

COUNCIL REPORT

M&C No.	2019-145
Report Date	June 12, 2019
Meeting Date	June 17, 2019
Service Area	Transportation and Environment Services

His Worship Mayor Don Darling and Members of Common Council

SUBJECT: Glen Falls Flooding

OPEN OR CLOSED SESSION

This matter is to be discussed in open session

AUTHORIZATION

Primary Author	Commissioner/Dept. Head	City Manager
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RECOMMENDATION

That this report be received and filed.

EXECUTIVE SUMMARY

Glen Falls was constructed in a natural floodplain. When severe rainstorms occur more runoff is directed into Marsh Creek than the channel can carry. This is due to insufficient capacity (due in part to the extremely flat topography) and obstructions. Several engineering studies have been commissioned by the City to study the flooding issues dating back to the 1960s. The recommendations of these studies vary in complexity and budget but the common observation in these reports is that Glen Falls will continue to flood during heavy rainfall events and partial solutions are expected to cost tens of millions of dollars.

The unfortunate rain event that occurred on January 23, 2019 caused severe flooding in Glen Falls as well as many other locations in Saint John that do not usually experience flooding. We attribute this flooding to many factors including lack of absorption due to the ground being frozen in addition to a rare and extreme heavy rain event. With climate change these types of events may become more frequent.

PREVIOUS RESOLUTION

On February 25, 2019 Council resolved that City staff would report back with an overview of the current City storm water management plan specifically surrounding the East side flood plain.

On June 20, 2011 council resolved that the recommendations in the submitted report M & C 2011 -149: Glen Falls Flooding and Residential Relocation be reviewed, vetted and followed up on by the City Manager and City Staff.

STRATEGIC ALIGNMENT

This aligns with Council's priorities for Valued Service Delivery, Growth and Prosperity and being Fiscally Responsible.

REPORT

ENGINEERING

The Mayor & Council report M&C 2011-149 provides a summary of the studies and work done in the Marsh Creek area. To summarize the report, Glen Falls and the surrounding area was constructed in a natural floodplain. The main issue is that in severe rainstorms more runoff is generated and directed into Marsh Creek than the channel can carry. This is due to insufficient capacity as well as obstructions. One issue with Marsh Creek is that it is extremely flat; Marsh Creek through the flood prone area is 5.0km long and only has 0.90m of vertical drop from the upper reaches of the marsh to the causeway. These capacity and obstruction issues cause the water levels in the upper channels of Marsh Creek to become elevated which leads to flooding.

Much of Glen Falls and surrounding area is also within a tidal floodplain. Tide gates were installed under the Courtenay Bay Causeway to prevent the high tides from the Bay of Fundy from flowing upstream during elevated tide levels. It is important to note that some areas in Glen Falls are actually lower than the high tide level in the Bay of Fundy.

After several severe flooding events occurred during the 1960s and 1970s, the Municipal and Provincial governments commissioned several engineering studies of the area (1974, 1976 and 1984). These studies examined the performance of the Marsh Creek system and tributary streams as well as the primary causes and extent of flooding, flood risk areas and recommendations to mitigate the effects of flooding. Several structural and non-structural recommendations came out of these reports. Low benefit to cost ratios for some of the works recommended by Proctor and Redfern rendered them impractical and, therefore, not all of the suggestions were acted upon. Also, some of the recommendations were not

done because the essential storage component of the whole system, the forebay area behind Courtenay Causeway could not be secured for storage purposes.

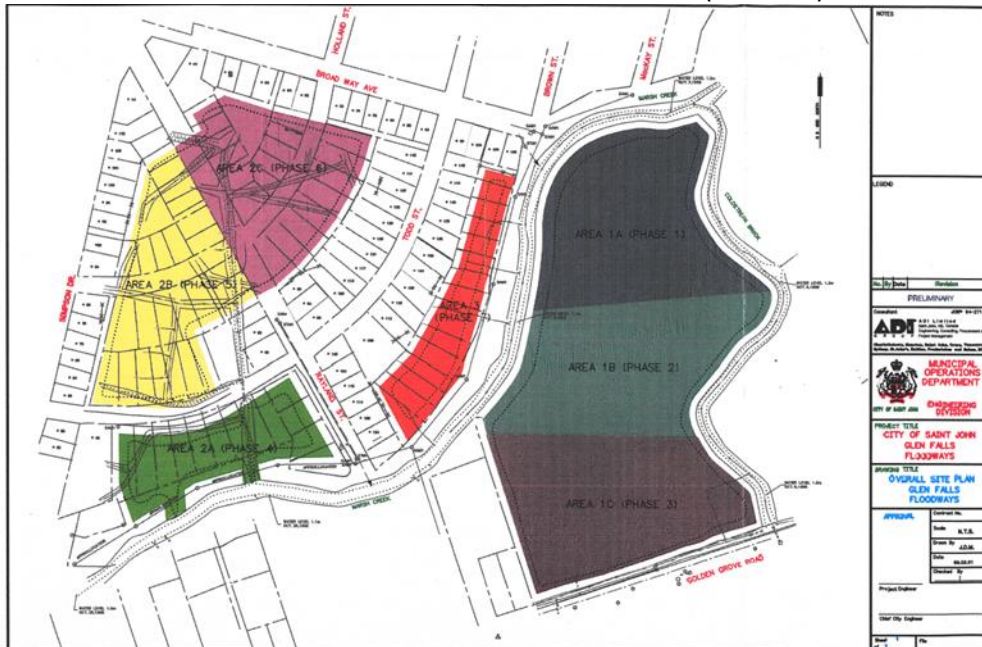
Council commissioned development of a Stormwater Management Strategy in June 2006. Terrain Group, Inc. was engaged to develop this initiative through a report. Marsh Creek was a primary area of focus. The main recommendation from the Terrain Group Inc. report to reduce flooding in Glen Falls and the Marsh Creek Drainage Basin was to divert excess runoff from the tributary streams in the upper reaches of the basin into Drury Cove via a closed pipe system. A preliminary design and cost benefit analysis report was completed in December 2009, and included an estimated cost for the construction of the project of \$51,660,000 (in 2009 dollars). Even if this project was completed, there was no guarantee that this work would solve all of the issues in the basin and there was still potential for storm surge flooding in the basin.

The attached M&C 2011-149, states the following; “while forebay storage is a critical moderating influence on the severity (depth) and duration of upstream flooding that occurs, it is important to also understand that increasing the amount of storage capacity available at this location (e.g. excavation, installation of a pumping station or high capacity operable sluice gates) can further improve but not “eliminate” upstream flooding. Glen Falls will continue to flood when runoff from heavy rainfall events is too great for the narrow channels to handle, causing stream levels to rise and local storm sewers to surcharge”. Despite the fact that improvements to forebay storage cannot eliminate upstream flooding, increased storage capacity in this part of the system has consistently been recommended in engineering studies. In the 2008 Stormwater Management Strategy, recommendations to increase storage capacity at the forebay included installation of a pumping station (estimated at \$11M in the report) or high capacity operable sluice gates (estimated at \$5M in the report), but only after the upstream piped diversion project was completed. Negotiations failed to secure a parcel of the forebay for additional flood storage and then expropriation proceedings were initiated in 1982 but the land was not acquired.

In 2009, a report was completed by GEMTEC Limited titled, *Mystery Lake Flood Control System*. In this report, design of a new outlet control structure for Mystery Lake was examined. The volume of storage that would become available by raising the outlet within the confines of conditions of the site was determined to not be enough to be effective. Also properties upstream would need to be acquired as they would flood if the outlet was raised. A section of Golden Grove Road would also need to be raised.

The ADI Limited report titled *Glen Falls Floodways – Preliminary Design Report* was completed in February 1999 (attached). This report outlined floodway options for alleviating flooding as well as for compensatory storage. This report states that the construction of the floodways should be completed in the order shown to function properly. Therefore, prior to constructing a floodway in the

area highlighted by Councillor Strowbridge (the area bounded by Simpson Drive/Broadway Avenue/Todd Street (Area 2B and Area 2C)), a floodway should be constructed between Marsh Creek and Todd Street (Area 2A).



According to this report, the volume available in floodways 2A, 2B and 2C is approximately 50,000m³ at an estimated current construction cost of between \$1.5M and \$2M. A floodway with 50,000m³ of storage would only accommodate 3% of the required 1,630,000m³ of water that Terrain determined would need to be diverted in a piped system to Drury Cove during a 1:100 year, 24 hour duration storm. In order to retain the full volume required (1,630,000m³) in a wetland or pond with a depth of 0.5m, a surface area of 327 Ha would be required. For comparison purposes, the area of the floodway that currently exists between the Golden Grove Road and MacKay Street/Brown Street (Areas 1A, 1B and 1C in the ADI report) is approximately 7.1 Ha.

The City of Saint John is working towards developing a fully operational and calibrated model of the Saint John Sanitary Sewer and Storm Water collection systems. Having a sewer model of municipal infrastructure is an industry best practice as it provides numerous benefits as noted below.

- It serves as a key asset management tool, allowing staff to balance risk against service standards to identify priorities, all while using real system data.
- An important tool to identify where capital investments provide the largest return on investment (ROI), allowing for more informed prioritization of capital projects and the most effective use of public funds.
- For growth and development, the sewer model allows staff to quantify system impacts (storm and sanitary) and assess how system performance will change if a project proceeds and more importantly what key system

modifications would be necessary to allow the growth and development to proceed.

- Aids in quantifying overflows for monitoring and reporting to Regulators.
- Provides the ability to assess climate change impacts.
- Provides key information for the effective design of storm and sanitary systems.

MAINTENANCE

The City's stormwater drainage systems are on a preventative maintenance inspection and cleaning program that on average have these systems cleaned out about every 4 to 5 years. Special consideration is given to Glen Falls including that prior to every storm event, regardless of the season, City crews inspect catch basins, inlets and outlets in the Glen Falls area to ensure that they are open and functioning properly.

Components of the Glen Falls drainage basin are inspected based on a frequency either determined when these systems were installed or on best practice. The drainage ditches located behind Simpson Drive are inspected, visually, on a regular basis to determine if they require cleaning. Other ditches in the City are only cleaned out and inspected on a work order by work order basis.

The Glen Falls detention pond is on a 2 year inspection schedule. Trained engineering technologists take a representative sample, repeatable every 2 years. Elevations shots are collected and compared back to the original design drawings. Elevation shots were collected in 2017 and compared to the engineered drawing; little deviation was observed during comparisons. Additional elevation shots are planned to be collected during August or September of 2019.

The City will continue to do all it can to reduce the risk of flooding in the Glen Falls area including checking all catch basins and drainage systems prior to any weather event throughout the year; flushing stormwater pipes once every 4 years or as necessary or requested and monitor the elevation of the trenches and the detention pond on a yearly to biennial basis.

DRAINAGE BYLAW AND STORMWATER SUBMISSION

The Drainage By-law, adopted by Common Council in 2016, addresses the requirements of stormwater drainage when developing in the City of Saint John. The intention of the By-law is to:

- Safeguard the function of existing storm drainage systems;
- clearly communicate storm drainage regulations; and
- mitigate drainage effects to both public and private property.

The Drainage By-law provides for Storm Drainage Submissions to include drainage plans, grading plans, erosion & sedimentation control plans, and

engineering design reports. The submission and approval of these plans provide a means for controlling drainage while considering adjacent properties. Depending on the type of development proposed, the submission requirements may vary. Each site and development project is unique and the submission standards take into account the complexity of the project.

The City, like many other municipalities, has a Storm Drainage Design Criteria Manual to guide storm drainage designs. This Manual, adopted in 2008 and revised in 2016, supports developers, builders, engineers and staff by providing guidance and direction in the preparation of drainage solutions for submissions. In proposing developments, the manual encourages alternate design approaches.

The requirement for a storm drainage submission is typically triggered at the building permit application stage of a project. Storm drainage submissions shall achieve the following:

- Prevent loss of life and to protect structures and property from damage due to flood events;
- Not increasing the amount of stormwater entering a municipal combined sewer;
- Not increasing amount of stormwater entering a municipal storm sewer beyond its capacity (surcharge sewers/culverts/ditches);
- Not creating an adverse effect (erosion, flooding, icing on streets);
- Provide safe and convenient use of streets, lot areas and lots during and following precipitation and snow melt events;
- Preserving designate Watercourses and Wetlands.

Equally important to a competent design is ensuring the system is built in accordance with the approved design. As-built Drawings are required under the Drainage By-law to confirm storm drainage systems are constructed as designed. The Drainage By-law works for the benefit of residents and property owners of the City.

FLOOD RISK AREAS BYLAW

The Flood Risk Areas By-law applies to the development of land in one of four specific flood risk areas on the east side of Saint John, one of which is the Glen Falls Flood Risk Area.

When developing land in any of the flood risk areas, there is a requirement to ensure that compensatory storage is being created within the same flood plain. The compensatory storage must offset the volume of flood water that will be displaced as a result of the development.

This requires the services from professional engineers and land surveyors who calculate the amount of compensatory storage required for the project, as well

as a plan for how it will be created. At the end of the project, a report from the professionals confirms that the required volume of compensatory storage has been created.

The purpose of the Glen Falls Detention Pond, when it was created in 1999, was to allow for major developments in the East side shopping district by acting as an offset to accommodate the compensatory storage that was required for those projects. 94% of the pond's capacity was used up by 2007 to support those major projects; to date, the pond is at 96% capacity.

Since that time, other land owners have been able to purchase space in the pond to allow for further development, however it is only considered when there is no other viable option available to provide the required compensatory storage.

For very small projects by home owners located within the Glen Falls Flood Risk Area (such as sheds or small garages), because there are few affordable options available for providing compensatory storage, the city may allow a home owner to purchase a small volume in the pond. These requests are few in number (an average of 1-2 requests per year). For all large scale development requests, purchasing compensatory storage within the city-owned pond requires council's approval and it is only brought for consideration after staff has ensured that all other options have been exhausted. This type of request is rare (an average of 2 requests over a 10 year period) because often compensatory storage is typically managed on the development site.

CLIMATE CHANGE

Many locations throughout the City, including those that typically do not flood experienced flooding during the rain event on January 23rd. Many of these locations are not connected to the Glen Falls detention pond and drainage basin. We attribute the flooding to:

- Rare and extreme heavy rain event
- Frozen ground that reduces the ability of rain water to absorb into the ground
- Frozen natural watercourses and ditches which have affected their ability to withstand higher than usual capacities thus reducing their effectiveness
- Surcharging of the City's storm system that lasted for more than 24 hours thus indicating that the systems upstream were full and beyond their capacity. This is a consequence of the bullets above

These unfortunate conditions resulted in flooding throughout the East side including the following locations:

- McAllister Drive (@McDonald's towards Rothesay Avenue)
- Retail Drive (@Rothesay Avenue)

- Anthony's Cove Road
- Ashburn Lake Road
- Rothesay Avenue (the majority of the road)
- Hay Market Square (City Road @ Rothesay Avenue)
- Bayside Drive (@Red Head Road)
- One mile interchange (@Russell Street)

The locations listed above typically do not flood, we attribute this flooding to the factors previously listed resulting in this rare and unfortunate flooding event which experts expect to be exacerbated by climate change in the coming years.

SERVICE AND FINANCIAL OUTCOMES

The solution presented by the Terrain Group Inc. in 2009 after preliminary design and cost analysis of \$51,660,000 in 2009 which in today's dollars (2019) would be approximately \$65,000, 000 would be a significant expense to the Capital Program

INPUT FROM OTHER SERVICE AREAS AND STAKEHOLDERS

Input provided by Engineering, Transportation and Environment Services, Building Inspection Services and Infrastructure Development.

ATTACHMENTS

M&C 2011-149

ADI Limited 1999 Glen Falls Floodway Preliminary Design
Glen Falls Floodway Preliminary Design Report, February 1, 1999 – ADI Limited