

FLOOD CONTROL RELIEF REMEDIATION PLAN

BACKGROUND

Madison has sustained several significant rain events over the last few years. The recent storm of August 20, 2018 was historic for areas on the far west side of Madison, Middleton and Cross Plains.

As a result of extreme rainfall events, large numbers of damage calls are generated from specific areas. Some of the areas generating these calls represent known problems and others are newly discovered problems.

The August 20th storm was unique in that in addition to generating many direct calls as a result of the storm the City was very shortly in the midst of a historic lake flooding event.

DEFINITIONS

Private Storm Water – this represents stormwater runoff that has been generated on private land, and draining from one private property onto another before ultimately entering the Public Right of Way or storm sewer system.

Public Storm Water – this represents stormwater runoff that has come from both public and private properties and is contained within the Public Right of Way or public drainage ways. 100-year storm Event – is a flood event that has a 1% probability of occurring in any given year. The 100-year flood is also referred to as the 1% flood, since its annual exceedance probability is 1%.

Atlas 14 - NOAA Atlas 14 contains precipitation frequency estimates for the United States and U.S. affiliated territories with associated 90% confidence intervals and supplementary information on temporal distribution of annual maximal, analysis of seasonality and trends in annual maximum series data, etc. It includes pertinent information on development methodologies and intermediate results. The results are published through the Precipitation Frequency Data Server (<http://hdsc.nws.noaa.gov/hdsc/pfds>). The Atlas is divided into volumes based on geographic sections of the country. The Atlas is intended as the U.S. Government source of precipitation frequency estimates and associated information for the United States and U.S. affiliated territories.

Impacted Property – a property that has sustained structural damage as a result of the entry of public water into the building or structure.

Structural Damage – damage sustained by a property that includes damage to the structure (drywall, framing, windows ...) or its internal contents (furnace, water heater, private possessions...).

Watershed Assessment – is a localized study that reviews the drainage properties of the site or area in question on a limited basis. A hydrologic and hydraulic assessment is completed but it is for only the area in question not a larger watershed.

Watershed Management Plan – is a study that takes into account not just the local problem but the larger watershed that that area in question is a part of and how changes to one area affect the other areas in the watershed. A hydrologic and hydraulic analysis is completed and will include proposed improvements for the watershed and is at a much more detailed level than would be completed as part of an assessment process.

100 Year Storm – The storm event that statistically has a 1-percent chance of occurring in any given **year**. The amount and duration of these events shall be in accord with the most current information provided from the National Oceanic and Atmospheric Administration (currently ATLAS 14).

It should be noted that for the Madison area the current 100 year event is 6.66 inches in 24 hours, but there are many other combinations of time and amount that are also “100-year storms”. In fact for Madison and most urban areas, it is not the 24 hour rain that causes most flooding but rather a smaller amount of rain in a shorter period of time, for example 4.36 inches in 3 hours which is also a 100-year event.

HISTORIC DESIGN STANDARDS

Storm design and the standards used for that design have changed over the years. A brief history of design follows: pre-1960, only very large pipes were sized using rigorous engineering methods while smaller pipes were sized using rules of thumb and often only shown in the plan view on plan sets and final design was completed by construction staff.

From the 1970’s to early 1980’s most pipes were designed using what is now considered basic hydrologic and hydraulic engineering techniques however NO DETENTION or water quality was considered.

Pipe sizing criteria from approximately the 1970’s to the current time has been pipes leading to a culvert road crossing are sized to convey the 10-year design storm.

Culverts at channel or greenway crossings have been designed for the 10-year design storm up to about 2011 when that design standard was increased to the 25-year design event.

Standards for the sizing of pipes/inlets serving enclosed depressions did not exist until the mid-2000’s when a standard of the 25-year storm event was set. In 2016 that standard was raised to the 100-year design storm.

1983 marked the first year that stormwater detention (rate control) was required by the City of Madison and design standards were such that the 10-year storm event was the design storm to be controlled. Smaller events passed through detention basins largely un-detained and storms exceeding the 10-year event overflowed the basins but the location of that overflow was not “rigorously” designed.

1993 – 2001 detention standards were revised to include water quality standards and overflow was more rigorously reviewed to assure that the overflow took place on public property but it was not “routed” or modeled to determine approximate elevations of the water. 2004 marked the first year that stormwater control of any type was required at a state level. Infiltration standards were also brought on line at that time.

2009, marked the requirement in City code for new development to meet 100-year detention standards citywide.

As a result of varying design standards over the years, available solutions to drainage problems can be limited and expensive especially in the case of retrofits to the existing infrastructure.

FIXING VS MOVING THE PROBLEM

The August 20th event impacted the far west side of the City particularly hard and highlighted some serious systematic problems that require a larger perspective to resolve in a responsible manner.

For example:

The Greentree Greenway system on the far southwest side of Madison had approximately five (5) road over-toppings associated with the Aug 20th storm event. As we proceed to reduce the frequency of these road overtopping locations we need to be very careful that improving one road crossing does not simply make the next downstream crossing worse in terms of overtopping.

POLICY CONSIDERATIONS

Engineering recently completed a Racial Equity Social Justice (RESJ) analysis to help determine an improved method to work on flood mitigation programs. Recommendations of the RESJ process include:

- 1) enhanced engagement
- 2) education for property owners, builders and developers
- 3) targeting flood prone areas for land acquisition
- 4) investigating the possibility of a reduced rate loan program for use where the problem does not involve public water but rather would be responded to under the policy for resolving private drainage problems and could require the response of only the property owner with no City involvement other than guidance
- 5) enhanced data collection
- 6) placing elevation restrictions on new and developing properties
- 7) for new development ensuring that the roadway system functions as a safe overflow for the 100-year storm event and that the design of major greenway systems accommodate the 500-year event

Many of these practices are already being followed (2, 5, 6, & 7). It is our intent to utilize these recommendations along with the below process to proceed to prioritize projects.

CURRENT ACTIONS:

Recognizing that each storm, each watershed, each public storm sewer, and even each private property presents its own unique problem, in response to recent flooding Engineering has been proceeding as follows:

1) SHORT-TERM ACTIONS:

- a. Data collection – Engineering continues to take reports of drainage problems and property damaged by flooding as a result of both the August 20th event and the resulting lake flooding. These problems are logged to the database of drainage problems that have been collected for a number of years.

- b. Immediate response to public safety concerns (either barricading off damaged or hazardous areas or repairs such as pavement patching to get the area functional in the short term) noting that long term repairs and upgrades will be needed in the future.
- c. If the area is barricaded off and short term repairs are beyond the capability of Engineering' staff, a contract or Purchase Order (PO) will be issued to a contractor to make immediate repairs to the area via the Public Works Emergency that has been declared.
- d. If the problem reported is not deemed to be a public safety concern but has resulted in flooding of private property or damage to public property that is not critical, the problem is added to our list of repairs that will be prioritized for action in accord with the priorities below.
- e. If the problem that is reported is related to an adjacent property and not caused by public water, meaning water from the street or public drainage system, the resident or owner that is reporting the issue will be advised that the City can only intervene in accord with our policy for resolving private drainage problems (**here**)

2) MID-TERM TERM ACTION:

- a. Outreach – in accord with the RESJ process, Engineering will work with other agencies to reach out to the community to request reporting of additional problem areas. Once outreach is completed and Engineering has what it believes to be a comprehensive list of flooding problems, each problem will be reviewed and prioritized for action based on the following criteria:
 - i. Amount of public and private property damage potentially avoided compared to the cost of potential public project to meet the design standard. Priority shall be given to projects with a higher multiplier of benefits.
 - ii. Public safety concern (flooding of arterial routes needed for emergency response). Priority shall be given to projects that have a positive impact on emergency response routes.
 - iii. Is the damage being experienced during the design event or is it related to the extreme event experienced on Aug 20th 2018. Priority shall be given to projects that resolve flooding impacts at lower recurrence interval events and properties that have flooded multiple times.
 - iv. Can the problem be resolved independent of other downstream negative impacts? Priority shall be given to projects that can be resolved independent of other downstream actions or that include improvements that mitigate downstream impacts.
 - v. Is the problem a result of an action taken by the property owner of their own volition? Priority shall be given to projects that solve problems that are not a direct result of a property owners direct actions.
 - vi. Proximity of the problem site to currently planned projects. Priority shall be given to projects that can be incorporated with work that is already programmed.
 - vii. Priority shall be given to properties that are within a Neighborhood Resource Team area.

- b. Continued work on the Emergency Preparedness Plan that would be directly related to the types of historical flooding we have been seeing on the Isthmus. The goal is to continue working on the plan and complete it within the next year. This plan will include archiving the knowledge we have gained from the 2018 flood and planning that will be useful for the City in responding to other natural disasters. For example: a debris management plan that will be incorporated in this plan is useful for floods or tornados.
- c. Create a cohesive system to report flooding. Police, Fire, Engineering, and Streets Division all accept and respond to calls independently. Data is shared but the format of data collection is not uniform. Engineering will involve Information Technology (IT) to create a repository for calls and complaints on flooding and as previously noted will work on an outreach plan to better gather information in a more proactive way. A report and map shall be maintained documenting progress and an update shall be provided to the Board of Public works on an annual basis.
- d. Residents/Owners who are providing a notice of the flooding problem shall be directed to self-report via a City of Madison website where data and information can be collected and used by multiple agencies. Residents/Owners shall be notified of our expected timeline as repairs or further studies are scheduled and kept up to date on progress via a web page dedicated to this purpose with an available email sign up.

3) LONG-TERM FLOOD MITIGATION ACTIONS

The remainder of this plan documents the solutions that will be considered, and what standards shall be used to complete that analysis. It should be noted that this plan is aimed at the repair/upgrade of public infrastructure to resolve problems created by public water on private property. The City is not able to intervene in private drainage disputes. In the case where private water is impacting another private property, Engineering staff may provide recommendations and if needed proceed in accord with the plan for resolving private drainage problems **(here)**.

In reviewing potential resolutions to existing drainage problems it is important to recognize that not all improvements can or will be designed to protect properties to the 100-year storm event. This is especially true in areas that are being retrofitted or that are limited by existing older private infrastructure.

GOAL - Engineering's goal is to be able to protect private property in events up to and including the 100-year design storm event. We recognize that many parts of the City were developed without modern design standards. As a result, this goal may not be achievable in all situations. Priority shall be given to projects that upgrade areas which flood during the lowest recurrence interval storms. In those cases, a minimum design standard of increasing these areas to allow protection during the 10-year design storm shall be pursued.

To allow Engineering and the public to comprehensively review possible solutions and provide guidance on improvements as watershed assessment and/or a full watershed management plan will be drafted. Depending on the size and scope, Watershed management plans may be prioritized and budgeted through the Capital Budget process.

PROPOSED MITIGATION APPROACHES

Once problems have been prioritized, using the criteria in Mid-term Actions described above, Engineering shall review potential solutions. Potential solutions shall include the following options, reviewed in the priority order below: (Note: this assumes that the problem is related to water in a public right of way, greenway or public easement that is flowing onto a private property and causing structural damage.)

- 1) Can an improvement in pipe or inlet capacity be made that will rectify the problem? Is it possible to make this improvement without causing additional damaging flood problems downstream? Will this solution protect the impacted properties in events up to and including the 100 Year Storm? If it is too costly to safely pass the 100 Year Storm, what storm event will this improvement protect the impacted properties to and what is the difference in cost? If not...
- 2) Is there a problem with the system overflow such that when the street is overtopped or the pipe system reaches capacity, the excess flow leaves publicly owned lands and damages private property? If so can a physical change be made in the street/channel such that the overland flow can be rerouted to resolve this problem? Will this solution protect the impacted properties in events up to and including the 100 Year Storm? If it is too costly to safely pass the 100 Year Storm, what storm event will this improvement protect the impacted properties to and what is the difference in cost? If not...
- 3) Is there a means to increase storage/detention upstream of the problem area that can be implemented to decrease flows in the impacted area? Is there a means to increase storage downstream to temper the increased flows from upstream improvements? Can this project be completed without causing new/additional flooding problems in the areas where the storage is to occur? Will this solution protect the impacted properties in events up to and including the 100 Year Storm? If it is too costly to safely pass the 100 Year Storm, what storm event will this improvement protect the impacted properties to and what is the difference in cost? If not...
- 4) Is there a solution on private property that would not significantly adversely impact the property owner that could be made at low cost? Will this solution protect the impacted properties in events up to and including the 100 Year Storm? If it is too costly to safely pass the 100 Year Storm, what storm event will this improvement protect the impacted properties to and what is the difference in cost? If not...
- 5) Is there a major change that can be made to private property that would resolve the problem but would negatively impact the homeowner? Examples of this could include but are not limited to: Closing off exposed windows/doors, reconstruction of full exposures from wood frame to concrete walls, construction of berms, retaining walls and flood walls on private property. Will this solution protect the impacted properties in events up to and including the 100 Year Storm? If it is too costly to safely pass the 100 Year Storm, what storm event will this improvement protect the impacted properties to and what is the difference in cost?

FUNDING

Project funding shall be requested with each budget cycle.