Storm Water Infrastructure Capacity Expansion Option

Introduction

Many areas throughout Saskatoon experience surface flooding during severe storms. In 2014, 30 known flood sites were modelled and prioritized for flood risk based on set criteria:

- Risk of surface water reaching the property and the building
- Classification of roadway affected
- Number of properties potentially affected

The following areas were identified as the highest ranking sites based on modelling and were examined in more detail to provide high level costs for improvements:[1]

1. Ruth/Cairns
2. First Street/Dufferin Avenue
3. Cascade Street/Dufferin Avenue

Based on testing of several options for each site, a capital infrastructure solution, using local ponds and increased pipe sizes, was identified as the preferred option to minimize flooding. Flood wall installation would be considerably less expensive, but is not effective in some cases and community engagement deemed these to be less desirable than the other infrastructure-based improvements.

The cost to reduce the risk for flood water reaching within three meters of 130 houses[2] in the top three high risk areas for a "1-in-10 year" rain event was estimated to be $17.3 million in 2014, and with inflation, is estimated to be $18.9 million in 2017 or an average of $6.3 million per area, and $141,000 per property protected to within three meters.

A decision to implement capital improvements to reduce the risk of flooding should consider economic factors and non-economic factors, particularly quality of life. Once the City's direction is determined and communicated, citizens living in at-risk areas can make more informed decisions about any actions they need to take to flood-proof their properties.

[1] Ruth-Cairns had no known PDAP claims from 2010 to 2016.
[2] More detailed modelling indicates 134 properties could benefit.

Provincial Disaster Assistance Claims

Between 2005 and 2016, the Provincial Government Disaster Assistance Program (PDAP) [3] paid approximately 256 claims for non-insurable surface flooding from severe rain events valued at about $1.4 million ($2017).[4]

More detailed information available from the 2010 to 2016 PDAP surface floods claims in Saskatoon identified the following:

- About 24% (208 out of 880) of total flood claims were due to surface flooding from rainwater flowing overland (i.e. through doorways, windows, ventilation openings, permeable brickwork, etc.) The value of surface flood claims was about 22% of the total non-insurable flood claim damage in Saskatoon ($1.0M of $4.8M total). The majority of flood claims were from seepage (high groundwater as a result of a severe rain event seeping through drains or cracks in basement walls).
- Flooding occurs in areas throughout Saskatoon. The 208 claims were in 175 postal code areas.
- Most flooding is relatively localized to the low spots within neighbourhoods. Postal code areas have an average of 19 houses, but of the 175 postal code areas with surface flood claims, only four had more than three claims.
- The PDAP surface flood claims ranged in value from $500 to $23,000, and averaged about $5,500 per claim.
- Ten postal code areas had claims totalling more than $20,000.
- The postal code area with the highest total claim value was in the Central Business District (approximately $34,000). Postal codes areas in the City Park, Westview, Varsity View, Lakeview, Confederation, and Stonebridge also had claims of more than $20,000.

Of the 30 modelled flood risk zones, 17 zones had PDAP claims (53 claims totaling about $292,000 in 2010 to 2016). Claims in these 17 zones represented about 25% of all surface flood PDAP claims and about 28% of the total value of claims in 2010 to 2016. Average claim damage in flood risk zones is slighter higher than the average for all claims. Five postal code areas in the Confederation / Laurier vicinity represented about 7.5% of surface flood claims (15 claims totalling $80,000).

[3] PDAP assists eligible property owners recover from the effects of natural disasters, such as flooding, by covering loss to uninsurable, essential property (PDAP does not cover damage caused by sanitary sewer backups). PDAP contributes up to $240,000 per home towards seepage or surface flooding damage from an identifiable storm event. A deductible of 5% is payable by the property owner for principal residences. Eligibility is being reviewed because private insurance for surface flooding was introduced in 2016.

[4] Interviews with claimants indicated no surface flooding in 2005. Surface flooding in 2007 was extrapolated at 24% of claims - the percentage of surface flood claims from 2010 to 2016. There were no flood claims in 2006, 2008, 2009, 2015 or 2016. Claims were inflated at 2.5% per year to estimate 2017 current dollars.

Benefit/Cost Assessment

Benefits

The most important benefit of reducing flooding risk is the increased quality of life for residents living in risk areas by reducing the stress related to both actual and potential flooding. Any reduction in time that citizens expend in dealing with flooding and repairs is also beneficial.

The economic value of benefits from reducing surface water flooding and resulting damage is complex to estimate because assumptions must be made about when intense rain events will occur, the intensity of these storms, and the resultant damage. Each storm event's impact is different. The damage is partly dependent on elevations and the actions that citizens have taken to flood-proof their properties.

The following summarizes the best estimates of economic benefits associated with reducing flood risk in the top three high risk areas:

- Based on PDAP flood claims from 2007 to 2016, about $64,000 ($2017) in actual total surface flood damage could have been prevented in the three areas over the last 10 years (nine claims).[5]
- Modelling of a worst case scenario over 10 years for 130 properties with average flood damage of $12,200 per property estimates damage of up to $1.64 million over 10 years (26 times the amount of average actual damage of $491 per property recorded over the last 10 years).[6]
- Reducing flood risk could increase the value of properties in affected areas.

The financial benefits of making improvements to reduce flooding would mainly flow to the provincial PDAP program which has covered 95% of uninsurable surface flood damage if it continues. In 2016, private sector surface flood insurance became available in Saskatchewan, so reducing risk could also reduce costs for insurance companies. Saskatoon and other Saskatchewan municipalities are not legally liable for surface flood damages to private properties unless there is negligence.

Costs

- The cost to reduce the risk for flood water reaching within three meters of 130 houses[7] in the top three high risk areas for a 1-in-10 year rain event was estimated to be $17.3 million in 2014. Using an estimated municipal inflation rate of 3%, the cost is estimated to be $18.9 million in 2017 or an average of $6.3 million per area.[8]

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[5] Assumptions include $44,173 actual claims paid from 2010 to 2016 in the three risk areas; assumed additional claims in 2007 valued at 11.5% of 2010 to 2016 claims, inflation at 3% annually (10 years for 2007 claims and 7 years for 2010 - 2016 claims); all claims grossed up from 95% to 100%. No PDAP claims for surface flood damage in 2005 or 2006 were made. Some of the nine claims may have been for the same property which experienced more than one flooding incident over the ten years.

[6] Assumptions are based on 130 houses.

[7] More detailed modelling indicates 134 properties could benefit.

[8] Edmonton invested $384 million to reduce flooding in 64 neighbourhoods since 2004 (an average of $6.0 million per neighbourhood prior to inflation).

- The cost to reduce the risk of flooding in a 1-in-10 year rain event ranges from about $80,000 per house at Ruth-Cairns to $264,000 per house at Cascade-Dufferin.
- Increasing capacity in these areas could set a precedent for other areas. The average cost per property in areas where fewer properties are impacted is likely to be significantly more.
- Park space currently used for recreation (e.g. soccer) could be converted to a dry storm water pond, and continue to be used for recreation, although potentially at a diminished level.
- Funding the capital program will increase costs for Saskatoon citizens and businesses. Alternatively, if funding is redirected from other storm water programs such as asset preservation, the longer term costs could be significantly higher.

The economic payback period to remediate all three high risk flood areas based on modelling would be, at best, about 115 years based on worst case flood damage of $1.64 million every ten years as indicated above.[9]

If a decision is made to fund large-scale capital projects to reduce the risk of flooding in high risk areas, the first area that is recommended to be remediated is First Street/ Dufferin Avenue because of the following:

- Has experienced the highest number (five) and value ($41,000[10]) of surface flood claims (Ruth/Cairns has no documented surface flood claims over the last ten years).
- Has the shortest payback period (68 years) based on modelling for worst case flooding (Cascade/Dufferin is 173 years).
- Has the lowest overall estimated capital cost ($3.8 million versus $10.8 million for Cascade/Dufferin) which could be funded in 2018 through reallocating funding from the capital reserve, riverbank stabilization, and asset preservation.
- Has a below average cost per property protected based on modelling for worst case of flooding ($106,000 compared to $80,000 for Ruth/Cairns and $264,000 for Cascade/Dufferin).

Although solution costs have not been researched for the other at-risk areas, if the cost per area were to be a similar order of magnitude and average $6.3 million per area, the extrapolated cost for the 30 modelled at-risk areas could range up to $189 million.

[9] Economic payback period is the amount of time it would take for economic benefits (flood damage prevented) to equal the economic costs. The costs are based on capital costs only and assume no increased costs for annual maintenance.
[10] Inflated to $2017 at 3% annually and grossed up from 95% to 100%.

Neighbourhood Improvement Levy Option

Saskatoon's 1994 Local Improvement Program (Bylaw 5257 *The Local Improvement Procedure* Bylaw) allows for Neighbourhood Improvement Levies to be collected. [11] If a decision is made to expand the capacity of the storm water network in the three modelled at-risk areas, a $600 annual levy for the 134 modelled properties that would benefit from increased storm water capacity would generate $804,000 over 10 years.

The main advantage to a levy would be the additional revenue and cost sharing for new infrastructure. Some residents who are at greatest risk of flooding would likely support the levy because reduced flood risk would improve their quality of life and increase the value of their property. The City's cost of providing higher service levels for storm water infrastructure in new neighbourhoods is passed on to property owners in the form of development levies.

Other considerations include the following:

- Neighbourhood Improvement Levies require that a majority of impacted property owners support the levies.
- The cost may be considered high relative to the cost property owners incurred over the last 10 years (93% of the 134 properties incurred no damage, and others with damage could have recouped 95% of the damage from PDAP).
- Some property owners have already made significant investments to make their properties resilient to flooding, and therefore they may be opposed to contributing financially to reduce flood damage in the area.
- The cost may be considered high relative to the additional cost of surface flood insurance of about $100 per year when added to other property insurance (surface flood insurance became available in Saskatchewan in 2016.)
- The revenue generated would be less than 5% of the estimated capital cost. The cost of managing, billing and collecting the levies would be high relative to the revenue generated.
- Neighbourhood Improvement Levies have not been implemented in Saskatoon for several years. Other infrastructure improvements that primarily benefit specific areas have been funded through general revenues.
- Adding a new fixed annual cost may reduce the quality of life for some residents, particularly fixed income residents who may be required to make difficult decisions to adapt to the higher costs.

[11] Assessing Owners' Share District Storm Sewers 16) In assessing the owner's share of the cost of construction of a district storm sewer, the said rate shall be specially assessed upon: (a) the land directly abutting upon the work; (b) the land not abutting directly on the work but deemed by Council to be benefitted thereby.