APPENDIX 2

City of Saskatoon
Saskatoon Water

STORM WATER UTILITY
2020 ANNUAL REPORT

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MESSAGE FROM THE DIRECTORS

The Storm Water Utility funds the complex system of storm water infrastructure network which starts from the collection ditches, storm ponds and sewer infrastructure and ends at the South Saskatchewan River by discharge through the City's 114 outfalls. The storm utility is responsible for the planning and design, management, storage, operation and maintenance, and asset preservation, which is managed by the following departments:

- Saskatoon Water
- Water and Waste Stream – Water and Sewer Operations
- Technical Services

The storm utility also funds the drainage inspector and management of the Bylaw and Compliance Section (Community Standards) and the oversight of the riverbank stability by the Geotechnical Specialist (Saskatoon Water).

Management and staff from the responsible departments are committed to providing exceptional storm water management and flood protection services including operations and maintenance of assets in the most reliable and cost-efficient way for the citizens of Saskatoon. We are pleased to present our results in the Storm Water Utility 2020 Annual Report on behalf of our departments.

The report describes our contributions to achieving the City of Saskatoon's Strategic Plan. We take great pride in efficient storm water management and reducing the flood risk for the citizens of Saskatoon. Several initiatives have been completed and more are underway to further enhance service to the citizens, increase efficiencies, reduce costs, and strengthen our environmental leadership.

Our financials show responsible stewardship of the resources that Saskatoon citizens have entrusted to us. We continue to provide excellent value to our citizens as we undertake capital and continuous improvement projects that ensure asset and financial sustainability. Our utility rates are designed to fund the needed capital, asset preservation, operation and maintenance costs for current and future storm water management and flood protection considering climate change. The departments have been focusing on customer service, storm water management for current and new neighbourhoods, flood protection for the most at-risk areas, and addressing aging infrastructure for storm water related services.

We are proud to work with a dedicated group of professionals who demonstrate an ongoing commitment to storm water management and flood protection, as well as ensuring the storm water infrastructure is sustainable. The work of the Storm Water Utility departments is greatly appreciated.

Russ Munro – Director of Saskatoon Water

Dan Willems – Director of Technical Services

Brendan Lemke – Director of Water and Waste Operations

EXECUTIVE SUMMARY

The Saskatoon Storm Water Utility funds storm water management and flood protection services including ongoing operations and maintenance of assets with an estimated replacement value of $2.6B. The Utility also monitors and stabilizes the East Riverbank to protect strategic public infrastructure. In 2020, the Storm Water Utility had revenues of $12.2M, with $11.8M for operating expenses which includes $9.5M transferred to Capital and Infrastructures Reserves. Approximately $0.3M was transferred to the Storm Water Stabilization Reserve which is available for future operating expenses.

In 2020 progress was made implementing the *Storm Water Utility Business Plan*, with the following highlights:

- Continued to progress the nine-project Flood Control Strategy which will reduce the flood risk for at least 10 top flood prone locations within the City before 2028. Detailed design and tendering for excavation and storm sewer infrastructure upgrades for the first project (W.W. Ashley District Park Dry Storm Pond) was completed. The feasibility assessment and preliminary design was completed for the second project (Churchill Neighborhood Park Dry Storm Pond).
- Presented options to City Council regarding the Montgomery Place Drainage Strategy. Reconstruction of overland drainage ditches was selected by Council to proceed in 2021. The detailed design for the first project was completed.
- Applied to the Investing in Canada Program (ICIP) for funding through the Provincial and Federal Government for future drainage improvement projects in Montgomery Place. This application included a Climate Change Resiliency Assessment that was completed by Saskatoon Water personnel.
- Completed construction of a concrete-grass drainage swale to resolve a long-standing flooding issue in Arbour Creek.
- Continued collaboration with the University of Saskatchewan, Meewasin, and others to monitor and research storm water quality and related concepts of the storm water system and South Saskatchewan River.
- Finalized the 2018-2019 State of Storm Water Infrastructure report which provides information regarding the storm systems inventory, replacement valuation, condition, and planned preservation.
- Continued collaboration with other City of Saskatoon Departments on safety and recreation uses of the storm pond system within the City. This included a pilot project of new welcome signage to be installed at each wet pond in the future.
- Completed a two-year research project on climate change risks for future intense rainfall events and implications for Saskatoon’s storm water infrastructure system and design standards.
- Responded to 888 storm water and drainage inquiries through our Customer Care team. Bylaw and Compliance also responded to 158 drainage related complaint and the Storm Water team responded to 228 inquiries including 87 billings inquires and 44 site visits.

- Roadways Fleet and Support completed the fall sweep which included 119 km of streets and 1,738 tonnes of debris collected. Water and Waste Operations flushed 3,154 m of storm sewers, cleaned 5,726 catch basins, and completed 46 repairs to storm outfalls and 23 repairs to storm ponds.
- Completed the annual Spring Reconnaissance for the first time internally. This comprises visual inspection of the slopes and monitoring of instrumentation to assess and rate specific sections of the East Riverbank. Annual monitoring programs were completed near 16th Street and 11th Street.
- A Crime Prevention Through Environmental Design (CPTED) review of the lane within the Nutana Slope Area was completed and resulting recommendations implemented.

In 2020, Saskatoon experienced two localized rainfall events with estimated return periods of “two to five years”. Rainfall on June 6th and 7th included a 1-in-2-year storm followed by a 1-in-2-year storm event on June 16th to 17th. The total rainfall accumulated for 2020 was 257 mm which was slightly less than the historical average of 264 mm.

1.0 OVERVIEW

1.1 Introduction

The Saskatoon Storm Water Utility provides storm water management and flood protection through funding the storm water system's operations and maintenance, asset preservation, capacity enhancements, and drainage inspections. The Utility also monitors and mitigates damage to strategic public infrastructure along the riverbank.

Storm water services are provided to residential and industrial, commercial, and institutional (ICI) properties. In 2020, storm water charges were applied to approximately 66,193 single-family residential properties, 1,102 multi-family residential and 3,565 ICI properties including City-owned properties.

Saskatoon's storm water infrastructure includes over 23,066 manholes and catch basins, 956 km of linear infrastructure such as storm sewer pipes and culverts, 37 storm ponds, and other drainage infrastructure with a replacement value of approximately $2.6B.

A list of key definitions for the report is provided in Appendix 1.

1.2 Strategic Linkages

The City's Strategic Plan 2013-2023 provides the direction that guides Saskatoon Water's activities. The following section outlines our Vision, Mission, and linkages to the Corporate Strategic Goals, Leadership Commitments, and Values.

Our Vision

The City of Saskatoon (COS) is a leader in storm water design and asset management. We effectively collaborate with citizens and partners to utilize storm water as a resource and mitigate the risk of flooding.

Our Mission

The Storm Water Utility provides safe, efficient, and cost-effective storm water management to Saskatoon citizens through teamwork and innovation. We develop proactive strategies that ensure the effective long-term performance of our storm water systems, supported by sustainable, accountable, and responsive funding structures. Storm water management charges entrusted by citizens are used as effectively as possible to minimize storm water and snow melt impacts.

Our Strategic Goals

Quality of Life: Provide citizens with cost effective, reliable, and high-quality storm water management services.

Continuous Improvement: Increase workplace efficiencies and improve services through implementing innovative approaches that maximize value.

Asset and Financial Sustainability: Implement capital preservation and expansion plans that provide the most cost-effective, storm water-related infrastructure for current and future citizens and businesses.

Environmental Leadership: Implement leading-edge innovations for environmentally responsible storm water-related infrastructure and services.

Sustainable Growth: Work closely with other departments to provide efficient and resilient designs for storm water infrastructure for new developments.

Moving Around: Collaborate with all stakeholders to minimize storm water-related transportation disruptions.

Economic Diversity and Prosperity: Provide competitively priced and reliable storm water related services, and cost-effective designs for new developments.

Our Leadership Commitments

Our employees support leadership commitments in our day-to-day work:

- Reliable and Responsible Service
- Strong Management and Fiscal Responsibility
- Effective Communication, Openness, and Accountability
- Innovation and Creativity

Our Corporate Values

Trust *makes us Stronger:* We build trust with citizens and colleagues by providing accurate technical information, analysis, and responses in a timely manner.

Act and Communicate with ***Integrity****:* We lead by example, making the best decisions and striving to work beyond the scope of the position.

Respect one Another*:* We build on each other's strengths; respectfully acknowledging individual beliefs.

People *Matter:* In the storm water professions, we place the protection of the public and our staff as our highest priority.

Courage *to move Forward:* We take smart risks, thinking through challenges, suggesting new approaches, and embracing change to enhance our level of service.

Safety *in all we do:* We put safety at the forefront of all decision making and never compromise on the safety or well-being of ourselves, co-workers or the public.

2.0 OUR STORM WATER UTILITY TEAM

The Storm Water Utility is part of Saskatoon Water in the Utilities and Environment Division. The Utility had two full-time employees and two engineering interns in 2020. The Utility also pays for services provided by the following departments:

Saskatoon Water's Engineering and Planning section is responsible for overseeing the Storm Water Utility and providing storm water engineering expertise. Saskatoon Water (SW) provides the following storm water management services:

- Flood Control Strategy
- Montgomery Place Drainage Strategy and Ditch Crossing Applications
- Rainfall monitoring and storm water quality monitoring
- Assessing runoff factors of multi-residential and ICI properties for billing purposes
- Engineering support for drainage projects
- Community liaison for storm water issues
- Modelling storm system capacity relative to rainfall volume and intensity
- Planning and design of storm water infrastructure for new land development

Water & Waste Operations (WWO) provides the ongoing day-to-day operations and maintenance of storm water ponds, outfalls, and below ground (sewer) storm water drainage infrastructure.

Roadways, Fleet, & Support (RFS) maintains above ground drainage, including culverts, and completes a fall street sweep.

Technical Services (TS) tracks the inventory, completes condition assessment, and oversees asset preservation for storm sewer infrastructure.

Construction & Design (C&D) operates the "Connection Desk" and provides project management services, including survey work and inspection, for storm water infrastructure construction projects.

Community Standards provides drainage inspections, drainage advice to residents and developers, *Drainage Bylaw* updates, and *Drainage Bylaw* enforcement.

Sustainability provides leadership in activities that contribute to storm water practices that protect our watershed and natural resources.

Communications & Public Engagement (Communications) assists in initiatives to enhance citizen awareness and engagement to improve flood resiliency.

Corporate Revenue provides storm water billing and collection services.

Finance provides accounting and administrative support.

3.0 OUR INFRASTRUCTURE

Table 1 summarizes the City's storm water infrastructure with a replacement value of $2.6B.

The Storm Water Utility's **minor system** consists of sewer pipes, manholes, catch basins, and outfall structures that convey runoff from more frequent, lower intensity storm events (up to a "1-in-2-year" storm). The system includes 956 km of linear infrastructure such as storm sewer pipes and culverts, 9,370 manholes, 13,696 catch basins, 2,930 service connections, 114 outfalls, and minor ditches.

The **major system** consists of overland street drainage, eight dry ponds, 29 wet ponds (including six naturalized ponds and two constructed wetlands), major ditches, swales, and any other land that is required to convey runoff from less frequent, higher intensity storms that produce runoff in excess of what the minor system typically handles.

Table 1: Storm Water Inventory

Asset	Type	2020 Inventory	
Sewer Mains	Collectors	670	km
	Trunks	71	km
Manholes	Collectors	8,867	ea.
	Trunks	503	ea.
Force mains		4	km
Service Connections		2,930	ea.
Catch Basins	Collectors	13,204	ea.
	Trunks	492	ea.
Leads	Collectors	151	km
	Trunks	7	km
Dry Ponds		8	ea.
Wet Ponds		29	ea.
Culverts		9	km
Outfalls		114	ea.
Sub-drainage		44	km
Oil & Grit Separators		1	ea.
Lift Stations		2	ea.
Replacement value		**$2.6**	**B**

4.0 OUR RESULTS

4.1 Surface Flooding

Annual Rainfall

Eight rainfall gauges were regularly monitored between April 1, 2020 and September 30, 2020 with a summary of Saskatoon's 2020 rainfall season provided in the *2020 Annual Rainfall Report*. Overall, Saskatoon had an average rainfall year with 257 mm of rainfall accumulating compared to the 264 mm historical average and 569 mm record high in 2010.

Two rainfall events with an estimated return period of two years or greater were recorded at City rain gauges in 2020. The greatest 2020 return rain event (1-in-2-year) was early in the morning on June 6 with 45 mm recorded by City Hall and Shaw Centre rain gauges. Table 2 provides the rain event details recorded by six rain gauges.

Table 2: Rain Events in 2020

Date	Rain Event Statistics	Acadia	City Hall	Shaw Centre	Wastewater Treatment Plant	Woodlawn	Aden Bowman
June 6-7th, 2020	Accumulation (mm)	37	45	45	31	41	38
	Duration (minutes)	795	770	755	775	760	790
	Return Period (yr.)	< 2	2	2	<2	2	2
June 16-17th, 2020	Accumulation (mm)	38	39	30	34	37	N/A
	Duration (minutes)	795	745	740	770	780	N/A
	Return Period (yr.)	2	2	<2	2	2	N/A

Flood Control Strategy

The $54M Flood Control Strategy (FCS) includes nine projects to reduce the flood risk for at least 10 flood zones between 2019 and 2028. The FCS is funded by the Storm Water Utility (60%) and the Government of Canada (GoC) Disaster Mitigation and Adaptation Fund (DMAF) (40%). The GoC approved the FCS Greenhouse Gas Emissions assessment, completed internally by Saskatoon Water and Sustainability staff, that was required as part of the funding agreement.

In 2020, Saskatoon Water and Parks completed the detailed design including landscaping of the W.W. Ashley District Park dry storm pond which will reduce flood risk for the following intersections:

- Lansdowne Avenue/1st Street;
- Dufferin Avenue/1st Street; and
- Broadway Avenue/Taylor Street.

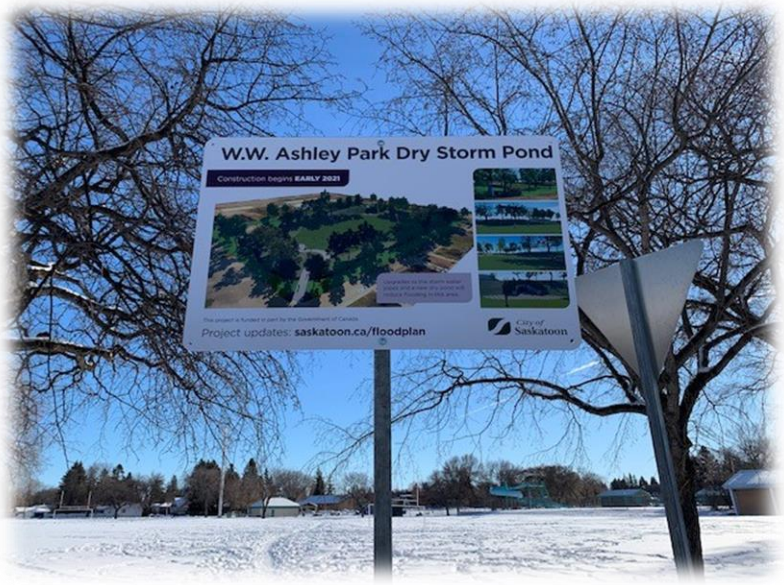
Construction for the FCS started in 2019 with the sports field at Aden Bowman Collegiate (ABC) to replace the full-size multi-purpose field at W.W. Ashley District Park. The new field opened to the public in October 2020 under a joint use agreement between Saskatoon Public Schools and the City. The ABC field construction will cost less than reconstructing the full-size field at W.W. Ashley District Park and provides uninterrupted high quality space for sports field users.

Aden Bowman Sports Field

Construction of the dry storm pond at W.W. Ashley District Park and associated sewer infrastructure work was tendered in December 2020 with construction scheduled for early 2021. All construction is expected to be completed in 2021.

"The work has started in the Park. I keep walking by in amazement that it is really happening. I hope you know how grateful we are!"
Ms. Bourgeois (resident near the W.W. Ashley Park project)

W.W. Ashley Park Detailed Design Rendering



W.W. Ashley Park Project Signage (November 2020)

Saskatoon Water began preliminary design (technical feasibility study) of the second FCS project, a dry storm pond proposed within the north half of Churchill Neighbourhood Park to reduce the flood risk at the following intersections:

- Ruth Street/Cairns Avenue;
- Bute Street/Munroe Avenue;
- Ruth Street/York Avenue; and
- Bute Street/Albert Avenue.

This proposed project will be presented to City Council in early 2021 for approval to proceed to detailed design, public engagement, and construction. Pending approval, construction is scheduled to start in early 2022.

4.2 Maintenance and Operations

Citizen Inquiries

In 2020, the Customer Care Centre responded to 888 inquiries (similar to 2019) from citizens regarding culvert, drainage, storm sewer, and storm water flooding issues. The Storm Water Utility group responded to 228 citizen inquiries (See Table 3), which included 39 internal inquiries and 44 required a site visit.

Table 3. 2020 Storm Water Group Customer Inquiries

Summary of Inquiries	
Alley Drainage	8
Surface Drainage	15
Sewer Drainage	10
Montgomery General	14
Montgomery Drainage Strategy	13
Montgomery Ditch Crossings	13
Flooding	15
Storm Water Utility Billing	87
General	47
Bylaw	6
Total	228

Roadways, Fleet, & Support Fall Sweep

Similar to 2019, the 2020 fall Street Sweep program utilized a tree density and flood risk approach. A total of 119 km of streets were swept, with 1,738 tonnes of debris collected. From 2019 to 2020, sweeping efficiency went down from 19 to 15 tonnes per linear kilometer swept due to being cut short by an early snowfall. By designing the program based on higher tree density, increased debris captured during the sweep provides better flood risk reduction per kilometer swept.

Water & Waste Operations Maintenance

Water & Waste Operations operates and maintains below-ground storm water infrastructure including sewer mains, manholes, and connections. Table 4 below summarizes WWO's 2020 storm water related maintenance activities including flushing and televising storm water sewers, and cleaning and inspecting infrastructure.

Table 4: WWO's Storm Water Infrastructure Maintenance

Activity	2019	2020	Units
Flushing Storm Sewers	8,905	3,154	Meters
Storm Sewer Meters	1,861	1,549	Meters
# of passes	116	43	Each
Televise Storm Sewers	20,157	2,104	Meters
Catch Basin Leads	138	42	Each
Inspect Catch Basins	301	See Note 1	Each
Clean Catch Basins	25,380	5,726	Each
Repair Catch Basins	117	19	Each
Inspect Storm Manholes	582	80	Each
Repair Storm Manholes	116	41	Each
Grout MHs/CBs	1	0	Each
Outfalls	400	46	Each
Storm Ponds	69	23	Each

Note 1: CB inspections not recorded in 2020

Table Definitions

- "Storm Sewer Meters" refers to the storm segment meters flushed.
- "Flushing Storm Sewers" includes multiple passes by the flusher hose in the same segment.
- "Catch Basin Leads" is the number of leads flushed or cleaned.
- "Outfalls" is the number of total times outfalls inspected and/or cleaned.
- "Storm Ponds" is the number of trips made to maintain storm ponds.

A total of 60 manholes and catch basins were repaired in 2020. Replacement work for catch basins and manholes were not tracked in 2020. Repair and replacements for both storm sewers and catch basin leads were also not recorded in 2020. Figure 1 below displays the 2020 WWO repairs and replacements of storm water infrastructure compared to the previous five years.

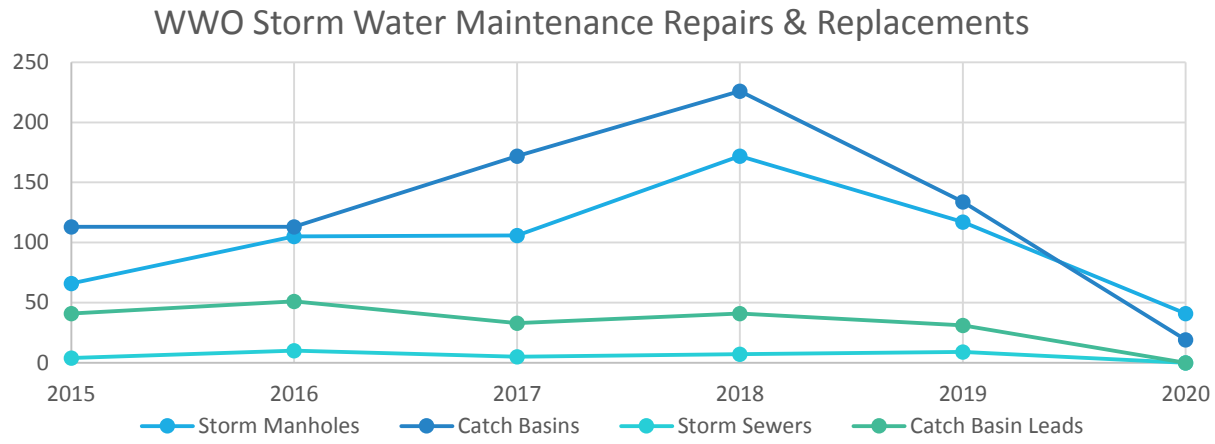


Figure 1. Storm Water Maintenance Comparison for Five Years

Less maintenance was completed in 2020 because of the response to COVID-19 with fewer than normal seasonal workers being hired and some that were hired started later in the summer. Physical distancing requirements and other COVID-response related procedures also impacted operating efficiencies.

4.3 Storm Water Asset Management

Storm Sewer Inspection, Cleaning and Lining

In 2020, the Storm Water Utility funded the cleaning and inspection of approximately five km of storm sewers. Over 150 km of storm pipes in total have been inspected to date (20% of total system), and 120 km of these have been rated (16% of total system). The inspected storm sewers were rated using a three-point scale:

- A: No structural problem evident
- C: Sewer main showing deterioration
- F: Physical condition has failed

The rating for 120 km of inspected sewer mains is provided in Figure 2 below:

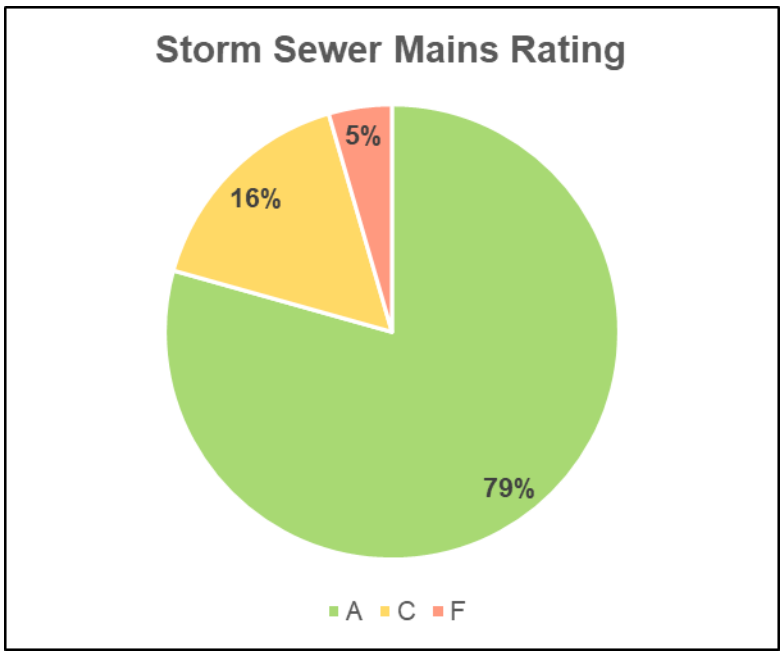


Figure 2. Storm Sewer Mains Rating

State of Storm Water Infrastructure Report

Saskatoon Water finalized the 2018-2019 State of Storm Water Infrastructure report in 2020. This report provides the inventory of the storm water infrastructure assets (Table 1), provides a replacement valuation for each asset, and documents next steps to improve overall storm water asset management. The Storm Water group plans to work with the City's Corporate Asset Management Manager to align our future report with other City Asset Management Plans.

Brand Road Storm Dredging

Construction of the dredging project for Brand Road Pond commenced in December 2020 to improve the drainage flow path for the storm water management network.

Storm Pond Sedimentation Pilot Project

In 2020, a pilot project was conducted to investigate sediment buildup in four wet ponds. Bathymetric surveys concluded that two ponds had sedimentation build-up equivalent to over 50% of the ponds' dead storage. Sediment samples from each pond also were tested by the U of S to determine potential contaminants. A cost-benefit analysis will be conducted to determine whether to proceed with dredging the ponds to restore original capacity.

Drainage Projects

- **Melville Street (Stonebridge)**
  In 2018, the Utility assessed design options for improving drainage near Melville Street/Portage Avenue. In 2019, four options were reviewed in detail and a preferred option determined. The preferred option of extending the existing storm pipe under the CN rail tracks and discharging into the Cartwright Storm Pond was progressed during 2020.

  However due to the complexity of access, boring under the CN tracks and requirement for an easement agreement for the existing storm pipe, the design process has taken longer than expected. Due to these complexities, which are difficult to foresee and account for during the conceptual design stage, the estimated budget to complete the work has substantially increased. A cost value analysis review is considered necessary to continue this project and will be completed in 2021.

  If approved, the final design will be completed in early 2021 with construction of the storm sewer extension to be completed in winter of 2021/2022. The remaining drainage upgrades can then be completed in coordination with roadway reconstruction projects in 2022.

- **Lashyn Cove (Arbour Creek)**
  Flooding has occurred several times at the drainage low point within Lashyn Cove causing significant basement flood damage. A concrete-grass combination side-yard drainage swale was designed in late 2019 and the concrete portion of the swale was constructed in October and November of 2019 on the right-of-way. The contractor returned in early summer 2020 to complete the side-yard swale.

"I want to thank you for all your hard work regarding the installation of the swale at our residence. I feel confident this swale will keep the water out of our basement and I can't begin to tell you how much stress this will remove from our lives!"
Mr. and Mrs. Chouinard

Lashyn Cove side-yard swale (May 2020)

- **Montgomery Place Drainage Strategy**
  Frozen culverts and other drainage issues resulted in ponding during spring snow melt. In 2020, 17 work requests were made to the Customer Care Centre regarding culverts and drainage in Montgomery Place, which was down from 26 in 2019.

  Saskatoon Water held an open house attended by 60 residents in Montgomery Place on February 13, 2020 to discuss several drainage related items:

  - Present design of drainage improvements on Caen St, Lancaster Blvd, and Dundonald Ave.
  - Review costs and impacts on driveway crossings of the proposed construction
  - Review the current ditch crossing standard and review possible alternatives for the neighbourhood with unique rural setting lots

  Results of a survey completed by 62 Montgomery Place residents about the above items also was compiled. The public engagement results were incorporated in the Montgomery Place Drainage Strategy with three options presented to City Council in June 2020. City Council approved the option of proceeding with drainage improvements, restoring existing crossings to current width during construction and cost sharing driveway material and culvert construction with private property owners. Drainage improvement construction is expected to occur in 2021 (Figure 3).

  A cost savings strategy to include water main replacement, lead-line and fiber connection replacement, and road reconstruction with the ditch reconstruction and shallow storm sewer installation is planned to be completed as a coordinated large-scale project.

Saskatoon Water applied to the Investing in Canada Infrastructure Program (ICIP) for funding (approximately $6.4M) through the Provincial and Federal Governments for future drainage improvement projects in Montgomery Place. The decision on the application is expected in early 2021.

"*On behalf of Montgomery Place residents, I would like to thank Angela Schmidt and her team of engineers for the extensive work of assessing the drainage issues and continued consultation with residents*."
Ms. Barb Biddle (Montgomery Place Community Association)

Figure 3. 2021 Proposed Construction Map

4.4 Bylaws and Enforcement

The Storm Water Utility funds a dedicated drainage inspector position and partially funds three other positions in the Community Standards Bylaw Compliance Section. The drainage inspector helps citizens and developers ensure compliance to Saskatoon's *Drainage Bylaw* through a model of education and enforcement. In 2020, Community Standard's Bylaw Enforcement Network software tracked 158 property drainage-related complaints, up from 117 in 2019. Table 5 displays the number of drainage related complaints in 2020 compared to 2019.

Table 5. Drainage Complaint Numbers

Complaint Type	2019	2020
Lot Grading Concern	24	25
Sump Pump Discharge	23	6
Sump Pump Winter Bypass	-	11
Drainage Advice & Education	19	64
Lot Grading Plan Requests & Questions	12	8
Rear Property Line Drainage	9	15
Eaves Trough & Downspouts	9	11
ROW Closure Approvals	6	-
Side Yard Drainage Concerns	3	1
Garden/Garage Suite Plan Approvals	3	1
Commercial Property Development	3	1
Retaining Wall Concerns	2	1
Groundwater Issues	2	1
Infill Development	1	8
Condo Development	-	1
Detached Garage Flooding	-	1
Garage Pad Elevations	1	3
Total	**117**	**158**

The Storm Water Utility provided funding for a capital project led by Community Standards to improve Drainage Bylaw compliance. Completed and in-progress initiatives under this project are described below.

4.4.1 Drainage Regulation Completed Initiatives

- Residential Property Lot Grading Guidelines – This document was completed in August of 2020 and is available on the City's Lot Drainage webpage. A comprehensive set of guidelines assist property owners in ensuring proper storm water management on their lot. A Communications Plan has been developed for this information which includes social media posts, public service announcements (PSAs), targeted emails to stakeholders, and printed hard copies that will be available from City Hall.

- Lot Drainage Webpage – The City's Lot Drainage webpage was revised to provide property owners more detailed information on lot grading. Four new webpages were added that contain information on residential lot grading styles and lot grading

requirements. The webpages also provide access to the Residential Property Lot Grading Guidelines and City's Lot Grading Plans database.

- Infill Lot Grading Regulation – An Infill Lot Grading Plan review and approval process has been developed. The process includes the required submission of an Infill Lot Grading Plan at the Building Permit Application stage with an optional inspection at the 'rough grade' stage and a mandatory inspection at the 'final grade' stage. Plan review, approval, and inspections will be completed by Community Standards. Timing for this item is dependent on timing associated with implementation of the revised Drainage Bylaw. Educational material for external stakeholders regarding this process has been developed in anticipation of the revised Drainage Bylaw.

- Commercial & Multi-Family Site Grading Regulation – A Site Grading Plan review and approval process has been developed. The process includes the current requirement of submitting a Site Grading Plan to Saskatoon Water for approval prior to development and submitting an as-built drawing upon completion of the development. The process also involves an optional inspection at the 'rough grade' stage and a mandatory inspection at the 'final grade' stage. Site inspections will be performed by Community Standards. The timeline for this process is dependent on timing associated with the implementation of the revised Drainage Bylaw and the development of internal workflow procedures. Educational material for external stakeholders regarding this process has been developed in anticipation of the revised Drainage Bylaw.

4.4.2 Current Initiatives

- Drainage Bylaw Amendments – A draft of proposed Drainage Bylaw amendments has been prepared and Council consideration of the proposed bylaw amendments is anticipated in early 2021.

- Rear Property Line Elevation Control – Revisions to the Design and Development Standards Manual have been proposed which provide administration with additional regulatory tools respecting drainage and lot grading matters. This includes requirements that compel a more extensive use of rear property line concrete swales. These swales provide a visual benchmark to help assist builders and homeowners in establishing proper lot grades while also facilitating the conveyance of overland storm water flows.

- Park Development Guidelines – Stakeholder engagement will continue through spring of 2021 regarding potential park infrastructure improvements to better accommodate drainage from lots adjacent to parks. This serves to address situations where parks are frequently damaged due to high amounts of storm water runoff.

- Garage Pad Elevations – Stakeholder engagement will continue through spring of 2021 on methods to regulate the elevations of garage pads. This serves to eliminate drainage issues caused by differing garage pad elevations on side-by-side lots.

4.4.3 The Private Crossings Over Ditches Bylaw, 2020

Saskatoon Water, in collaboration with City Solicitors, drafted a new bylaw for the City to cost share Montgomery Place driveway reconstruction and culvert installations with private property owners. *Bylaw No. 9730, The Private Crossings Over Ditches Bylaw* was approved by Council in December 2020.

4.5 Riverbank Slope Stability

The Storm Water Utility funds riverbank slope stability monitoring due to the impact of snow melt and rainfall on groundwater levels and erosion. The City's goal is to manage the East Riverbank slope stability more proactively for increased efficiency and lower long-term costs.

East Riverbank Spring Reconnaissance

Since 2009 an annual Spring Reconnaissance has been completed on the East Riverbank, for areas considered most susceptible to slope instability, between the North and South Railway Bridges. This reconnaissance comprises visual inspections of the slopes and monitoring of slope inclinometers and standpipe and vibrating wire piezometers. The reconnaissance aims to provide a yearly review of the riverbank status from a geotechnical and risk of slope instability perspective.

The Spring Reconnaissance has previously been completed by an external geotechnical consultant, but in 2020 following the purchase of instrumentation equipment and the hire of an internal geotechnical engineer in 2018, the Reconnaissance was successfully completed by Saskatoon Water staff. Completion of this report internally will enable the City to have a more detailed understanding of the East Riverbank and to provide a higher level of maintenance where required.

In addition to the monitoring completed as part of the Spring Reconnaissance, Saskatoon Water staff visually monitored East Riverbank sites near 16th Street and 11th Street, with monitoring being more frequent when risk of slope movement was higher.

Nutana Slope Area

In June 2020, a Crime Prevention Through Environmental Design (CPTED) review of the lane within the Nutana Slope Area was completed by the City. To improve the area's aesthetics and reduce littering in the area, the following items were completed in 2020:

- vegetation cutback to provide sightlines through the lane;
- installation of lockable gates to replace the road closed barricades and signs and to stop vehicle traffic through the lane; and
- painting of the overland storm water pipe to camouflage the pipe into the surrounding environment and reduce graffiti.

Gate at West End of Nutana Lane installed October 2020

Drainage Pipe after Painting (October 2020)

In spring 2021, a creeper will be planted at the base of each wooden crib supporting the storm pipe to aid pipe camouflaging.

In 2020, the contract with Golder and Associates for instrumentation monitoring in the Nutana Slope Area was renewed for 2021-2023 to maintain consistency due to specific instrumentation requirements.

Saskatoon Riverbank Stability Modeling:
The 3D model, created in 2018, continued to be updated with new and revised information in 2020 and was utilized to review ground and ground water conditions and their impacts on slope stability along the East Riverbank. The model has been successfully used to

demonstrate how proposed construction by the City to maintain level of service for residents will impact the stability of adjacent riverbank slopes.

Riverbank Development Regulations
In December 2019, City Council approved the bylaw amendment which included the Riverbank Slope Overlay District and applies appropriate development standards and regulations. The bylaw helps to avoid or minimize potential impacts of slope instability and subsidence on development, and to prevent injury and minimize property damage related to public and private properties adjacent to the South Saskatchewan River.

In 2020 three applications were received and approved for development in Zone 1. The regulations have been well received by the local residents and developer community as development is now able to proceed within this area. Six applications were approved in Zone 2.

Geotechnical Support
In addition to managing the riverbank, the City Geotechnical Engineering Specialist is a resource for all City departments and in 2020 was involved in several projects, providing geotechnical support. Some of these projects included the following:

- McOrmond Drive Trunks & Primary Water Main
- Recovery Park
- Faithful Avenue Area Grading, Trunks & Primary Water Main
- W.W. Ashley District Park Dry Storm Pond
- West Compost Depot
- Landfill Monitoring

4.6 Community Awareness and Engagement

Montgomery Place Drainage
Saskatoon Water updates Montgomery Place residents annually regarding spring melt, ongoing drainage issues with the rural drainage path, and expectations of the City and property owners. The 2020 spring update delivered to the Montgomery Place neighbourhood in 2020 is provided in Appendix 2. In addition to the annual spring update, residents of Montgomery Place received a notification flyer before the February 2020 public engagement event and residents in the proposed 2021 project construction footprint received a letter to set up virtual meetings for a project update in September 2020.

The virtual meetings between the City and property owners were to review ROW and driveway impacts during construction. Saskatoon Water received feedback from approximately 40 of the 60 property owners within the construction footprint.

Flood Control Strategy
Communications and engagement for the Flood Control Strategy is a priority for the Storm Water Team. The following communications were mailed to area residents:

- W.W. Ashley Storm Pond Construction Delay (Spring 2020)
- W.W. Ashley Storm Pond Construction Update (Fall 2020)

A general FCS email to the subscriber list was also completed in the fall of 2020. Communication and public engagement for the second FCS Project (Churchill Park) is expected to occur in early 2021. The FCS communication documents are provided in Appendix 3.

Nutana Slope

Two flyers were distributed to residents near the Nutana Slope to inform them of instrumentation monitoring results. A "Notice to Residents" was also delivered in the spring, to provide information on what to expect from the City and what citizens can do to reduce risk from slumping. A "Lane Update" was delivered in the fall detailing the modifications made in the back alley.

Yellow Fish Road™ Program

The Storm Water Utility, in collaboration with Sustainability and WWO, supported the Partners for the Saskatchewan River Basin (PFSRB) and Meewasin Valley Authority in delivering the "Yellow Fish Road™ Program" to make students and citizens aware that water goes through the storm water system untreated to the South Saskatchewan River. In 2020, six schools/groups and 165 students and teachers participated in Yellow Fish Road™. Yellow fish were painted on 131 storm drains in three neighbourhoods, and 593 door hangers were distributed.

Storm Water Charges

Bill inserts were prepared to provide information to ICI property owners about the storm water management charges including information about changes to rates from 2020 to 2022 and the Storm Water Management Credit Program.

Saskatoon.ca Website Updates

The Storm Water website is reviewed bi-annually and as needed to ensure up-to-date information is provided to Saskatoon residents.

4.7 Storm Water Ponds

Storm Water Ponds

The City currently has 29 wet ponds and eight dry ponds within the storm water management network. The Storm Water Team formally inspects the storm water management ponds every three years, with new ponds inspected the year they are in-service, as part of the Asset Management Plan.

Storm Water Ponds and Recreational Use

The City permits use of storm water ponds for recreational use through Policy C10-024. A storm pond recreational use committee that meets bi-annually includes members from Saskatoon Fire, Recreational & Community Development, Communications, Water and Waste Operations, Technical Services, and Saskatoon Water to discuss safety of the storm pond system. Saskatoon Fire completes ice thickness testing in the winter to permit recreational use of the storm ponds for the season. Additional seasonal testing is completed by Saskatoon Fire as required based on weather conditions.

Signage Pilot Project

A pilot project was completed for the new welcome sign at Bev M. Dyck Park in Kensington. The sign received some damage after installation which prompted further investigation into the sign material by the Storm Water Team. A second 10 sign pilot project is expected to occur in mid 2021 to select a final sign material for installation of all welcome signs in the city.

Welcome Sign at Bev M Dyck Wet Pond

4.8 Storm Water and the Environment

Storm Water Quality Monitoring

Saskatoon Water monitors 12 major outfalls for storm water quality. These outfalls are sampled and tested for temperature, chlorine, E.coli, and total coliforms every alternate week.

The Storm Water Utility continued its partnership with the University of Saskatchewan (U of S) for storm water quality testing and analysis. In 2020, the City completed the remediation that was required to address a water quality issue at a storm water outfall identified previously through the partnership. Additional smoke testing also was completed in 2020 by WWO to identify the source of contamination contributing to water quality issues for two other outfalls.

The monitoring program also tracks changes in water quality and quantity for the Northeast Swale. The monitoring measures basic water quality parameters, and monthly water samples provide for more detailed analysis. Annual reporting includes trend analysis of samples, and comparisons to guidelines and historical data.

Green Infrastructure Strategy

The Storm Water Utility participated in and contributed funding for the Green Infrastructure Strategy (Strategy) with Sustainability, Planning and Development, other departments, and Meewasin Valley Authority. The Strategy includes actions that support

managing rain where it falls and recognizes storm water as an important resource. An implementation plan is being developed in alignment with the Strategy's priorities presented to Council in February 2020. Green storm water infrastructure, such as swales and storm water ponds, are an important part of Saskatoon's green network. Green storm water infrastructure will be incorporated in future neighbourhood planning to contribute to the green network and to improve storm water quality entering the South Saskatchewan River.

Climate Change

In 2020, a two-year research project was completed on climate change risks for future intense rainfall events and implications for Saskatoon's storm water infrastructure standards. The project was done in partnership with the U of S and Concordia University with partial funding from the Government of Canada's National Disaster Mitigation Program. Historical intense rainfall data shows increasing and decreasing trends, depending on rain gauge, time frame considered, rainfall timing (sub-hourly, hourly, daily), and the methodology used to assess the trends. The future holds much uncertainty for rain events, with risk of higher intensity extreme rainfalls.

Saskatoon's current **minor system** design standards for a 1-in-2-year rainfall (16.5 mm/hour) appear to be adequate. More risk exists that a 1-in-100-year future rainfall will exceed current **major system** design standards (96.5 mm/24 hours). About 10% of climate change models forecast a 1-in-100-year rainfall that exceeds 140 mm/24 hours. The study concluded that a change in major system design standards to convey 45% more rainfall would approximately double construction costs. The study results will be further considered in 2021 in making recommendations for changes to the City's storm water infrastructure standards.

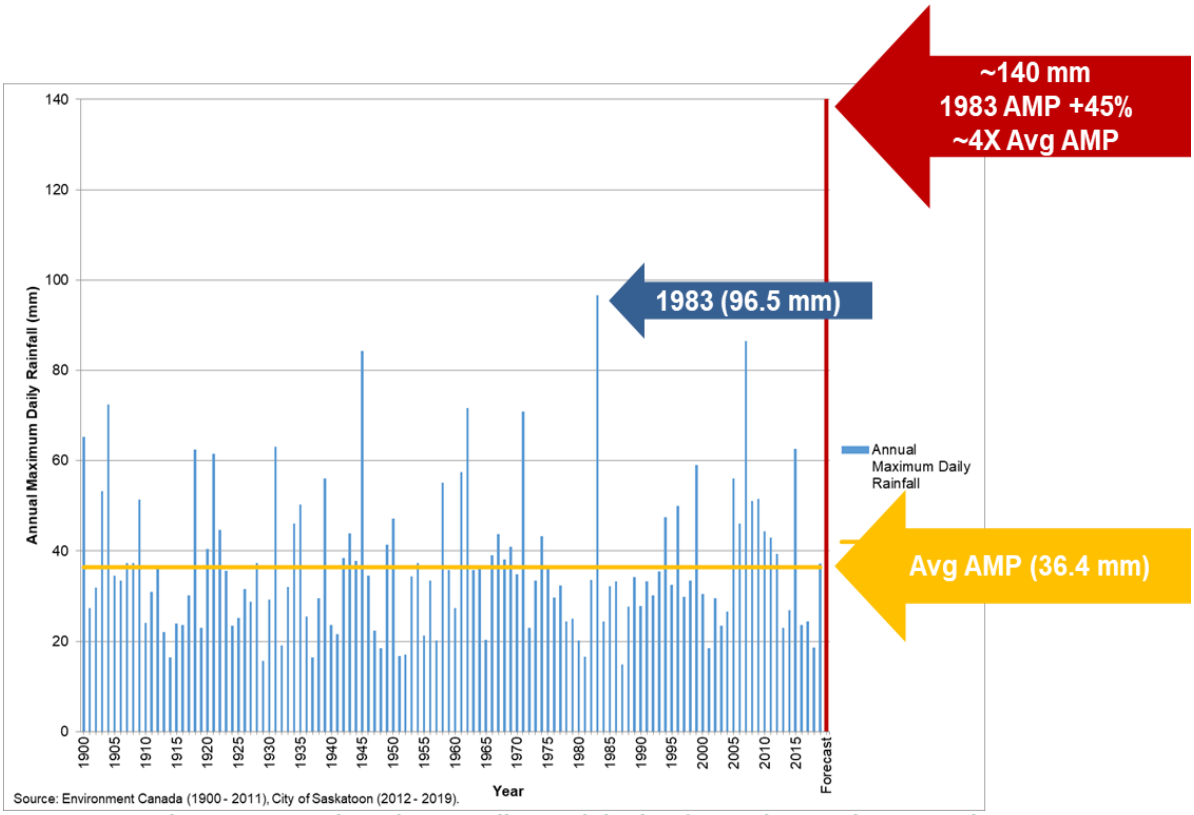


Figure 4. Annual Maximum Daily Precipitation for Saskatoon (1900-2019)

Climate Change Resiliency Assessment

As part of the application for the Montgomery Place Drainage Strategy funding through the ICIP (Section 4.3), Saskatoon Water completed a Climate Change Resiliency Assessment in December of 2020. This report will be submitted to the Provincial and Federal Governments in early 2021.

Sediment Sampling – Pilot Project

Saskatoon Water completed the bathymetric survey and sediment sampling pilot project in Fall 2020, as mentioned in Section 4.3, to provide a better understanding of the water and sediment in our storm water management ponds. Through an ongoing partnership, the U of S completed in-kind laboratory testing of the sediment samples. The U of S analysis confirmed that the samples contained contaminants and metals expected to be observed in municipal storm water ponds throughout North America.

Floating Treatment Wetland Pilot Project

The Storm Water Utility collaborated with the Sustainability Division, the South Saskatchewan River Watershed Stewards (SSRWs), and Meewasin on a Floating Treatment Wetland Pilot Project for the Evergreen Storm Water Pond. The project will test the platform design, the robustness of various native plant species, and the soil used for plant growth, and impact on pond water quality, with a new monitoring program established in 2020. The project is expected to attract students on educational field trips. The floating wetland was expanded from 2 to 13 units in September 2020 through an RBC Grant championed by Meewasin. In 2020, the City worked with project partners to install informative signage about the floating wetland project.

Floating Wetland Sign installed in September 2020

4.9 Utility Billing

ERU Assessment Updates

In 2020, the Storm Water team reassessed 76 ICI and multi-residential properties due to recent construction or customer inquiries. In addition, 33 new assessments were completed on new ICI or multi-residential properties within the City.

Storm Water Management Credit Program

The Storm Water Management Credit Program took effect January 1, 2019, providing the opportunity for a reduction in Storm Water Management Charges for ICI and multi-residential property owners who have implemented onsite storm water management measures. Properties are eligible for a credit in the three categories up to a maximum total combined credit of 50%. The details of the three categories are provided in Table 6 below.

Table 6: Storm Water Management Credit Categories

Category	Evaluation Criteria	Total Credit (50% Maximum)
Water Quality Improvements	Based on the percentage of storm water directed through a quality control infrastructure that meets the minimum standard of 80% total suspended solids (TSS) removal for particles sizes 50 micron or larger.	Up to 20%
Peak Flow Reduction	Based on the proportion of storm water for a standard 1-in-2 year rain event held onsite and released slowly to the City's storm water system. The credit is equal to 0.4 multiplied by the peak flow reduction percentage up to 75%.	Up to 30%
Onsite Retention (Runoff Volume Reduction)	Based on 2% per millimeter of storm water up to 25 mm that is retained onsite and not released to the City's storm water system.	Up to 50%

The Storm Water website includes Frequently Asked Questions, a fillable application form, a user-friendly credit calculation calculator, an inspection and maintenance template, and a comprehensive guidance manual. Information about the credit program was sent with all 2020 ICI Storm Water Utility bills. The City received 10 inquiries and follow-up questions regarding the storm water credit program but did not receive any formal applications. A communication plan will be implemented in 2021 to increase awareness of the credit program for ICI and Multi-residential property owners.

4.10 Continuous Improvement Highlights

The Storm Water Utility has undertaken Continuous Improvement to increase service levels, improve efficiencies, and reduce costs in 2020:

- The Flood Control Strategy, cost-shared with the Government of Canada, will help the City adapt to the risk of more intense storms associated with climate change. Detailed design of Project 1 (W.W. Ashley Park Dry Pond) and preliminary design of Project 2 (Churchill Neighbourhood Park Dry Pond) were completed in 2020.
- The new multi-purpose field at Aden Bowman Collegiate, constructed through a City partnership with the Saskatoon School Board, opened to the public in the fall of 2020. The field was funded by the Storm Water Utility to provide soccer teams and other sport field users with continued access to a high-quality field when a new dry pond is constructed in W.W. Ashley District Park to reduce the risk of neighbourhood flooding.
- Cost-effective research was leveraged through a partnership with the U of S to identify the water quality of storm water run-off in outfalls. The results were used to remediate a source of contamination. The U of S also completed analysis of storm pond sedimentation and water quality in 2020 in partnership with the Utility.
- An application was made to the Government of Canada to cost share the Montgomery Place Drainage Strategy, with construction to restore drainage expected to start in 2021.
- Participation in the National Water and Wastewater Benchmarking Initiative provided access to best practices and lessons learned from other Canadian municipalities regarding storm water management.
- The 2018-2019 State of Storm Infrastructure Report was finalized in 2020. A formal Asset Management Plan for the storm infrastructure system was initiated in collaboration with Water and Waste Operations and Technical Services.
- Sedimentation levels at four storm water ponds were assessed as the first step in developing a long-term plan to maintain pond performance through a dredging program.
- *Bylaw 9730, Private Crossings over Ditches,* was completed in collaboration with Solicitors to further improve and control drainage within Montgomery Place.
- The riverbank slope stability 3D model was used to demonstrate how proposed construction by the City to maintain level of service for residents will impact the stability of adjacent riverbank slopes.
- The Storm Water team began working from home full-time (besides field work) in March 2020 in response to the COVID-19 pandemic. Work and project management best practices were quickly implemented to maintain and improve productivity.

5.0 OUR FINANCES

The Storm Water Utility is funded through a user-pay principle with charges reasonably proportional to storm water runoff generated according to property size and surface imperviousness (green space is charged less than buildings and pavement). A single-family residential dwelling is deemed to produce one Equivalent Runoff Unit (ERU) of storm water which forms the unit for charging other property types. The Storm Water Management Charge for single residential properties in 2020 was $6.65 per month ($79.80 annually).

Commercial properties can generate significantly more storm water than residential properties; therefore, they are charged multiple ERUs from a minimum of two annual ERUs ($159.60) to a maximum of 100 ERUs ($7,980) in 2020. In 2020, the Storm Water Utility billed 4,667 ICI (3,565) and multi-residential (1,102) properties.

After intense rain events caused sanitary sewer backups in 2005, a temporary Flood Protection Program (FPP) was established with a $36.00 annual ($3.00 monthly) charge on all water meters. The charge was increased to $54.00 annually ($4.50 monthly) in 2009. In 2018, City Council approved the phase out of the FPP charge by $13.50 per year from 2019 to 2022, in conjunction with an increase to the ERU rate of $13.50 per year. Figure 5 below displays the ERU and FPP rates for single family residential properties from 2018 to 2022, with the total charges not changing.

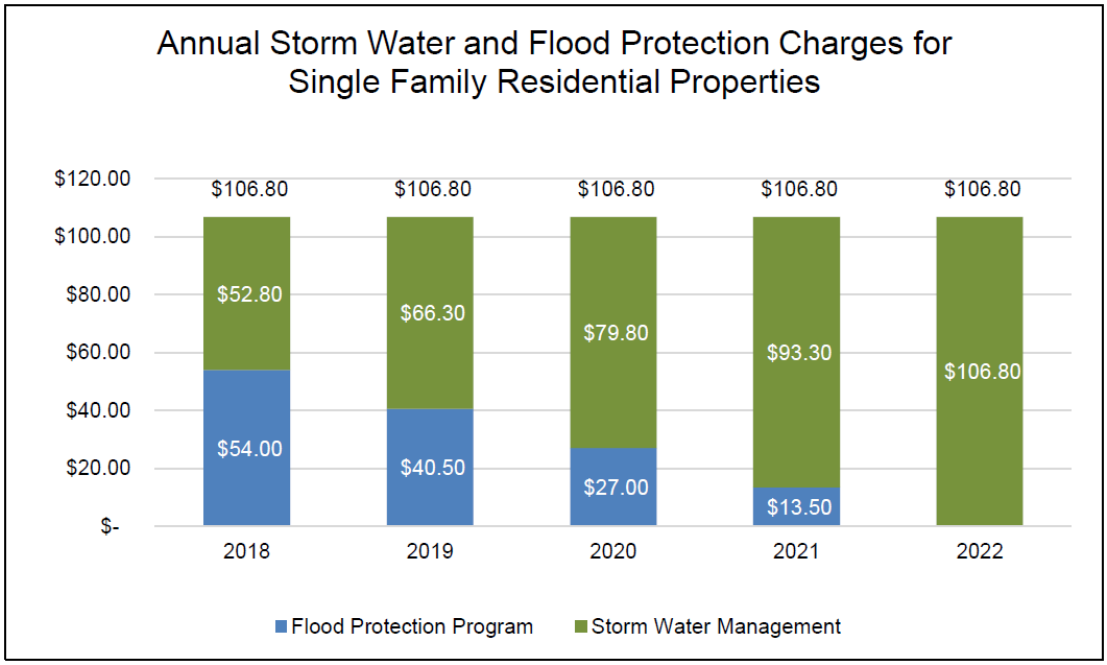


Figure 5. Annual Storm Water and Flood Protection Charges per Year

5.1 Revenues

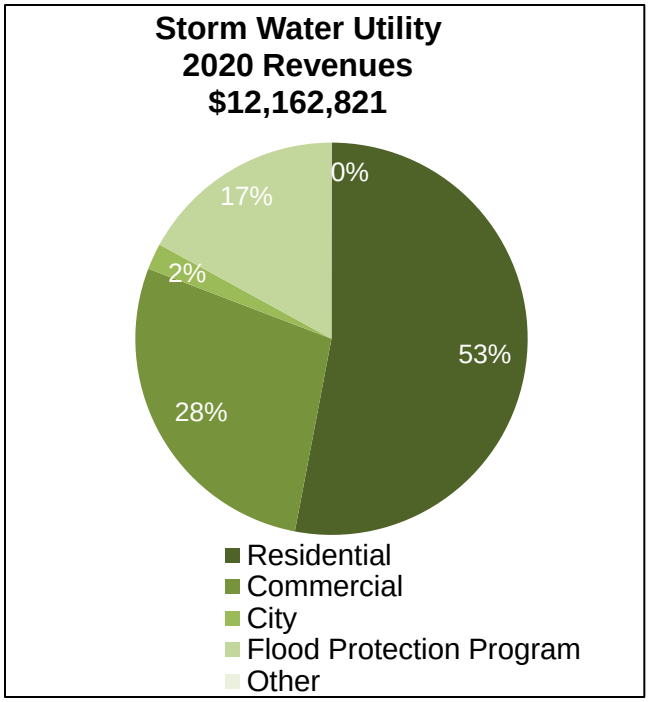


Figure 6. 2020 Revenues by Category

In 2020, total Storm Water Utility revenues including the temporary FPP were $12.2M, an increase of 7.7% from 2019. Storm Water Management revenues of $10.1M based on ERUs included $3.4M from ICI properties (28% of total revenues and 5% of customers of the storm water management charge), and $6.4M from residential properties (53% of total revenues and 95% of customers of the storm water management charge). Revenue from City-owned properties was $263K. Figure 6 displays the revenues in percentage by category.

The 2020 revenue from the temporary FPP of $2.1M was directed to the Infrastructure Reserve for future Flood Control Strategy projects.

Variances: Actual total Storm Water Utility revenues were $189K (1.6%) higher than budgeted in 2020 because of ERU reassessments completed, new sites, and higher than budgeted FPP revenues.

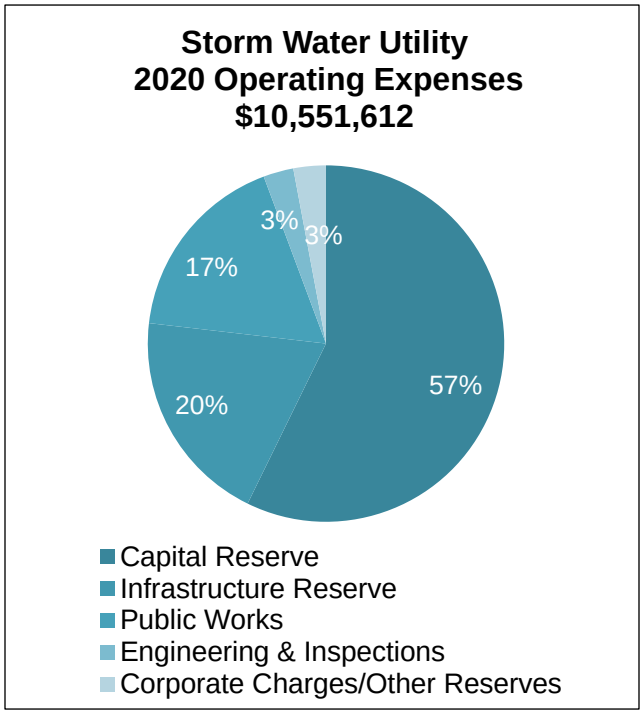


Figure 7. 2020 Operating Expenditures by Category

5.2 Operating Expenditures

The Storm Water Utility's 2020 operating expenditures were $10.6M, including $8.2M (78%) allocated to Capital and Infrastructure reserves.

WWO and RFS (Public Works) expended $1.8M (16% of total operating expenses) to operate and maintain the storm water system including handling citizen drainage calls, keeping storm drains clear, replacing and repairing the infrastructure, and sweeping streets in the fall. Of the $1.8M spent by Public Works, $1.2M was spent on sewer maintenance by WWO, which was a $0.7M (38%) decrease from 2019. The drainage (RFS) component of Public Works spent $0.7M in 2020 which was down from $0.8M (10%) spent in 2019.

Administration costs (corporate charges) of $0.25M included billing services by the Revenue Branch, financial and administration services from Finance, and insurance.

Engineering and inspections, including overall utility management, accounted for $0.29M. Figure 7 displays the operating expenses in percentage by category.

Variances: Operating expenditures in 2020 were $1.42M (11.9%) below budget. Public Works (RFS drainage and WWO maintenance) actuals for 2020 were $1.3M (41%) below budget. This reduced spending was due to staff vacancies, rain events were less widespread than average years, COVID-related delays in hiring seasonal staff and new processes delaying the start of the busy operation and maintenance season. Expenses also included a $114K transfer to a capital reserve for the City's enterprise resource program (Fusion).

Table 7 displays the actual 2020 Operating Revenues and Expenditures compared to the 2020 budgeted and 2019 actual amounts.

Table 7: 2020 Storm Water Operating Revenues and Expenditures

Storm Water Utility Operating Revenues and Expenses ($1000s)	2020 Actual	2020 Budget	2019 Actual
Revenues			
Storm Water Charges	$ 10,092	$ 9,975	$ 8,269
Flood Protection Program	$ 2,066	3,026	$ 3,008
Late Charges	$ 5	12	$ 11
Total Revenues	**$ 12,163**	**$ 11,147**	**$ 10,520**
Expenses			
Engineering & Inspections Operations	$ 289	$ 580	$ 313
Maintenance (Public Works)	$ 1,168	$ 2,126	2,306
Drainage (Public Works)	$ 677	$ 1,018	693
Customer Billing	$ 117	$ 136	123
Corporate Services	$ 52	$ 58	52
Licenses & Insurance	$ 82	$ 82	68
Interest Expense/(Revenue)	$ (54)	$ (54)	(23)
Provision to Capital Reserve	$ 6,041	$ 6,041	2,728
Provision to Other Reserves	$ 114	$ -	-
Provision to Infrastrucure Reserve	$ 2,066	$ 1,987	3,974
Total Operating Expenses	**$ 10,552**	**$ 11,974**	**$ 10,234**
Revenues Less Expenses	**$ 1,611**	**$ -**	**$ 747**
(To)/From Stabilization/Capital Reserves	**$ (1,611)**	**$ -**	**$ (747)**

5.3 Storm Water Stabilization Reserve

The Storm Water Stabilization Reserve has been established to provide for normal fluctuations in storm water expenses because of differences in weather conditions, such as widespread severe rain events, that impact requirements for storm water maintenance services. The Stabilization Reserve reached the maximum cap in 2020, which is the one-year operating budget for WWO and RFS, resulting in the difference of $1.27M being transferred to the Capital Reserve. The $3.14M balance at the end of 2020 was $341K more than in 2019.

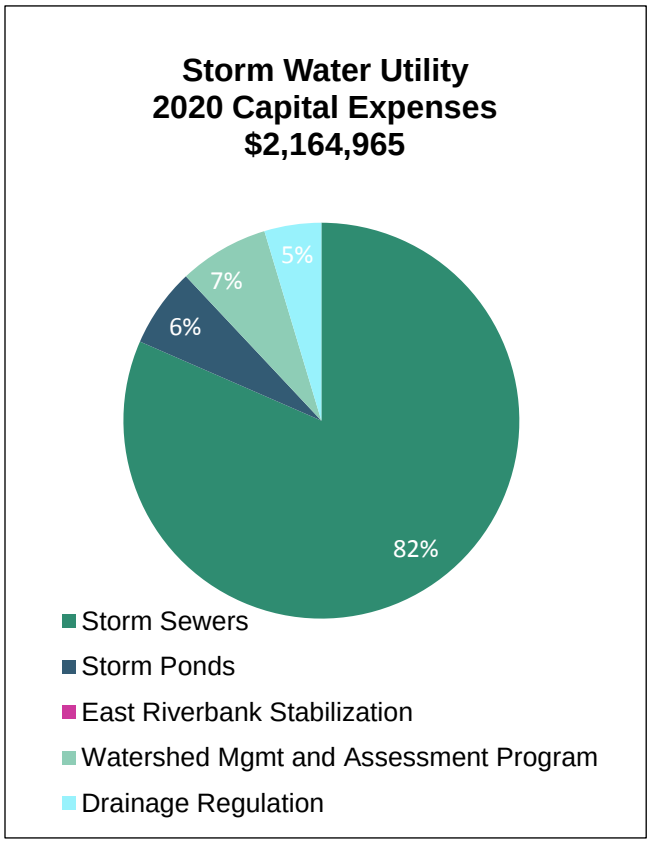
Table 8: 2020 Change in Stabilization Reserves

Change in Storm Water Stabilization Reserve ($1000s)			
Description/Year	**2020**	**2019**	**2018**
Stabilization Reserve Beginning of Year	$ 2,803	$ 2,056	$ 1,753
Balance From Year	$ 1,611	$ 747	$ 303
Transfer Out to Capital Reserve	$ (1,270)	$ -	$ -
Storm Stabilization Reserve End of Year	**$ 3,144**	**$ 2,803**	**$ 2,056**

5.4 Capital Funding

In 2020, $7.3M was allocated to the Storm Water Capital Reserve (including the $6.0M budget provision and $1.3M from the Stabilization Reserve) and $2.1M from FPP revenue was allocated to the Infrastructure Reserve. In addition to revenue allocated to capital from the Storm Water operations, $5K was received from the GoC's National Disaster Mitigation Program (NDMP) for the climate change project and $19K from the GoC's Disaster Mitigation and Adaptation Fund (DMAF) for the Flood Control Strategy (W.W. Ashley Storm Pond eligible expenditures).

5.5 Capital Expenditures



In 2020, Storm Water Utility capital expenditures were approximately $2.2M (Figure 8). Approximately 82% of capital expenditures were for storm sewer network management, asset preservation, and capacity building ($1.8M).

East Riverbank Stabilization expenditures of $159K primarily included the in-house geotechnical engineer salary, the 3D slope stability modelling, and other riverbank monitoring costs.

Storm pond preservation expenditures were $140K, and included inspections, monitoring, asset management and reporting, and planning and initial costs of the Brand Road Pond dredging.

Figure 8. 2020 Capital Expenditures by Category

Variances: Actual 2020 capital expenditures were $8.6M less than budgeted with the following significant contributing factors:

- Actual expenditures for the East Riverbank Stabilization project were $944K less than budget because no slope remediation projects were completed in 2020. A balance of up to $3.0M will be maintained in the East Riverbank Stabilization Capital Project to ensure funding is available if there is an emergency slope failure which impacts strategic public infrastructure. The unexpended balance at the end of 2020 was $3.1M.
- Storm Water Sewer expenditures were $7.2M less than the budget because of delays in the Flood Control Strategy projects. The remaining budget will be used in future years before 2028.
- Storm Water Pond preservation expenditures were $466K less than budgeted because the Brand Road dredging project was not completed in 2020.

Table 9 displays the actual 2020 Storm Water Capital Expenditures compared to the 2020 budgeted and 2019 actual amounts.

Table 9: 2020 Storm Water Capital Expenditures from Capital Reserve Fund

Storm Water Capital Expenditures ($1000s)	2020 Actuals	2020 Budget	2019 Actual
Storm Trunk and Collection Sewers	$ 1,765	$ 8,955	$ 2,573
Storm Sewer Pond Preservation	$ 140	$ 606	$ 110
Utility Billing Management	$ -	$ -	$ 3
East Riverbank Stabilization	$ 159	$ 1,103	$ 183
Drainage Regulation	$ 101	$ -	$ 1
Watershed Mgmt and Assessment Program	$ 22	$ 75	$ -
Total Capital Expenditures	**$ 2,186**	**$ 10,739**	**$ 2,870**

Note: The 2020 Capital Budget includes allocations of $8.9M from the Storm Water Capital Reserve and an additional $2.4 from the Redevelopment Levy fund (Flood Protection Program revenues are included in the Storm Trunk and Collection Sewers).

The drainage regulation project spending of $101K in 2020 was from annual budgets prior to 2020. The watershed management assessment program are expenses for a Sustainability Department project that was not previously budgeted.

At the end of 2020, ongoing capital projects extending over more than one year had unspent capital balances of $15.0M. This does not include $1.9M in funding from the Government of Canada for the Flood Control Strategy that was allocated in the 2020 budget but was not received in 2020.

5.6 Storm Water Capital Reserves

The Storm Water Capital Reserve provides funding for future large-scale capital projects. The capital reserve at the end of 2020 was $2.6M. No capital closures occurred in 2020 with adjustments yielding a net addition of $0.6M. Table 10 displays the comparison of 2020 Capital Reserves End of Year to those of 2018 and 2019.

Table 10: 2020 Change in Storm Water Capital Reserve

Change in Storm Water Capital Reserve ($1000s) Description/Year	2020	2019	2018
Capital Reserve Beginning of Year	$ 1,052	$ 1,857	$ 2,008
Provision to Capital Reserve	$ 6,041	$ 4,253	$ 2,728
Capital Budget	$ (8,793)	$ (5,065)	$ (2,989)
Redevelopment Levy Adjustment	$ 2,402	$ -	$ -
Transfer in from Stabilizaton	$ 1,270	$ -	$ -
Closures and Adjustments Returned to Capital Reserve	$ 585	$ 8	$ 109
Capital Reserve End of Year	**$ 2,557**	**$ 1,052**	**$ 1,857**

Since inception, FPP funding has been paid into the "Infrastructure Reserve". Table 11 shows changes in the component of the Infrastructure Reserve funding from FPP revenue for capital projects to reduce risks of sanitary sewer back-ups and overland flooding. At the end of 2020, $1.97M was available in the Infrastructure Reserve for future Flood Control Strategy projects.

Table 11: 2020 Change in Infrastructure Reserve from Flood Protection Program Funding

Change in Infrastructure Reserve from Flood Protection Program Revenues ($1000s)			
Description/Year	**2020**	**2019**	**2018**
Infrastructure Reserve Beginning of Year	$ (90)	$ (439)	$ (5,612)
Provision to Infrastructure Reserve	$ 2,059	$ 3,008	$ 3,975
Infrastructure Capital Budget - Sanitary Sewer Project (1678)	$ -	$ -	$ 1,197
Infrastructure Capital Budget - Flood Control Project (1619)	$ -	$ (2,658)	$ -
Closures and Adjustments Returned to Infrastructure Reserve	$ -	$ (1)	$ -
Infrastructure Reserve End of Year	**$ 1,969**	**$ (90)**	**$ (439)**

At the end of 2020, the total balance of all three storm water related reserves (Storm Water Stabilization, Capital, and Infrastructure Reserves) was $7.7M.

5.7 Storm Water Utility Benchmarking

In 2020, the Storm Water Utility compared its utility rates to 11 other cities with utilities across Canada using publicly available information on the cities' websites. For single residential properties, Saskatoon's overall charges including Storm Water Management ($79.80) and Flood Protection[1] ($27.00) were $106.80, which is the fifth lowest compared to the 11 other comparison cities. The combined Storm Water Management and Flood Protection charge compared to fees in other prairie cities is shown in Figure 9 (Winnipeg has no storm water utility fees).

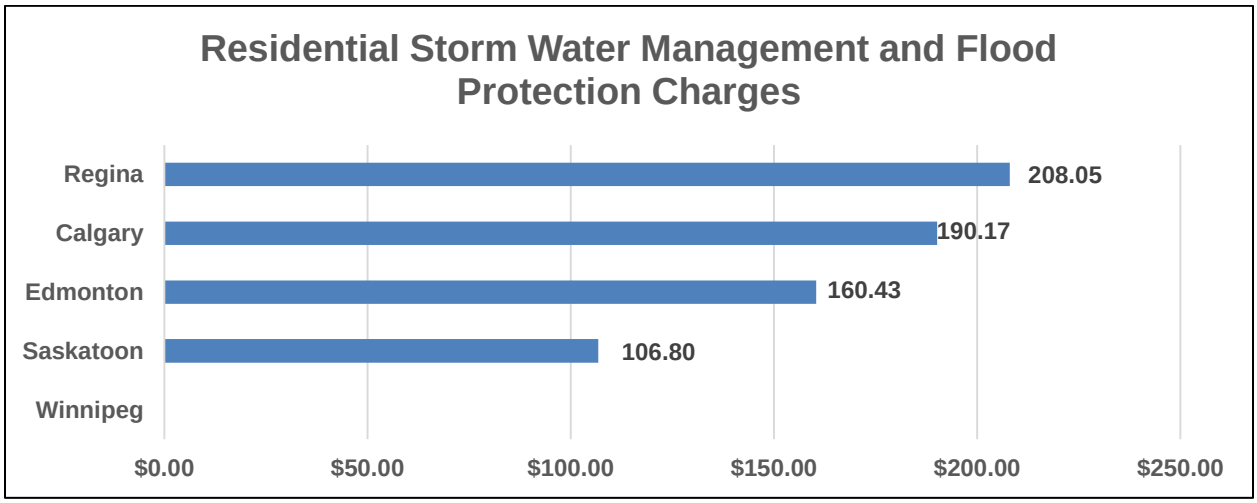


Figure 9. 2020 Residential Storm Water Management and Flood Protection Charges[2]

Non-residential properties are more difficult to compare as storm water utility programs ranged from flat rates for all customers to charges based on area size and imperviousness. Saskatoon's maximum annual storm water charge was $7,980 in 2020 for non-residential properties which was the fourth highest charge out of 11 cities surveyed.

- For a typical restaurant (4,515 m^2) that is all hard surface, municipality storm water charges range from $94 (Sherwood Park) to $2,481 (Kitchener), with Saskatoon charging $1,240.
- For a large shopping center (37,200 m^2) that is all hard surface, municipality storm water charges range from $94 (Sherwood Park) to $19,961 (Edmonton), with Saskatoon charging $7,980.

The comparison 2020 annual minimum and maximum Storm Water Management charge for the prairie cities are shown in Figure 10. The rates illustrated in the graph are based on a property equivalent to 100 ERU in Saskatoon (30,000 m^2). Note the FPP charges for each water meter were not included for Saskatoon in Figure 10.

[1] Prior to 2019, the "Flood Protection Program" levy was charged to fund projects that mitigate damage from sanitary sewer backups during intense rain events.
[2] Sources: Rates from websites of Cities of Regina, Calgary, Edmonton, and Winnipeg

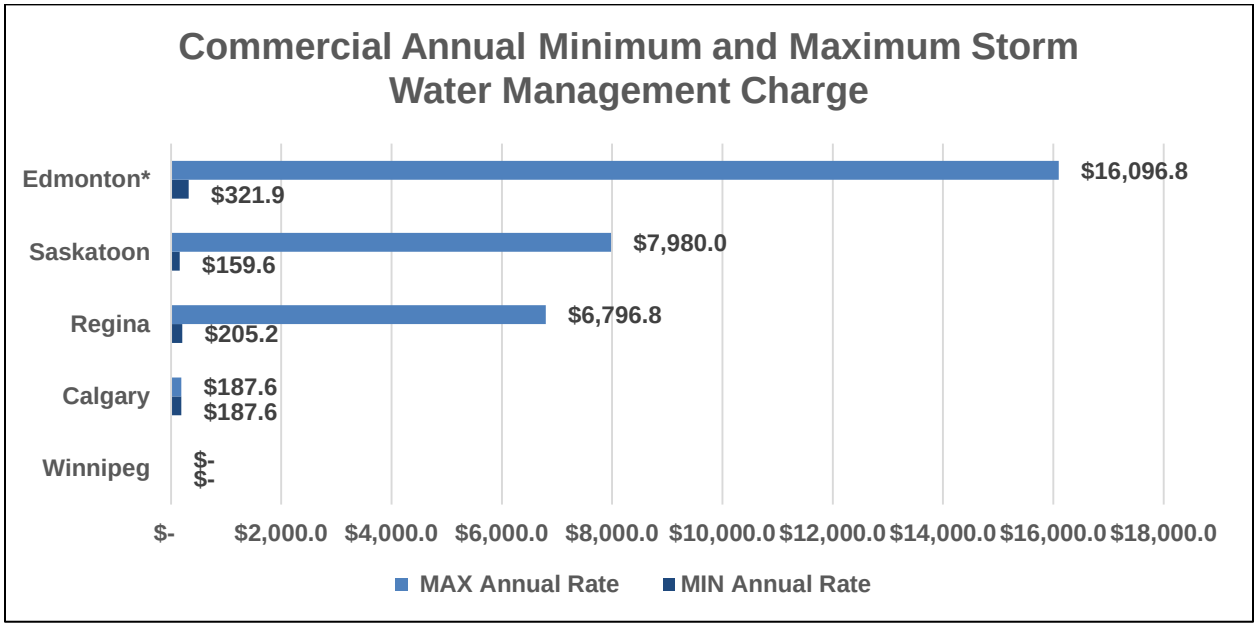


Figure 10. 2020 Commercial Annual Minimum and Maximum Storm Water Charges[3]

6.0 OUR CHALLENGES

6.1 Ongoing Challenges

Storm water management has continuing and expected future challenges which are summarized below.

Climate Change: Climate change adds to the potential of more frequent, higher intensity rain events, and increased demands on the storm water infrastructure.

Condition of Existing Infrastructure: Water infrastructure has a limited life expectancy and over time the pipes, culverts and other infrastructure must be repaired or replaced. Some of Saskatoon's storm water infrastructure dates back to the early 1900s.

Historical Design Standards: Limited standards for storm water infrastructure were in place when Saskatoon neighbourhoods began to develop. In 1989, new storm water standards for new neighbourhoods were established to handle "1 in 100 year" storms. Surface flooding during high intensity storms continues to be an issue for many low-lying areas in older areas of the City.

Fluctuating Groundwater Levels: Higher groundwater levels have changed drainage patterns as water is unable to seep into the ground. The groundwater levels impact neighbourhood drainage and contribute to East Riverbank slumping and slope failure.

[3] Sources: Rates from websites of Cities of Regina, Calgary, Edmonton, and Winnipeg

Infill Development: Cumulative impacts of infill development are placing higher demands on our storm water-related infrastructure. Infill reduces greenspace and increases surface runoff.

***Citizen Expectations*:** Citizens have high expectations for storm water drainage that minimizes ponding on their streets and on properties. Flooding happens relatively rarely, but when it does happen, it can impact many properties at once. Citizens expect quick reactions by the City to their areas.

Drainage Bylaw Enforcement: Neighbourhood storm water drainage is negatively impacted by properties developed contrary to approved design standards or drainage paths that are not maintained. Inspections when development occurs are necessary to minimize future problems.

Regulatory Requirements: Evolving federal and provincial regulations have the potential to impact discharges to the river and may require future investments to improve the quality of storm water runoff.

***Inflow & Infiltration to the Sanitary Sewer*:** Extraneous inflow and infiltration of snowmelt and rainfall to the sanitary system increases risk of sanitary sewer back-up during rain events and creates unnecessary costs for treatment and capacity upgrades for the Wastewater Treatment Plant.

***Costs for Businesses*:** Storm water charges for some businesses will more than double between 2018 and 2022, which may generate negative feedback. Actions that businesses can take to reduce their storm water run-off generally have high capital costs relative to the annual reduction in storm water management charges.

6.2 Pandemic Challenges

The Storm Water team experienced the following challenges in 2020 that were unique due to the pandemic which impacted work processes starting in March. Some of the challenges are included below.

- Roadways, Fleets and Support and Water and Waste Operations were delayed on increasing seasonal staff in the spring.
- Collaboration and design meetings changed from in-person to virtual meetings.
- Coordination of field work included additional planning and scheduling time for equipment retrieval and on-site meetings.
- Standard work procedures were updated due to changes in safety and process protocols.
- Working alone procedures were updated to reflect working from home requirements and additional safety procedures.
- Site meetings between the public and internal colleagues were completed based on current safety protocols and procedures.

7.0 CONCLUSION

Several initiatives that the Storm Water Utility undertook in 2020 will be further developed in 2021 and future years including the following:

- Furthering the nine-year Flood Control Strategy to reduce flood risk in areas that have a long history of frequent flooding. The W.W. Ashley Dry Storm Pond will be constructed in 2021. The detailed design and public engagement for the Churchill Park Dry Storm Pond will be completed in 2021 with construction scheduled for early 2022 (pending Council approval).

- The first project of the Montgomery Place Drainage Strategy will be constructed in 2021 along Caen St., Dundonald Ave, Lancaster Blvd, and Ortona St. The ICIP funding application for future projects to improve surface drainage for this neighbourhood will be further investigated in 2021.

- Further the design and cost-benefit analysis for the Melville Drainage improvement project.

- Continuing the storm water pipe lining program to extend the life of storm water infrastructure and improving drainage for two areas with ongoing drainage issues in collaboration with Technical Services.

- Developing the storm water system asset management plan in collaboration with the City's Corporate Asset Manager, Technical Services, and Water and Waste Operations.

- Completing the formal Storm Pond system assessment and report in 2021 which is completed every three years.

- Further leveraging resources through partnerships with the U of S for research about storm water quality and the impact of climate change risks on storm water.

- Reassessing ICI and Multi-residential properties storm water utility ERU assessment through the 2021 aerial photo.

- Promoting the Storm Water Management Credit Program.

- Participating in the National Water and Wastewater Benchmarking Initiative management by AECOM.

The Storm Water Team is committed to working collaboratively with other divisions towards making Saskatoon a more flood resilient City.

8.0 Appendices

Appendix 1: Definitions

Catch Basins: Used to convey storm water from the ground surface, usually on a street or parking lot, to the storm water collection system. Collector catch basins are located on collector mains and trunk catch basins are located on trunk manholes.

Culverts: Used to channel water under roads, railways, or embankments. Culverts have open inlets and outlets, usually transporting water from one ditch to another.

Dredging: The process of removing sedimentation (mud), weeds, and rubbish from pond bottoms.

Equivalent Runoff Unit (ERU): A measurement unit for runoff that is used for storm water management fees. One ERU is based on an average single-family residential property's areas and types of surfaces (i.e. amount of grass, hard surface, etc.).

Floating Treatment Wetland: Floating treatment wetlands (FTWs) or islands are artificial platforms that allow aquatic plants to grow in water that is typically too deep for them. Their roots spread through the floating islands and down into the water creating dense columns of roots with lots of surface area.

Force Mains: Pressurized mains from 100 mm to 900 mm in diameter which connect storm water pumping stations and lift stations to the gravity collection system.

Leads: Pipes connecting catch basins to the storm collection system which range in diameter from 100 mm to 900 mm. Collector leads are located on collector storm mains. Trunk leads are located on trunk storm mains.

Lift Stations: Move storm water from lower to higher elevations, particularly where the elevation of the source is not sufficient for gravity flow and/or when the use of gravity conveyance will result in excessive excavation depths and high sewer construction costs.

Lining: A layer of material installed in a sewer main to improve performance and extend the lifespan.

Manholes: Chambers used to access sewer mains for maintenance and inspection purposes.

Oil and Grit Separators (OGS): A variation of the traditional settling tanks designed to capture sediments and trapped hydrocarbons (oils) in storm water runoff. OGS replace conventional manholes.

Outfalls: Are the discharge point of the storm sewer system to the river, and include the following three categories:

- Local – Expel water from relatively smaller local areas than the collector or trunk outfalls
- Collector – Connect to the storm sewer system through collector mains

- Trunk – Connect to the storm sewer system through trunk mains

Piezometers: Devices used to measure pressure or depth of groundwater at a specific point.

Return Period: The estimated average time between equivalent rain events based on rainfall intensity and duration. A rain event with a 2-year return period has a 50% probability of occurring in any year. A rain event with a 100-year return period has a 1% probability of occurring in any year.

Runoff: Rain and snowmelt draining from land, buildings, or other surfaces.

Service Connections: Connect drainage systems from customer properties to storm mains in the street.

Sewer Mains: Principal pipes in a system that distribute water or collect storm water and waste water, and include the following two categories:

- Collector – Sewer mains that are less than 1350 mm in diameter
- Trunk – Sewer mains that are more than 1350 mm in diameter

Slope Inclinometer: Geotechnical instruments used to measure horizontal displacements along various points on a borehole to detect slope movement.

Standpipes: Plastic pipes with perforated holes at the base used to measure groundwater level.

Storm Water Ponds: Manmade basins that control excess storm water during and after heavy rainfall events and provide water quality improvement for runoff. **Dry Ponds** normally do not have water - they detain runoff during intense rain events and then gradually release the water back into the storm sewer system. **Wet ponds** permanently retain water throughout the year.

Sub-Drainage: Perforated pipes located in the slope along the riverbank used to collect ground water and remove it from the slope. This decreases the groundwater level in the slope and helps to stabilize the slope.

Sump Pumps: Remove water that has accumulated in a water-collecting sump basin, commonly found in the basements of homes

Vibrating Wire Piezometers: Used to provide accurate pore-water pressure readings in soils to measure groundwater levels.

Appendix 2: Montgomery Place Drainage Strategy Communication

City of Saskatoon

Utilities and Environment
222 3rd Avenue North
Saskatoon SK S7K 0J5

www.saskatoon.ca
tel 306-975-2476
fax 306-975-2971

September 4, 2020

Dear Resident / Property Owner:

Re: Montgomery Place Drainage Strategy – Planning Meeting for Property Owners

Your property will be impacted by the reconstruction of drainage ditches scheduled for 2021 construction season. A map of the 2021 construction area is included with this letter to help you understand the scope of the project, which will be coordinated with road and water infrastructure work.

A project team member will meet with each property owner by phone to review the following elements for your property and answer any questions you have:

- Driveway crossing alignment and material type,
- Existing culverts (if any),
- Right of way (ROW) distance from road to your property line, and
- Existing landscaping or irrigation features that will need to be removed prior to construction commencement.

To book this planning meeting, please email stormwater@saskatoon.ca with your name and phone number, along with your preferred meeting timeframe:

1. Tuesday September 15, 2020 between 9:00 AM – 12:00 PM
2. Wednesday September 16, 2020 between 8:30 AM – 11:30 AM
3. Thursday September 17, 2020 between 9:00 AM – 12:00 PM or 2:30 PM – 5:00 PM
4. Friday September 18, 2020 between 9:00 AM to 12:00 PM or 1:00 PM – 4:30 PM

A City project representative will phone you within the timeframe selected. If you are not available for the above times, please indicate an alternative time.

Watch for more 2021 construction work communication in the coming months. To subscribe to project updates, send an email to constructionupdates@saskatoon.ca with your name and property address.

Sincerely,

Saskatoon Water (Storm Water)

Drainage

When it rains or melts, help maintain ditch drainage to reduce flooding in Montgomery Place

How you can help:

- Do not fill in ditches within City of Saskatoon Right-of-Way (ROW). A permit to alter the ROW is required (the same as for a driveway crossing).
- Keep culverts (pipe under your driveway) clear.
- Work with neighbours to resolve ditch drainage issues.
- Obtain a Driveway Crossing Permit from the City for new or modified driveway crossings to ensure culverts meet the proper standards.

What you can expect from us:

- City crews will clear major drainage paths and culverts each spring.
- The City will assist homeowners through the Private Driveway Crossing Permit application process.
- City staff will follow up on ditch drainage complaints regarding new driveway crossings.

Contact Us

Maintenance Requests:

Customer Care Centre

Email: customercare@saskatoon.ca

Phone: 306-975-2476

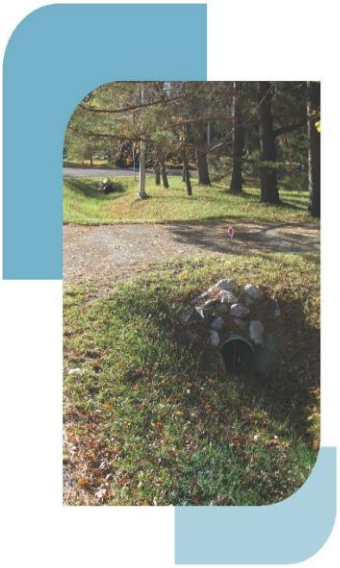
Driveway Crossing Permits (Montgomery Place Only) and General Drainage Questions:

Storm Water

Email: stormwater@saskatoon.ca

Phone: 306-986-0914

Driveway application process for Montgomery Place:
saskatoon.ca/ditchcrossing



Spring 2020 Update

Montgomery Place

City of Saskatoon

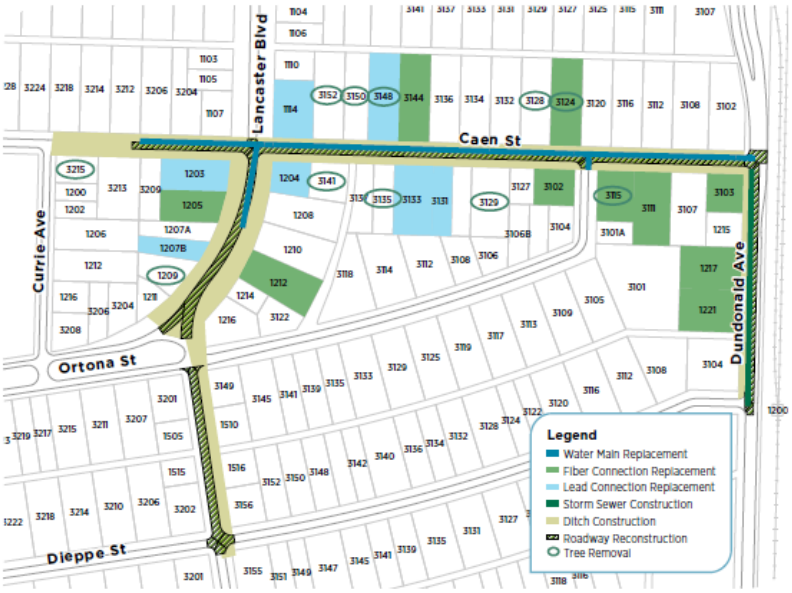
Drainage Improvement Project

The City presented a drainage improvement plan with new ditches and portion of underground storm sewer for Montgomery Place for the following:

- **Dundonald Ave**
  from Dieppe St. to Caen St.
- **Caen Street**
  from Dundonald Ave. to Currie Ave.
- **Lancaster Blvd**
  from Caen St. to Dieppe St.

Drainage improvements are being coordinated with water main and lead line replacements, and road reconstruction.

This project and other work shown will be scheduled to begin in spring/summer 2021, pending City Council approval this summer. Affected residents will be notified ahead of construction with the final project plan.



What you said:

The City presented the drainage improvement project and collected your feedback on cost sharing, driveway standards, and other general project information at an open house in February 2020. Montgomery Place residents were also encouraged to complete an online survey. The results are summarized below:

- **About 80% support ditch reconstruction to improve drainage.**
- **More than half (61%) indicated damage or ponding on their property.**
- **About 47% support maintaining short steep ditch sections to preserve trees.**
- **About 46% believe maximum crossing width should be based on lot size.**
- **The majority (58%) said that driveways should be rebuilt to their existing width, compared to about a third (35%) said they should be the new standard.**
- **Responses about cost sharing for non-compliant crossings varied.**

The community feedback will be incorporated in a report to City Council on cost-sharing options.

See the project Engage Page for more engagement and online survey results: saskatoon.ca/engage/montgomery-place-drainage-improvements

Appendix 3: Flood Control Strategy Communication

City of Saskatoon

Flood Protection Plan

The nine-year Flood Protection Plan, approved by City Council in December 2018, will improve storm water drainage to reduce flood risk in up to ten flood prone areas, including a combination of storm water pipes, dry storage ponds in parks and underground storage.

Project Update: W.W. Ashley Park

A new dry pond in W.W. Ashley Park will be the first project to be constructed under the Flood Protection Plan. The new dry pond will detain the storm water that pools in the Dufferin Ave/1st St E and Broadway Ave/Taylor St areas during intense rain events.

The City is pleased to report that the new sports field at Aden Bowman Collegiate will be ready for the start of the fall school year. It was important to have this new full-sized field available for students and community sports teams who have relied on the W.W. Ashley District Park sport field.

Unfortunately, the final storm pond design was not ready in time to tender the construction for this spring and summer, as communicated at the open house in June 2019. The new expectation is that everything will be in place for construction to begin by spring 2021.

We recognize residents and business in the area who experience flooding may be concerned about this delay. We want to reassure you that this project remains a high priority and will proceed as soon as possible. Please check in on the project page for ongoing updates and sign up for Flood Protection Plan email updates at saskatoon.ca/floodplan.

Protect Your Property

Please ensure you are taking all precautionary measures to protect your home from flood damage this spring and summer. Find a home flood protection checklist and other resources at saskatoon.ca/floodprotect.

If you have any questions, please contact us by email or call our Customer Care Centre at 306-975-2476. Learn about the City's storm water management programs.

SEND TO A FRIEND WEBSITE

W.W. Ashley Park Dry Storm Pond Project Update

BACKGROUND

The City of Saskatoon is upgrading the storm water system to reduce flood risk for residential and business properties near the 1st Street/ Dufferin Avenue and Taylor Street/Broadway Avenue intersections.

When intense rainfall occurs, storm water will drain into a newly constructed dry storm pond in the nearby W.W. Ashley District Park rather than flood intersections. It will then slowly drain into the storm water system and to the river.

SCHEDULE

Construction of the dry storm pond at W.W. Ashley District Park begins with the excavation of the dry pond in early 2021. The remaining phases (storm sewer pipes, outlet-inlet structure and landscape construction) will be scheduled between May and November 2021.

A full-sized sports field was developed last summer at Aden Bowman Collegiate to replace the existing field in W.W. Ashley District Park, with brand new terrain, trees, seating and irrigation—ready for public use in May 2021.

PROJECT FUNDING

W.W. Ashley Park Dry Storm Pond is the first of nine projects that will address flooding at Saskatoon's most flood-prone areas through the nine-year $54 million Flood Control Strategy. The Government of Canada is contributing 40% of the eligible construction costs up to a maximum of $21.6 million.

ENGAGEMENT & COMMUNICATIONS

Learn more about the W.W. Ashley Park Dry Storm Pond at saskatoon.ca/engage. Properties adjacent to the park will receive a construction notice with important information prior to the excavation work planned for early 2021.

In the meantime, we ask that residents sign up to receive project updates. To sign up, please email us at constructionupdates@saskatoon.ca from your preferred email address with "W.W. Ashley District Park" as the subject to provide your name and address.

DESIGN

Feedback Included

Your feedback at the summer 2019 open house was incorporated in the design of the storm pond:

- Pathway around the top of the storm pond (above the slope crest) allows for direct access through the site.
- Walking paths and wheelchair accessibility were incorporated with two ramps connecting to a common sitting area.
- Existing fences along Lansdowne Avenue and Albert Avenue will be removed.
- Side slopes of the pond were optimized and softened, to contain the required storm water volume for a 1-in-10-year storm and incorporate green space use.
- Green space is large enough for dog walking, kite flying, and regular family park uses.
- Pond base is large enough for a sports field and other informal recreational activities.
- Pond features terraces with seating, planting areas, trash receptacles and other amenities.

City of Saskatoon

ENGAGE

Customer Care Centre | 306-975-2476 | stormwater@saskatoon.ca

saskatoon.ca/engage