

Enhanced Maintenance to Catch Basins

Purpose

Provide an update on activities to improve the delivery of stormwater management in The Greater Sudbury and interim enhanced catch basin cleaning options.

Executive Summary

City stormwater services are critical to manage typical rainfall events, the risk of flooding and improve the quality of water reaching the environment for the community. These services are delivered through a significant portfolio of stormwater assets with a replacement value of \$520M of which 80% are buried linear assets, including pipes, maintenance holes and catch basins.

The City has been working on several projects to improve the delivery of stormwater services to the community. These include the Stormwater Asset Management Plan, Subwatershed Studies and Stormwater Master Plans and Sustainable Stormwater Funding Study. The Stormwater Asset Management Plan has proposed service levels that see increased operations and maintenance efforts, and capital reinvestment in assets at or beyond their lifecycle. A Managers Report will be prepared with recommended service levels and financial implications in the second quarter of 2021.

The Subwatershed Studies and Stormwater Master Plans recommend several major improvement projects that seek to improve flood resiliency, improve the quality of water reaching the environment or both. These recommended projects have a combined estimated value of \$100M but are only to be constructed as funding and opportunities exist, none are mandatory.

Winter control has significant influences on the operation and maintenance of the stormwater system, specifically the use of sand. Sand is used on 75% of City streets as a salt management initiative that protects the environment. One of the main challenges with winter sand is while less impactful to the environment it does require significant efforts to clean up with maintenance activities like, street sweeping and catch basin cleaning.

Catch basins primary purpose is to provide an outlet for precipitation events on urban streets. They are also designed to capture debris from the road to prevent it from entering pipes or the environment where it can affect natural habitat, transport contaminants or reduce capacity of natural systems to convey flow in significant events. If allowed to build up in the catch basin, storm system capacity is reduced leading to road flooding in advance of design capacities, and blockage of road subdrain systems. Subdrain blockages lead to the road bed not draining adequately and can shorten the lifespan of the road or lead to more frequent and/or intensive maintenance of the road.

Catch basin cleaning is funded at \$435K (2020 Budget) which is a 1 in 7 seven year cycle with some assets seeing maintenance more frequently in problem areas and some seeing less frequent cleaning. Given the significant use of sand as a winter control product the Stormwater Asset Management Plan recommends annual cleaning of all catch basins.

The City's current annual stormwater budget is approximately \$12.8 million per year. This is broken down into \$5 million for operations and maintenance, \$2.5 million for asset renewal, \$300,000 for Conservation Sudbury stormwater assets and \$5 million for stormwater improvements like flood resiliency and water quality improvements. The proposed levels of service from the Stormwater Asset Management Plan would see an increase in operations and maintenance, and asset renewal to a proposed annual budget of \$16.9 million. To address this funding gap a Sustainable Stormwater Funding study has been initiated to propose to Council options that provide a sustainable and reliable source of funding for stormwater.

Increasing the catch basin maintenance in the Ramsey Lake watershed to annual will require an additional \$144K per year. If all catch basins were cleaned annually a total of \$730K would be required. However, the first year of a program like this would likely require double the effort due to the amount of debris in the catch basin

Background

Councillor's McCausland and McIntosh presented Motion M-2 at the May 11, 2020 City Council Meeting requesting a report on enhance catch basin cleaning. The following report summarizes background on stormwater management, efforts to improve stormwater management in the community and recommendations to enhance catch basin cleaning in sensitive areas. The report summarizes; the Stormwater System, Stormwater Asset Management Plan, Subwatershed Studies, Relationship Between Winter Control and Stormwater Management, Stormwater Operations and Maintenance, Sustainable Stormwater Funding Study and Conclusions and Next Steps.

Analysis

Stormwater System

The City owns and operates a stormwater system that provides quality stormwater services to the community by managing typical rainfall events, improving water quality and reducing the risk of flooding while addressing the challenges of climate change, available budgets and resources. The City has a diverse and large portfolio of stormwater assets within the system to provide this service and is summarized in **Table 1**.

Table 1: City of Greater Sudbury Asset Inventory Summary

Stormwater Assets	Quantity	Unit
Stormwater Pipes	537	km
Ditches	1536	km
Municipal Drains	188	km
Maintenance Holes	8,600	EA
Catch Basins	8,744	EA
Discharges / Outlets	2,751	EA
Inlets	3,372	EA
Stormwater Management Ponds	15	EA
Oil Grit Separators (OGS)	24	EA

It is currently estimated that the replacement value of these assets is approximately \$520M with over 80% of that value being the pipe, maintenance holes and catch basins. Through community development there are many privately owned and operated stormwater management systems to protect the City stormwater system and the environment from increased flows and water quality.

When originally constructed these assets have an estimated useful lifecycle which is dependent on performing regular maintenance and working within expected service parameters. Meeting an established service level requires the system to be operated in accordance with a plan, and to ensure that sufficient resources are available for that plan. There is always a risk that service levels will not be met, or that resources required for sustaining service levels are different than what was planned.

Stormwater Asset Management Plan

Asset management planning is the process used to manage the risk that service levels and resource requirements fall outside expected levels. There is a balance that needs to be established between the community's desired level of service and its funding commitments for stormwater management, and this balance reflects the City's choice about how it wants to manage the risk that service levels or costs do not reflect expected levels. Asset Management Plans help define acceptable conditions for that asset to meet the performance targets and, when followed, reduce risk.

The City initiated a Stormwater Asset Management Plan (SAMP) with the primary objective to deliver a recommended level of service for the lowest total lifecycle cost, with risk exposure being reduced in the most cost effective manner possible. The SAMP will fulfill the requirements of *Asset Management Planning for Municipal Infrastructure Regulation, O. Reg. 588/17*.

The SAMP process involved detailed analysis and complex tasks to create a plan for the City of Greater Sudbury to provide effective stormwater management. This involved;

- Review and update of the City's stormwater asset inventory;
- Lifecycle analysis and replacement cost assessment;
- Evaluation of criticality of system assets;
- Defining existing levels of service, and comparison against industry best practice;
- Preparing a Capital Improvement Plan;
- Reviewing existing Operations and Maintenance Plans; and,
- Determining funding requirements and strategies for required funding.

Any changes to the level of service will require Council approval. Staff will assist in this process by presenting a recommended service level, accompanied with the financial implications. To assist with the deliberations, staff will provide information on best practices from across Canada. Asset management is an iterative process where desired service levels are weighed against cost. As the process progresses Council will be presented options for approval of the preferred level of service for the City.

The Target Levels of Service are divided into five goals;

- Protect the Environment;
- Ensure Adequate and Sustainable Funding;
- Adequate Capacity to Protect Life and Property;
- Provide a Safe and Productive Workplace; and,
- Have Satisfied and Informed Customers.

Each of these goals is further divided into sub-goals and performance measures. The Target Level of Service framework serves as the basis for all subsequent tasks in the SAMP by providing a defensible basis for capital planning, optimized operations and maintenance, risk management, and total funding requirements.

The lifecycle of City stormwater assets are approaching midlife as much urbanization, including the installation of stormsewers, took place in the 1960's and 1970's. Capital re-investment profiles were created based on the age of assets and risk. Current annual capital investments are close to what is required for the future, however in most capital reconstruction contracts stormwater is not the driving asset for project choices. Choosing the right reconstruction project for all buried and road assets is a complicated process that is refined annually for the capital budget process.

Critical to the lifecycle of any asset is the operation and maintenance of those assets. To meet the desired levels of service increased operations and maintenance is recommended. Table 2 demonstrates proposed changes to current operations and maintenance program.

Table 2: O & M Activities Supporting Desired Level of Service

Lifecycle Activity	New Activity for Desired LoS	Adjustments from Current LoS Required
Ditch Inspections	✓	-
Mechanical Ditching	-	✓
Screens and Inlet Inspections	-	✓
Street Sweeping	-	-
Culvert Inspections	-	✓
Culvert Maintenance	-	-
Culvert Resets	-	-
Culvert Cleaning	-	✓
Culvert Snow Removal	-	-
Storm Structure Cleaning	-	✓
OGS Maintenance (Inspect/Clean/Repair)	✓	-
Pond Maintenance (Inspect/Clean/Repair)	✓	-
Stormwater Compliance	-	✓
Storm Sewer CCTV	-	✓
Storm Sewer Flushing	-	✓
Storm Sewer Repairs	-	✓

As shown most operations and maintenance activities are recommended to be increased or new activities added. The recommended operations and maintenance program to meet the desired levels of service would result in an annual budget increase from approximately \$5M to \$7.7M. There are proposed scenarios where this increase would be phased in over a number of years as resources are developed to complete this increased service.

Subwatershed Studies

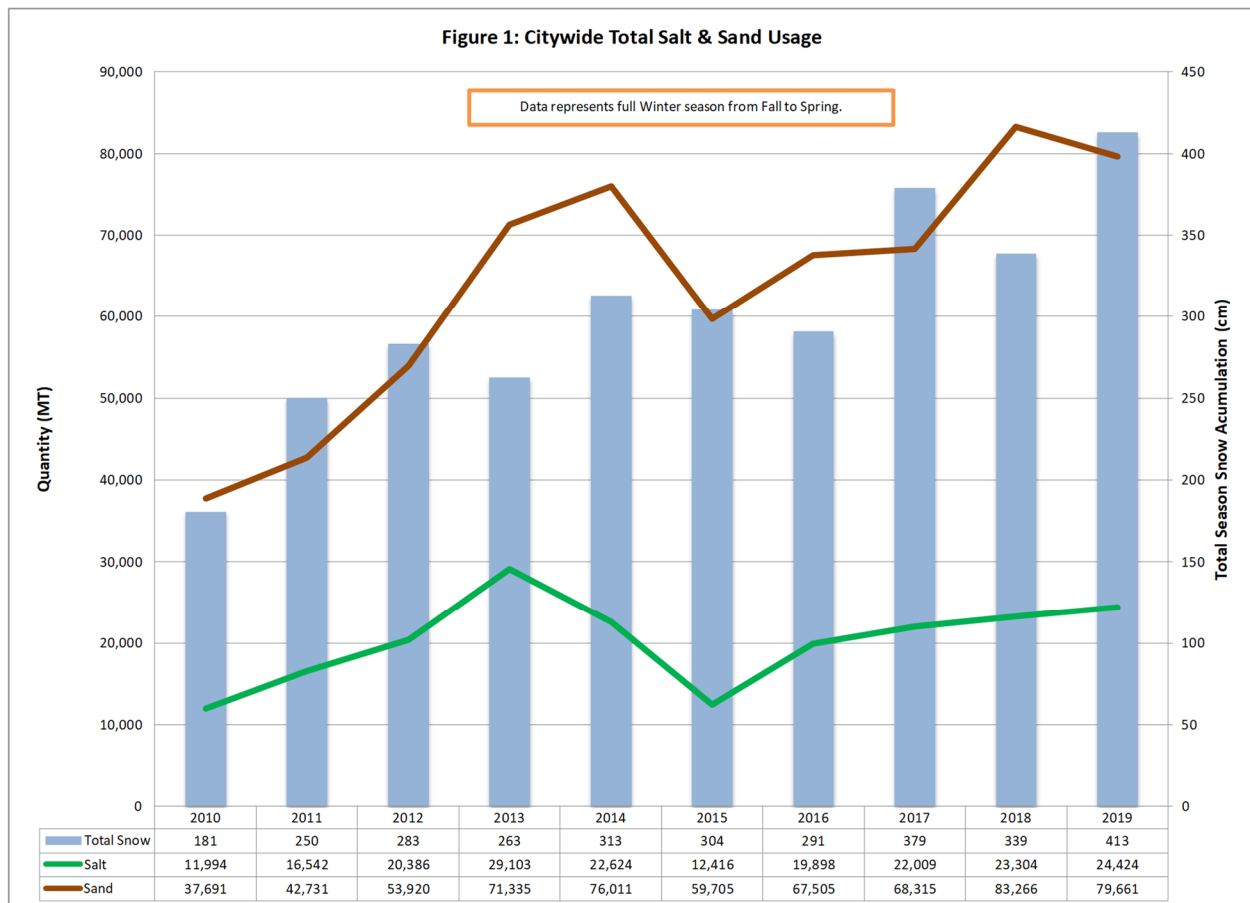
The City has been in the process of completing several Subwatershed Studies and Stormwater Master Plans throughout the community, notably the Ramsey Lake, Junction Creek, Whitewater Lake, Whitson River and Richard Lake subwatersheds. Each of these studies are at different points of completion, but there is enough information and recommendations to recognize that there are several major improvement projects recommended in each that seek to improve flood resiliency, improve the quality of water reaching the environment or both.

These major master plan projects can come with significant costs to construct and some recent grants have been secured to assist with them (Disaster Mitigation and Adaptation Fund). Across all of the above studies the recommended projects would be in excess of \$100M but are only to be constructed as funding and opportunities exist, none of them are mandatory.

These projects are primarily intended to improve existing conditions with City infrastructure not future development. Future develop is intended to manage their stormwater impacts within their development through the best guidance of the respective subwatershed study the development is within. However, opportunities to best serve stormwater management needs through partnership with the development community are encouraged.

Winter Control and Stormwater Management

Greater Sudbury has taken a very progressive approach to manage cost and environmental concerns through the winter control plan. In 2005 the City's first Salt Management Plan (SMP) was initiated which has been updated periodically since. The main goal of the SMP was to optimize the use of salt as a winter control agent and to adopt a continuous improvement method in its approach to winter control. In addition a Risk Management Plan for the Frobisher Facility and a Salt Optimization Plan were completed as part of Source Water Protection efforts, that further help the City maintain a safe road network while protecting the environment. Through these efforts the usage of salt as a winter control agent has been managed through a changing winter season where more freeze thaw cycles have been experienced in the winter and increased snow accumulation. Some salt usage has been replace with a greater usage of winter sand as a winter control agent, as depicted in Figure 1.



This is an important change for the stormwater system as the winter sand that is not collected through the intensive spring sweeping program ends up in stormwater assets. This is most impactful to catch basins and ditches where the accumulation of sand can inhibit these assets to function properly. Sand can migrate to pipes, where system capacity can be reduced, and ultimately the environment if no stormwater management facilities like ponds or Oil and Grit Separators (OGS) exist to remove it. Once in the environment it can have adverse effects on habitat for natural species, transport pollutants or inhibit the capacity of these natural systems to convey storm flows.

The dominant use of winter sand in the City is much different than the practices of many southern Ontario municipalities where nearly all of their roads are treated with salt, Greater Sudbury salts 25% of roads while the remaining 75% are sanded. While this has a positive effect on reducing the amount of salt that reaches the environment there are consequences for the stormwater system that can be managed through maintenance.

Stormwater System Operations and Maintenance

The City owns and operates several stormwater management facilities like ponds and small and large OGSs. The stormwater management facilities all have Environmental Compliance Approvals (ECA) through the Ministry of Environment, Conservation and Parks. These ECAs dictate varying levels of inspection, sampling, reporting and maintenance dependant on the facility. The City's stormwater management facilities are in compliance with these ECAs.

A catch basins primary purpose is to provide an outlet for precipitation events on urban streets, however they are also intended to capture and store winter sand and other road debris. If not cleaned out they could fill quickly and inhibit the designed capacity of the stormwater system. The debris in a catch basin if not cleaned out routinely will migrate into the stormwater pipe where it could potentially reduce system capacity and ultimately reach the environment.

As the debris builds up it can reach above the pipe outlets and block the flow of water. It can also built up and block the road subdrain outlets that keep the road subgrade free of water. This is very different than other municipalities in Ontario where sand is not a dominant winter control product. In Ontario several municipalities are testing products to manage the resuspension of solids in the bottom or sump of catch basins. They report that when inspected annually a catch basin sump never reaches above 50% capacity year after year. Winter sand is quite gritty and dense when compared to typical road debris a catch basin will capture and does not resuspend easily, meaning Greater Sudbury catch basins see very different conditions than that of many peers in Ontario. As such catch basin cleaning is a more vital function in Greater Sudbury than other regions.

When a catch basin fills beyond the pipe outlet and/or subdrain connection ponding on the road surface could occur in lesser precipitation events than designed meaning water ponds on the road more often than intended. Water ponding on the road can lead to user inconvenience, asphalt surface damages, seasonal ice accumulation and property damage. This can further lead to blockages of the road subdrain system that is intended to keep the engineered road base free of water. The road subgrade is a critical structural support of the road and designed to be free of water, if saturated with water the road subgrade is compromised leading to premature failure of the road surface.

Poor drainage as described above can have long term consequences to the service life of the road and increases, or shortens the interval between, more significant intervening maintenance activities, like crack sealing, and resurfacing.

An extensive literature review was completed by Staff in support of this report to determine how poor drainage can affect road service life or how many years poor drainage could remove from the expected service life of a road. Through this review it is apparent that a great deal of study on road drainage has been completed and the importance of good drainage for meeting performance and service life are recognized but no indication of decrease in service life or increase in road maintenance were found through the literature review. This may be due to significant additional factors for the service life of a road, like; traffic volumes, traffic types, ground conditions, water table, design, age and materials. All of these factors also contribute to the life span of a road and in Greater Sudbury a number of these factors could change several times on a single road, from swamp to rock cut to rock fill.

In addition Staff reached out to the National Water/Wastewater Benchmarking Initiative Stormwater Task Force through a survey to determine if any participating municipalities have compared road service life to drainage issues or stormwater maintenance activities. All respondents did recognize the relationship between stormwater maintenance/subgrade drainage and road service life. None of the respondents had done a financial analysis on the benefit of stormwater maintenance to road service life nor were they aware of such an analysis. The responding municipalities that use sand as part of their winter control program have annual catch basin cleaning programs at a minimum for arterial roads if not all roads.

Sustainable Stormwater Funding Study

Like many municipalities across Canada, the City is reviewing its current stormwater funding model, which is primarily supported by the general tax levy. The City wishes to investigate funding options that provide a sustainable and reliable source of funding as recommended in the City of Greater Sudbury 2015-2018 Corporate Strategic Plan.

In addition to exploring sustainable and reliable sources of funding, the Sustainable Stormwater Funding Study, along with the Stormwater Asset Management Plan, helps the City meet its regulatory requirements under *Ontario Regulation 588/17: Asset*

Management Planning for Municipal Infrastructure. This regulation states that “All Asset Management Plans must include information about the levels of service that the municipality proposes to provide, the activities required to meet those levels of service, and a strategy to fund activities.”

The Sustainable Stormwater Funding Study will propose options to Council to address the funding gap between current stormwater funding and the proposed levels of service in the second quarter of 2021. The proposed service levels include increases to the operations and maintenance program, capital reinvestment/asset renewal and support the stormwater management improvements recommended in the Subwatershed Studies and Stormwater Master Plans.

The City's current annual stormwater budget is approximately \$12.8 million per year. This is broken down into \$5 million for operations and maintenance, \$2.5 million for asset renewal, primarily large culvert replacement, \$300,000 for Conservation Sudbury stormwater assets and \$5 million for stormwater improvements like flood resiliency and water quality improvements. The proposed levels of service would see an increase in operations and maintenance, and asset renewal to a proposed annual budget of \$16.9 million.

Conclusions and Next Steps

The SAMP has demonstrated the need for new and increased/enhanced stormwater operations and maintenance activities to meet the desired service levels and best practices. This is most seen in the recommended increase in preventative maintenance of the linear stormwater assets, primarily catch basin cleaning, pipe cleaning and ditch cleanouts. Cleaning these assets will ensure they meet the design lifespan but predominantly the cleaning is necessary to ensure they function as designed.

The current service level for catch basin maintenance is a 1 in 7 year cycle. While the funding is 1 in 7 years in practice some catch basins see less maintenance and some see more maintenance. Catch basins along Paris Street, in areas of the Flour Mill and know problem catch basins are cleaned on an annual frequency while others are not cleaned within the 7 years. What has been seen is that the effort to clean a catch basin once every seven years is very high and time consuming compared to annual cleaning as they have been allowed to accumulate much debris that becomes very compacted in the catch basin. This can also lead to drainage issues for the road surface and subgrade.

2020 annual funding for catch basin cleaning is approximately \$435K. As requested increasing the catch basin cleaning in the Ramsey Lake watershed to annual would require an additional \$144K per year. If all catch basins were cleaned annually a total of \$730K would be required. The first year of an annual program would likely be more costly as the effort to clean the catch basins the first time is higher and the above numbers are based on a typical annual program. The first year would likely require double the effort, or \$288K for the Ramsey Lake watershed or \$1.46 M for all catch

basins. Once the first cleaning is done costs would be reduced in subsequent years to the above annual values.

As the Sustainable Stormwater Funding Study is completed and potentially implemented there is likely a number of years before a sustainable funding source for the recommended service levels is available. Providing funding for enhanced catch basin cleaning in the interim would help ensure that the stormwater system manages typical rainfall events, the risk of flooding and improve the quality of water reaching the environment for the community. If requested staff could prepare a business case for the 2021 budget process for enhanced catch basin cleaning.