WARRNAMBOOL
CITY COUNCIL

Drainage Asset Management Plan

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Schedule of Adoption

Acknowledgements:

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1 EXECUTIVE SUMMARY

1.1 The Purpose of the Plan

Drainage Asset management planning is a comprehensive process to ensure delivery of services from Council's Drainage infrastructure is provided in a financially sustainable manner. The plan combines management, financial, engineering and technical practises to ensure that the required services levels of stormwater drainage are met by the most efficient means with consideration for Council's fiscal and resource limitation.

This asset management plan details information about infrastructure assets including actions required to provide an agreed level of service in the most cost effective manner while outlining associated risks. The plan defines the services to be provided, how the services are provided and what funds are required to provide the services over a 15-year planning period.

Stormwater drainage is intended to manage the quality and quantity of the stormwater generated from developed areas. The primary aim for managing stormwater drainage is to ensure stormwater runoff from the impermeable areas causes minimum nuisance, danger and damage to community, property, and environment.

This plan covers drainage infrastructure serving to collect and convey, retain and improve water quality. Water flows are mainly collected via run-off from hard surfaced, impervious areas (roads, roof tops, paved areas etc.) in open drains, pits, pipes and other designed features to retard and direct water flows, improve and manage water quality, store and discharge water.

1.2 Asset Description

The Warrnambool City council stormwater drainage network is primarily comprised of following assets:

- 10,954Pits
- 270,950 m Pipes
- 24,017 m Open drains / Surface drains
- 2,879 m Tunnels
- 270,239 m2 Basins
- 25,000 L (5 tanks) Rainwater Tanks
- 40 Stormwater quality improvement devices (GPTs and Litter Traps)
- 13,720 m2 Swales
- 1,331 m2 Rain gardens

These infrastructure assets have significant value estimated at **$89,380,798**

1.3 Levels of Service

The current levels of service have been formulated with regard for legislative requirements, Australian standards, Infrastructure Design Manual, results from the community satisfaction survey and through analysis of customer requests. Service level performance will be monitored in accordance with this plan over the 15 year period, which will provide guidance on the required funding to ensure these service levels. Our present funding levels are insufficient to continue to provide existing services at current levels in the medium term.

If funding levels are reduced this would impact on Council's ability to maintain current levels of service and performance.

The main service consequences would result in:

- Reduced levels of service leading to a decrease in overall performance of the drainage network.
- Increased risk of flooding and property impact.
- Increased risk of public hazards due to failure of critical drainage infrastructure.

1.4 Future Demand

Understanding the future demand for Drainage within the municipality is essential in ensuring an ongoing appropriate service is provided to the community. Council recognises and plans for many factors which are predicted to influence the future service requirements of drainage.

The main demands for new services are created by:

- Demographics-Residential and commercial land development due to population growth.
- Climate change-Storm intensity and severity due to climate change impacts.
- Finance and economics-Changes in material and resource cost, technology, design regulations and legislative standards.

These will be managed through a combination of managing existing assets, upgrading of existing assets and providing new assets to meet demand and demand management. Demand management practices include non-asset solutions, insuring against risks and managing failures.

- Using emerging and new technologies to ensure cost effective management of repairs and asset renewal works.
- Targeted renewal, upgrade and new infrastructure to focus and address where capacity issues have been identified.

1.5 Lifecycle Management Plan

What does it Cost?

The projected outlays necessary to provide the services covered by this Asset Management Plan (AM Plan) includes operations, maintenance, renewal, upgrade and new assets over the 10-year planning period is **$ 2.4 million** on average per year. This includes modelled numbers in lieu of full condition data. All costs in this plan are in current (real) dollars at the time of publication.

1.6 Financial Summary

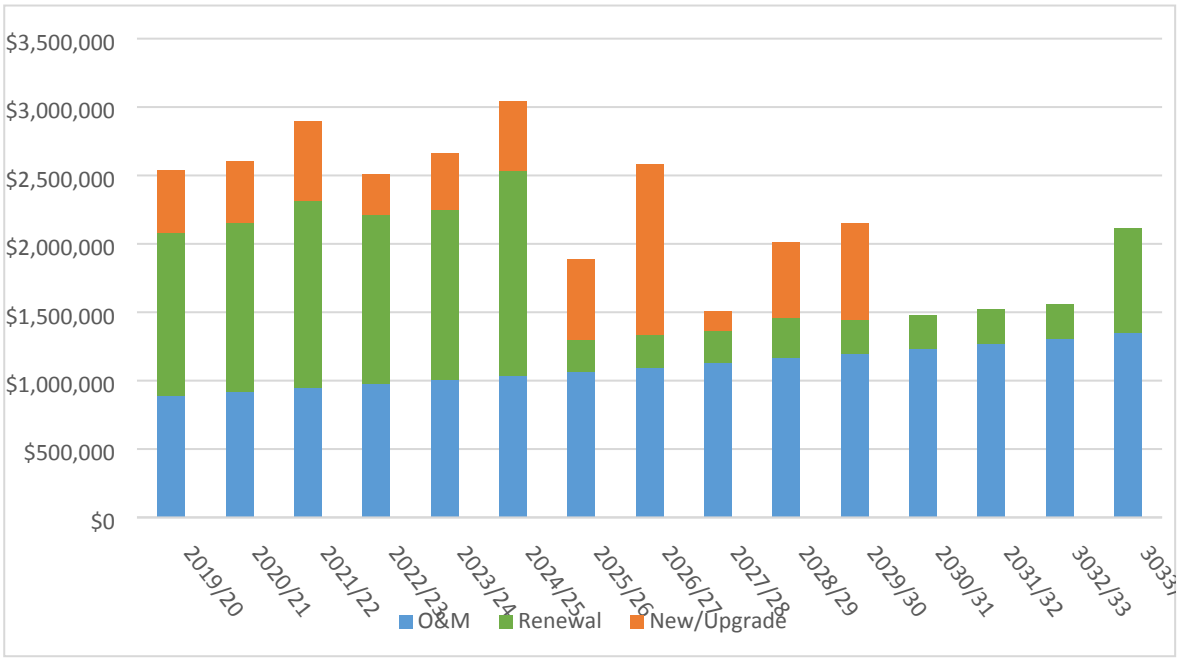
What we will do

Estimated available funding for this period **$1.36 million** on average per year as per the long term financial plan or budget forecast. This is **55%** of the cost to sustain the current level of service at the lowest lifecycle cost.

The infrastructure reality is that only what is funded in the long term financial plan can be provided. The emphasis of the Asset Management Plan is to communicate the consequences that this will have on the service provided and risks, so that decision making is “informed”.

The allocated funding leaves a shortfall of **$1.1 million** on average per year of the projected expenditure required to provide services in the AM Plan compared with planned expenditure currently included in the Long Term Financial Plan. This is shown in the figure below.

Projected Operating and Capital Expenditure



We plan to provide stormwater drainage services for the following:

- Operation, maintenance, renewal and upgrade of drainage infrastructure assets as detailed in Table 2.1a to meet service levels set by in annual budgets.
- Major renewal and improvements works as identified in Appendix A and Appendix B within the 10-year planning period.
- Maintain critical drainage assets as a high priority.

What we cannot do

We currently do **not** allocate enough funding to sustain these services at the desired standard or to provide all new services being sought. Works and services that cannot be provided under present funding levels are:

- Reduction of water soluble pollutants of stormwater discharged to natural water bodies.
- Mitigation and resilience to climate change impacts.
- Mitigation and reduction of impact to flooding hotspots within the municipality.
- Increase in drainage infrastructure condition assessment investigations.
- Assessment of capacity and renewal requirements for all stormwater basins.
- Daily residential street cleaning.

Managing the Risks

The risk management section identifies risks that may affect the ongoing delivery of services from drainage infrastructure. During the process of identifying significant risks, assets which present a high consequence of failure were highlighted as “critical assets” such that they may potentially receive greater consideration during the formulation of works programs, with respect to their overall risk rating. Our present funding levels are insufficient to continue to manage risks in the medium term.

The main risk consequences are:

- Further deterioration of critical drainage assets increasing risk of failure.
- Further exposure to risk and liability as a result of flooding.

We will endeavour to manage these risks within the available funding by:

- Undertaking further investigations of the identified flooding hotspots to determine the best value for money treatment outcomes.
- Undertake a regular review of this Asset Management Plan to ensure alignment with Council's strategic planning cycle and to inform the investment need through the Long Term Financial Plan.

1.7 Asset Management Practices

Council is using a systemised approach to monitor and manage the Council's Drainage Infrastructure which has helped to improve the productivity and efficiency in Asset Management and are as follows:

- **Technology One**: Council's Financial management/information system.

- **Conquest**: Council's Asset register that contains Asset data, description and hierarchy, condition inspection and defects.

1.8 Monitoring and Improvement Program

The next steps resulting from this asset management plan is to improve asset management practices. The items listed below are the priority improvement actions identified during the development of the plan. Refer to the action plan (Table 8.1) for the full lists of actions and further details.

- We currently have no targeted research on customer expectation data relating to service level needs and requirements for drainage infrastructure. The Victorian Community Satisfaction Survey 2019 that relates to the sentiment towards Council's local streets and footpath is used to gain overall perspective on drainage assets. Thus, undertaking community consultation to determine and confirm community levels of service for drainage infrastructure is necessary in the future.
- There are 83km of pipes with an unknown age, for depreciation purpose these were assumed to be halfway through their life. Improvement in asset data confidence for condition and attributes (i.e. age) is necessary.
- Prepare an annual renewal works program that is fully funded. The annual renewal work program would be based on CCTV condition inspection and would be prioritised based on the criticality of the assets.
- Continue to analyse drainage capacity modelling. This would identify the deficiencies in the Council drainage system, identify the areas that may be subject to overland flow and determine best value for money upgrade project.

2. INTRODUCTION

2.1 Background

This asset management plan communicates the actions required for the responsive management of assets, compliance with regulatory requirements, and funding needed to provide the required levels of service over a 15-year planning period. The plan combines management, financial, engineering and technical practises to ensure that the required service levels of drainage infrastructures are met by the most efficient means with consideration for Council's fiscal and resource limitations.

The Drainage Asset Management Plan is to be read in conjunction with relevant planning documents including the Asset Management Policy and Asset Management Strategy as well as all documents and references identified within this document.

Stormwater drainage is intended to manage the quality and quantity of the stormwater generated from developed areas. The primary aim for managing stormwater drainage is to ensure stormwater runoff from the impermeable areas causes minimum nuisance, danger and damage to community, property, and environment.

Drainage networks can functionally be grouped into three sections, namely;

- Collection and Conveyance – The infrastructure responsible for the collection and conveyance of runoff from impervious surfaces belong in this category. These are the drainage infrastructure used for conveyance including pits, pipes, surface drains, tunnels and minor culverts. The primary responsibility of the infrastructure is to protect the community and assets from the flooding.

- Retention - This is a hold point for stormwater. The conveyance infrastructures leaves the water to this phase where stormwater is retained to enable some level of treatment and groundwater recharge or reuse. The infrastructure elements included in the retention phase are stormwater basins, aquifer recharge bores, water harvesting tanks and other machinery related to this infrastructure such as pumps in basins and backflow prevention devices.

- Water quality – The infrastructure, which helps in enhancing stormwater quality such as Stormwater Quality Improvement Devices (SQID) and Water Sensitive Urban Devices elements (WSUD). SQIDs include litter traps, gross pollution traps, and water sensitive urban devices including swales, rain gardens, etc.

The infrastructure assets covered by this asset management plan are shown in Table 2.1a.

Table 2.1a: Assets covered by this Plan

Functional type	Asset components
Collection and Conveyance	Pits (Side entry pits, Junction Pits, Grate pits, End walls, Headwalls, Outfalls, etc.)
	Pipes (Includes concrete pipes, PVC pipes, Black Max pipes, HDPE pipes, minor culverts, and earthen pipes)
	Surface drains (Agricultural drains, natural open drain, open drains, grated drainage channel)
	Tunnels
Retention	Basins
	Soak pits
	Rainwater harvesting tanks
	Aquifer recharge bores
	Drainage pumps
	Backflow prevention devices
	Retention cells
Water Quality	Swales and rain gardens,
	Stormwater Quality Improvement Devices (GPT, Litter trap)
Flood Plain	Flood Walls

Management	Boom Gates
	Level Sensors
	Indicator Signs

Note: Major Culverts are considered within the Bridge and Major Culvert Asset Management Plan

The key stakeholders in this Stormwater Drainage Asset Management Plan include:

Table 2.1b: Key Stakeholders involved in this plan

KEY STAKEHOLDER	ROLE IN ASSET MANAGEMENT PLAN
Asset Custodian	Regulatory authority responsible for the care and control of the drainage network to service community service needs.
Asset management	Responsible for development of the Drainage Asset Management Plan and renewal modelling
Executive Management Team	Management – responsible for corporate review, resourcing and ensuring implementation of the Drainage Asset Management Plan.
Councillors	Council authority – Approval of the Drainage Asset Management Plan and approval of annual budgets and long term financial planning.
Community	General public – Service level recipients.

Roles and Responsibilities for asset management within Warrnambool City Council is described as follows;

Service Managers, who are responsible for planning, controlling, and directing Council services.
The primary service manager for drainage assets is the Manager Infrastructure Services, who is responsible for planning, operation, maintenance and renewal/ upgrade works. The table below details the breakup of drainage related responsibilities vested with each service manager.

DESIGNATION	RESPONSIBILITY
Coordinator Infrastructure Management	Responsible for the planning of drainage infrastructure. Improve/enhance the capacity and function of the drainage network. Providing input for required service levels such as performance and safety. Responsible for delivery of renewal and upgrade programs. Respond to customer requests.
Coordinator Municipal Operations	Ensure the performance of drainage systems with periodic maintenance and operational activities. Providing reports and metrics concerning the drainage performance. Monitoring the risks associated with the respective assets.
Manager Infrastructure Services	Emergency Management.

Asset Managers, who are responsible for planning the delivery and longevity of assets required for Council services.
The asset manager for drainage is Coordinator Strategic Asset Management, who is responsible for the following:

- Collecting and managing asset data to keep the asset register updated and complete.
- Conducting condition assessments.
- Ensuring the timely maintenance of drainage.
- Monitoring and development of the service levels for drainage.
- Assist the service managers in predicting future demand.
- Develop the asset renewal and upgrade programs.

Improvement Action:
Split roles and responsibilities matrix by each drainage asset types for clarity

2.2 Goals and Objectives of Asset Ownership

Our goal in managing infrastructure assets is to meet the defined level of service (as amended from time to time) in the most cost effective manner for present and future consumers. The key elements of infrastructure asset management are:

- Providing a defined level of service and monitoring performance,
- Managing the impact of growth through demand management and infrastructure investment,
- Taking a lifecycle approach to developing cost-effective management strategies for the long-term that meets the defined level of service,
- Identifying, assessing and appropriately controlling risks, and
- Linking to a long-term financial plan which identifies required, affordable expenditure and how it will be allocated.

Key elements of the planning framework are

- Levels of service – specifies the services and levels of service to be provided,
- Future demand – how this will impact on future service delivery and how this is to be met,
- Life cycle management – how to manage its existing and future assets to provide defined levels of service,
- Financial summary – what funds are required to provide the defined services,
- Asset management practices – how we manage provision of the services,
- Monitoring – how the plan will be monitored to ensure objectives are met,
- Asset management improvement plan – how we increase asset management maturity.

Other references to the benefits, fundamentals principles and objectives of asset management are:
- International Infrastructure Management Manual 2015
- ISO 55000

2.3 Core and Advanced Asset Management

This plan is prepared as a 'core to intermediate' asset management plan over a 15 year planning period in accordance with the International Infrastructure Management Manual. The plan contains more than the minimum requirements of a basic plan, with legislative and organisational requirements for sustainable service delivery along with long-term financial planning and reporting.

Further revisions of this plan will move towards advanced asset management using a 'bottom up' approach, with additional information on individual assets and programs to meet agreed service levels.

3. LEVELS OF SERVICE

3.1 Customer Research and Expectations

We currently have no targeted research on customer expectation data relating to service level needs and requirements for drainage infrastructure, however there are a number of other surveys and community engagement processes that have been undertaken that provides guidance as to the community expectations including the Victorian Community Satisfaction Survey (2019), the Warrnambool Flood Plain Management Plan, and council's customer request system. Council acknowledges the

need to undertake targeted community engagement to understand the community needs and expectations with respect to service levels and will investigated for future updates of the asset management plan.

Warrnambool City Council participates in the Victorian Local Government Customer Satisfaction survey which benchmarks the performance of most councils across Victoria. This extensive telephone survey polls residents to determine the importance of a service and the council's performance of that service.

The survey below relates to the sentiment towards Council's local streets and footpaths, and is not specific to Council's drainage assets, however it is believed an overall perspective can be gained on the general performance of drainage assets as they form a critical part of the road network.

Table 3.1: Victorian Community Satisfaction Survey 2019

Local Streets and footpaths	Importance Level	Performance
Warrnambool City Council	**78**	**64**
Regional Average	77	61
State Average	77	59

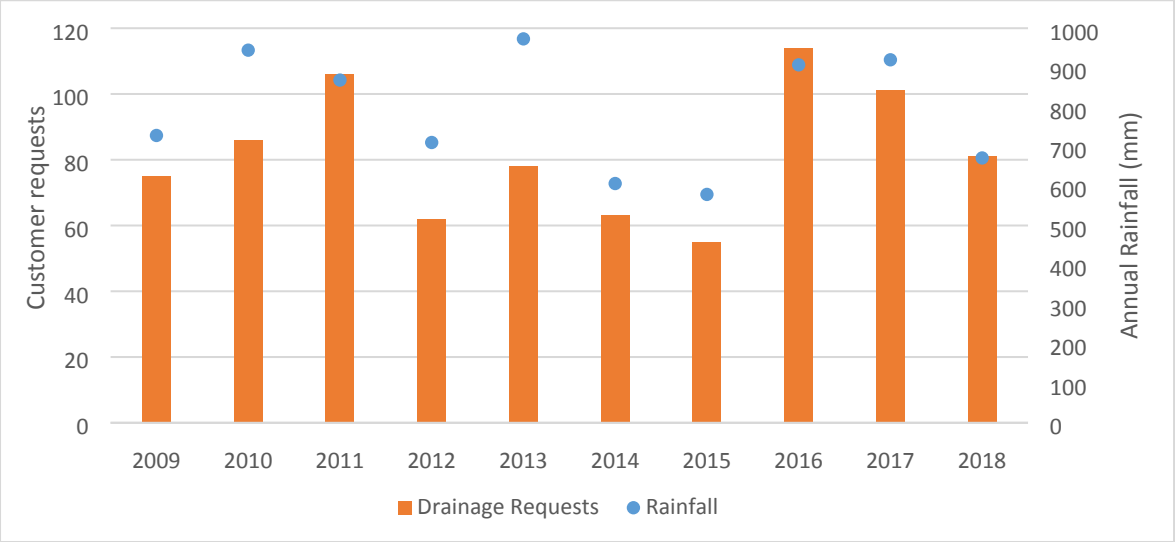
It is considered reasonable to extrapolate the results from the community satisfaction survey relating to the road network to reflect the satisfaction for drainage and drainage related infrastructure especially as this forms a critical component of a functioning road network. The results of the Victorian Community Satisfaction Survey 2019 show Warrnambool City Council is performing well compared to the average regional and state performance index with regard to drainage infrastructure management.

Council acknowledges that in future, community satisfaction should be assessed specifically against drainage infrastructure as a standalone service.

In addition to the above survey, Council's customer request system is used for tracking and actioning requests from the public with respect to drainage related enquiries. Typically it is expected the requests associated with drainage infrastructure will fluctuate and align with rain events and storm intensity. It is generally considered there is a strong correlation between recorded rainfall and the number of requests received which gives high level insight to the network performance and capacity of the drainage network. It is acknowledged the relationship between customer requests received, and alignment with rain events would provide greater clarity and therefore service delivery understanding if the customer requests could be interrogated with respect to location clusters, timing of rain event and rain intensity.

Figure 3.1 shows the customer requests relating to drainage and the annual reported rainfall over the last 10 years. As previously outlined, it is unclear what impact rain intensity had on customer requests. There were wide spread regional flooding events during 2011 and 2016 however the total rainfall for these years was not out of the ordinary. This may explain why these two years showed customer requests significantly higher when compared to other years.

Figure 3.1: Customer Requests and Annual Rainfall



A significant number of customer requests relate to flooding, which indicates the drainage capacity is not meeting the needs and expectations of the community. Council has undertaken flood modelling and analysis which confirms there are areas across the network that are under capacity and do not deliver the community or technical service levels. This has been incorporated into Council's drainage upgrade program for consideration in future capital investment, and is included within the financial modelling within this management plan.

Improvement Action

- *Introduce drainage satisfaction questions to the Victorian Local Government Satisfaction Survey*
- *Ensure the AMP review focuses on community levels of service*

3.2 Strategic and Corporate Goals

This asset management plan is prepared under the direction of the Warrnambool City Council's vision, mission, goals and objectives.

Our vision for Warrnambool is: ***A cosmopolitan city by the sea***

Our mission is: ***To make Warrnambool Australia's most liveable regional city***

Relevant goals and objectives and how these are addressed in this asset management plan are:

Table 3.2a: Council Plan Goals and how these are addressed in this Plan

Goal	Action	How Goals and Actions are addressed in this AM Plan
Objective 2. Foster a healthy, welcoming city that is socially and culturally rich		
2.2 Increase participation, connection, equity, access and inclusion.	Support the collection and sharing of consistent data and evidence to inform strategic and service planning.	Identifies current technical and community levels of service for drainage. Documents the upgrade and improvement works required to meet the current service levels for drainage.
Objective 3. Maintain and improve the physical places and visual appeal of the city.		
3.4 Maintain and enhance existing Council infrastructure	Identify and regularly monitor condition of asset classes.	Utilise asset condition modelling to determine renewal funding requirements. Highlights the benefits of improved data confidence and knowledge in refining future funding requirements.
	Update asset management plans for asset classes including drainage, roads, open space, IT, buildings and monuments.	The preparation and adoption of this asset management plan will achieve this action.

	Complete service level reviews for parks and gardens, roads and drainage services.	Identify asset maintenance requirements to continue to provide current levels of service and maintain safe infrastructure. Investigate service demands to determine drainage upgrades necessary to meet future community needs.
Objective 5. Practice good governance through openness and accountability while balancing aspirations with sound financial management.		
5.3 Ensure financial sustainability through effective use of Council's resources and assets and prudent management of risk	Review and update the Long Term Financial Plan to ensure Council remains financially sustainable into the future.	Identifies poor condition, aged and unserviceable assets requiring renewal or disposal to be included within Council's Long Term Financial Plan.

Table 3.2b: Blue Warrnambool and Warrnambool 2040 goals and how these are addressed in this Plan

2040 Goal	Action	How Goals and Actions are addressed in this AMP
Water Sensitive Urban Design principles are used in all infrastructure and open space developments and upgrades.	Develop a Green-Blue City Plan for Warrnambool to provide a framework for integrated water management and incorporate Water Sensitive Urban Design into residential and commercial development	Alignment of new developments and gifted assets with IDM guidelines that set out the requirement in relation to a range of WSUD options from large scale detention systems to small scale detention systems.
All new developments incorporate roof water harvesting infrastructure.	Neighbourhood scale solutions for stormwater treatment and reuse.	Investigation of the most efficient policy change to achieve this Goal as improvement plan.
No stormwater enters our waterways and coast without treatment.	Contribute to management and protection of groundwater systems.	All hazards identified by risk assessment to be addressed appropriately. Targeted 100% performance of the SQIDs.

The Warrnambool City Council will exercise its duty of care to ensure public safety in accordance with the infrastructure risk management plan prepared in conjunction with this AM Plan. Management of infrastructure risks is covered in Section 6.

Improvement Action:
Investigation of most efficient policy to incorporate roof water harvesting infrastructure in all new developments.
Determine the costs to ensure the SQIDs to perform at 100%.

3.3 Legislative Requirements

There are many legislative requirements relating to the management of assets. These include:

Table 3.3: Legislative Requirements

Legislation	Requirement
Local Government Act 2020	Sets out the role, purpose, responsibilities and powers of local governments including the preparation of a long term financial plan supported by infrastructure and asset management plans for sustainable service delivery.
Road Management Act 2004	Enables the council to set out its own specific Road Management Plan and intervention levels. This enables councils to manage their network to provide a safe and responsive network for the public, in order to manage their civil liability. Road authorities lost their immunity through the removal

	of nonfeasance which gave rise to the 2004 legislation in Victoria.
Road Management (General) Regulations 2005	Sets out additional matters for the review and amendment of a Road Management Plan not contained in the 2004 Road Management Act for consultation with the community. The regulation also prescribes certain matters that must be recorded on a register of public roads and provides for the protection of roads and property. Provides for a coordinated management system for public roads including use of the road reserves for other legitimate purposes such as the provision of utility services and drainage. It defines the responsible authorities , and makes Council the controlling authority for public local roads, boundary roads and parts of declared roads within the municipal area, which also makes Council responsible for managing the infrastructure assets within them.
Transport Act 1983	Relates to the operation of the road network and regulation or prohibition of drainage discharge onto any road.
Water Act 1989	Management of the use of water resources including conservation, protection, and discharge requirements.
Environmental Protection Act 1970	Relates to the discharge, emissions, or deposits especially within drainage systems and at the point of discharge to water ways.
Wrongs Act 1958	The Act imposes several thresholds for the recovery of damages for economic and non-economic loss from personal injury and death in Victoria, as a result of negligence or fault. It defines Duty of Care and establishes the principles for determining negligence.
Integrated Water Management Framework for Victoria	A framework to deliver greater community value through consistent and strategic collaboration within the water sector – including water corporations, local governments, catchment management authorities, and links with organisations involved in land use planning.
Applicable Standards, Codes of Practice, Design Guidelines, Local Laws and Council policy and governance	Used to determine minimum standards for road construction and maintenance including drainage, basins and any drainage related infrastructure.

3.4 Customer Levels of Service

Service levels are defined service levels in two terms, customer levels of service and technical levels of service. These are supplemented by organisational measures.

Customer Levels of Service measure how the customer receives the service and whether value to the customer is provided.

Customer levels of service measures used in the asset management plan are:

Quality — How good is the service … *what is the condition or quality of the service? This is the condition score with C1 being Very good and C5 being Very poor*

Function — Is it suitable for its intended purpose …. *Is it the right service?*

Capacity/Use — Is the service over or under used … *do we need more or less of these assets?* O*ne indication of the capacity is the serviceability score with SER1 being Very good and SER5 being Very poor*

The current and expected customer service levels are detailed in Tables 3.4 and 3.5. Table 3.4 shows the expected levels of service based on resource levels in the current long-term financial plan.

Organisational measures are measures of fact related to the service delivery outcome e.g. number of occasions when service is not available, condition percent of Very Poor, Poor/Average/Good, Very good.

These Organisational measures provide a balance in comparison to the customer perception that may be more subjective.

Table 3.4: Customer Level of Service

Key Performance Indicator	Level of Service	Performance Measure	Target Performance	Current Performance
Community levels of service				
Health and safety	Drainage system is safe and hazard free	Absence of significant health and safety hazards	All hazards identified by risk assessment should be addressed appropriately	No hazards identified to date for 2019/2020 financial year.
Environmental Standards	Gross pollutants are removed from Stormwater prior to entering waterways	Performance of GPTs	100% of SQIDs are functioning as designed	< 100% functioning as designed
Responsiveness	Registered drainage complaints are timely responded	Response time for the complaints registered	100% of the customer complaints to close in time	87% of the customer complaints are closed in time

Improvement Action:

- *Determine effectiveness of GPTs*
- *Develop water quality monitoring of stormwater discharge at outfalls*

3.5 Technical Levels of Service

Supporting the customer service levels are operational or technical measures of performance. These technical measures relate to the allocation of resources to service activities that the organisation undertakes to best achieve the desired customer outcomes and demonstrate effective organisational performance.

Technical service measures are linked to the activities and annual budgets covering:

- **Operations** – the regular activities to provide services (e.g. opening hours, cleansing, street sweeping, mowing grass, inspections, etc.)
- **Maintenance** – the activities necessary to retain an asset as near as practicable to an appropriate service condition. Maintenance activities enable an asset to provide service for its planned life (e.g. cleaning of refuse/rubble, removing tree roots, replacing cracked pit lids)
- **Renewal** – the activities that return the service capability of an asset up to that which it had originally (e.g. frequency and cost of pipeline replacement),
- **Upgrade/New** – the activities to provide a higher level of service (e.g. replacing a pipeline with a larger size) or a new service that did not exist previously (e.g. drainage augmentation projects).

Service and asset managers plan, implement and control technical service levels to influence the customer service levels.

Table 3.5 shows the technical levels of service expected to be provided under this AM Plan. The 'Desired' position in the table documents the position being recommended in this AM Plan.

Table 3.5: Technical Levels of Service

Key Performance Indicator	Level of Service	Performance Measure	Desired Performance	Current Performance
Technical levels of service				
Design	Capacity in accordance with land use and IDM	Pipe capacity as per flood model	No pipes over capacity in accordance with IDM	45% of drains are under the desired level of capacity
	Serviceability	Pipe capacity not reduced by blockages, lack of maintenance or intrusions	100% of pipes with a serviceability score better than 5(SER5)	79% of pipes with a serviceability score better than SER5 (Appendix E)
	New developments and gifted assets meet current-day IDM design guidelines	Amount of infrastructure meeting current-day IDM design requirements at handover	100% alignment	TBD
Condition	Drainage maintained in good condition and fit for purpose.	Condition Score	95% of assets better than Condition Score 5(C5)	96.6% better than C5
		Renewal Planning	100% of C5 assets covered by the 15-year capital works program	15-year capital works program currently in development stage.
		Amount of network inspected each year	5% of pipe network per year	3%
Operations	Street sweeping	Frequency of Street sweeping	CBD-Daily Residential Street-Annually	CBD-Daily Residential Street-Annually

It is important to monitor the service levels provided regularly as these will change. The current performance is influenced by work efficiencies and technology, and customer priorities will change over time. Review and establishment of the agreed position which achieves the best balance between service, risk and cost is essential.

Improvement Action:

- *Develop condition inspection and inventory collection programs for all drainage asset types.*
- *Develop a 15-year works program*
- *The Current Performance of New developments and gifted assets meet current-day IDM design guidelines*

4. FUTURE DEMAND

4.1 Demand Drivers

Drivers affecting demand include things such as population and demographic changes, environmental factors influencing infrastructure capacity and design requirements, and technological change and improvements in maintenance and management of infrastructure. The main drivers are discussed as follows;

Natural Environment

It is expected climate change will influence demand for new and upgraded drainage infrastructure to address changes in rainfall intensity and storm frequency. A study of climate change impacts show Warrnambool might experience a sea-level rise of 0.49m and increased rainfall intensity by 2070. Given the cities topography and close proximity to the ocean, climate change impacts are likely to increase flooding vulnerability, frequency and impact.

Population and Demographic Changes

Population forecasts predict Warrnambool will be home to approximately 46,210 people by 2036, which is a significant increase of 28% of the current population. Significant development of current broad acre allotments will be required to meet the housing development required to house the significant population growth. It is also anticipated infill development type will change to more consolidated high density development, which will place further demand on the ageing existing stormwater system.

Finance and Economics

Factors include changes to regulations and design standards, technology advancements, material and resource cost increases. When these factors are combined it provides opportunities of increased life expectancy for new technology assets, reduced maintenance resources/costs and alternative renewal methods to prolong asset life. This also provides for improved service levels and reduction of impact from asset failure, flooding severity and social impact.

4.2 Demand Forecasts

The present position and projections for demand drivers that may impact future service delivery and use of assets were identified and are documented in Table 4.3. Warrnambool's current population is expected to grow from 36,000 in 2019 to 46,000 in 2036. This is an increase of 28% over 17 years. This growth will require the expansion of the existing stormwater network to these new growth areas as well as potential upgrade to brownfield development sites.

4.3 Demand Impact on Assets

The impact of demand drivers that may affect future service delivery and use of assets are shown in Table 4.3.

Table 4.3: Demand Drivers, Projections and Impact on Services

Demand drivers	Present position	Projection	Impact on services
Natural Environment			
Climate Change	A study on climate change impact on Warrnambool's drainage was carried out. This stated that a notable risk is posed by climate change through increasing storm surges, sea-level rise, ground-level movement, groundwater changes, temperature, and solar radiation and frequency and intensity of extreme rainfall events.	Warrnambool might experience a sea-level rise of 0.49m and increased rainfall intensity with climate change.	City more vulnerable to flooding, especially in areas like Koroit Street, Japan Street and Koroit Street intersection, Harrington Road, Morriss Road and Anthony Street.
Demographics and Land use			
New growth areas (North of Merri, West Dennington, East Warrnambool, and	Drainage infrastructure will be constructed in growth areas as per the Council's adopted growth area	It is anticipated to have an additional 8.5km of pipes, 325 pits, minimum of 25 soak pits, 15 GPT's, 7km of	Significant increase in impervious area.

Logans)	structure plans.	swales and five basins in next 10 year as per planned development.	
Increased infill developments within the urban areas	One of the recommendations of the Warrnambool City-Wide Housing Strategy is that housing densities should be expected to increase in many parts of Warrnambool.	Increase in demand for capacity on existing network or need for onsite retention	Increase in impervious areas.
Finance and Economics			
Technology improvement and utilisation	Increase in available technology for the construction, management, maintenance, and renewal of drainage infrastructure.	Further analysis is required.	Opportunity of cost savings in service delivery as well as improvement in structural integrity resulting in more life span for the assets.
Unit rate changes	Unit rate cost might increase larger than the expected rate of increase or vice versa	Further analysis is required, however consideration given in ongoing maintenance costs within LTFP.	Changes in unit cost will affect in Council's utilisation of maintenance, renewal, and capital expenses.

4.4 Demand Management Plan

Demand for new services will be managed through a combination of managing existing assets, upgrading of existing assets and providing new assets to meet demand and demand management. Demand management practices can include non-asset solutions, insuring against risks and managing failures.

Opportunities identified to date for demand management are shown in Table 4.4. Further opportunities will be developed in future revisions of this asset management plan.

Table 4.4: Demand Management Plan Summary

Demand Driver	Impact on Services	Demand Management Plan
Climate Change	City more vulnerable to flooding, especially in areas like Koroit Street, Japan Street and Koroit Street intersection, Harrington Road, Morriss Road and Anthony Street.	Warrnambool Climate Change Drainage Impact Study details the impact of Climate change and suggests the flood mitigation measures associated with it.
New growth areas	Significant increase in impervious area.	The planning and construction of drainage in new subdivisions is managed through the planning process, which includes a detailed drainage study and design for the area.
Increased infill developments	Increase in impervious areas.	All the infill developments are guided through the planning process, which should satisfy various amendments, including amendment VC154 on stormwater management.
Inadequate controls of private retention	Increased run-off beyond design capacity	No management plan in place

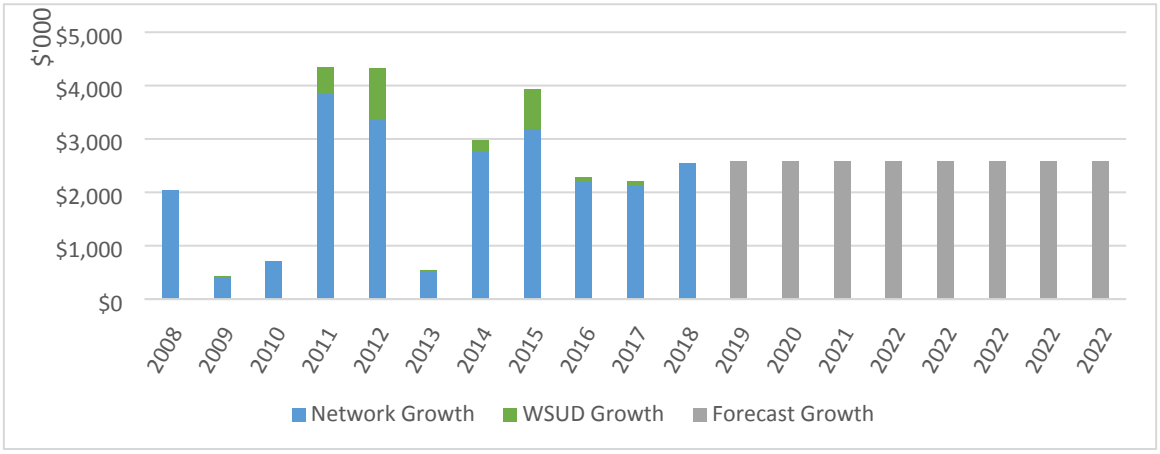
Technology improvement and utilisation	Opportunity of cost savings in service delivery as well as improvement in structural integrity resulting in more life span for the assets.	Continue to monitor and be updated with the new developments in this space.
Unit rate changes	Changes in unit cost will affect Council's utilisation of maintenance, renewal, and capital expenses.	Conduct an annual review on unit rates.

Improvement Action: Create controls relating to private retention systems

4.5 Asset Programs to meet Demand

New drainage assets are typically received through the development of land and are then gifted to Council. They can also be acquired or constructed. Additional assets are discussed in Section 5.4. The summary of the value of additional asset is shown in Figure 4.5. Although there are cycles of peaks and troughs, on average the stormwater asset base grows by $2.5M (or 3%) annually.

Figure 4.5: Annual additions to Council's stormwater network from developments and capital projects.



All subsequent values in this document are in current (real) dollars and not discounted for inflation. Acquiring these new assets will commit ongoing operations, maintenance and renewal costs for the period that the service provided from the assets is required. These future costs are identified and considered in developing forecasts of future operations, maintenance and renewal costs for inclusion in the long term financial plan further in Section 5.

These figures are only based on asset expansion to provide the existing level of service to new catchment areas in line with population growth. Refer to Section 5.4 which identifies upgrade and improvement projects to expand the capacity of the existing network to reduce the impact of flood events on current customers in line with community accepted levels of service.

Improvement Action: Assess the impact of Victorian Planning Provision VC154 on drainage requirements

5. LIFECYCLE MANAGEMENT PLAN

The lifecycle management plan details how the Warrnambool City Council plans to manage and operate the assets at the agreed levels of service (defined in Section 3) while managing life cycle costs.

5.1 Background Data

5.1.1 Physical parameters

Table 5.1a: The assets covered by this asset management plan

Asset Type	Quantity	Asset Replacement Value ($)	Asset Current Value ($)	Annual deterioration rate ($)
Pits	10,954	$17,983,421	$12,538,321	$180,298
Pipes	270,950 m	$50,921,138	$37,533,324	$505,195
Surface drains	24,017.29 m	$761,970	$698,636	$7,262
Tunnels	2,879 m	$8,211,870	$4,745,109	$53,280
Basins	18 (270,239 m2)	$4,730,487	$4,601,471	$27,215
Soak pits	300	$478,963	$355,304	$4,801
Rainwater harvesting tanks	5 (5,000 L each)	$387,839	$345,183	$3,876
Aquifer recharge bores	1	$40,020	$38,620	$200
Drainage pumps	5	$702,500	$409,666	$61,983
Backflow prevention devices	4	$41,589	$41,589	$2,310
Flood Walls	1180 m	$1,563,778	$1,518,132	$15,659
Retention cells	1	$21,240	$20,805	$435
Stormwater Quality Improvement Devices	40	$2,798,680	$2,586,223	$27,881
Swales	13,720 m2	$0	$0	$0
Rain Gardens	1,331.2 m2	$671,685	$613,724	$9,157

The age profile of the assets included in this AM Plan are shown in Figure 5.1a. There is more confidence in construction dates from 2010 onwards. Prior to this time, ages were taken from archived records and design plans which would have unlikely been constructed in the same year as being drafted.

There are 83km of pipes with an unknown age, for depreciation purposes these were assumed to be halfway through their life and given the construction date of 1975. Investigation should be done to apply appropriate ages to these assets. They are included in all graphs and models going forward.

Figure 5.1a: Asset Age Profile

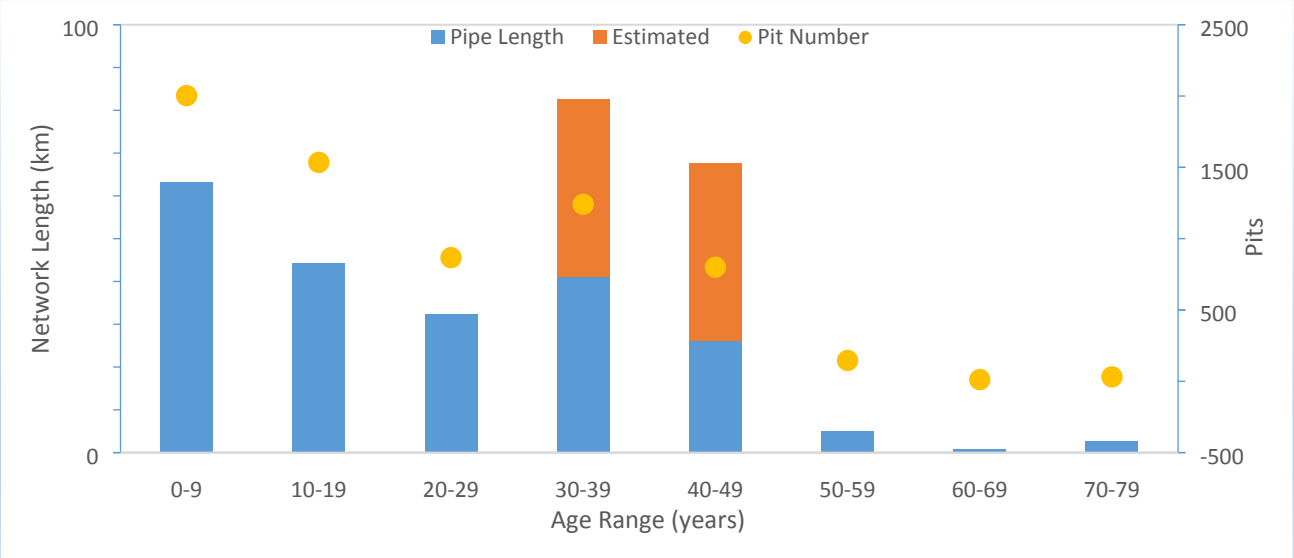
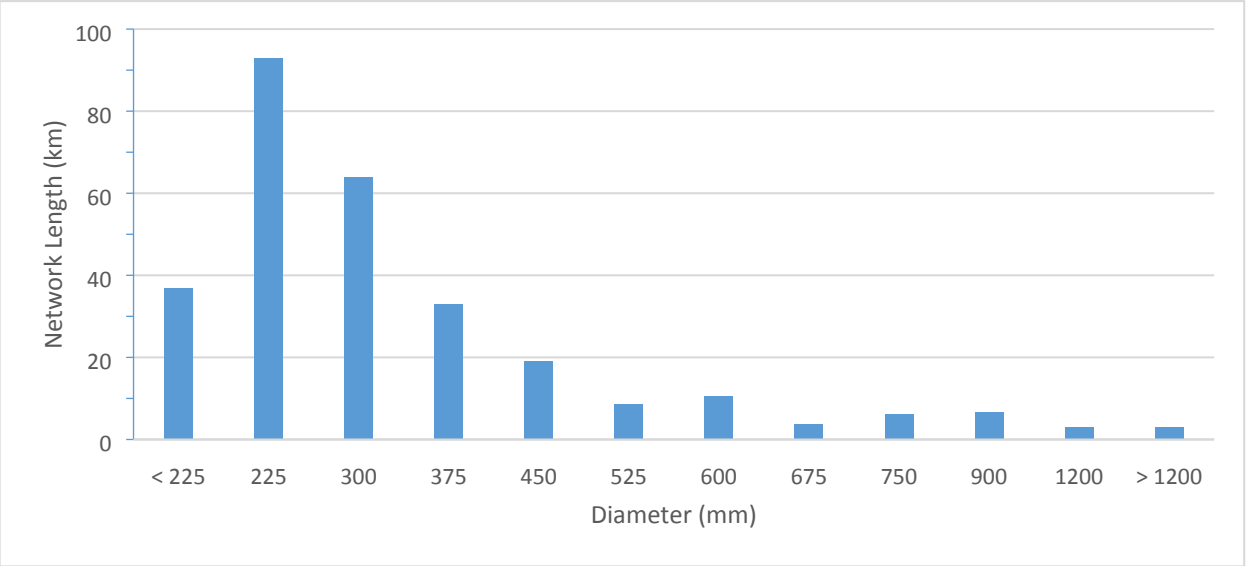


Figure 5.1b shows that most of Council's stormwater network is small in diameter, with 66% of the network being 300mm or less in diameter, these are the lines which primarily service properties and are likely to block due to their reduced capacity. Two percent of the network is 1200mm or greater. Note only significant groups are shown.

Figure 5.1b: Length of Network by Diameter



Improvement Action: Investigate best method to record accurate construction dates on all drainage assets.

5.1.2 Expected Useful Lives

Extracts of expected useful lives of different asset types are given in table 5.1.2a.

Table 5.1.2a: Expected useful lives

Asset Type	Expected useful life
Pipes	**100**
Pits	**100**
Surface drains	**100**
Tunnels	**100**
Basins	**200**
Soak pits	**100**
Rainwater harvesting tanks	**50**
Aquifer recharge bores	**200**
Drainage pumps	**20**
Backflow prevention devices	**20**
Flood Walls	**100**
Retention cells	**50**
Stormwater Quality Improvement Devices	**100**
Swales	**150**
Rain Gardens	**60**

Improvement Action: Founded on industry benchmarks, investigation to be confirmed for Warrnambool environment

5.1.3 Asset capacity and performance

Assets are generally provided to meet design standards where these are available. Locations where deficiencies in service performance are identified in Appendix E.

The capacity of pipes were assessed against their prescribed IDM standard for their designated land use. Drains in or around commercial areas, essential utilities, institutions and hospitals should have a capacity for a 5% AEP, drains in the industrial area should have a capacity to take 10% AEP and drains in residential areas should have a capacity for an 18% AEP flood event (Table 5.1.3b)

Pipes under capacity are given a score of 1 in the AMS indicating great performance. Those at capacities are given a score of 2, indicating they are meeting current demand without issue but that there is no potential for increasing the future demand under the current condition. Assets over capacity are given a score of 5 indicating a failure in their levels of service.

Table 5.1.3a: IDM drainage capacities by land use

Zone	Capacity Score		
	Under Capacity	At Capacity	Over Capacity
Commercial	1% AEP	5% AEP	10% AEP
Essential utilities/ Institutions/ Hospitals	1% AEP	5% AEP	10% AEP
Industrial	5% AEP	10% AEP	18% AEP
Residential	10% AEP	18% AEP	>20% AEP

Following an assessment of existing infrastructure under current IDM standards, about 45% of Council's drains are under capacity according to these IDM standards. Table 5.1b details the current capacity of the drainage network for various planning zones. A TUFLOW flood model calculated the maximum amount of stormwater which can flow through corresponding pipes. This model assumes no blockages, root intrusions or debris are reducing the capacity of these pipes.

Table 5.1.3b: Percentage of pipe length with corresponding capacity limits

Pipe capacity						
Zone	1%AEP (1 in 100 year event)	5% AEP (1 in 20 year event)	10% AEP (1 in 10 year event)	18% AEP (1 in 5 year event)	>20% AEP	Percentage of pipe with capacity lower than suggested flood immunity
Commercial	0.66%	14.07%	**14.73%**	**17.05%**	**53.49%**	85% (16.3km) of drainage pipes along commercial areas are lower than flood immunity as per IDM
Essential utilities/ Institutions/ Hospitals	1.40%	17.55%	**14.08%**	**9.37%**	**57.60%**	81% (13.2km) of drainage pipes along essential utility areas are lower than flood immunity as per IDM
Industrial	2.90%	21.36%	6.24%	**10.41%**	**59.09%**	69% (9.8km)of drainage pipes along Industrial areas are lower than flood immunity as per IDM
Residential	4.74%	24.46%	16.65%	14.19%	**39.86%**	39.8% (82km) of drainage pipes along residential areas are lower than flood immunity as per IDM

Flooding hotspots- Flooding hotspots are identified and prioritised under the Drainage Strategy. Twenty prioritised hotspots are considered for upgrade projects to increase the capacity of drainage.

5.1.4 Asset condition

Condition of the pipe network is determined via CCTV inspections which apply WSAA defect codes to each asset and provide an overall condition (structural) and serviceability score. An annual budget of $50,000 allows for approximately 3% of the underground drainage network to be done each year. Reinspections to determine deterioration over time have not yet been planned.

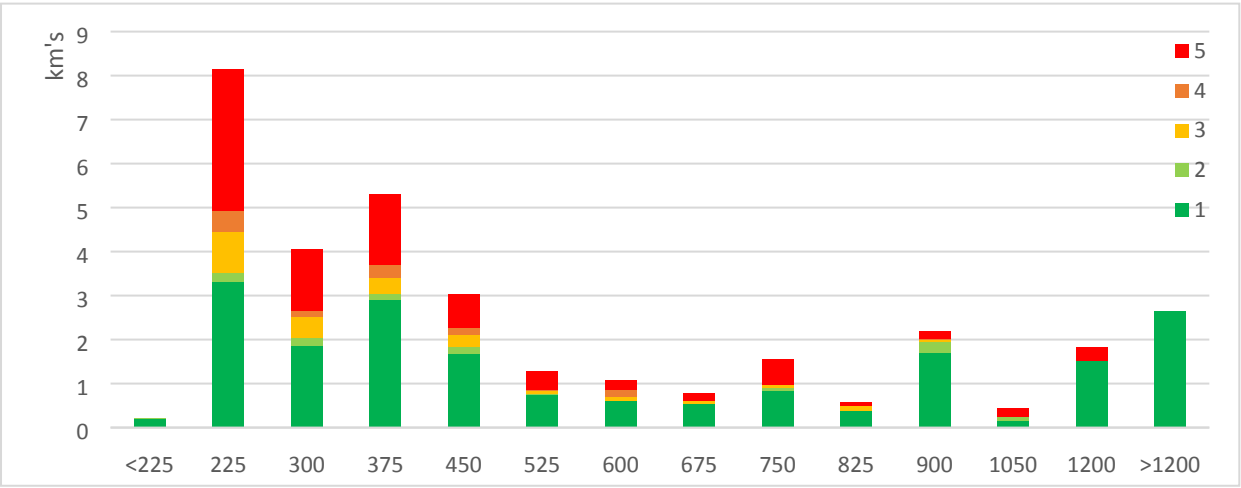
Condition is measured using a 1 – 5 grading system as detailed in Table 5.1.4a.

Table 5.1.4a: Simple Condition Grading Model

Condition Grading	Description of Condition
1	**Very Good**: only planned maintenance required
2	**Good**: minor maintenance required plus planned maintenance
3	**Fair**: significant maintenance required
4	**Poor**: significant renewal/rehabilitation required
5	**Very Poor**: physically unsound and/or beyond rehabilitation

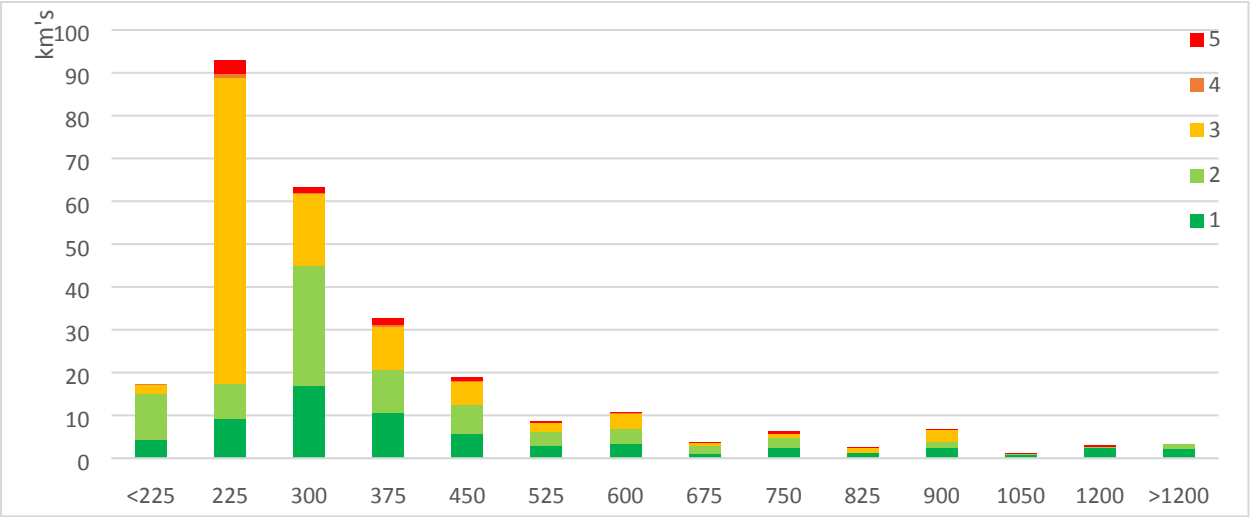
The condition profile of our each method is shown below. There appears to be a trend that the smaller the diameter of pipe, the worse the condition it will be, this may be due to the location in road reserves and how they are impacted by other works, excavation and property connections.

Figure 5.1.4a: Asset Condition Profile from Inspected Pipes by Diameter



A decision tree model using age, material, diameter, and soil salinity as inputs was created to predict condition scores for the remainder of the network which has not yet been inspected based on how these inputs affect the known sample areas. This Coarse Condition Score (CCS) was applied to all non-inspected pipes, asset-by-asset, and provides an indicative condition score for financial and renewal planning. This is believed to be a robust assessment with enough confidence for predictive renewal modelling, the confidence can be improved with ongoing condition assessments to refine the model and these scores can also be updated as actually condition information becomes available.

Fig 5.1.4b: Asset Condition Profile from Desktop Assessment by Diameter



Serviceability of drains- This score indicates the degree to which root intrusions or debris are causing blockages or reducing the capacity of the drainage system, reducing the performance of the drainage. Figure 5.1a summarises the serviceability of pipes which have been visually condition assessed. 21% of pipes have a serviceability score of 5, which suggests blockages in these pipes are greatly preventing stormwater conveyance and potentially causing flooding upstream. It is recommended to jet or root-cut these lines where the pipes are structurally sound enough to withstand the impact of these activities (Table 5.1c).

Figure 5.1.4c: Summary of network serviceability

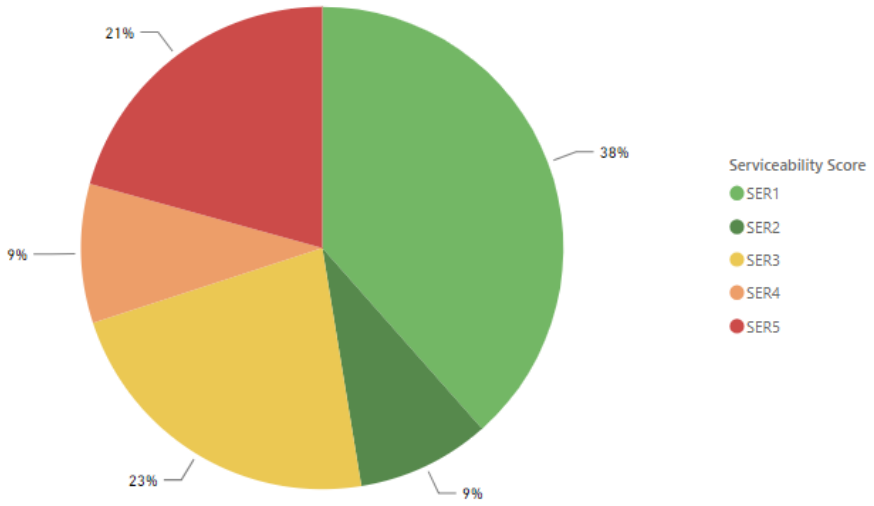


Table 5.1.4b: Length of pipe by serviceability cross referenced by structural score

	SER1	SER2	SER3	SER4	SER5	Total
C1	8,458m	1,775m	3,722m	97m	3,979m	**10,452m**
C2	362m	24m	256m	46m	405m	**1,093m**
C3	1,192m	64m	516m	368m	708m	**2,848m**
C4	653m	6m	276m	112m	188m	**1,235m**
C5	2,123m	1,098m	2,729m	1,595m	1,602m	**9,147m**
Total	**4,330m**	**2,967m**	**7,499m**	**3,097m**	**6,882m**	**24,775m**

5.2 Operations and Maintenance Plan

Operations include regular activities to provide services such as public health, safety and amenity, e.g. Condition assessments and inspections, pit cleaning, pipe jetting, street sweeping, including all labour, plant and overhead costs. This also includes staff training and development.

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, e.g. Pipe patching, pit repairs or pit cover replacements and minor repairs under the capital threshold and doesn't extend the life of the asset.

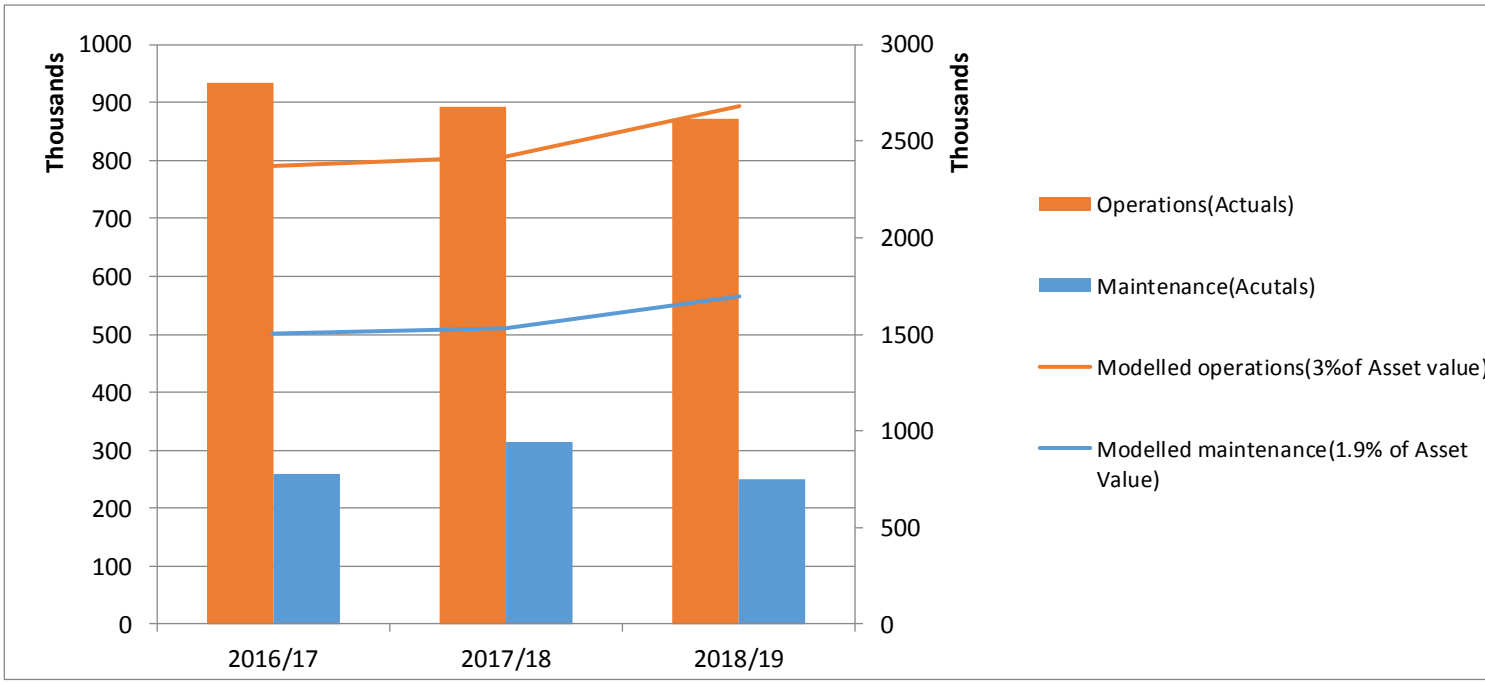
Maintenance includes all actions necessary for retaining an asset as near as practicable to an appropriate service condition including regular ongoing day-to-day work necessary to keep assets operating.

Maintenance expenditure is shown in Table 5.2.

Table 5.2: Operations and Maintenance Expenditure Trends

Year	Operations(Actuals) ,000	Maintenance(Actuals) ,000	Modelled operations(3% of Asset Value),000	Modelled maintenance(1.9%of Asset Value),000	Asset value
2016/17	$935	$258	$2,37	$1,50	$79,152,436
2017/18	$892	$314	$2,42	$1,53	$80,745,376
2018/19	$873	$250	$2,68	$1,70	$89,380,798

Fig 5.2a: Operations and Maintenance Expenditure Trends



Note: The assumptions in table 5.2 have been included within the above section of the AMP. Considering this, Council should carefully review these assumptions and resulting forecasts and update accordingly with a more accurate set of data as required. It is recommended that these forecasts should be reviewed prior to the adoption of the final 10-year budgets.

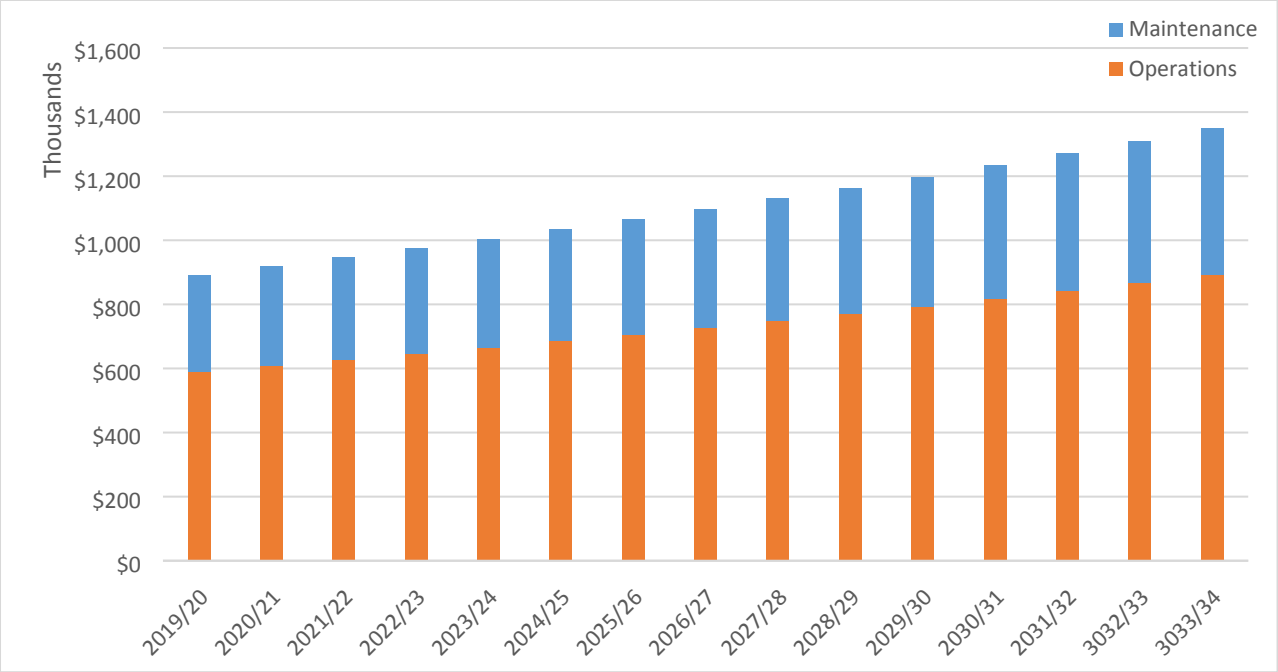
Operations and Mmaintenance expenditure levels are considered to be inadequate to meet projected service levels, which may be less than or equal to current service levels. Where maintenance expenditure levels are such that they will result in a lesser level of service, the service consequences and service risks have been identified and highlighted in this AM Plan and service risks considered in the Infrastructure Risk Management Plan.

IA: Test the assumptions used to model operational and maintenance expenditure to determine if rates are appropriate
Refine actual O&M expenditure to ensure all appropriate drainage activities are covered

Summary of future operations and maintenance expenditures

Future operations and maintenance expenditure is forecast to trend in line with the value of the asset stock as shown in Figure 5.2b.

Figure 5.2b: Projected Operations and Maintenance Expenditure



This expenditure is in line with the drafted levels of service agreed upon by the Drainage Working Group. It allows for extremely high priority assets to be done every two years, and low priority assets only once in 15 years. These are set to also increase by 3% annually in line with the growth of the asset base. As this is the first time we are defining levels of service for maintenance, as opposed to being reactive driven by customer requests, this level of service should be reviewed annually in line with community and budget expectations.

Deferred maintenance, i.e. works that are identified for maintenance and unable to be funded are to be included in the risk assessment and analysis in the infrastructure risk management plan.

Maintenance is funded from the operating budget where available. This is further discussed in Section 7.

5.3 Renewal/Replacement Plan

Renewal and replacement expenditure is major work which restores, rehabilitates, replaces or renews an existing asset to its original service potential without increasing the asset's design capacity. Work over and above restoring an asset to original service potential is considered to be an upgrade or new work expenditure resulting in additional future operations and maintenance costs.

5.3.1 Renewal ranking criteria

Asset renewal and replacement is typically undertaken to either:

- Ensure the reliability of the existing infrastructure to deliver the service it was constructed to facilitate (e.g. replacing a pipe that has partially collapsed), or
- To ensure the infrastructure is of sufficient quality to meet the service requirements (e.g. Drains water to reduce pooling and ponding).

It is possible to get some indication of capital renewal and replacement priorities by identifying assets or asset groups that:

- Have a high consequence of failure,
- Have high use and subsequent impact on users would be greatest,
- Have a total value representing the greatest net value,
- Have the highest average age relative to their expected lives,
- Are identified in the AM Plan as key cost factors,
- Have high operational or maintenance costs, and
- Have replacement with a modern equivalent asset that would provide the equivalent service at a savings.

The ranking criteria used to determine priority of identified renewal and replacement proposals is detailed in Table 5.3.

Table 5.3: Renewal and Replacement Priority Ranking Criteria

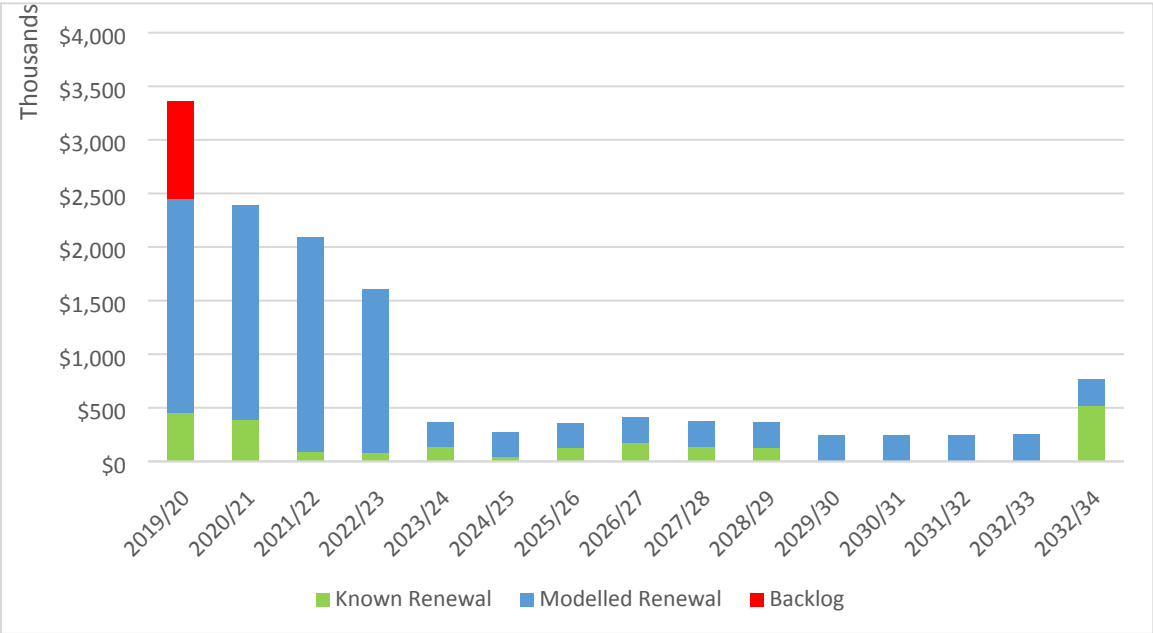
Criteria	Priority level
Assets with an alarming defect and zero or no remaining life, criticality score 4 & 5 and extremely high risk	1 (Extreme high)
Assets with an alarming defect and up to 10-year remaining life with criticality score 3 and high risk	2 (High)
Assets with a significant defect and up to 15-year remaining life with criticality score 2 and medium risk	3 (Medium)
Assets with a significant defect and more than 15-year remaining life with criticality score 1 and low risk	4 (Low)

5.3.2 Summary of future renewal and replacement expenditure

Projected future renewal and replacement expenditures are forecast to increase over time when the asset stock increases. The expenditure is required is shown in Figure 5.3.

The projected capital renewal and replacement program is shown in Appendix A.

Figure 5.3: Projected Capital Renewal and Replacement Expenditure



It is not deemed appropriate to use age alone as a measure for future renewal requirement as there are no assets which have reached the standard useful life, and no significant renewal expenditure to determine the appropriateness of this life - it is merely an industry benchmarked average.Estimates of remaining useful life for those assets in condition 5 tend to be conservative due to the fact they may fail at any time. However they may also last years beyond this estimate. This also makes it is difficult to determine the remaining useful lives accurately in the mid to long-term period.

Pipes

There are varying levels of confidence in sources of renewal requirement. There is high confidence in the cost and treatment requirement identified from CCTV inspections over the years. These have been reviewed, treatments proposed, and costed. All pipes known to be in condition 5 total $1.7M in replacement cost. As these audits cover 12% of the network and assumed to be a representative sample, this suggests 77km of the network is in condition 5 and due for renewal in the near future at a potential cost of $6.9M, however relining or patching may offer cheaper alternatives.

Pits

Various components of pits are given condition scores, with walls acting as the indicator of overall condition. Of the assessed pits, 274 (9%) are condition 5. It is likely to cost $411k to replace all of these. If this is applied to all pits, 1030 may require replacing at a cost of $1.5M.

Basins

Condition of basins, swales and rain gardens are unknown and not identified in the renewal requirement above. It could be argued that these can be maintained without capital renewal investment. Investigation is required to determine if Lake Pertobe requires renewal works and to what extent.

Deferred renewal and replacement (those assets identified for renewal and/or replacement and not scheduled in capital works programs) are to be included in the risk analysis process in the risk management plan.

Renewal expenditure in the capital works program will be accommodated in the long term financial plan. This is further discussed in Section 7.

5.4 Creation/Acquisition/Upgrade Plan

New works are those that create a new asset that did not previously exist, or works which will upgrade or improve an existing asset beyond its existing capacity. They may result from growth, social or environmental needs. Assets may also be acquired at no cost. These additional assets are considered in Section 4.4.

5.4.1 Selection criteria

New and upgrade projects are identified from various sources such as community requests, proposals identified by strategic plans or partnerships with others. Candidate proposals are inspected to verify need and to develop a preliminary project estimate. Verified proposals are ranked by priority and available funds and scheduled in future works programmes. The priority ranking criteria detailed below was developed by Water Tech during their drafting of the Drainage Strategy .

Table 5.4.1a: Prioritisation of Flood Study Projects

Weighting	Properties Flooded	Depth >150mm	Depth >300mm	Depth >500mm
	0.25	1	2	3

The flooding hotspots identified in the flood study were assessed using maximum depth results for the 1% AEP flood event. The number of properties and building footprints within the flood extent were identified for each area as well as the maximum depth of flooding within building footprints classified into flooding above 150mm, 300mm & 500mm depth. The parcels within each category were then counted and a weighting (Table 5.4.1a) was used to develop the criteria assessment for current flood risk.

A multi-criteria assessment was then used to select the 20 flooding hotspots where further investigation would be undertaken. This utilised the above flood risk assessment weighting as well as four additional criteria. These included the likely number of properties to have a reduced flood risk, an estimate of the overall cost, likely interest/support from Council (based on meetings with WCC) and constructability. Public Safety was also included in the analysis by assessing the maximum velocity or flood hazard (product of depth and velocity) for each of the flooding hotspots (Table 5.4b).

Table 5.4.1b Multi-Criteria Assessment Weighting

Criteria	Weighting	Classification		
Reduction in Flood Risk (Properties)	1.5	N/A (Number of properties)		
Cost	20	Low 1 (<$50,000)	Medium 2 ($50,000-$1,000,000)	High 3 (>$1,000,000)
Public Safety	5	Low 1 (Velocity < 2 m/s or Flood Hazard < 0.2m^2/s)	Medium 2 (Velocity 2-3 m/s or Flood Hazard 0.2 – 0.3m^2/s)	High 3 (Velocity > 3 m/s or Flood Hazard > 0.3m^2/s)
Interest / Support	5	Low -5 (Not Wanted)	Medium 1	High 5 (Priority)
Constructability Difficulty (Including disruption/ consultation/ technical design	10	Low 3 (minor works)	Medium 1 (Consultation Required)	High -10 (eg. major disruption, new tunnel outlet)

Table 5.4.1c Cost benefit analysis of top 20 Flooding Hotspots

Please refer to Drainage Strategy and Appendix B for and the description of Area of Interest (AOI)

Mitigation Option	Average Annual Damages	Annual Maintenance Cost	Actual Cost Saving(Reduction in AAD)	Net Present Value (6%)	Project Capital Cost	Cost-Benefit Ratio
AOI 2: Additional pipe capacity / raised kerb	$248,236	$6,346	$198,672	$2,842,307	$345,054	8.10
AOI3: New Pipe alignment along Banyan St	$20,850	$5,066	$297	$4,173	$264,439	0.02
AOI 7&10: Mitigation / ongoing Racecourse project. Re-orientated retention basin.	$2,620 $3,733	$2,584	$10,842	$152,461	$141,397	1.08
AOI 12: Mitigation pipe	$ 7,742	$2,131	$3,492	$49,107	$113,759	0.43
AOI 14: Raise kerb & new retarding basin	$3,149	$754	$902	$12,686	$43,070	0.29
AOI 19 & 35: Install new retarding basin & pipe upgrade	$4,006	$8,670	$-5,225	$-73,475	$462,534	-0.16
AOI 21: Increase pipe size & new pits	$28,854	$441	$16,069	$225,966	$27,019	8.36
AOI 23: Stormwater harvesting	$1,838	$8,011	$-7,091	$-99,721	$415,619	-0.24
AOI 24: Diversion pipe along Timor St	$43,590	$3,048	$19,288	$271,234	$165,210	1.64
AOI 30: Additional Pits & Raised Kerb	$268,201	$13,716	$-7,951	$-111,810	$730,308	-0.15
AOI 33&48: Pipe upgrade	$3,501	$2,719	$16,382	$230,377	$148,290	1.55
AOI39: Mitigation pipe & regrading road	$207	$8,670	$-5225	$73,475	$462,534	-0.16
AOI 40&44: New retarding basin and pipe	$20,883	$10,500	$-9,426	$-135,556	$552,124	-0.24
AOI 42: Divert north to Racecourse	$5,393	$5,151	$-4,026	$-56,508	$268,763	-0.21
Kelp Street Diversion Pipe	$1,464,425	$10,913	$51,556	$725,002	$591,498	1.23
AOI 40 only: New retarding basin and pipe	$20,874	$6,750	$-5685	$-65,238	$356,869	-0.22

5.4.2 Summary of future upgrade/new assets expenditure

Projected upgrade/new asset expenditures are summarised in Figure 5.4a. The projected upgrade/new capital works program is shown in Appendix B.

Figure 5.4.2a: Projected Capital Upgrade/New Asset Expenditure

Expenditure on new assets and services in the capital works program will be accommodated in the long term financial plan but only to the extent of the available funds

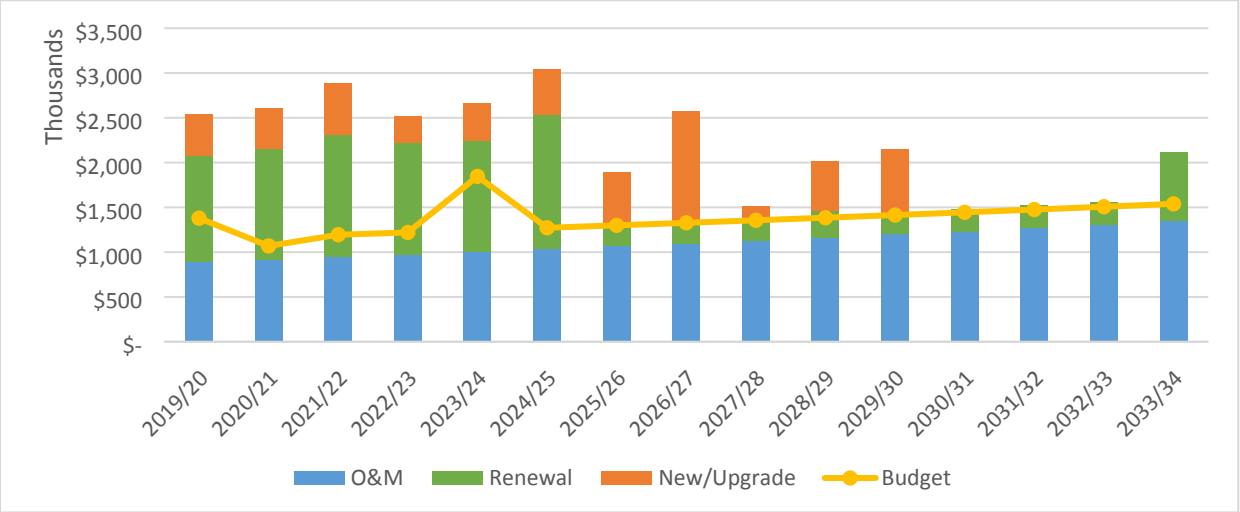
Raising the levels of service results in an increase in future renewal liability, whether pipes are duplicated, enlarged, or retention basins installed, these will all add to the renewal requirement in years to come. Acquiring these new assets will also commit the funding of ongoing operations and maintenance costs for the period that the service is provided, which is typically indefinitely.

5.5 Summary of asset expenditure requirements

The financial projections from this asset plan are shown in Figure 5.4.2b for projected operating (operations and maintenance) and capital expenditure (renewal and upgrade/expansion/new assets).

The bars in the graphs represent the anticipated budget needs required to achieve lowest lifecycle costs, the budget line indicates what is currently available. The gap between these informs the discussion on achieving the balance between services, costs and risk to achieve the best value outcome.

Figure 5.4.2b: Projected Operating and Capital Expenditure



Operational costs will steadily grow as the asset base continues to increase in line with land development, the recurrent generally increases in line with this growth. We are currently funding to meet the Operations and Maintenance and slight renewal. The majority of renewal is not funded and will increase in future years. Identified new and upgrade works are not funded.

5.6 Disposal Plan

Disposal includes any activity associated with the disposal of a decommissioned asset including sale, demolition or relocation. Assets identified for possible decommissioning and disposal are shown in Table 5.5, together with estimated annual savings from not having to fund operations and maintenance of the assets. These assets will be further reinvestigated to determine the required levels of service and see what options are available for alternate service delivery, if any. Disposal of drainage infrastructure may occur under the following conditions:

A request made by the community which is approved by Council.
Following the study of demand, it is demonstrated that an asset receives low or no usage and thus continual expenditure on maintaining the asset is not justified.
An asset handed over to private interest or other authority.

Table 5.5: Assets Identified for Disposal

Asset	Reason for Disposal	Timing	Disposal Expenditure	Operations & Maintenance Annual Savings
Asbestos pipes	Phasing out of dangerous substances	Subject to failure and identification of maintenance issues.	To be determined on case by case basis	To be determined.
Flood prone sites	Pipes of inadequate capacity.	Subject to 15 year capital plan	To be determined on case by case basis	To be determined.
Japan Street tunnel (abandoned section)	Asset no longer in service	Subject to 15 year capital plan	To be determined.	To be determined.

Council uses approved contractors with respect to the removal of asbestos pipes for the correct OHS and disposal requirements.

IA: To determine cost to dispose assets.

6. RISK MANAGEMENT PLAN

The purpose of infrastructure risk management is to document the results and recommendations resulting from the periodic identification, assessment and treatment of risks associated with providing services from infrastructure, using the fundamentals of International Standard ISO 31000:2009 Risk management – Principles and guidelines.

Risk Management is defined in ISO 31000:2009 as: 'coordinated activities to direct and control with regard to risk.

An assessment of risks associated with service delivery from infrastructure assets has identified critical risks that will result in loss or reduction in service from infrastructure assets or a 'financial shock'. The risk assessment process identifies credible risks, the likelihood of the risk event occurring, the consequences should the event occur, develops a risk rating, evaluates the risk and develops a risk treatment plan for non-acceptable risks.

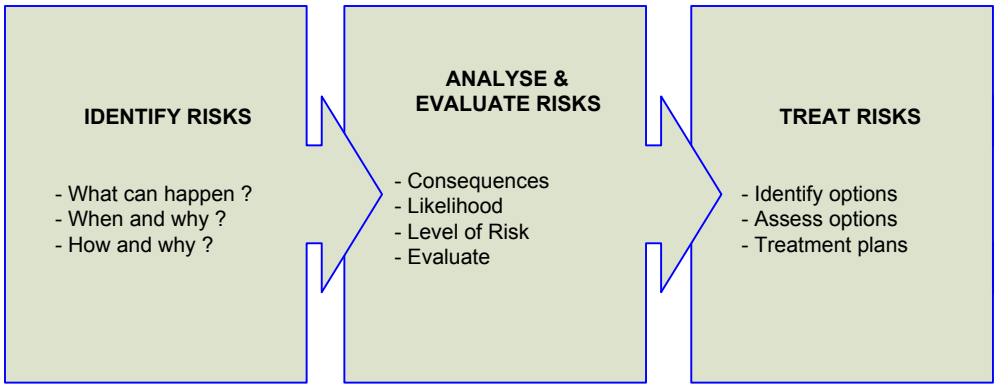
6.1 Risk Assessment

The risk management process used in this project is shown in Figure 6.2 below.

It is an analysis and problem solving technique designed to provide a logical process for the selection of treatment plans and management actions to protect the community against unacceptable risks.

The process is based on the fundamentals of the ISO risk assessment standard ISO 31000:2009.

Fig 6.2 Risk Management Process – Abridged



The risk assessment process identifies credible risks, the likelihood of the risk event occurring, the consequences should the event occur, develops a risk rating, evaluates the risk and develops a risk treatment plan for non-acceptable risks.

An assessment of risks associated with service delivery from infrastructure assets has identified the critical risks that will result in significant loss, 'financial shock 'or a reduction in service.

An assessment of overall asset risk classification was undertaken to determine what the percentage of drainage network (underground pits and pipes) was that sat within each category of the risk matrix. The summary is provided in Table 6.2.1 and Table 6.2.2.

Council has developed a criticality and risk model derived from a variety of factors as detailed below:

- **Consequence of failure:**
    - Location of infrastructure (at road reserve, under road or rail, below the building) - to assess the extent of impacts like road closure and economic impacts.
    - Flood depth as per flood model - to assess the impact due to the depth of flooding
    - Density of the areas, to assess the impact due to loss of service
    - Critical facilities - If the infrastructure is servicing critical facilities like hospitals, schools, etc.

- Cause of pollution
- Catchment area

- **Likelihood of failure:**
  - Material
  - Age
  - Asset Condition
  - Soil profile
  - Coarse condition of the soil, including the salinity of the soil.

Table 6.2.1: Risk matrix

Probability	Consequence(Percentage of the network)			
	Low (Minor)	Medium (Moderate)	High (Significant)	Extreme high (Catastrophic)
0-5 (Rare)	0.18%	9.12%	1.01%	0.02%
6-10 (Unlikely)	0.88%	24.47%	19.61%	0.56%
11-15 (Moderate chance)	0.27%	20.66%	18.07%	**1.17%**
16-21 (Likely)	0.14%	1.57%	**1.36%**	**0.91%**

Table 6.2.2: Drainage Network Risk Analysis

Risk Hazard Level	Percentage of network	Description
Extreme High Risk	**3.44%**	Extreme high-risk assets are the ones who have high consequence and probability. Risks are more associated with flooding of the depth of more than 500mm and failure of tunnels/ raising mains.
High Risk	**20.21%**	High-risk ones are the assets with a significant consequence of failure, and events have a moderate chance to happen. In case of drainage, it is more about flooding.
Medium Risk	**40.43%**	Medium risk assets are the assets have medium consequence and probability.
Low Risk	**35.92%**	Low-risk assets are the ones with low consequence and probability.

The risk register in Appendix D of the document identifies 2 “unacceptable risks” in the delivery and management of drainage infrastructure.

Potential failure modes and impacts are shown as follows;

Failure Mode	Impact
Urban/ built-in areas with experiencing flooding of depth more than 500mm	Public safety and amenity Property damage Financial Loss
Sinkholes due to failure of tunnels	Public safety and amenity Property damage Financial Loss

By identifying critical assets and failure modes investigative activities, condition inspection programs, maintenance and capital expenditure plans can be targeted at the critical areas.

6.2 Critical Assets

Critical assets are defined as those which have a high consequence of failure causing significant loss or reduction of service. Similarly, critical failure modes are those which have the highest consequences. These are thought to be assets which demonstrate attributes like >900mm diameter, have backflow prevention, have litter traps, or pits >5m deep, are considered critical assets.

Critical assets have been identified and their potential failure mode and the impact on community and service delivery. The critical assessment maps are shown in Appendix G.

Following factors were considered in determining critical assets:

Consequence of failure	
Location of infrastructure	At regionally significant Lifelines Facility(Hospitals), Schools, Arterial roads, Buildings, City Centre, Under Train track, Industrial zones.
Flooding Factor	Flood depth as per flood model to assess the impact due to the depth of flooding
Density of the areas	To assess the impact due to loss of service
Critical facilities	If the infrastructure is servicing critical facilities like hospitals, schools, etc.
Cause of pollution	Asset with no GPT/Swales/Raingardens or leading to or near to pollution prone areas.
Catchment area	Basins with catchment Area with area >500,000,000 sq. metre

By identifying critical assets and failure modes investigative activities, condition inspection programs, maintenance and capital expenditure plans can be targeted at the critical areas.

Critical risks are assessed with ‘Extreme High’ (requiring immediate corrective action) and ‘High’ (requiring corrective action) risk ratings identified in the Infrastructure Risk Management Plan. The residual risk after the selected treatment plan is implemented is shown in Appendix H. These risks and costs are reported to management.

IA:
Determine if risks are acceptable or additional controls are needed.
Calculate costs associated with mitigating risks

6.3 Infrastructure Resilience Approach

The resilience of our critical infrastructure is vital to our customers and the services we provide. To adapt to changing conditions and grow over time we need to understand our capacity to respond to possible disruptions and be positioned to absorb disturbance and act effectively in a crisis to ensure continuity of service.

Resilience is built on aspects such as response and recovery planning, financial capacity and crisis leadership.

Our current measure of resilience is shown in Table 6.4 which includes the type of threats and hazards, resilience assessment and identified improvements and/or interventions.

Table 6.4: Resilience

Threat / Hazard	Resilience LMH	Improvements / Interventions
Infill Development - Increased demand for capacity on existing networks	Low	Understanding capacity issues of existing network and impacts to that. Model infill development impacts Preparation of a drainage strategy using the current data, modelling and investigations that have been completed. Have drainage fund available for large capacity projects via drainage reserve. Funding capacity is available
Climate Change impacts – Rising sea levels	Low	Model sea level rise to identify impact areas Consideration to infrastructure treatments i.e. backflow prevention
Climate Change impacts – high intensity storm events	Low	Flood modelling Modelling network capacity issues Retention and diversion infrastructure
Climate Change impacts – rise in riverine flooding	Low	Flood modelling Modelling network capacity issues Retention and diversion infrastructure
Environmental impact – gross pollutants within waterways and drainage points.	Low	Formalise inspection program for current GPT's installed Carry out routine maintenance for GPT repair and operational upkeep. Carry out routine operational maintenance (i.e. cleaning)

6.4 Service and Risk Trade-Offs

The decisions made in adopting this AM Plan are based on the objective to achieve the optimum benefits from the available resources.

6.4.1 What we cannot do

There are some operations and maintenance activities and capital projects that are unable to be undertaken within the next 10 years. These include:

- Provide a fully compliant drainage network to meet the capacity requirements of the Infrastructure Design Manual.
- Complete condition assessments for all drainage assets.
- Address and mitigate all flood hot spot areas as identified in the Drainage Study.
- Address and mitigate impacts of climate change on Council drainage infrastructure (i.e. outfall management impact due to sea level rise).
- Improve stormwater discharge quality to align with the performance targets within the CSIRO guidelines.

6.4.2 Service trade-off

Operations and maintenance activities and capital projects that cannot be undertaken will maintain or create service consequences for users. These include:

- Property owners will continue to be impacted by overland flooding during heavy storm events.
- Stormwater discharge water quality may continue to impact on water body quality.
- Delayed renewal and replacement of existing drainage infrastructure assets.
- Reduction of investment and provision of new and upgraded drainage infrastructure.

6.4.3 Risk trade-off

The operations and maintenance activities and capital projects that cannot be undertaken may maintain or create risk consequences. These include:

- Reduction in serviceability or failure of critical drainage infrastructure
- Stormwater drainage failure risk remains due to gaps in asset condition assessment data.
- Property owners will continue to be impacted by overland flooding during heavy storm events.
- Stormwater discharge water quality may continue to impact on water body quality.

These actions and expenditures are considered in the projected expenditures, and where developed are included in the Risk Management Plan.

7. FINANCIAL SUMMARY

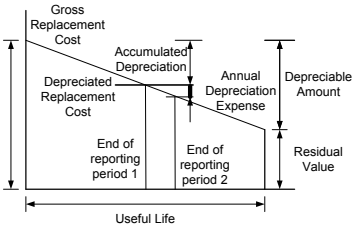
This section contains the financial requirements resulting from all the information presented in the previous sections of this asset management plan. The financial projections will be improved as further information becomes available on desired levels of service and current and projected future asset performance.

7.1 Financial Statements and Projections

7.1.1 Asset valuations

The best available estimate of the value of assets included in this Asset Management Plan are shown below. Assets are valued at fair value, using greenfield construction rates, condition and age as inputs to determine depreciated replacement cost and considerate of any impairment

Gross Replacement Cost	$89,380,798
Depreciable Amount	$89,380,798
Depreciated Replacement Cost	$66,109,536
Annual Average Asset Consumption	$897,765



7.1.1 Sustainability of service delivery

Two key indicators for service delivery sustainability that have been considered in the analysis of the services provided by this asset category, these being the:

- asset renewal funding ratio
- medium term budgeted expenditures/projected expenditure (over 10 years of the planning period).

Asset Renewal Funding Ratio

The 5-year average of the Asset Renewal Funding Ratio is currently 60% (Table 7.1a). This Ratio indicates that we are only funding 60% of Council's renewal requirement on average, this shortfall adds to the renewal gap which has been growing over

time. The peak in asset renewal in 2018-19 was due to the Simpson Street tunnel relining project. Although this project was fully funded, minor pipe networks were still neglected.

Table 7.1a: Asset Renewal Funding Ratio

Year	17/18**($000)**	18/19**($000)**	19/20**($000)**	20/21**($000)**	21/22**($000)**	5-year average
Actual(Budget)	$102	$3,109	$175	$216	$325	$785
Renewal Requirement	$550	$4,221	$530	$596	$616	$1,303
Renewal Ratio	19%	74%	33%	36%	53%	60%

*Values shown in $'000

Medium term – 10 year financial planning period

This asset management plan identifies the projected operations, maintenance and capital renewal expenditures required to provide an agreed level of service to the community over a 10 year period. This provides input into 10 year financial and funding plans aimed at providing the required services in a sustainable manner.

These projected expenditures may be compared to budgeted expenditures in the 10 year period to identify any funding shortfall. In a core asset management plan, a gap is generally due to increasing asset renewals for ageing assets.

The projected operations, maintenance and capital renewal expenditure required over the 10 year planning period is $1.9 Million on average per year. Estimated (budget) operations, maintenance and capital renewal funding is $941,538 on average per year giving a 10 year funding shortfall of $958,312 per year. As most of the new assets comes from new development of which Council has a little control in timing, upgrade/new assets have been excluded from this chapter.

Providing services from infrastructure in a sustainable manner requires the matching and managing of service levels, risks, projected expenditures and financing to achieve a financial indicator of approximately 1.0 for the first years of the asset management plan and ideally over the 10-year life of the Long Term Financial Plan.

7.1.2 Projected expenditures for long term financial plan

Table 7.1b shows the projected expenditures for the 10 year long term financial plan as of 2019.

Table 7.1b: Projected Expenditures for Long Term Financial Plan

Year	Operations & Maintenance **($000)**	Projected Capital Renewal **($000)**	Capital Upgrade/ New **($000)**	Disposals **($000)**
2019/20	$892	$1,185	$460	-
2020/21	$919	$1,233	$450	-
2021/22	$946	$1,367	$578	-
2022/23	$975	$1,241	$297	-
2023/24	$1,004	$1,242	$416	-
2024/25	$1,034	$1,503	$505	-
2025/26	$1,065	$1,185	$592	-
2026/27	$1,097	$236	$1,246	-
2027/28	$1,130	$238	$141	-
2028/29	$1,164	$1,185	$552	-

7.2 Funding Strategy

Funding for assets is provided from the budget and long term financial plan.

Council may, as a result of this plan, consider the funding or treatment arrangements over the coming years to manage the discrepancies between available and required renewal funding amounts to ensure the existing service levels are maintained. If this cannot be achieved, Council may alternatively decide to achieve a lower level of service for drainage infrastructure and manage the associated additional risk.

7.3 Valuation Forecasts

Asset values are forecast to increase as additional assets are added to the service, as well as the increased construction costs in line with CPI.

Additional assets will generally add to the operations and maintenance needs in the longer term, as well as the need for future renewal. Additional assets will also add to future depreciation forecasts.

Determination of future renewal demand in today's dollars is also likely to underestimate Council's future liability.

7.4 Key Assumptions Made in Financial Forecasts

This section details the key assumptions made in presenting the information contained in this asset management plan. It is presented to enable readers to gain an understanding of the levels of confidence in the data behind the financial forecasts.

Key assumptions made in this asset management plan are:

Table 7.4: Key Assumptions made in AM Plan and Risks of Change

- All figures are in current day dollars and do not account for inflation
- Budgets increase by 2% annually
- Growth of the asset base will continue with the previous 10-year average

7.5 Forecast Reliability and Confidence

The expenditure and valuations projections in this AM Plan are based on best available data. Currency and accuracy of data is critical to effective asset and financial management. Data confidence is classified on a 5 level scale in accordance with Table 7.5.

Table 7.5: Data Confidence Grading System

Confidence Grade	Description
A Highly reliable	Data based on sound records, procedures, investigations and analysis, documented properly and agreed as the best method of assessment. Dataset is complete and estimated to be accurate ± 2%
B Reliable	Data based on sound records, procedures, investigations and analysis, documented properly but has minor shortcomings, for example 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 to be accurate ± 10%
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 are available. Dataset is substantially complete but up to 50% is extrapolated data and accuracy estimated ± 25%
D Very Uncertain	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 ± 40%
E Unknown	None or very little data held.

The estimated confidence level for and reliability of data used in this AM Plan is shown in Table 7.5.1.

Table 7.5.1: Data Confidence Assessment for Data used in AM Plan

Data	Confidence Assessment	Comment
Population Growth and Demand drivers	A	Derived from Census report.
Acquisition forecast	C	Averages of past acquisitions, this is largely dependent on developers of which Council has little control. The Drainage Strategy identifies additional asset requirements.
Operation forecast	C	Opex is budget driven, not service driven, compare against 3% of asset base value.
Maintenance forecast	D	Limited maintenance records, budget driven, compare against 1.9% of asset base value.
Renewal forecast	D	Renewal estimates only, no CW to test assumptions
Asset values	C	Based on tender rates, but no actual invoices, some asset types have never been reconstructed
Asset useful lives	C	Founded on industry benchmarks, have not been confirmed for Warrnambool environment
Condition modelling	C	Only 12% of network condition assessed, drivers have been extrapolated to rest of network in a desktop exercise (coarse condition rating)
Disposal forecast	C	Identified disposals have not been confirmed or costed

IA: To improve the Confidence Level from Uncertain/Very Uncertain(C, D) to Reliable (B) as a minimum

8. PLAN IMPROVEMENT AND MONITORING

8.1 Status of Asset Management Practices

8.1.1 Accounting and financial data sources

All financial processes including budgets, forecasts, profiling and transactions are recorded in Council's corporate financial system Technology One. Asset valuation, depreciation and capitalisation occur in excel.

8.1.2 Asset management data sources

Council's drainage asset data is stored in Conquest. The accuracy and extent of data across the various asset categories varies significantly, however the asset register attribute data includes the structure location, description, dimension, condition, function, replacement cost, written down value, useful life, construction date and more.

Drainage assets are also represented spatially using Council's geographic information system (GIS) MapInfo and QGIS. As the GIS platforms integrate with Conquest, all data is stored and maintained solely within Conquest providing confidence in having a single point of truth for asset data.

8.2 Improvement Plan

The asset management improvement plan generated from this asset management plan is shown in Table 8.1.

Table 8.1: Improvement Plan

Action No	Section / Reference	Task	Responsibility	Timeline
1.	2.1	Split roles and responsibilities matrix by each drainage asset types for clarity	Coordinator Strategic Asset Management	Short term
2.	3.1	Ensure the AMP review focuses on community levels of service	Coordinator Strategic Asset Management	Immediate
3.	3.1	Introduce drainage satisfaction questions to the Victorian Local Government Satisfaction Survey	Coordinator Strategic Asset Management	Medium term
4.	3.2	Investigation of most efficient policy to incorporate roof water harvesting infrastructure in all new developments.	Coordinator Infrastructure Management	Medium term
5.	3.2	Determine the costs to ensure the SQIDs to perform at 100%.	Coordinator Infrastructure Management	Medium term
6.	3.4	Determine effectiveness of GPTs	Coordinator Infrastructure Management	Medium term
7.	3.4	Develop water quality monitoring of stormwater discharge at outfalls	Coordinator Natural Environment	Medium term
8.	3.5	Develop condition inspection and inventory collection programs for all drainage asset types.	Coordinator Strategic Asset Management	Immediate
9.	3.5	Develop a 15-year works program	Coordinator Strategic Asset Management	Short term
10.	3.5	The Current Performance of New developments and gifted assets meet current-day IDM design guidelines	Coordinator Infrastructure Management	Medium term
11.	4.4	Create controls relating to private retention systems	Coordinator Infrastructure Management	Medium term
12.	4.5	Assess the impact of Victorian Planning Provision VC154 on drainage requirements	Coordinator Infrastructure Management	Short term
13.	5.1	Investigate best method to record accurate construction dates on all drainage assets.	Coordinator Infrastructure Management	Short term
14.	5.1.2	Useful lives of assets based on industry benchmarks, investigation to be confirmed for Warrnambool environment	Coordinator Strategic Asset Management	Long term
15.	5.2	Test the assumptions used to model operational and maintenance expenditure to determine if rates are appropriate	Coordinator Strategic Asset Management	Medium term
16.	5.2	Refine actual O&M expenditure to ensure all appropriate drainage activities are covered	Coordinator Strategic Asset Management	Medium term
17.	5.6	To determine cost to dispose assets.	Coordinator Infrastructure	Short term

			Management	
18.	6.2	Determine if risks are acceptable or additional controls are needed.	Coordinator Infrastructure Management	Medium
19.	6.2	Revision of Criticality Inputs	Coordinator Strategic Asset Management	Long term
20.	6.2	Calculate costs associated with mitigating risks	Coordinator Strategic Asset Management	Medium term
21.	7.5	To improve the Confidence Level from Uncertain/Very Uncertain(C,D) to Reliable(B) as a minimum	Coordinator Strategic Asset Management	Medium term

8.3 Monitoring and Review Procedures

This asset management plan will be reviewed during annual budget planning processes and amended to show any material changes in service levels and/or resources available to provide those services as a result of budget decisions.

The AM Plan will be updated annually to ensure it represents the current service level, asset values, projected operations, maintenance, capital renewal and replacement, capital upgrade/new and asset disposal expenditures and projected expenditure values incorporated into the long term financial plan.

The AM Plan has a life of 4 years and is due for complete revision and updating within 12 months of each Council election of Warrnambool City Council.

The progress of the implementation of the improvement plan will be monitored by the Asset Management Steering Committee.

8.4 Performance Measures

The effectiveness of the asset management plan can be measured in the following ways:

- Progress with the implementation of the Improvement Actions as identified in Table 8.1.
- The degree to which 1-5 year detailed works programs, budgets, business plans and corporate structures take into account the 'global' works program trends provided by the asset management plan,
- The degree to which the existing and projected service levels and service consequences (what we cannot do), risks and residual risks are incorporated into the Strategic Plan and associated plans,
- The Asset Renewal Funding Ratio achieving the target of 1.0.

9. REFERENCES

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- IPWEA, 2012 LTFP Practice Note 6 PN Long Term Financial Plan, Institute of Public Works Engineering Australasia, Sydney
- Warrnambool City Council

- Council Plan (2017-2021)
- Warrnambool 2040
- Asset Management Policy 2019
- Asset Management Strategy 2019
- Drainage Strategy Action Plan 2019

10. APPENDICES

Appendix A Projected 10 year Capital Renewal and Replacement Works Program

Appendix B Projected 10 year Capital Upgrade/New Works Program

Appendix C LTFP Budgeted Expenditures Accommodated in AM Plan

Appendix D Drainage Infrastructure Risk Register

Appendix E Network by Serviceability Score

Appendix F Drainage Capacity

Appendix G Critical Assets Identified from Drainage Criticality Model

Appendix H Critical Risks and Treatments

Appendix I Pit and Pipe Condition Rating

Appendix A. Projected 10-year Capital Renewal and Replacement Works Program

This is subject to our annual review as new works are identified or as budgets and priority change.

Year	Asset ID	Description	Asset Location	Length (m)	Treatment	Cost
1	151466	RCP - 225	Garden St	42	Replacement	$93,641.60
	134129	RCP - 225	Morriss Rd: Archibald St (Intersection)	18	Replacement	$39,625.31
	64012	RCP - 375	Pecten Ave: From Mannix - Beamish	5	Relining	$1,786.08
	132980	RCP - 225	Banyan St: Timor St (Intersection)	7	Patching	$1,605.15
	153070	PVC - 225	Coles Carpark	66	Relining	$24,192.60
	124609	RCP - 300	Dennington Rise	39	Relining	$14,274.00
	124611	RCP - 300	Dennington Rise	43	Relining	$15,738.00
	168137	HDPE - 375	Warburton Way: Wiltshire - Toleman	22	Patching	$5,376.00
		Pits-C5	Various Locations		Replacement	$260,300.00
					Total Renewal	**$456,538.74**
2	133291	RCP - 225	Mortlake Rd Service Rd (East side): Russells Creek - Moore	27	Patching	$2,472.00
	133296	RCP - 225	Mortlake Rd Service Rd (West side): Russells Creek - Botanic	76	Relining	$3,550.20
	139634	RCP - 375	Drummond St: Russell St (Intersection)	10	Patching	$2,472.00
	139727	RCP - 225	Drummond St: Preston St (Intersection)	10	Relining	$3,550.20
	139731	RCP - 225	Drummond St: Bath Ave (Intersection)	8	Relining	$2,780.87
	64202	RCP - 300	Saltau St: From Laverock - Patterson	40	Patching	$9,600.00
	64203	RCP - 375	Saltau St: From Laverock - Patterson	42	Patching	$10,185.60
	134180	RCP - 225	Morriss Rd: Helpman - Archibald	70	Relining	$25,565.42
	63914	RCP - 225	Newry Ct: From Breton - Bowl	23	Replacement	$52,853.48
	63915	RCP - 450	Newry Ct: From Breton - Bowl	13	Patching	$3,096.00
	132348	RCP - 375	Laverock Gr: Fitzroy - Clancey	21	Relining	$7,847.02
	133160	RCP - 225	Mortlake Rd: Moore - Allan	18	Patching	$4,391.07
		Pits-C5	Various Locations		Replacement	$260,300.00
					Total Renewal	***$388,663.86***
3	133170	RCP - 225	Mortlake Rd Service Rd (East side): Russells Creek - Moore	3	Replacement	$7,799.63
	133228	RCP - 225	Moore St: Rogers Ave (Intersection)	5	Patching	$1,245.38

	133240	RCP - 225	Moore St: Kiama Ave (Intersection)	22	Patching	$5,373.14
	133260	RCP - 225	Cramer St: Wildwood - Monash	15	Patching	$3,642.77
	133261	RCP - 225	Cramer St: Birdwood - Wildwood	15	Patching	$3,543.67
	133278	RCP - 225	Moore St: Cramer - Garden	10	Patching	$2,411.34
	133291	RCP - 225	Mortlake Rd Service Rd (East side): Russells Creek - Moore	27	Relining	$9,873.59
	133296	RCP - 225	Mortlake Rd Service Rd (West side): Russells Creek - Botanic	76	Patching	$18,317.33
	133309	RCP - 225	Wildwood Cres: Birdwood - Cramer	7	Relining	$2,536.31
	133331	RCP - 225	Moore St: Kiama - Rogers	40	Patching	$9,672.01
	145926	RCP - 225	Somers Rd: Raglan - Canterbury	47	Patching	$11,376.00
	61267	RCP - 375	Beamish St: From Pecten - Ross	57	Patching	$13,658.40
					Total Renewal	***$89,449.58***
4	142983	RCP - 300	Drummond St: Russell - Dennington Underpass	45	Relining	$16,579.80
	162870	RCP - 450	Laverock Rd: From Angela - Saltau	11	Patching	$2,529.60
	162841	PVC - 600	Laverock Rd: From Carolyn - Woodend	24	Patching	$5,877.60
	140094	RCP - 300	The Esplanade: Raglan - Drummond	34	Patching	$8,136.00
	139261	RCP - 450	Mortlake Rd Service Rd (East side)	29	Patching	$6,864.00
	134241	RCP - 225	Drainpipe 225mm: : 44.0m	44	Relining	$16,117.56
	133099	RCP - 225	Nicholson St: Foster - Ocean (West)	31	Patching	$7,539.87
	161874	RCP - 375	Merriviews Stage 1	54	Patching	$13,032.00
					Total Renewal	***$76,676.43***
5	133270	RCP - 225	Cramer St: Officer Ct (Intersection)	11	Patching	$14,421.60
	61217	RCP - 375	Beamish St: From Pecten - Ross	60	Patching	$52,853.48
	141991	RCP - 375	Morack Ave: Birdwood - Bowl	20	Patching	$4,680.00
	132872	RCP - 225	Koroit St: Japan - Foster	60	Relining	$21,819.31
	132872	RCP - 225	Koroit St: Japan - Foster	60	Relining	$21,819.31
	133059	RCP - 225	Koroit St: Japan - Foster	12	Relining	$4,390.43
	132385	RCP - 450	Drainpipe 450mm: : 52.2m	52	Patching	$12,530.55
	64021	PVC - 600	Pecten Ave: From Carolyn - Pecten	37	Patching	$8,880.00
					Total Renewal	**$141,394.67**

6	61217	RCP - 375	Beamish St: From Pecten - Ross	60	Patching	$14,421.60
	64286	RCP - 225	Warroon Ct: From Balmoral - Bowl	11	Relining	$4,172.40
	61567	RCP - 225	Edwin Ct: From Janlor - Bowl	34	Patching	$8,068.80
	64118	RCP - 225	Roslyn Cl: From Mortlake - Bowl	25	Patching	$6,028.80
	61553	RCP - 375	Dooley St: From St James (East) - Mortlake	17	Patching	$3,988.80
	63961	RCP - 300	Mortlake Rd: From Moore - Roslyn (Vicroads)	10	Patching	$2,419.20
	133214	RCP - 225	Cramer St: McConnell - Birdwood	13	Patching	$3,215.04
					Total Renewal	***$42,314.64***
7	133312	RCP - 225	Nelson St: Banyan - Cramer: 36.0m	36	Patching	$8,646.55
	133315	RCP - 225	Nelson St: Banyan - Cramer: 4.8m	5	Patching	$1,147.92
	133335	RCP - 225	Cramer St: Monash - Grafton: 55.3m	55	Patching	$13,276.05
	134126	RCP - 225	Morriss Rd: Lipook Ct (Intersection): 42.2m	42	Relining	$15,438.81
	141389	RCP - 525	Queens Rd: St Josephs Schoolyard	113	Patching	$27,216.00
	132271	RCP - 375	Pertobe Rd: Stanley St (Intersection): 8.8m	9	Patching	$2,115.49
	135069	RCP - 750	Lava St: Kelp - Japan: 48.2m	98	Relining	$35,868.00
	135069	RCP - 750	Lava St: Kelp - Japan: 48.2m	98	Relining	$35,868.00
	132178	RCP - 375	Moore St: Rowley St (Intersection): 16.9m	17	Patching	$4,044.41
	133980	RCP - 225	Merrivale Dr: Duirs - Wellington: 49.9m	50	Relining	$18,270.92
					Total Renewal	***$126,024.15***
8	142982	RCP - 375	Drummond St: Russell - Dennington Underpass: 44.8m	45	Patching	$10,752.00
	153086	RCP - 750	From Kingsway - Ilex	186	Relining	$68,149.20
	61499	RCP - 225	Carramar Cres: From Lineda - Kagoola	32	Patching	$7,766.40
	62246	RCP - 375	Moonah St: From Dunlea - Medinah	29	Patching	$6,890.40
	133265	RCP - 225	Fenton St: Cramer - Lafferty	46	Patching	$11,001.61
	133348	RCP - 225	Fenton St: Cramer - Lafferty	25	Patching	$6,023.42
	132902	RCP - 225	Foster St: Margarets La (Intersection)	15	Relining	5,516.13
	61725	RCP - 375	Fotheringham St: From Chester - Saywell	29	Relining	$10,705.50
	139293	RCP - 1200	Donovans Rd: Lutana - Mortlake	63	Patching	$15,192.00
	133100	RCP - 225	Nicholson St: Ocean Gr (West) (Intersection)	90	Relining	$32,992.93

					Total Renewal	***$174,989.60***
9	61177	RCP - 300	Balmoral Rd: From Warroon - Whites	9	Patching	$2,220.00
	63912	RCP - 450	Newry Ct: From Breton - Bowl	8	Patching	$1,944.00
	162852	RCP - 450	Flaxman St	63	Patching	$15,120.00
	132876	RCP - 225	Patricks La	29	Patching	$7,043.16
	132967	RCP - 225	Nicholson St: Ocean (West) - Harper	35	Patching	$8,517.44
	132138	RCP - 450	Road-089: Fletcher - Road	160	Patching	$38,393.29
	132138	RCP - 450	Road-089: Fletcher - Road	160	Patching	$38,393.29
	134160	RCP - 225	Osburne Ct: Bradley - Bowl	77	Patching	$18,523.72
	145721	RCP - 300	Dooley St: St James Cres (West) (Intersection)	10	Patching	$2,352.00
					Total Renewal	***$132,506.91***
10	61321	RCP - 300	Breton St: From Moonah (East) - Garden	9	Relining	$3,473.34
	64072	RCP - 375	Pecten Ave: From Mannix - Beamish	22	Patching	$5,208.00
	61910	RCP - 300	Janlor Dr: From Edwin - Curtin	34	Patching	$8,052.00
	61908	RCP - 375	Janlor Dr: From Edwin - Curtin	9	Patching	$2,212.80
	61739	RCP - 300	Garden St: From Breton - Mott	179	Patching	$42,960.00
	132177	RCP - 375	Birdwood Ave: Banyan - Kiama	32	Patching	$7,757.84
	132180	RCP - 375	Mortlake Rd Service Rd (West side): Allan - Russells Creek	50	Patching	$12,106.67
	132471	RCP - 225	Botanic Rd: Bromfield - Queens	73	Patching	$17,424.00
	133153	RCP - 225	Mortlake Rd Service Rd (East side): Breton - Roslyn	19	Patching	$4,608.73
	133213	RCP - 225	Cramer St: McConnell St (Intersection):	29	Patching	$6,949.35
	133215	RCP - 225	McConnell St: Banyan - Cramer	7	Patching	$1,709.87
	134277	RCP - 225	Fitzroy Rd: Clyde East - Westmore	63	Patching	$15,209.46
					Total Renewal	***$127,672.07***

Appendix B. Projected New/Upgrade/Expansion 10-year Capital Works Program

This is subject to funding and priority change. Refer to Drainage Strategy for further details of the project.

Year	Area	Description	Cost
2019/20	AOI 3	Timor St West/ Gibson St	$295,000
	AOI 24	Margaret St/ Latrobe St	$165,000
2020/21	AOI 14	Hopetoun Rd/ Chisholm St/ Crawley St	$120,000
	AOI 21	Georges Av/Skiddaw Cr	$27,000
	AOI 39	McKiernan Rd	$303,000.
2021/22	AOI 12	Hyland St/ Timor St	$114,000
	AOI 19 & 35	Laverock Rd/ Saltau St	$464,200
2022/23	AOI 42	Waikato Ct	$297,000
2023/24	AOI 23	Birdwood Rd /McConnell St	$416,000
2024/25	AOI 33 & 48	Henry St	$148,000
	AOI 40	McKeller Ct	$357,000
2025/26	AOI 2	Japan St and Kelp St	$592,000
2026/27	AOI 3	Banyan St	$1,246,000
2027/28	AOI 7 & 10	Wanstead St, Fleetwood Ct / Armstrong Gr	$141,400
2028/29	AOI 44	McKeller Ct/ White St	$552,000
2029/30	AOI 22	Braithwaite St	$705,000

Appendix C. Budgeted Expenditures Accommodated in LTFP

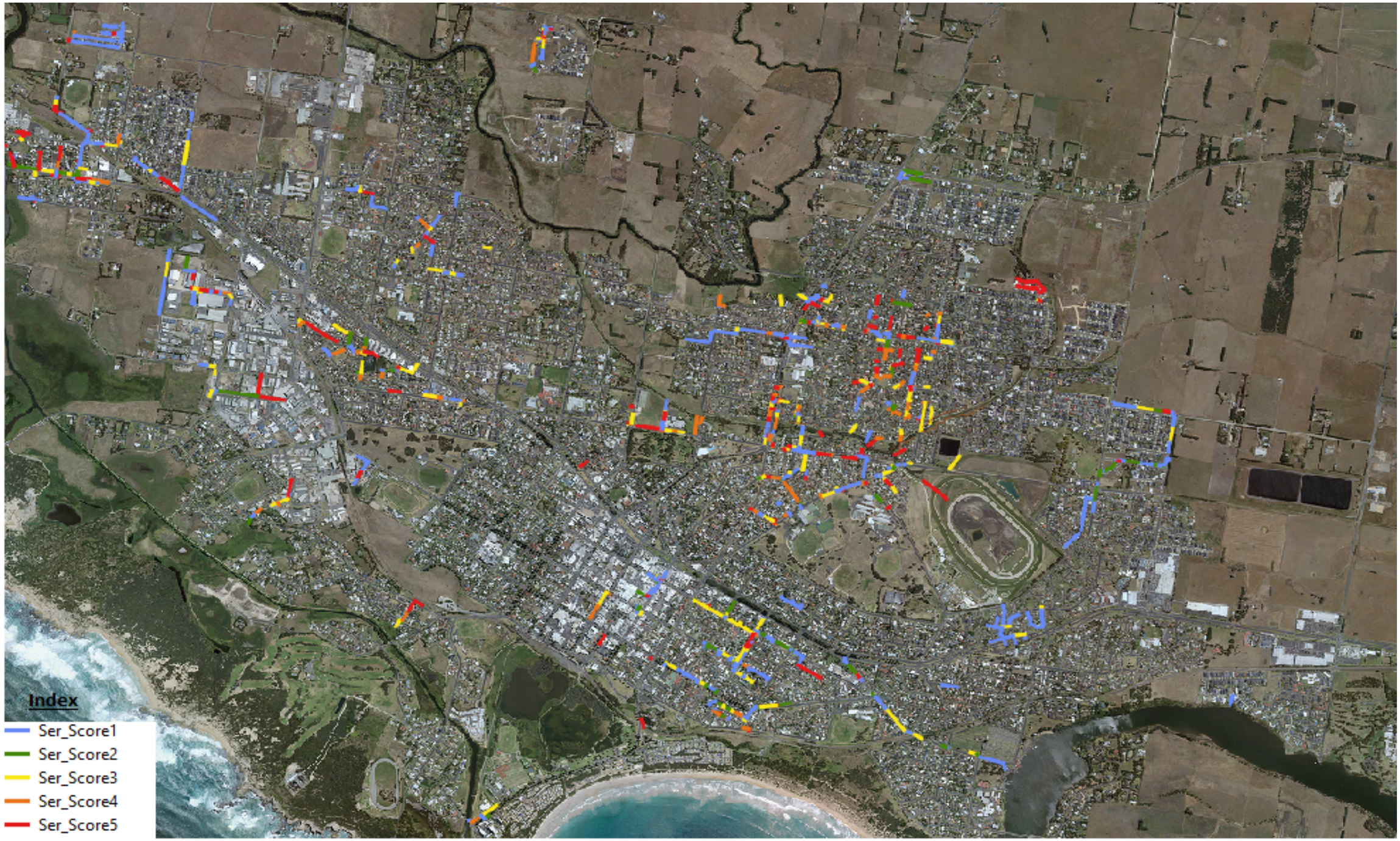
Current Replacement Cost	$89,380,798														% of Asset Value
Depreciable Amount	$89,380,798												Annual Operation		3.0%
Depreciated Replacement Cost	$66,109,536												Annual Maintenance		1.9%
Annual Depreciation	$897,765												Annual Depreciation		1.36%
Financial Year	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	2025-2026	2026-2027	2027-2028	2028-2029	2029-2030	2030-2031	2031-2032	2032-2033	2033-2034
Expenditure															
O&M	$891,907	$918,664	$946,224	$974,610	$1,003,849	$1,033,964	$1,064,983	$1,096,933	$1,129,841	$1,163,736	$1,198,648	$1,234,607	$1,271,645	$1,309,795	$1,349,089
Renewal	$1,184,627	$1,232,874	$1,366,840	$1,241,156	$1,242,304	$1,503,225	$232,373	$235,534	$238,034	$296,823	$243,381	$246,062	$248,749	$251,442	$765,212
New/Upgrade	$460,000	$450,000	$578,200	$297,000	$416,000	$505,000	$592,000	$1,246,000	$141,400	$552,000	$705,000	$-	$-	$-	$-
Total Expenditure	$2,536,534	$2,601,538	$2,891,264	$2,512,766	$2,662,153	$3,042,189	$1,889,356	$2,578,467	$1,509,275	$2,012,559	$2,147,029	$1,480,669	$1,520,394	$1,561,237	$2,114,301
Budget															
Drainage Capital from LTFP 2019	$543,610	$216,429	$325,000	$332,500	$940,813	$349,333	$358,066	$367,018	$376,193	$385,598	$395,238	$405,119	$415,247	$425,628	$436,269
Drainage Maintenance - Index from TechOne Recu	$835,829	$852,546	$869,596	$886,988	$904,728	$922,823	$941,279	$960,105	$979,307	$998,893	$1,018,871	$1,039,248	$1,060,033	$1,081,234	$1,102,859
Drainage - priority works(Renewal)	$ 25,000.00	$ 25,000.00	$ 25,000.00	$ 25,000.00	$ 25,562.50	$ 26,201.56	$ 26,856.60	$ 27,528.02	$ 28,216.22	$ 28,921.62	$ 29,644.66	$ 30,385.78	$ 31,145.42	$ 31,924.06	$ 32,722.16
Asset Disposals	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Budget	$1,404,439	$1,093,975	$1,219,596	$1,244,488	$1,871,104	$1,298,358	$1,326,202	$1,354,651	$1,383,716	$1,413,413	$1,443,754	$1,474,753	$1,506,425	$1,538,786	$1,571,850

Appendix D. Drainage Infrastructure Risks Register

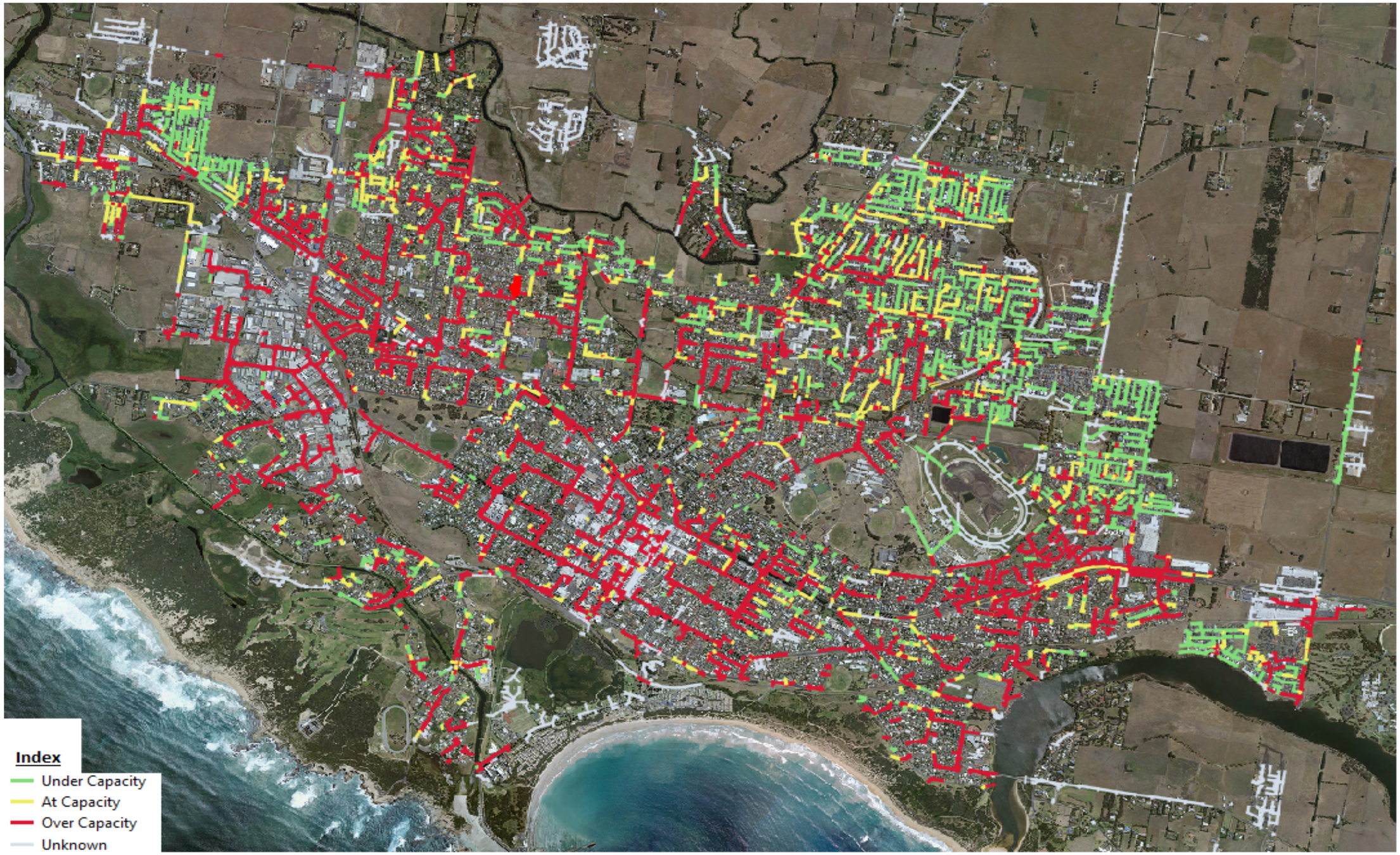
Risk Identification				Risk Analysis			Risk Management
Risk Description	**Risk type**	**Causes**	**Existing controls**	**Consequence**	**Likelihood**	**Risk rating**	**Management options**
Sink holes due to tunnel failure	Safety , Image and reputation	Structurally condition 5 tunnel sections	Relined Simpson Street tunnel	Extreme high	Possible	Extreme high	Reline structurally bad sections of tunnel
Flooding (areas where flood depth above 500mm)	Environment /Image and reputation	Inadequate drainage capacity	Improve network via priority back works	High	Possible	Extreme High	Adopt drainage strategy and consider utility map for the drainage work in respective areas
Flooding (areas where flood depth 300mm- 500mm)	Environment /Image and reputation	Inadequate drainage capacity	Improve network via priority back works	High	Possible	High	Adopt drainage strategy and consider utility map for the drainage work in respective areas
Flooding in highly dense, commercial areas, CBD and near critical facilities	Loss of service	Blockages - due to lack of proactive maintenance	Reactive maintenance and limited proactive maintenance	High	Possible	High	Pro-active maintenance
Environmental contamination - poor storm water quality discharges to waterways	Environment	Lack of proactive maintenance	Reactive maintenance and limited proactive maintenance	High	Possible	High	Proactive maintenance required
Environmental contamination - poor storm water quality discharges to waterways	Environment	Lack of GPT's and stormwater treatment measures	Periodic GPT cleaning	High	Possible	High	More GPT's and stormwater treatment measures
Environmental contamination - poor storm water quality discharges to waterways	Environment	Inadequate stormwater treatment measures	No stormwater quality benchmarks	High	Possible	High	Planned action required

Sink holes due to pipe failure of above 900mm diameter and raising main	Safety , Image and reputation	Structurally condition 5 pipe sections	N/A	High	Possible	High	Reline structurally bad sections of pipe
Flooding (areas where flood depth 150mm to 300mm)	Environment /Image and reputation	Inadequate drainage capacity	Improve network via priority back works	Medium	Possible	Medium	Adopt drainage strategy and consider utility map for the drainage work in respective areas
Flooding in medium dense and residential areas	Loss of service	Blockages - due to lack of proactive maintenance	Reactive maintenance and limited proactive maintenance	Medium	Possible	Medium	Pro-active maintenance
Sink holes due to pipe failure of 450mm diameter to 900mm diameter	Safety , Image and reputation	Structurally condition 5 pipe sections	N/A	Medium	Possible	Medium	Reline structurally bad sections of pipe
Sink holes due to pipe failure of pipe till 450mm diameter	Safety , Image and reputation	Structurally condition 5 pipe sections	N/A	Medium	Possible	Medium	Reline structurally bad sections of pipe
Flooding (areas where flood depth 150mm)	Environment /Image and reputation	Inadequate drainage capacity	Improve network via priority back works	Low	Possible	Low	Adopt drainage strategy and consider utility map for the drainage work in respective areas
Flooding in low dense and recreational areas including open space	Loss of service	Blockages- due to lack of proactive maintenance	Reactive maintenance and limited proactive maintenance	Low	Possible	Low	Pro-active maintenance

Appendix E. Network by Serviceability Score

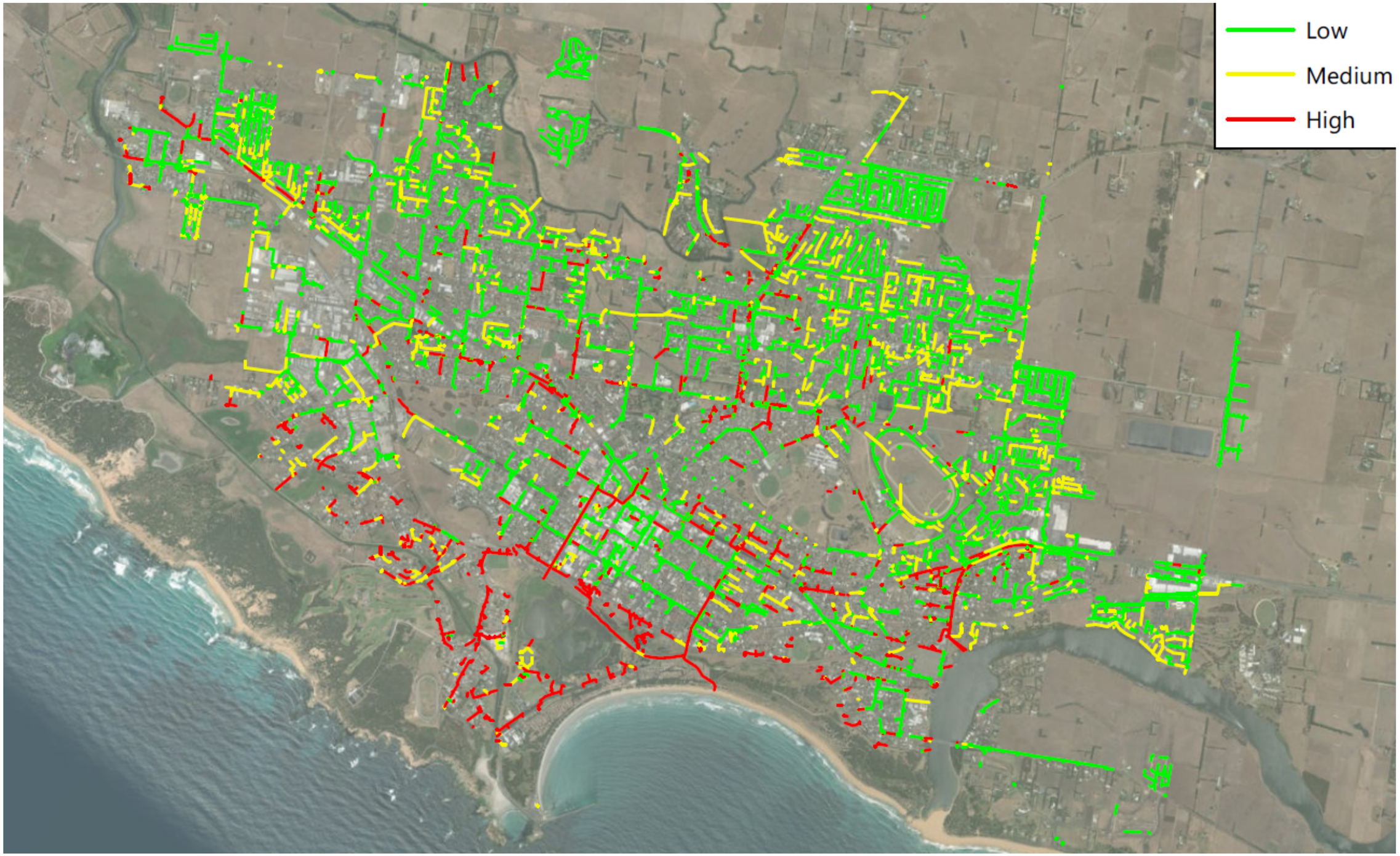


Appendix F. Drainage Capacity

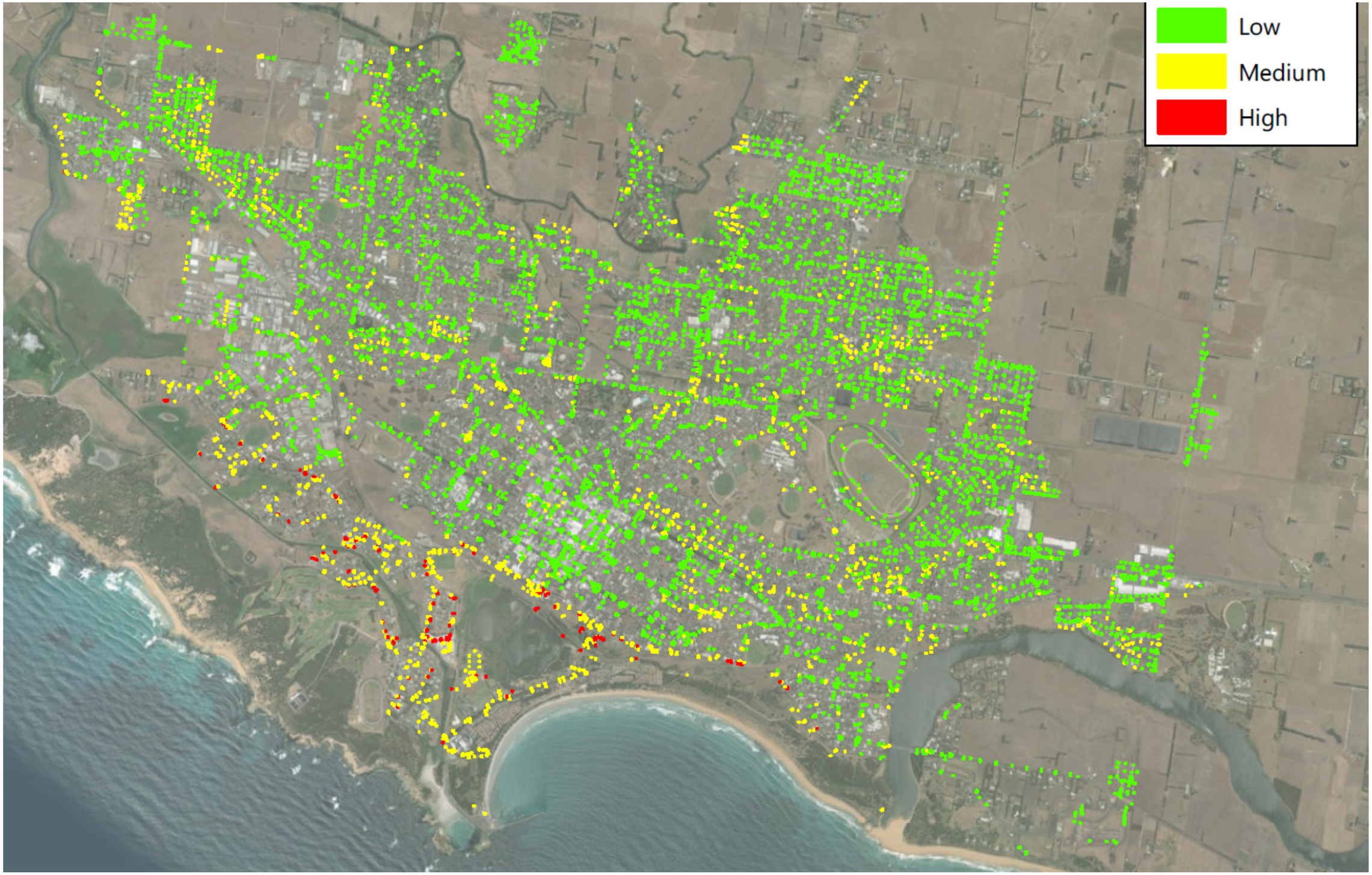


Appendix G. Critical Assets identified from Drainage Criticality Model.

Critical Pipes



Critical Pits



Critical GPT and litter Traps

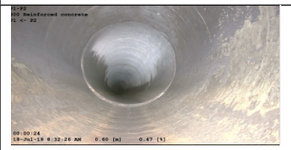
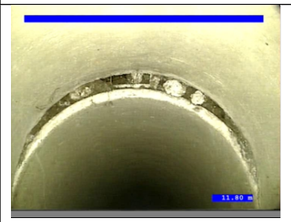
Critical Basins

Appendix H. Critical Risks and Treatment Plans

Risk Description	The Cause (How can it happen)	Issue (What can happen)	Assessment Without Controls		Risk Rating (VH, H,M,L)	Proposed Controls	Re-Assessment with Controls in Place		Residual Risk Rating(VH, H,M,L)	Residual Risk Level Acceptable?
			Probability	Consequence			Probability	Consequence		
Structural failure of critical pipes.	Presence of significant cracks Missing pieces Corroded reinforcement bars Major displacement of joints	Loss of service	Likely	Significant	VH	CCTV inspections of pipes in most critical area identified from Drainage Criticality Study High consideration in renewal and maintenance programs for critical assets identified. Early intervention	Unlikely	Minor	L	YES
		Negative Financial impact	Likely	Significant	VH		Unlikely	Minor		YES
		Adverse impact on Council's image and reputation.	Likely	Significant	VH		Unlikely	Minor	L	YES
		Can induce failure of other Council assets; for instance road failure, sink holes.	Moderate	Catastrophic	VH		Unlikely	Minor	L	YES
Structural failure of critical pits.	Broken Pit Lids Significant Cracks Corroded Reinforcement bars	Loss of service	Likely	Moderate	H	Inspections of pits in most critical area identified from Drainage Criticality Study High consideration in renewal and maintenance programs for critical assets identified. Early intervention	Unlikely	Minor	L	YES
		Negative Financial impact	Likely	Significant	VH		Unlikely	Minor		YES
		Adverse impact on Council's image and reputation	Likely	Significant	VH		Unlikely	Minor	L	
		Hazard in relation to Public Safety.	Likely	Catastrophic	VH		Unlikely	Minor	L	
Environmental Contamination	GPT/Litter Traps Not Functioning 100%	Poor quality stormwater discharges to waterways	Likely	Significant	VH	Periodic GPT cleaning Reactive and proactive maintenance programs. Water Quality Study.	Unlikely	Minor	L	YES
		Degrades the water ecosystem	Likely	Significant	VH		Unlikely	Minor	L	YES

Note * The residual risk is the risk remaining after the selected risk treatment plan is operational.

Appendix I. Pipe and Pit Condition Rating

Rating	Condition	Example of Pipes	Example of Pits	Description
1	Excellent			Recently installed or in as-new condition
2	Good			As-new, sound physical condition. Assets likely to perform adequately without major works.
3	Average	 		Wear and tear could be evident but no failures in structural integrity. Potentially half way through its useful life. Some minor slipping at joints or exposed lifting points.
4	Poor			Evidence of minor structural failures and/or maintenance required.
5	Very poor			Failed or failure imminent. Poor condition which would have the structure in need of intervention in the short term.