APPENDIX
PRIORITIZATION TOOLS

STORMWATER MANAGEMENT PROGRAM MASTER PLAN

Contents

Prioritization Tools

Optimizing efficiency and effectiveness with limited resources and a wide range of competing needs can only be achieved by a solid understanding of relative priorities. The SWMP's prioritization framework has been developed from a focused review/assessment of the available stormwater datasets (past planning, inventories, tools, experiences/lessons learned). Based on the available data, the stormwater program has invested, and continues to invest, significant effort and resources to prioritize the most efficient and effective projects and initiatives to meet the goals of the City, the mission of the SWMP, and the needs of the community. Several tools have been developed since the program was created to guide the prioritization of stormwater resources. These prioritization tools will be leveraged to inform future resources allocations and heavy emphasis will continue to be made on refining and appropriately applying these tools. The primary prioritization tools developed to date are:

1. Capital Project Prioritization
2. Citywide Areas of Potential High Water
3. Repetitive Loss Area Analysis
4. Drainage Area Prioritization
5. Citywide Erosion Hazard Potential
6. Maintenance Project Prioritization
7. Criticality of Stormwater Infrastructure
8. Stream Crossing Inventory
9. Citywide Pipe Capacity
10. Documented Flooding Incidents Data Set

Each of these tools is currently being utilized, as applicable, to optimize resource utilization for each of the SWMP program elements: Maintain, Mitigate, Warn, and Oversee Development. The application of the tools to each of the program elements is described further in the following sections.

1. Capital Project Prioritization

The SWMP has developed a project prioritization system to support decision making for CIP planning. The system provides scores and rankings as an objective basis for determining the relative merit of projects. Prioritization criteria and weights were selected in alignment with the mission and objectives of the Stormwater division, as well as broader City guidelines. Scoring system rules and inputs were developed to support an objective evaluation of benefits as well as flexibility to accommodate changing inputs. The inputs include risk-based metrics that help focus results on projects which address the most chronic flooding issues. A database was developed to implement the prioritization system and organize project information. A variety of database functions, forms, and reports support both day-to-day and long-term decision-making

| Project Prioritization Criteria	Metrics
Regulatory/Risk	Reduction in flood risk at structures
Capital Replacement	Criticality
Efficiency/Sustainability	Cost efficiency (modified score-to-cost ratio)
Safest City	Reduction in road hazard
Citizen/Customer Satisfaction	Support/opposition or drainage issues

The high priority potential projects identified by the tool are then considered for implementation and used by the SWMP to proactively seek opportunities for grants and partnerships based on the potential project type and benefits.

The image below shows a screenshot of the Project Prioritization Data Entry Form for Channel Improvements and Culvert Replacements along Wildcat Branch.

2. Citywide Areas of Potential High Water:

The Areas of Potential High Water dataset is a floodplain mapping tool that was developed using approximate methods. It serves as a strategic, planning level indication of the potential flooding problems facing the City. It is used to help identify problem areas where more detailed studies and models might be warranted, and provides a proactive approach for master planning efforts. The FEMA floodplain maps remain the best available data for riverine flooding, and City watershed planning reports provide more detailed mapping for local (non-FEMA) floodplain data. Nevertheless, for evaluating flood risk due to undersized storm drains, the Areas of Potential High Water is a powerful planning tool, which provides a comprehensive understanding of potential neighborhood flooding throughout the City.
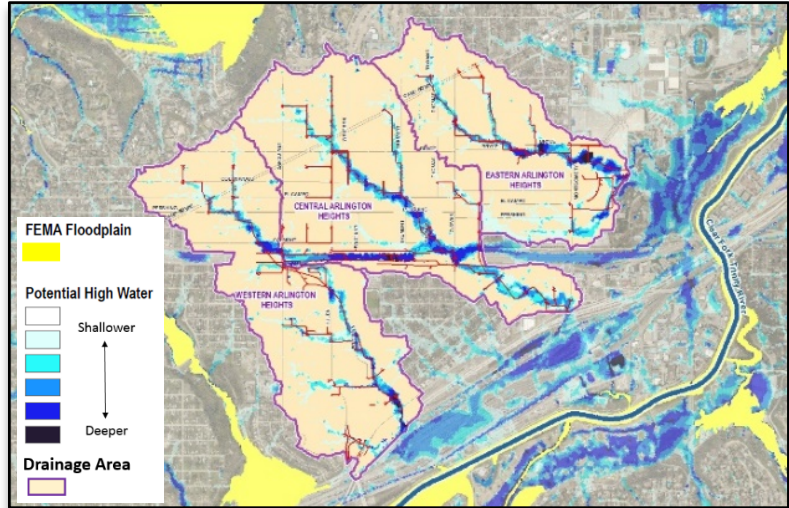
The image to the right shows the Areas of Potential High Water in the Arlington Heights area.

3. Repetitive Loss Area Analysis

In 2016, the City initiated a Repetitive Loss Area Analysis, or RLAA, to quantify the Repetitive Loss Properties (RLP's) and Severe Repetitive Loss (SRL) properties across the city, and to determine the causes of the flooding experienced at these locations. Repetitive loss data is particularly valuable because it is based upon known flood events, monetizes the damage at individual properties, and the data is maintained by the NFIP for decades.

RLP's are those that have made two or more flood insurance claims, within any rolling ten-year period since 1978, where more than $1,000 per claim was paid by the NFIP. If a property files 4 or more claims for $5,000 or more per claim, totaling $20,000 or more, or files two claims for a total that exceed the value of the property, the property is classified as a SRL property.

FEMA provided a list of 46 RLP's that were known at that time, and these properties were grouped into 38 areas where the cause of flooding was likely to affect other nearby properties. These 38 areas comprise the Repetitive Loss Areas (RLA's) studied in the RLAA. The results of the analysis found that 8 of the RLA's have been mitigated by previous capital improvement projects with no additional mitigation measures required. Only 7 of the 38 RLA's experience riverine flooding, indicating inadequate storm drain capacity or individual lot grading problems outside mapped floodplain areas for the remainder of the areas. Preliminary flooding causes and mitigation measures identified in the RLAA will be used to guide future capital improvement projects and mitigation grant applications.

 The figure below shows an example of a RLA (outlined in pink) in the TCU area. The area in blue represents the local floodplain.
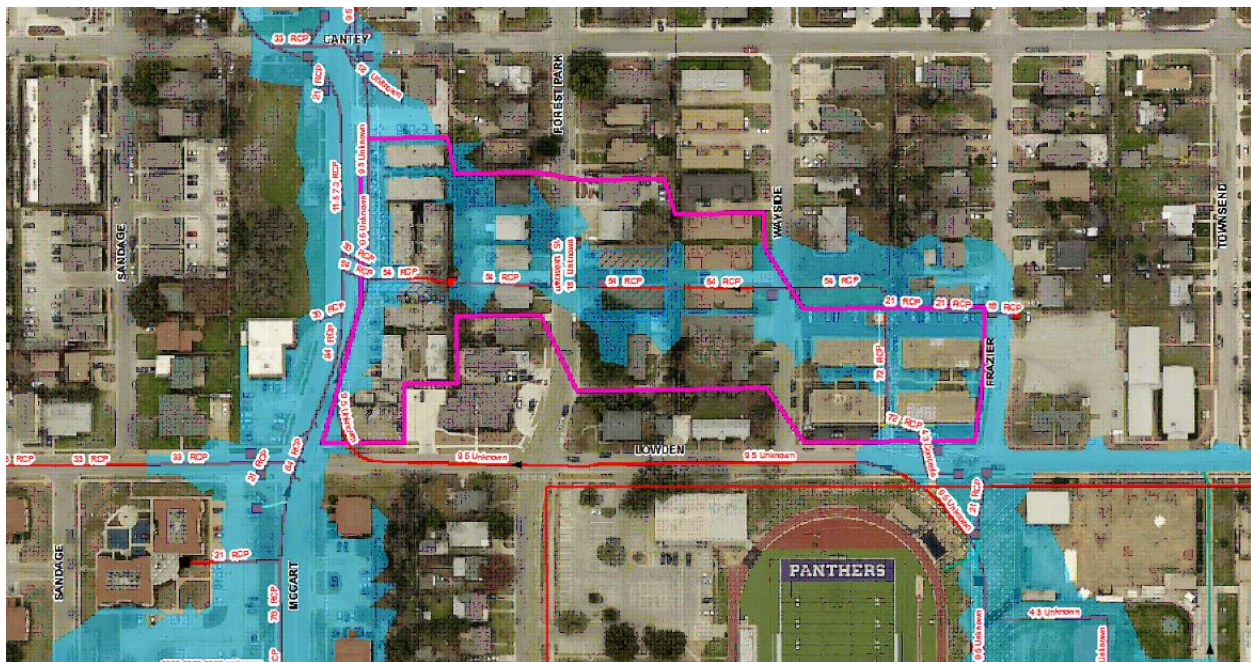
4. Drainage Area Prioritization

The City of Fort Worth has been divided into roughly 300 small drainage areas, also known as mapsheds. Mapshed rankings were developed as part of a high-level, GIS-based analysis to assist in the prioritization of future drainage planning efforts to help prioritize and rank the need for additional stormwater planning investigations and maintenance programs. The scoring system to prioritize drainage areas was developed according to the goals of the SWMP in alignment with boarder City prioritization criteria. Five mapshed prioritization criteria were implemented in the mapshed prioritization system and the input metrics were developed using City GIS layers. GIS based metrics were identified to prioritize drainage areas.
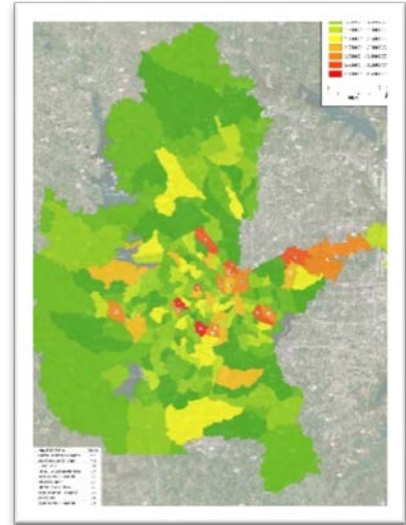
Mapshed Prioritization Criteria	GIS-based Metrics
Regulatory/Risk	Structures at risk of flooding from area of potential high water layer or FEMA floodplain; repetitive loss areas
Capacity	Pipe grades
Capital Replacement	Criticality
Safest City	Low water crossings; high water rescues; fatalities
Citizen/Customer Satisfaction	Storm event incidents; reported drainage issues

The mapshed rankings provide an objective basis for comparing the magnitude of drainage issues between mapsheds. The higher priority drainage areas are shown in darker colors in the image on the right. The prioritization process, which can be updated over time as needs and opportunities change, will help guide the City in prioritizing available and future resources. However, in the decision-making process for prioritizing planning efforts, it is important to consider additional factors which were not included in the spatial analysis.

5. Citywide Erosion Hazard Potential

This high level planning tool can be used to assess the erosion hazard potential of the landscape, including erosion prone streams and channels across the City. This tool can help provide guidance on erosion risk for existing properties as well as future development or redevelopment. It can also assist the City assess erosion risk to public infrastructure and prioritize erosion mitigation projects.

This data set could be used as a starting point in the future to evaluate potential channel buffer zones and open/natural area preservation areas. The image below shows erosion hazard potential in the Cottonwood Creek area.
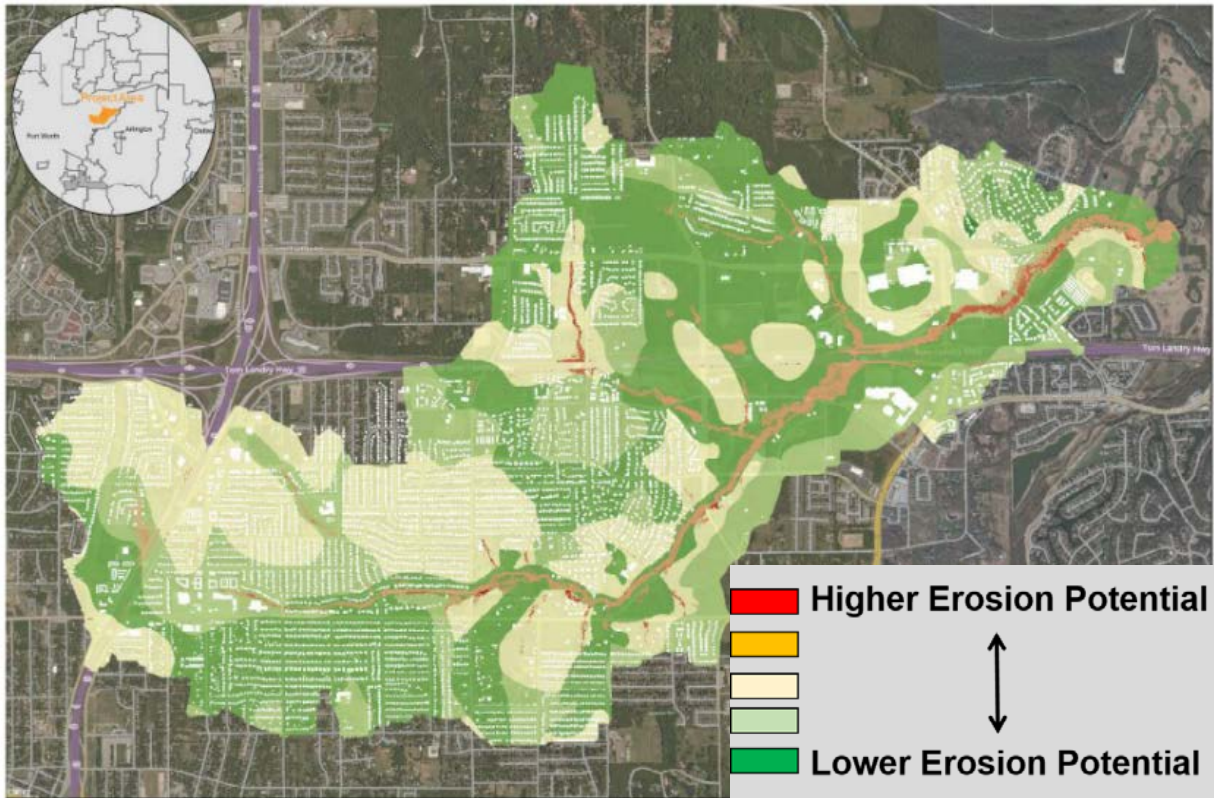
6. Maintenance Project Prioritization

The Fiscal Year 2017 annual budget for the maintenance of the City's drainage system is approximately $8.4 Million, or about 22% of the annual Stormwater budget. Of this, approximately $625,000 is dedicated to channel maintenance. Channel maintenance projects are prioritized based on assessment factors that consider: sedimentation, erosion, vegetation, property damage, channel type, and location. Through this channel condition evaluation process, the Stormwater Program is able to prioritize maintenance resources to the areas and assets of greatest need throughout the City.

TPW STORMWATER CHANNEL RATING FORM

Channel Name: Whites Branch
Channel ID: CH004000
Address: 9205 GENERAL WORTH DR
Child Records: WO-1711-0244 (RE VM WO)

Date: 11/13/2017
Inspected By: Karla Morales
Record ID: WO-1711-0241

FORT WORTH®

CATEGORY	SCORING LOW 1 2 3 4 5 HIGH
SEDIMENTATION	
Sedimentation condition	2
Sediment movement	3
Blockage/Clogging	1
Trash/Debris	2
Channel Obstructed	
Small Accumulation	✓
EROSION	
Erosion Bank & Channel Stability	2
Bank Cutting	2
VEGETATION	
Vegetation condition	2
Vegetative Bank protection	1
PROPERTY DAMAGE	
Flooding roads	1
Flooding of Private structures	1
Utility Asset Damage	1
Structural Components (Channel concrete condition)	1
Scoring Total	19

Channel Type	
Earthen Maintained 1.1	✓
Concrete 1.25	
Earthen Unmaintained 1.6	

Location (adjacent property)	
Undeveloped 0.5	
Serivce Road 1.25	
Commercial 1.5	
Residential 2.0	✓

In Floodplain:

Citizen Related: ✓

Notes:

Downstream of channel at General Worth infall, some minor sedimentation, no MBC blocking. There is erosion and scour about 30 feet from infall. The 24" rcp headwall outfall structure is surrounded by loose debris bricks and tree twigs. There is also a short length of high grass and a willow tree at flow line.

Recommendation:

Request by citizen/Cannon and PACS for FO's assistance on channel outfalls. Recommend removing the minor sediment from the 24" rcp headwall. mow high grass and remove the willow tree growing in the flow line. See location map and pics for location.

Total Score: 41.8

Formula:
Scoring Total*Channel Type*Location=Total Score

Priority Level Scale	
> 50	High Priority Work Order
>30 and <50	Low Priority Work Order
>28 and <30	Reactive Maintenance
<27	Routine Maintenance

Condition Rating Scale
0 = N/A
1 = Good
2 = Okay
3 = Fair/Degrading Condition
4 = Poor/In need of Attention
5 = Failure/Worst Condition

7. Criticality of Stormwater Infrastructure

The SWMP has developed a high level criticality assessment of several types of stormwater infrastructure assets: pipes, inlets, outfalls, and infalls. Each asset was assessed from the aspect of Probability of Failure (likelihood that failure will occur) and Consequence of Failure (impacts if failure does occur). Factors such as age, size, estimated capacity, operating environment, material type, and proximity to roadways and structures were used to evaluate the probability and consequence of failure. The result is a criticality (Business Risk Exposure) score for each asset. This criticality assessment enables the program to assess and manage the risks each asset present to the organization. The findings are used to prioritize maintenance work, rehabilitation needs, and capital projects to promote the efficient use of resources and budget. The criticality assessment continues to be refined as more and better information becomes available.
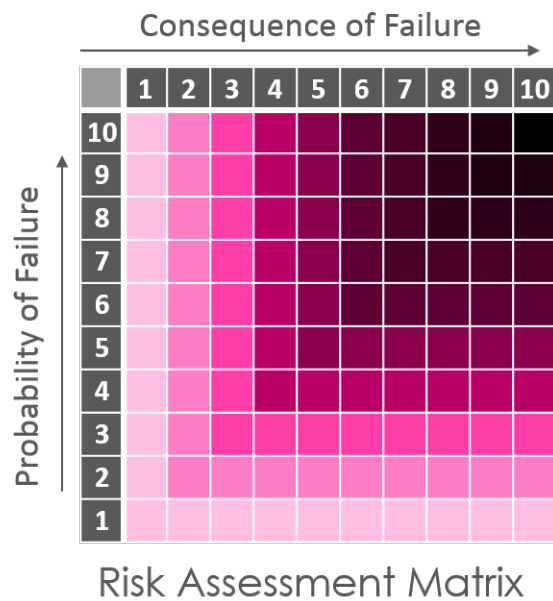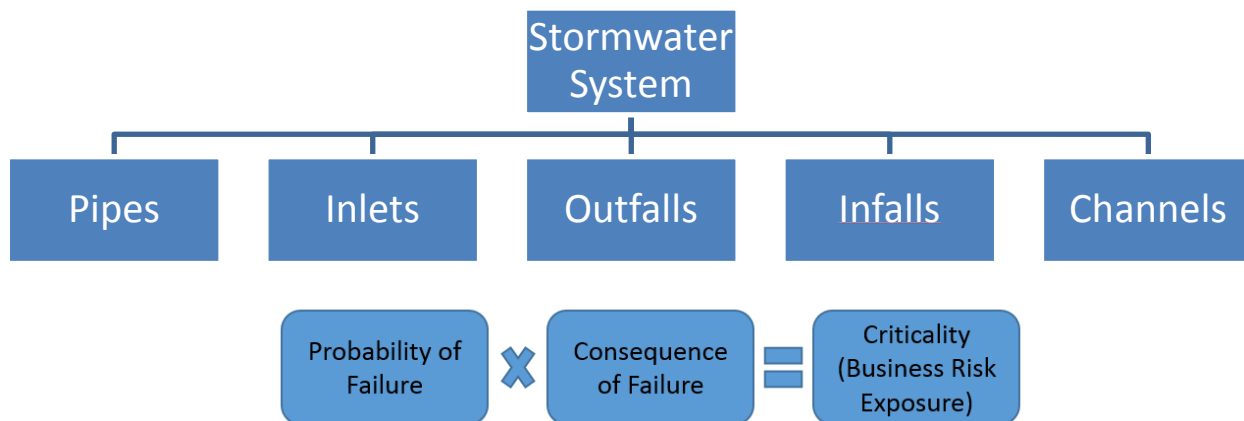
8. Stream Crossing Inventory

Nearly 300 low-water street crossings in the City were inventoried and rated for flood hazard based on depth of flooding, frequency of overtopping, traffic volume, past fatalities at the crossing, high water rescues, flooding complaints, concealment of the hazard, conditions downstream of the crossing, and detour length. The ratings were ranked in a database, and 52 of the highest ranked crossings were selected for installation of road side flashers, which alert drivers to rising flood waters. These ratings area also utilized to help inform capital project prioritizations. This inventory continues to assist with the prioritization of sites for high water warning and capital project mitigation considerations. If a low-water street crossing is no longer a flood threat due to a capital project improvement, the flashers from that crossing are moved to next highest priority hazardous low-water crossing.

9. Citywide Pipe Capacity

A GIS-based tool was developed to evaluate every pipe in the City's storm drain system on a high level, City-wide scale. Each storm drain was evaluated based on its size and ground slope to estimate individual capacity in comparison to the amount of drainage area being routed through the pipe. The results were then evaluated based on the estimated capacity needed for the 100-year storm to be conveyed by them and graded from A (good) to F (very poor) resulting in a pipe capacity / grades GIS layer. The findings, in conjunction with other prioritization tools such as the areas of potential high water and documented flooding incidents, are helpful to further understanding the flooding problems in the City. They also help with prioritizing maintenance, rehabilitation, and capital project needs.

10. Documented Flooding Incidents Data Set

Since 2009, the SWMP has been tracking flood incidents using GIS. Prior to this time, incidents were documented in paper files. Each incident is categorized as rescue, structure flooding, car stalled, road overtop, or other. Easily available findings about each incident are documented using information pulled from police and fire reports, photos, and emailed documentation from residents. Depending on the incident, rain event, and available resources, key incidents are investigated in more detail by further coordination with residents and/or site visits to help verify the information. Flood incident information is used to identify areas where maintenance investigations may be needed, such as where a storm drain line may need to be inspected to determine if the line is clogged. The information also helps determine where future planning may be needed to ascertain if a capital project to mitigate the flooding is warranted. The image below shows an overview of documented flooding incidents, FEMA floodplain, and the areas of potential high water in a portion of Council District 9.