NORTH SYDNEY COUNCIL

ASSET MANAGEMENT PLAN

STORMWATER DRAINAGE ASSET CLASS

2025/35

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1.0 Executive Summary

This Asset Management Plan (AMP) covers the Stormwater Drainage Asset Class and details the following asset categories: Gross Pollutant Traps (GPTs), Pipes, and Pits. This Asset Management Plan outlines the required actions to maintain the current level of service in the most cost-effective manner while outlining associated risks within each of the asset classes. The scope and value of this Asset Class is shown in the Table below:

Table: Scope and Replacement Cost of Stormwater Drainage Asset Class by Asset Category ($)2024

Stormwater Drainage Asset Class		
Asset Category	**Scope**	**Replacement Cost (2024)**
GPTs	27 items	$14,349,627
Pipes	106.6 km	$229,450,740
Pits	6,659 Pits	$26,650,455
	TOTAL	**$270,450,822**

Stormwater Drainage Assets

Stormwater drainage assets in North Sydney provide a vital service to the local community. During rainfall events stormwater flows from surfaces, in particular, hard surfaces such as roofs, footpaths, and roads. This water is then collected by street gutters, pits, and pipes. North Sydney Council embraces the principles of Water Sensitive Urban Design (WSUD). As such some of this water is harvested for the watering of a number of sporting fields as well as Cammeray Golf Course. Also, approximately sixty percent (60%) of stormwater in the North Sydney catchment passes through Stormwater Quality Improvement Devices (SQIDS) to improve water quality before entering the harbour. In addition, Council has built several rain gardens and bio retention swales to improve water quality.

Many of the main trunk drainage pipes in North Sydney were built approximately 100 years ago and are approaching the end of their useful life and will require replacement. Also, a large number of concrete pipes under roads have prematurely failed due to excessive vehicle loads.

The North Sydney Local Government Area covers an area of approximately 10.9 square km. The catchments are generally short and steep. The characteristics of the catchments have also changed over the decades due to development and an increase in the amount of, hard surfaces, which increases rainfall runoff, which has resulted in a reduced useful life of many of these pipes due to capacity issues.

Gross Pollutant Trap Assets

Stormwater drainage assets and the associated Gross Pollutant Trap (GPT) network in North Sydney provide a vital service to the local community. During rainfall events stormwater flows from surfaces, in particular, hard surfaces such as roofs, footpaths, and roads. Stormwater is rainwater plus anything the rain carries along with litter, nutrients, chemicals, sediments. This water is then collected by street gutters, pits, pipes, and then where present, the water flows into various Stormwater Quality Improvement Devices (SQIDS). Stormwater eventually enters our waterways inhabited by fish, frogs and other aquatic animals and plants.

The two key factors that need to be addressed when managing stormwater are quantity and quality. North Sydney covers an area of 10 square km. The stormwater catchments are generally short and steep. North Sydney is an established area that is highly urbanised. This means that there is a significant amount of stormwater carrying pollution flowing from hard surfaces that needs to be managed by council. North Sydney Council embraces the principles of Water Sensitive Urban Design (WSUD) and has invested a significant amount of funds on improving the quality of stormwater.

North Sydney Council plays a vital role in the water quality of Sydney Harbour. Council's GPTs are designed to capture and retain gross pollutants, litter, plastics, grit, sediments and associated oils, utilising indirect screens. These are our last line of defence, so we use the highest performance, non-blocking type of gross pollutant trap to effectively trap and remove debris, sediment, and other pollutants from stormwater to improve water quality and protect our environment. Plastic bags and other pollution are a blight on our beautiful harbour and

its marine life. This waste material will be collected and recycled where possible, currently 90% of materials removed, by Councils current GPT cleaning contractor, is recycled or turned into usable soil materials. Council's GPTs help maintain the beauty and ecology of Sydney Harbour which is primarily utilised for recreation, fishing, recreational boating, and commercial vessels such as ferries and gets visited by millions of international tourists every year.

North Sydney Council has recently undertaken an audit of the performance of its Gross Pollutant Traps (GPTs) network within the North Sydney LGA. Consultants, Optimal Stormwater, were engaged to undertake a detailed audit on the performance of each of Council's Gross Pollutant Traps (GPTs). The audit findings were presented to Council's Environment Reference Group Meeting held on 30 May 2016. GPTs contain trash racks or litter basket components. Many of these components are exposed to salt water and require replacement every five years. The consultant report recommended to increase the maintenance budget of the GPTs so that trash racks or litter basket components can be replaced when broken or rusted.

The Table below shows that the current cost to bring all Council's Stormwater Drainage infrastructure assets to a satisfactory standard is $30.1M. This amount includes the cost to replace existing infrastructure currently in either poor or very poor condition (condition 4 or 5). This represents 11.1% of the Stormwater Drainage infrastructure network in terms of Replacement Cost. This means that 88.9% of this portfolio is in very good to fair condition (1 to 3).

The Table also shows that the total current Depreciation Expense is $2.4M or 0.9% of the Total Replacement Cost of Council's assets. This assumes that all Council's assets are completely replaced every 112.3 years on average.

The Table shows that the 10-year Long Term Cost to bring all Council's infrastructure assets to a satisfactory standard as well as maintain the current standard is $54.2M over 10 years or an average annual cost of $5.4M. This includes the total Depreciation Expense over 10 years (maintaining the existing standard) and assumes that all condition 4 and 5 assets will be replaced over the next 10 years (bringing all assets to a satisfactory condition).

Table: Long Term Infrastructure Funding Required ($)2024

Asset Class / Category	Cost to bring to assets to satisfactory Cond. (4 + 5)	Total replacement cost	Depreciation Expense (2024)	Funding required over 10 years (Depreciation x 10 + Cond 4 + 5)	Average Annual Funding Required (2024)
Stormwater Drainage / GPTs	$4,575,448	$14,349,627	$297,464	$7,550,087	$755,009
Stormwater Drainage / Pipes	$21,819,528	$229,450,740	$1,778,479	$39,604,319	$3,960,432
Stormwater Drainage / Pits	$3,745,288	$26,650,455	$332,711	$7,072,400	$707,240
TOTAL	**$30,140,264**	**$270,450,822**	**$2,408,654**	**$54,226,807**	**$5,422,681**

The allocation in the current forecast capital budget (as at 30 June 2024) is insufficient to continue providing existing services at current levels for the planning period.

The main service consequences of the current forecast capital budget are:

- Assets progressively deteriorating over time
- Increasing asset failures and potential closures
- Service levels not fully meeting the needs of users

2.0 Asset Description

2.1 Asset Description – Stormwater Drainage Pipes

As shown in the Table below the Pipe network mainly comprises of:

- Concrete Pipes = 70.8%

Pipe Material	Length (m)	Replacement Cost (2024)	% of the Network
Brickwork	627	$3,919,631	1.7%
Cast iron	154	$196,618	0.1%
Cement mortar	34	$157,590	0.1%
Concrete	71,048	$162,339,175	70.8%
Fibre reinforced cement	3,547	$5,929,128	2.6%
Glass reinforced plastics	4,008	$6,994,383	3.0%
Masonry (coursed)	376	$1,505,588	0.7%
Masonry (uncoursed or rough)	309	$2,325,069	1.0%
Other	428	$794,993	0.3%
Polyethylene	653	$1,046,251	0.5%
Polypropylene	361	$667,941	0.3%
PVC-Plasticised	5,153	$6,868,928	3.0%
SC	138	$769,149	0.3%
Steel	73	$271,005	0.1%
Vitrified clay	6,457	$9,518,920	4.1%
Unidentified type of plastics	180	$526,164	0.2%
Unidentified material	162	$292,942	0.1%
CBC	64	$249,680	0.1%
Epoxy	27	$49,655	0.0%
Not Surveyed	13,122	$25,027,930	10.9%
Grand Total	**106,919**	**$229,450,740**	**100.0%**

2.2 Asset Description – Stormwater Drainage Pits

As shown in the Table below the Pit network mainly comprises of:

- On Grade Grate & EKI (Extended Kerb Inlet) = 25.5%

Pit Type	Quantity	Replacement Cost (2024)	% of the Network
Blind Pit	5	$19,951	0.1%
Converter	78	$311,235	1.2%
Dead End	5	$19,951	0.1%
Grated Inlet Pit	1	$3,990	0.0%
Headwall	35	$139,657	0.5%

Pit Type	Quantity	Replacement Cost (2024)	% of the Network
Inlet	34	$135,666	0.5%
Junction Buried	272	$1,085,331	4.1%
Junction Solid Lid	1,015	$4,050,039	15.2%
Letter Box	61	$243,401	0.9%
Node (Dropper No Pit)	13	$51,872	0.2%
Node (Junction No Pit)	295	$1,177,105	4.4%
On Grade EKI	29	$115,715	0.4%
On Grade Grate	393	$1,568,143	5.9%
On Grade Grate	1	$3,990	0.0%
On Grade Grate & EKI	1,705	$6,803,268	25.5%
Outlet	172	$686,312	2.6%
Pollution Trap	4	$15,961	0.1%
Sag EKI	10	$39,902	0.1%
Sag Grate	208	$829,959	3.1%
Sag Grate & EKI	626	$2,497,857	9.4%
Unknown Pit Type	1,717	$6,851,150	25.7%
Grand Total	**6,679**	**$26,650,455**	**100%**

2.3 Asset Description – Gross Pollutant Traps

As shown in the Table below the Gross Pollutant Trap (GPT) network comprises of 80.4% GPTs and 19.6% of other types of pollutant trap.

GPT Type	Quantity	Replacement Cost (2024)	% of the Network
GPT	21	$8,859,045	80.4%
NSC Litter Basket	4	$1,594,669	14.5%
NSC Trash Rack	1	$568,642	5.2%
Grand Total	**26**	**$11,022,356**	**100.0%**

3.0 Levels of Service

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

- Operations – the regular activities to provide services (e.g. cleansing, 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. footpath repair – patching, minor works),
- Renewal – the activities that return the service capability of an asset up to that which it had originally (e.g. footpath replacement and or footpath reconstruction),
- Upgrade – the activities to provide a higher level of service (e.g. widening a footpath or replacing an existing footpath with a different type as per Public Domain Style Manual).
- New - the activities to provide an additional level of service (e.g. constructing a footpath where none previously existed).

The Table below shows the technical levels of service expected to be provided for the Stormwater Drainage Asset Class infrastructure assets. The 'Desired' position in the Table documents the position being recommended in this Asset Management Plan

Table: Stormwater Drainage Asset Class – Technical Levels of Service

Service Attribute	Service Activity Objective	Activity Measure Process	Current Performance	Desired for Optimum Lifecycle Cost
Operations	Undertake network inspections to monitor condition	Stormwater pipes CCTV'd to monitor condition	All reactive CCTV inspections undertaken as soon as practical. Additional proactive inspections also carried out.	All reactive CCTV inspections undertaken as soon as practical. Additional proactive inspections also carried out.
Maintenance	Reactive service Requests completed in a timely manner or made safe.	Respond to complaints.	Minor repairs undertaken in accordance with Maintenance Management System	Minor repairs undertaken in accordance with Maintenance Management Delivery System.
Renewal	Maintain existing assets to a satisfactory condition	Percentage of assets in 'poor' or 'very poor' (4, 5) Condition.	Stormwater Drainage (11.1%)	Improve
Upgrade	Satisfactory provision of Stormwater Drainage and GPT Assets.	Percentage of GPT Devices are currently Suitable Increase existing pipe size subject to Design	46% of GPT Devices Suitable (12 out of 26) Increase existing pipe size subject to Design	100% of GPT Devices Suitable Increase existing pipe size subject to Design
New	Satisfactory provision of Stormwater Drainage and GPT Assets.	The number of flood affected properties identified across the LGA by the Catchment Study (Flood Study) Build new GPTs and increase the Catchment Area covered by GPTs	The number of flood affected properties identified across the LGA by the Catchment Study (Flood Study) New GPTs built subject to funding	Improve – reduce the number of flood affected properties New GPTs built subject to funding

3.1 Future Demand

For stormwater drainage the future upgrade or new capital works program will be primarily based on the Catchment Study. In addition, as part of each major renewal project, a detailed design is undertaken and improvements to the capacity of the stormwater system made as required. A review of stormwater drainage projects completed in recent years showed that a significant amount of new drainage was carried out during the process of renewing pipes in poor condition (based on improving capacity to a suitable standard). It should be noted that most of the renewal expenditure is actually upgrade work, for example, an existing 300mm diameter pipe replaced with a 450mm diameter pipe. To simplify calculations, it has been assumed that any upgrade work is considered to be renewal work on the basis that the upgraded pipe meets the modern equivalent standard.

For Gross Pollutant Traps the future Upgrades and capital works program will be primarily based on the recommendations of the "Optimal Stormwater" consultant's report of 2016 and also will be informed by the outcomes of Councils Flood Study which is currently underway.

There is an anticipated population increase due to increasing medium to high density developments, rezoning of land by the State Government and demand for active transport. This will have significant implications on

demand for these assets. Increasing frequency and intensity of storm events impacted by climate change and other factors may lead to Council's stormwater drainage network being under capacity.

4.0 Asset Condition

4.1 Asset Condition – Stormwater Drainage and GPT Assets

Stormwater Drainage Assets

The condition of Council's of Stormwater Drainage Assets has been progressively surveyed using CCTV inspection contractors since 2006. This information is collated in a database using WINCAN Pipe Inspection Software. CCTV condition surveys are expensive due to the equipment and specialised contractors required. In addition, this method of data collection often requires the organisation of Work Zones, RMS Road Occupancy Licences, and traffic control which adds to the cost of the survey. Subject to funding availability, detailed reactive and proactive CCTV condition surveys are carried out on Council's pipe network each year.

The condition profile as shown in the Table below. It is based on the CCTV condition survey carried out in accordance with the WSAA Conduit Inspection Reporting Code. The graph also shows that the number of pipes in condition "1" is relatively high. It is likely that some of these condition 1 pipes may be in condition 2 or even in condition 3. This could be due to a CCTV Operator not observing and recording very small defects such as hairline cracks. The reasons for not observing very small defects include inadequate equipment such as poor lighting, not using the correctly sized "camera tractor" or camera configuration to centre the camera in varying pipe sizes, or simply assuming that the pipe is generally in reasonable condition. Improved specifications and closer monitoring, as well as the increased use of high-definition cameras, should overcome the issues of not observing minor defects. It should be noted that this does not impact on either the short- or medium-term capital works programs which are based on pipes which have been clearly identified as condition 5.

Gross Pollutant Traps (GPTs)

The condition of council's GPTs and litter baskets was surveyed extensively in 2016 by consultants Optimal Storm water Pty Ltd. The performance of the GPTs is monitored regularly through Council's cleaning regime and any damage, faults or repairs are reported. Obsolescence has been factored into the condition of GPTs. Where a GPT has been identified as unfit for purpose, it has been deemed as being in very poor condition.

The following condition criteria was used:

Table: Stormwater Drainage and GPT Condition Survey Criteria

Grade	Condition	Description
0	Not inspected	Yet to be condition assessed.
1	Very Good	Sound Stormwater Drainage and GPT Assets designed to current standards and well maintained with no defects. **No work required**
2	Good	As grade 1 but not designed to current standards or showing minor wear, tear and deterioration of capacity e.g. tree root intrusion, minor collapse and or undersize – with *minor* capacity and or blockage issues – has potential to block in large storm events, but no undermining of Stormwater Drainage and GPT Assets that would seriously compromise property or life. Needs to be reinspected in 2- 3 years. Deterioration has no significant impact on performance of the Stormwater Drainage and GPT Assets. **Only minor work required**
3	Fair	Stormwater Drainage and GPT Assets functionally sound, but capacity and function affected by minor defects e.g. tree root intrusions, blockages from other sources, collapsed sections, undermining or washout of foundations to the line of is starting to become apparent – *moderate* capacity and or blockage issues – has a moderate potential to block in large storm events, but no significant undermining of Stormwater Drainage and GPT Assets that would seriously compromise property or life. **Some repair work and replacement of sections work required within 4 -10 years**

Grade	Condition	Description
4	Poor	Stormwater Drainage and GPT Assets functioning but with problems due to significant defects e.g. Major tree root intrusions, major blockages from other sources , large % of line collapsed in sections, undermining or washout of foundations to the line of is major causing structural and performance issues with the line – *major* capacity and or blockage issues – has a major potential to block in large and or moderate storm events - undermining of Stormwater Drainage and GPT Assets is showing signs of failure that would that would lead to property damage and or seriously compromise public safety and or life., likely to cause significantly deteriorate within 1-2 years. **Significant replacement or rehabilitation needed within 2-4 years**
5	Very Poor	Stormwater Drainage and GPT Assets is not functioning and or has failed due to significant defects e.g. Major tree root intrusions, major blockages from other sources, more that 75% of line collapsed in sections, undermining or washout of foundations to the line has caused the line to fail / collapse – *major* capacity and or blockage issues – will block and not function in any storm event. Stormwater Drainage and GPT Assets have failed and would lead to property damage and or seriously compromise public safety and or life. Stormwater Drainage and GPT Assets has serious problems and has failed or are about to fail in the near future, causing unacceptable stability, appearance and public safety hazard. **Urgent replacement/ rehabilitation required**

The Table below shows the Replacement Cost for each of the condition scores.

Table: Stormwater Drainage Pits Condition Survey Results

Condition	Replacement Cost (2024)	% Condition (based on cost)
1 (Very Good)	$14,777,004	55.4%
2 (Good)	$7,711,106	28.9%
3 (Fair)	$417,057	1.6%
4 (poor)	$494,678	1.9%
5 (Very Poor)	$3,250,610	12.2%
Total	**$26,650,455**	**100.0%**

The Graph below shows the condition of Stormwater Drainage Pits assets in terms of replacement cost.

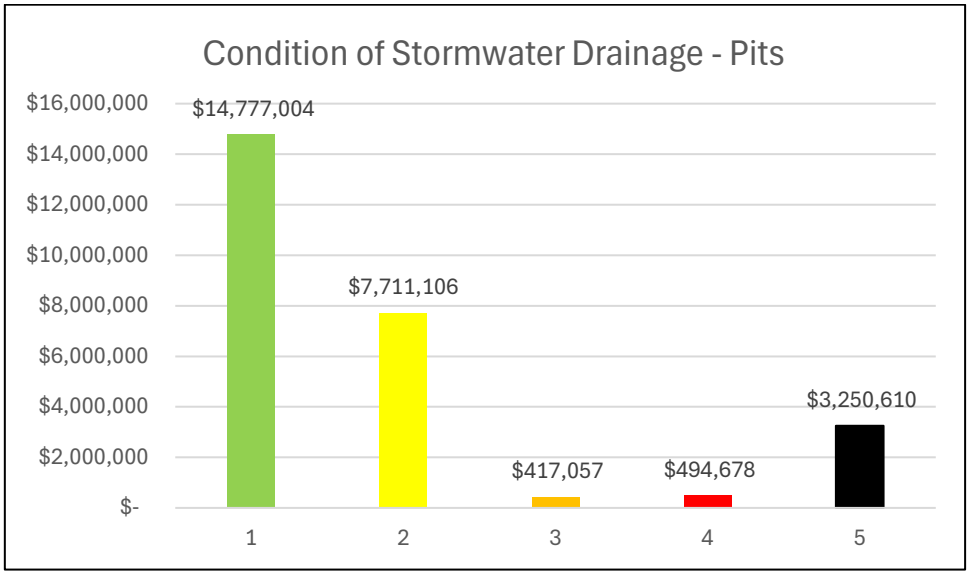
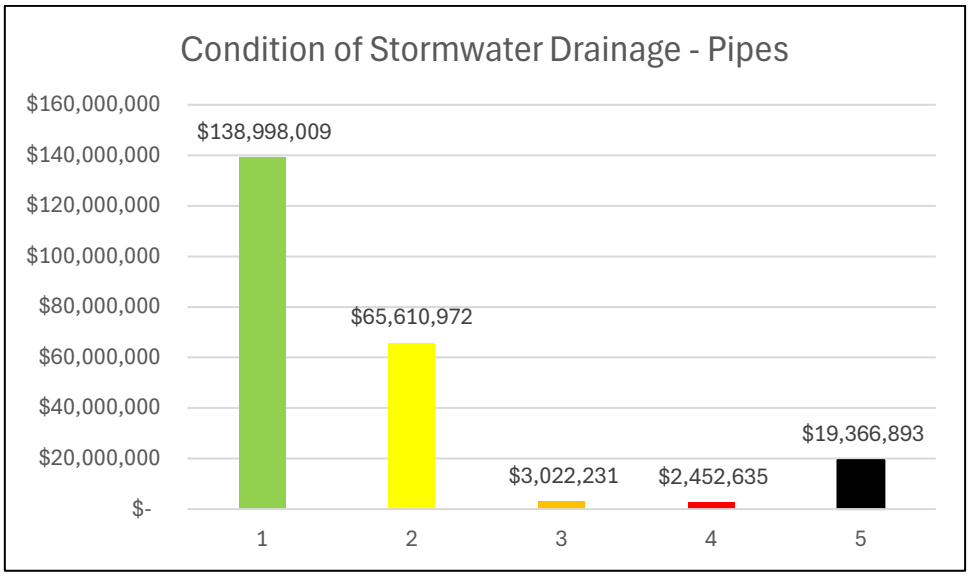


Table: Stormwater Drainage Pipes Condition Survey Results

Condition	Replacement Cost (2024)	% Condition (based on cost)
1 (Very Good)	$138,998,009	60.6%
2 (Good)	$65,610,972	28.6%
3 (Fair)	$3,022,231	1.3%
4 (Poor)	$2,452,635	1.1%
5 (Very Poor)	$19,366,893	8.4%
Total	**$229,450,740**	**100.0%**

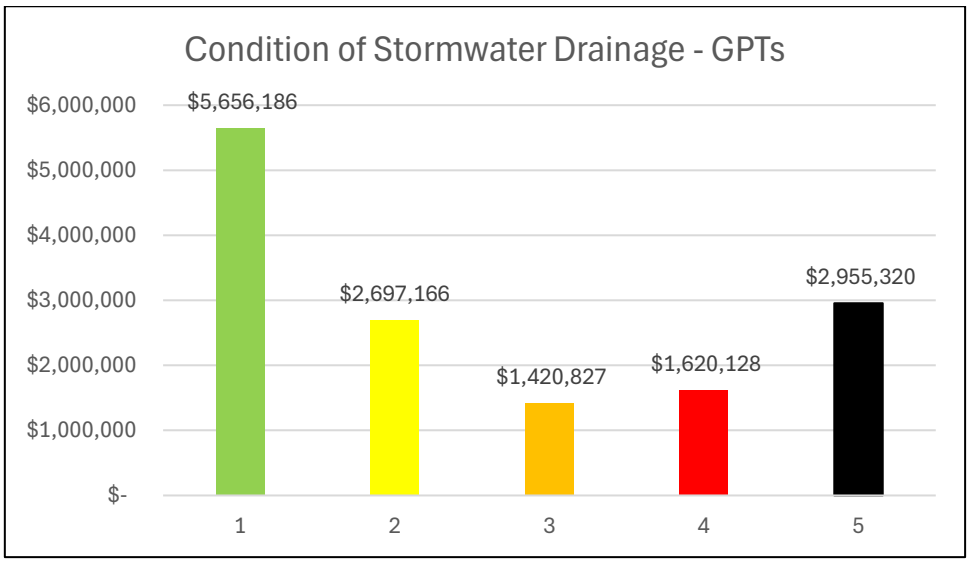
The Graph below shows the condition of Stormwater Drainage Pipes assets in terms of replacement cost.



Gross Pollutant Traps Condition Survey Results

Condition	Replacement Cost (2024)	% Condition (based on cost)
1 (Very Good)	$5,656,186	39.4%
2 (Good)	$2,697,166	18.8%
3 (Fair)	$1,420,827	9.9%
4 (poor)	$1,620,128	11.3%
5 (Very Poor)	$2,955,320	20.6%
Total	**$14,349,627**	**100.0%**

The Graph below shows the condition of Gross Pollutant Traps assets in terms of replacement cost.



5.0 Financial Summary

5.1 Asset Valuation

The total Replacement Value of the Stormwater Drainage & GPT network is shown in the Table below as at 30 June 2024.

Table: Stormwater Drainage & GPT Valuation ($) 2024

Asset Category	Replacement Value (2024)	Accumulated Depreciation (2024)	Fair Value (2024)	Depreciation Expense (2024)
GPTs	$14,349,627	$6,847,888	$7,501,739	$297,464
Pipes	$229,450,740	$66,594,244	$162,856,496	$1,778,479
Pits	$26,650,455	$8,529,854	$18,120,601	$332,711
TOTAL	**$270,450,822**	**$81,971,986**	**$188,478,836**	**$2,408,654**

5.2 Funding Requirements

The Table below shows that the current cost to bring all Council's Stormwater Drainage infrastructure assets to a satisfactory standard is $30.1M. This amount includes the cost to replace existing infrastructure currently in either poor or very poor condition (condition 4 or 5). This represents 11.1% of the Stormwater Drainage infrastructure network in terms of Replacement Cost. This means that 88.9% of this portfolio is in very good to fair condition (1 to 3).

The Table also shows that the total current Depreciation Expense is $2.4M or 0.9% of the Total Replacement Cost of Council's assets. This assumes that all Council's assets are completely replaced every 112.3 years on average. This is a weighted average for the network as useful lives of the individual components varies.

The Table shows that the 10-year Long Term Cost to bring all Council's infrastructure assets to a satisfactory standard as well as maintain the current standard is $54.2M over 10 years or an average annual cost of $5.4M. This includes the total Depreciation Expense over 10 years (maintaining the existing standard) and assumes

that all condition 4 and 5 assets will be replaced over the next 10 years (bringing all assets to a satisfactory condition).

Historically, Council has reported a 'cost to bring to satisfactory condition' that assumed those assets in 'poor' condition (category 4) were acceptable by the community. Council's recommendation is that assets in poor condition should be brought to a satisfactory condition, and therefore we have included these in our backlog estimates.

The Local Government Code of Accounting Practice outlines the requirements for both Council's financial statements and the special schedules. Under this Code, where Councils haven't developed an 'agreed' level of service, a standard of 'good' (category 2) should be used for the 'Estimated cost to bring to satisfactory condition'. This would mean including within our backlog figures category 3, 4 and 5 assets.

North Sydney Council has not undertaken the exercise with the community to determine the 'agreed level of service'. However, Council did not think it was reasonable to inflate the backlog to this extent. Instead, Council has opted to use the standard of 'satisfactory/fair' (category 3) as the condition to aspire to, rather than 'good' (category 2).

At a recent demographically selected workshop in 2024 (involving a group of residents, representative of the demographics of the North Sydney local government area), feedback suggested that infrastructure in a 'poor' or 'very poor' condition would not be acceptable to the community. Based on Council's review, it is recommended that all infrastructure currently classified as 'poor' or 'very poor' are required to be addressed.

Table: Long Term Infrastructure Funding Required ($)2024

Asset Class / Category	Cost to bring to assets to satisfactory Cond. (4 + 5)	Total replacement cost	Depreciation Expense (2024)	Funding required over 10 years (Depreciation x 10 + Cond 4 + 5)	Average Annual Funding Required (2024)
Stormwater Drainage / GPTs	$4,575,448	$14,349,627	$297,464	$7,550,087	$755,009
Stormwater Drainage / Pipes	$21,819,528	$229,450,740	$1,778,479	$39,604,319	$3,960,432
Stormwater Drainage / Pits	$3,745,288	$26,650,455	$332,711	$7,072,400	$707,240
TOTAL	**$30,140,264**	**$270,450,822**	**$2,408,654**	**$54,226,807**	**$5,422,681**

5.3 Useful Lives – Stormwater Drainage Pipes

The useful lives of all types of Stormwater Drainage & GPT assets were reviewed by Australis Pty Ltd and are shown in the following Table. The Weighted Average useful life of Pipes is 129.0 years.

Stormwater Drainage Pipes - Material	Useful Life (Years)
Cast Iron	100
Unidentified type of plastics	70
Brickwork	70
Composite brick/ concrete	70
Cement mortar	70
Concrete pipe	100
Concrete segments	100
Fibre reinforced cement	70
Glass reinforced plastics	70
Masonry (coursed)	70
Masonry (uncoursed or rough)	70
Polyethylene	70
Polypropylene	70

Stormwater Drainage Pipes - Material	Useful Life (Years)
PVC-Plasticised	70
Reinforced concrete	100
Sandstone culvert	70
Steel	100
Vitrified clay	70
Other	70
Unidentified material	100

5.4 Useful Lives – Stormwater Drainage Pits

The useful lives of all types of Stormwater Drainage & GPT assets were reviewed by Australis Pty Ltd and are shown in the following Table. The Weighted Average useful life of Pits is 80 years.

Stormwater Drainage Pits - Material	Useful Life (Years)
All Materials	80

5.5 Useful Lives – GPT Assets

The useful lives of all types of Stormwater Drainage & GPT assets were reviewed by Australis Pty Ltd and are shown in the following Table. The Weighted Average useful life of GPTs is 48.2 years.

Gross Pollutant Traps - Type	Useful Life (Years)
GPT	50
NSC Litter Basket	15
NSC Trash Rack	15

6.0 Managing the Risks

Councils present budget levels (as at 30 June 2024) are insufficient to continue to manage risks in the medium term (4 years).

The main risk consequences are:

- Stormwater Drainage Assets in a poor or very poor condition which may result in the Stormwater Drainage Asset failing. This may be due to significant defects, for example, major tree root intrusions, major blockages from other sources, undermining or washout of foundations to the line that has caused the line to block or collapse. This may lead to property damage and or seriously compromise to public safety and or life.
- Capacity of Stormwater Drainage Assets to cope with major flooding events.
- Gross Pollutant Trap Assets in a Poor or very Poor condition. This includes Gross Pollutant Trap Assets are not functioning and or have failed due to significant defects, for example, corrosion, structural failure, or capacity issues. This will lead to Environmental pollution, possible property damage or seriously compromise public safety or life.

Council will endeavour to manage these risks within available funding by:

- Prioritising higher risk works within the planned budget where possible
- Re-allocating budgets from other sources if required and where possible
- Seeking emergency funding if required and where possible
- Partial or full closure where necessary

The Risk Matrix used to prioritise capital works for Stormwater Drainage and GPT Assets are shown in the Tables below.

Table: Risk Matrix – Stormwater Drainage – Pits & Pipes

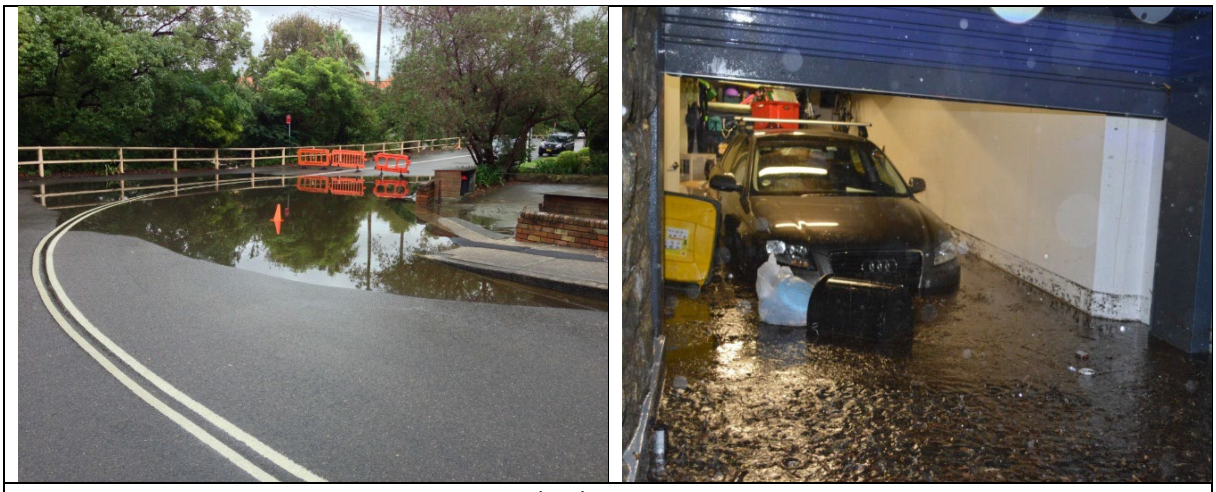
Risk Matrix - Stormwater Drainage – Pits & Pipes					
Condition	In Private Property	No	No	No	Yes
	Road Hierarchy	Lane	Local	Collector	Regional / State
	Park Hierarchy	Local	District	Regional	
	Pipe Size	0-375	>375-600	>600-900	>900
	Score	1	2	3	4
Condition 1 – Very Good	1	L	L	L	L
Condition 2 - Good	2	L	L	L	M
Condition 3 – Fair	3	M	M	M	H
Condition 4 – Poor	4	H	H	H	VH
Condition 5 – Very Poor	5	H	VH	VH	VH

Table: Risk Matrix – GPTs

Risk Matrix - GPTs					
Condition	Catchment Size (Ha)	0-15	15-30	30-45	>45
	Road Hierarchy	Lane	Local	Collector	Regional / State
	Park Hierarchy	Local	District	Regional	
	Score	1	2	3	4
Condition 1 – Very Good	1	L	L	L	L
Condition 2 - Good	2	L	L	L	M
Condition 3 – Fair	3	M	M	M	H
Condition 4 – Poor	4	H	H	H	VH
Condition 5 – Very Poor	5	H	VH	VH	VH

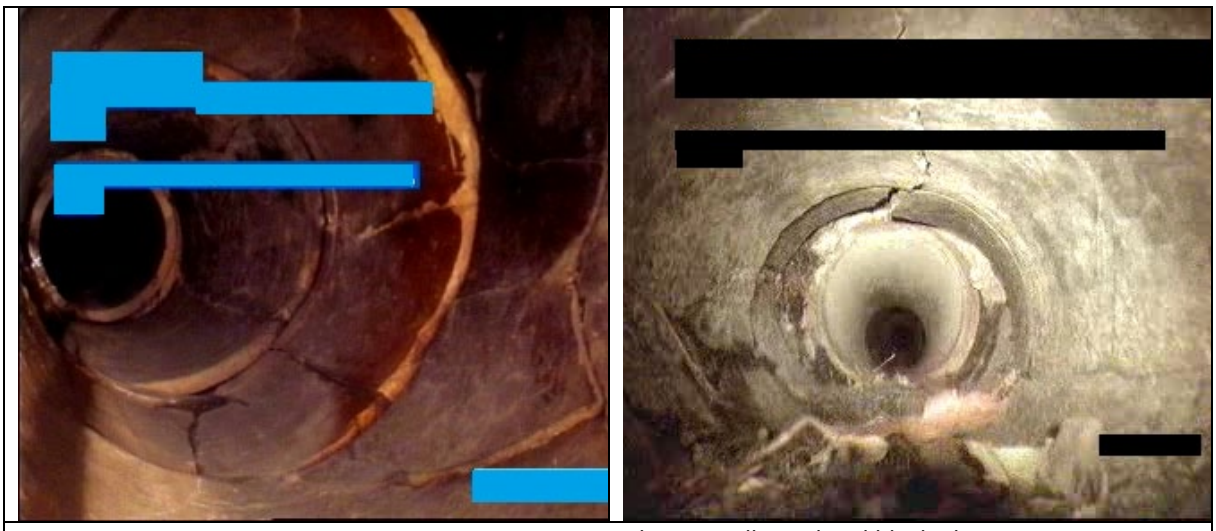
6.1 Examples of Stormwater Drainage and GPT risks in the North Sydney LGA.

Stormwater Pipes in very poor condition – collapsed and blocked

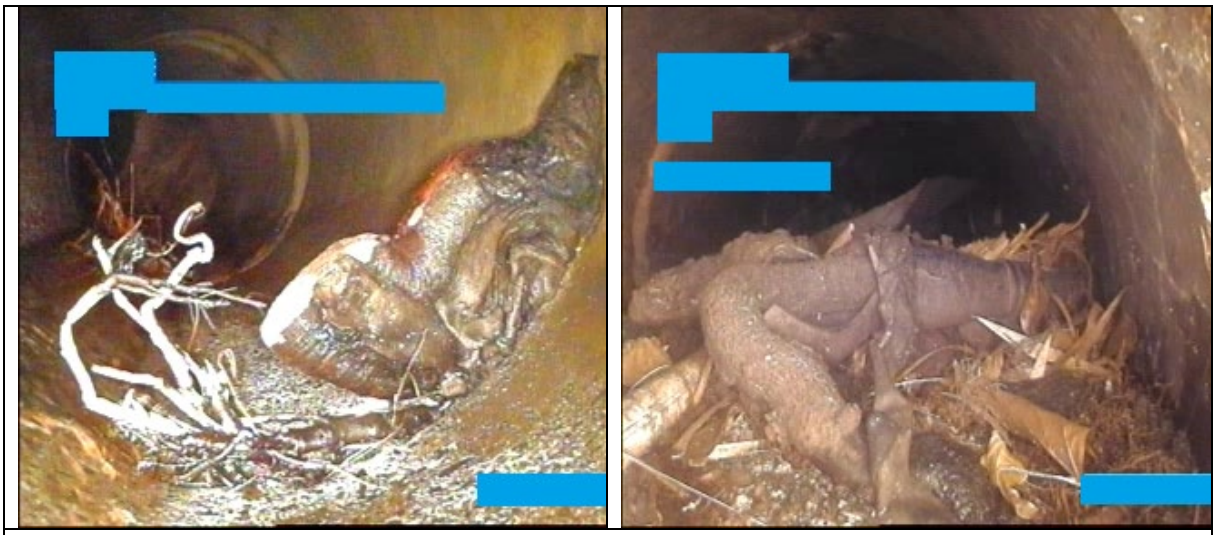


Flooding Issues

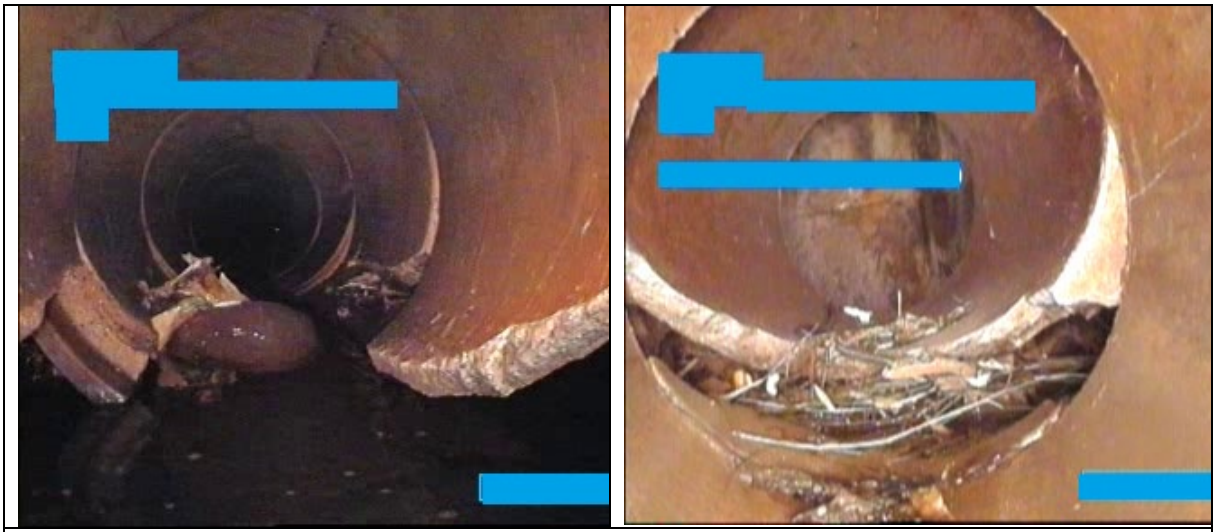
Sinkholes created from collapsed pipes and washout from leaking pipes



Stormwater Pipes in very poor condition – collapsed and blocked



Stormwater Pipes in very poor condition – Tree root infiltrations and blocked



Stormwater Pipes in very poor condition – collapsed


Lids are too heavy - The wood is starting to chip; they should be replaced. Lifting points rusted or broken off


Sediment and trash build up in front of the weir and in pits generally – low capacity.



Difficult access to a lot of GPTs for maintenance



Corrosion and structural damage to GPT manhole covers


The floatables flap was jammed open due to a broken hinge and pollution trapped in it stopping it closing.

7.0 Funding Programs

7.1 Maintenance Program

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. trip hazard repair. 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.

The current maintenance expenditure levels are considered to be adequate to meet projected service levels.

Over the longer term, future operations and maintenance expenditure is forecast to increase as the asset stock increases and asset type changes to meet the requirements of the Public Domain Style Manual.

7.2 Capital Works – Prioritised list based on risk

The list of prioritised capital works for this asset category are based on the Risk Matrix. The extent of the program depends on the final adopted Council budget. The Program is prioritised in the following order:

1. Risk sorting score (descending order)
2. Risk rating score (descending order)
3. % Condition 5 (descending order)
4. % Condition 4 (descending order)

The following Table shows the prioritised list of capital works. Only projects with a Very High-Risk Sorting Score are shown. The Capital Works Program is based on data collected by consultants engaged to undertake condition assessments of the asset network. Prior to any Capital Works Program being finalised a detailed inspection, project scoping, and project estimate is undertaken. Program priorities may change as a result. In practice, and where funds permit, assets in condition 3 are generally replaced at the same time as assets in condition 4 or 5 if they are adjacent if there are potential risks and if it is cost effective.

It should be noted that these assets may also be replaced based on other criteria including:

- Damage.
- Restorations.
- Works in association with other projects such as Streetscape and Public Domain Upgrades
- Building Developments (DA Conditions)
- Professional judgement in cases where the risk matrix score does not accurately reflect the actual risk on site.

7.3 Capital Works Program – Prioritised list based on risk – Stormwater Drainage Pits & Pipes

Table: Prioritised Capital Works - Stormwater Drainage Pits & Pipes

Location	Risk Rating	Risk Rating Score	Cost Estimate
1 Balls Head Road Waverton	Very High	20	$74,646
1 Clark Road North Sydney	Very High	20	$28,780
1 Gundimaine Avenue Kurraba Point	Very High	20	$66,163
106 Parraween Street Cremorne	Very High	20	$75,284
1-11 Bridge End Wollstonecraft	Very High	20	$140,886
1-5 Russell Street Wollstonecraft	Very High	20	$259,482
163 Alexander Street Crows Nest	Very High	20	$71,879
164 Willoughby Road Crows Nest	Very High	20	$17,032
2 Ernest Place Crows Nest	Very High	20	$46,337
200 Miller Street North Sydney	Very High	20	$104,035
21 Churchill Crescent Cammeray	Very High	20	$111,521
21 Wonga Road Cremorne	Very High	20	$11,919
23a Bay View Street Lavender Bay	Very High	20	$15,092
24 Tryon Avenue Wollstonecraft	Very High	20	$31,405
25 Shellcove Road Kurraba Point	Very High	20	$18,000
29a Shellcove Road Kurraba Point	Very High	20	$59,371
3 Bertha Road Cremorne	Very High	20	$45,698
3 Powell Street Neutral Bay	Very High	20	$219,448
39 Young Street Cremorne	Very High	20	$84,907
43 Young Street Cremorne	Very High	20	$214,401
54 McLaren Street NORTH SYDNEY	Very High	20	$35,296
550 Miller Street Cammeray	Very High	20	$14,648
6 Powell Street Neutral Bay	Very High	20	$127,235
63 Willoughby Road Crows Nest	Very High	20	$18,163
68a Kareela Road Cremorne Point	Very High	20	$16,154
6a Glen Street Milsons Point	Very High	20	$41,921
7 The Boulevarde Cammeray	Very High	20	$118,193
8 Cowdroy Avenue Cammeray	Very High	20	$175,391
8 Hayes Street Neutral Bay	Very High	20	$145,168
81 Gerard Lane Cremorne	Very High	20	$36,635
86 Kurraba Road Neutral Bay	Very High	20	$24,534
9 Cowdroy Avenue Cammeray	Very High	20	$50,091
96b Macpherson Street Cremorne	Very High	20	$30,469
Badangi Reserve	Very High	20	$333,907
Brennan Park	Very High	20	$216,955
Cammeray Park	Very High	20	$141,282
Forsyth Park	Very High	20	$300,000
Lower Spofforth Walk (Includes Hunts Lookout)	Very High	20	$62,461

Location	Risk Rating	Risk Rating Score	Cost Estimate
Primrose Park	Very High	20	$1,000,000
St Leonards Park	Very High	20	$792,633
Ted Mack Civic Park	Very High	20	$126,659
Tunks Park	Very High	20	$1,000,000
PSID 166 Clark Rd, North Sydney	Very High	20	$27,071
PSID 375 Miller St, North Sydney	Very High	20	$100,000
PSID 708 James Pl, North Sydney	Very High	20	$31,754
PSID 18 Alexander St, Crows Nest	Very High	20	$35,376
PSID 36 Atchison St, Crows Nest	Very High	20	$45,875
PSID 696 Hospital La, Crows Nest	Very High	20	$53,830
PSID 160 Christie St, St. Leonards	Very High	20	$27,572
PSID 158 Chandos St (Westbound), St. Leonards	Very High	20	$251,022
PSID 1004 Creek Lane, Cammeray	Very High	20	$500,000
PSID 377 Miller St, North Sydney	Very High	20	$163,943
PSID 321 Kurraba Rd, Neutral Bay	Very High	20	$309,854
PSID 271 Hayes St, Neutral Bay	Very High	20	$536,120
PSID 604 Wycombe Rd, Neutral Bay	Very High	20	$34,472
PSID 372 Miller St, North Sydney	Very High	20	$107,996
PSID 373 Miller St, North Sydney	Very High	20	$173,090
PSID 474 River Rd, Wollstonecraft	Very High	20	$219,202
PSID 416 Newlands La, Wollstonecraft	Very High	20	$316,424
PSID 415 Newlands La, Wollstonecraft	Very High	20	$584,059
PSID 54 Bannerman St, Cremorne	Very High	20	$98,493
PSID 764 Powell St, Neutral Bay	Very High	20	$238,345
PSID 265 Harriette St, Neutral Bay	Very High	20	$16,984
PSID 177 Cowdroy Ave, Cammeray	Very High	20	$5,389
PSID 972 Railway Ave, Lavender Bay	Very High	20	$73,104
PSID 458 Rangers Rd, Cremorne	Very High	20	$265,411
PSID 832 Spofforth St (Northbound), Cremorne	Very High	20	$227,308
PSID 833 Spofforth St (Northbound), Cremorne	Very High	20	$185,018
PSID 244 Gerard St, Cremorne	Very High	20	$127,648
PSID 66 Belgrave St, Cremorne	Very High	20	$78,724
PSID 245 Gerard St, Cremorne	Very High	20	$29,698
PSID 867 Gerard St, Cremorne	Very High	20	$87,242
PSID 347 Macpherson St (Northbound), Cremorne	Very High	20	$24,180
PSID 39 Aubin St, Neutral Bay	Very High	16	$72,287
PSID 273 Hazelbank Rd, Wollstonecraft	Very High	16	$364,956
1 Olympic Drive Milsons Point	Very High	16	$60,962
122 Kurraba Road Kurraba Point	Very High	16	$109,818
168 Walker Street North Sydney	Very High	16	$73,339
2 Hayes Street Neutral Bay	Very High	16	$248,254
25 Reynolds Street Cremorne	Very High	16	$58,651

Location	Risk Rating	Risk Rating Score	Cost Estimate
4 Grasmere Road Cremorne	Very High	16	$219,881
40 Brightmore Street Cremorne	Very High	16	$36,636
42a Milray Avenue Wollstonecraft	Very High	16	$251,020
9 Sutherland Street Cremorne	Very High	16	$24,783
Phillips Street Playground	Very High	16	$101,198
PSID 165 Clark Rd, North Sydney	Very High	16	$20,584
PSID 586 Willoughby Rd, Crows Nest	Very High	16	$65,482
PSID 152 Chandos La, Crows Nest	Very High	16	$19,781
PSID 376 Miller St, North Sydney	Very High	16	$13,235
PSID 374 Miller St, North Sydney	Very High	16	$5,324
PSID 969 Gas Works Rd, Wollstonecraft	Very High	16	$283,182
PSID 1011 Spofforth St (Northbound), Cremorne	Very High	16	$41,803
PSID 68 Gerard St, Cremorne	Very High	16	$72,656
PSID 221 Ernest St, Cremorne	Very High	16	$9,670
Anderson Street Neutral Bay	Very High	15	$42,657
Balls Head Reserve	Very High	15	$98,921
Berry Island Reserve	Very High	15	$67,814
Blues Point Reserve	Very High	15	$14,111
Bradfield Park	Very High	15	$82,252
Cremorne Reserve	Very High	15	$362,188
Green Park	Very High	15	$96,151
Hamilton Reserve	Very High	15	$17,782
Lodge Road Playground	Very High	15	$116,985
Pine Street/Arkland Street Reserve	Very High	15	$15,194
Smoothey Park	Very High	15	$116,336
Suspension Bridge Reserve	Very High	15	$25,097
Wyagdon Street Reserve	Very High	15	$24,776
PSID 92 Bent St, Neutral Bay	Very High	15	$172,494
PSID 401 Montpelier St, Neutral Bay	Very High	15	$87,182
PSID 618 Alfred St North (Northbound), Neutral Bay	Very High	15	$249,464
PSID 359 McLaren St, North Sydney	Very High	15	$260,768
PSID 83 Ben Boyd Rd, Neutral Bay	Very High	15	$30,000
PSID 358 McLaren St, North Sydney	Very High	15	$6,510
PSID 93 Bent St, Neutral Bay	Very High	15	$189,525
PSID 619 Alfred St North (Northbound), Neutral Bay	Very High	15	$172,742
PSID 584 Willoughby Rd, Crows Nest	Very High	15	$113,521
PSID 976 Chandos St (Westbound), St. Leonards	Very High	15	$10,410
PSID 249 Grafton St, Cremorne	Very High	15	$7,462
PSID 435 Park Ave, Cammeray	Very High	15	$197,431
PSID 434 Park Ave, Cammeray	Very High	15	$46,003
PSID 133 Cammeray Rd, Cammeray	Very High	15	$85,661

Location	Risk Rating	Risk Rating Score	Cost Estimate
PSID 563 West St, North Sydney	Very High	15	$24,124
PSID 134 Cammeray Rd, Cammeray	Very High	15	$96,122
PSID 541 View St, Cremorne	Very High	15	$299,357
PSID 195 Earle St, Cremorne	Very High	15	$83,506
PSID 148 Carter St, Cammeray	Very High	15	$52,823
PSID 140 Carlow St, North Sydney	Very High	15	$117,167
PSID 24 Amherst St, Cammeray	Very High	15	$2,000,000
PSID 70 Bellevue St, Cammeray	Very High	15	$50,736
PSID 565 West St, Crows Nest	Very High	15	$55,736
PSID 216 Ernest St, Crows Nest	Very High	15	$21,761
PSID 564 West St, Crows Nest	Very High	15	$18,097
PSID 15 Alexander St, Crows Nest	Very High	15	$40,814
PSID 82 Ben Boyd Rd, Neutral Bay	Very High	15	$47,518
PSID 752 Olympic Dr, Milsons Point	Very High	15	$89,680
PSID 118 Broughton St, Kirribilli	Very High	15	$224,538
PSID 487 Ryries Pde, Cremorne	Very High	15	$140,883
PSID 822 Walker St, North Sydney	Very High	15	$25,682
PSID 58 Bay Rd, North Sydney	Very High	15	$10,880
PSID 417 Newlands St, Wollstonecraft	Very High	15	$3,975
PSID 404 Morton St, Wollstonecraft	Very High	15	$294,725
PSID 475 Rocklands La, Wollstonecraft	Very High	15	$308,471
PSID 184 Crows Nest Rd, Waverton	Very High	15	$18,495
PSID 405 Morton St, Wollstonecraft	Very High	15	$11,945
PSID 477 Rocklands Rd, Wollstonecraft	Very High	15	$80,698
PSID 97 Bertha Rd, Cremorne	Very High	15	$209,053
PSID 490 Shellcove Rd, Neutral Bay	Very High	15	$70,824
PSID 600 Wycombe Rd, Neutral Bay	Very High	15	$208,597
PSID 260 Gundimaine Ave, Neutral Bay	Very High	15	$143,304
PSID 792 Milson Rd, Cremorne Point	Very High	15	$59,311
PSID 393 Milson Rd, Cremorne Point	Very High	15	$115,957
PSID 989 Tunks Park Carpark, Cammeray	Very High	15	$287,041
PSID 543 Walker St, Lavender Bay	Very High	15	$15,700
PSID 333 Lavender St, Lavender Bay	Very High	15	$78,386
PSID 534 Union St, McMahons Point	Very High	15	$34,393
PSID 107 Blues Point Rd, McMahons Point	Very High	15	$32,783
PSID 106 Blues Point Rd, McMahons Point	Very High	15	$8,504
PSID 20 Alfred St South, Milsons Point	Very High	15	$50,603
PSID 642 Burton St, Milsons Point	Very High	15	$10,888
PSID 248 Glen St, Milsons Point	Very High	15	$3,993
PSID 239 Florence St, Cremorne	Very High	15	$46,964
PSID 457 Rangers Rd, Cremorne	Very High	15	$314,220
PSID 409 Murdoch St, Cremorne	Very High	15	$31,418

Location	Risk Rating	Risk Rating Score	Cost Estimate
PSID 253 Grasmere Rd, Cremorne	Very High	15	$65,965
PSID 252 Grasmere La, Cremorne	Very High	15	$696,857
PSID 800 Young St, Neutral Bay	Very High	15	$244,247
PSID 803 Young St, Cremorne	Very High	15	$8,949
PSID 557 Waters Rd, Neutral Bay	Very High	15	$288,666
PSID 589 Winnie St, Cremorne	Very High	15	$331,615
PSID 801 Young St, Cremorne	Very High	15	$74,182
PSID 258 Grosvenor St, Neutral Bay	Very High	15	$17,148
PSID 88 Benelong Rd, Cremorne	Very High	15	$35,660
PSID 147 Carr St, Waverton	Very High	15	$20,203
PSID 146 Carr St, Waverton	Very High	15	$14,378
PSID 535 Union St, McMahons Point	Very High	15	$241,886
PSID 186 Crows Nest Rd, Waverton	Very High	15	$80,917
PSID 60 Bay Rd, Waverton	Very High	15	$338,738
PSID 46 Balls Head Dr, Waverton	Very High	15	$21,576

7.4 Capital Works Program – Prioritised list based on risk – GPTs

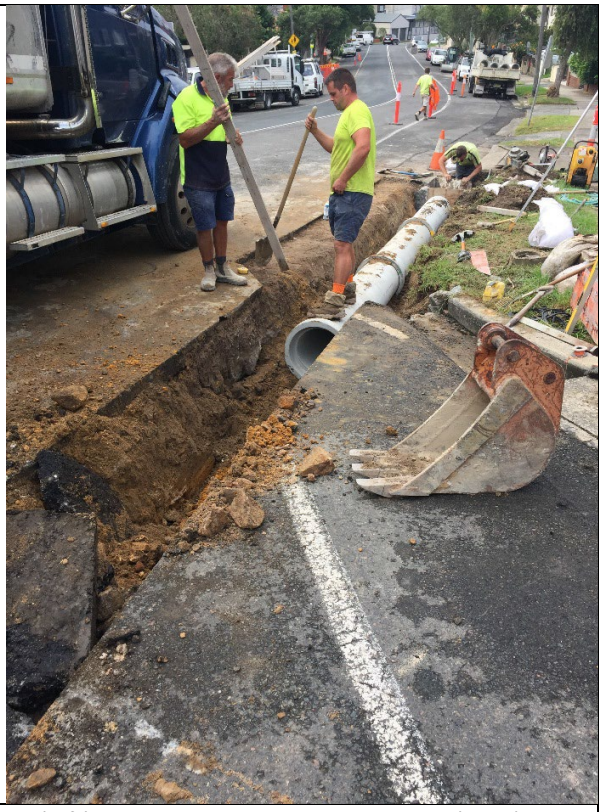
Table: Prioritised Capital Works - GPTs

Location	Risk Rating	Risk Rating Score	Cost Estimate
Grafton St, Cammeray	Very High	20	$962,384
Ryries Parade, North Cremorne	Very High	15	$679,945
Lavender Bay, Milsons Point	High	10	$679,945
Elamang Ave, Kirribilli	High	12	$376,585
Waverton Park West, Waverton	High	8	$962,384

7.5 Examples of completed Capital Works Projects – Stormwater Pits and Pipes

Pit and Pipe replacement at Bob Gordon Reserve, Lavender Bay.

Pit and Pipe replacement at Carabella Street. Kirribilli.

Pit and Pipe replacement at Echo Street, Cammeray, (left), and at Carter Street, Cammeray (right)


Pit and Pipe replacement at Abbott Street, Cammeray (left), and at Montpellier Street, Neutral Bay (right).

Pit and Pipe replacement at Milson Road, Cremorne Point.

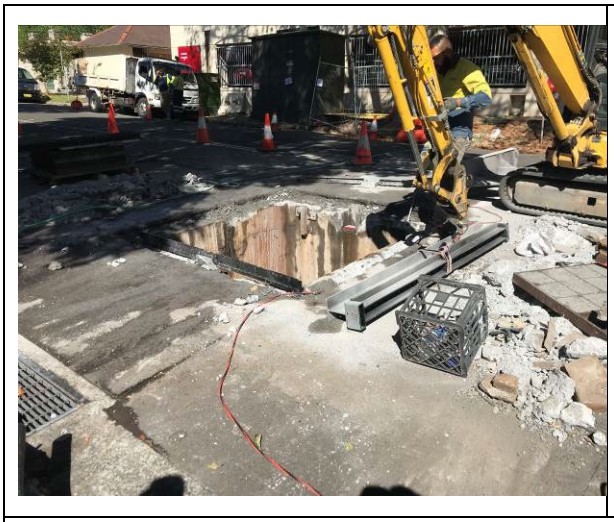
Pit and Pipe replacement at Carlyle Lane, Wollstonecraft.

7.6 Examples of completed Capital Works Projects – GPTs


Replacement of GPT at Little Young Street, Cremorne.

Replacement of GPT at Little Young Street, Cremorne.


Replacement of GPT at Little Young Street, Cremorne.



Replacement of GPT Lids at Elamang Avenue, Neutral Bay.

Replacement of GPT Lids at Elamang Avenue, Neutral Bay.

8.0 Monitoring and Improvement Program

A whole of organisation approach is essential for continuous asset management practices to continue to improve. Council's Asset Management Plans AMPs need to be based on accurate data and require detailed Valuations to be done on a periodic basis. Accurate Valuations in turn require detailed condition assessments of infrastructure assets. The following Improvement Plan summarises the areas for improvement within AMPs.

Table: Improvement Plan

Asset	Last Comprehensive Valuation (Year)	Comprehensive Valuation to be performed
Roads Asset Class: Stormwater Drainage Pits and Pipes, GPTs	2020	Planned for 2025
Community Consultation to determine and adopt Level of Service		No later than 2029

9.0 References

- GPT Audit Report by Optimal Stormwater
- IPWEA, 2015 Practice Note 5 Stormwater Drainage, Institute of Public Works Engineering Australasia, Sydney
- IPWEA, 2006, 'International Infrastructure Management Manual', Institute of Public Works Engineering Australasia, Sydney, www.ipwea.org/IIMM
- IPWEA, 2008, 'NAMS.PLUS Asset Management', Institute of Public Works Engineering Australasia, Sydney,
- IPWEA, 2015, 2nd edition, 'Australian Infrastructure Financial Management Manual', Institute of Public Works Engineering Australasia, Sydney
- IPWEA, 2015, 3rd edition, 'International Infrastructure Management Manual', Institute of Public Works Engineering Australasia, Sydney
- IPWEA, 2012 LTFP Practice Note 6 PN Long Term Financial Plan, Institute of Public Works Engineering Australasia, Sydney

10.0 Appendix A: Maintenance Management System - Drainage Pits and Kerb & Guttering

Inspection areas have been defined in accordance with the identified key factors of:

- Volume of pedestrian traffic, e.g. transport hubs; retail/commercial areas; schools and hospitals.
- Use by people over 50 years old.

Inspection frequencies are based on these areas as defined by the reference maps and the resources currently available to undertake the inspections.

Red – 2 times per year; **Blue** – Annual; **Other** – Once every 2 years;

The results of inspections will be downloaded into the MMDS database. There are 5 categories in which a defect may be placed. Not all categories may be applicable to every inspection area and/or type of asset:

Cat 5		Will be **made safe** no later than 2 working days after allocation of defect to work crew. Defect may then be re-categorised as Cat 4 or Cat 3.
Cat 4		Will be repaired no later than 10 working days after allocation of defect to work crew.
Cat 3		Will be placed on Zone Maintenance Program. This program operates on an 8 week cycle, however, depending on workload and reactive maintenance requests, Cat 3 defects may miss a cycle or more before repairs are able to be undertaken.
Cat 2		Deferred maintenance. Could also have aesthetic issues such as gum, stains, services mark-up, etc. May be addressed if close-by to Cat 4 or Cat 3 defect that is being repaired. Otherwise, will be re-inspected on next area inspection.
Cat 1		As new. Surface displaying no defects.

Intervention Matrix

KERB + GUTTER	RED	BLUE	OTHER
MISSING/DAMAGED/LOOSE	28	24	21
> 50mm/GRATE NOT BICYCLE SAFE	23	19	16
25mm – 50mm/GRATE BLOCKED	20	16	13
10mm – 25mm	18	14	11
AESTHETIC	12	8	5
AS NEW	10	6	3

Scoring example: 28 = High Use Area score 10 and Defect of Missing or Loose score 18

The focus of inspections will be the kerb section and unobstructed gutter sections. It is noted that the gutter section may be obstructed and not visible due to parked vehicles during inspection. Inspectors are not expected to get down on their hands and knees to look for defects. The kerb and guttering includes all drainage kerb inlets, convertor outlets, gutter grates or access pit lids in gutter. Driveway crossings shall be listed as **private** when selecting the owner of the asset.