		C	
Executive & Management Team	Provide leadership to execute strategic direction; Ensures community feedback and service review outcomes are incorporated in AMPs; Ensures the organisation is financially sustainable Ensures risks are managed effectively		A	S		
Director City Assets	Responsible for the development and review of AMPs Ensures annual capital program is delivered Ensures maintenance programs are established, active and achieving service standards	R		S		
Asset Management Team	Lead development and review of AMPs Ensures improvement strategies are implemented Coordinates governance framework for ongoing monitoring of Asset Management Promote AM awareness, and supports capability building across the organisation Manage AM information systems	R		S		

Program Managers	Develop and implement maintenance, renewal, and capital works programs; Report asset-related risks; Provide technical expertise	R		S		
Finance Department	Ensure accurate asset valuations Use AMPs for annual preparation and review of LTFP Develop supporting policies and prepare financial reports	R		S		
Field Teams	Undertake maintenance programs and report maintenance issues	R				
Project Leaders	Lead the delivery of capital renewal, upgrade and new projects	R				
Environment Protection Authority and SA Water	Establish legislative requirements and assess compliance on water entering waterways		A	S		
Stormwater Management Authority	The SMA promotes the development of integrated Stormwater Management Plans (SMPs) by local government, and administers the Stormwater Management Fund to assist local government with the costs of stormwater management planning and stormwater infrastructure.			S	C	



3.0: PAE's CITY VISION

PAE's City Vision sets our long-term strategic direction. It identifies the key Goals and Objectives that we will work towards delivering over 10 years. The City Vision informs other more detailed strategies and plans. Our AMPs and Long Term Financial Plan (LTFP) outline how we will resource the delivery of strategies and plans.

Vision	A welcoming, liveable City: made by people			
	Equity and belonging · Building a better future for all Participation · Listening to the community and involving them in our decision making Sustainability · Managing our environment responsibly and sustainably Integrity · Making informed decisions honestly, transparently and accountably Transformative · Showing courage, foresight and innovation			
Goals	Thriving Community	Prosperous Economy	Clean And Green City	Places For People
	<i>A City where people have the opportunity to connect and flourish</i>	<i>A City with a thriving economy that enriches its local community</i>	<i>A City that values its natural environment</i>	<i>An accessible City where people love to be</i>
Objectives	We promote community capacity, connection and participation in civic life ————— We encourage cultural expression and recognise people's history, stories and connection to place ————— We support and encourage people to live healthy and active lives	We participate in the economy with the community in mind ————— We support local businesses, big and small, to grow, innovate and succeed ————— We invest in our local economy to benefit current and future generations	We reduce the City's adverse environmental impact and participate in a circular economy ————— We shape the City to tackle the challenges of a changing climate ————— We protect and enhance the City's natural environment	We walk together on Kaurua country ————— We shape the City to be attractive and liveable and care for our cultural and built heritage ————— We bring places to life through community events, culture, design and the arts
Enablers	Organisational Capability Our diverse workforce is resourced to deliver meaningful outcomes Our systems, processes and tools are contemporary and reflect leading practice Our assets and finances are managed with good stewardship			

3.1: ASSET MANAGEMENT STRATEGY AND POLICY

City of PAE has an Asset Management Strategy (2019-2024) and an Asset Management Policy. These strategic documents provide linkages between the organisational objectives and the asset management objectives, as well as setting areas of focus and principles to guide decision making and practices to support meeting those objectives.

As the Council recently revised its Strategic Management Framework and adopted a new City Vision, which importantly, resets Council's long terms goals and objectives it is timely to review the Asset Management Strategy and Policy to determine their role and focus for the future. Notwithstanding

this review, the key principles within the policy and strategy have guided the review and revision of the AMPs.

3.2: KEY STRATEGIC DOCUMENTS & GUIDELINES

Stormwater Management Plans (SMP's)

Stormwater Management Plans (SMP) are key stormwater planning documents that provide a strategic approach to flood management and planning of infrastructure upgrades to meet service levels. SMP's also provide information regarding required improvements to the quality of stormwater being discharged into the receiving environment.

To date Council have completed and endorsed the following SMP's which, amongst other mitigation strategies, provide recommendations for the upgrade of existing stormwater assets based on increased capacity requirements within a catchment, and also recommendations for new infrastructure where catchment studies confirm infill development will require the need for additional infrastructure to mitigate projected run off.

STORMWATER MANAGEMENT PLAN (SMP)	STATUS
Torrens Rd Drainage Authority (TRDA)	Completed - March 2015
North Arm East (NAE)	Completed - November 2016
Lefevre Peninsula	Completed - April 2018
Port River East	Completed - August 2019
Barker Inlet Central area including North Arm West (NAW)	Completed - May 2022
Torrens River (TUNE)	Current
Hindmarsh Enfield Prospect (HEP)	Current (Managed by City of Prospect)
Dunstan Rd (NAW 5)	Future
Dry Creek	Future

4.0: HOW MUCH WE MANAGE

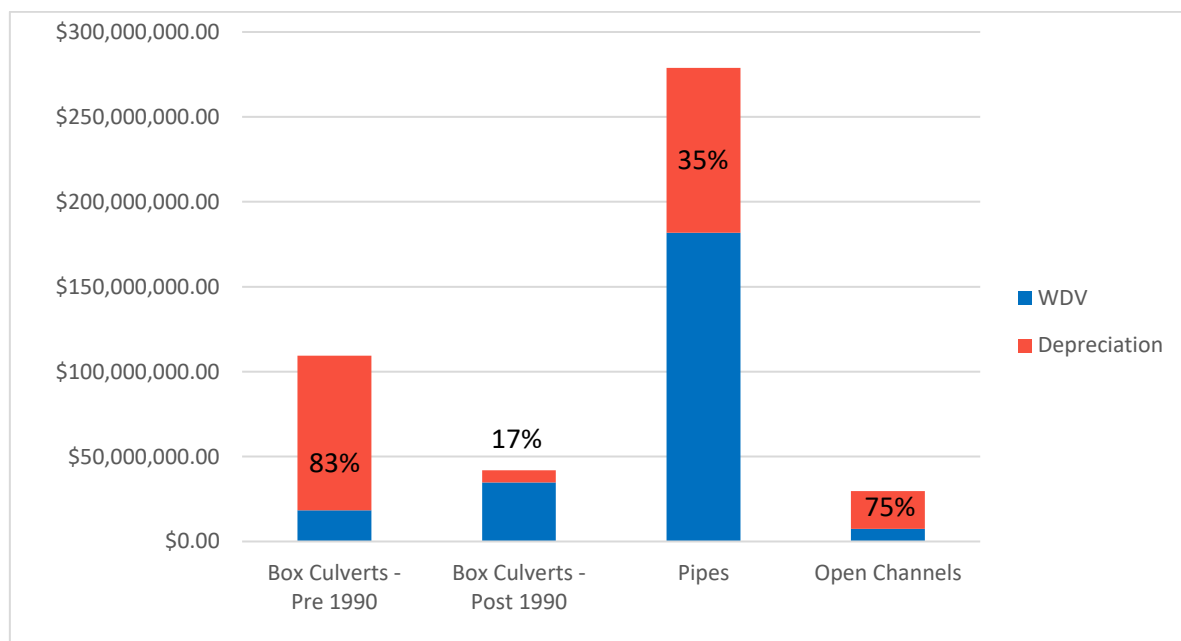
4.1: LENGTH & VALUATION BY ASSET TYPE

The stormwater infrastructure assets covered by this AMP are shown below. The following rates and values relate to the 2023/24 valuation data.

Table 4.1.1: Valuation by Asset Type

	Length/ Number	Replacement Value	Written Down Vale	Depreciation	Annual Depreciation	% Consumed
Pipes	468.48 km	\$278,871,940	\$181,857,128	\$97,014,813	\$2,112,666	34.79%
Box Culverts - Pre 1990	34.52 km	\$109,413,929	\$18,328,546	\$91,085,382	\$1,541,041	83.25%
Box Culverts - Post 1990	19.77 km	\$41,912,868	\$34,798,572	\$7,114,295	\$419,128	16.97%
Inlets	11257	\$43,114,483	\$27,150,752	\$15,994,936	\$417,422	37.10%
Stormwater Channels	11.08 km	\$29,707,102	\$7,409,087	\$22,298,014	\$529,225	75.06%
Manholes / Pits	5214	\$20,586,892	\$14,229,811	\$6,372,874	\$190,691	30.96%
GPT	60	\$8,376,976	\$5,922,161	\$2,454,814	\$155,485	29.30%
Trash Racks	57	\$4,388,990	\$3,046,924	\$1,342,066	\$67,721	30.58%
Basin	11	\$3,001,126	\$2,780,362	\$220,763	\$26,673	7.36%
Soakage Pits	283	\$2,914,837	\$1,827,615	\$1,094,644	\$23,588	37.55%
Misc. - Headwall, Outlet, Surcharge Pit, Connects	868	\$2,445,127	\$1,619,745	\$826,910	\$22,696	33.82%
Valve	21	\$1,123,287	\$1,001,698	\$121,589	\$19,682	10.82%
		\$545,857,557	\$299,972,401	\$245,941,100	\$5,526,019	45.06%

Graph 4.1.1: Accumulated Depreciation of linear assets (Percentage Consumed)



As per table 4.1.1, the City of PAE manages over \$545 Million worth of Stormwater infrastructure, which range from linear assets (pipes, culverts, and channels) to various pits and outlets. This includes a total of

- 535.5 km of conduit (include Pipes, Culverts, & Channels),
- 16,754 pits (includes side entry pits, manholes, and soakage pits)
- 60 GPT's and 57 Trash racks.

Graph 4.1.1 demonstrates that Council has \$278.8M of pipe infrastructure that on average is 35% through its useful life. For valuation purposes, pipes have a useful life of 120 years which is confirmed through ongoing CCTV inspections and comparing condition against the age of pipe being inspected.

However, both Open Channels and pre-1990 Box Culverts have a useful life of 60 years, and given that most of our open channels were built pre 1960 are now approaching the end of life. As there has been some recent capital investment into Open Channels, the 75% depreciation does skew the condition of certain locations that are requiring immediate Capital Renewal works due to sections of concrete walls and floor failing, making it difficult to slash and clean. Table 11.5.1 in Section 11 of this AMP has a total investment of \$3.9M dedicated to open channels over the ten year projection period.

An action following the endorsement of this AMP will be to establish a program of CCTV inspection of the 34kms of underground pre 1990 culverts that are approaching their end of life. The results from this investigation will inform the 2028 AMP, which will likely budget for a culvert replacement project.

Based on age, our combined asset base of all pit and conduit types is approximately 45% through its useful life, with the annual depreciation expense at \$5.5 Million.

Table 4.1.2: Useful Lives by Stormwater type

Stormwater Type	Useful Lives	Stormwater Type	Useful Lives
GPT - SPEL	25	Pipe - HDPE	100
Box Culvert Pre 1990	60	Side Entry pit	100
Open Channel	60	Headwall	100
Field Gully	60	Outlet	100
GPT	60	Soakage Pit	100
Trash Rack	60	Flood Gate	100
Drainage Basin	100	Valve	100
Box Culvert	100	Pipe - Concrete	120
Pipe - PVC	100		

5.0: NETWORK GROWTH

5.1: HOW HAS OUR NETWORK GROWN

The City of PAE is a high growth Council continually acquiring new stormwater assets through the development of greenfield and brownfield land sites. Completed developments include Lightsview and Enfield High, with current development around the Port River, and Oakden Rise progressing quickly with such development (in the order of 1000+ homes) due to be completed within the next 5-10 years.

The major developments that have been completed, are currently in progress, or are planned for the future are summarised below. All of these developments will continue to contribute stormwater assets to City of PAE's network.

Table 5.1.1: List of Major Land Developments

Completed	Current	Future
Lancaster Ave, North Haven. Lightsview Enfield (Enfield High) Gracechurch Street, Port Adelaide. Days Road, Regency Park. Trafford Street Stages: 1 and 2, Angle Park Osmond Tce, Gilles Plains Fourth Ave, Klemzig Neptune Terrace: Stages 1-4, Gilman	Dock 1, Port Adelaide Fletchers Slip, Port Adelaide Fort Largs, Taperoo Oakden Rise, Oakden Blair Athol Housing Trust renewal	Dock 1 North, Port Adelaide Belford Ave, Devon Park Oakden Rise, Oakden (later stages) Wilkins Road Industrial Estate Kilburn Housing Trust renewal Perkins Drive Industrial Estate Gilles Plains PS Pty Ltd. Hillcrest Grand Trunkway Industrial Estate Martin Ave, Gillman

5.2: GROWTH AND MAINTENANCE BUDGET

Table 5.1.1: Network Growth from New Stormwater Conduits

Pipes and Culverts	Growth			
Year	2012	2016	2020	2024
Length (kms)	461.5	477.53	518.9	522.77

From 2012 to 2024, there has been an increase of 61.27km's of our underground conduits. Over this 12 year period our network has grown by an average of 5km's per year which is approximately 1.1% per annum.

Table 5.1.2: Network Growth from New Stormwater Inlets

Inlets	Growth			
Year	2012	2016	2020	2024
Number	10,110	10,267	10,931	11,257

From 2012 to 2024, there has been an increase of 1,147 inlets to our stormwater network. Over this 12 year period our network has grown by an average of 95 inlets per year which is approximately 1% per annum.

Table 5.1.3: Historic Stormwater Maintenance Expenditure

Year	Actual Maintenance budget by Financial Year
2017/18	\$1,385,415
2018/19	\$1,354,337
2019/20	\$1,457,613
2020/21	\$1,528,811
2021/22	\$1,457,102
2022/23	\$1,543,127
2023/24	\$1,615,550



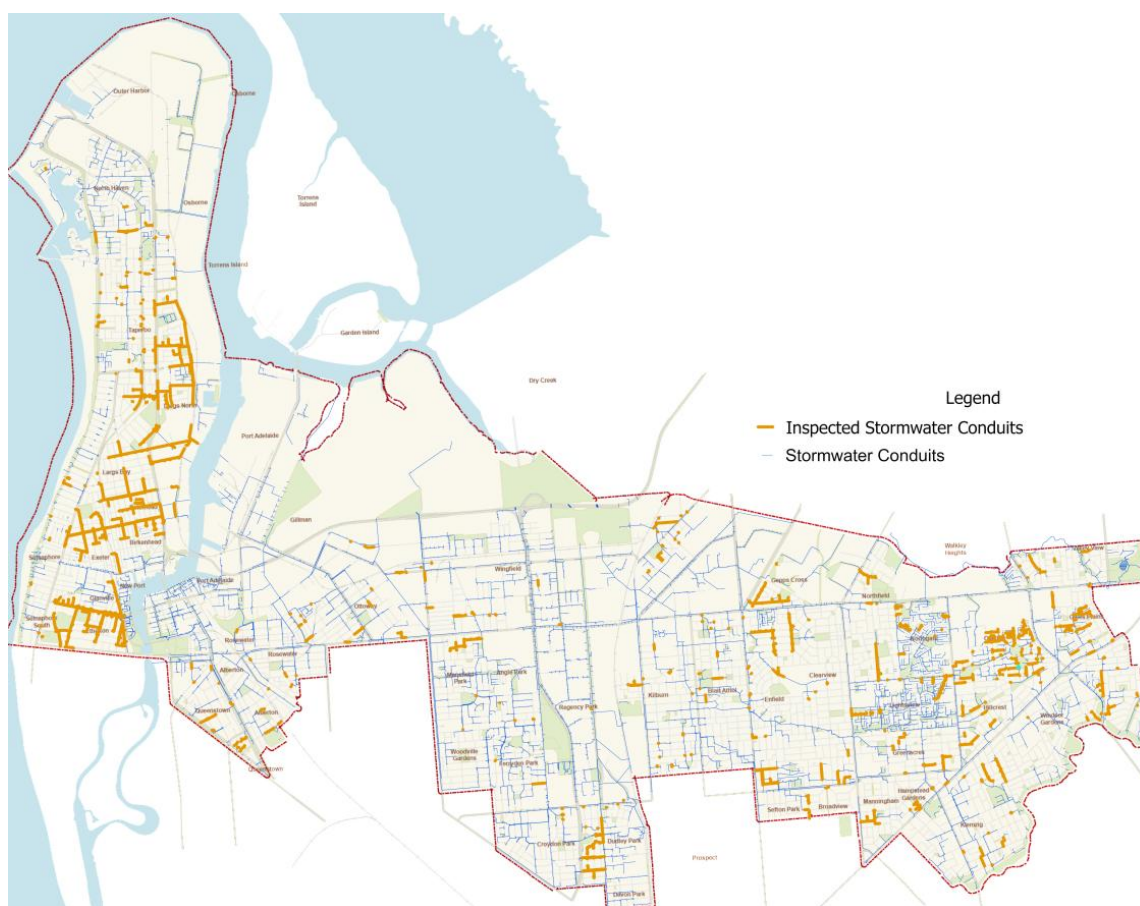
6.0: CONDITION OF OUR NETWORK

6.1: AGE BASED CONDITION

As the majority of stormwater infrastructure is underground, it is expensive to regularly capture the condition of this asset. With life expectancy of the majority of stormwater concrete and PVC materials determined to be 100 years or greater, careful selection of conduits and pits based on age, size, and criticality are prioritised for proactive inspection. The useful life of assets are annually reviewed against other Council asset registers, industry standards, and manufacturer assigned lives.

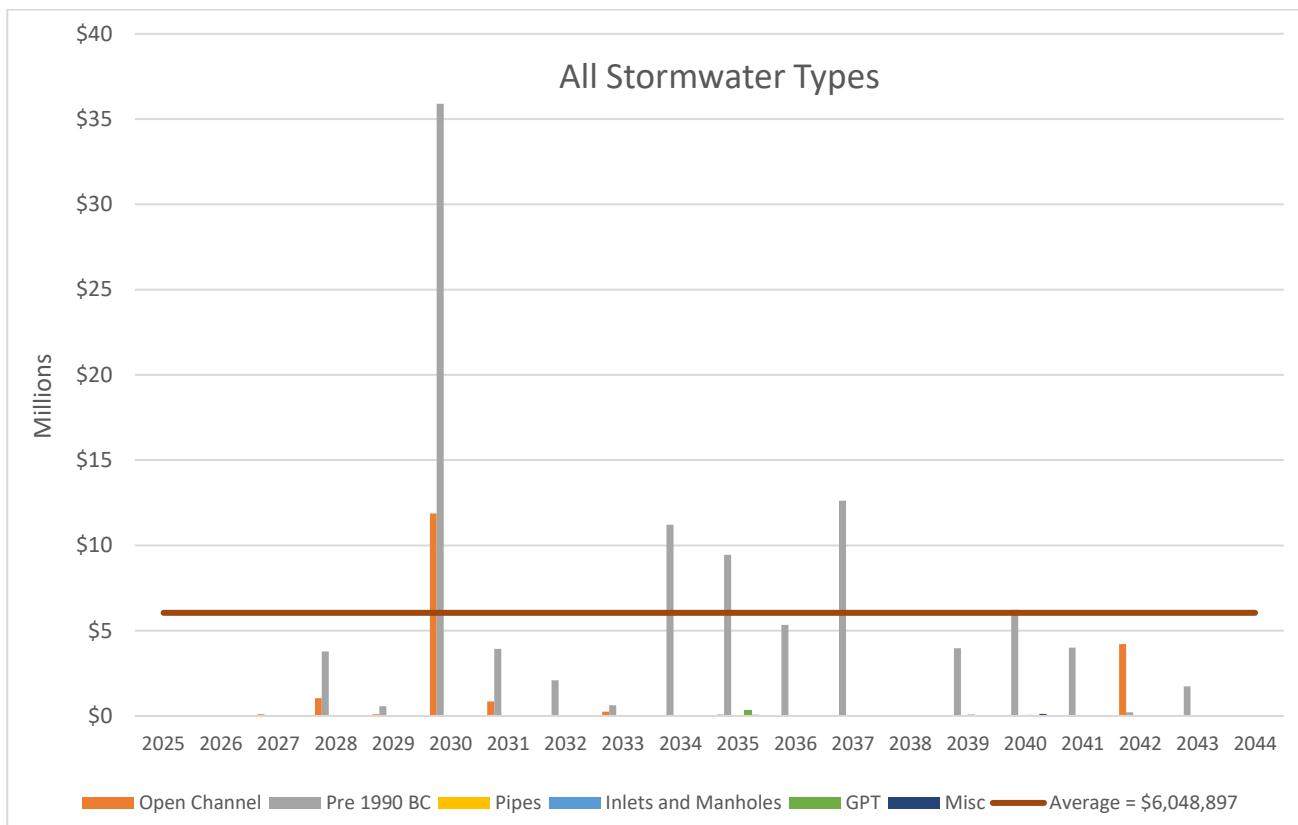
As with all proactive inspections, all maintenance type CCTV inspections that result from identified flooding instances, are also reviewed and captured within Council's Asset Management System. Underground infrastructure in locations of capital upgrades such as road reconstructions are also inspected to align construction work reducing future repair and rebuild costs.

Image 6.1.1: Condition Inspections of underground conduits which help to confirm useful life rates and also enables proactive works where required.

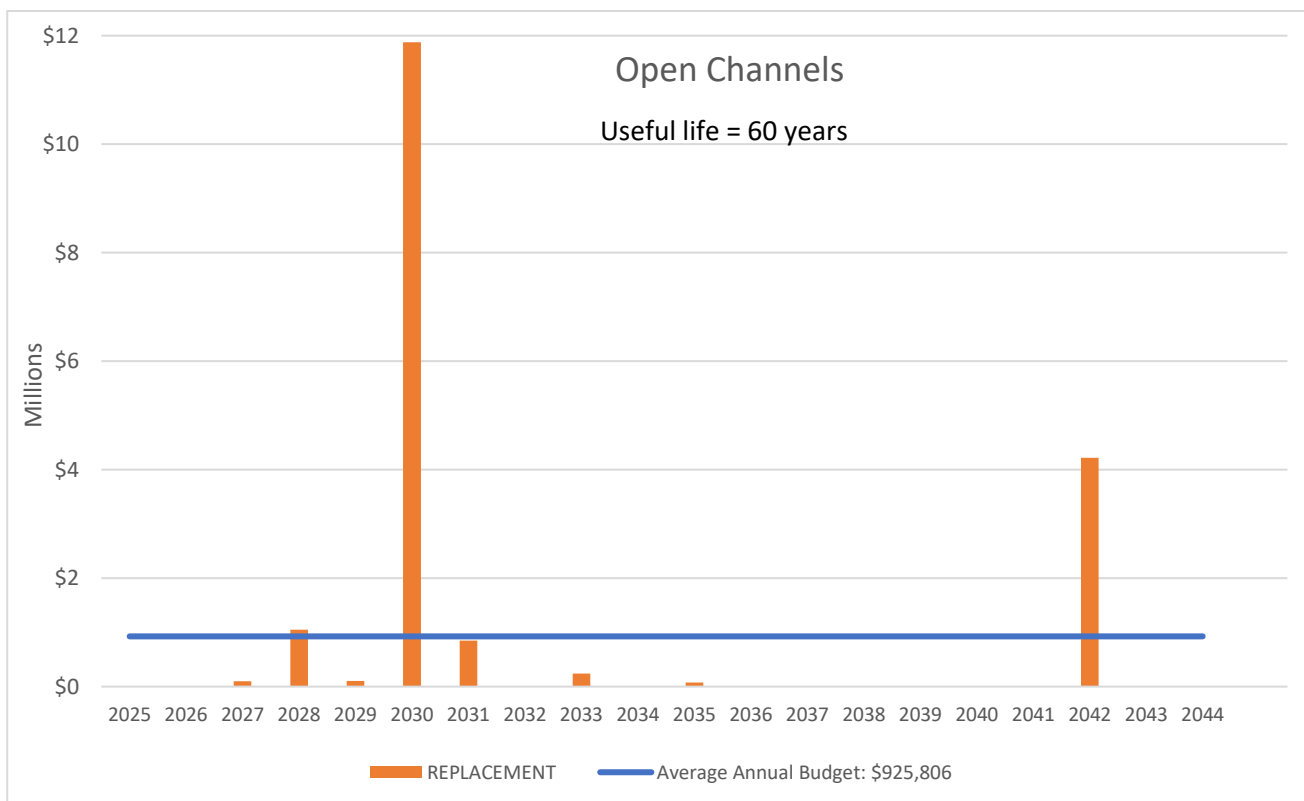


Through continually reviewing the useful life of conduits and pits through CCTV inspections, Council uses the remaining life of assets from valuation data to understand the likely condition of stormwater assets. Using the remaining life enables Council to focus inspections on our oldest infrastructure. The following charts identify the projected renewal year and total cost of works based on the remaining life of each stormwater asset type.

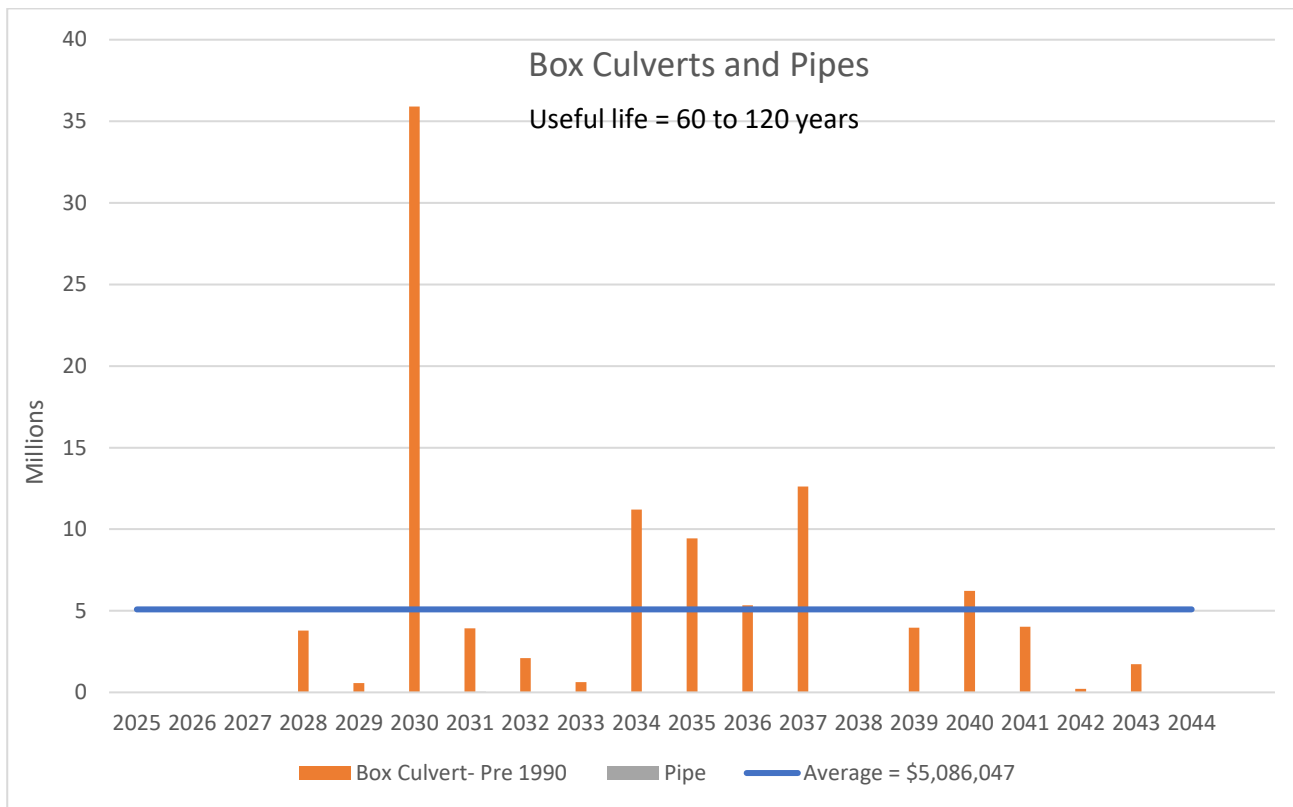
Graph 6.1.1: All Asset Types: Projected Renewal Expenditure based on Remaining Life of each Asset Type



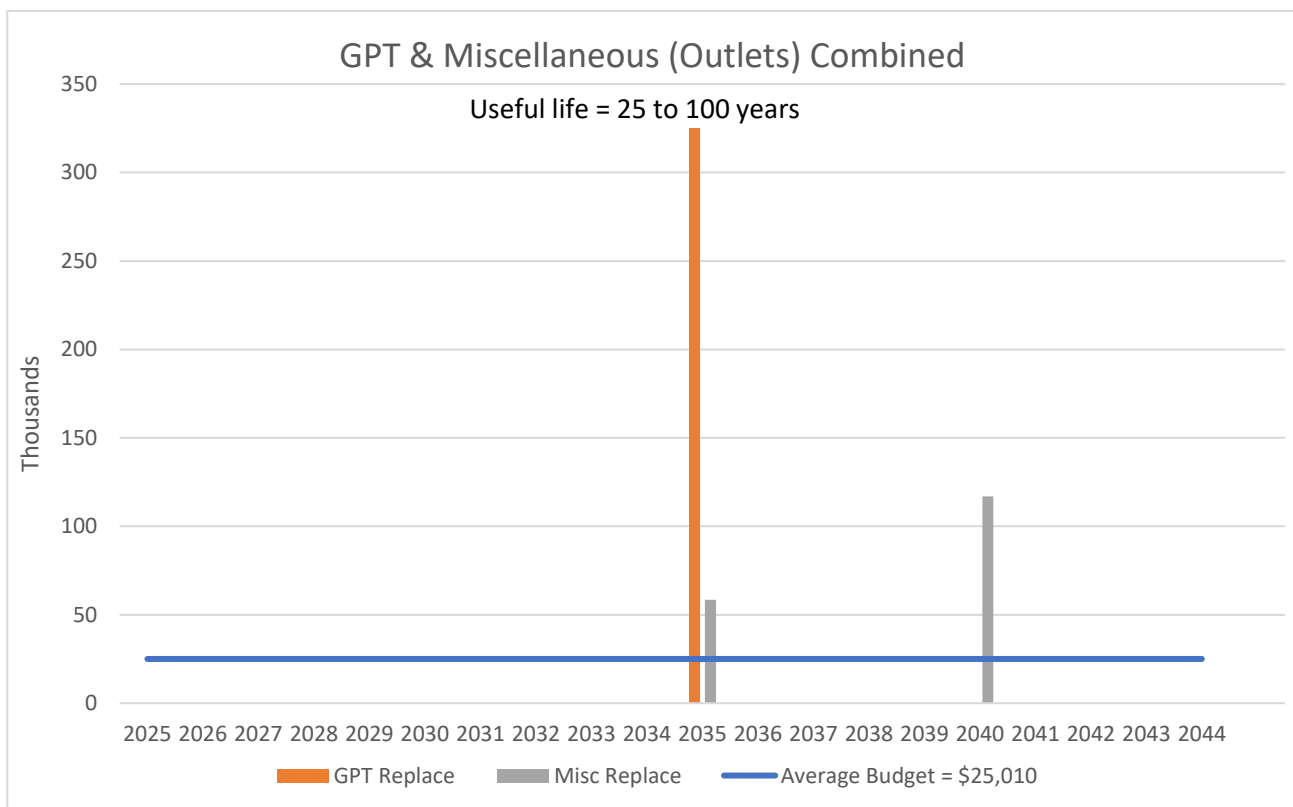
Graph 6.1.2: Open Channels: Projected Renewal based on Remaining Life



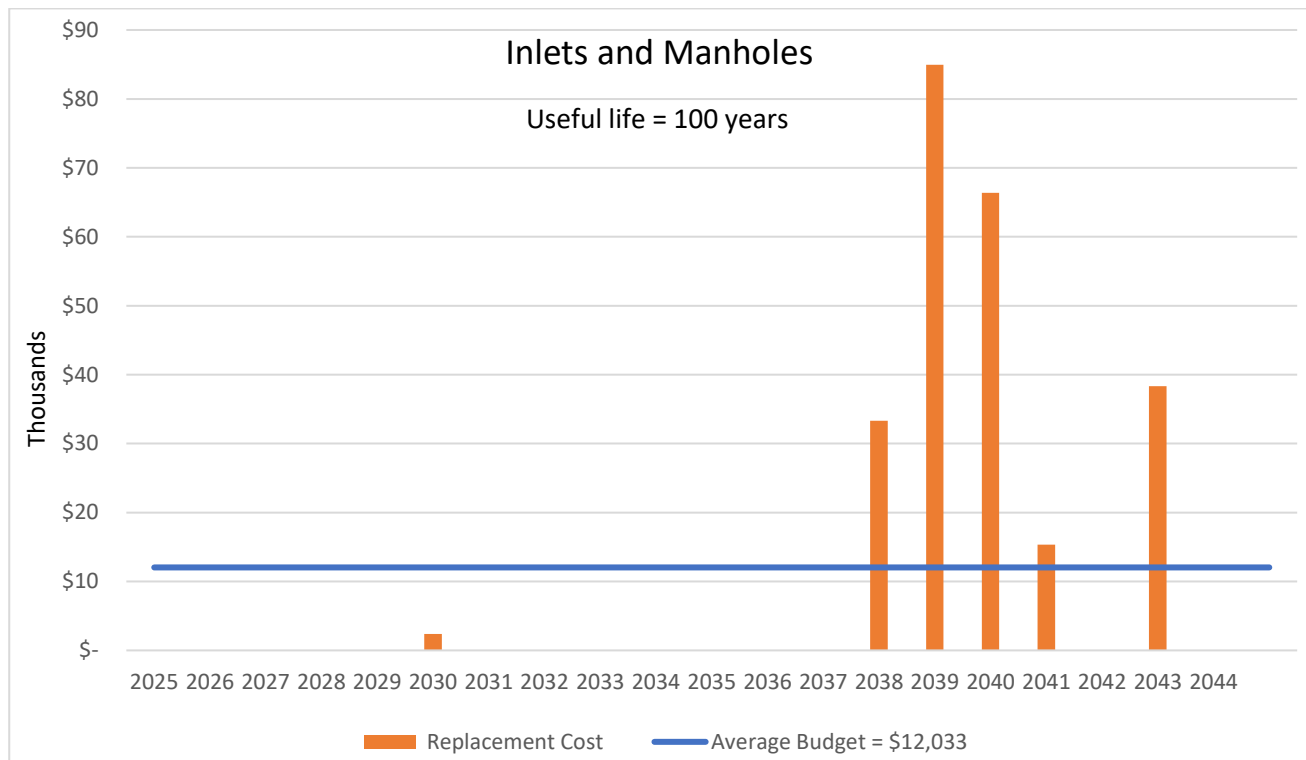
Graph 6.1.3: Box Culverts and Pipes: Projected Renewal based on Remaining Life



Graph 6.1.4: Gross Pollutant Traps and Miscellaneous: Projected Renewal based on Remaining Life



Graph 6.1.5: Inlets and Manholes: Projected Renewal based on Remaining Life



Council strategically captures condition data annually as part of the road renewal program along with budgeting for catchment related CCTV projects. This approach has captured a reasonable proportion of our network and confirms useful life rates.

As identified under Table 4.1.2, the various stormwater infrastructure types have a broad range of useful life values ranging from 25 years for SPEL GPT's, 60 years for Open Channels and Pre 1990 Box Culverts, 100 years for pits, and 120 years for pipes.

Graph 6.1.2 identifies that our Open Channels are approaching the end of their useful life as most are close to or past 60 years of age. Based on unit rates and total length of channel the valuation records suggest an average Capital Renewal investment of \$925,806 per year is required for the staged replacement of this asset type.

A physical condition inspection of Open Channels is required to better understand the actual condition and expenditure required rather than relying on remaining life through valuations. This has been identified as a priority action.

Graph 6.1.1 identifies a forecasted annual Capital Renewal amount of \$6,048,897 over the next 20 years to progress staged replacement of our aging infrastructure. Spreading the cost of replacement further aids financial sustainability for Council and ensures intergenerational equity of investment. The annual depreciation of our combined Stormwater asset class is \$5.526 Million.

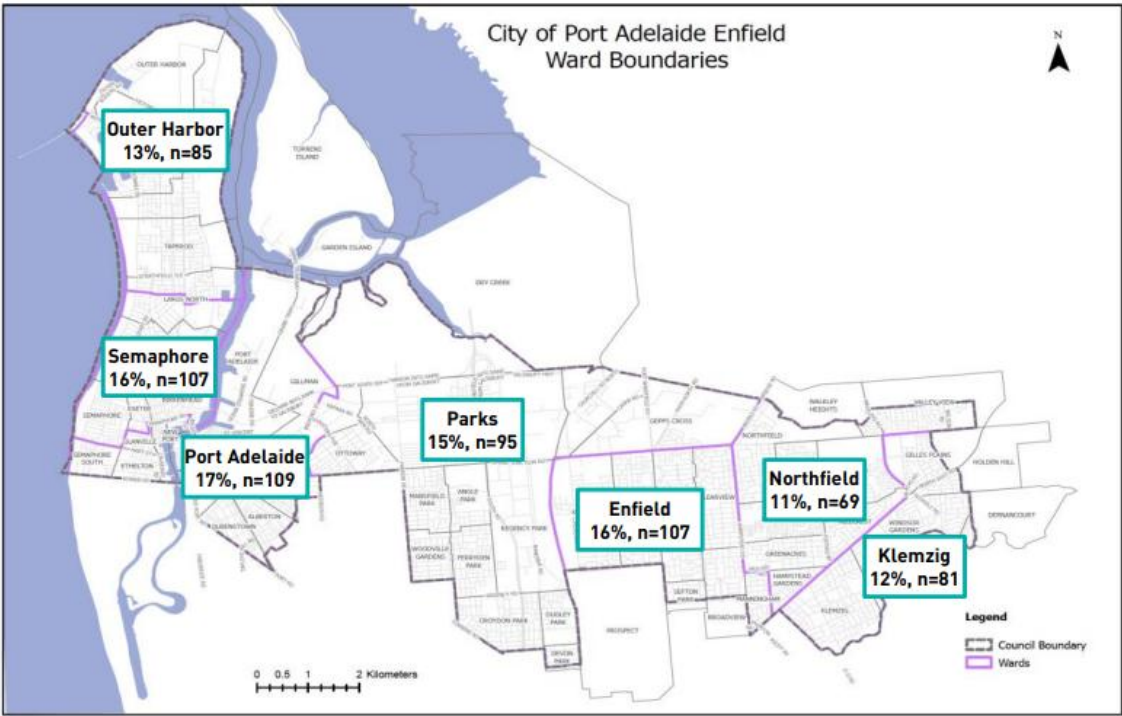
It is important to isolate and review the condition of those shorter life asset types requiring renewal from the longer life assets. Open Channels and Box Culverts play a critical role in safeguarding our upstream residential, commercial and Industrial ratepayers from flooding.

7.0: LEVELS OF SERVICE

7.1: CUSTOMER RESEARCH & EXPECTATIONS

The 2023 Community Survey was undertaken between 12 September and 6 October 2023. The following is a snapshot of findings from this survey relating to our community's perception of services provided.

Image 7.1.1: 2023 Community Survey sample size by location and demography



	Age	- Under 40s (40%) 40 and over (60%)
	Household	- Families with children (42%) - Individuals and families with no children at home (58%)
	Length of residency	- Up to 10 years (41%) 10+ years (58%)

Image 7.1.2: Community Perception by Importance

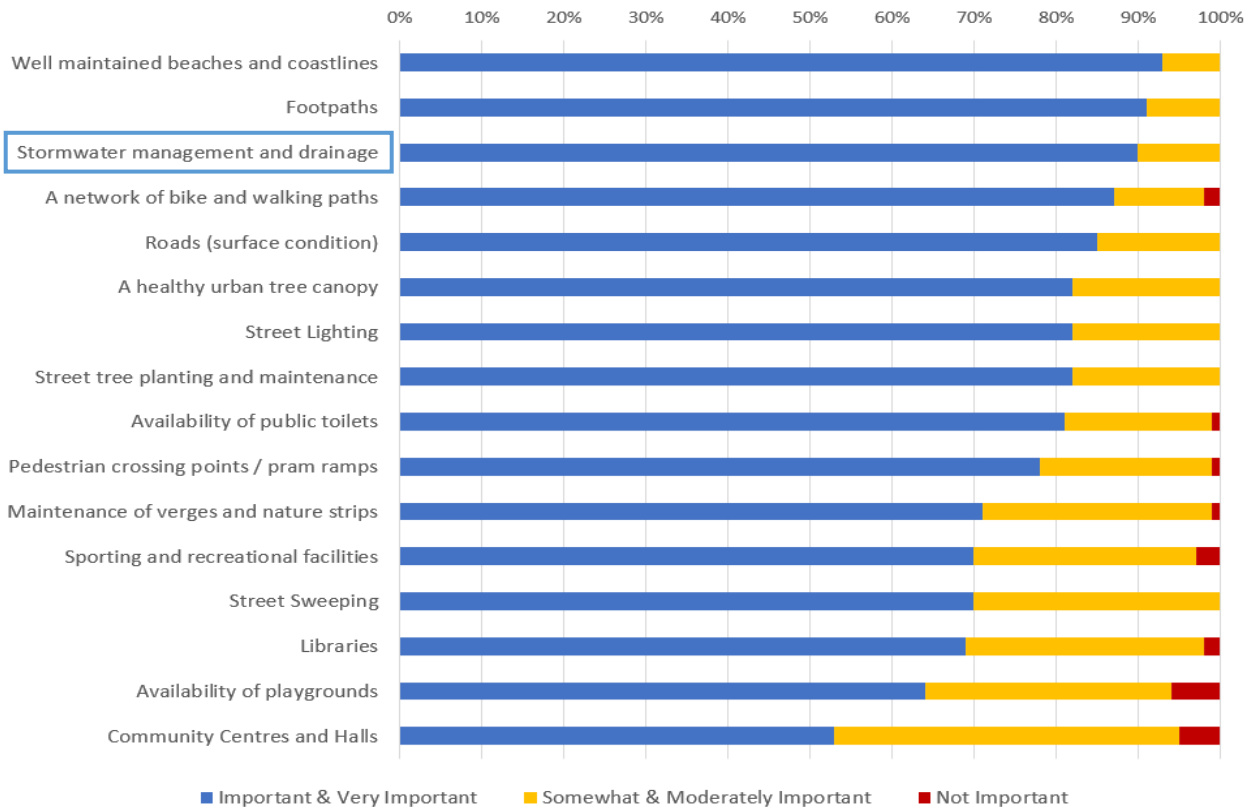


Image 7.1.3: Community Perception by Satisfaction

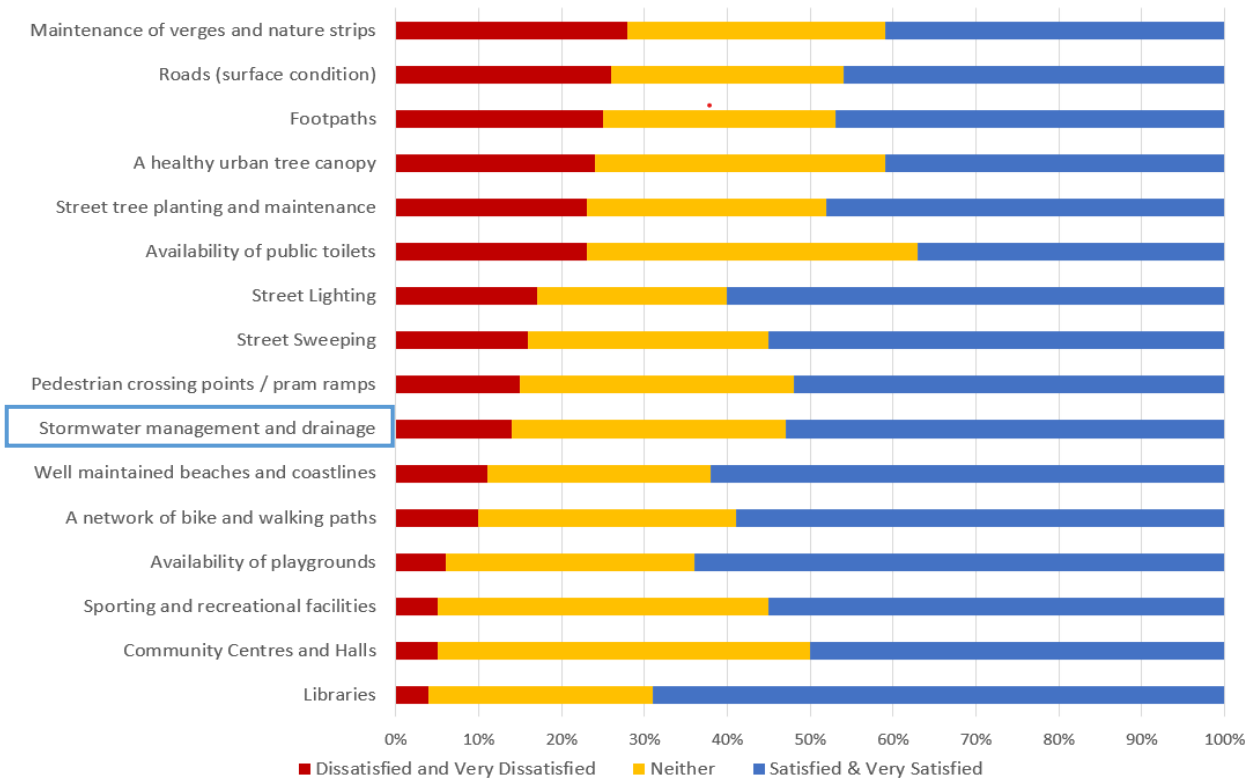


Image 7.1.4: 2023 Community perception of Stormwater Management and Drainage Service relating to a range of Council services

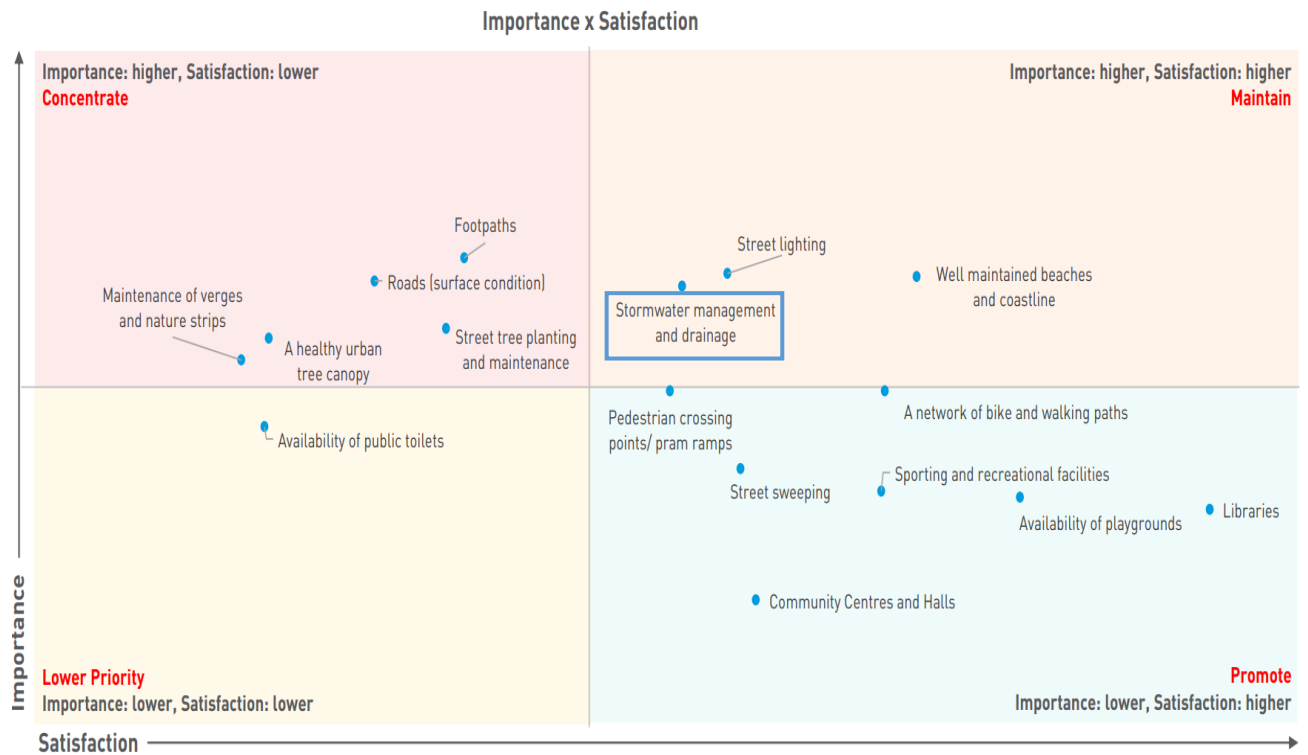


Image 7.1.5: 2020 Community perception: Importance

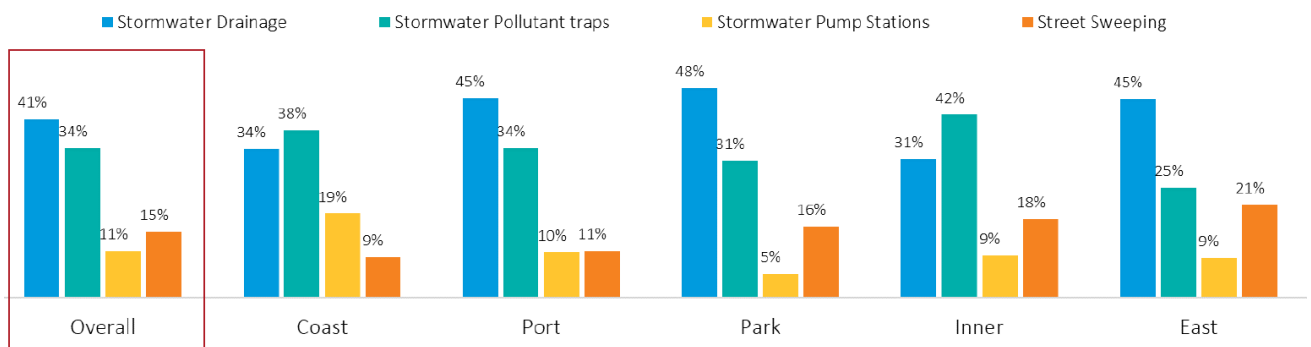
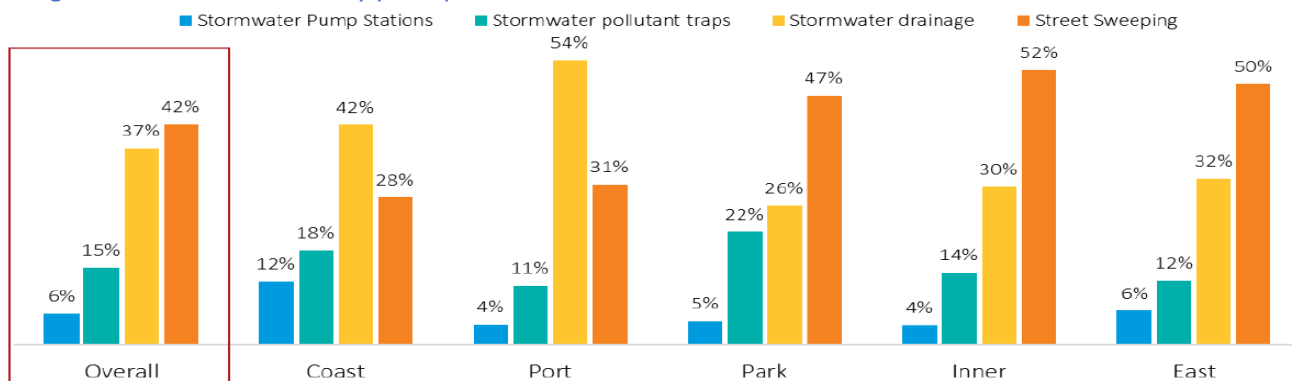


Image 7.1.6: 2020 Community perception: Satisfaction



The 2023 Community Perception Survey confirmed that our community consider the management of stormwater and drainage to be an important service, with a high level of satisfaction. Both Image 7.1.2 and 7.1.3 provide a snapshot of the community's perception of this important service against

other services provided by Council. In considering all services provided by our major infrastructure types, stormwater management is considered to have a rating of high importance.

A similar survey was conducted in 2020 which provided a greater level of understanding of our community's perception of services delivered by each stormwater service type. The community identified that environmental outcomes delivered by pollutant traps is of high importance, particularly in the coastal and inner (around Enfield) areas. Overall, the community indicated a high level of importance and satisfaction for the general stormwater drainage service delivered by Council.

The community's feedback through these surveys shows that both important and satisfaction levels are relatively high for the management of our stormwater network, and therefore Council should continue to maintain the asset management programs in place to continue to deliver this important service to our Community.

7.2: MEASURING CUSTOMER REQUESTS

In addition to the Community perception survey, Council also tracks the number of Customer Requests received for work relating to the management of stormwater. The graph and tables below show the trend of customer requests created over the last 4 year period.

Stormwater requests are generally only received when localised flooding occurs. Table 7.2.1 indicate that Council receives less than 500 requests per year on average. Graph 7.2.1 provides an indication of how many requests for stormwater related matters are received against other customer request types.

Graph 7.2.1: Comparison of Customer Requests by Year for Stormwater

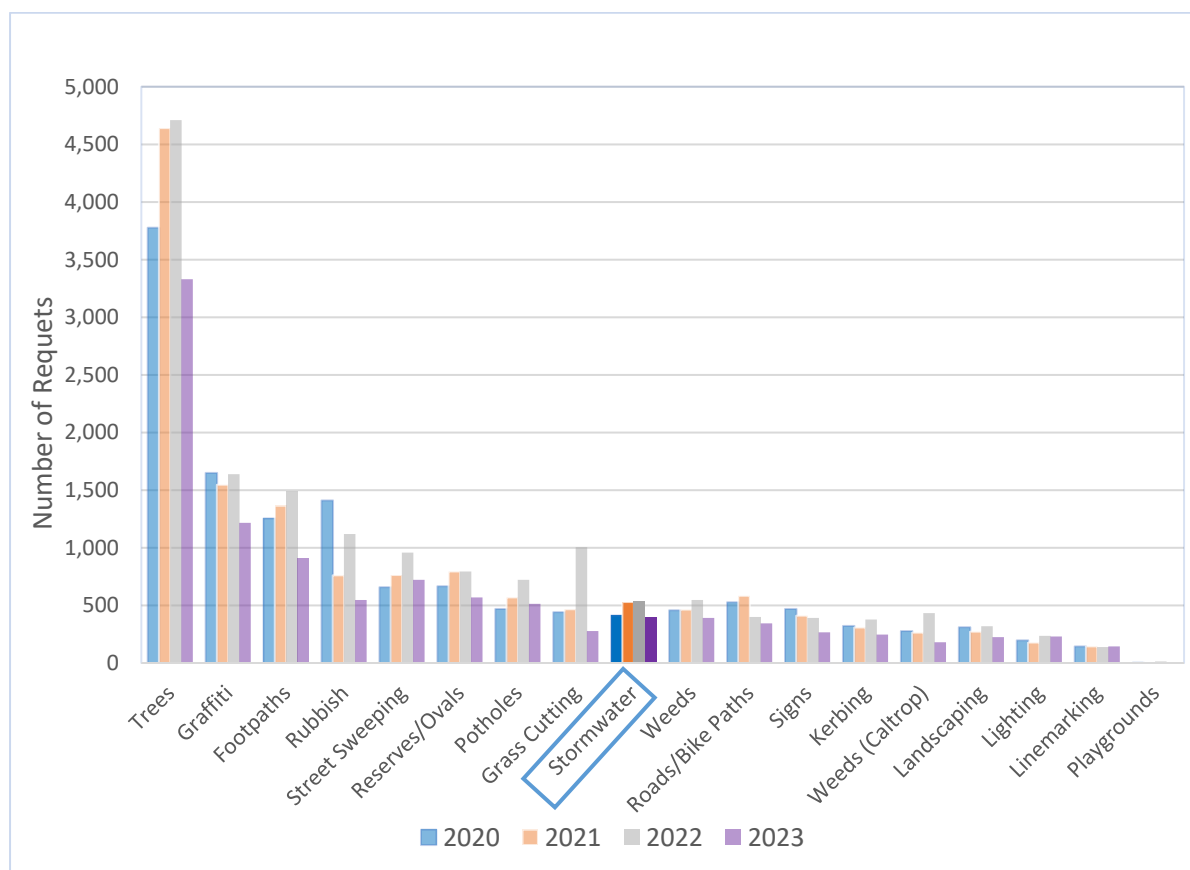


Table 7.2.1: Stormwater Customer Requests by Calendar year

	2020	2021	2022	2023	Average
Number Requests	412	529	534	512	497

7.3: MEASURING PERFORMANCE

Council sets technical service levels for the operation of the physical assets to ensure they function at a level where they provide the community service level expected of them. For example, when council is made aware of blockages or damage to pits and pipes, either from customer contacts or by observations from various Council staff, the aim is to respond and repair within a prescribed Service Standard time.

The current operational Service Standards for drainage are:

- Complete 75% of all drain/sump blockages and repairs within five days (blockages are generally cleared within 24 hours, repairs to damaged pits typically within the 5 day service level)

Graph 7.3.1: Measuring Performance of Community Requests against Service Standard (5 Days)

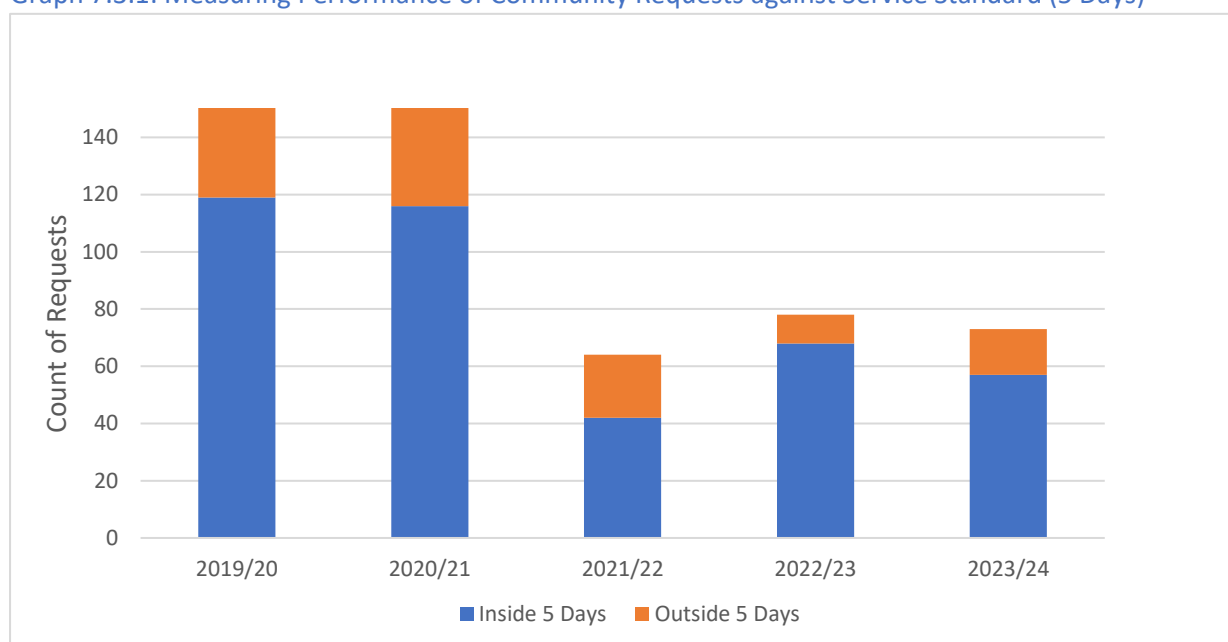


Table 7.3.2: Performance Measures for Drain Sump/Cleaning request types

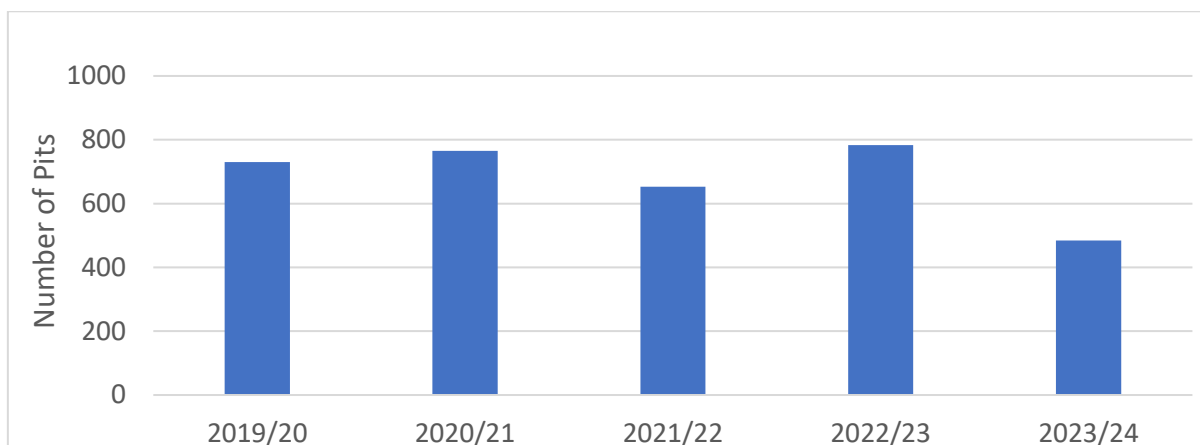
	Inside 5 Days	Outside 5 Days	Percentage inside Service Standard
2019/20	119	32	79%
2020/21	116	35	77%
2021/22	42	22	66%
2022/23	68	10	87%
2023/24	57	16	78%

We continually measure our operational standards, ensuring that Customer Requests are efficiently responded to and that our network remains safe. Table 7.3.2 demonstrates that our drainage

requests are consistently responded to within the established service standard of 5 days, and that the response standard of 75% of customer requests relating to stormwater requests are completed within an average of 5 days year on year.

Graph 7.3.3 identifies that customer requests have been declining since Council have been proactively cleaning pits from 2019.

Graph 7.3.3: Pro Active Pit Cleaning



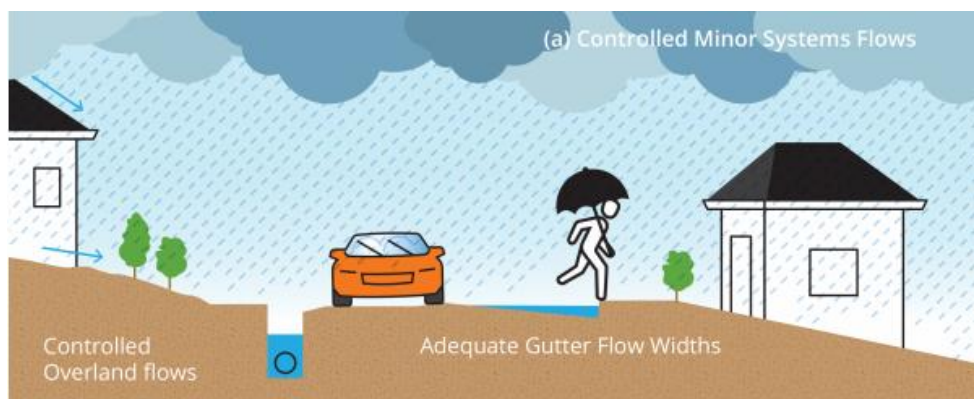
7.4: TECHNICAL LEVELS OF SERVICE

Urban stormwater drainage systems aim to achieve service levels consistent with the Australian Rainfall and Runoff (ARR 2016) Guidebook, and in doing so are broken in to two categories;

1. The minor system is designed to convey low flows safely via the pit and pipe infrastructure;
2. The major system is designed to ensure the urban area can safely convey larger storm events.

Image 7.4.1 demonstrates what is meant by the major/minor flow philosophy.

Image – 7.4.1 Major and Minor Design of a Street Stormwater System (ARR 2016)





Minor (Underground) System and Pits

The aim of the minor stormwater system of pits and pipes is to remove surface stormwater flows from the road network and convey them to the appropriate outlet system. The minor system is designed to cater for the 0.2 Exceedance per Year (EY) or 5 year Annual Recurrence Interval (ARI) design storm event.

When designing new infrastructure or upgrading existing infrastructure Council aims to achieve the following design criteria as the minimum service standard:

- Gutter flow width for 0.2 EY (5yr ARI) storms to be no greater than 2.5m (i.e. the width of water measured from the face of the kerb towards the centre of the road)
- Gutter flow width at pedestrian crossings for 0.2EY (5yr ARI) storms to be no greater than 1.0m
- Hydraulic grade line (HGL) for 0.2EY (5yr ARI) storms to be a minimum of 150mm below the water table.

Major (Overland) System

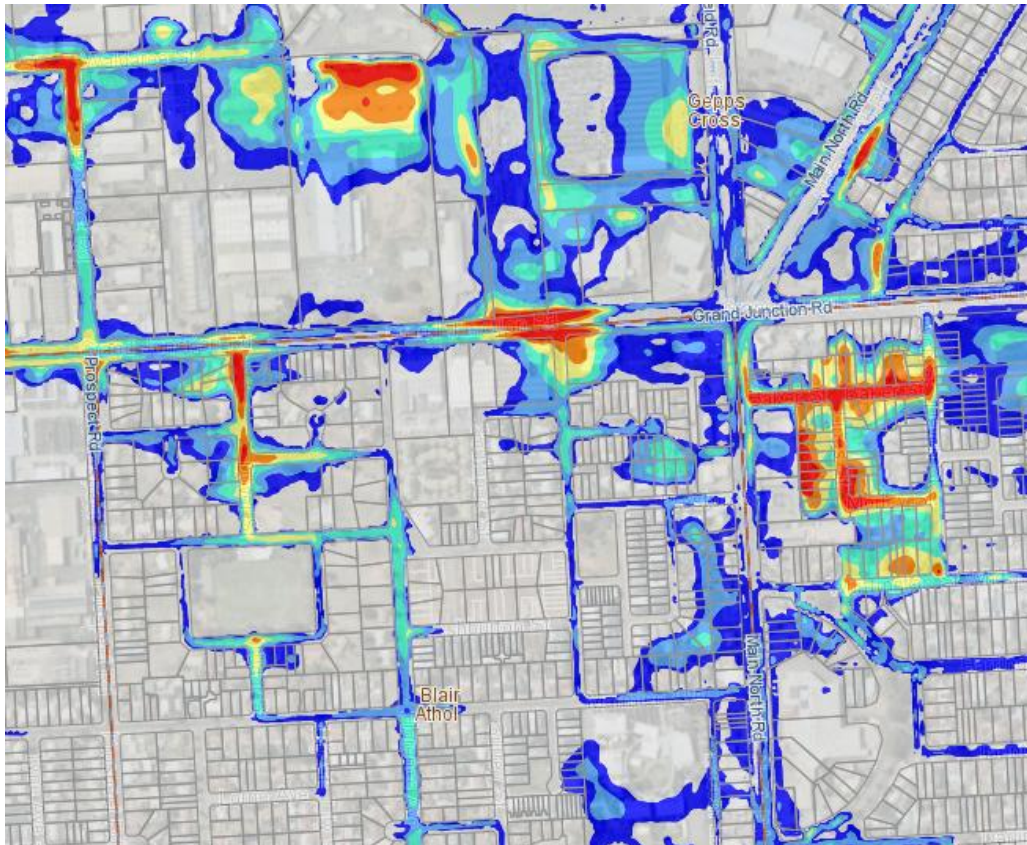
The major system typically comprises the road and footpath areas up to the property boundary lines as shown in the Image above. The aim of the major system is to safely convey all stormwater overland to the appropriate outlet point without above floor flooding of properties for all events up to and including a 0.01EY storm (100yr ARI).

In all new developments the major system is designed to safely convey the 0.01EY design storm event with a minimum freeboard between the top of the predicted flood level and the property floor levels of no less than 200mm.

In some existing stormwater catchment areas it is not always possible to cater for the 0.01EY design storm event within the major system, therefore (if possible) the minor system may be designed to a higher standard to reduce the overland flow component or potentially a lower service standard must be adopted in these areas.

Image 7.4.2 is an example of two dimensional flood mapping that is undertaken to understand predicted flood depths and low lying areas within the Council area.

Image 7.4.2 - Flood mapping map showing depths of flooding for a major storm event



Stormwater Management Plans (SMP's)

Stormwater Management Plans (SMP's) are key stormwater planning documents that provide a strategic approach to flood management and planning of infrastructure upgrades to meet service levels. SMP's also provide information regarding required improvements to the quality of stormwater being discharged into the receiving environment.

To date Council have completed and endorsed the following SMP's:

STORMWATER MANAGEMENT PLAN (SMP)	STATUS
Torrens Rd Drainage Authority (TRDA)	Completed - March 2015
North Arm East (NAE)	Completed - November 2016
Lefevre Peninsula	Completed - April 2018
Port River East	Completed - August 2019
Barker Inlet Central area including North Arm West (NAW)	Completed - May 2022
Torrens River (TUNE)	Current
Hindmarsh Enfield Prospect (HEP)	Current (Managed by City of Prospect)
Dunstan Rd (NAW 5)	Future
Dry Creek	Future

7.5: COMMUNITY LEVELS OF SERVICE

Councils use their assets to provide services for the betterment of their communities. Whether it is evident or not, all assets provide a 'level of service' to the community.

Well defined levels of service can be used to:

- Provide information about the current level of service being provided;
- Measure performance against the identified level of service; and
- Consider options to adjust service levels (if desired or appropriate).

A key objective for PAE is to manage our assets and finances with good stewardship, and to match the levels of service we provide with the expectations of our community.

The table below sets out our levels of service relating to stormwater:

- **Criteria:** Describes the category of service levels, consistent across all asset classes.
- **Community Level of Service:** describes the service from a customer's point of view. In other words, it helps to explain what PAE intends to provide. (Note: Asset Community Level of Service in this context is distinct from Customer Service response time).
- **Technical Level of Service:** Describes how PAE achieves delivery of the Community Level of Service. In other words, it explains what PAE will do at an operational level.
- **Performance Indicator:** Describes the metric by which success in service delivery will be assessed.
- **Key strategic relationships:** Describes the key PAE strategies and plans that each service level is aligned to.

Criteria	Community Level of Service <i>How community receives the service</i>	Technical Level of Service <i>How the community service level is achieved</i>	Performance indicator	Key strategic relationships
Function	During a Minor Storm Event residents and businesses experience minimal disruption from flooding (predominately on streets and roads) During a Major Storm Event, a minority of established dwellings and commercial premises may experience above-floor-level flooding	Minor system – designed to cater for the 0.2 Exceedance per Year (EY) or 5-year Annual Recurrence Interval (ARI) design storm event Major system – designed to convey stormwater overland to the appropriate outlet point for events up to and including a 0.01 EY storm (100yr ARI).	90% of channels cleaned annually. Proactive program of 600 pits cleaned annually. Stormwater Management Plans are prepared for the remaining areas that currently do not have Plans in place.	Places for People We shape the City to be attractive and liveable and care for our built heritage
Condition	Our stormwater pits and pipes provide suitable conditions for water capture and flow during all rain events.	Inspecting pipe network underneath scheduled road renewal projects.	10km of pipes inspected annually.	Places for People We shape the City to be attractive and liveable and care

		Replacing culverts at end of life (60 years for culverts built pre-1990; 100 years for those built 1990 or later). Mowing and cleaning open channels and outlets to ensure unrestricted flow during peak events	At least 90% of open channels and outlets mowed and cleaned annually.	for our built heritage Organisational Capability Our systems, processes and tools are contemporary and reflect leading practice Our assets and finances are managed with good stewardship
Safety	Our stormwater network is designed and maintained to enhance safety and minimise disruptions to service.	Proactively maintaining channels, pits and pipes to ensure sufficient capacity to carry flow during peak events. Responding to customer requests relating to flooding instances.	At least 90% of channels cleaned annually. Proactive program of 600 pits cleaned annually. 75% Customer Requests responded to within agreed Service Standard timeframes.	Places for People We shape the City to be attractive and liveable and care for our built heritage
Environmentally Sustainable	Our stormwater network captures pollutants and waste before it enters waterways.	Maintaining Gross Pollutant Traps (GPTs), Baskets and Trash Racks at outlets to ensure functionality.	100% of GPTs, Baskets and Trash Racks cleaned per annum. Deliver annual Water Sensitive Urban Design program commitments	Clean and Green City We reduce the City's adverse environmental impact and participate in a circular economy We shape the City to tackle the challenges of a changing climate
Financially Sustainable	Our stormwater program is structured to ensure that today's asset users contribute fairly to the lifetime cost of the asset.	Ensure the current cost of managing our stormwater network achieves community expectations while also balancing renewal works with consideration of future budgets	Asset Renewal Funding Ratio is within identified target range on average over four-year period (LGA target = 90%<110%).	City Vision: <i>Organisational Capability</i> —'Our assets and finances are managed with good stewardship.'

8.0: ASSET CRITICALITY

Asset Criticality is defined as those assets which have a high consequence of failure (but not necessarily a high probability of failure); those which are the most important for delivering the required service. (Definition provided by IIMM).

Criticality is assessed on a 1-5 scale with 5 considered to have the highest consequence in the event of failure. Along with other key data and information including Levels of Service and Condition data, Criticality will be used to prioritise resourcing and future investment into capital and maintenance programs. As a priority focus area, any assets assessed as being in poor condition that are considered to have major or catastrophic consequences will be prioritised for treatment.

Table 8.1.1 summarises the Asset criticality assessment across all of PAE's major asset classes.

Table 8.1.1: Criticality Score against all Major Asset Classes.

Asset Class	Average Criticality Score (by service provided)
Stormwater	4.01
Pump Stations	3.72
Roads	3.59
Footpaths	2.91
Parks & Gardens	2.89
Buildings	2.75

High Criticality						Low Criticality
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To evaluate the criticality of an asset, the service delivered by a type of infrastructure was considered against Council's Risk Consequence Table. The consequence of Community wellbeing, the environment, safety, service, and financial exposure was evaluated to provide a criticality score.

Table 8.1.2 provides various services grouped as cohorts that were assessed to understand the consequence of service failure. Table 8.1.1 provides the average score of the various cohorts assessed within each asset class. Stormwater is the highest Asset class on the criticality table due to the severity of damage caused by flooding.

Open Channels and Major Pipes are critical in exiting water during peak storm events. Should either of these assets be blocked or choked, flooding is likely to occur upstream which could cause safety concerns and financial impacts to residents. Litigation could also be levelled at Council should it be found that the drainage system had not been managed with appropriate levels of inspections and cleaning.

Major culverts, particularly bridge culverts, were also considered to have a high criticality given the consequence of collapse. Not only could one or more people be seriously injured through operating a vehicle while crossing the culvert bridge, but any collapse could cause a blockage to a point in the drainage network. Should this occur during a peak storm event, the consequence has been assessed as catastrophic.

Table 8.1.2: Criticality by Stormwater Cohorts

Footpath Cohort		Rounded Criticality Service Score	Major Consequence Driver
1	Open channels	5	Service/Safety/Financial
2	Major pipes	5	Service/Safety/Financial
3	Major Culverts and Crossings	5	Service/Safety/Financial
4	Branson Road Pipe, Audrey Ave pipe	4	Safety
5	Assets in Main Roads (DoT operated roads, main arterials)	4	Safety
6	Channels into Wetlands receiving environment	5	Safety/Environment
7	Wetlands and basins (large)	5	Safety
8	Wetlands and basins (other)	4	Safety
9	Non return valves	4	Safety
10	Trash racks/GPTs	3	Environment
11	Miscellaneous – Headwalls, Outlets, Surcharge Pits, Inlets	3	Financial
12	Soakage Trenches	2	Service

The Cohorts represent various stormwater asset types as well as infrastructure in high volume locations. Branson Road and Audrey Avenue are significant pipes that direct water from large catchment areas into open channels. Non return valves could result in localised flooding during king tide events.

Image 8.1.1 provides a priority ranking for each cohort, measuring condition against consequence.

Image 8.1.1: Consequence by Condition Matrix

Consequence	Criticality Group	Condition 1 (Excellent)	Condition 2	Condition 3	Condition 4	Condition 5 (Very Poor)
Catastrophic	5		2, 7	3	1, 6	
Major	4		4, 5, 8, 9			
Moderate	3		11	10		
Minor	2					
Insignificant	1					

* Condition based on remaining life of each asset type as determined by percent of consumption from the valuation data (Section 4, table: 4.1).

Priority 1	Priority 2	Priority 3	Priority 4
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Image 8.1.1 provides a visual representation of consequence for each cohort type, and further considers what condition the stormwater network is in to ensure a sustainable delivery of service.

Open Channels (1), major culverts and crossings (3), and channels into wetland receiving environments were assessed as having a Catastrophic consequence of failure during a major storm event and are of condition 3 or worse. A priority for Council is to undertake a review of these asset cohorts and plan to improve their condition.

This is the first stage of assessing criticality of infrastructure types within Council and will provide opportunity to expand in future AMP editions. Future analysis will inform our decision-making process when planning infrastructure projects and maintenance activities.

9.0 RISK

The identification of risks that can impact the delivery of service is an important component of our decision making. As part of Council's internal Asset Management process, the Stormwater Custodian Group meets annually to identify new risks and review existing risks treatments, using PAE's Risk Management Framework.

A governance model is in place to oversee ongoing monitoring and escalation of asset related risks, ensuring that residual High and Extreme risks are considered by the Asset Management Steering Group and escalated to Corporate Risk Committees to consider appropriate options for treatment.

Image 9.1.1: View of identified Risks following assessment and treatment control

Risk Rating		Consequence				
		Insignificant	Minor	Moderate	Major	Catastrophic
Likelihood	Almost Certain					
	Likely					
	Possible					
	Unlikely					
	Rare					
		Low	Medium	High	Extreme	

Image 9.1.2 demonstrates the number of inherent risks assessed by the Stormwater Custodian Group, and the reduced residual risk following existing treatment controls. The calculation of risk is based on both likelihood and consequence, as depicted in image 9.1.1.

Image 9.1.1: View of identified Risks following assessment and treatment control

Inherent Risk Rating					
Consequence / Likelihood	Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
Almost Certain (5)	SW_0002	SW_0003 SW_0020	SW_0022	SW_0012 SW_0013 SW_0019	SW_0024
Likely (4)	SW_0004		SW_0005 SW_0015 SW_0016	SW_0001 SW_0006 SW_0017	SW_0007.1
Possible (3)			SW_0014	SW_0008 SW_0010 SW_0018	SW_0011
Unlikely (2)	SW_0007.4		SW_0007.2	SW_0007.3	
Rare (1)					

Residual Risk Rating

Consequence / Likelihood	Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
Almost Certain (5)	SW_0003				
Likely (4)	SW_0002	SW_0001			
Possible (3)	SW_0004	SW_0020	SW_0007.1 SW_0012 SW_0022 SW_0024		
Unlikely (2)	SW_0007.2 SW_0015 SW_0016	SW_0014 SW_0017	SW_0005 SW_0010 SW_0013	SW_0006 SW_0008 SW_0018 SW_0019	
Rare (1)	SW_0007.3		SW_0007.4 SW_0011		

The risks assessment for the Stormwater asset class identified three Stormwater 'extreme' Inherent Risks, and two extreme inherent risks for Pump Stations (refer to the Pump Station AMP). The residual risk summary demonstrates these extreme risks have been effectively mitigated to a moderate level through a range of treatments which will assist the community during peak storm events. No additional risk treatments are required for these risks.

Table 9.1.1 below, provides a summary those inherent risks assessed as Extreme, and shows the existing treatments to reduce the risk to Moderate.

Table 9.1.1: Risks identified as Extreme with existing treatment.

Risk ID	Description	Consequence Description	Inherent Risk	Treatment	Residual
SW012	Urban infill exceeds capacity and impact on Council infrastructure	Infill development resulting in under design in capacity of existing stormwater network	Extreme	New developments assessed to ensure outflows from development are restricted to the capacity of existing infrastructure so that new development does not exacerbate the existing conditions. SMP's consider flood mapping and WSUD treatments Flood mapping of Torrens catchment.	Moderate
SW0013	Unable to clean open earth channels maintenance due to seasonal impacts	Loss of brand credibility and significant level of community concern due to upstream flooding	Extreme	Program of channel maintenance including mowing, spraying, cleaning. Improve access through more and higher quality	Moderate

		as a result of overgrown channels.		ramps - eg North Arm East Channel upgrade Continue structural Capital upgrade of channels as per endorsed SMP's	
SW0024	Wetland silt levels causing reduction in channel flows and financial exposure to de-silt and maintain.	Wetland silt levels causing reduction in channel flows, increasing potential litigation from flooding, and financial exposure to de-silt and maintain.	Extreme	Program to proactively clean and de-silt open channel mouths and greater wetland environment across multiple years.	Moderate

Using the internal Risk Register, Council has prioritised decisions made in adopting this AMP to continue to manage current risks and consider future risks.

The following Major Inherent Risks that have been mitigated by existing treatments will safeguard our community from flooding.

- Appropriate renewal funding, particularly for open channels and pre 1990 culverts;
- Renewal of Open Channels will assist future slashing and scaping of grass and sediment;
- Dredging works budgeted for wetlands at the mouth of the open channels;
- Maintaining Upgrade and New projects in line with recommendations from the Stormwater Management Plans (SMP's).

By ongoing underground CCTV condition audits, we are able to analyse the performance of our underground pipes and culverts and compare useful life parameters. This also allows the identification of any infrastructure in poor condition or suffering displacement, which enables planned renewal works. This not only ensures efficient drainage but also protects the road asset above.

Ongoing cleaning of pits, pipes, and open channels ensures design capacity of our infrastructure during peak rain events. It has been identified that dredging works is required at the outlet of channels which will help mitigate all private land upstream from flooding.

10.0: DEMAND

10.1: DEMOGRAPHIC TRENDS

All tables and graphs within Section 10.1 have been sourced through ‘Population and household forecasts, compiled by informed decisions’ and demonstrate the projected population increase in PAE over the next 20+ years which will have an impact on our assets.

Graph 10.1.1: Projected Population Increase

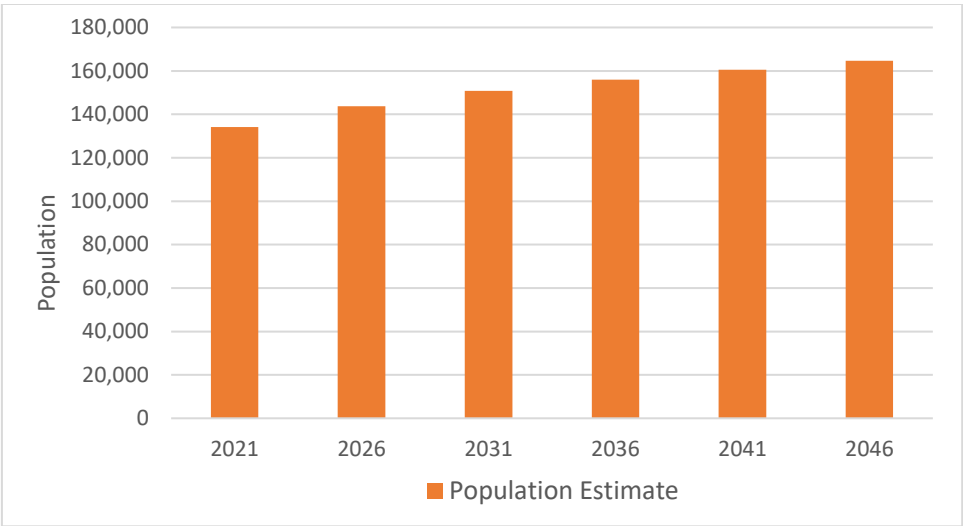
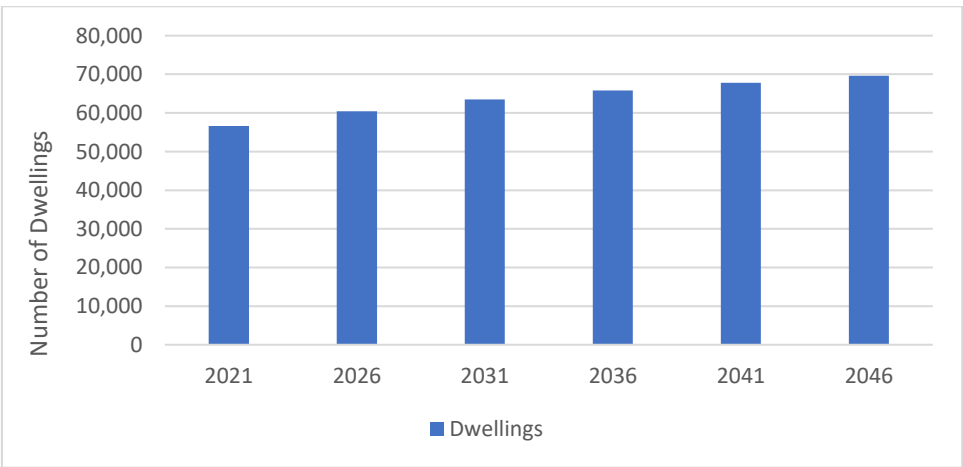


Table 10.1.1: Projected Population Increase

	Total
Population 2021	134,192
Population 2046	164,684
Change 2021-2046	↑ 22.7%

Graph 10.1.2: Projected Number of Dwellings



Based on the last Census undertaken in 2021, our population will have grown by approximately 22% from 134,000 to 164,000 over a projected 25 year period. The number of dwellings will also increase,

from 56,642 to 69,606. This will be through both infill development (i.e. 1 existing allotment into 2 or more) and through greenfield new residential development such as Oakden Rise.

Higher population with infill housing on smaller allotments with less natural drainage and an increase in hard stand area will impact our stormwater asset class. Built to current design standards additional underground pipework is required, along with detention basins to control the outflows into existing lower capacity systems. This is further discussed under sub section 10.3.

10.2: DEMAND THROUGH NEW LAND DEVELOPMENT

Image 10.2.1 clearly illustrates the growth of new infrastructure from recently constructed Lightsview and Northgate suburbs in comparison to the surrounding older suburbs of Clearview, Greenacres and Northfield.

Through limited private back yard space and more roof and driveway areas, the higher density developments result in a reduction in natural drainage and an increase in impervious land. Built to current design standards additional underground pipework is required, along with detention basins to control the outflows into the lower capacity existing systems.

The additional infrastructure leads to increased maintenance costs to maintain it, and eventually renewal costs when it needs replacement.

Current standards for underground stormwater infrastructure intensify the design of pits and pipes to ensure:

- the 20% AEP (5yr ARI) storm flow within the pipe system will be contained, and
- the gutter flow widths will be limited to approximately 2.5 metres.

This inevitably means that a higher number of side entry pits are required in new stormwater systems than what was previously provided in older networks in order to manage the stormwater flow widths in the streets.

Furthermore, the higher number of side entry pits and decreased use of the street storage in the 20% AEP (5yr ARI) storm means that bigger storm water flows are conveyed in the underground stormwater systems which then leads to larger underground pipes being required.

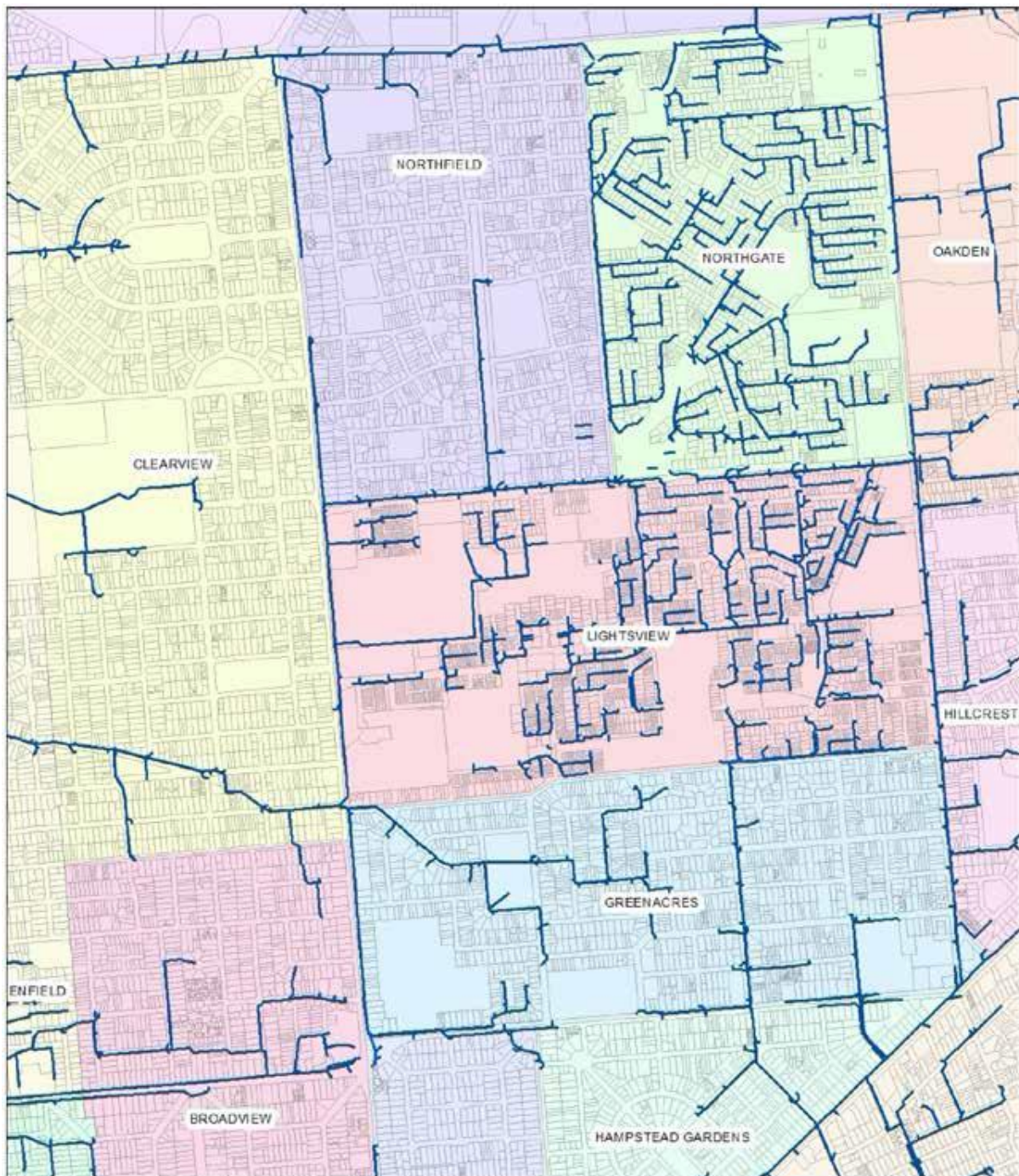
This is particularly evident when comparing the stormwater network in Clearview with the stormwater network in the recent Northgate and current Lightsview developments.

The older suburbs like Clearview (along with Northfield, and Greenacres) generally only have side entry pits located at low points where water tends to naturally fall. This often means a very limited pipe network connecting these pits to the outlet point.

Based on the current and new design standards factoring in climate change effects, it is reasonable to assume that in the future the stormwater network will be more pit and pipe intensive and will therefore mean that Council's stormwater infrastructure asset maintenance and renewal requirements will continue to increase.

The existing stormwater systems downstream of new developments are generally not designed to cater for the additional flow produced by these new developments, therefore a detention basin is often required to control the outflows into the existing stormwater network to prevent flooding issues.

Image 10.2.1: Comparison of intensified infrastructure requirements for new suburbs against existing suburbs



10.3: FUTURE DEMAND DRIVERS AND POTENTIAL IMPACTS

Drivers affecting demand include:

- Population change
- Demographic change
- Seasonal factors
- Consumer preference and expectations
- Technological changes
- Economic factors
- Environmental and climate change awareness

Image 10.3.1 is a snapshot of the broader social and environmental demand factors that have been identified through reviewing Council's library of strategic plans and consideration of market and social trends.

The continued infill development across our City will result in more infrastructure resulting in greater maintenance need.

Image 10.3.1: Current and future demand factors

Demand Driver Type	Primary Factor	Relationship	How this will impact current operations
Climate Adaptation	Higher intensity rainfall	Stormwater Management Plan (SMP)	Increased potential for flooding and the need to manage localised events.
Climate Adaptation	Increased flowrates from hard stand areas created through land developments	Urban Design	Creation of stormwater detention basins in existing open space. This will however reduce usable open space.
New Assets	Major Land Development	Asset Management	Increased resources required for asset management. Additional maintenance and asset renewal.
Urban Design	Increased hard stand area	Climate adaptation SMP Planning Design Guidelines	Increase for potential flooding due to existing infrastructure under capacity
Water contamination, Environment Protection	Rubbish / waste – increased population growth – likely to increase residential waste / litter	Waste Management	Increased maintenance to uphold amenity of streetscapes – ie street / path sweeping. Increased maintenance of stormwater system – particularly pollutant traps (GPT's and Trash Racks)
Asset Management	Ageing or under-performing infrastructure	Long Term Financial Plan	Increased demand for replacement/upgrade/new assets
Climate adaptation	Sea level rise	Urban Design	Peak storm and high tides preventing drainage
Consumer preference	Increased percentage of sub-divisions with greater number of sole occupancy homes	Urban Design	Greater hard stand area and less permeable land
Planning and development	Increased density, poor design outcomes	Urban Design	Less Opportunity for Council to shape urban development in the City. Potential increase in residential complaints regarding localised flooding.

11.0: EXPENDITURE

11.1: FAILURE MODE AND EFFECTS ANALYSIS WITH EXPENDITURE TYPE

Table 11.1.1: Failure Mode and Effects Analysis

Service Provision	Failure Mode	Effects	Remedy	Expenditure Type	Action Type
Our Stormwater network is maintained in an appropriate condition to enable safe use in varying vehicle types. City Vision: Thriving Community—'We promote community capacity, connection, and participation in civic life.'	- Blocked Conduit, - Blocked Pit	Water Pooling Upstream - Damage to Road Structure or Reserve area - Flooding of private land.	High Pressure Jet Clean Root Cutters through pipe	Maintenance	Pro Active Re active
	Structural Damage to Pipe - Cracking - Displaced pipe - Structural Damage to Culvert - Reo Exposed - Cracking in Roof - Displaced section	Road Collapse Pipe Collapse and cause blockage	Displacement - Replace Pipe/culvert Section - Lift and Relay - Bandage Cracking - Replace Pipe/Culvert - Reline	Capital	Re active Pro Active
	Broken Valve	Water Backflow causing flooding	Replace	Capital	Pro Active
	Weed Growth in Channels Sediment build up	- Slows water flow during storm - Mosquitoes/snakes/vermin	Slash Poison Scrape/Clean	Maintenance	Pro Active
	Structural Damage to Channels - Undermining of walls - Walls collapse - Cracking and reduced integrity of floor	Difficult to slash and scrape with machinery Walls collapse and restrict/block water flow	Replace sections of wall and floor Review and Renew Sections of Channel	Capital	Pro Active
	Sediment build up in GPT	Unable to capture pollutants before entering waterway	High Pressure Vacuum Clean	Maintenance	Pro Active
	Trash Racks	Unable to capture pollutants before entering waterway	Empty / Clean	Maintenance	Pro Active
	Sediment build up in Basin	Overflow Choking at Channel Mouth	Excavation / Dredging	Capital Maintenance	Pro Active
	Sediment build up in Syphon	Unable to Capture Pollutants Smell to adjoining landowners	Excavate and Scrape	Maintenance	Pro Active

The Failure Mode and Effects Analysis (FMEA) as provided in table 11.1.1 provides a view of the effect from a failure mode, and what remedy is considered by Council to correct the failure. The expenditure type that relates to the remedy provides context to the following tables under subsection 11.2.

11.2: REVIEW OF PAST EXPENDITURE

Maintenance

Routine maintenance is the regular on-going work that is necessary to keep assets operating, including instances where portions of the asset fail and need immediate repair to make the asset operational again. Maintenance includes all actions necessary for retaining an asset to an appropriate service condition; which includes pipe and culvert cleaning and root cutting, open channel mowing and scraping, Trash Rack and GPT cleaning, and general flood management.

Our investment in Stormwater maintenance over the past 4 years is summarised below.

Table 11.2.1: Breakdown of Actual Maintenance by Service Type per Financial Year

Year	Underground Drainage	Trash racks	Open Channels	Flood Management	Total
2020/21	\$978,160	\$139,409	\$337,264	\$73,977	\$1,528,811
2021/22	\$1,047,249	\$100,915	\$268,266	\$40,672	\$1,457,103
2022/23	\$1,132,705	\$123,778	\$279,519	\$7,125	\$1,543,127
2023/24	\$1,092,157	\$144,796	\$359,305	\$19,293	\$1,615,550
Total	\$4,250,271	\$508,898	\$1,244,354	\$141,067	\$6,144,591

Capital

Capital investment is defined across two types of expenditure:

Renewal/Replacement expenditure is major work which does not increase the asset's design capacity but restores, rehabilitates, replaces or renews an existing asset to its original required service potential.

Upgrade/New expenditure is major work that provides an increase in design capacity, improves service potential, or creates a new asset. All of which will increase Councils operating costs through ongoing lifecycle management of the new or upgraded asset.

The capital investment over the past 4 years is summarised in Tables 11.2.3 and 11.2.4.

Table 11.2.3: Comparison of 2020 AMP proposed Capital Renewal budget against Actual Spend per financial year.

2021/22 AMP Proposed Spend (Addendum)					Actual Capital Expenditure
Year	Replace / Renew	Annual CPI %	Cumulative CPI %	Cumulative CPI Adjustment	Replace / Renew
2020/21	\$4,240,000	na	na	\$4,240,000	\$1,019,478
2021/22	\$3,091,800	na	na	\$3,091,800	\$2,822,283
2022/23	\$3,550,000	6.40%	6.40%	\$3,777,200	\$4,931,341
2023/24	\$4,200,000	6.90%	13.30%	\$4,758,600	\$3,281,119
Total				\$15,867,600	\$12,054,221

Table 11.2.4: Comparison of 2020 AMP proposed Capital Upgrade/New budget against Actual Spend per financial year.

2021/22 AMP Proposed Spend (Addendum)					Actual Capital Expenditure
Year	Upgrade / New	Annual CPI %	Cumulative CPI %	Cumulative CPI Adjustment	Upgrade / New
2020/21	\$6,105,000	na	na	\$4,240,000	\$7,162,833
2021/22	\$12,480,000	na	na	\$12,480,000	\$10,315,508
2022/23	\$6,000,000	6.40%	6.40%	\$6,384,000	\$9,864,257
2023/24	\$6,210,000	6.90%	13.30%	\$7,035,930	\$2,284,628
Total				\$30,139,930	\$29,627,226

Council has remained committed to investing into Council's stormwater infrastructure, as directed by the various Stormwater Management Plan (SMP) recommendations.

11.3: PROJECTED INVESTMENT

Asset Renewal Funding Ratio (RFR)

The Australian Infrastructure Financial Management Manual (AIFMM) defines the Asset Renewal Funding ratio as:

The ratio of the net present value of asset renewal funding accommodated over a 10 year period in a long term financial plan relative to the net present value of projected capital renewal expenditures identified in an asset management plan for the same period [AIFMM Financial Sustainability Indicator No 3].

The projected Capital Renewal Expenditure within this AMP has been calculated through:

- the analysis of data captured from programmed condition audits
- the analysis of data captured to inform capital works
- comparison against the Accumulated Depreciation expense.

The Asset Renewal Funding Ratio indicates the percentage of expenditure in the Long-Term Financial Plan (LTFP) relative to the 'Projected Capital Renewal Expenditure' in the AMP's. This ensures that infrastructure assets are being renewed in line with the AMPs, thereby maintaining service levels to the desired standard.

An Asset Renewal Funding Ratio of 100% in the LTFP means that PAE is budgeting to renew assets as projected by the AMP, resulting in assets being maintained at the lowest cost to the community.

In many cases, Council is upgrading existing infrastructure rather than like for like replacement, due to the need to increase existing capacity from impacts from infill development and changing weather patterns. Council is following the recommendations from the SMP's as discussed under Section 7.4.

11.4: PROPOSED RENEWAL & UPGRADE/NEW INVESTMENT

Table 11.4.1: Ten Year investment table with descriptions of expenditure projects.

Projection Description - 2024/25	Capital Investment Type	Amount
Soakage Pit Construction	New / Upgrade	\$250,000
Water Sensitive Urban Design streetscape projects	New / Upgrade	\$200,000
Localised Flood Relief	New / Upgrade	\$700,000
Open Channel Repairs / Drainage Reserves	Replace	\$50,000
BIC - Construction of upgrades Short St/Frederick St/John St	New / Upgrade	\$2,200,000
Hack St Port Adel Const Drainage - New-Const Drainage Quebec St	New / Upgrade	\$1,200,000
Talbot Rd Croydon Park Const Drainage - New-Const Drainage	New / Upgrade	\$2,300,000
Jetty Rd - Pump station	New / Upgrade	\$100,000
Lefevre - Flap Gate Upgrade (TideFlex)	New / Upgrade	\$120,000
Lefevre - Mersey PS - Construction of lateral drains and basin - CARRYOVER	New / Upgrade	\$500,000
Lefevre - Review of Hack St catchment and pump station efficiency	Replace	\$50,000
NAE - State Sports Park - Basin construction	New / Upgrade	\$1,500,000
TRDA - Design and construct GPT - Florence Tce, Rosewater	New / Upgrade	\$300,000
NAE - Upgrade concrete channel - railway reserve to GJ RD	New / Upgrade	\$150,000
Continuation of Lateral Drain Portland Rd	New / Upgrade	\$100,000
PRE - Design of Port Centre East & West Pump Station	New / Upgrade	\$150,000
Upgrade pipe and outlet from Semaphore Rd Catchment + GPT + Tideflex valve	New / Upgrade	\$600,000
Replacement of Trash Racks at Rafferty Rd, wingfield	Replace	\$80,000
		\$10,550,000

Project Description - 2025/26	Capital Investment Type	Amount
Drainage Construction of Lateral Drain on Portland Rd	New / Upgrade	\$950,000
Detailed Design of Commercial Rd Drainage Upgrade	New / Upgrade	\$114,000
Detailed Design of Providence Place Drainage Upgrade	New / Upgrade	\$95,000
Dunstan Rd Detailed design of Mitigation options from SMP	New / Upgrade	\$95,000
Hack St Pump Station DESIGN	New / Upgrade	\$95,000
HEP Detailed design of Mitigation options from SMP	New / Upgrade	\$95,000
Lipson St New Drain	New / Upgrade	\$332,500
NAW Mansfield Park Channel Replace	Replace	\$150,000
Design Nazar Reserve Lateral Drain and overflow	New / Upgrade	\$100,000
Design of Port Road Median WSUD	New / Upgrade	\$100,000
Russell St Basin Upgrade	New / Upgrade	\$475,000
Construction channel between Railway Reserve & Grand Junction Rd	New / Upgrade	\$950,000

Kolapore Ave Soakage Upgrade	New / Upgrade	\$950,000
Design and construction of Eastbourne Tce GPT	New / Upgrade	\$475,000
Klingberg GPT Investigation and Design	New / Upgrade	\$77,500
Service Relocations	New / Upgrade	\$950,000
		\$6,004,000

Project Description - 2026/27	Capital Investment Type	Amount
Drainage Construction of Lateral Drain on Portland Rd	New / Upgrade	\$950,000
Design of Charon Rd Detention Basin	New / Upgrade	\$90,000
HEP - Prospect Replace	Replace	\$100,000
Design upgrade channel between Grand Junction Rd & Northcote	New / Upgrade	\$95,000
Upgrade of Wellington St Pump Station and GPT	New / Upgrade	\$1,900,000
Drainage Design from Torrens Urban North East (TUNE) SMP	New / Upgrade	\$475,000
Semaphore Rd Upgrade	New / Upgrade	\$950,000
		\$4,560,000

Project Description - 2027/28	Capital Investment Type	Amount
Design upgrade channel between Grand Junction Rd & Northcote	New / Upgrade	\$950,000
Construction of Charon Basin	New / Upgrade	\$1,425,000
Construction of Mersey Rd Drains and Basin	New / Upgrade	\$950,000
Henschke Drain Channel - Capital Replace	Replace	\$100,000
Drainage Construction of Wellington St	New / Upgrade	\$950,000
Drainage Construction from TUNE SMP	New / Upgrade	\$1,900,000
Drainage Design from Updated TR & NAE SMP	New / Upgrade	\$375,000
Service Relocations	New / Upgrade	\$950,000
		\$7,600,000

Project Description - 2028/29	Capital Investment Type	Amount
Drainage Construction from TUNE SMP	New / Upgrade	\$1,900,000
Upgrade Drainage on Commercial Rd	New / Upgrade	\$950,000
Design and construction of GPT – Audley St	New / Upgrade	\$475,000
Drainage Construction from Updated TR & NAE SMP	New / Upgrade	\$1,900,000
Design upgrade channel between Grand Junction Rd & Northcote	New / Upgrade	\$1,425,000
Service Relocations	New / Upgrade	\$950,000
		\$7,600,000

Project Description - 2029/30	Capital Investment Type	Amount
Drainage Construction from TUNE SMP	New / Upgrade	\$2,850,000
Drainage Construction from Updated TR & NAE SMP	New / Upgrade	\$2,850,000

Design and construction of GPT x 2	New / Upgrade	\$950,000
Drainage Design from TUNE SMP	New / Upgrade	\$190,000
Drainage Design from NAE SMP	New / Upgrade	\$190,000
Drainage Design from TR SMP	New / Upgrade	\$190,000
Service Relocations	New / Upgrade	\$950,000
		\$8,170,000

Project Description - 2030/31	Capital Investment Type	Amount
Drainage Construction from TUNE SMP	New / Upgrade	\$1,900,000
Design and construction of GPT x 2	New / Upgrade	\$950,000
Drainage Design from TUNE SMP	New / Upgrade	\$190,000
Drainage Design from NAE SMP	New / Upgrade	\$190,000
Drainage Design from TR SMP	New / Upgrade	\$190,000
Drainage Construction from Updated NAE SMP	New / Upgrade	\$1,900,000
Drainage Construction from Updated TR SMP	New / Upgrade	\$1,900,000
Design Drainage from Lefevre SMP	New / Upgrade	\$475,000
Service Relocations	New / Upgrade	\$950,000
		\$8,645,000

Project Description - 2031/32	Capital Investment Type	Amount
Design and construction of GPT x 2	New / Upgrade	\$950,000
Drainage Design from TUNE SMP	New / Upgrade	\$190,000
Drainage Design from NAE SMP	New / Upgrade	\$190,000
Drainage Design from TR SMP	New / Upgrade	\$190,000
Drainage Construction from TUNE SMP	New / Upgrade	\$950,000
Design Jobs from Port River East SMP	New / Upgrade	\$475,000
Drainage Construction from Lefevre SMP	New / Upgrade	\$1,900,000
Drainage Design from PRE SMP	New / Upgrade	\$475,000
Drainage Construction from NAE SMP	New / Upgrade	\$950,000
Drainage Construction from TR SMP	New / Upgrade	\$950,000
Service Relocations	Replace	\$950,000
		\$8,170,000

Project Description - 2032/33	Capital Investment Type	Amount
Drainage Design from TUNE SMP	New / Upgrade	\$190,000
Drainage Design from NAE SMP	New / Upgrade	\$190,000
Drainage Design from TR SMP	New / Upgrade	\$190,000
Design Drainage from Lefevre SMP	New / Upgrade	\$475,000
Drainage Design from PRE SMP	New / Upgrade	\$190,000
Drainage Construction from NAE SMP	New / Upgrade	\$950,000
Drainage Construction from TR SMP	New / Upgrade	\$950,000

Drainage Construction from TUNE SMP	New / Upgrade	\$950,000
Design Drainage from Barker Inlet Central SMP	New / Upgrade	\$475,000
Design Construction from Lefevre SMP	New / Upgrade	\$950,000
Drainage Construction from PRE SMP	New / Upgrade	\$1,900,000
Service Relocations	New / Upgrade	\$950,000
		\$8,360,000

Project Description - 2033/34	Capital Investment Type	Amount
Drainage Design from TUNE SMP	New / Upgrade	\$190,000
Drainage Design from NAE SMP	New / Upgrade	\$190,000
Drainage Design from TR SMP	New / Upgrade	\$190,000
Design Drainage from Lefevre SMP	New / Upgrade	\$475,000
Drainage Design from PRE SMP	New / Upgrade	\$190,000
Drainage Construction from NAE SMP	New / Upgrade	\$950,000
Drainage Construction from TR SMP	New / Upgrade	\$950,000
Drainage Construction from TUNE SMP	New / Upgrade	\$950,000
Design Drainage from Barker Inlet Central SMP	New / Upgrade	\$475,000
Design Construction from Lefevre SMP	New / Upgrade	\$950,000
Drainage Construction from PRE SMP	New / Upgrade	\$950,000
Design Construction from Barker Inlet Central SMP	New / Upgrade	\$950,000
Service Relocations	New / Upgrade	\$950,000
		\$8,360,000

Table 11.4.2: Additional Operational projects.

Project Description	Year	Amount
Infiltration Study	2025/26	500,000
Semaphore Area soakage catchment options review and study	2025/26	100,000
Desilting of Whicker Rd Sediment Basin	2025/26	200,000
Feasibility Study of Charon Reserve pump station	2026/27	100,000
Feasibility Study of Railway Tce Pump Station	2026/27	100,000
Update TR & NAE SMPS	2026/27	500,000
Wetlands Performance Investigation	2027/28	500,000
Update Lefevre SMP	2029/30	500,000
Update Port River East SMP	2030/31	500,000
Update Barker Inlet Central SMP	2031/32	500,000

11.5: INVESTMENT SUMMARY

Through the modelling undertaken within each SMP review, areas of Council's older stormwater infrastructure is now considered to be under capacity. This is due to infill development creating more runoff coinciding with changing weather patterns which is increasing rainfall intensity. Accordingly, many of the existing assets coming to end of life are now being upgraded to larger dimensions.

Table 11.6.1 indicates a relatively small Capital Renewal budget based on the following reasons:

- Stormwater assets are generally long life assets with lives exceeding 100 years. Much of the asset types with 100 year lives are only approximately 30% consumed. Refer Table 4.1.1 under Section 4)
- Asset types with shorter 60 year lives, such as trash racks, have been progressively replaced over recent years
- Much of the existing infrastructure has been deemed to be undersized, and is now designed for upgraded capacity.
- New infrastructure is being constructed to assist with existing capacity issues.

Table 6.1.1 (Section 6) identified that on average Council should spend around \$6M per year on renewal. On average Council will be spending \$7.6M a year on capital projects.

Table 11.4.2 depicts a total of \$3.5M allocated to:

- Feasibility studies
- Desilting of Whicker Rd Basin which will mitigate current channel flow risks.

Open Channels have been identified as a critical assets to drain large quantities of water into the wetlands. Much of the channel infrastructure was constructed more than 60 years ago, and is now recognised as failing, making it difficult to slash and clean. Table 11.4.1 contains a total of \$3.9M invested over the next 10 years into both renewing and upgrading various open channels within our existing network.

Infiltration studies proposed from 2025/26 onwards will indicate whether Council can construct infiltration basins rather than the Port Centre and Jetty Rd Pump Stations (as discussed in the Pump Station AMP). If the results are positive, Council will not be required to budget more than \$20M for Pump Station construction over the next 10 years.

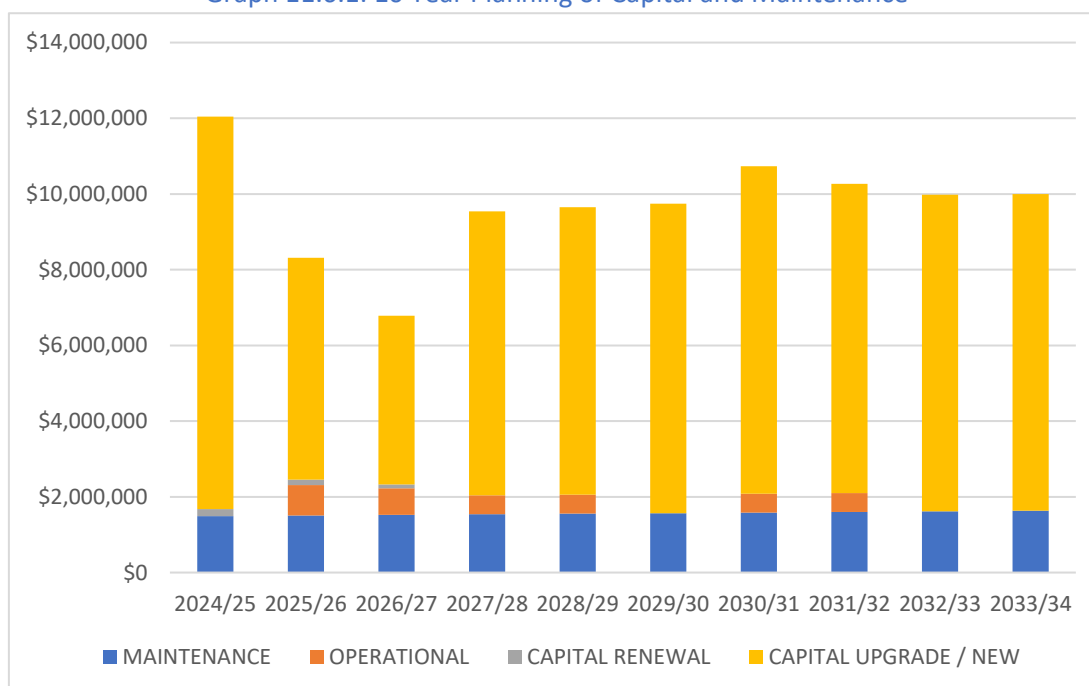
11.6: INVESTMENT TABLE

This section identifies the spend required for capital and maintenance for the next 10 years.

Table 11.6.1: 10 Year Planning of Capital and Maintenance Expenditure

YEAR	MAINTENANCE	OPERATIONAL	CAPITAL RENEWAL	CAPITAL UPGRADE / NEW	TOTAL
2024/25	\$1,493,800		\$180,000	\$10,370,000	\$12,043,800
2025/26	\$1,508,700	\$800,000	\$150,000	\$5,854,000	\$8,312,700
2026/27	\$1,523,800	\$700,000	\$100,000	\$4,460,000	\$6,783,800
2027/28	\$1,539,100	\$500,000	\$100,000	\$7,500,000	\$9,639,000
2028/29	\$1,554,500	\$500,000		\$7,600,000	\$9,654,500
2029/30	\$1,570,000			\$8,170,000	\$9,740,000
2030/31	\$1,585,700	\$500,000		\$8,645,000	\$10,730,700
2031/32	\$1,601,600	\$500,000		\$8,170,000	\$10,271,600
2032/33	\$1,617,600			\$8,360,000	\$9,977,600
2033/34	\$1,633,700			\$8,360,000	\$9,993,700
Total	\$15,628,500	\$3,500,000	\$530,000	\$77,489,000	\$97,147,400

Graph 11.6.1: 10 Year Planning of Capital and Maintenance



12.0: DATA CONFIDENCE

The expenditure projections are based on the best available data. Data confidence is critical for expenditure projection accuracy. As new data becomes available, future plans will be updated.

Table 12.1: The 5 levels that measure data confidence.

Confidence Level	Description
A - Highly Reliable < 2%	Data based on sound records, procedures, investigations, and analysis, documented properly and agreed as the best method of assessment. Data set is complete and estimated accuracy <2% uncertainty .
B – Reliable +/- 2 – 10%	Data based on sound records, procedures, investigations, and analysis, documented properly but has minor shortcomings, e.g. some of the data is old, some documentation is missing and /or reliance is placed on unconfirmed reports or some extrapolation. Dataset is complete and estimated accuracy +/- 2 -10% uncertainty .
C - Uncertain +/- 10 – 25%	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 are available. Dataset is substantially complete but up to 50% is extrapolated data and estimated accuracy +/- 10 – 25% uncertainty .
D - Very Uncertain +/- 25 – 50%	Data is based on unconfirmed verbal reports and/or cursory inspections and analysis. Dataset may not be fully complete, and most data is estimated or extrapolated. Accuracy +/- 25 – 50% uncertainty .
E – Unknown >50%	None or very little data held. Accuracy >50% uncertainty .

Source: IIMM Version 6.0, 2020

Table 11.1.1 displays the 5 levels of data confidence. From this table, Council's Stormwater asset data confidence level is at a **B rating** where the data is 'Reliable' with an estimate accuracy of +/- 2 to 10%.

Given the complexity and expense to capture condition of Council's underground assets, Council is currently relying on valuation records to determine the remaining life of existing infrastructure. This method has highlighted the need to develop inspection programs for pre 1990 culverts, and to continue to improve data capture of open channel condition. However, based on the existing data and information on open channels, there are sections of open channel requiring renewal and upgrade and as such \$3.9M is allocated to deliver a number of related projects.

13.0: IMPROVEMENT PLAN

The improvement program derived from the plan is shown in the table below:

Ref.	Category	Requirement	Responsible	Due Date
1	Criticality	Ensure annual budgeting for Open Channel replacement and dredging of channel mouths at wetlands.	Manager Infrastructure Assets and Maintenance	On Going
2	Condition	Review condition of all culvert bridges on major transport routes	Team Leader Traffic / Asset Planner	June 2025
3	Condition	Establish a Culvert Inspection program for all culverts approaching end of life.	Asset Planner	June 2025
4	Levels of Service	Further review and embed levels of service and monitoring and reporting of performance indicators	Asset Planner	December 2025
5	Criticality	Undertake risk reviews based on new criticality and failure modes and effects assessments	Asset Planner	June 2025
6	Investment	Continue to seek co contribution from neighbouring Councils that drain into Open Channels that require Capital Renewal or Upgrade	Manager Infrastructure Assets and Maintenance	On Going

14.0: APPENDIX ITEMS

Appendix 1: Legislative Requirements

There are many legislative requirements and regulations relating to the management of our stormwater assets as listed below. Council must ensure compliance with these legislative requirements

- South Australian Local Government Act 1999
- South Australian State Records Act 1977
- Environment Protection Act 1993
- Development Act 1993 / Planning, Development and Infrastructure Act 2016
- Work Health and Safety Act 2012 and Regulations 2012
- Return to Work Act 2014
- Environment Protection (Water Quality) Policy 2015
- Australian Standards
- Water Industry Act 2012 and regulations 2012
- Landscape South Australia Act 2019
- Dangerous Substances Act 1979 and associated Regulations 2008
- Public Health Act 2011