



Storm & Sanitary Sewer Study City Staff Recommendations

October 29, 2018

OHM/HRC Consultant's:



- In October 2017, the Joint Venture team of Orchard, Hiltz & McCliment (OHM) and Hubbell, Roth & Clark (HRC) were hired to evaluate the City's stormwater and wastewater collection systems.

Consultant's Recommendations:



- Included a combined long-range storm and sanitary sewer Capital Improvement Plan totaling \$118 million, comprised of:
 - \$30 million, Priority 1 Storm Sewer Improvements
 - \$50 million, Priority 2 Storm Sewer Improvements
 - Up to \$38 million, Sanitary Sewer Improvements

Consultant's Recommendations for Storm Sewer:



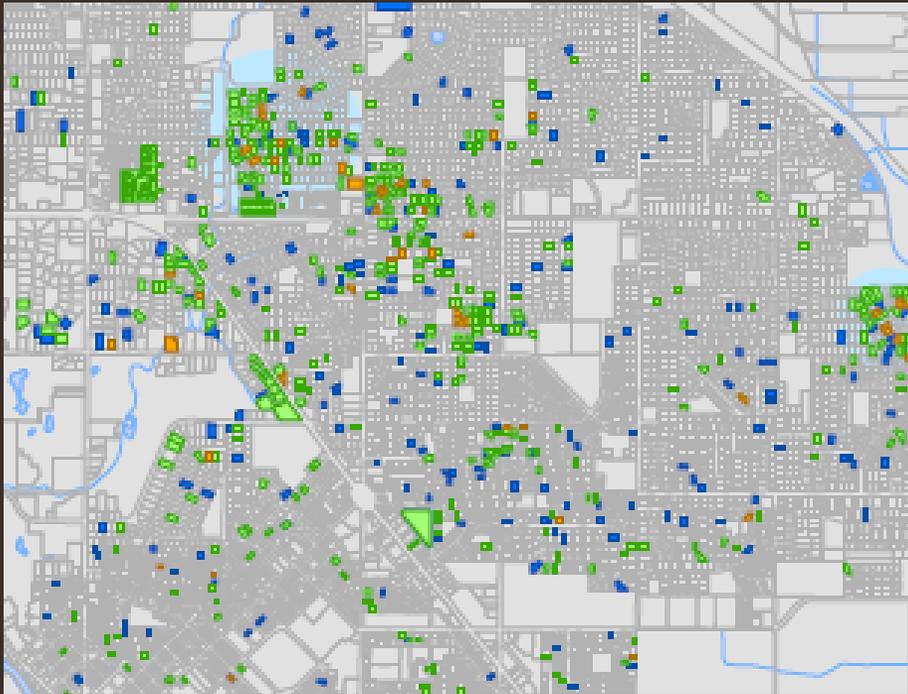
- Over 50 individual sewer segments
- Four culvert replacements
- 15 offline stormwater detention storage areas
- An initial allowance for high priority sewer inspection, cleaning, and emergency repairs
- To be implemented over many years

Consultant's Priority Projects for Storm Sewer:



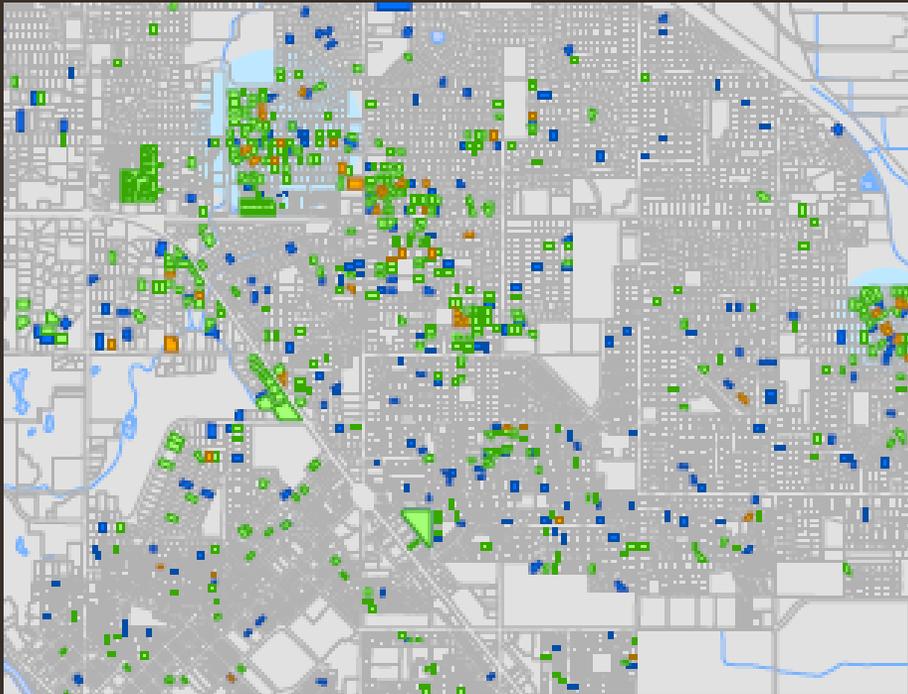
- Priority 1 Projects – are defined as those that will have the most significant impact on reducing flood potential in the City
- Priority 2 - are either projects that only marginally fail the current desired Level of Service or they depend on Priority 1 (downstream) projects to be implemented first before they are feasible projects.

Consultant's Recommendations for Sanitary Sewer:



- Footing drain disconnections to remove rainwater dependent inflow sources from the sewer system
- Enlargement of the Sewer system to convey peak flows without causing sanitary sewer overflows
- Pump station upgrades to increase flow capacity and operational reliability
- Wet weather storage tanks to control peak flows
- Inflow/infiltration source removal to reduce wet weather peak flows

Consultant's Priority Projects for Sanitary Sewer:



- Priority 1 Projects – where basement flooding was reported and the model predicted surcharging
- Priority 2 Projects - are in areas where limited basement flooding occurred during the June 2017 event, but which the model showed significant risk of basement flooding during a severe rain event
- The Priority 2 areas should be reviewed in the future and considered for potential improvements following completion of the Priority 1 improvements.
- Also included Phase 2 Investigation for those areas where the model did not support the reported basement flooding and therefore, further investigation is recommended.

Priority 1 and 2 Projects Generally:

Legend

-  Priority 1 Sanitary Sewer CIP
-  Priority 2 Sanitary Sewer CIP
-  Phase 2 Future Sanitary Sewer Study/Investigation Area
-  Sanitary Sewer Pump Station
-  **WWTP** Treatment Plant
-  Flood Sanitary Problem
-  Flooded Parcels Flooded Parcels (Moderate to Severe)
-  Tax Parcels
-  Waterbody
-  Waterline
-  Priority 1 Storm Sewer CIP
-  Priority 2 Storm Sewer CIP

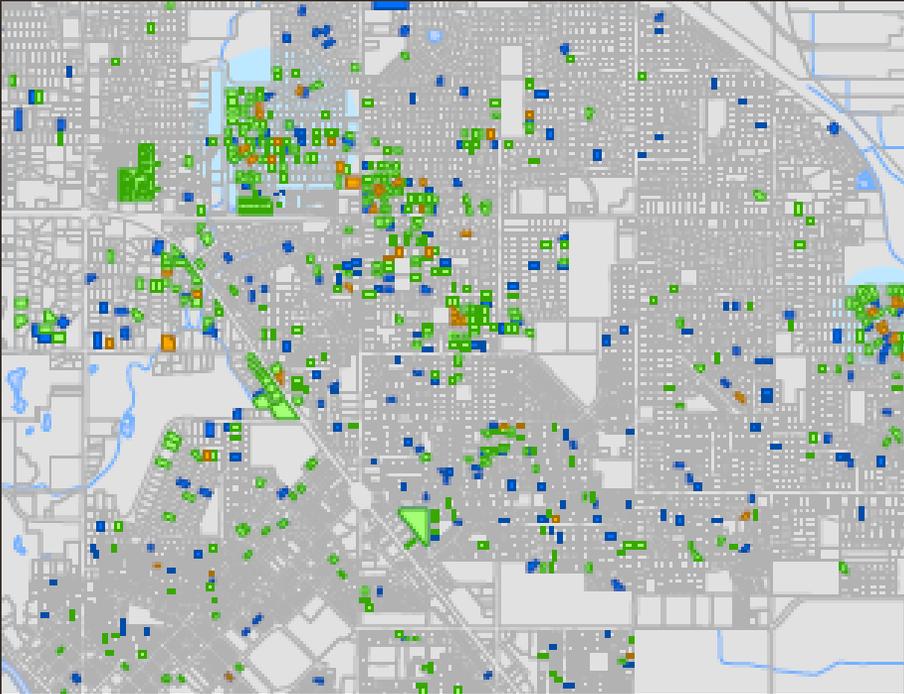
- Were derived from a system-wide analysis of storm sewers, ditches, channels, detention ponds, bridges, culverts, sanitary sewers, and pump stations
- The analysis was completed with the help of resident provided data, public input collected during and after the June 2017 event, and aerial photos and videos of the event
- All of which allowed the project team to focus its efforts on known problem areas

***Storm Sewer
Projects
Recommended by
Consultants:***



- Focused on improvements sized to a 10-year rain event LOS
- Emphasis on enlargement of storm pipes and some roadway culverts to convey peak flows without excessive flooding
- Detention ponds to store wet weather flows to limit peak flow impacts downstream

Sanitary Sewer Projects Recommended by Consultants:



- Focused on improvements sized to a 25-year rain event LOS
- Emphasis on the collections system, not the Waste Water Treatment Plant
- Inflow/infiltration source removal to reduce wet weather peak flows
- Footing Drain Disconnection to remove inflow from the sanitary sewer system
- System enlargement and pump station upgrades to convey peak flows without sanitary sewer overflows

Considerations in Determining Staff Recommendations

- Michigan Department of Environmental Quality Sanitary Sewer Overflow Policy
- OHM/HRC Storm and Sanitary Sewer Report
- Observed conditions versus computerized modeling
- Impact of storm sewer improvements on receiving waters
- Impact of sanitary sewer improvements on the WWTP and storm sewer system
- Current staffing, Resources, and Funding Levels
- Overall financial impact to the community
- Public feedback



Staff Recommendations

Storm Sewer System

- Staff recommendations will begin with the OHM/HRC recommended Early Action Items for Stormwater prior to any new pipes or storage mechanisms being initiated.

Staff Recommendations

Storm Sewer System

- Sturgeon Creek Maintenance
 - Initiate discussions with property owners on options to address Creek debris removal between W Wackerly St and N Saginaw Rd
 - Jurisdiction of the Sturgeon Creek lies with both private and City ownership
 - Survey bridges and culverts along the Creek to verify hydraulic opening area and identify existing hydraulic capacities
 - Staff concurs with OHM/HRC that improvements to storm sewers discharging to the Sturgeon Creek should not occur until the channel (including bridges/culverts) has been cleared of debris and downstream restrictions.

Staff Recommendations

Storm Sewer System

- Snake Creek Culverts
 - Begin preliminary engineering on four Snake Creek culverts identified for proper sizing and possible replacement:
 - Snake Creek at N Saginaw Road
 - Snake Creek south of Castle Dr
 - Snake Creek at W Wheeler Rd
 - Snake Creek at Sylvan Lane
 - Appropriately size the culverts before storm sewer improvements impacting the Snake Creek watershed are undertaken.

Staff Recommendations

Storm Sewer System

- ...Snake Creek Culverts

Replacing these culverts will lower the flood profile along the Snake Creek , improving the tail water conditions for multiple connecting storm sewers, and should provide adequate conveyance without exacerbating flooding downstream

- Appropriately size the culverts before storm sewer improvements impacting the Snake Creek watershed are undertaken

Staff Recommendations

Storm Sewer System

- Jacobs Drain
 - Inspect and assess the condition of the Jacobs Drain enclosure (County Fairgrounds) and confirm whether a blockage exists
 - If a blockage exists, it will be removed
 - If it is determined that the condition of the drain is a cause of concern, the replacement or rehabilitation of the drain will then be incorporated in the City's long-range capital plan

Staff Recommendations

Storm Sewer System

- Storm Sewer Inspections
 - Initiate a storm sewer televising/inspection program.
 - Tracking structural condition, maintenance issues, etc.
 - Evaluate storm pipes in Priority 1 areas in the first 2 years.
 - Predicated on assistance from the sanitary sewer crew
 - Continue to regularly clean storm sewers; focus on clearing blockages identified during the televising and inspection efforts.

Staff Recommendations

Storm Sewer System

- Priority 1 Storm Sewer Projects
 - Priority 1 storm sewer projects will be planned and constructed once the Snake Creek culverts are appropriately sized and the debris and obstructions are removed from the Sturgeon Creek
 - The construction of Priority 1 storm sewer projects will be coordinated with the City's existing long-range capital improvement plan for road projects.
 - This strategy will result in the long-term implementation of the Capital Improvement Plan

Staff Recommendations

Storm Sewer System

- Staff Recommended Storm Sewer Spending Activities

The recommended spending levels do not require an increase in funding over current City expenditures.

The distributed spending line items in the table are to reflect the intended year in which the activities will occur.

An exception could be where it may take two or more years to accumulate enough funding to implement a particular recommended capital improvement.

Staff Recommendations

Storm Sewer System

	Year						
	0	1	2	3	4	5	
RECOMMENDED SPENDING ACTIVITIES	CY 2019	2020	2021	2022	2023	2024	TOTAL
1. STURGEON CREEK	\$ 250,000	\$ 300,000					\$ 550,000
2. SNAKE CREEK CULVERT REPLACEMENT	75,000						75,000
- AT N SAGINAW ROAD – BOX CULVERT		300,000					300,000
- SOUTH OF CASTLE DRIVE - BOX CULVERT			250,000				250,000
- AT W WHEELER ROAD – BOX CULVERT				250,000			250,000
- AT SYLVAN LANE – BOX CULVERT					250,000		250,000
3. JACOBS DRAIN INSPECTION	20,000						20,000
4. STORM SEWER INSPECTIONS	280,000	280,000	220,000	210,000	200,000	200,000	1,390,000
5. INFRASTRUCTURE IMPROVEMENTS			300,000	300,000	300,000	300,000	1,200,000
TOTAL RECOMMENDED SPENDING	\$ 625,000	\$ 880,000	\$ 770,000	\$ 760,000	\$ 750,000	\$ 500,000	\$ 4,285,000
ANTICIPATED AVAILABLE FUNDING	\$ 1,114,723	\$ 715,000	\$ 490,000	\$ 740,000	\$ 740,000	\$ 740,000	
ANNUAL FUNDING VS SPENDING	\$ 489,723	\$ (165,000)	\$ (280,000)	\$ (20,000)	\$ (10,000)	\$ 240,000	
Cumulative Variance	\$ 489,723	\$ 324,723	\$ 44,723	\$ 24,723	\$ 14,723	\$ 254,723	

Staff Recommendations

Sanitary Sewer System

One of the baseline considerations made before new collection and conveyance infrastructure is to be constructed is the MDEQ Sanitary Sewer Overflow (SSO) Policy, which states that the MDEQ does not authorize the discharge of raw or partially treated SSOs

Staff recommendations will begin with the OHM/HRC recommended Early Action Items for Sanitary Sewer

- As well as the completion of activities that have already been initiated by Wastewater staff

Staff Recommendations

Sanitary Sewer System

- **Sewer System Monitoring**

- Establish a system of rain gauges and temporary and permanently placed sewer flow meters to more accurately track the sources of infiltration and inflow, and to better understand levels of localized flooding
 - Rain gauges would provide better feedback and extent of the rain event over a larger geographic area, which would afford staff more time to prepare the WWTP for the impending increase in flows during a rain event
 - Flow monitoring activities will also help staff prioritize inspections, which will expedite the determination and extent to which the City may eventually build infrastructure to handle wet weather flows

Staff Recommendations

Sanitary Sewer System

- **...Sewer System Monitoring**
 - Flow meters would be installed first in Priority 1 areas, as defined by the OHM/HRC Report, Volume 3.
 - Once flow metering results are derived from sufficient dry weather conditions and wet weather events, the meters would be moved to Priority 2 areas, and then to other areas of the City.

Staff Recommendations

Sanitary Sewer System

- **...Sewer System Monitoring**
 - Update the sanitary sewer system model as new data is gathered and enables the staff to fine tune the list of recommended improvement projects.

Staff Recommendations

Sanitary Sewer System

- **Asset Characterization Program**
 - Assess condition of pipes and manholes of the entire gravity sewer system, using an array of robotic multi-sensor inspection devices, to provide a standardized pipe-condition scoring system
 - Pipeline Assessment Certification Program (PACP) – national standard for pipeline defect identification and assessment, providing standardization and consistency to the methods in which pipeline conditions are identified, evaluated and managed

Staff Recommendations

Sanitary Sewer System

- **...Asset Characterization Program**

- Manhole Assessment Certification Program (MACP) is the standard for the coding of defects within manholes.
- Areas of priority would be near the river, creeks, open drains, sanitary sewer Priority 1 areas, as indicated in the OHM/HRC Study, and areas indicated in the road projects included in the City's long-range Capital Improvement Plan.
- Will allow the City to bolster its Asset Management Program (will be a MDEQ requirement in the near future) and GIS by identifying pipes not shown in the City's GIS identifying all remaining cross-connections with storm sewers, and confirming all existing pipe diameters.

Staff Recommendations

Sanitary Sewer System

- **...Asset Characterization Program**
 - The Asset Characterization Program will require outside contractor assistance in order to provide the condition assessments capabilities in a very short period of time
 - The cost for this service has been incorporated in the staff recommended spending activities for sanitary sewer

Staff Recommendations

Sanitary Sewer System

- **Infiltration and Inflow (I&I) Removal**
 - As ongoing pipe and manhole assessment results are received from the Asset Characterization Program, staff will prioritize the repairs or rehabilitation needs based on condition severity
 - This will be accomplished by utilizing spot liners, full-length liners, removing cross connections with storm, and water-proofing manholes
 - I&I flow was the root cause of our SSO during June 2017 event; caused an increase in pump station and WWTP electricity costs, treatment chemical costs, and damaged critical conveyance and treatment assets

Staff Recommendations

Sanitary Sewer System

- **...Infiltration and Inflow (I&I) Removal**
 - For every gallon of rain/ground water removed or not allowed into our sanitary sewer there is an increase in capacity of that system. When excess flows are removed from the sanitary sewer system it benefits the entire system.
 - ✓ Threat of basement backups is reduced.
 - ✓ Need for relief sewers is reduced and potentially eliminated.
 - ✓ Annual sewage treatment costs are reduced.
 - ✓ Frequency of SSOs will be reduced.
 - ✓ Sanitary sewer system will be able to handle larger storm events.

Staff Recommendations

Sanitary Sewer System

- **...Infiltration and Inflow (I&I) Removal**
 - Continue regular cleaning of sanitary sewers to remove sediment, roots, debris, and other obstructions.

Staff Recommendations

Sanitary Sewer System

- **Footing Drain Disconnection Program (FDDP)**
 - Whitewood Subdivision is the only area of the City where footing drain disconnection demonstrated the highest potential for resolving the problem of basement backups from surcharged sanitary sewers - FDDP to begin here.

Staff Recommendations

Sanitary Sewer System

- **...Footing Drain Disconnection Program (FDDP)**
 - Perform pre- and post-program flow analysis.
 - Front end - is necessary to provide an assessment of the footing drain contributions to the sanitary sewer in order to ensure that the storm sewer in that area can handle additional flow.
 - Back end - the footing drain removal analysis would be used to determine the extent of sanitary sewer improvements identified downstream
 - Expand the FDDP to other high priority areas

Staff Recommendations

Sanitary Sewer System

- Pump Station Supervisory Control and Data Acquisition (SCADA)
 - Upgrade the City's 42 pump stations to provide interconnectivity to the WWTP to monitor, gather, and process real-time pump operations, rain, and flow data
 - Will allow staff to remotely monitor and control many aspects of the pump station operations, improving preparation and response actions
 - Funding has been budgeted to begin this multi-year process

Staff Recommendations

Sanitary Sewer System

- Early Detection Notification (already implemented)
 - Early detection notification devices have been installed in two areas of the City to warn of rising levels in the sanitary sewer.
 - With cellular notification, staff are able to mobilize pumping equipment to these areas well ahead of needing them

Staff Recommendations

Sanitary Sewer System

- Infrastructure Improvements
 - As sufficient I&I is removed from the sanitary sewer, the updated information derived from the asset characterization and flow monitoring of the collections system will be integrated back into the computer model that was recently developed to help properly size any new infrastructure needs
 - Align recommended sanitary sewer improvements with upcoming road projects
 - This strategy will result in long-term implementation of the Capital Improvement Plan

Staff Recommendations

Sanitary Sewer System

- Staff Recommended Sanitary Sewer Spending Activities

The recommended spending levels do not require an increase in funding.

The distributed spending line items in the table are to reflect the intended year in which the activities will occur.

An exception could be where it may take two or more years to accumulate enough funding to implement a particular recommended improvement.

Staff Recommendations Sanitary Sewer System

	Year						TOTAL
	0	1	2	3	4	5	
RECOMMENDED SPENDING ACTIVITIES	CY 2019	2020	2021	2022	2023	2024	
1. SEWER SYSTEM MONITORING	\$ 140,000	\$ 100,000					\$ 240,000
2. ASSET CHARACTERIZATION PROGRAM *	400,000	400,000	400,000	400,000	400,000		2,000,000
3. INFILTRATION AND INFLOW (I&I) REMOVAL	200,000	250,000					450,000
4. FOOTING DISCONNECTION PROGRAM		140,000	150,000	100,000			390,000
5. PUMP STATION SCADA	250,000	250,000	100,000				600,000
6. EARLY DETECTION NOTIFICATION (2017/18)							-
7. INFRASTRUCTURE IMPROVEMENTS			500,000	700,000	800,000	1,250,000	3,250,000
				**	**	**	
TOTAL RECOMMENDED SPENDING	\$ 990,000	\$ 1,140,000	\$ 1,150,000	\$ 1,200,000	\$ 1,200,000	\$ 1,250,000	\$ 6,930,000
ANTICIPATED AVAILABLE FUNDING	\$ 990,000	\$ 1,140,000	\$ 1,150,000	\$ 1,205,000	\$ 1,214,640	\$ 1,259,640	
FUNDING VS SPENDING	\$ -	\$ -	\$ -	\$ 5,000	\$ 14,640	\$ 9,640	
Cumulative Variance	\$ -	\$ -	\$ -	\$ 5,000	\$ 19,640	\$ 29,280	
<i>* Activity to be completed within 24 months; financed through contractor over 5 years.</i>							
<i>** Sewer bond debt matures in 2021 and 2022, lowering costs to the Wastewater Fund, totaling \$1.51M for years 2022 to 2024.</i>							
<i>The indicated spending levels do not include spending of the debt savings to be made available to the Wastewater Fund.</i>							

Conclusion – Storm Sewer

- ❑ The storm sewer recommended spending activities total **\$4,285,000** through year 2024.
- ❑ The primary activities will address flooding concerns along the Sturgeon Creek, the Snake Creek, and Jacobs Drain.
- ❑ The cleaning, televising, and inspecting efforts of the storm sewer system are essential and will lay the groundwork for Priority 1 capital improvements.
 - Will enhance the City's Asset Management Plan to provide better long-range planning of needed improvements.

Conclusion – Sanitary Sewer

- ❑ The sanitary sewer recommended spending activities total **\$6,930,000** through year 2024.
- ❑ This will provide an expedited infrastructure assessment of the entire gravity sewer system that will allow for a more rapid inventory of needed infrastructure improvements.
- ❑ Initiating a FDDP, coupled with an intense program of flow monitoring and data collection to find and remove I&I, will better define the necessary size and scope of sanitary sewer system improvements.

Staff Recommended Plan

- ❖ Recommendation at this time is to approve the implementation plan outlined in the Staff Recommendations of the 2018 Storm & Sanitary Sewer Study.