Green Infrastructure Progress Report
Upper Rouge Tributary Area

Fiscal Year July 1, 2016 – June 30, 2017

NPDES Permit No. MI0022802

Detroit Water and Sewerage Department
735 Randolph
Detroit, MI 48226

August 1, 2017

Green Infrastructure Program
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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
BSEED	Buildings, Safety Engineering and Environmental Department
CDBG	Community Development Block Grant
CIP	Capital Improvement Plan
CSO	Combined Sewer Overflow
DBA	Detroit Building Authority
DLBA	Detroit Land Bank Authority
DPSCD	Detroit Public Schools Community District
DPW	Department of Public Works
DWSD	Detroit Water and Sewerage Department
EPA	Environmental Protection Agency
FBNP	Faith Based and Non-Profit Organizations
FY	Fiscal Year
GLWA	Great Lakes Water Authority
GRDC	Grandmont Rosedale Development Corporation
GSD	General Services Department
GSI	Green Stormwater Infrastructure
HRD	Detroit Housing and Revitalization Department
MDEQ	Michigan Department of Environmental Quality
MDOT	Michigan Department of Transportation
MG	Million Gallons
MOU	Memorandum of Understanding
NGO	Non-Governmental Organization
NPDES	National Pollutant Discharge Elimination System
NWI	Northwest Interceptor
OPC	Opinion of Probable Cost
PCSWMO	Post Construction Stormwater Management Ordinance
P&DD	Planning and Development Department
RFP	Request for Proposal
ROW	Right-of-way
RPR	Resident Project Representative (for construction)
TAC	Technical Advisory Committee
TNC	The Nature Conservancy
URT	Upper Rouge Tributary Area/ Upper Rouge Tunnel

1.0 EXECUTIVE SUMMARY

The City of Detroit is experiencing a renaissance in its downtown and midtown areas, but neighborhoods are still struggling to gain traction. Managing stormwater close to its source of origin provides an opportunity to improve the lives of Detroit's residents. Conscious and thoughtful investments in green stormwater infrastructure (GSI) have the potential to reduce basement backups and street flooding, beautify neighborhoods and reduce combined sewer overflows. In 2010, the City's desire to include GSI as a component of its combined sewer overflow (CSO) control program was formally approved by the Michigan Department of Environmental Quality (MDEQ), and the program was subsequently incorporated into the Department of Water and Sewerage's (DWSD) National Pollutant Discharge Elimination System (NPDES) permit. The specific area of the City where the program is focused is the Upper Rouge Tributary Area (URT). This report provides an update on the status of GSI efforts by DWSD. It fulfills the annual regulatory reporting requirements associated with GSI in the URT.

PROGRESS OF MAJOR INITIATIVES IN FY2017

DWSD recognizes that the historic methods of stormwater management were implemented over a period of 100 years or more, and that gray infrastructure will remain as an integral backbone of the engineered system. Changes will not occur overnight and will include a vast number of small and moderate size projects. In order to make the desired change in the City possible, DWSD must work with others in a spirit of team work and collaboration.

With the basic understanding that GSI programs are, by nature, a mix of actions from public and private entities, DWSD's efforts are intended to create a policy and process framework that will drive the greatest possible implementation of GSI. These efforts have included the development of institutional structures that change the way stormwater is managed on parcels, collaboration with other City of Detroit departments to encourage GSI as a component of each project, implementing projects that support neighborhoods, and evaluation of those projects in coordination with research partners.

Four primary actions undertaken by DWSD and the City of Detroit and partner public agencies such as the Detroit Land Bank Authority and the Detroit Building Authority, will result in changed stormwater management. These include:

- Post-Construction Stormwater Management Ordinance – will require stormwater management on new development and redevelopment projects
- Drainage Charge Credit System – will incentivize retrofits on existing developed properties
- DWSD and City of Detroit implemented GSI projects – will result in stormwater management for public lands and neighborhoods
- Demolitions resulting in the removal of impervious cover

Post Construction Stormwater Management Ordinance (PCSWMO)

DWSD is working with other City departments on updates to the City's codes and ordinances with the intent of requiring stormwater management on new development and redevelopment. The work has included so called "Greening of the Code" updates, which have been included within a set of compiled code updates called the 5th General Text Amendment. These updates are intended to facilitate the implementation of GSI practices. The primary mechanism for more effective stormwater management is an update of Article III *Sewer and Drains* of Chapter 48 (formerly Chapter 56) *Utilities*. The proposed PCSWMO language will call for retention and detention of stormwater on development sites, and establishes the structures for ordinance enforcement. In FY2017, the emphasis was on the assessment of development impacts and the potential structures of alternative compliance for constrained sites. Results of this analysis have been incorporated into the current draft document.

The NPDES permit, A.15.d.9. includes the following language:

> *As part of this adaptive management approach, storm water runoff from new development and redevelopment that will be conveyed through storm sewers to DWSD's combined sewers will require control to help further reduce volume and frequency of untreated CSO discharges. These are projects that will require construction plan review by the permittee, and a Part 41 construction permit issued by the Department.*

DWSD's approach accomplished this permit requirement. The estimated schedule for the PCSWMO implementation was submitted to MDEQ on April 1, 2017. As of the date of this report, the 5th General Text Amendment is ready for presentation to City Council and the Post Construction Stormwater Ordinance is being prepared as a final DWSD draft for circulation to other City departments.

Drainage Charge Credit System

In FY2017, DWSD launched the updated drainage charge system, which will result in an equitable distribution of wet weather related costs to those properties served by the DWSD combined sewer system. As part of this update, all properties will be charged based on their impervious cover, and will be able to access credits associated with how well stormwater is managed on their properties. DWSD is providing customers with a broad array of technical support to facilitate implementation of GSI on private properties. Through June 30, 2017, DWSD had conducted a series of workshops and one on one meetings that collectively contacted property owners representing about 19% of impervious parcel acreage. DWSD's total level of dedicated customer technical support includes education and credit consultation meetings under CS-1831, engineering analysis for GSI implementation under CS-1830 and up to $5 million annually for capital support in a matching grant program.

In the URT, a 43-acre parcel at 18900 Borman, has completed design of a stormwater management and reuse system that will reduce stormwater contributions to the combined sewer system by 1.26 MG during the 2-year storm event.

Figure 1 Drainage Charge Credit Workshop

DWSD Implemented GSI Projects

Four DWSD construction projects reached substantial completion in FY2017. These included Stoepel Park No. 1, Liuzzo Park, transportation corridor projects (PW-6968, joint with DPW) and Tireman bioswales. DWSD also initiated two projects with the Parks and Recreation Department (Crowell and O'Shea) which will begin construction in fall 2017. A shift was made to neighborhood scale projects, with planning and design of several such projects in process. Monitoring of existing projects helped define the performance of constructed practices, and a better understanding of the geotechnical limitations in the City of Detroit shifted the emphasis of projects to those that would remove volume from the system by redirecting stormwater to the Rouge River, or have a primary emphasis on detention.

Figure 2 Constructed GSI Projects in the URT

1. Permeable pavers on Keeler Street; 2. Vacant lot bioretention on Evergreen; 3. Stoepel Park permeable pavement parking lot; 4 & 5. Viola Luizzo Park bioretention; 6. linear bioswales on Tireman Avenue; 7. Stoepel Park bioretention.

Demolition Program

The demolition program, including efforts by the Detroit Land Bank Authority (DLBA) and the Detroit Building Authority (DBA) has resulted in an additional 473 demolitions in FY2017 in the URT. The impervious acres removed associated with these demolitions is 34 acres. The comparison of impervious cover as of June 30, 2017 with land cover as of April 2010, indicates a net reduction of approximately 1,433 impervious acres in the URT. This change equates to approximately 44.09 MG of estimated runoff reduction during the 2-year design storm event. This work has largely been performed by other City of Detroit departments or agencies, specifically BSEED from 2010 – 2013 and DLBA from 2014 – 2017. DLBA has adopted standards of site restoration, based on the input of DWSD to the demolition specification, that are designed to promote the reduction of runoff. DWSD also invested over $660,000 in demolitions over this period. An estimated net reduction of 3,289 acres of impervious area has occurred City-wide between 2010 and 2017.

MAJOR INSTITUTIONAL CHANGES IN FY2017

Each year, the annual report highlights the various institutional changes and activities that impact the GSI Program. As in prior years, the City of Detroit continues to work toward policies and processes that include GSI as the standard approach for project implementation. Internal to DWSD, in collaboration with the GSI community in Detroit and in partnership with the Great Lakes Water Authority (GLWA), structures are gradually being established to facilitate project implementation.

Collaboration and commitment. The momentum realized on the GSI program is credited to the highly collaborative effort of entities such as the Detroit Parks and Recreation Department (DPRD), Detroit General Services Department (DGSD), Detroit Land Bank Authority (DLBA), the Building, Safety and Environmental and Engineering Department (BSEED), the Planning and Development Department (PDD), the Department of Public Works (DPW), the University of Michigan Water Center, and many community groups including Grandmont Rosedale Development Corporation, Friends of Rouge Park, Cody Rouge Community Action Alliance, Warrendale Community Organization, and the Viola Liuzzo Park Association. Of note related to this collaboration is the creation of an Office of Sustainability with support from the Office of the Mayor.

Significant DWSD events:

- DWSD launched the Stormwater Management Group (SMG) and hired a manager to lead the stormwater efforts. This group will be responsible for management of stormwater related to regulatory requirements, capital improvement programs, stormwater ordinance implementation and drainage charge technical efforts.
- DWSD launched the updated drainage charge and drainage charge credit system in October 2016.
- DWSD procured a consultant for its capital improvements program management office (CS-1812). This program office will be responsible for water main and sewer improvements, with which GSI projects will coordinate. The notice to proceed was issued late FY2017 and coordination between the programs will initiate in FY2018.
- DWSD restructured the GSI Program Contract (CS-1522), shifting procurement of construction contractors directly to DWSD and focusing the contract resources toward planning and design.
- DWSD invested in asset management, procuring additional equipment for the maintenance of stormwater assets such as catch basins and sewers.

City of Detroit events:

- The Sustainability Office was created with the recognition that activities related to sustainability span all areas and initiatives within the City and should be coordinated appropriately. There are four main priority areas including green stormwater infrastructure, renewable energy, land use & food policy, and capital planning.
- The GSI interdepartmental working group, which is associated with the sustainability initiatives, advanced from an ad-hoc group to a more formalized coordinating effort between departments.
- The Planning & Development Department (P&DD) and Housing and Revitalization Department (HRD) issued RFPs for four planning studies, and three of these studies were well advanced at the end of the fiscal year. The planning studies include a significant element of GSI evaluation, including aesthetic and stormwater quantity management to support neighborhood revitalization and a reduction in flooding.

- P&DD advanced the City's efforts toward green and complete streets, including planning efforts toward commercial streetscape implementation and workshops with various departments to coordinate efforts.
- The City acquired 7.5 miles of former railroad corridors to advance the inner circle greenway, intended for development of a non-motorized trail, but also providing opportunities for stormwater management along the alignment.
- Detroit Public Schools was reorganized into the Detroit Public School Community District (DPSCD), elected a school board and hired a superintendent.

Joint with GLWA:

- GLWA and DWSD submitted the *Amendment to the Supplemental Report on Alternative CSO Controls for the Upper Rouge River* on January 1, 2017. This permit required report discussed the various activities and initiatives being pursued in the URT for CSO control and GSI implementation. It highlighted the impact of changing land use on the planning of GSI.
- GLWA and DWSD submitted the *Conceptual Engineering Plan for Outfalls 005-009, 011, and 012* on April 1, 2017. This report identified various efforts and initiatives for GSI in the "Near East Side" of the City.
- GLWA entered into an agreement for CS-0036 Wastewater master plan. DWSD is closely collaborating with GLWA on this project.
- GLWA is implementing the West Side Model project for an area that includes the URT. This model is supported by extensive flow monitoring data and will provide the necessary modeling tools and understanding of hydrology in the URT to better assess the impact of specific GSI projects on CSO discharges.
- GLWA initiated a series of workshops to discuss the interim wet weather operations protocols for the GLWA operated wastewater system. This workshop series has included DWSD and MDEQ staff and allowed attendees to further their understanding of current system operations.

Activities of project partners:

- The Great Lakes and St Lawrence Green Infrastructure Conference was held from May 31 to June 2, 2017.
- The Detroit Blue Green Workgroup, facilitated by the Erb Family Foundation, grew in participation and established a monthly meeting schedule.
- The Nature Conservancy, through an Erb Foundation Grant, conducted a planning effort for a GSI Mapping and Knowledge Database for the City of Detroit.
- The Detroit Economic Growth Corporation, through an Erb Foundation Grant, provided training to contractors in GSI implementation and maintenance.

NPDES METRICS

DWSD's NPDES permit requires certain reporting and expenditure metrics and also establishes a volumetric reduction goal. The NPDES permit term concludes in 2017, and an overall update of the program progress against goals is to be made at this point in time.

The permit language, from Part I.A.15.d.5.a includes a reporting requirement, an expenditure requirement and a flow reduction goal. The end of the fiscal year falls in the middle of the construction season, a difficult point in construction activities to determine a financial commitment or the level of flow volume reduction, so DWSD is reporting the expected cost incurred and volume reductions associated with construction projects complete, bid or pending bid that are expected to be complete by the end of the calendar year.

Reporting Requirement: *The permittee shall prepare and submit a Progress Report by August 1st of each year for review and approval that 1) summarizes the GI implementation work during the preceding DWSD fiscal year that has been undertaken and completed as part of the Green Infrastructure program, 2) contains a work plan for GI implementation projects for the next DWSD fiscal year, 3) documents the annual expenditure for the preceding DWSD fiscal year, 4) documents a cumulative total-spent-to-date on the GI program, and 5) includes an updated estimate of the volume of wet weather flow that has been removed from the combined sewer system as a result of the Green Infrastructure program, using agreed upon calculation techniques.*

The annual reporting requirement is fulfilled by this annual report.

Expenditure Requirement: *As part of this reporting process, it will be necessary to document that an average of $3 million dollars per fiscal year was spent per fiscal year for the five years ending June 30, 2017.*

Based on work completed or in progress, DWSD will have invested approximately $15.7M or more by the end of the 2017 construction season.

Flow Reduction Goal: *In addition, the performance goal is that by June 30, 2017, the permittee have in place in these sewersheds GI practices that cumulatively have the capacity to reduce flows into the sewer system in a 2-year — 24-hour storm event by at least 2,800,000 gallons, as determined by using modeling and quantification methods and data sources mutually agreed to in writing between the permittee and the Department.*

As a result of work performed directly by DWSD, and through DWSD incentivized projects, 2.1 MG of flow will be removed from the sewer system during the 2-year, 24-hour storm event. This figure includes drainage charge credit motivated actions and modifications to the restoration standard for demolitions. In total, all work in the URT is estimated to have reduced flow during the 2-year, 24 hour event by 44.09 MG.

Table 1 Summary of Progress Toward GSI

Permit Objective	Metric	NPDES performance target	Status as of 2017 construction season, DWSD related investment[1]	Status as of June 30, 2017; City of Detroit investment[2]
Investment in GSI **(permit requirement)**	Dollars	$15,000,000	$15,673,067	
Volumetric reduction during 2-year, 24-hour event **(permit goal)**	MG of stormwater removed	2.8	2.10	44.09[3]
Area managed (standard GSI metric)	Acres, total	N/A	42.69	1433[4]

[1] Includes residual value on construction contracts, commitment to Joy Road GSI and contract PC-799. (Crowell and eco-site modifications)

[2] Includes DWSD investment

[3] Total reduction in flow due to demolitions is 44.09 MG, with 43.62 MG due to impervious cover removal and 0.47 MG due to modified restoration standard. The 0.47 MG is included in DWSD related investment.

[4] Reflects estimated change in impervious cover in the URT, primarily related to demolitions by the DLBA and the City of Detroit

FY2017 Expenditures

In FY2017, DWSD's Green Stormwater Infrastructure program expended funds or awarded projects worth approximately $6.09 million, as shown in Table 2. Of this amount, $945,000 previously transferred to DPW was claimed in FY2015, and this is reflected in the amounts claimed for FY2017. A more detailed description of expenditures is included in Section 4.0, Investment in Green Infrastructure.

Table 2 FY2017 Expenditure Summary

Effort	Expenditures and awarded projects in 2017	Amount reported in FY2017 annual report	Comments
Code and Ordinance Efforts	$ 280,753	$ 43,820	Prorated current and prior expenditures by 27.1% for share of URT to City total
Project Management and Planning	$ 706,365	$ 642,301	Includes consultant and allowance for DWSD staff time. Excludes expenditure for January 1 report submittal.
Drainage Charge Program	$ -	$ -	Removed reporting of drainage charge related efforts
Outreach	$ 141,990	$ 141,990	Green Infrastructure program related outreach
Tracking / Impervious Cover Analysis	$ -	$ -	Prorated by share of URT to City total (27.1%)
Project Implementation	$ 4,804,821	$ 3,859,321	$945,500 was expended and invoiced on transportation projects that was previously claimed in 2015 when funds were transferred to DPW.
Subtotal	**$ 5,933,929**	**$ 4,687,432**	
Project Implementation (bid but not spent)	$ 1,409,246	$ 1,409,246	Includes Crowell Recreation Center, Eco Site modification, and Joy Road commitment projects and additional spend projected for PW6968 based on processed change orders.
Totals	**$ 7,343,176**	**$ 6,096,678**	

Through the previous fiscal year, June 30, 2016, $9,576,389 of expenditures were claimed. With the additional work in the current fiscal year, the total expenditure as of June 30, 2017, is **$15,673,067**, which include Crowell Recreation Center, Eco Site Modifications, and the stated commitment by DWSD to the Joy Road streetscape improvements. The spending requirement for the GSI Program is for a cumulative expenditure of $15 million by June 30, 2017, and $50 million cumulative by 2029 in the URT. A number of larger projects are in design for bidding and construction in FY2018 and FY2019.

FY2018 PLAN

DWSD has a number of projects in the planning stages for FY2018 and beyond. DWSD is advancing the following projects for calendar year 2018 bidding and construction start. Many of these projects are expected to be under construction by the end of FY2018.

- O'Shea Park
- Oakman Boulevard
- Vacant Lot GSI projects
- Orangelawn Phase I

- Charles Wright Academy/Ludington Magnet Middle School

The following significant activities will also occur:

- Post construction stormwater management ordinance advanced to City council
- All drainage charge customers transitioned to impervious acreage billing (as of July 1, 2018)
- West Side Model complete and available for project analysis (this project is by GLWA)

2.0 INTRODUCTION

The Detroit Water and Sewerage Department (DWSD) and the Great Lakes Water Authority (GLWA) are jointly responsible for developing and implementing the Alternative Rouge River Combined Sewer Overflow (CSO) Control Program. This CSO Control Program is designed to restore water quality and protect public health, while staying within the City's financial means to pay for new projects. The program encompasses a 25-year phased plan that focuses on green stormwater infrastructure (GSI) solutions along with "right-sized" conventional CSO control facilities. DWSD is responsible for the implementation of the GSI program.

This document is the Green Infrastructure Annual Progress Report for FY2017, which corresponds to the time period of July 1, 2016 – June 30, 2017. An annual progress report is required according to the permit (NPDES MI0022802 Part I.A.15.d.5.a) that:

1) *Summarizes the GSI implementation work during the preceding DWSD fiscal year that has been undertaken and completed as part of the Green Infrastructure program,*
2) *Contains a work plan for GSI implementation projects for the next DWSD fiscal year,*
3) *Documents the annual expenditure for the preceding DWSD fiscal year,*
4) *Documents a cumulative total-spent-to-date on the GSI program, and*
5) *Includes an updated estimate of the volume of wet weather flow that has been removed from the combined sewer system as a result of the Green Infrastructure program, using agreed upon calculation techniques.*

PROGRAM GEOGRAPHY AND BACKGROUND

The Green Stormwater Infrastructure Program is focused on a 37.5-square-mile portion of the City of Detroit where CSO discharges are tributary to the Upper Rouge River. This portion of the City, alternately referred to as the Upper Rouge Tunnel area and the Upper Rouge Tributary (URT) area comprises approximately 27% of the City of Detroit and is illustrated in Figure 3. This area was identified for a program of both traditional CSO controls and green infrastructure in 2010, following the cancellation of the Rouge River CSO tunnel project due to escalating costs and financial challenges. The URT includes a complex network of combined sewers. Combined sewage flows in the URT that exceed the capacity of the interceptor system are either discharged from uncontrolled outfalls or treated at the Hubbell-Southfield, Seven Mile, or Puritan-Fenkell CSO Facilities. The area includes a variety of residential, industrial, and commercial neighborhoods which are in varying states of stability. The potential of stormwater to be converted to CSO discharges is a factor in prioritizing efforts, while the local socio-economic conditions are a determinant in the type of project implemented.

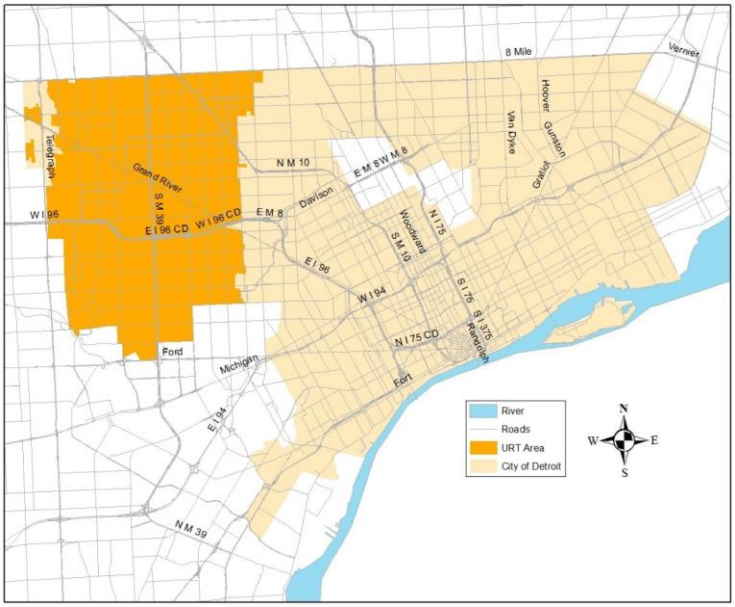


Figure 3 Upper Rouge Tributary Area

DWSD's GSI Program has seen a series of major changes in organizational structures and other events that influence the context within which the Program must function. In previous reports, the major institutional changes that occurred from FY 2013 - FY 2016 have been discussed. These include the City's bankruptcy and the significant role that the Detroit Land Bank Authority assumed relative to blight removal and management of publicly owned residential parcels in the City. They include major changes in City departments, including PDD and HRD, which are emphasizing GSI and flood remediation as part of their work. They include the bifurcation of GLWA and DWSD in January 2016. This bifurcation and subsequent local emphasis of DWSD resulted in such major organizational changes internal to

DWSD as the establishment of the Stormwater Management Group (SMG) and a program management office for capital investments (through CS-1812).

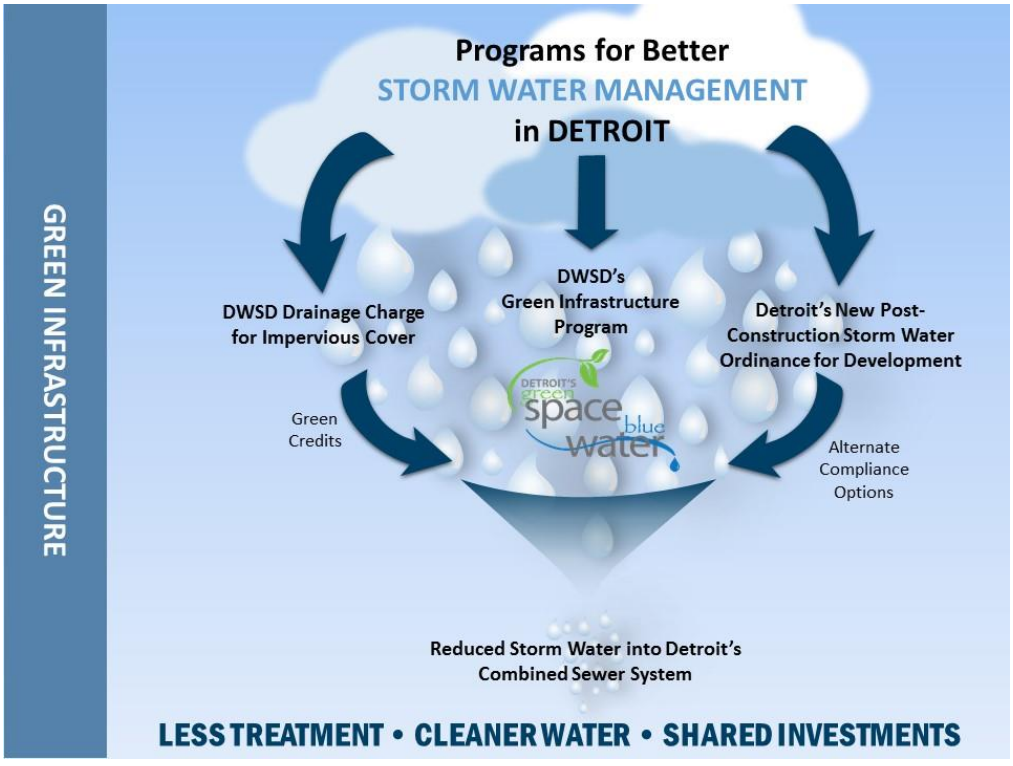
With 138 square miles of GSI opportunity, DWSD sees the potential to be a benchmark city for stormwater management using green stormwater infrastructure. The department's executive management team is emphasizing the potential for Detroit to be a national leader in green infrastructure. The working relationships between the DWSD GSI Program, City of Detroit departments, and other authorities and groups continue to be cooperative and positive. Under the endorsement of the Office of the Mayor, the City created a Sustainability Office that focuses on four main pillars of sustainability: green stormwater infrastructure, renewable energy, land use & food policy, and capital planning. DWSD's GSI team facilitates the City's GSI workgroup that has identified a citywide definition and vision of green stormwater infrastructure and is developing metrics to benchmark progress toward becoming a greener city.

The focus of activities in FY2017 has included GSI project implementation, identification and development of future projects, launch of the revised drainage charge program and credit system, and continued building of institutional structures to support internal and external project coordination. Long-term planning within the URT has also been a major focus of FY2017; this will be discussed in sections 2 and 5.

PROGRAM OVERVIEW

The ultimate regulatory goal of GSI implementation is a reduction in stormwater entering the combined sewer system, which, in turn, will help to reduce untreated combined sewer overflows. DWSD recognizes that its direct spending on project implementation represents only a portion of the overall actions that result in a change in flow to the combined sewer system. Many of the actions that will impact the quantity of flow entering the sewer system will be a result of activities such as redevelopment or demolition and stormwater management retrofits by private property owners seeking to reduce their drainage charges. As a result, DWSD is implementing a three pronged approach for better stormwater management in the City of Detroit. The three approaches include code and ordinance modifications, implementation of a drainage charge credit system and project implementation in coordination with other activities and partners.

Figure 4 DWSD's Approach to Stormwater Management



Annual Report Organization

Details for the various items in the permit requirement are presented in this Progress Report. It is structured in the following manner:

- Section 3.0 summarizes the planning, coordination, and implementation efforts undertaken during FY2017.
- Section 4.0 provides a financial summary of the investments made toward the green stormwater infrastructure program, both for the preceding year and the cumulative total to date.
- Section 5.0 documents the estimated volume of wet weather flow removed as a result of the green infrastructure program.
- Section 6.0 summarizes the planned activities for the upcoming fiscal year.

3.0 PLAN IMPLEMENTATION – FY2017

The Green Stormwater Infrastructure Plan was a requirement for DWSD under the NPDES permit (Permit No. MI0022802), issued by MDEQ (State of Michigan Department of Environmental Quality, 2013). The permit requires DWSD to develop and implement a plan that will describe a process for locating, designing, constructing, operating, and evaluating GSI in the sewersheds for 17 outfalls to the Rouge River. The permit identifies specific elements that will be included in the Plan including downspout disconnection, demolitions, tree planting, vacant lot greening, bioswales along roadways and parking lots, rain barrels and rain gardens at properties, and programmatic and policy type elements. The 2014 Plan was submitted to MDEQ on August 1, 2014, and was conditionally approved by MDEQ on May 8, 2016.

DWSD's Green Stormwater Infrastructure Program is envisioned as a continually evolving effort to identify and implement projects and programs that will reduce CSO discharges while benefiting the community. It is and will continue to be coordinated with other activities in the City that impact stormwater runoff. Because of the dramatic land use changes in the City of Detroit, the stormwater management benefits will develop from three primary mechanisms (1) DWSD or City of Detroit program efforts including implemented projects for stormwater management/ green infrastructure; (2) green infrastructure (or traditional stormwater management) implementation on existing or redeveloped sites; and (3) change in impervious area. The change in impervious cover is primarily occurring through City of Detroit actions to reduce blight and demolish vacant properties. DWSD's program includes directly implemented projects and the advancement of institutional structures that will result in better stormwater management on parcels. These actions will be funded by property owners and have minimal cost to DWSD. Therefore, the Program includes a suite of activities which consider long-term and short-term objectives, and balance institutional structures with project implementation.

DWSD's Green Stormwater Infrastructure Program includes five major activities. Progress on each of those activities over the last year is described in this section. Table 3 provides an overview of the status of each identified activity, with additional detail in the following sections for activities with significant efforts.

Table 3 GSI Plan Activities – FY2017 Progress

Task ID	Proposed Activities Presented in FY2016 Annual Report	Planned Timeline as Reported in FY2016 Annual Report	Current Status	Updated Completion Date
Activity 1 – Policies, Procedures and Standards				
1-1	Codes and Ordinances	FY2017 to focus on post-construction stormwater ordinance (PCSWMO) and "greening of the code".	Draft post-construction stormwater ordinance complete with the exception of alternative compliance; revised code language drafted and under review	August 2018
	Comment: On April 1, 2017, DWSD provided an implementation schedule for stormwater controls. In that communication, DWSD identified the tasks associated with the PCSWMO and greening of the code efforts, milestones and schedule. The alternative compliance analysis and recommendation was incorporated into the draft PCSWMO. The ordinance will be presented to stakeholders for final input. At that point it will be submitted as a draft to the City Planning Commission and City Council. Completion date relates to readiness for City council action. See detailed discussion in following section.			
1-2	Stormwater Design Manual	Publically available version by April 2017.	In progress	September 2017
	Comment: Overall scheduled revised to remain in alignment with the post-construction stormwater ordinance efforts as outlined in the letter DWSD submitted to the MDEQ dated April 1, 2017, regarding the implementation schedule for stormwater controls.			
1-3	Drainage Charge Credit System	Draft publicly available by October 1, 2016	Complete. Credit program launched in October 2016; credit manual posted on DWSD's website.	Complete.
	Comment: The drainage charge credit system was made available on October 1, 2016. See detailed discussion in following section. DWSD continues to expand materials and documented policies. Updates to previously published materials will be made as necessary.			
1-4	Green Streets Standards	Original timelines were for actions in FY2016/FY2017. See discussion.	Green Streets Workshops held on June 22 and June 23, 2017	Additional coordination during FY2018
	Comment: Green and complete street efforts have been led by P&DD with support from DPW. DWSD has participated in these efforts, which include GSI concepts. Current efforts are being coordinated with the neighborhood planning studies being implemented by P&DD and HRD. An EPA facilitated green and complete streets workshop was held on June 22 (stakeholders) and June 23 (city departments). Emphasis at this time has been on commercial corridors which are targeted for streetscape and enhanced quality of life elements. Several complete streets projects have been advanced using temporary materials; these projects showcase innovation; deliver immediate results; leverage local partnerships; and integrate bike, pedestrian and transit planning. Projects implemented include a new civic square at Woodward Avenue and Jefferson Avenue; a redesigned, safer intersection at Gratiot Avenue and Randolph Street; and protected bike lanes on Michigan Avenue. In the URT, planning studies for the Grand River/Northwest area of the City have considered modifications to Grand River.			
1-5	Structure Demolition and Lot Greening Standards	Complete FY2016.	Complete	Complete
	Comment: DWSD has provided technical assistance upon request. DLBA adopted site restoration standards.			

Task ID	Proposed Activities Presented in FY2016 Annual Report	Planned Timeline as Reported in FY2016 Annual Report	Current Status	Updated Completion Date
1-6	Public Stormwater Maintenance Guidance	Publically available version by October 2016	Preliminary materials complete	Updates and expanded materials January 2018
	Comment: General stormwater maintenance guidance for GSI practices has been included in various drainage charge materials that are distributed to the public. These include the Drainage Charge Manual and various GSI practice "starter guides". As part of the stormwater design manual, chapters will be included for GSI maintenance.			
1-7	Municipal Stormwater Maintenance Manual	Draft maintenance manual by July 31, 2017	Draft complete	Updates and expanded materials January 2018
	Comment: Standard Operation Procedures (SOPs) for maintenance of DWSD owned GSI have been developed and have been compiled into a draft manual. Additional SOPs are being developed as different practices and projects come on line. These SOPs and additional reference materials will be formalized into a Municipal Stormwater Maintenance Manual in FY2018.			
1-8	Tracking System	Tracking systems ongoing	In progress	Ongoing
	Comment: DWSD is currently tracking all green infrastructure investments in GIS data sets. Detailed impervious cover for the City of Detroit was completed in 2015 based on April 2015 aerial photography.			
Activity 2 - Prototype Projects				
2-1	Small Scale Greening	Evaluation of other greening opportunities in FY2017. Modification of existing Ecological Restoration of Demolition Sites (Eco sites) projects to accommodate additional tributary area in FY2017. Additional vacant lot bioretention locations in FY2017.	Modification of existing Eco sites – design complete; advertised for bid in June 2017. Selection of additional sites in progress.	Eco site modification construction – FY2018; Additional site selection, design and construction – FY2018/19
	Comment: See detailed discussion in following section.			
2-2	Large Scale Greening and Historic Stream Corridors	Ongoing planning and project development and implementation of concept designs FY2017-FY2018.	A number of neighborhood scale opportunities are in various stages of design.	Initiate construction of Oakman Boulevard in FY2018. Complete design for Orangelawn Street in FY2018, construction initiated in FY2019.
	Comment: See detailed discussion in following section.			
2-3	Public Facilities Green Infrastructure/ Flow Management	Identify additional projects by October 31, 2016.	Additional location identification and selection is an ongoing activity.	Review candidate opportunities and City of Detroit capital needs annually.
	Comment: See detailed discussion in following section. Budget for public facilities greening in FY2017 was designated for school GSI. DWSD has ongoing coordination efforts with GSD to facilitate the inclusion of GSI on major capital projects for City facilities.			

Task ID	Proposed Activities Presented in FY2016 Annual Report	Planned Timeline as Reported in FY2016 Annual Report	Current Status	Updated Completion Date
2-5	Municipal Parks Green Infrastructure/ Flow Management	Ongoing implementation, including design and construction for identified opportunities FY2017. Evaluate opportunities in Rouge Park corridor FY2017 and program investments.	Stoepel Park – substantial completion in October 2016; Liuzzo substantially complete in October 2016; Crowell Rec center design complete. Rouge Park area impacted by adjacent neighborhood projects	Construct Crowell Recreation Center in fall 2017.
	Comment: Bid opening for Crowell Recreation Center was on July 5, 2017; approval by the Financial Review Committee is scheduled for August 2017. Project identified for design in FY2017 was O'Shea Park. See detailed discussion in Activity 2.			
2-6	Transportation Corridor Flow Management	Update prioritized opportunity list by October 2016. Project selection and implementation schedule November 2016. Annual update and coordination with city departments, county and state.	See comment	Ongoing
	Comment: As a result of planned investments in neighborhood scale GSI projects, no specific transportation corridor projects were identified in FY2017. The neighborhood scale projects include GSI in transportation corridors as part of the implementation. DWSD and DPW are continuing to work on transportation opportunities including aligning project planning and construction schedules and reviewing contracting structures. Coordination with DWSD's capital improvement program will also be initiated in the future. See detailed discussion in Activity 2.			
Activity 3 - Continued Implementation				
3-1	Downspout Disconnection - Homes	Coordination with community groups for downspout disconnection programs in conjunction with drainage charge credit system and outreach.	In Progress	See comment
	Comment: Downspout disconnection efforts are being targeted through the drainage charge credit program through education/outreach credits. Program is under development, going through final legal review. Homes that are being auctioned through the DLBA are required to disconnect downspouts. Similarly, homes sold through the *Rehabbed and Ready* program have disconnected their downspouts.			
3-2	Downspout Disconnection - Multi-Family Residential, Commercial, and Industrial	Non-SFR properties are included either in 2-3 Public Facilities Flow Management addressed through drainage charge/code review activities.	In Progress	See comment
	Comment: Downspout disconnection efforts are being targeted through the drainage charge credit program for non-residential properties.			
3-3	Demolitions and Site Restoration	Coordination with DLBA and DBA ongoing.	Ongoing	TBD

Task ID	Proposed Activities Presented in FY2016 Annual Report	Planned Timeline as Reported in FY2016 Annual Report	Current Status	Updated Completion Date
	Comment: DWSD has been in regular contact with the DLBA regarding demolition coordination. The DLBA has primarily been focused on the demolition efforts using Hardest Hit Funds.			
3-4	Tree Plantings	No additional plantings planned for FY2017.	Complete	Complete
	Comment: No additional activities planned at this time. P&DD is working on tree canopy assessments.			
Activity 4 - Long Term Performance				
4-1	Updated Collection Systems Model	Model work is being updated by GLWA.	Activity by others	
	Comment: GLWA currently has a project for the "West Side Model" in progress that will develop a calibrated model for planning purposes. This modeling effort includes extensive data collection to better understand the system operation. Flow monitoring is ongoing through 2017. DWSD and MDEQ are participating in ongoing update meetings.			
4-2	Green Infrastructure Performance Planning	The "Ecological Restoration of Demolition Sites" monitoring is ongoing with the initial monitoring period through September 30, 2016. Monitoring of the other projects will be planned as they are implemented.	First round of performance monitoring completed in fall 2016. Second round of monitoring – started in April 2017. Identification of overall monitoring goals in progress.	Complete Round 2 of monitoring in November 2017. Develop monitoring plan to address program goals – January 2018.
	Comment: Monitoring of the Ecological Restoration of Demolition Sites projects is ongoing through 2017. The first monitoring period occurred June – October 2016; additional monitoring is planned for April – October 2017.			
4-3	Green Infrastructure Benefits Evaluation	Prepare as part of CIP planning effort. Draft completion January 1, 2017. See prioritization information discussed in Activity 4-2.	Working version of prioritization available	Ongoing
	Comment: DWSD developed a prioritization evaluation that included impacts on CSO gallons discharged, CSO costs offset, basement backup and neighborhood stability. Use of the tool is considered preliminary as many of the analyses build off of the 2014 version of the hydraulic model, which was not calibrated. The analysis will be updated when the West Side Model is complete. Additional social multi-benefit analysis is ongoing.			
4-4	Amendment to the Supplemental Report on Alternative CSO Controls for the Upper Rouge	Permit required date was January 1, 2017	The CIP effort has resulted in identification of a series of major projects. Additional project identification and planning efforts are ongoing.	Ongoing

Task ID	Proposed Activities Presented in FY2016 Annual Report	Planned Timeline as Reported in FY2016 Annual Report	Current Status	Updated Completion Date
	Comment: DWSD has initiated development of the full plan for $50 million implementation spend in the URT. This work involves prioritization of outfalls and assessment of CSO reduction impacts associated with the green infrastructure spending requirement. The required report entitled "Amendment to the Supplemental Report on Alternative CSO Controls for the Upper Rouge" was submitted on schedule to MDEQ as a joint effort of GLWA and DWSD.			
4-5	Legal agreements for long-term sustainability	Ongoing activity	Ongoing	
	Comment: DWSD has executed or initiated discussion on legal agreements for joint public projects. Green infrastructure on private property will be incentivized/ sustained through the financial incentives of the drainage charge credit program (launched October 2016) or the post-construction stormwater ordinance (pending final ordinance adoption – see Activity 1-1 for detailed discussion of status).			
Activity 5 - Stakeholder and Community Engagement				
5-1	Green Infrastructure Website	Ongoing updates.	Ongoing updates.	Ongoing updates
	Comment: DWSD Public Affairs updated structure and content of the Drainage and GSI web pages with a large emphasis on drainage charge credit educational materials. DWSD continues to update content to reflect the newly formed Stormwater Management Group. The content focuses on the drainage charge program and credit process, the DWSD Green Stormwater Infrastructure Program and DWSD-funded projects, and the post-construction stormwater ordinance. DWSD anticipates that the City of Detroit website format will change in FY2018, which will lead to additional changes.			
5-2	Drainage Charge Credit Program Stakeholder Engagement	Ongoing activity.	Ongoing	Ongoing
	Comment: DWSD's outreach efforts for the drainage charge program include monthly training workshops, engagement with various groups including the Erb Foundation facilitated Blue Green Work Group, various NGOs and faith-based coalitions. This work is a part of the drainage charge program (investment not included in green infrastructure expenditures).			
5-3	Drainage Charge Toolbox	Initial materials available in fall 2016.	Initial materials available on schedule	See Comment
	Comment: Materials for drainage charge customer support are continually evolving and being updated. DWSD maintains a robust drainage charge website at http://www.detroitmi.gov/drainage. DWSD released the Drainage Charge Manual in September 2016 via the DWSD website, as well as in hard copy at all monthly Drainage Charge Credit workshops. In addition to the manual, DWSD created numerous other handouts for distribution on the website and at workshops, including a Drainage Charge Credit Action Plan, credit application and instructions, and a credit application process flow document. DWSD initiated the development of GSI Starter Guides for residential and nonresidential property owners specific to GSI practices. This work is a part of the drainage charge program (investment not included in green infrastructure expenditures). The following materials are being developed for distribution: Starter Guides – September 2017; Capital Assistance Program – September 2017; Credit Calculator – January 2018; ROI Calculator – January 2018			
5-4	Drainage Charge Training Workshops	Concurrent with Green Credits Public Launch, fall 2016	Launched October 2016; held monthly	Ongoing monthly drainage charge workshops throughout FY2018.
	Comment: DWSD launched monthly Drainage Charge Credit Workshops for nonresidential property owners beginning in October 2016. Also held a one-time Drainage Charge Credit Workshop for engineers in October 2016. DWSD supported the Contractor Training sessions funded by the Erb Family Foundation, held in February, March, and April 2017 providing two days of instruction in each 50-hour training session. This work is a part of the drainage charge program (investment not included in green infrastructure expenditures).			

Task ID	Proposed Activities Presented in FY2016 Annual Report	Planned Timeline as Reported in FY2016 Annual Report	Current Status	Updated Completion Date
5-5	Green Infrastructure Case Studies and Demonstration Projects	Ongoing with case study updates to include monitoring/ performance information as available.	In progress	Ongoing
	Comment: Stakeholder and community engagement is conducted as part of the GSI design process. Information is disseminated through fact sheet and meeting invitation mailings, a series of public information and input meetings, groundbreaking ceremonies, dedication/ribbon cutting events, signage, and GSI tours. Local residents were also involved in planting, visual monitoring, and some maintenance activities. DWSD participated in the GSI Knowledge Mapping effort funded by the Erb Family Foundation that will allow Detroiters to exchange information on and locate GSI and other intentional vegetated projects around the city.			
5-6	Green Infrastructure Forum	Spring 2017, to share findings of Green Infrastructure Steering Committee vision/goal setting.	See comment	FY2018 GSI Forum – May 2018.
	Comment: DWSD outreach efforts to a broader stakeholder group continue to be provided through existing city forums, including the Erb Blue Green Infrastructure Workgroup and the City Council Green Task Force's Blue Green Subgroup, as well as the City Interdepartmental GSI Coordination Group. These groups meet on a regular basis and provide a forum for sharing current and anticipated GSI project information. DWSD participated in MDEQ's Great Lakes and St. Lawrence Green Infrastructure Conference, with numerous presentations on GSI projects. The content of these presentations was comparable to content that would be provided in a forum, and with a similar audience so no additional GSI forum was held. With the launch of Detroit's new Sustainability Office, the Interdepartmental GSI Coordination Group is a subcommittee that can finalize Detroit's GSI vision and goal setting and host a city-focused GSI forum.			
5-7	Stakeholder Involvement and Education Strategy	Ongoing updates and modifications to drainage charge and green credit strategy, project specifications-strategies, and overarching education strategy.	Ongoing	FY2018 updates reflect new DWSD goals, priorities, and processes for outreach.
	Comment: Project-level strategies coordinated with DWSD Public Affairs team and Stormwater Management Group manager. Additional coordination with Mayor's office communications staff for GSI projects involving other city departments.			
5-8	Overarching Green Infrastructure Educational Campaign	Ongoing, see comment.	See comment	Ongoing
	Comment: DWSD continues to coordinate with a variety of partners, including those who participate in the Erb coordinated Blue/Green Infrastructure group and other City departments and agencies. DWSD worked with Erb Family Foundation to produce a Detroit-focused GSI video that celebrates the GSI implementation work currently happening across the city and the vision to do more. Originally anticipated activities associated with logo development and participation in website/mapping effort were performed.			

Additional information for major activities is provided in the following sections.

ACTIVITY 1 - POLICIES, PROCEDURES AND STANDARDS

Institutional processes that are put in place by DWSD and the City of Detroit will drive implementation of green stormwater infrastructure on parcels and private property in the long term. Within the URT area, approximately 70 percent of the land area is made up of parcels and 63 percent of the total impervious area is located on parcels. Managing flow from these parcels is directly related to the institutional processes that are in development.

Significant efforts occurred relative to activities 1-1 and 1-3, which are discussed below.

Activity 1-1 Codes and Ordinance

In the previous fiscal year (FY2015), DWSD completed a review of existing codes and ordinances and presented findings in a workshop of City departments. As a result of the review, DWSD began the process of developing the draft post-construction stormwater management ordinance in cooperation with the Technical Advisory Committee (TAC) that was formed with DWSD and other city departments. During FY2016, The Nature Conservancy (TNC) conducted an options analysis to see which alternate compliance mechanisms (e.g., off-site mitigation, payment-in-lieu) might be appropriate and beneficial for the City of Detroit and evaluated the impacts to developers who will be regulated by the new rules. The options analysis was completed in July 2016.

During the winter of 2016 and the spring of 2017, TNC and DWSD met numerous times to determine how off-site mitigation will be implemented in the City. These implementation options will be presented to the TAC and the stakeholders in fall 2017. The draft ordinance will then be updated to include the alternative compliance implementation options and presented to the City Planning Commission for review. The City Planning Commission will need to approve the required changes to the city's zoning ordinance which relate to ordinance implementation. The zoning ordinance changes and the post construction stormwater ordinance will then be submitted to the City Council.

Simultaneous to the post-construction stormwater ordinance effort, the City initiated the effort to "green the code", making implementation of GSI practices more feasible and accepted for property owners. The proposed code revisions were presented to stakeholders on July 21, 2016, for input. On April 6, 2017, the City Planning Commission approved the code updates and included them in a general text amendment which will go to City Council for review and approval in September 2017.

Table 4 highlights the TAC meetings held in FY2017, both web-based and in person, intended to address issues related to the post-construction stormwater ordinance and the greening of Detroit's municipal code.

Table 4 Significant Codes and Ordinance Meetings

Date	Representatives	Purpose
July 22, 2016; August 1, 2016; October 21, 2016; November 28, 2016; April 26, 2017	DWSD, Tetra Tech, TNC	Alternative Compliance
October 20, 2016; March 2, 2017; April 6, 2017	DWSD, Tetra Tech, Crossroads Consulting, Detroit City Planning Commission	Greening of the Code
July 20, 2016; September 12, 2016	DWSD, Tetra Tech	Site Plan Review Process for Private GSI Projects
July 25, 2016; October 24, 2016	DWSD, BSEED, Tetra Tech	Technical Advisory Committee Post Construction SW Ordinance

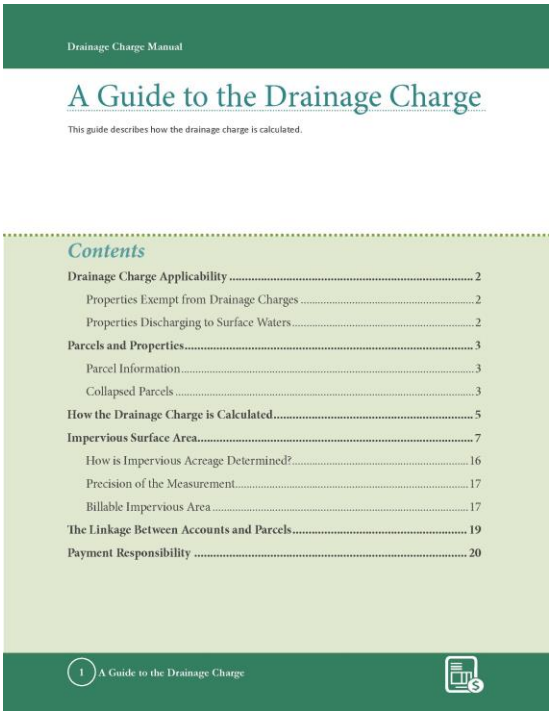
Activity 1-3 Drainage Charge Credit System

DWSD funds wet weather related costs (e.g., CSO control, treatment of wet weather flows at the treatment plant) through a drainage charge. DWSD began implementation of the updated drainage charge program which includes a phased schedule of bill changes that began in July 2016 and is continuing through July 2018. Activities

for FY2017 revolved around rate payer outreach to communicate the drainage charge program phasing by rate payer property class, as well as completion of and communication about the drainage charge credit program manual.

Starting in the summer of 2016, DWSD rate payers were notified of planned changes to the drainage charge portion of their bills. Workshops were conducted for non-residential customers to communicate the change. Workshops in October 2016 included an "Engineer's Workshop" to educate consultants on the credit system to provide support for customers preparing to apply for credits. Focus workshops were set up for sectors of the non-residential customers to address their specific concerns. This included "faith-based" organizations and small commercial business owners such as gas stations. In February and March of 2017, industrial property owners were transitioned to the impervious area billing. Drainage charge program and credit workshops continue on a monthly basis as part of the ongoing public outreach about the drainage charge program.

Figure 5 Drainage Charge System and Credit Manual



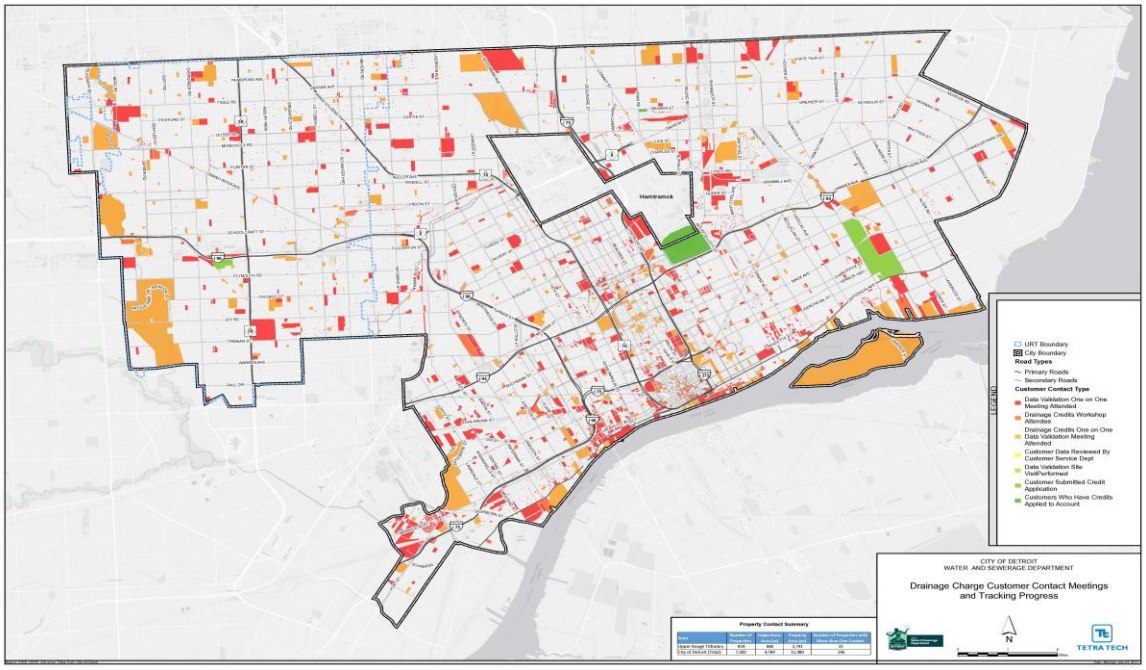
A drainage charge system and credit manual was completed in FY2017 and published on DWSD's website in October 2016. The manual provides information on the drainage charge system, drainage charge rates, and encourages implementation of green stormwater infrastructure and other stormwater management practices on parcels. Besides workshops, individual customer meetings were set up to validate property billing data and to review property/sites of interested customers for potential stormwater practices as a method to reduce the drainage charge. As a result of these individual customer meetings, DWSD has had personal contact with owners of nearly 7,500 parcels in the city (See Figure 6 below). Of this area, 4,784 acres are impervious, which is approximately 10% of the total impervious acreage in the City. The total parcel impervious area in the City is 39.8 square miles, so this represents almost 19% of parcel impervious acreage.

In addition to external education and outreach, a substantial effort was focused on customer support and drainage charge system training of DWSD personnel. Processes were defined for various scenarios and a tracking system was implemented to track customer's concerns and progress. Additional information regarding this education effort is discussed under Activity 5-4, Green Credit Training Workshops.

Table 5 Property Contact Summary

Area	Number of Properties	Impervious Area (ac)	Property Area (ac)	Number of Properties with more than one Contact
Upper Rouge Tributary	**834**	**660**	**2,741**	**31**
City of Detroit (Total)	**7,582**	**4,784**	**11,980**	**146**

Figure 6 Drainage Charge Customer Contact Meetings and Progress Tracking



ACTIVITY 2 – PROTOTYPE PROJECTS

Activity 2-1 Small Scale Greening: Ecological Restoration of Demolition Sites

In FY2016, DWSD, in cooperation with the Detroit Land Bank Authority (DLBA) and the University of Michigan Water Center, completed construction of four bioretention practices on eight cleared residential lots within the URT to help manage local road runoff.

Activities in FY2017 focused on post-construction monitoring of the constructed practices. The first round of monitoring was conducted from June through November 2016. DWSD monitored the green infrastructure practices to compare the estimated performance with the measured (actual) performance for volume and peak flow reduction. Table 6 presents the project summary information and volumetric performance based on the monitoring data. Results of the monitoring efforts are discussed in further detail under Activity 4-1, GSI Monitoring Program. Concurrently, the University of Michigan Water Center evaluated social and water quality impacts resulting from these practices.

A second round of monitoring began in May 2017 and is scheduled to continue through October 2017. The goal of this round of monitoring is to quantify the extent of flow migration from the GSI practice to the local combined sewer through soil/groundwater pathways.

Design modifications were completed for two of the four sites that include installation of a trench drain that will allow for the capture of stormwater runoff from the opposite side of the road. The modifications will also include the installation of anti-seep collars. The anti-seep collars will help prevent infiltration and inflow back into the combined sewer system. DWSD completed the final design in June 2017 and advertised for construction bids starting June 7, 2017. The construction bid package included proposed work at Crowell Recreation Center as well as the Eco Site modifications. Six construction bids were received on July 5, 2017, ranging from $127,420 to 191,737 for the Eco site modification portion of the project. DWSD recommended award to a Contractor to the Board of Water Commissioners for consideration at the July 2017 meeting. Construction is anticipated to begin in late August 2017 with substantial completion expected by December 2017.

Figure 8 shows the location of the four original sites and indicates which two of the four are planned for expanded drainage area. Figure 7 shows a photo of the Evergreen site in May 2017.

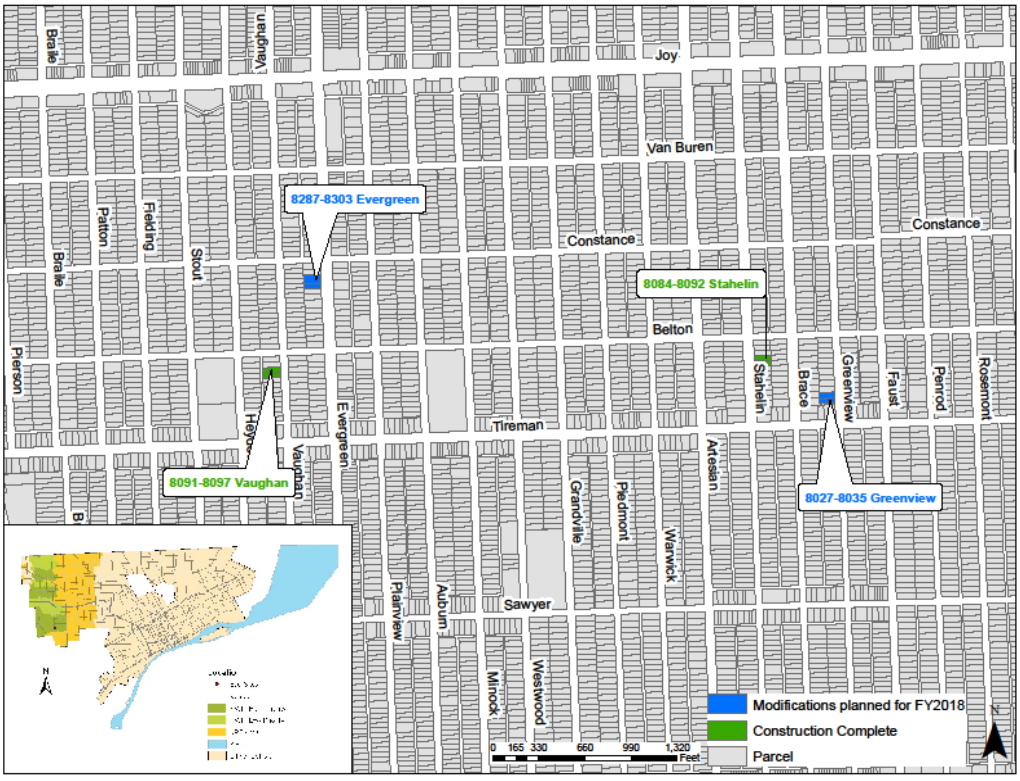
Table 6 Vacant Lot GSI Design Project Cost and Performance

Lot Address	Total Construction Cost	Cost Effectiveness ($/gal)	Total Tributary DA (Acres)	2-yr Volume Managed (MG)	Performance (MG)[2]	% of 2-Year Design Storm	Annual Volume (MG)[2]	Status
8287-8303 Evergreen	$150,781	$6.28	0.72	0.024	Retain: 0.024 Detain: 0	100%	Retain: 0.14 Detain: 0.19	Constructed summer/fall 2016
8091-8097 Vaughan	$190,429 [1]	$5.28	1.01	0.036	Retain: 0.036* Detain: 0	100%	Retain: 0.44* Detain: 0.2	Constructed summer/fall 2016. Bids received for Modifications July 2017. Construction anticipated for August 2017.
8084-8092 Stahelin	$204,536 [1]	$4.64	1.12	0.044	Retain: 0.044* Detain: 0	100%	Retain: 0.37* Detain: 0.25	Constructed summer/fall 2016. Bids received for Modifications July 2017. Construction anticipated for August 2017.
8027-8035 Greenview	$122,269	$8.73	0.46	0.014	Retain: 0.014 Detain: 0	100%	Retain: 0.05 Detain: 0.16	Constructed summer/fall 2016
Vacant Lot GSI	$900,000	TBD	TBD	TBD	TBD	TBD	TBD	Concept Design
Quantity of Measured Runoff Reduction (MG)					**Retain: 0.12 Detain: 0**		**Retain: 1.0 Detain: 0.8**	

1 – Includes construction cost of original design plus engineer's opinion of probable construction cost for modifications for 2017 construction project.
2 – Based on actual performance monitoring data (June – October 2016). Detailed results of the monitoring are discussed under Activity 4-2.
* indicates an estimated value based on the expectation that more runoff will be diverted into the garden following the construction of the Eco Site modifications and less water will inflow back into the sewer system once the anti seep collar is installed. Annual runoff to the practice is currently a proxy for annual volume detention: estimates may be refined in the future. This is an estimate and will be checked as part of the monitoring program in FY2018.

Figure 7 Vacant Lot Bioretention on Evergreen Street - May 2017

Figure 8 Ecological Design Project Locations



Additional work activities associated with vacant lot greening in FY2017 included selection of additional vacant lots that will be utilized for neighborhood bioretention. This effort is discussed under Activity 2-2, Vacant Lot GSI Projects.

Vacant Lot GSI

Project Identification

This project includes the implementation of additional vacant lot GSI projects throughout the URT. Each site will be used to capture runoff from the street. Both sides of the street will be captured in these systems. An analysis was completed within the URT boundary to identify potential locations to implement the GSI practices. The analysis included a GIS desktop exercise followed by a review of the sites in the field. The desktop exercise used the following primary criteria:

- Parcels currently owned by Detroit Land Bank Authority (DLBA)[a] or another public entity
- Parcels consisting of two or more vacant adjacent parcels within the URT tributary area
- Nearest catch basin located within 30 feet of the lot border
- Parcels located within the identified priority areas in the URT
- Parcels located outside of high vacancy zones as designated by Detroit Future City data
- Surrounding conditions were rated via Google Earth and verified by field inspection; conditions should be rated good or moderate to proceed

The field review was conducted at the sites that met the primary criteria listed above. During the field visit, teams reviewed the site conditions including verification of distance to nearby catch basins, major features left on the site, overall neighborhood condition, and condition of road and sidewalk that could be impacted by construction. After the site windshield survey, sixteen sites were identified as feasible candidates for future vacant lot bioretention. Details about the future efforts planned for FY2018 are included in Section 5.0, Activity 2-1.

Project Partners

The primary project partner is the DLBA. Other partners include community groups and the University of Michigan Water Center.

Project Description

The sixteen potential sites are shown in Figure 9. As project scoping is completed, it is expected that the number of locations will be reduced. Standard design templates will be customized for each site based on tributary area and site specifics. Template designs include the following:

- Bioretention similar to the existing vacant lot bioretention projects, but with some modifications
- Bioretention with turf grass vegetation only
- Tree moat
- Subsurface storage (shown in Figure 10)

Project Performance

Performance goal for these projects will be to retain the 90th percentile rainfall event and detain the 2-year event. These performance goals will be reviewed for each site based on site constraints (e.g. parcel size and soils) and tributary drainage area.

Cost

The proposed overall expenditure for the vacant lot bioretention is approximately $900,000. The cost per site will vary based on the selected template and site specific drainage area and design elements. The final number of locations to be included in the design will be determined at the conceptual design phase. Design and bidding of the vacant lot GSI projects will occur in FY2018.

Project Schedule

Design and bidding of the vacant lots GSI projects will occur in FY2018.

Figure 9 Selected Locations for Vacant Lot GSI

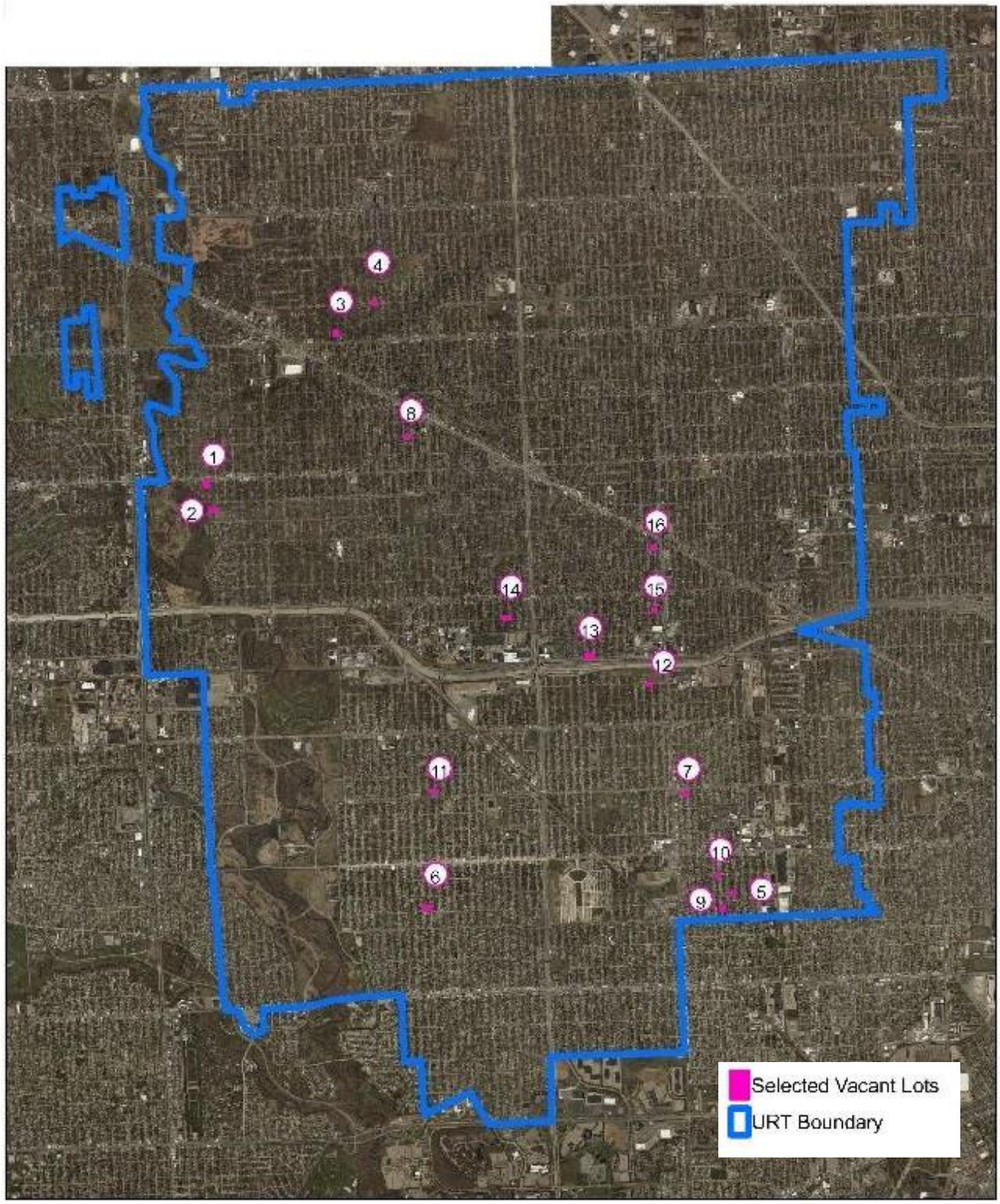
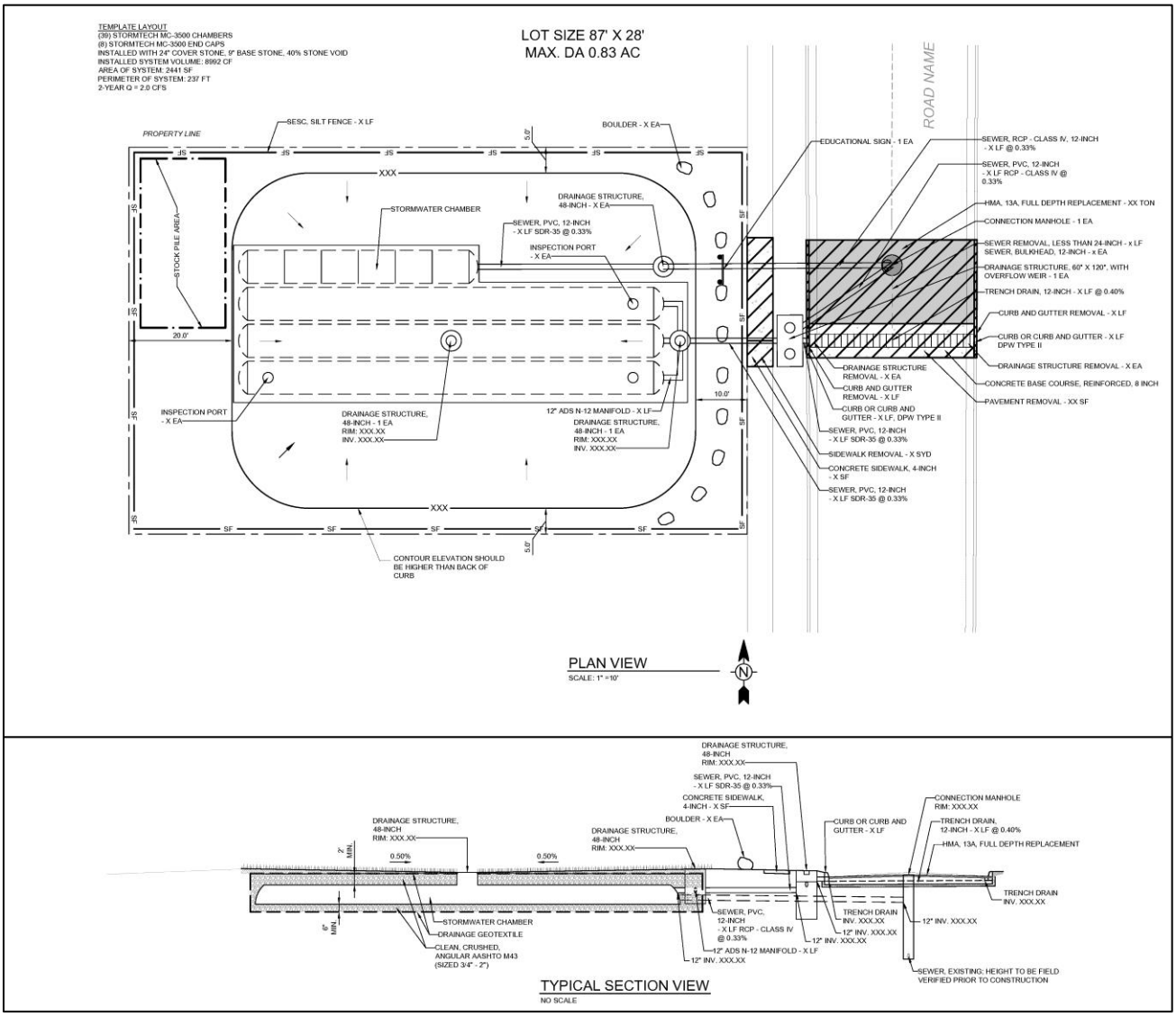


Figure 10 Subsurface Storage Design Template



Activity 2-2 Large Scale Greening

Large scale greening projects are intentional neighborhood scale stormwater management efforts. These projects will use a mix of small scale practices, such as bioretention or green streets along with storm sewer construction and regional stormwater management practices. They will be used to reduce stormwater volume and flow rate into the combined sewer system, improve drainage, help protect properties against basement backup, and provide aesthetic improvements to neighborhoods.

In FY2017, DWSD identified a series of projects that could be implemented in future years and would accomplish the required $50 million in GSI implementation. DWSD has identified projects for near term design and implementation (FY2018 and FY2019). Because of neighborhood stability concerns in the URT, and concurrent planning efforts, DWSD is not committing to specific projects beyond FY2019. Additionally, DWSD is retaining flexibility in the program to include projects that have not yet been identified.

In FY2017, DWSD worked to identify priority locations for GSI implementation (see activity 4-2). This prioritization will be updated when the West Side Model is complete. DWSD is collaborating with PDD and HRD as they conclude work on the Northwest/Grand River planning study. This study will help to identify GSI implementation priorities within the study area.

The following large scale greening projects are in various stages of conceptual and detailed design. Specific information associated with these project locations is presented below. Locations and potential drainage areas for these are shown in Figure 11.

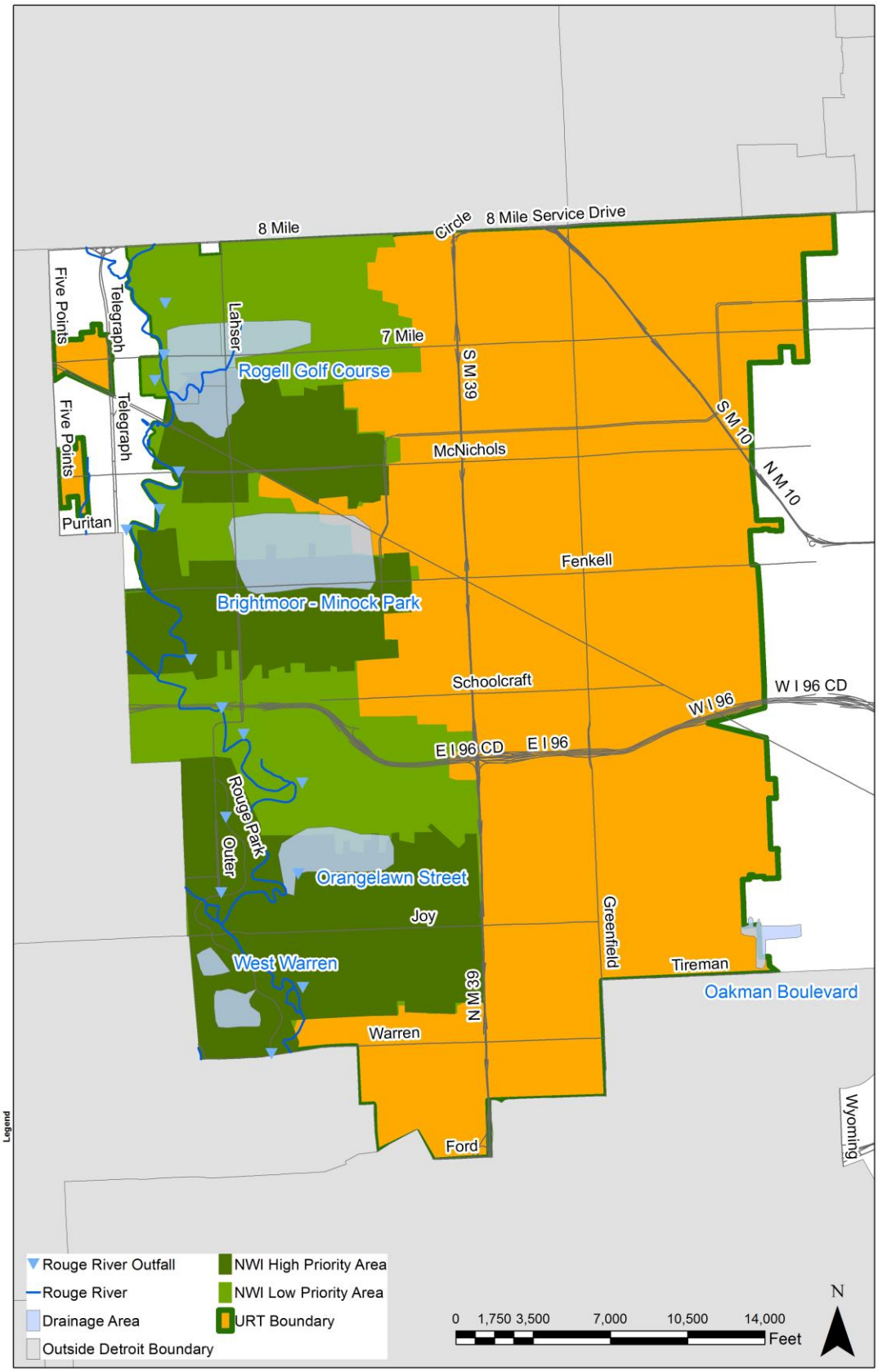
- Oakman Boulevard
- Orangelawn Street
- West Warren Project Area (previously reported as Constance Phase II and Tireman Phase III)
- Rogell Regional Stormwater Practice
- Brightmoor-Minock Park Project Area

Table 7 Large Scale Greening Project Summary

Project Name	Location	Acres Managed	Estimated Construction Cost	2-year, 24-hour Cost Effectiveness ($/gal)	2-yr Volume Managed (MG)	2-year, 24-hour Design Storm Performance (MG)[1]	% of 2-Year Design Storm	Annual Volume Removed (MG)[2]	Status
Oakman Boulevard	URT	63.0	$6,170,000	$9.49	1.75	Retain: 0.65 Detain: 1.32	49%	Retain: 11.7 Detain: 25.6	60% design complete
Orangelawn Street	NWI	96.3	$8,300,000	$2.66	3.67	Retain: 3.11 Detain: 0.56	97%	Retain: 40.2 Detain: 8.54	Concept design
West Warren[3]	NWI	44.9	$4,900,000	$2.75	1.78	Retain: 1.78 Detain: 0	100%	Retain: 12.6 Detain: 0	Concept design
Rogell	NWI	349.9	$20,000,000	$1.64	12.17	Retain: 12.17 Detain: 0	100%	Retain: 140. Detain: 0	Concept design
Minock Park	NWI	133				TBD		TBD	Exploratory phase
Estimate of Runoff Reduction (MG)						**Retain: 17.93** **Detain: 1.48**		**Retain: 204.9** **Detain: 34.1**	

1 – Based on retained volume of 2-year design event
2 – Annual runoff to the practice is currently a proxy for annual volume detention: estimates may be refined in the future.
3 - West Warren project area includes Constance Phase II and Tireman Phase III

Figure 11 Large Scale Greening/Neighborhood Scale Opportunities



Oakman Boulevard

Project Identification

Oakman Boulevard is located in the Aviation neighborhood on the southeast corner of the URT. This subdivision experienced extensive basement backup during the August 2014 flooding event. Oakman Boulevard crosses through the neighborhood and provides an opportunity to manage stormwater runoff within the subdivision to improve the level of service provided by the neighborhood sewer system. This is a neighborhood scale project.

Selected Project Description

The proposed project includes stormwater management in the medians of Oakman Boulevard. The central medians have a consistent width of approximately 50 feet that can accommodate both surface and subsurface practices. The project is intended to reduce the direct connection of stormwater flows to local combined sewers and provide both retention and detention management of stormwater. The proposed work includes routing runoff from areas tributary to the median to underground storage practices while treating surface runoff with bioretention. The underground practices will convey overflow runoff to two primary trunk sewers. The landscape design of the medians is being coordinated with the local residents and is intended to upgrade the local aesthetic condition of these medians. The contract will include local water main work to limit disruption to the residents and will also allow for resurfacing of the local streets in partnership with DPW. The project area has a total tributary area of approximately 63 acres. The project location and tributary areas are shown in Figure 12.

Project Performance

The performance of the project will vary for specific locations based on available space. The overall constructed volume for stormwater management provided in the practices is approximately 1.75 MG. Final volumes will be determined as final grading plans are developed. Soil conditions allow limited infiltration. Detention in the practices is provided based on space available. Detention capacity is between a one year and ten year volume.

Cost

At the 60% design phase, the opinion of probable construction cost of this project is approximately $6,170,000. This does not include the water main or street resurfacing outside of the direct project impacts.

Project Status and Schedule

Work in FY2017 focused on further analysis and refinement of the design including a constructability review to improve storage volumes, elevations, and footprints, detailed review of conflicts with existing utilities, detailed hydrologic and hydraulic modeling of the GSI and associated storm sewers to define structure sizing, alignment, locations and elevations, and benefits of the project to the existing local combined sewer, along with additional field investigations. Five alternatives were evaluated during a design team workshop in November 2016. A community meeting was held in May 2017 about the Oakman Boulevard GSI project to get input on the current conceptual project design related to landscaping elements (see Figure below). As of the date of this report, the 60% design phase has been completed, and feedback from the May 2017 community meeting is being incorporated into the landscaping plans. Final design and bidding will occur in FY2018 for construction start spring 2018.

Figure 12 Oakman Boulevard, Selected Alternative Tributary Areas and Practice Footprints

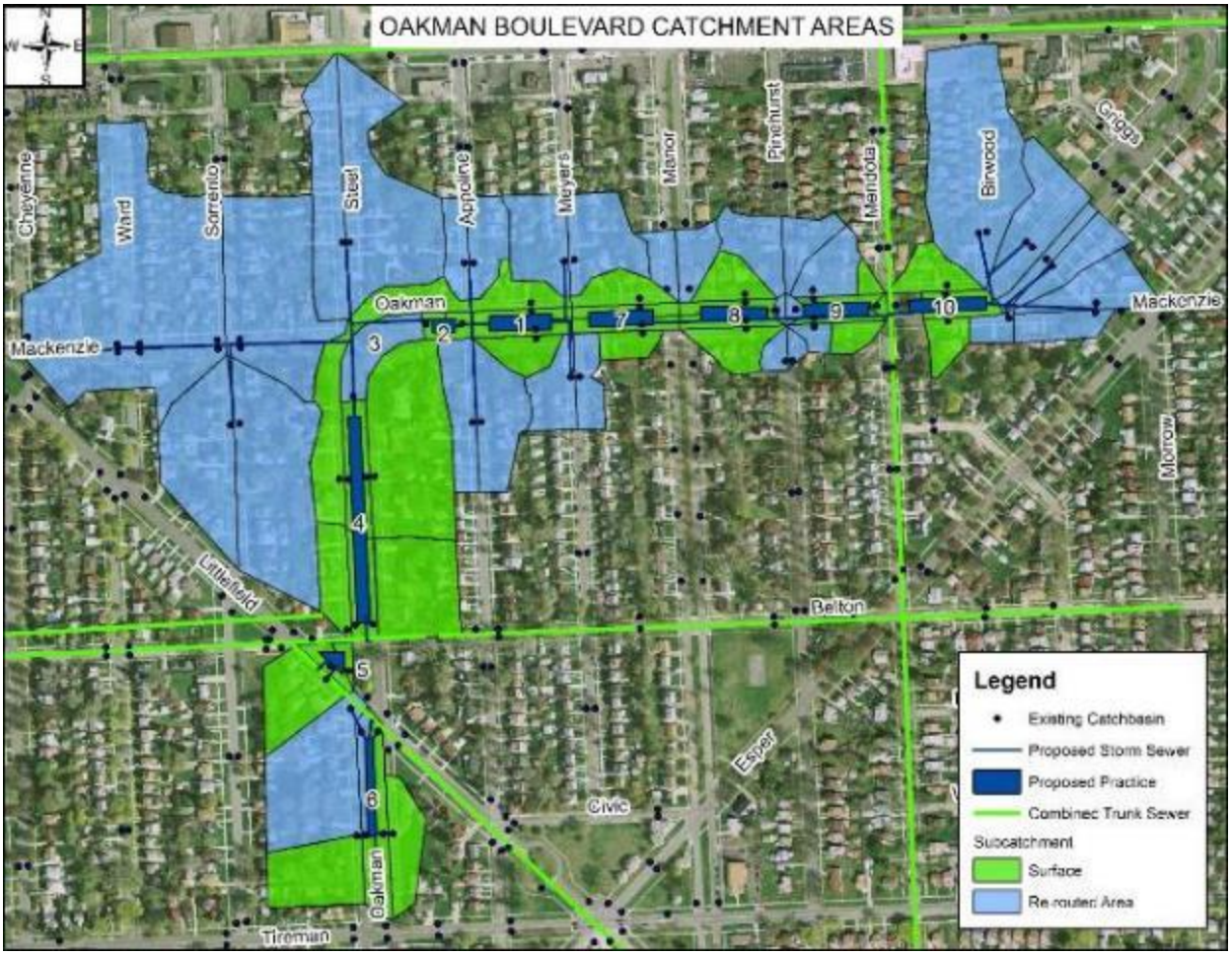


Figure 13 Oakman Boulevard Conceptual Landscape Rendering

Orangelawn Street

Project Identification

The project area is located immediately east of Rouge Park between Plymouth Road and West Chicago. The project area centers on Orangelawn Street from Brace St to Burt Road, which borders Rouge Park. The right-of-way (ROW) located along Orangelawn from Burt to Fielding and Vaughan to Westwood is approximately 150 feet wide and provides abundant space for managing stormwater using bioretention. There are several large-diameter trees located inside the ROW between Burt and Fielding, while the ROW between Vaughan and Westwood consist primarily of grassed areas. The project area is surrounded by well-maintained residential lots with various sizes from 1/10-acre to 1/4-acre with the majority of lots located on Orangelawn being larger in size. Existing residential buildings in the project area are typically in good condition and well kept. The total tributary area within the project boundary is approximately 96 acres, which includes approximately 20 acres that could be managed from a non-residential site northeast of Elmira.

The area was selected for a GSI project for multiple reasons including:

- Designated high priority outfalls in NPDES permit.
- Stable neighborhood impacted by basement backups in the August 2014 event.
- Proximity to Rouge Park and the Rouge River allowing for separation of stormwater and implementation of large scale GSI practice in the park.
- Wide right-of-way that provides opportunity for implementation of bioretention and neighborhood beautification.

Selected Project Description

The selected project consists of a combination of storm sewer separation, bioretention, and a large stormwater management practice. It includes storm sewers along Orangelawn, Elmira and Burt that would intercept existing storm sewers and provide an outlet for a large non-residential property near Plymouth Road. Collected stormwater would be managed in a regional practice in Rouge Park prior to discharge to the Rouge River. The current concept assumes that the regional practice would discharge to the West Chicago outfall.

Runoff east of Evergreen Street along Orangelawn Street will be captured in local bioretention practices in the Orangelawn right-of-way between Evergreen Street and Minock Street. These practices will also collect surface and side street runoff, and will be designed to manage the 2-year, 24-hour storm event with a mix of retention and detention.

A bioretention practice is also proposed at the northwest corner of Evergreen Street and Elmira Street. Four DLBA parcels are located here, with two of the lots currently vacant. Additional area may be added in the future should either of the two existing homes on the northern parcels be demolished. This practice will receive stormwater runoff from Vaughn Street, as well as from Elmira Street. The practice will be designed to manage the 2-year, 24-hour storm event with a mix of retention and detention.

The project, as defined, includes four project segments, as shown on Figure 14. The segments and their projected costs are:

- Orangelawn west of Evergreen: storm separation and possible intersection bioretention practices, outletting to stormwater practice in Rouge Park. ($3.71M)
- Orangelawn east of Evergreen: bioretention in right-of-way areas to provide retention and detention, with discharge to West Chicago combined sewer. ($1.92M)
- Elmira, storm separation and possible intersection bioretention practices, outletting to stormwater practice in Rouge Park. ($2.03M)
- Vaughan Street, capture of stormwater runoff and manage in DLBA vacant lots on Evergreen, vacant lot bioretention. ($0.6M)

Project Performance

The sewer separation component of this project is expected to remove up to an estimated 2.96 MG of runoff from the combined sewer during a 2-year, 24-hour rain event. Additionally, the bioretention components are expected to infiltrate an estimated 0.15 MG of runoff during the 2-year, 24-hour rain event for a project total of 3.11 MG of stormwater removed from the sewer system during a 2-year, 24-hour storm event.

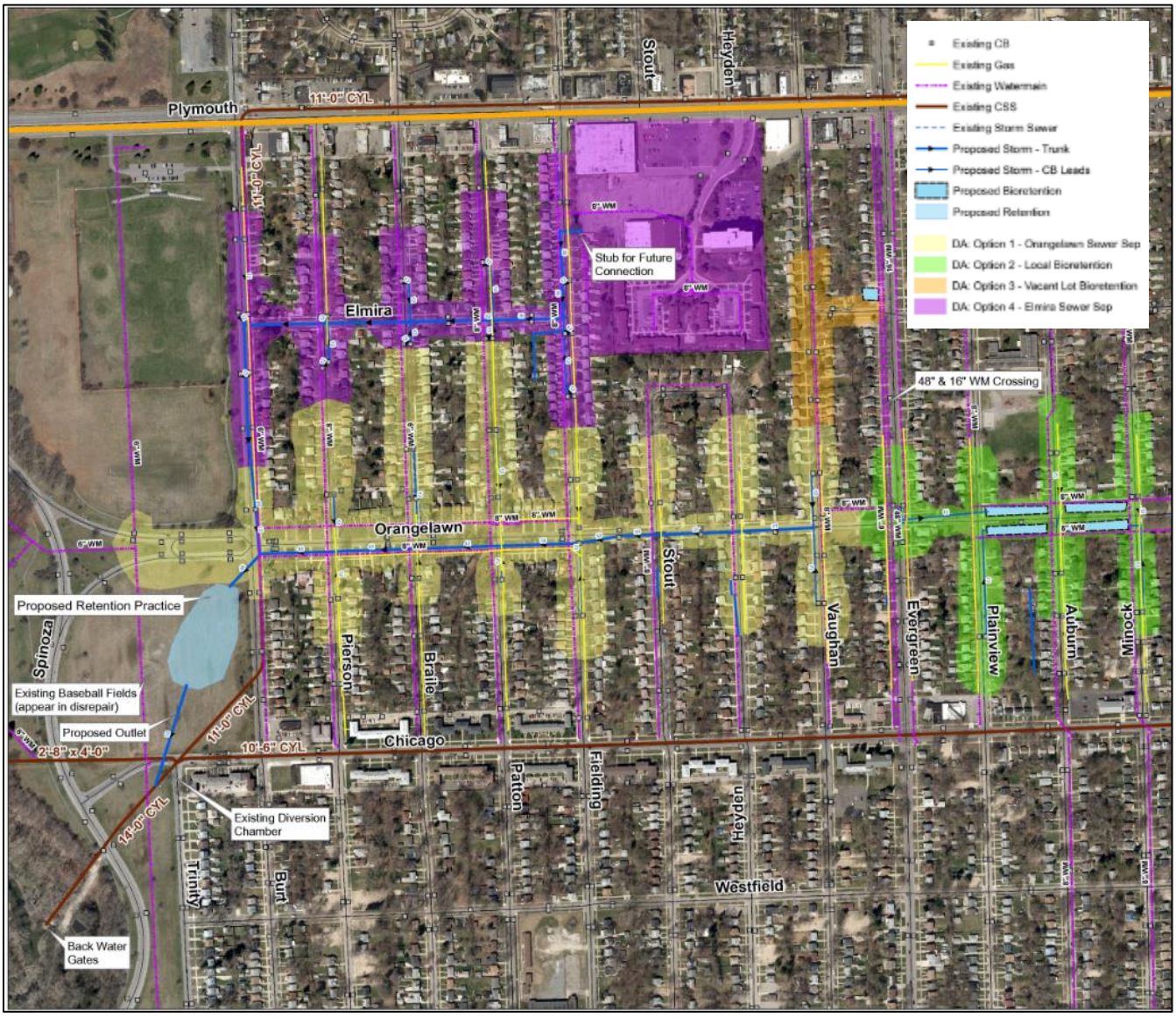
Cost

The conceptual opinion of probable cost (OPC) to manage the proposed 96 acres of tributary area is $8.3 million.

Project Status and Schedule

DWSD recently identified the potential phases of the Orangelawn Street project. Work to date has included: field survey, sewer system investigation, geotechnical evaluation, alternatives evaluation, preliminary cost development and performance assessment. The project is ready to move into discussion with Parks relative to the stormwater management practice and design of the early project phases. Design and bidding of one segment of the project is expected in FY2018.

Figure 14 Orangelawn Street Selected GSI Project Tributary Area and Practice Footprint



West Warren

The West Warren project area incorporates both the Tireman and Constance projects. Each are discussed separately below.

Project Identification

Tireman Phase III is the last of a three-phased design along Tireman Avenue west of the Rouge River, from Chatham to Outer Drive. Collectively the three phases of the Tireman project provide separation, bioswales, bioretention, water quality treatment and discharge to the Rouge River, permanently removing these flows from the combined sewer system.

Constance Phase II includes stormwater treatment in Rouge Park for the newly separated Constance area as well as potential additional separated areas. The two project phases include storm sewer and a stormwater practice element in the park.

Project Partners

Department of Public Works, Parks and Recreation, General Services Department, Friends of Rouge Park, Far West Side Neighborhood Association.

Project Description

Tireman Phase III includes additional sewer separation and construction of a stormwater outlet through Rouge Park. This final phase provides a discharge outlet from the existing bioretention practices directly to the Rouge River (versus dewatering to the combined sewer system). It also provides the opportunity to pick up other drainage areas along Sawyer and potentially Majestic. Opportunities for GSI elements along these streets will be evaluated. The outlet to the Rouge River is being evaluated as either piped flow, naturalized swale, with or without bioretention, or wetland elements. The final tributary area to this outlet continues under evaluation, with an estimated total of between 30 – 40 acres based on preliminary assessments.

Constance Phase II would similarly provide the outlet for the Constance storm sewer. It will route the separated storm sewer into an area of Rouge Park bounded by Joy Road to the north, Tireman Street to the south, Parkland Street to the west, and Outer Drive to the east. A large bioretention basin that is envisioned as both stormwater treatment and a park amenity will be constructed within the park to provide detention and water quality treatment. Additional tributary areas will also discharge to this stormwater practice. This practice will be incorporated into an existing prairie and trail system with native plantings, a bridge to link the trail across the practice and various opportunities for educational outreach will be designed with the input of neighborhood groups who routinely bring students to the park. See Figure 16 for a conceptual rendering of the proposed neighborhood wetland practice in Rouge Park. This particular rendering was selected by the community as the most favorable.

Project Performance

As these final phases of the design projects will convey flow directly to the Rouge River, 100% of the 2-year runoff volume for the area will be removed from the sewer system via sewer separation. Design criteria has not been finalized for the green stormwater infrastructure practice proposed within Rouge Park.

Cost

The conceptual opinions of probable construction cost for Tireman Phase III and Constance Phase II are $1,200,000 and $3,700,000 respectively adding to an overall project cost for this planned phase of $4,900,000.

Project Status and Schedule

Work to date has included: review of concept for the Constance outfall with Friends of Rouge Park. In addition, survey, geotechnical work (Constance), wetland mapping (Constance), sewer system investigation, and conceptual development is underway. The Constance practice design was delayed until after modifications to the Tireman Phase II project were well advanced.

DWSD is currently completing the conceptual design of the West Warren Project area and reviewing the overall impacts this project will have on the CSO system. Design of priority segments will be advanced in FY2018. Construction is expected to begin in FY2019.

Figure 15 West Warren Project Area Tributary Drainage Areas and GSI Practices

Figure 16 Concept Rendering of Constance Phase II in Rouge Park

Rogell Regional Stormwater Practice

Project Identification

The Rogell site is a former golf course that provides an opportunity for recreational and water management space. The Grand River/Northwest Planning Study has identified this site for potential recreation space. In addition, there is the potential for wetland mitigation on the property.

DWSD evaluated the potential tributary area that could be brought into the Rogell site, along with preliminary storm sewer routing and footprint and general location of stormwater practices. DWSD identified three potential drainage areas, north, east and south of the site where stormwater could be redirected to regional practices. These practices could include bioretention, ponds, or stormwater wetlands. The feasibility of any of these segments will be related to the status of the neighborhood

Project Partners

Planning and Development Department, Housing and Revitalization Department, Michigan Department of Transportation

Selected Project Description

The project concept includes sewer separation, potentially with local GSI practices, outletting to regional stormwater practice(s) in the Rogell site; see Figure 17. Each potential tributary area would likely function independently to take advantage of the topography in the site. The stormwater practices would outlet directly to the Rouge River, eliminating this area from the combined sewer tributary area. The project(s) would help alleviate local flooding and basement backup issues while creating an aesthetically pleasing, yet functional use of a significant green space.

Project Performance

Design criteria has not been finalized for the stormwater management practices proposed for the Rogell site. However, any stormwater directed to the practices would be completely removed from the combined sewer system. Volumes associated with all three segments of the Rogell project would within the abandoned golf course. However, preliminary drainage area delineation identified up to 350 acres of tributary area. Volume of runoff from the tributary area during a 2-year, 24-hour event is approximately 12.2 MG.

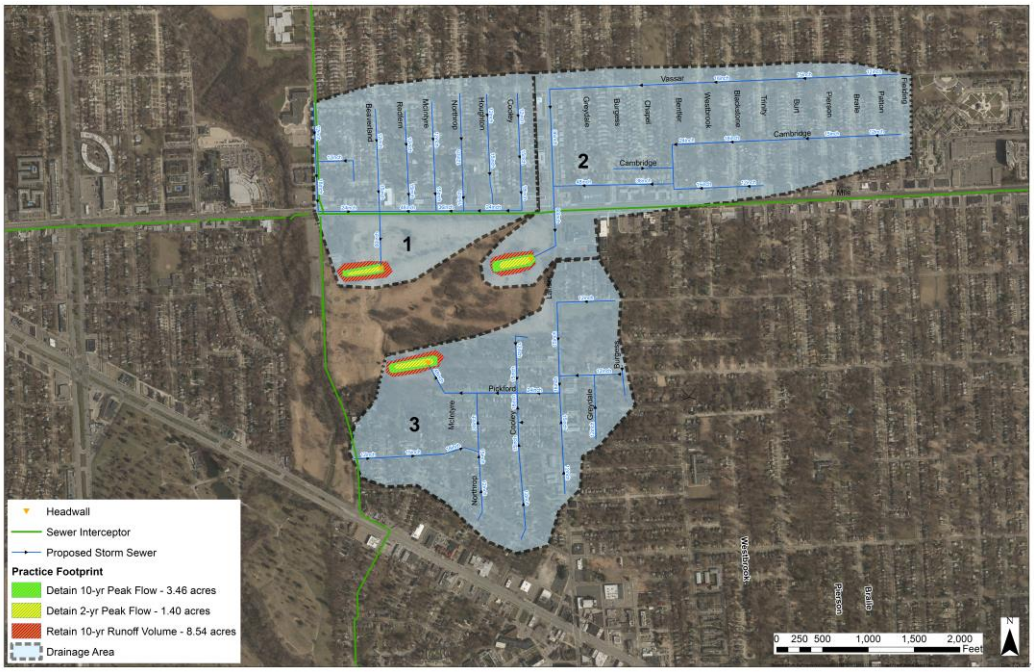
Cost

The planning-level cost for this project area is estimated at $20 million.

Project Schedule

In FY2018, DWSD expects to confirm the implementation plan including segments selected for implementation and timing.

Figure 17 Conceptual Tributary Area and Proposed GSI Practices in Rogell Golf Course



Exploratory Project Areas

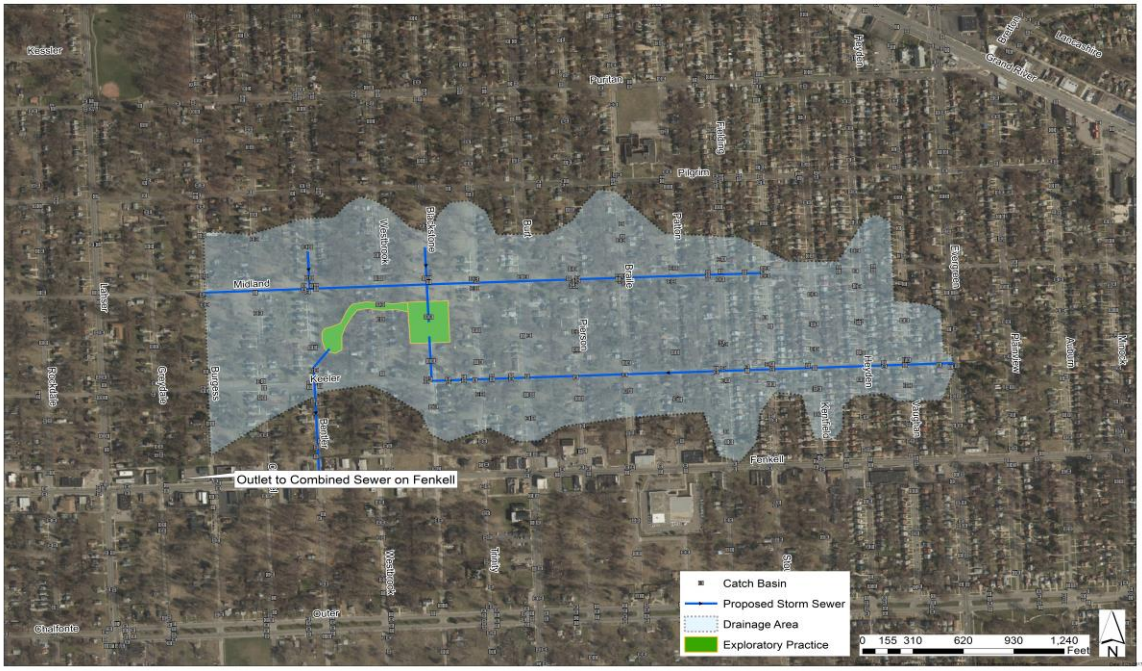
Several additional project locations are being explored as potential GSI project locations for future design. These locations are neighborhood scale projects that would incorporate a large stormwater management feature in a central location in the neighborhood to provide an amenity to the area. The various locations have been identified through several methods, including planning meetings with Detroit HRD and PDD, Brightmoor community partners, and current work being done by university scholars from the University of Michigan as part of the New-GI program that aims to study the effects of integrating social and environmental benefits into neighborhood stormwater infrastructure. The following are locations currently under review, which are discussed in further detail in Section 5 of this report:

- Minock Park/Brightmoor
- St. Martins Street through to Henry Ford High School
- Green Streets – City-wide discussions are underway to create green (and complete) streets throughout the city. The planning level details of this is being led by PDD and DPW. DWSD has an integrated role related to stormwater management evaluation and incorporation into the design of green streets. DWSD is currently reviewing various streets within the URT priority areas to effectively manage stormwater with street resurfacing and reconstruction projects.

Minock Park/Brightmoor

DWSD is currently evaluating a neighborhood scale GSI project in the Minock Park/ Brightmoor area. The project will be scheduled following completion of scoping efforts. Activities anticipated through FY2018 include project scoping, conceptual design and community outreach. The project provides opportunities for a large scale stormwater management practice and nature area in a highly vacated location along Blackstone Street. The site could be used to manage stormwater from the adjacent Minock Park subdivision. The project study area and potential stormwater management area are shown on Figure 18.

Figure 18 Minock/Brightmoor Project Locations



Activity 2-3 Public Facilities Flow Management

The focus in FY2017 was on advancing projects associated with Detroit Public Schools.

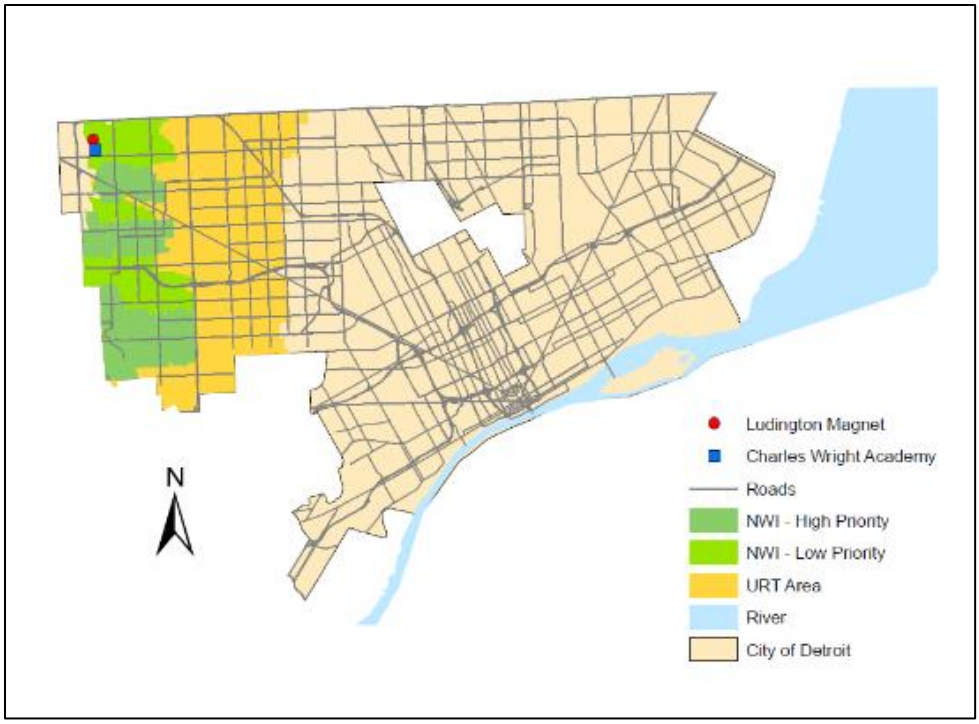
Charles Wright Academy/Ludington Magnet Middle School

Project Identification

Charles Wright Academy and Ludington Magnet Middle School are located in the URT immediately adjacent to the Rouge River. Ludington Magnet Middle School is located at 19501 Berg Road and is adjacent to the north of Charles Wright Academy at 19299 Berg Road. The schools are bounded by Seven Mile Road on the south, Berg Road on the east, Pembroke Avenue on the north and the Rouge River on the west. Figure 19 shows the location of the school properties within the City and URT project area.

The combined school property of Ludington Magnet Middle School and Charles Wright Academy consists of approximately 43 acres, of which 14 acres are impervious. Large grassy areas surround the school on all sides with heavily wooded areas on the southern and western property boundary.

Figure 19 Ludington Magnet Middle School and Charles Wright Academy Location Map



Project Partners

The primary project partner is the Detroit Public Schools.

Selected Project Description

The conceptual design includes four elements that consist of installation of several smaller rain garden systems and larger GSI practices that collect and manage stormwater from Charles Wright. Overflow from the GSI practices is conveyed to the Upper Rouge River through sheet flow. This completely removes stormwater runoff from Charles Wright from the combined sewer system. Stormwater management of Ludington Magnet Middle School was excluded from the current concept due to the fact that the vast majority of the runoff is currently conveyed to the CSO outfall downstream of the regulator, with the exception of two downspouts which discharge to grade on the front of the building. Therefore, that stormwater is not directly tributary to the WWTP or CSO regional facilities.

Element 1 includes the redirection of stormwater from the south part of the Charles Wright rooftop and adjacent parking areas, along with capturing runoff collected in the existing yard drains, and conveys the flows into the large GSI practice proposed on the south side of Charles Wright parking lot. Stormwater from this practice will overflow toward the Rouge River via overland flow. Element 2 consists of the large GSI practice between the two schools that includes an underground storage basin, a bioretention basin, and proposed storm sewers that collects runoff from the rooftop of Charles Wright. Element 3 and 4 consist of rain gardens between Charles Wright and Berg Road. These capture stormwater from the adjacent driveway at Charles Wright and would overflow into the proposed sewer that discharges into the large GSI practice between the two schools (element 2 practice).

Project Performance

The total stormwater storage capacity of these combined practices is 0.46 MG, with the 2-year, 24-hour storm event completely removed from the combined sewer system.

Cost

At the conceptual design phase, the opinion of probable construction cost of this project is $1,600,000.

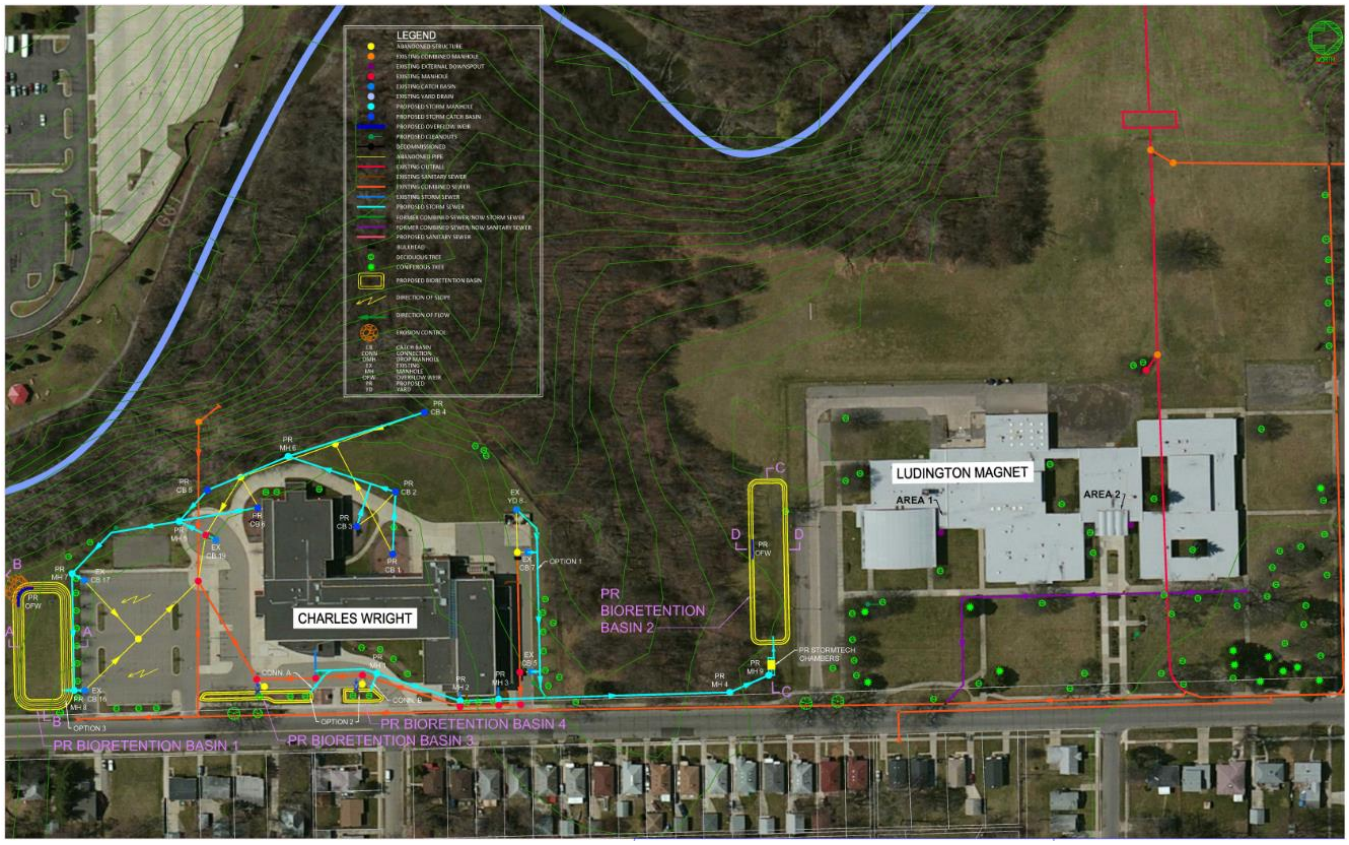
Project Status and Schedule

During FY2017, conceptual design for this project was completed based on a review of utility data, survey, soil borings, sewer system configuration, and input received from DPS during meetings held in 2016 and in March 2017 regarding the following project elements:

- Educational benefits
- GSI practices options
- Conservation of trees
- Maintenance obligations
- Permit requirements
- Construction schedule
- Cost

The reorganization of DPS into the DPSCD resulted in a delay in the implementation of the GSI at schools projects. In FY2018, DWSD and DPSCD will finalize a memorandum of understanding to move this project into preliminary design.

Figure 20 DPS Proposed GSI Practices



Activity 2-5 Municipal Parks Flow Management

Municipal parks provide an opportunity to manage not only runoff generated within the park, but also from adjacent roads and other impervious surfaces. Management of runoff generated on municipal park parcels is often accomplished by redirecting the impervious surfaces to open spaces within the park or reconstructing the paved surfaces as porous pavement. Additional stormwater from adjacent roads can sometimes be directed to

the public park in an effort to further manage stormwater that would otherwise flow directly into the combined sewer system.

In previous reporting periods, work related to this activity included a comprehensive analysis of all parks within the URT, and prioritization of the parks based on weighting factors. From the prioritized list, three parks were initially selected for GSI project implementation and construction began at one of the locations.

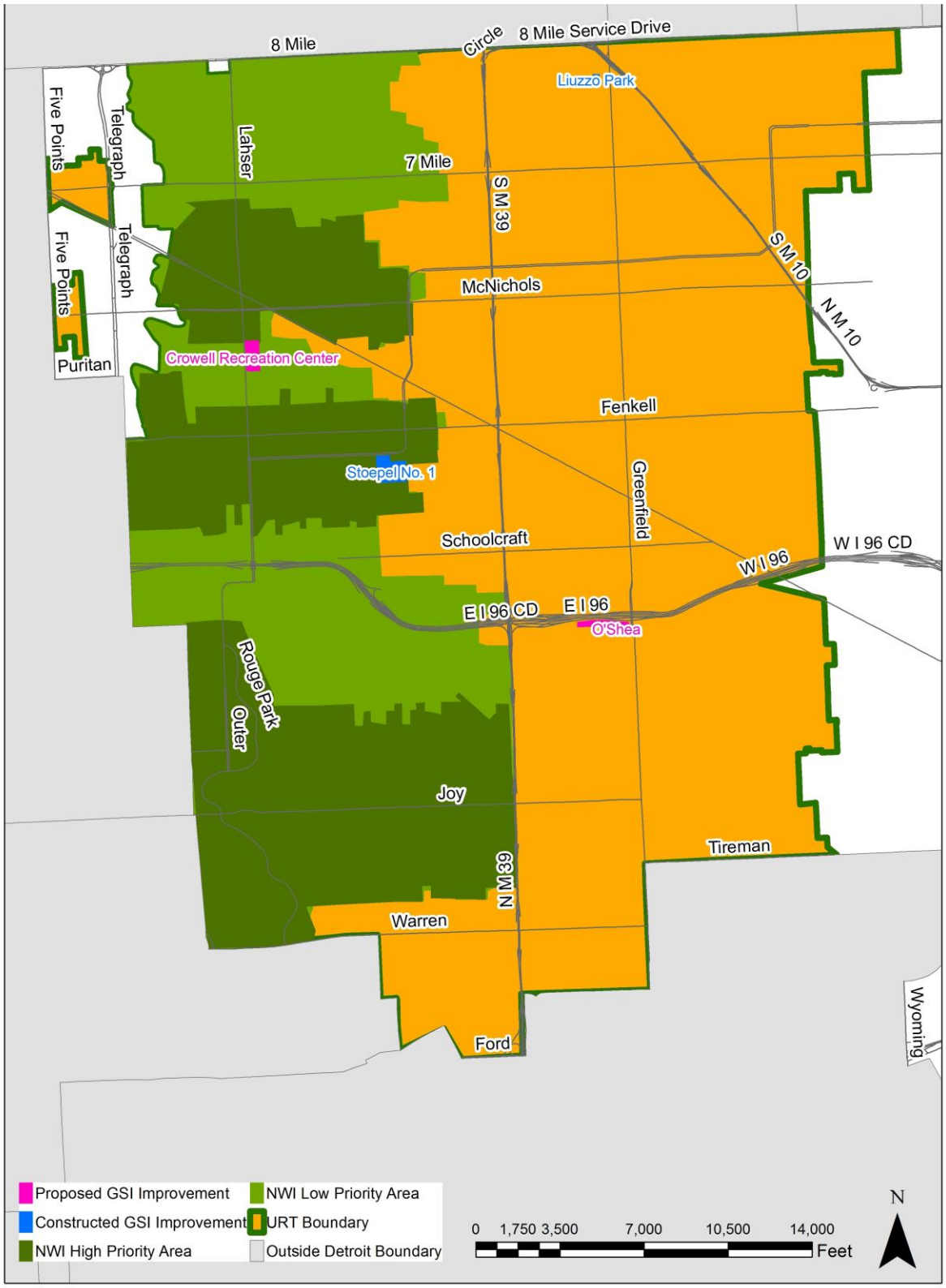
The focus in FY2017 was on advancing the projects previously selected for implementation and selection of additional park projects to move into design and implementation. Details about the selected park projects are included in the section below. Table 8 provides a summary of the parks DWSD has selected for GSI implementation, including practice information, construction cost and system benefits (volume reduction).

Table 8 Selected Parks for GSI Projects

Park Name	Total Construction Cost	2-year, 24-hour Cost Effectiveness ($/gal)	Total Tributary DA (acres)	2-yr Volume Managed (MG)	2-year, 24-hour Performance (MG)[1]	% of 2-Year Design Storm	Annual Volume Removed (MG)[2]	Status
Stoepel Park No. 1	$623,383	$6.92	6.43	0.09	Retain: 0.09 Detain:0.01	44%	Retain: 0.17 Detain: 1.86	Substantial Completion reached July 2017
Liuzzo Park	$459,222	$15.30	3.1	0.09	Retain: 0.03 Detain:0.06	33%	Retain: 0.28 Detain: 0.71	Substantial Completion anticipated October 2017
Crowell Recreation Center	$773,352	$8.59	2.48	0.09	Retain: 0.09 Detain: 0	100%	Retain: 0.32 Detain: 1.15	Awarded to Contractor
O'Shea Park	$443,000	$14.76	3.72	0.08	Retain: 0.03 Detain: 0.05	37%	Retain: 0.24 Detain: 1.35	90% Design Complete
Estimate of Runoff Reduction (MG)					**Retain: 0.24 Detain: 0.12**		**Retain: 1.01 Detain: 5.07**	

1. Performance is based on volume reduction during a 2-year, 24-hour storm event.
2. Annual runoff to the practice is currently a proxy for annual volume detention: estimates may be refined in the future.

Figure 21 Municipal Park GSI Project Locations



Stoepel Park No. 1

Stoepel Park No. 1 is approximately 30 acres in size, and is located within the northeast section of Detroit's Brightmoor Neighborhood within the designated URT priority area. The park provides baseball/softball amenities to the Rosedale Grandmont Little League nonprofit organization which serves roughly 400-800 youth participants annually.

The green stormwater infrastructure project includes two bioretention practices that manage the stormwater runoff generated from tributary areas along Westwood Street. The project also included removal of the existing paved parking lot and replacement with a permeable parking lot constructed of open-graded aggregate to reduce runoff from the parking area. The GSI project was awarded to WCI Contractors, and construction commenced in June 2016.

During FY2017, construction activities continued and were substantially complete at the end of November 2016. DWSD worked with the local community to conduct a planting event with nearby grade school children that allowed students an opportunity to learn about the project, and install the plants and mulch. Table 8 identifies the actual construction cost, total tributary area, and anticipated performance of the practices while Figure 22 shows the recently constructed GSI elements in the park. In addition, the park was one of three stops as part of a tour sponsored by the Great Lakes and St. Lawrence Green Infrastructure Conference in Detroit, which was held May 31-June 2, 2017. Outreach activities associated with this conference are discussed in more detail under Activity 5 – Stakeholder and Community Engagement.

Figure 22 Stoepel Park No. 1 Constructed Practices (Pictured from top left to bottom right: Porous Parking Lot, Trench Drain, and South and North Bioretention)

Liuzzo Park

In cooperation with the Office of the Mayor, the Parks and Recreation Department with support from the General Services Department, and the Viola Liuzzo Park Association, DWSD began construction in July 2016 of the three bioretention practices in Liuzzo Park to incorporate green stormwater infrastructure with the planned park improvements. The three bioretention practices capture stormwater runoff from the existing roads on the north and east sides of the park, as well as runoff from within the park. The GSI construction project was substantially complete in July 2017. Completion of remaining construction items will occur once the work is completed for the other park improvements under construction by a different contractor.

Figure 23 Liuzzo Park Bioretention

Table 8 identifies the location, actual construction cost, total tributary acres, and anticipated performance of the practices while Figure 23 shows the constructed bioretention in the northeast section of the park and Figure 24 displays the proposed educational sign to be installed at the bioretention gardens.

Figure 24 Proposed Educational Sign for Liuzzo Park GSI Project

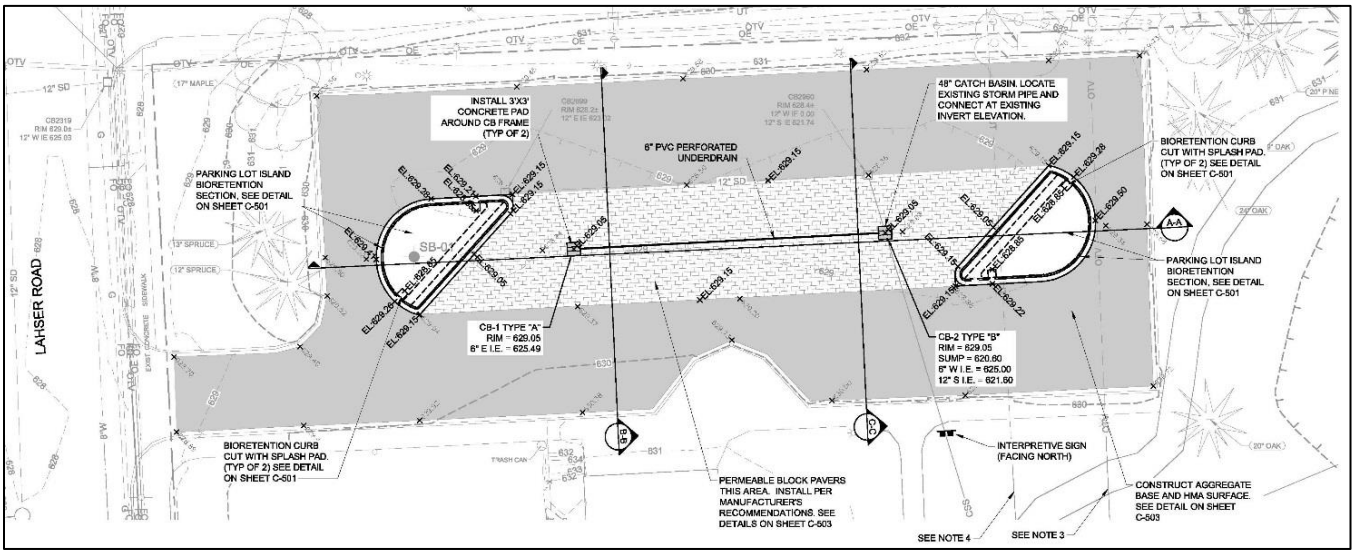
Crowell Recreation Center

Crowell Recreation Center and its surrounding park, Hope Playground, sits in the center of the Riverdale neighborhood and is surrounded primarily by single-family residential properties.

The green stormwater infrastructure project includes removal of two existing paved parking lots (north and south) and replacement of the center section of parking stalls with permeable block pavement and bioretention islands. Conventional HMA pavement will be laid for the remaining portions of the parking lot with new curb installed around the perimeter of the parking lot. Both parking lots will be regraded to allow the stormwater that is tributary to the parking lots to drain to the proposed permeable block pavement in the center of each parking lot. Additionally, each parking lot will have two endcap bioretention islands that will overflow to the permeable block pavement. Stormwater will enter the bioretention islands through curb cuts that are designed to capture roughly one quarter of the tributary area from the parking lot per island. The proposed GSI practices (see Figure 25) will capture stormwater from 2.48 acres, of which 1.35 acres are impervious, and provide storage volume for 84,000 gallons.

DWSD completed the final design in June 2017 and advertised for construction bids starting June 7, 2017. The construction package included Crowell Recreation Center as well as the Eco Site modifications. Six construction bids were received on July 5, 2017, ranging from $722,047 to $1,086,509 for the Crowell portion of the project. DWSD has awarded the contract. Construction is anticipated to begin in late August 2017 with substantial completion expected by December 2017.

Figure 25 Crowell Recreation Center Parking Lot (North) GSI Practice Design



O'Shea Park

O'Shea Park is a 20 acre park located just south of I-96 east of M-39. A complete park renovation is scheduled to take place in summer 2017 through the collective efforts of PDD, DWSD and DTE. The park renovation includes demolition of the abandoned recreation center on site and construction of the largest urban solar array at 9 acres, open park space, a basketball court, walking paths and an overlook for the solar array. DWSD collaborated with PDD to incorporate a stormwater management feature into the overall park improvements.

The proposed GSI practice (see Figure 26) consists of a surface bioretention practice at the corner of Rutherford Street and Capitol Street. Road runoff from Rutherford Street north of Capitol Street, the north side of Capitol Street between Forrer and Rutherford, and park areas including the parking lot will be conveyed to the bioretention practice via concrete inlets along the southern edge and a trench drain inlet on the west side. Based on results of the soil borings, the soils appear to be very poorly draining. As a result, the practice will be constructed with underdrains that will dewater the system and discharge back to the combined sewer. The practice was designed to retain the 90th percentile storm event (30,000 gallons) and is anticipated to retain 130,000 gallons of stormwater annually. Several public meetings have been held for this particular project;

DWSD participated in a public meeting in May 2017 to provide the community with an update of the proposed project and overall benefits. As part of the GSI monitoring effort, a camera will be installed at this location to generate time lapse footage of construction activities. This will allow designers to observe construction activities (e.g., sequencing, logistics) while providing residents with informational media that can be used in future outreach activities.

DWSD completed the 90% design phase in June 2017, which is calculated to manage 3.72 acres of tributary area with a constructed storage volume of 92,000 gallons. The opinion of probable construction cost at 90% is $443,000. DTE began construction of one of the largest urban solar arrays in the United States in January 2016. The park amenity project was advertised for bid with bids received in June 2017. Deconstruction of the recreation center along with construction of the planned park amenities is scheduled for summer 2017. The GSI elements of the park improvements are planned for bid advertisement in August 2017.

Figure 26 O'Shea Park Bioretention Improvement Rendering

Activity 2-6 Transportation Corridor Flow Management

Contract PW-6968 included the implementation of a series of GSI projects along four City of Detroit streets. Construction activities were ongoing through 2016 and construction was complete in early 2017. As of June 30, 2017, remaining work associated with the four street GSI projects includes minor construction related items. PW-6968 was bid through DPW, with GSI elements designed and funded by DWSD.

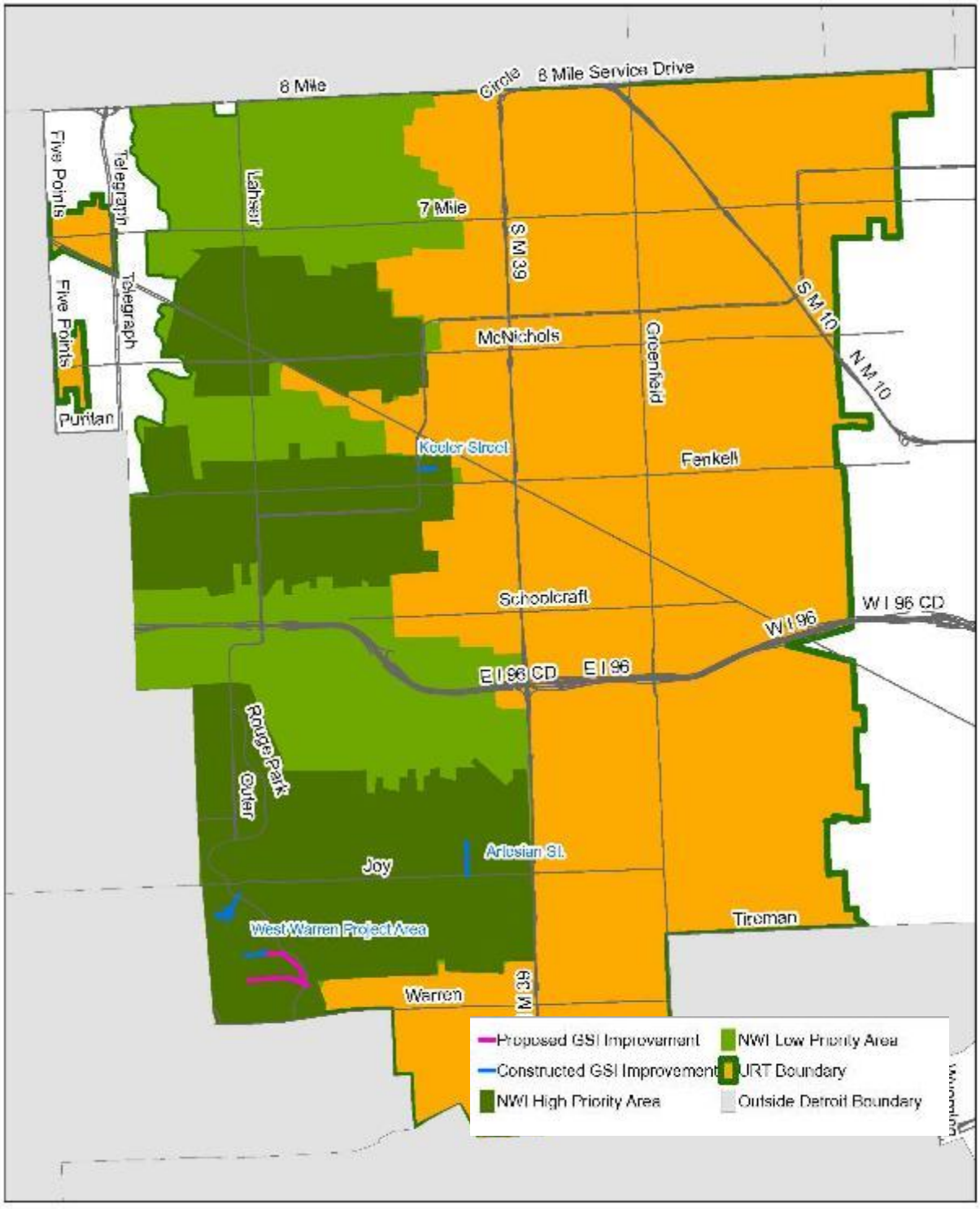
The GSI project locations are shown in Figure 27 and performance and cost information is shown in Table 9.

Table 9 Transportation Corridor Projects

Road Name	GSI Type	Total Construction Cost	2-year, 24-hour Design Storm Event Cost Effectiveness ($/gal)	Total Tributary DA (acres)	2-yr Volume Managed (MG)	2-year, 24-hour Performance (MG)[1]	% of 2 Year Design Storm	Annual Volume Retained (MG)[2]	Status
Artesian Street (Cathedral to Joy)	Porous asphalt	$447,000	$4.06	5.3	0.11	Retain: 0.06 Detain: 0.0	47%	Retain: 0.53 Detain: 3.31	PW6968; construction substantially complete 2016
Constance Street Phase I & II (Beaverland to Parkland)	Ph I: storm sewer	$487,000	$0.85	15.1	0.57	Retain: 0.57 Detain: 0	100%	Retain: 5.86 Detain: 0	Storm Sewer PW6968; construction substantially complete 2016;
	Ph II: retention in Rouge Park	$1,200,000	$2.44	12.4	0.49	Retain: 0.49 Detain: 0	100%	Retain: 5.30 Detain: 0	Phase II: GSI in Rouge Park; under design
Comment: This project includes construction of a storm sewer along Constance Street and a large surface storage feature within Rouge Park to discharge to an existing outfall to Bigelow Drain, tributary to Rouge River (Outfall R-17). The "retained" volume is the volume for the 2-year event that is removed from the combined system. The stormwater practice will provide attenuation of the peak flow from the 10-yr 1-hr event, will promote infiltration, will improve water quality and will provide an educational and aesthetic amenity in the park.									
Keeler Street (W. Outer Dr. to Piedmont)	Permeable Pavers	$279,000	$6.98	1.0	0.04	Retain: 0.04 Detain: 0	93%	Retain: 0.17 Detain: 0.5	PW6968; construction completed 2016
Tireman Avenue Phase I, II & III (Chatham to Outer Dr.)	Ph I: bioswales/sewer	$1,207,799	$60.38	6.48	0.02	Retain: 0.02 Detain: 0	7%	Retain: 0.11 Detain: 3.37	Phase I: Bioswales/ sewer; Bid PW6968; construction completed Spring 2016
	Ph II: bioswales in Rouge Park	$438,847	$3.13	3.05	0.17	Retain: 0.14 Detain: 0.03	87%	Retain: 0.58 Detain: 0.9	Phase II: Bioswales om Rouge Park; construction completed
	Ph III: conveyance to river	$3,700,000	$1.78	14.56	1.29	Retain: 1.29 Detain: 0	100%	Retain: 7.30 Detain: 0	Phase III: Sewer separation to Rouge River: in concept
Comment: This is Phase I and II of a three-phase project. Phase I and II include storm sewer and bioswales on Tireman. Phase III includes green infrastructure and an outfall to the Rouge River via Rouge Park. Phase III will also collect additional stormwater from Sawyer Street. Once Phase III is complete, approximately 1 MG of runoff will be removed from the combined sewer system for the 2-year, 24-hour event. (See discussion in large scale greening).									
Estimate of Runoff Reduction (MG)						**Retain: 2.61** **Detain: 0.03**		**Retain: 20.41** **Detain: 8.08**	

1 Performance is based on volume reduction during a 2-year, 24-hour storm event.
2 Annual runoff to the practice is currently a proxy for annual volume detention: estimates may be refined in the future.

Figure 27 Transportation Corridor Project Locations



Work in the transportation corridor projects included two types of permeable pavement: Porous asphalt on Artesian and permeable pavers on Keeler. Photos of completed practices are shown in Figure 28 and Figure 29. Artesian and Keeler were completed in spring 2017, with post-construction infiltration testing confirming a rate of approximately 725 inches per hour for the permeable block pavers. Maintenance of this practice will be crucial moving forward, as there are opportunities for debris to collect and inhibit intended performance. Regular

maintenance activities will be performed by DWSD, or its contractor, to ensure that the system's performance is maintained; these activities include vacuuming dirt, grass and other debris from joints and replacing cracked pavers.

Figure 28 Artesian Street Porous Asphalt

Figure 29 Keeler Street Permeable Pavers

Constance Street storm sewer work allows for collection of stormwater in Rouge Park, into the proposed bioretention/ wetland area currently being designed. Figure 30 shows the completed roadwork restoration for the Constance Street storm sewer.

Figure 30 Road Restoration for Constance Storm Sewer

Tireman Phase I is also a component of PW6968. This phase consists of bioswales along the green space between the road and sidewalk that captures road runoff from Tireman Avenue. Overflow from the bioswales is conveyed to a separate storm sewer that runs east along Tireman where it is temporarily connected back into the combined sewer just west of Parkland Street. Phase I construction was completed in fall 2016; it was found that plantings along this route were not surviving and must therefore be replaced. This work will occur in FY2018.

Tireman Phase II includes a large bioswale in Rouge Park on the north and south sides of Tireman Avenue between Parkland Street and Outer Drive. This practice captures sheet flow runoff from the adjacent roadway as well as road runoff conveyed to the bioswales from catch basins capturing drainage from the intersection of Parkland Street and Tireman Avenue. The overflow for the bioswales in the park is also temporarily connected back into the combined sewer system at Parkland Street. Phase II construction was initiated in FY2016 with an excavating contract. The project landscaping and enhancements contract was initiated in FY2016; Figure 32 and Figure 33 show Tireman Phase II in operation and thus at substantial completion. Cover crop has been installed and will be maintained until fall 2017, when the final plantings will be completed. Additional work included the installation of underdrain and decorative boulders with a gravel path for sediment control. Curb cuts were added to the larger Tireman bioswale as a change order. The third phase of this project, Tireman Phase III, will convey flow from the existing practices and discharge to the Rouge River. This project, along with Constance Phase II which is referred to collectively as the West Warren Project Area, is discussed in further detail in Projects and Activity 5 – Stakeholder and Community Engagement.

Figure 32 Tireman Phase I Bioswale

Figure 31 Tireman Avenue Bioswale - Phase II (North) at Substantial Completion

Figure 33 Tireman Avenue Bioswale - Phase II (South) at Substantial Completion

ACTIVITY 3 – CONTINUED IMPLEMENTATION

DWSD has previously participated in a series of projects including downspout disconnection, demolitions and site restoration, and the planting of trees in the area. Activities will continually adapt based on current conditions and needs. The general status of this fiscal year's efforts are detailed in the sections below.

Activity 3-1 and 3-2 Downspout Disconnections

In previous fiscal years, the annual report discussed the feasibility of downspout disconnections for non-residential and residential properties. The conclusions of those feasibility evaluations was that non-residential properties rarely have a vegetated area to which they can disconnect without construction of a stormwater management practice. Residential properties can sometimes disconnect their downspouts to lawn areas, and the City of Detroit requires this to occur as homes are rehabilitated.

On November 2, 2016, DWSD provided an update on the approach to downspout disconnection, particularly for non-residential customers. That correspondence indicated that DWSD has devoted extensive efforts to the drainage charge credit system, which will encourage management of roof drainage from non-residential properties, whether it is discharged through downspouts or through internal roof drains. The letter states:

> *…Implementation of the green credits system is the only way for DWSD to encourage the disconnection of roof drainage from the combined sewer system. To encourage stormwater management on private property, DWSD will offer site assessments to customers who meet certain criteria. This program will be available in the first quarter of 2017.*
>
> *The progress towards disconnection of eaves, troughs, and roof downspouts is dependent upon property owners implementing stormwater management practices and applying for a credit on their drainage charge. DWSD will be able to track disconnected impervious area, including roof drainage, as customers complete their projects and apply for credits.*

DWSD is in the process of developing a credit program that would encourage faith based and non-profit groups to identify connected downspouts in various neighborhoods throughout the City. As connected downspouts are identified, actions can be implemented to assist residents in disconnecting them from the system. As housing stock changes through the removal of structures in poor condition (demolition), sale of homes through the DLBA auction process (requires improvements to the home to achieve code compliance), sale of homes included in DLBA's *Rehabbed and Ready Program,* and in other code upgrades, downspouts that are connected to the system will gradually be redirected. In some cases blight enforcement actions that require homeowners to upgrade their properties. One element of the building inspection process includes ensuring that downspouts are present and are "directed away from the foundation".

These actions will gradually result in a reduction in the number of connected downspouts and the redirection of roof drainage onto lawn areas.

Activity 3-3 Demolitions and Site Restoration

In FY2015, DWSD completed an aerial flight of the city. Post processing of the aerial imagery was completed in FY2016, which resulted in a city-wide detailed impervious cover dataset. The pace of demolitions in the URT decreased slightly in FY2017 but still resulted in substantial reductions in impervious cover both in the URT and city-wide. DWSD estimated total impact of demolitions from a variety of data sources. Estimated recent and cumulative impact of demolitions is summarized in Table 10. Note that the quantification of the change in impervious cover is based on actual change from 2010 to 2017 (which includes both increases in impervious cover from 2010-2015 and decreases in impervious cover through DLBA and DBA demolitions from 2015-present).

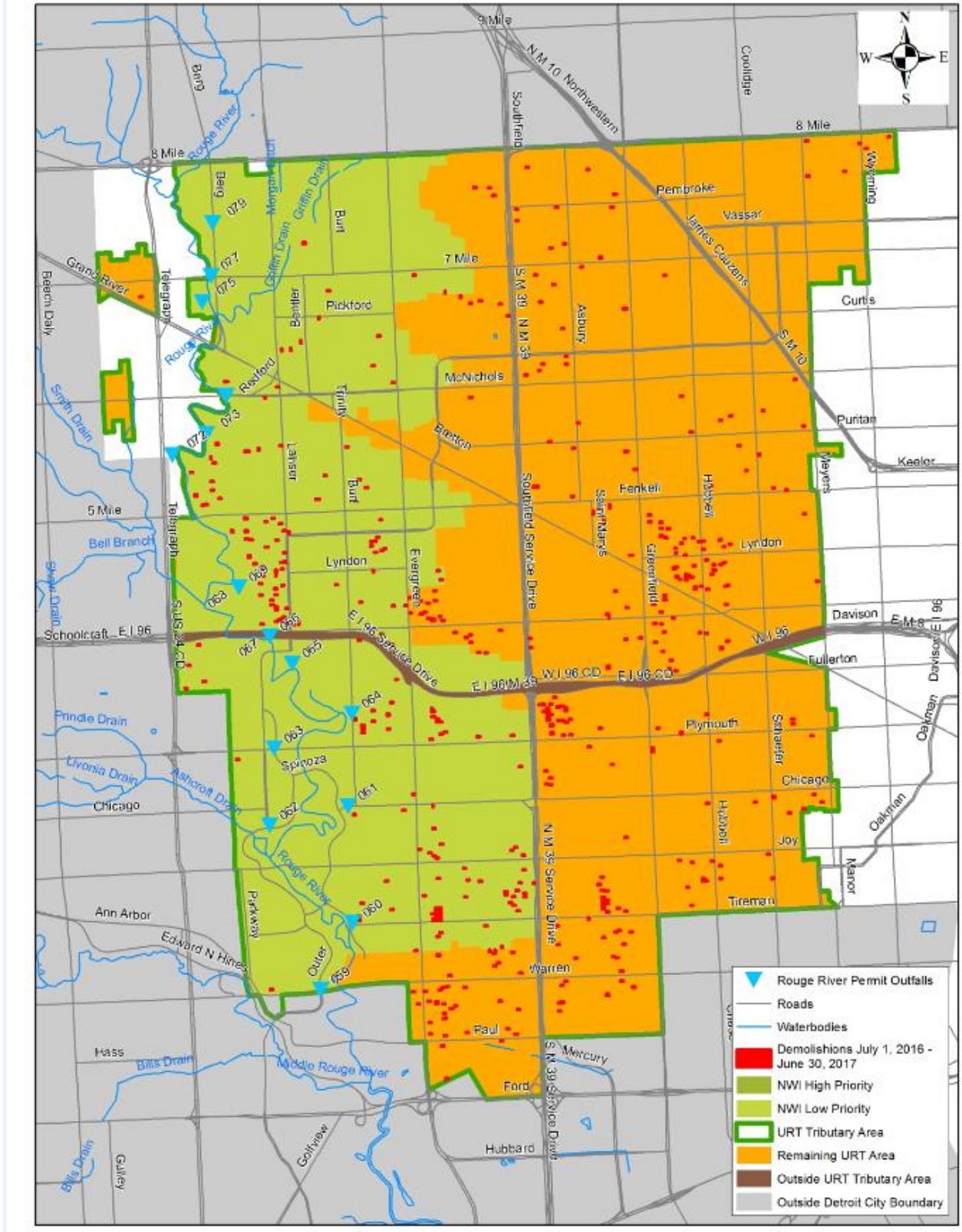
The revised restoration specification resulted in improved hydrologic performance versus methodologies. The change in restoration specification is estimated to have reduced runoff for the design event an additional 0.47 MG in the URT and 1.69 MG city-wide.

Locations of URT demolitions that occurred in FY2017 are shown in Figure 34. There were 473 documented demolitions in FY2017.

Table 10 Impervious Cover Removal Summary

Statistic	URT (acres)	City-wide (acres)
Impervious Acres in 2010	13,016	48,581
Impervious Acres as of April 2015	11,667	45,639
Subtotal Change in impervious cover (April 2010 – April 2015)	1,349	2,942
Demolition (acres) reported FY2016 Annual Report	50	199
Demolition (acres) reported FY2017 Annual Report	34	148
Total Change in Impervious Cover (April 2010 – June 2017)	1,433	3,289
Estimated Runoff Reduction (MG)	**44.09**	**101.80**

Figure 34 URT Area Demolitions, July 1, 2016 - June 30, 2017



Activity 3-4 Tree Planting

DWSD has previously funded tree planting through The Greening of Detroit. This work was originally performed under contract CS-1546. Later efforts were performed under CS-1522. Cumulative to date, DWSD's team has planted 7,117 trees in the URT area under the DWSD Green Stormwater Infrastructure Program, which resulted in an estimated 0.2 MG of stormwater runoff reduction. There were no targeted efforts to plant trees in FY2017.

Table 11 Tree Plantings and Estimated Runoff Reduction

Description	Number of Trees Planted in the URT Area	Estimated Runoff Reduction (MG)
Through FY 2011 Street Trees	332	0.009
Through FY 2011 Park Trees	769	0.022
FY 2011-2012 Street Trees	985	0.028
FY 2012-2013 Street Trees	1,867	0.052
FY 2012-2013 Park Trees	170	0.005
FY 2013-2014 Street Trees	1,219	0.034
FY 2014-2015 Street Trees	1,493	0.042
FY 2014-2015 Park Trees	282	0.007
Total	**7,117**	**0.199**

ACTIVITY 4 – LONG TERM PERFORMANCE

Activities associated with long term performance over the period of FY2017 were focused on initiating a monitoring program for GSI practices and developing a prioritization process for GSI design and implementation. In addition, progress was made in developing a capital improvement plan (CIP) for the full $50M green stormwater infrastructure spend requirement.

Activity 4-1 GSI Monitoring Program

Four prototype GSI projects (Eco Sites) were designed and constructed in 2015 with the intention of collecting data and documenting their performance with respect to stormwater management and water quality objectives.

DWSD is working with the department's green stormwater infrastructure program consultants, the University of Michigan Water Center, and Wayne State University to continue testing and monitoring at the Ecological Restoration Sites to study the effects these bioretention areas have on the reduction of rainwater inflow to the combined sewer system. The monitoring sites are located to the north and south of Belton Street between Greenview Road and Vaughan Street. The main objectives for monitoring at these sites include:

- Quantifying the change in runoff entering the combined sewer due to the presence of the bioretention system
- Quantifying the infiltration volume, rate and duration occurring
- Quantifying the extent, rate and duration of groundwater mounding
- Supporting the university research team's monitoring efforts
- Optimizing the outlet control system to maximize the subgrade infiltration while not causing excessive groundwater mounding that may affect adjacent infrastructure and getting the system ready for the next storm event
- Comparing and contrasting the results between sites

The initial round of monitoring took place from June through September 2016. Flow reduction was evaluated by taking the difference between the inflow and outflow of the bioretention; see Figure 35 for results summary. Limited data prevented comprehensive analysis on the Greenview site. A second round of monitoring is currently underway. One of the main issues being assessed is the amount of infiltration entering the backlot combined sewer from the bioretention through unintended flow paths. To facilitate the monitoring, some minor design changes are being implemented along with pre- and post-monitoring. Figure 36 and Figure 37 show some of the

activities that occurred during the first and second monitoring periods, while Table 12 shows a summary of findings from the initial monitoring period with respect to peak flow and volume control.

Table 12 Eco-Site Monitoring Performance Summary - 2 year event

Site	Peak Flow Reduction	Volume Reduction
Stahelin	85.5%	75.1%
Vaughn	96.5%	92.6%
Evergreen	91.3%	88.3%
Average	**91.4%**	**87.0%**

Figure 35 Example Data from Initial Monitoring Period (FY2017)

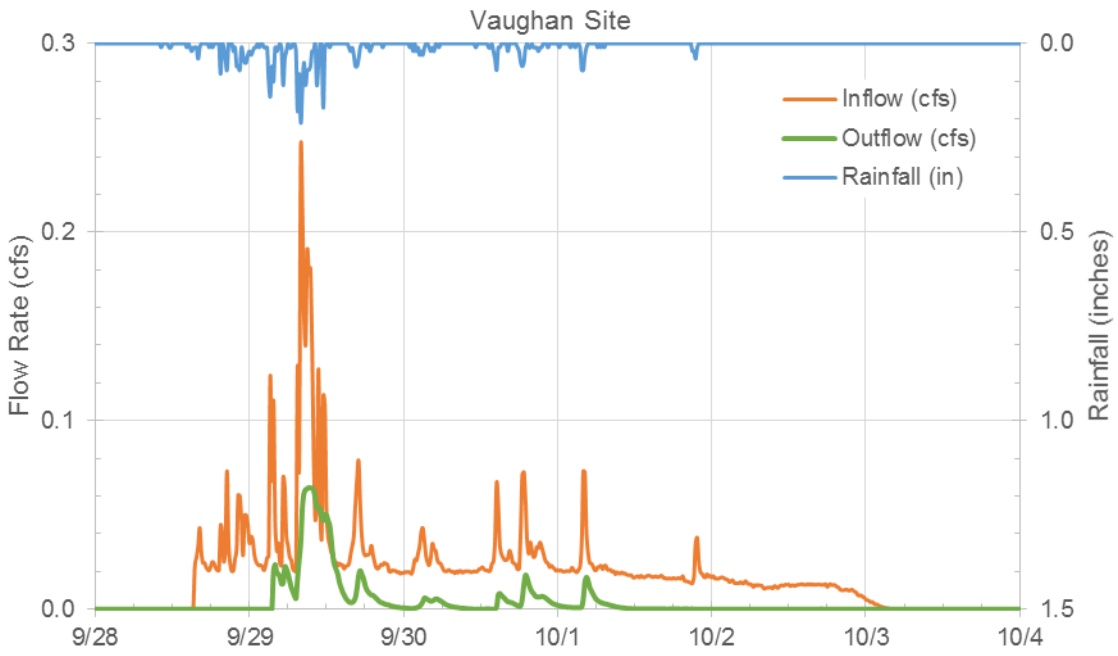


Figure 37 Calculating Inlet Efficiency During First Monitoring Period

Figure 36 Installation of Compound Weir Prior to Beginning the Second Monitoring Period

Activity 4-2 Prioritization Process for Project Selection

The NPDES permit requires the development of a green stormwater infrastructure program for the Rouge River tributary (URT) area to "capture wet weather flows that would otherwise flow into the sewer system and contribute to CSOs". Additionally, sites for the implementation of GSI are to be selected using prioritization criteria that "focus on locations and designs that will provide the greatest benefits in terms [of] keeping flows out of the sewer system and helping to reduce CSOs. Additional prioritization criteria could include locations that could help reduce localized flooding or basement back-ups."

The permit language emphasizes flow related requirements. As an additional criterion, DWSD is prioritizing those neighborhoods where the neighborhood is sufficiently stable to support the long-term viability of installed GSI practices, and where the amenity values of GSI projects will contribute to neighborhood stability.

The prioritization process is recognized as being limited in precision, and to be used primarily as a guide for project selection. It is understood that numerical values can be misleading, thus these are not presented.

The 2014 URT model was used in the analysis. This model provides a reasonable representation of the system's hydrology and hydraulics, although it had minimal calibration data to support it. When the West Side Model is fully complete (expected in 2018), it will have the capability to support a refined analysis. Based on the model, 797 subcatchments were identified and individually scored based on the criteria described below.

CSO Volume Reduction Potential

Stormwater detention, retention, and infiltration associated with GSI projects in the service area will have an impact on the runoff entering the combined sewer system. The impact of a GSI installation will be greater in those parts of the system where runoff is more likely to convert to CSO discharge. The model was used to estimate the relative fraction of runoff from each subcatchment that would become CSO discharge. In this analysis, the CSO volume associated with the 10-year, 1-hour event was traced back to its originating subcatchment. Normalizing by drainage area, the CSO volume is expressed in units of million gallons/impervious acre.

Potential for CSO Control Capital Cost Savings

A further evaluation of GSI impact was made by assigning potential CSO costs to the individual subcatchments. This analysis helps to prioritize those locations where potential savings on gray infrastructure can be maximized. CSO control costs in the current plan of record were allocated to each subcatchment based on the 10-year, 1-hour design storm event, as follows:

- Volume of the runoff generated in each subcatchment reaching each CSO outfall is calculated based on the tracer method
- CSO control costs are defined by outfall.
- CSO dollars are thus distributed to the tributary areas based on the contributing flow
- The cost allocated to each subcatchment is normalized on a per-acre basis

CSO costs were thus expressed on a dollar/impervious acre basis for each subcatchment.

Potential for Reducing Basement Flooding

The final permit-identified criterion for GSI site prioritization is the potential for reducing or eliminating basement flooding within the service area. Basement flooding will result from surcharging of the local or trunk sewers in the collection system. Areas with the highest incidence of basement backups were identified based on FEMA claims for the 2014 flood of record. Scoring considered both the percentage of houses in each subcatchment with a recorded claim, and the dollar value of claims per acre.

Potential for Reinforcing Neighborhood Strength

An additional objective evaluated for the prioritization of GSI sites is the potential of the project to support the economic stabilization of neighborhoods. In other words, higher scores are assigned for projects in areas of the City that have the best potential for maintaining social and economic vitality (or of being revitalized), than for those areas where there are a significant number of vacant lots and homes, which make long-term sustainability of practices less clear.

A variety of source data was used in this analysis including data from Detroit Future City, property values, demolition priorities, and planning study locations. The use of this score as an opportunity constraint rather than a potential project score was considered, but in the end its use for scoring was adopted.

A composite score for each location was determine based on a weighting of the individual criteria as shown in Table 13.

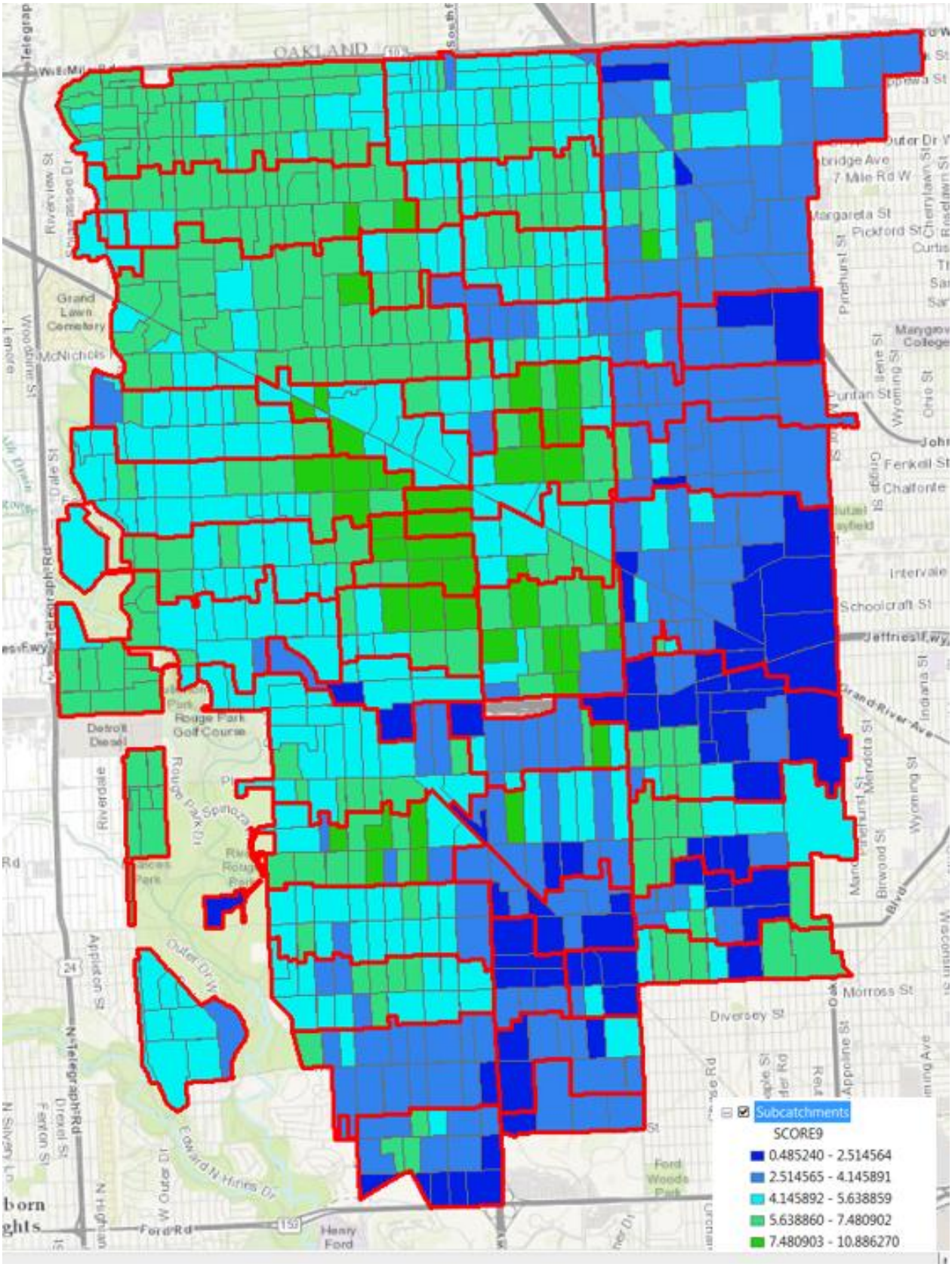
Table 13 Ranking for Multi-Objective Subcatchment Prioritization Scores

Category	Weights		Scores
Potential CSO Volume Reduction, in MG/impervious acre	Top 10%	10	25%
	Lower 90%	1-9	
Potential CSO Control Capital Cost Reduction, $/impervious acre	Top 10%	10	25%
	Lower 90%	1-9	
Potential Basement Backup Reduction, $/impervious acre	Top 10%	20	25%
	Lower 90%	1-9	
Neighborhood Strength (unitless)	No differentiation	1-10	25%

[1]The potential basement backup reduction score is based on equal weights for %houses with flooding and the total damage per impervious acre of the subcatchment (Run No. 9)

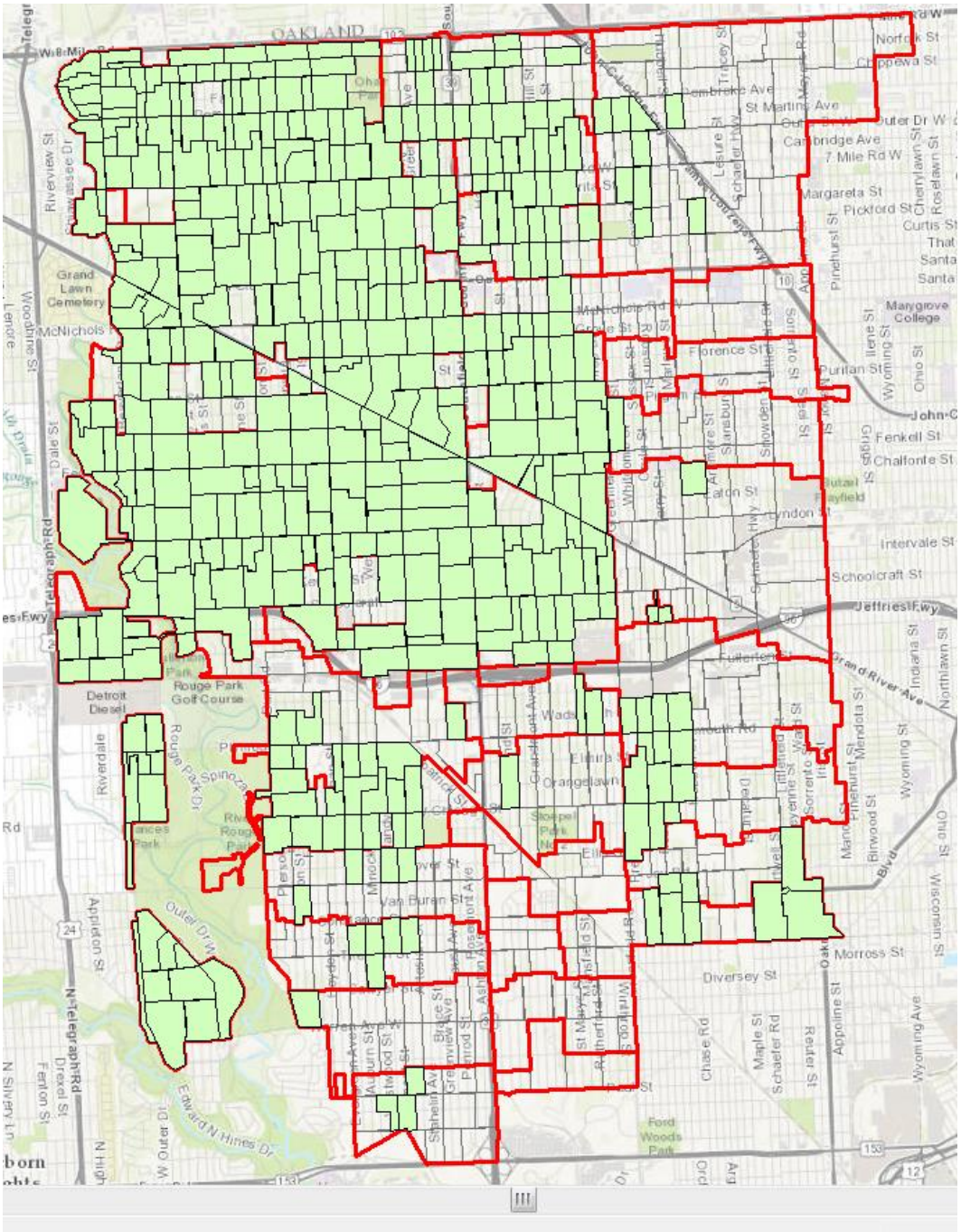
The results of the ranking analysis are shown in Figure 38.

Figure 38 Ranked Subcatchments



The multi-objective scoring may be too selective in that some locations which have a high ranking in one category but not in others may receive an overall low score. To avoid this possibility, the subcatchments scoring within the top ten percent of at least one of the objects were identified. These areas were combined with the areas with multi-objective scores within the top 50 percent of subcatchments to create the priority area for locating potential GSI projects, as shown in 39.

Figure 39 Top 50% Scored Catchments and Top 10% of Catchments in Individual Criterion



ACTIVITY 5 – STAKEHOLDER AND COMMUNITY ENGAGEMENT

DWSD continued a wide range of internal and external stakeholder engagement and outreach activities during FY2017. GSI engagement and outreach activities occur through the drainage charge credit program, the city interdepartmental GSI coordination group, the post-construction stormwater management ordinance and greening of the municipal code, and DWSD GSI projects on public lands. DWSD continues to explore processes and institutional structures for coordinated, collaborative citywide green stormwater infrastructure outreach and engagement, including working with key city GSI partners such as the Erb Family Foundation, The Greening of Detroit, Model D, and The Nature Conservancy.

During FY2017, DWSD created a Stormwater Management Group (SMG) to lead all stormwater related activities, including the drainage charge program, the post-construction stormwater management ordinance, and city-funded GSI projects through the GSI Program. DWSD coordinated with numerous departments, agencies, and groups on GSI-related issues and will continue to do so through the SMG. A list of the internal and external stakeholders that DWSD engaged on GSI activities during FY2017 is provided below.

Internal DWSD Groups

- DWSD Customer Services
- DWSD Financial Planning Division
- DWSD GIS Group
- DWSD Water Supply Operations
- DWSD Public Affairs
- DWSD Billing Team

City Government

- Buildings, Safety, Engineering and Environment (BSEED)
- Planning and Development (PDD)
- Department of Public Works (DPW)
- Housing and Revitalization (HRD)
- Jobs and Economy Team (D)
- Public Health
- General Services – parks
- General Services – buildings
- Neighborhoods
- City Planning Commission
- Sustainability Office
- Mayor's office
- City Council

Agencies

- Detroit Land Bank Authority
- Detroit Building Authority
- Wayne County Department of the Environment
- Wayne County Road Commission
- Michigan Department of Transportation (MDOT)
- Detroit Economic Growth Corporation
- Great Lakes Water Authority
- Michigan Department of Environmental Quality (MDEQ)
- United States Environmental Protection Agency (US EPA), Region V
- Detroit Public Schools
- Detroit Housing Commission
- Michigan State Housing Development Authority
- DTE Energy

Organizations

- Detroit Future City
- Sierra Club
- Erb Family Foundation
- Detroit Greenways Coalition
- Brightmoor Alliance
- Grandmont Rosedale Development Corporation
- The Nature Conservancy
- Bloomberg Associates
- Rosedale Grandmont Little League Baseball
- Joy Southfield Development Corporation
- Friends of Rouge Park
- Far West Detroit Civic Association
- Cody Rouge Neighborhood Partnership
- Cody Rouge Community Action Alliance
- Warrendale Community Organization
- Viola Liuzzo Park Association
- GFFD Community Center

Institutions

- University of Michigan
- Wayne State University
- Lawrence Tech University
- Wayne County Community College District

Groups

- City Council Green Infrastructure Task Force – Blue/Green subcommittee
- Erb Family Foundation Blue Green Infrastructure Workgroup
- The Nature Conservancy/Greening of Detroit/Erb Family Foundation GSI Mapping and Knowledgebase Project Team
- GSI Interdepartmental Coordination Group (subcommittee of the Sustainability Office)

Stakeholder outreach and participation has been, and will continue to be an important aspect of DWSD's overall Green Stormwater Infrastructure Plan. DWSD's green stormwater infrastructure stakeholder outreach is comprised of three components:

1) Drainage charge reduction through green stormwater infrastructure implementation;

2) Green stormwater infrastructure project-specific outreach; and

3) Overarching, collaborative green stormwater infrastructure public education campaign.

All green stormwater infrastructure outreach activities conducted during FY2017 touch on one or more of these branches.

Drainage Charge and Credit Outreach and Engagement

Activities for drainage charge and credit outreach and engagement in FY2017 focused on the launch of the drainage charge program and credit process. The drainage charge customer steering committee engaged customers and provided input during the initial phases of drainage charge program rollout. DWSD Drainage Charge Program Team members met with a variety of key customer groups during FY2017, including business groups, nonprofit organizations, and residential groups. DWSD created a wide variety of outreach materials to communicate the overall drainage charge program, phased rate schedule, property information, and credit information. DWSD has hosted monthly drainage charge credit workshops since October 2016 for nonresidential property owners.

Green Stormwater Infrastructure Project-Specific Outreach

Project-specific outreach includes coordination with neighborhood groups and key stakeholders, such as Department of Neighborhood district managers, city council members, and project partners. For each project, DWSD creates a project fact sheet, plans and facilitates public meetings to inform stakeholders and solicit early feedback on project concepts, coordinates informational mailings that include project facts and engagement opportunities, permanent project signage, and engagement events that are both educational and celebratory. DWSD creates tailored outreach and engagement strategies for each project and documents ongoing outreach efforts and needs. During FY2017, DWSD has identified the need for additional outreach and engagement to deter behaviors that adversely impact GSI practices, such as dumping and driving recreational vehicles. DWSD also conducted additional outreach for certain projects that experienced shifts in construction schedules to keep local stakeholders aware of progress.

Overarching, Collaborative Green Infrastructure Public Education Campaign

During FY2017, DWSD coordinated with the Erb Family Foundation to create a video that celebrates Detroit's commitment to GSI implementation. DWSD shared this video during MDEQ's Great Lakes and St. Lawrence Green Infrastructure Conference. DWSD also continues to assist in coordinating the city interdepartmental GSI group that is now a subcommittee of the City of Detroit Sustainability Office. Through this interdepartmental

group, DWSD is contributing to the development of a citywide GSI vision, definition, and goals that will serve as the foundation for a future collaborative citywide GSI public education campaign that also involves input from key city GSI partners, such as the Erb Family Foundation.

Activity 5-1 Green Infrastructure Website

DWSD continues to improve the existing stormwater, drainage, and GSI web pages with updated information and reorganized content. Recent changes reflect the creation of the Stormwater Management Group and the activities related to this group. DWSD Public Affairs and the SMG manager restructured the content in a manner that relays broad stormwater information and branches into drainage charge and credits, city-funded GSI projects through the DWSD GSI Program, and post-construction stormwater ordinance and greening of the code. DWSD provided new content throughout FY2017, including the Viola Liuzzo GSI project video, information about monthly drainage charge credit workshops, and drainage charge site assessment and credit application information. DWSD also uses social media, including Facebook and Twitter, as well as e-blasts, to distribute information about drainage charge credit workshops and GSI stories. DWSD Stormwater Management Group also continued participation in the GSI Mapping and Knowledgebase tool development through a collaborative effort led by The Nature Conservancy, Greening of Detroit, and Erb Family Foundation through an Erb grant. DWSD has committed to hosting this tool on its website. DWSD Public Affairs staff and the Stormwater Management Group are continuing to make website improvements and will work with the City of Detroit in an anticipated citywide website update during FY2018.

Below is a list (with links) of additional media of green stormwater infrastructure that has been published by DWSD and the Erb Foundation:

- Detroit: Becoming the Front-Runner in Green Stormwater Infrastructure
- Revitalizing Viola Liuzzo Park
- Southwest Solutions Detroit Farm & Garden
- Rain Gardens to the Rescue
- Northend Rain Gardens

Activity 5-2 Drainage Charge Program Stakeholder Engagement

DWSD continued to work with The Allen Lewis Agency in FY2017 to create an updated stakeholder outreach and engagement strategy for the drainage charge effort. DWSD hosted additional Drainage Charge Steering Committee meetings in April and July 2016. DWSD has also reached out to other stakeholder groups in the city to share information and obtain input on the drainage charge and green credit program, including the Arab American/Chaldean Merchants Association and the Erb Family Foundation Blue-Green Infrastructure Work Group. DWSD uses feedback from the Drainage Charge Steering Committee and other stakeholder groups to help refine messages and the outreach strategy for the drainage charge and green credit program.

Activity 5-3 Drainage Charge Toolbox

DWSD developed numerous drainage charge documents and tools to assist DWSD customers understand the Drainage Charge Program and the process to obtain drainage charge credits. DWSD released the Drainage Charge Customer Guide in October 2016 electronically on the DWSD drainage website and in hard copy for distribution at Drainage Charge Credit workshops. DWSD developed collateral to educate drainage customers and correct customer data, including a Drainage Charge Program Frequently Asked Questions document, rate calculation fact sheet, drainage charge adjustment forms to assist in correcting customer parcel and impervious data, drainage charge credit application form, and a credit action plan document. DWSD developed and launched a three-step site assessment process that involves data validation, credit consultation, and an engineering analysis. DWSD initiated the development of residential and nonresidential GSI Starter Guides to help drainage customers identify and plan GSI practices to obtain drainage charge credits. DWSD continues to update the Drainage website with new collateral targeting key stakeholder groups to help them understanding the relevant rate transition schedule and credit opportunities. DWSD also announced the creation of a GSI capital assistance fund in FY2017; details on this fund should be available in early FY2018.

Activity 5-4 Drainage Charge Training Workshops

DWSD initiated monthly Drainage Charge Credit Workshops in October 2016. These monthly workshops have primarily focused on nonresidential property owners, with one workshop focused on engineers. In FY2017, approximately 600 individuals registered for Drainage Charge Credit Workshops and approximately 300 individuals participated. DWSD also participated in developing and giving a 50-hour Contractor Training in conjunction with the Detroit Training Center, through the Detroit Economic Growth Corporation with funding from the Erb Family Foundation. Contractor Trainings took place in February, March and April 2017 and reached approximately 33 local contractors. DWSD has made the list of contractors completing the training available on the drainage charge credit website. DWSD has also met with nonprofit organizations, including faith-based organizations, to discuss the development of service credits and is in the early stages of planning training workshops for these organizations, as well as residential customers.

Activity 5-5 Green Infrastructure Case Studies and Demonstration Projects

DWSD updated existing GSI project fact sheets to reflect project progress during FY2017 and initiated the development of new fact sheets and other outreach materials, such as presentations and conceptual renderings, for in-progress projects. Case study fact sheets include project overviews and updates on project implementation for use during community stakeholder meetings and other outreach activities to reach key stakeholders. The current versions of the existing suite of green infrastructure case study fact sheets are available on DWSD's green infrastructure web pages. DWSD has developed presentation materials and concept renderings for public review and input for the O'Shea Park bioretention and the Oakman Blvd. bioretention and subsurface storage project. DWSD presented these concepts to community residents during a public meeting in FY2017 and will continue to do so in FY2018. DWSD also developed the Viola Liuzzo Park Revitalization video that highlights the bioretention gardens designed for the park project. This video is available on the DWSD GSI Project web page. DWSD initiated development of a project fact sheet and poster for the Crowell Recreation Center GSI project that will begin construction in FY2018. In October 2016, DWSD participated in the "Make A Difference Day" with Grandmont Rosedale Development Corporation, students from Groves High School, and local volunteers representing Boy and Girl Scout troops and the Rosedale Grandmont Little League. The event provided DWSD with the opportunity to demonstrate how the pervious stone parking lot infiltrates drainage more effectively than traditional asphalt. This event also gave DWSD the opportunity to guide volunteers in planting 500 plants in the northern bioretention garden. In addition, DWSD planned and hosted a green infrastructure tour in FY2017 for participants of the MDEQ Great Lakes and St. Lawrence Green Infrastructure Conference that showcased DWSD GSI projects in the URT. DWSD will conduct additional tours of existing GSI projects for community residents, such as those in the Oakman Blvd. GSI project area, to give residents the opportunity to see the practices on the ground.

Activity 5-6 Green Infrastructure Forum

DWSD outreach efforts to a broader stakeholder group continue to be provided through existing city forums, including the Erb Blue Green Infrastructure Workgroup and the City Council Green Task Force's Blue Green Subgroup. These groups met on a regular basis during FY2017 and provide a forum for sharing current and anticipated GSI project information. DWSD continued to help coordinate and facilitate the citywide Interdepartmental GSI Coordination Group on a monthly basis. The Interdepartmental GSI Coordination Group exchanged information on planned and ongoing GSI projects throughout the city, as well as drafted a citywide GSI vision, definition, and goals. With the launch of Detroit's new Sustainability Office in FY2017, the Interdepartmental GSI Coordination Group will serve as a subcommittee. DWSD participated in MDEQ's Great Lakes and St. Lawrence Green Infrastructure Conference, with numerous presentations on GSI projects. These groups and the conference functioned as a GSI forum for DWSD to exchange GSI information in FY2017. Once the Interdepartmental GSI Subcommittee completes the GSI vision, definition, and goal-setting, and contributes to the development of the Detroit Sustainability Action Plan, a formal, comprehensive city-level GSI forum can be considered for FY2018.

Activity 5-7 Stakeholder Involvement and Education Strategy

DWSD initially developed a draft Green Stormwater Infrastructure Stakeholder Outreach Strategy in September 2014 that identifies three branches of outreach consisting of the six elements of stakeholder outreach used in EPA's *Getting In Step Guide*. As mentioned above, the three branches include: (1) Drainage charge reduction

through green stormwater infrastructure implementation; (2) Green stormwater infrastructure project-specific outreach; and (3) Overarching, collaborative green stormwater infrastructure public education campaign. During FY2017, DWSD continued to update the three branches of this strategy through separate involvement and education strategy documents.

The first branch of involvement and education related to the drainage charge has been a significant focus for DWSD in FY2017. DWSD developed a stand-alone drainage charge and green credit stakeholder involvement and education strategy in FY2016. Implementation of this strategy has been a significant focus in FY2017 as discussed under Activity 5-2, with a strong emphasis on outreach and education related to the drainage charge credit process through workshops, meetings and presentations to key stakeholder groups, and contractor training.

The second branch of stakeholder outreach—green stormwater infrastructure project-specific outreach—has continued throughout FY2017. Each GSI project has a tailored outreach strategy that identifies key stakeholders, messaging, planned outreach and engagement activities, and documentation on outreach materials. The primary projects with outreach and education activities in FY2017 have included Stoepel Park No. 1, Liuzzo Park, Tireman, O'Shea Park, Crowell Recreation Center, and Oakman Blvd. A brief description of project-specific outreach for these GSI projects is provided below.

***Stoepel Park No. 1*.** DWSD worked with the Grandmont Rosedale Development Corporation to support volunteer planting at the northern bioretention garden for Make A Difference Day on October 22, 2016. Student and community volunteers planted 500 plants with guidance, as shown in Figure 40. Volunteers also watched an infiltration test on the Stoepel Park porous stone parking lot. DWSD worked with project partners to develop permanent, educational signage for the bioretention gardens and the parking lot, as shown in Figure 41. DWSD continued to communicate with GRDC staff about concerns related to yard waste dumping activities and asked for input on potential effective messages and mechanisms for deterring dumping activities. DWSD initiated development of an information flyer to be mailed to residents surrounding the park, as well as left in a box at the park to inform park users. DWSD also initiated development of permanent No Dumping signs for installation near the bioretention gardens, in addition to permanent educational signage.

Liuzzo Park. DWSD continued to coordinate with the Viola Liuzzo Park Association (VLPA) throughout FY2017 to keep residents informed of park construction activities and schedule. Residents communicated safety concerns related to the in-progress bioretention garden depressions that would fill with stormwater during rainy weather. Consistent communication and outreach between DWSD and residents resulted in placement of temporary fencing around the bioretention garden basin to address residents' safety concerns. DWSD continued to have regular outreach discussions with residents and the VLPA about the construction schedule and a possible dedication ceremony. Given the construction schedule, this dedication celebration will take place in FY2018 in conjunction with the Mayor's office. DWSD worked with VLPA and the Mayor's office to develop and finalize permanent educational signage for the three bioretention gardens. The educational signs communicate historical information about Viola Liuzzo and VLPA, as well as provide information on bioretention and the types of plants selected for each bioretention garden, as shown in Figure 41. In early FY2017, DWSD developed an outreach video highlighting the work at Viola Liuzzo Park. DWSD will complete this video once the overall park revitalization project is complete.

***Tireman Phase II*.** DWSD met with the Far West Civic Association to provide an update on the progress of the phased Tireman GSI project. DWSD updated the project fact sheet to reflect the project status.

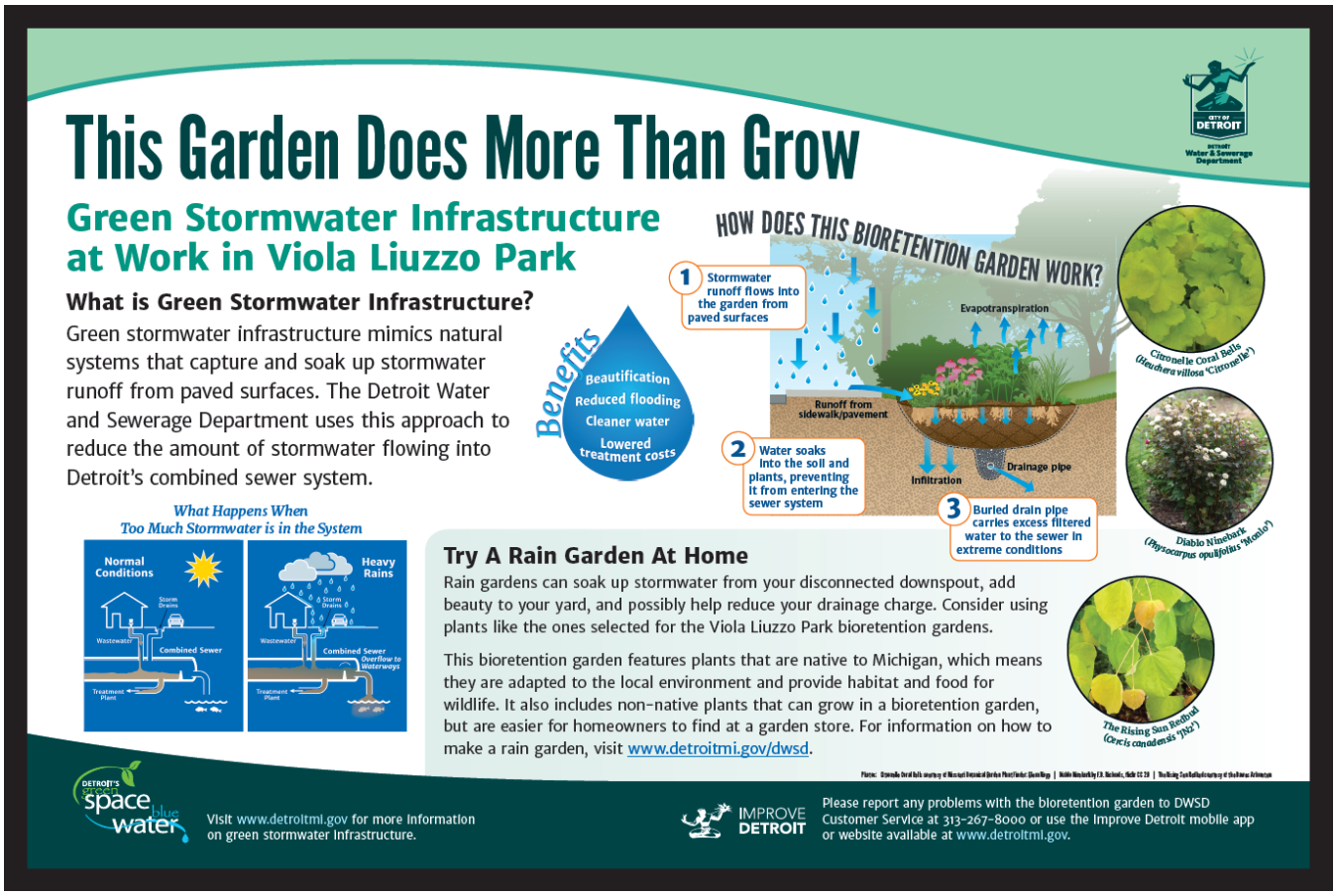
***O'Shea Park*.** DWSD developed and presented conceptual renderings of the bioretention garden designed for the O'Shea Park project. DWSD contributes to the GSI outreach and education efforts to the larger project outreach strategy coordinated by P&DD.

Crowell Recreation Center. DWSD initiated development of permanent signage and a project fact sheet for the GSI project to be installed in the facility's parking lots. DWSD also initiated development of a project poster that will hang in the facility to inform visitors about the project, including purpose, benefits, schedule, and where to find additional information.

***Oakman Blvd*.** DWSD coordinated and facilitated a community input meeting in May 2017 to provide residents with an opportunity to voice opinions on concepts for surface bioretention. The meeting included a presentation on the overall project, renderings of the concepts, and a facilitated discussion of preferences. DWSD summarized the residents' input and used the input to guide new conceptual designs for surface bioretention. DWSD is planning a follow-up meeting to present residents with the designs that reflect their input.

Figure 40 Students and Residents Participating in Bioretention Planting at Stoepel Park No. 1 During "Make a Difference Day" in October 2016

Figure 41 Permanent Educational Signage Designed by DWSD for Viola Liuzzo Park and Stoepel Park No. 1 GSI Project Elements, Including Bioretention and Pervious Stone Parking Lots



The third branch of stakeholder outreach—the overarching, collaborative green infrastructure public education campaign—is discussed under Activity 5-8.

Activity 5-8 Overarching Green Infrastructure Educational Campaign

An overarching green stormwater infrastructure education campaign continued to be a topic of discussion in FY2017 among DWSD and other key city GSI partners. A formal overarching citywide GSI education campaign is likely to become a product of the Interdepartmental GSI Subcommittee in collaboration with other key city GSI partners, documented in the city's forthcoming Sustainability Action Plan. During FY2017, DWSD contributed to a number of GSI articles that highlight key GSI projects, such as the four Ecological Restoration sites in Cody Rouge. Examples of articles released during FY2017 include:

- How Detroit's public parks are using green infrastructure to prevent flooding, save money http://www.modeldmedia.com/features/green-infrastructure-parks-111016.aspx
- Detroit property owners plan on green infrastructure to save on water bills http://www.modeldmedia.com/features/green-infrastructure-drainage-fee-122016.aspx
- Detroit banks on green infrastructure to rescue city from heavy rains http://www.mlive.com/news/index.ssf/2016/09/detroit_banks_on_green_infrast.html

DWSD also participated in a number of conferences and panel discussions on GSI during FY2017. Palencia Mobley, DWSD's Deputy Director and Chief Engineer, served as a panelist on the September 2016 Harnessing Detroit's Green Infrastructure Potential panel as part of Model D's Speaker Series. She also presented at

WEFTEC Stormwater Congress, American Water Works Association Utility Management Conference, Southeast Michigan St. Lawrence Great Lakes Conference, along with the Green Infrastructure Learning Exchange.

DWSD worked with the Erb Family Foundation to create a video promoting GSI implementation in Detroit. This video was shown in the opening plenary remarks of the MDEQ Great Lakes and St. Lawrence Green Infrastructure Conference in spring 2017.

Further work on the existing *Detroit's Green Space, Blue Water* logo and usage criteria was tabled in FY2017, although the logo has appeared on DWSD GSI outreach collateral. It is anticipated that the Interdepartmental GSI Subcommittee may address the logo in FY2018 as part of discussions related to citywide GSI outreach.

As discussed under Activity 5-1, DWSD continues to work with The Nature Conservancy, The Greening of Detroit, and Erb Family Foundation on the development of a centralized, collaborative Detroit GSI mapping and knowledgebase tool that contains comprehensive citywide GSI information. This tool will help promote overarching GSI education throughout Detroit once deployed on DWSD's website.

4.0 INVESTMENT IN GREEN INFRASTRUCTURE

Since the inception of DWSD's Green Stormwater Infrastructure Program, a variety of implementation projects and coordination efforts have occurred.

The costs included in this report include the following:

- Efforts implemented through Contract CS-1522, which include professional services and construction.
  - Professional services items include: project selection, survey, geotechnical, field investigations, neighborhood characterizations, project conceptual and detailed design, project specific outreach and stakeholder engagement, interagency coordination, bid administration, construction administration and resident project representative (RPR) services.
  - Construction includes earned contract value (including unpaid retainage) and contract markup on contractors.
- Construction not implemented through CS-1522. These amounts include earned construction value. These values may include retainage which has not been released. They may also include agency administrative costs (such as DPW oversight), although DPW administrative costs are not included in FY2017 values. DWSD and DPW are working through the final accounting for PW-6968 and the expected total that DWSD will be paying is included.

The costs in this report do not include the following:

- Efforts associated with the drainage charge program.
- Construction markup for DPW administration of PW-6968 (may be added later).
- Effort associated with locations outside of the URT.
- Efforts associated with the preparation of regulatory required reports (Including the January 1 Supplemental Report for the Upper Rouge).

The following costs have been prorated or adjusted:

- Codes and ordinance efforts were prorated as 27.1% of the total investment. This was based on the URT as 27.1% of the City as a whole.
- Work associated with the impervious cover analysis City-wide was prorated to 27.1% as described for the codes and ordinance effort.
- Drainage charge efforts previously reported have been backed out of the report. This is shown as an adjustments to FY2016. No additional adjustments are needed for FY2017.
- Investment associated with PW6968 of $2 million was reported in FY2016 when funds were encumbered for DPW costs. The current and future spend on this contract is reported, but then adjusted for this prior reporting of these costs.

DWSD's permit requires a $15 million spend by June 30, 2017, and a total spend of $50 million by 2029. The net reported value for spend during FY2017, which includes actual spend, and the value of executed construction contracts is $6,096,678. Cumulatively, DWSD has spent $15,673,067 on the Green Stormwater Infrastructure Program. Costs (including adjustments) are identified in Table 14 and Table 15 and displayed on Figure 42.

Table 14 DWSD Green Infrastructure Program Expenditures Summary

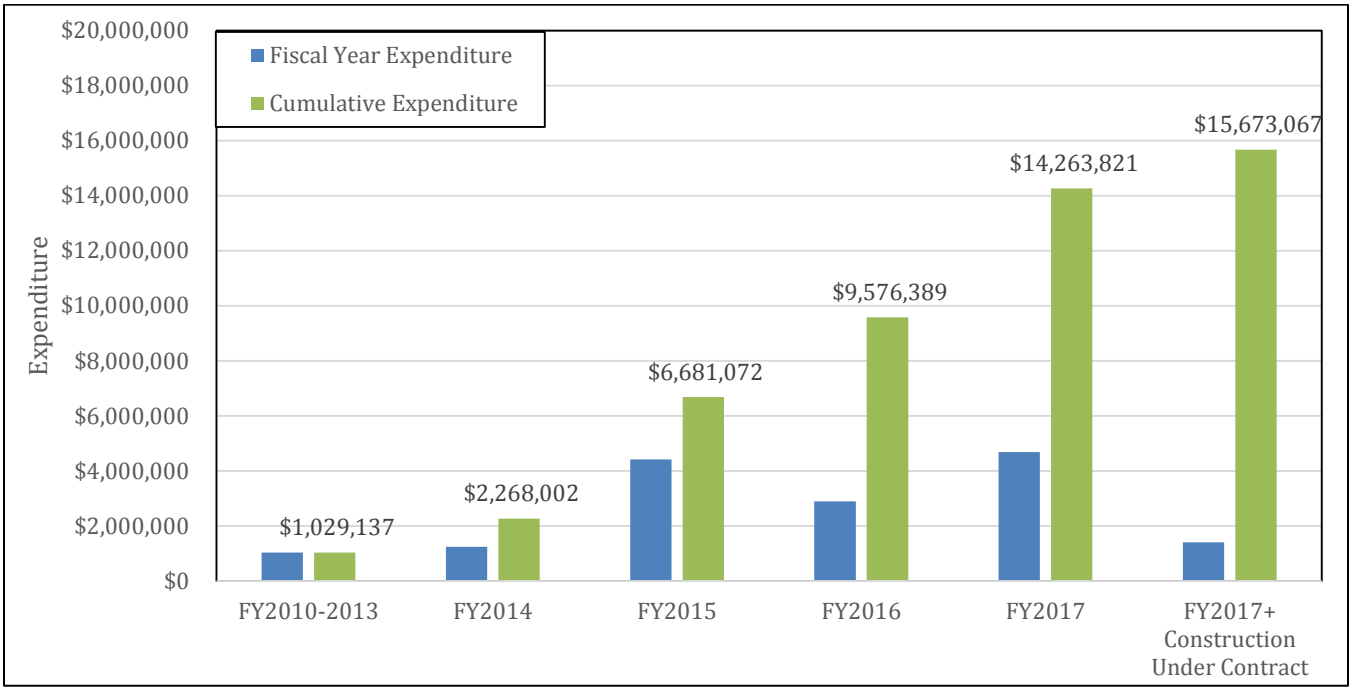
Fiscal Year	Expenditures	Adjustments	Revised Expenditures	Cumulative
FY2010-FY2013	$ 1,029,137	$ -	$ 1,029,137	$ 1,029,137
FY2014	$ 1,238,864	$ -	$ 1,238,864	$ 2,268,002
FY2015	$ 4,413,070	$ -	$ 4,413,070	$ 6,681,072
FY2016	$ 3,121,040	$ (225,724)	$ 2,895,317	$ 9,576,389
FY2017	$ 4,687,432	$ -	$ 4,687,432	$ 14,263,821
FY2017 + Construction Under Contract	$ 1,409,246	$ -	$ 1,409,246	$ 15,673,067

Table 15 Green Stormwater Infrastructure Program Cumulative Expenditures

Activity	Prior Years		FY2017 Annual Report				Totals	Notes
	FY2010–FY2016 Professional Services	FY2010–FY2016 Construction	FY2010–FY2016 Adjustments	FY2017 Professional Services	FY2017 Construction Contractor (earned value)	FY2017 Construction Contractor (residual contract	Cumulative Expenditures	
General Project Management	$ 462,716	$ -		$ 129,642			$ 592,358	
Activity 1 – Policies, Procedures and Standards								
1-1 Codes and Ordinances 1-2 Storm Water Technical Reference Manual 1-4 Green Streets Standards 1-5 Structure Demolition and Lot Greening Standards 1-6 Public Storm Water Maintenance Guidance 1-7 Municipal Storm Water Maintenance Manual	$ 118,956	$ -		$ 43,820			$ 162,775	Prorated relative to URT as share of City as a whole (27.1%). Subtracted work associated with the Storm Water Technical Reference Manual for FY2017.
1-3 Drainage Charge Credit System	$ -	$ -	$ -				$ -	Removed prior work from summary per MDEQ direction. No longer included in reporting.
1-8 Tracking System	$ 55,303						$ 55,303	Includes 2015 impervious cover analysis efforts prorated by
Activity 2 – Prototype Projects								
2-1 Small Scale Greening Ecological restoration of demolition sites	$ 314,190	$ 492,962.38		$ 572,856	$ 25,967.40		$ 1,342,397	Includes design, construction, monitoring efforts and additional site selection.
2-2 Large Scale Greening and 2-4 Historic Stream Corridors	$ 663,569	$ -		$ 829,595			$ 1,493,164	Includes survey, geotech, planning, concept and detailed design to date.
2-3 Public Facilities Flow Management and 2-5 Municipal Parks Management	$ 1,016,454	$ 32,624		$ 768,613	$ 1,024,351	$ 929,228	$ 2,905,773	Residual contract value is for Stoepel Park and Liuzzo.
2-6 Transportation Corridor Flow Management	$ 487,338	$ 2,314,143		$ 178,126	$ 1,405,315	$ 480,018	$ 3,752,185	Adjustments are for DPW funds transfer reported in FY2015, and are taken against current for PW-6968. Residual value includes Joy Road partner commitment
2-6 Transportation Corridor Flow Management (adjustment)					$ (945,500)			
Activity 3 – Continued Implementation								
3-1 and 3-2 Downspout Disconnection	$ 38,788	$ 151,846		$ -	$ -	$ -	$ 190,635	No longer included in reporting after 2015
3-3 Demolitions and Site Restoration	$ 83,246	$ 579,334		$ -	$ -	$ -	$ 662,580	
3-4 Tree Plantings	$ 37,321	$ 1,405,082		$ -	$ -	$ -	$ 1,442,403	

Activity	Prior Years		FY2017 Annual Report				Totals	Notes
	FY2010–FY2016 Professional Services	FY2010–FY2016 Construction	FY2010–FY2016 Adjustments	FY2017 Professional Services	FY2017 Construction Contractor (earned value)	FY2017 Construction Contractor (residual contract	Cumulative Expenditures	
Activity 4 – Long Term Performance								
2014 GI Plan	$ 498,374	$ -		$ -	$ -	$ -	$ 498,374	
Annual Reports	$ 67,384	$ -		$ 27,904	$ -	$ -	$ 95,288	
4-1 Updated Collection Systems Model				$ -	$ -	$ -	$ -	Under separate DWSD contract
4-2 Green Infrastructure Performance Planning 4-3 Green Infrastructure Benefits Evaluation 4-5 Legal agreements for long-term sustainability	$ 68,391	$ -		$ 409,755	$ -	$ -	$ 478,146	Program efforts to ensure sustainability; $50M CIP development
4-4 Amendment to the Suppl. Report on Alt. CSO Controls for the Upper Rouge				$ -	$ -	$ -		Not included as part of green infrastructure spend
Activity 5 – Stakeholder and Community								
5-1: Green Infrastructure Website 5-5: Green Infrastructure Case Studies and Demonstration Projects 5-6: Green Infrastructure Forum 5-7: Stakeholder Involvement and Education Strategy 5-8: Overarching Green Infrastructure Educational Campaign	$ 263,369	$ -		$ 141,990	$ -	$ -	$ 405,359	All outreach activities
5-2: Green Rewards Program Stakeholder Engagement 5-3: Green Rewards Toolbox 5-4: Green Rewards Training Workshops	$ -	$ -	$ -	$ -	$ -	$ -	$ -	Related to Drainage Charge and no longer reported
DWSD Staff	$ 425,000	$ -		$ 75,000			$ 500,000	
Total	$ 4,600,398	$ 4,975,991	$ -	$ 3,177,299	$ 1,510,133	$ 1,409,246	$ 15,673,067	

Figure 42 DWSD GSI Program Expenditures



5.0 VOLUMETRIC REDUCTIONS

QUANTIFICATION

The runoff volume estimates for discrete storm events are based on NRCS curve number hydrology calculations. Green stormwater infrastructure practices that are designed to manage stormwater runoff are calculated based on the runoff volume from the tributary area. In the case of practices which result in a land cover conversion the managed runoff calculation is based on the change in curve numbers. Detailed information of the NRCS Curve Number approach is available in the NRCS Part 630 National Engineering Handbook (NRCS, USDA, 2004). The initial abstractions assumption inherent in the NRCS approach was updated according to the ASCE *State of the Practice Curve Number Hydrology* (Hawkins, 2009). Volume calculations are summarized in Table 16 for a single 2-year, 24-hour design storm event (equivalent to approximately 2.34 inches of rainfall).

Estimated runoff reduction volumes for tree planting are based on 7,117 trees being planted in the URT since the inception of the program. The planting locations and methods are such that the greatest benefit from a stormwater runoff perspective is from tree canopy interception. Tree canopy interception rates are based on interception capabilities as planted. As the trees grow and the canopy increases, the interception will increase and the corresponding runoff reduction estimates from tree plantings will increase.

Table 16 Stormwater Runoff Volume Reduction Summary

Activity	FY2010-FY2013	FY2014	FY2015	FY2016	FY 2017	Cumulative Total, 2-yr (MG)[1]	Annual Volume Retained (MG)
Activity 2-1 Small Scale Greening	N/A	0.02	N/A	0.08	0.04	0.14	0.83
Activity 2-2 Large Scale Greening	N/A	N/A	N/A	0.55	0	0.55	5.87
Activity 2-5 Municipal Parks Flow Management	N/A	N/A	N/A	0.21	0.03	0.24	5.07
Activity 2-6 Transportation Corridor Flow Management	N/A	N/A	0.11	0.14	0.06	0.31	8.08
Activity 3-1 and 3-2 Downspout Disconnection	N/A	0.06	N/A	N/A	N/A	0.06	
Activity 3-3 Demolitions and Site Restoration	N/A	0.13	N/A	N/A	0.47	0.60	
Activity 3-4 Tree Planting	0.12	0.03	0.05	N/A	N/A	0.20	
Totals						**2.1**	**19.85**

6.0 ACTION PLAN FOR FY2018

INTRODUCTION

This section provides a description of the action plan for FY2018. As the program has advanced, the programmatic efforts and project types have become better defined. The FY2018 action plan generally follows the original program structure, but includes some revision to the project implementation subtasks to better align with the implementation mechanisms, rather than the type of GSI implemented. This recognizes that the projects more typically include a mix of GSI practices and property types (e.g., road, parcel) than the original project designations.

The original activity designations include:

1. Policies, Procedures and Standards
2. Prototype Projects (renamed in FY2018 to be Project Implementation)
3. Continued Implementation (renamed in FY2018 as Distributed GSI Projects)
4. Long Term Performance
5. Stakeholder and Community Engagement

Project implementation

Efforts under Activity 2 include a wide range of projects generally grouped into the following project types:

a) Neighborhood scale projects that are intended to control larger acreage, result in significant reductions of stormwater to the combined sewer system, address level of service issues and contribute to the quality of life. These projects will use a mix of small and large GSI practices and sewer separation. They will frequently include a mix of project locations such as roadways, parks and parcels. These projects are DWSD led and executed.
b) Localized projects that use GSI practices to control relatively small tributary areas (generally less than five acres). These projects have a primary impact of managing stormwater prior to discharge to the combined sewer system and enhancing neighborhoods. They may be constructed in roadways, parks or parcels. Lead on these projects may be either DWSD or another agency.
c) Opportunistic GSI projects that result from coordination with other departments, agencies, community groups and NGOs. These projects may have limited lead time and may have another lead agency. In these project types, DWSD may perform a companion project, execute a design component, provide input and review on approach and methodology or other project effort to advance the implementation of GSI.
d) GSI implemented in conjunction with other DWSD infrastructure efforts. In FY2017, DWSD procured a program manager under CS-1812. As that program implements expanded water main and sewer infrastructure, opportunities for these projects to also include GSI will be evaluated.

Distributed GSI Implementation

The efforts previously identified as “continued implementation” are being renamed to avoid confusion with other GSI efforts. The “continued” term is no longer a distinguishing characteristic of these projects.

Planned activities for FY2018 and future are reflected in this section.

IMPLEMENTATION SCHEDULE

The schedule for implementation of green stormwater infrastructure projects has been developed to identify specific activities and the proposed schedule for implementation. In the first year of implementation of the GSI Plan, some activities were prioritized over others, resulting in either tasks being completed ahead of the original schedule or delayed relative to the dates presented. Capitalizing on opportunities, the program completed design and bidding of transportation corridor projects well ahead of what was originally envisioned. Code and ordinance efforts were also accelerated based on the significant interest in new development in the City. The following section includes an updated implementation plan based on results of FY2017, and includes some items that were

not identified in the 2014 Plan. Note that **bolded dates** shown in the tables below are actual dates. Tasks within specific activities that have been completed have been removed from this section.

SUMMARY OF ACTIVITIES

Table 17 provides an overview of the action items planned. Additional details describing the individual activities are provided in the subsequent sections.

Table 17 Proposed FY2018 Activities

No.	Activities	Proposed Activities and Schedule
Activity 1 – Policies, Procedures and Standards		
1-1	Codes and Ordinances	Post construction stormwater management ordinance August 2018 Code updates "greening of the code" September 2017
1-2	Stormwater Design Manual (for Stormwater Ordinance)	Draft September 2017
1-3	Drainage Charge Credit System	Major credit programs: capital assistance, FBNP and off-site to be developed and available by December 2017.
1-4	Green Streets Standards	DWSD will support efforts by P&DD and DPW to promote green and complete streets.
1-5	Structure Demolition and Lot Greening Standards	No activities planned
1-6	Public Stormwater Maintenance Guidance	Expand existing information into a guidance document by December 2017
1-7	Municipal Stormwater Maintenance Manual	Expand information as new GSI technologies are implemented.
1-8	Tracking System	Tracking systems ongoing.
Activity 2 – Project Implementation		
	PW6968 (Transportation Projects)	Construction complete. Contract closeout in FY2018
	Stoepel Park No. 1	Construction complete. Contract maintenance period continues in FY2018
	Liuzzo Park	Construction substantially complete. Contract maintenance period continues in FY2018
	Tireman Phase II (Bioswales in Rouge Park)	Construction of retrofits complete in FY2018
	Crowell Recreation Center	Bids received. Begin and substantially complete construction in FY2018
	Ecosites Retrofits	Bids received. Begin and substantially complete construction in FY2018
	O'Shea Park	Design complete. Begin and substantially complete construction in FY2018
	Oakman Blvd	Design at 60% complete. Begin construction in FY2018; complete construction FY2019 or FY2020
	Vacant Lot GSI	Design FY2018; Construction FY2019
	Orangelawn Street Phase I	Design FY2018; Construction FY2019 – FY2020

No.	Activities	Proposed Activities and Schedule
	West Warren Projects (Constance Phase II and Tireman Phase III)	Design FY2018 – FY2019; Construction FY2019-FY2020
	Rogell	FY2018 Complete concept and schedule implementation
	Minock Park/ Brightmoor	FY2018 Develop concept and schedule implementation
	Ludington Magnet Middle School and Charles Wright Academy	Acceptance of project by DPS in July 2017. Design complete and construction start in FY2018
	Additional GSI Projects	DWSD will consider additional opportunistic projects in collaboration with city parks, city facilities and DPS.
Activity 3 – Distributed GSI Implementation		
3-1	Downspout Disconnection - Homes	Coordination with faith-based and non-profit groups for downspout disconnection programs in conjunction with drainage charge credit system and outreach. See activity 1-3.
3-2	Downspout Disconnection - Multi-Family Residential, Commercial, and Industrial	Non-residential outreach to stimulate private investment through activity 1-3 and 5-4.
3-3	Demolitions and Site Restoration	Coordination with DLBA and DBA is ongoing.
3-4	Tree Plantings	No additional plantings planned for FY2018.
Activity 4 - Long Term Performance		
4-2	Green Stormwater Infrastructure Performance Planning	Ecosite monitoring through fall 2017 Overarching monitoring objectives and work plan December 2017
4-3	Green Stormwater Infrastructure Benefits Evaluation	Ongoing coordination with the University of Michigan Water Center.
4-5	Legal agreements for long-term sustainability	Ongoing activity.
Activity 5 - Stakeholder and Community Engagement		
5-1	Green Stormwater Infrastructure Website	Ongoing updates.
5-2	Green Credits Program Stakeholder Engagement	Ongoing activity. Multiple efforts. See detail.
5-3	Green Credits Toolbox	Ongoing updates and additional materials to include credit calculators, starter guides and other materials
5-4	Green Credits Training Workshops	Ongoing updates. Workshops in drainage charge credits to be updated for the capital assistance program.
5-5	Green Stormwater Infrastructure Case Studies and Demonstration Projects	Ongoing updates.
5-6	Green Stormwater Infrastructure Forum	Spring 2018
5-7	Stakeholder Involvement and Education Strategy	Ongoing updates.
5-8	Overarching Green Stormwater Infrastructure Educational Campaign	Ongoing updates.

ACTIVITIES DESCRIPTIONS

ACTIVITY 1 – POLICIES, PROCEDURES AND STANDARDS

DWSD has created a Stormwater Management Group (SMG) to ensure efforts for better stormwater management are coordinated throughout the organization and with other agencies. Efforts through this newly created SMG will be focused on publication of the post-construction stormwater ordinance and greening of the code revisions and processes to support ongoing stormwater management programs.

Any activities that were completed in prior years have been removed from this section and planned activity tables.

1-1 Codes and Ordinances

The code-related implementation tasks have been delineated into two distinct work streams – "Greening the Code" and "Development of the Post Construction Stormwater Management Ordinance". It should be noted that all of the actions described below are subject to the legislative process which will dictate the implementation schedule. The following activities are envisioned to be part of FY2018:

- Post-construction stormwater management ordinance:
  - Continue the development of post construction stormwater management ordinance. Incorporate alternative compliance options analysis and recommendations for final PCSWMO.
  - Present draft final ordinance to the City Planning Commission and City Council for review and approval.
- "Greening of the Code"
  - Present "Greening the Code" and 5th Text Amendment to City Council for approval.
  - Adoption of "Greening the Code" and 5th Text Amendment by City Council
- Continue coordination with BSEED, PDD, DPW and other relevant departments that manage the zoning, building codes and site reviews/ permitting in the city.
- Conduct stakeholder outreach regarding final draft of PCSWMO and code revisions.
- Continue to coordinate the development of the Stormwater Design Manual with the modifications to the City's codes and ordinances.

The milestone schedule for these efforts is:

Task ID	Activity	Target/Actual Start	Target/Actual Complete
1-1-1	Post-construction stormwater management ordinance	**January 2016**	August 2018
1-1-2	Code updates to remove barriers to green stormwater infrastructure	**June 2016**	September 2017

1-2 Stormwater Management Design Manual

A technical design manual is under development that will accompany the requirements in the post construction stormwater management ordinance. This manual will serve as a resource manual for both applicants and City personnel to ensure compliance with the post-construction stormwater ordinance (Note: purpose narrowed from the GSI Plan). The manual will also address the permit requirements (Part I.A.15.d.9) pertaining to stormwater controls for projects requiring a Part 41 construction permit issued by MDEQ. Design standards of green infrastructure practices will be included in the manual as well as the following topics:

- Applicability of the requirements for new development, redevelopment, and municipal projects including roadway improvements.
- Design criteria for site drainage, roadway and parking lots, and flow conveyance of sewers, culverts, and open channels. The design criteria will address water quantity and quality considerations. Design standards for both the combined sewered areas and the separately sewered areas will be addressed.

- Overview of drainage design methodologies and acceptable practices.
- Stormwater control measures design considerations for systems such as green roofs, water harvesting, bioretention, tree plantings, porous pavements, and detention and retention basins.
- Special conditions and constraints for environmentally sensitive areas, floodplain encroachments, and contaminated sites.
- Procedures and submittals requirements for site plan approval.
- Operation and maintenance practices, agreements and easements.
- Design and construction performance certifications.
- Erosion and sediment control for construction sites.

Development of the manual is a collaborative effort between City departments. As such, a subcommittee working group was developed and has met to provide comments and revisions during chapter development. In addition, meetings have been held with Wayne County in efforts to coordinate and understand ordinance development between the two government agencies. DWSD is leading the effort in drafting the manual but adoption of the manual will require the participation of other departments.

The milestone schedule for these efforts is:

Task ID	Activity	Target/Actual Start	Target/Actual Complete
1-2	Manual development	**October 2015**	Draft: September 2017 Final: TBD

1-3 Drainage Charge Credit System

The drainage charge credit system is in support of the drainage charge system that generates bills for rate payers based on parcel imperviousness. The credit system is designed to encourage implementation of GSI and other stormwater management practices on parcels to reduce the drainage charge a property owner pays and add to the overall combined sewer system benefit of reducing runoff entering the system. The following activities will continue throughout the next year to promote credits:

- Continue monthly credit workshops and individual customer credit consultation meetings to assist customers in implementing stormwater practices at their site.
- Finalize credit policies and programs for capital assistance program, faith-based and non-profit (FBNP) outreach credits, and off-site credits.
- Internal DWSD drainage charge program team continue working to refine policies, processes, and implementation of the drainage charge and credit program including internal training.
- Ongoing coordination with code and ordinance issues to facilitate property owner ability to implement green infrastructure practices.
- Ongoing implementation of community conversation with stakeholder group and broader audience. (Reported under Activity 5-2).

The milestone schedule for these efforts is:

Task ID	Activity	Target/Actual Start	Target/Actual Complete
1-3-1 and 1-3-2	Drainage Charge Manual	**March 2016**	**October 2016**
1-3-3	Provide education and training	**August 2016**	**Ongoing through FY2018**
1-3-4	Policy and program development for capital assistance program, FBNP outreach and off-site implementation	**January 2017**	December 2017
*Comment: The Drainage Charge Manual and supporting documentation will be treated as a living document for the first several years of the program.			

1-4 Green and Complete Streets Standards

Green and complete streets have become an initiative led by PDD with support from DPW and the mayor's office. The primary area of focus for these agencies is commercial corridors and major roadways impacted by a mix of objectives including various modes of transportation (automotive, transit, bicycle, and pedestrian), attractive settings (streetscape design features) and stormwater management and other utility objectives (such as moving overhead power below grade). DWSD will support the development of various concepts and standards as this process moves forward and will work on details of GSI for implementation in commercial corridors.

DWSD will work with DPW on application of GSI on residential streets through the implementation of various neighborhood scale projects.

1-5 Structure Demolition and Lot Greening Standards

This activity is complete.

1-6 Public Stormwater Maintenance Guidance

General maintenance protocols for GSI practices were included in the drainage charge manual, published in October 2016. A more extensive maintenance guidance document will be developed, building off of the municipal maintenance manual which is in draft form as of FY2017 (see also green credits toolbox materials (Activity 5-3)). A target audience for this guidance is private property owners receiving drainage credits for stormwater management practices such as bioretention, permeable pavement and subsurface storage. This guidance will address common types and frequency of maintenance activities. Inspection and recordkeeping for practices receiving stormwater drainage credits will also be addressed. Development of the maintenance guidance is being coordinated with the development of the stormwater technical design manual, and as such, will be vetted through a subcommittee of City department staff and key stakeholders.

The milestone schedule for these efforts is:

Task ID	Activity	Target/Actual Start	Target/Actual Complete
1-6-1	Public maintenance materials available	**October 1, 2016**	Updated and expanded December 2017

1-7 Municipal Stormwater Maintenance Manual

The target audience for this manual is the municipal staff responsible for caring for the publically owned and maintained stormwater management practices. Municipal staff includes but is not limited to DWSD. The objective of the manual is to identify methods and approaches to maintain green stormwater infrastructure practices. This manual will address institutional and technical issues, inspections, and recordkeeping, amongst other efforts. The manual is complete for existing DWSD implemented projects as of July 2017. As additional project types are added, the manual will be expanded to address such items as inlet structures, subsurface storage, and manufacturers' treatment devices that are included on projects.

The milestone schedule for these efforts is:

Task ID	Activity	Target/Actual Start	Target/Actual Complete
1-7-1	Draft manual	**August 1, 2016**	**June 2017**
1-7-2	Final manual	TBD	TBD
1-7-3	Provide education and training	TBD	Ongoing

1-8 Tracking System

DWSD is developing a tracking and performance assessment database for green stormwater infrastructure implementation activities. The objective of this database is to define, at a minimum, the location, ownership, financial investment, performance, and installation date of the green stormwater infrastructure practices. Three primary types of data are maintained by DWSD:

- DWSD constructed or direct funded green stormwater infrastructure.
- Privately owned green stormwater infrastructure practices that qualify for drainage charge credits.
- General land use cover change over time.

Activities planned for FY2018

- Updates to impervious cover. DWSD and the assessor's office are coordinating on aerial photography and impervious cover mapping of the city to reflect conditions in April 2018.
- Phase 2 of GSI mapping for practices for public education purposes. *Conceptual public facing map tool under development by The Nature Conservancy with DWSD a partner in the concept development and with funding from the Erb Foundation.*

The milestone schedule for these efforts is:

Task ID	Activity	Target/Actual Start	Target/Actual Complete
1-8-5	Mapping tool of GSI practices (TNC-led project under Erb Foundation grant) (Phase 2) – DWSD participation	FY2018	FY2019
1-8-6	Impervious cover updates – April 2018	**May 2017**	December 2018

ACTIVITY 2 – PROJECT IMPLEMENTATION

DWSD has a series of projects that are close to completion. The majority of these projects are substantially complete but the construction contracts are not closed. A summary of these projects and future action items is shown in Table 6, Table 7, Table 8, and Table.

Activity	Target/Actual Start	Target/Actual Complete
PW6968	**May 2016**	**FY2017 (Construction)** FY2018 (Contract closeout)
Stoepel Park No. 1	**June 2016**	**FY2017 (Construction)** FY2018 (Maintenance Period)
Liuzzo Park	**July 2016**	FY2018 (Construction completion and maintenance Period)
Tireman Phase II (retrofits)	**November 2016**	FY2018 (Plantings)

DWSD has multiple projects that are planned for implementation. Descriptions of projects are presented in section 2 of this report. These projects include Crowell Recreation Center, Ecosites Retrofits, O'Shea Park and Oakman Boulevard. Projects that are in concept development are described in this section of the report. Projects and their status are shown below.

There are several projects in the final design stages; Table 18 shows the estimated construction completion dates, as well as the projected engineering and construction costs for these projects after July 1, 2017.

Table 18 Future Projects and Status

Project Name/Location	Current Status	Anticipated Construction Year	Estimated Construction Value
Crowell Recreation Center	Bid	FY2018	$730,000
Eco Sites Retrofit	Bid	FY2018	$120,000
O'Shea Park	90% design complete	FY2018	$500,000
Oakman Blvd	60% design complete	FY 2018 – FY 2019	$4,500,000
Vacant Lot GSI	Project scoping	FY2018 – FY2019	TBD
Orangelawn Street	Project scoping	FY2019-FY2020	TBD
West Warren Projects (Constance Phase II and Tireman Phase III)	Project scoping	FY2019-FY2020	TBD
TOTAL	**$580,000**	**$5,667,000**	**$6,247,000**

Oakman Boulevard

The 60% design phase for Oakman Boulevard was completed in May 2017. Activities related to the design of Oakman Boulevard in FY2018 include holding a second public meeting to gather input on the revised landscaping plans and development of the final design and construction package to advertise for bid.

Vacant Lot GSI

DWSD recently completed the initial screening process and developed a list of 16 potential sites for review. It is anticipated that FY2018 activities will include final site selection and conceptual design through preliminary design. The schedule for implementation of these projects is dependent on interagency coordination including legal issues which may impact the planned project timeline.

Orangelawn Street

Conceptual design for the Orangelawn project was completed in July 2017. Planned activities in FY2018 include selection of Phase 1 implementation project, coordination with parks regarding work in Rouge Park, detailed design and preparation of the final construction documents. Public outreach activities are anticipated to occur during FY2018.

West Warren

The West Warren project area is in the concept design phase. Activities related to FY2018 for the advancement of this project include sewer system investigation, completion of conceptual design, coordination of public meetings to review the proposed design and seek input on the landscaping elements, and preliminary design. The overall project schedule proposes final design in late 2018 and construction starting in 2019.

Rogell Regional Stormwater Practice

DWSD is currently coordinating meetings with MDOT, PDD and HRD to discuss integration of these various projects and entities on the site and completion of conceptual design. Activities anticipated through FY2018 include project scoping, conceptual design and community outreach. The project will be scheduled following completion of scoping efforts. Coordination with MDOT, P&DD and HRD will be ongoing.

Minock Park/ Brightmoor

DWSD is currently evaluating a neighborhood scale GSI project in the Minock Park/ Brightmoor area. The project will be scheduled following completion of scoping efforts. Activities anticipated through FY2018 include project scoping, conceptual design and community outreach.

Ludington Magnet Middle School and Charles Wright Academy

The 30% design phase for this project has been completed. In FY2018, project review and progress meetings will be held between DWSD's design team and DPS to discuss each major design milestone through final design. The final design is anticipated to be complete and issued for bid in FY2018. These implementation projects require a memorandum of understanding between DWSD and DPS. A draft MOU was prepared that clarifies issues of funding, ownership, maintenance, and education. The MOU will be finalized in FY2018.

Opportunistic Projects

DWSD will continue to collaborate with other City departments and project partners. This may result in identification of additional projects and opportunities.

ACTIVITY 3 – DISTRIBUTED GSI IMPLEMENTATION

DWSD has previously participated in a series of projects including downspout disconnection, demolitions and site restoration, and planting trees in the URT project area. Each of these activities has evolved at the policy and program implementation level.

3-1 Downspout Disconnection - Homes

Disconnection of downspouts for homes, including single family residential, duplex and townhomes involves working with the property owner, resident and BSEED. The primary mechanism that is cost effective and efficient for downspout disconnection has been through code compliance with individual home upgrades, as was discussed in Section 2 of this report. DWSD, as part of the credit program for faith-based and non-profit organizations is developing a drainage charge credit for those organizations that inventory the existing condition of downspouts in order to encourage and/ or require disconnection of these downspouts from the sewer system.

3-2 Downspout Disconnection - Multi-Family Residential, Commercial, and Industrial

Opportunities for disconnection of downspouts for multi-family residential, commercial, industrial and institutional properties are limited unless other green infrastructure practices are included. This is due to the lack of lawn area on most parcels into which downspouts could be discharged. Downspout disconnection for these properties will therefore be included in City of Detroit (for public sites) or through property owner actions associated with the drainage charge credit system (private parcels). DWSD is currently providing technical assistance to property owners to better support their implementation of green infrastructure on site.

The "greening of the code" efforts being performed under Activity 1-1 will help enable private property discharge of roof runoff into green infrastructure practices, for both new development and retrofits of existing properties. As discussed in Activity 3-2, a letter was sent to MDEQ in November 2016 highlighting the green credit system in efforts to reduce stormwater runoff to the combined sewer resulting from connected roof drains.

3-3 Demolitions and Site Restoration

Residential demolitions in the City of Detroit are managed through the Detroit Land Bank Authority (DLBA) and implemented by the Detroit Building Authority (DBA). Commercial demolitions involve DBA and BSEED.

DWSD's strategy will be to support demolitions which cannot be funded through other mechanisms and will result in removal of significant impervious area. As such, these demolitions may include isolated single-family homes or non-single-family residential properties. DWSD funded demolitions will require control of runoff from the site as a condition of the funding.

DWSD is in regular communication with the DLBA and the DBA so that specific opportunities may be considered as the demolition activities continue. These may include DWSD involvement such as assisting with restoration of large demolition sites, such as school properties, which could also be used for stormwater management from surrounding areas.

3-4 Tree Planting

Tree planting efforts were advanced in FY2014 through FY2016. DWSD has no specific plans for mass tree planting outside of specific green stormwater infrastructure projects. Tree canopy is being evaluated by PDD.

ACTIVITY 4 - LONG TERM PERFORMANCE

Objectives of the GSI Program include a reduction in CSO discharge, a reduction in basement backups and street flooding and improved quality of life. As green stormwater infrastructure projects are implemented, monitoring of those projects and efforts which make them successful will be performed. The Long Term Performance effort includes a wide variety of activities that aid in the understanding of the performance of GSI, approaches to increase its impact and reduce its costs, and coordination on the development and placement of projects that will achieve multiple benefits.

Specific activities planned for FY2018 include:

- Evaluation of performance of various green stormwater infrastructure practices. Specific efforts in FY2018 include additional monitoring of the Ecological Restoration of Demolition Sites.
- Development of an overarching monitoring plan for GSI. The plan will identify study objectives and methods of analysis.
- Ongoing coordination with other research and study efforts being performed to assess the potential for GSI to benefit social stability of neighborhoods and assessment of characteristics that are most socially impactful. Effort is ongoing and will continue in FY2018.
- Ongoing efforts to define vision, mission, and metrics of GIS implementation with the GSI interdepartmental working group. Effort is ongoing and will continue in FY2018.
- Legal agreements between DWSD and the property owners for green stormwater infrastructure sites will be prepared to ensure long-term sustainability. The agreements will be prepared in conjunction with the project design and construction. Agencies include DLBA, DPS, DPW and General Services (for parks). Effort is ongoing and will continue in FY2018.
- Coordination with the West Side Model efforts to better understand the behavior of the sewer system on the west side and in the URT area. Effort is ongoing and will continue in FY2018.

Task ID	Activity	Target (or Actual) Start	Target Complete
4-2	Development of monitoring plans and implementation to evaluate questions of hydrology and green stormwater infrastructure performance. Work in FY2018 will include ongoing monitoring of the existing "eco-sites" and development of more extensive GSI study questions	**September 2014**	Ecosite monitoring through fall 2017 Overarching monitoring objectives memorandum December 2017

Task ID	Activity	Target (or Actual) Start	Target Complete
4-3	Study to evaluate benefits that can be achieved through green stormwater infrastructure implementation based on projects implemented and data collected (specifically evaluation of neighborhood scale implementation). In FY2018 this will include ongoing coordination with the University of Michigan Water Center and other researchers.	**August 1, 2016**	Ongoing
4-5	Legal agreements for long-term sustainability.	**January 1, 2016**	Ongoing

ACTIVITY 5 - STAKEHOLDER AND COMMUNITY ENGAGEMENT

In FY2018, stakeholder and community engagement will continue be a fundamental component of each green stormwater infrastructure implementation project, the Drainage Charge Program and associated credits through GSI practices, and the post-construction stormwater ordinance development and the greening of the municipal code. DWSD will continue to work with key partners to collaborate on GSI stakeholder involvement and education activities with the goal of gaining insight, input, implementation support, and balanced public policy. DWSD will also continue to promote implementation of green stormwater infrastructure on privately-owned parcels. DWSD will continue to support the Interdepartmental GSI Subcommittee under the Sustainability Office to craft a shared citywide vision and overarching educational campaign to promote widespread GSI implementation in Detroit.

5-1 Green Infrastructure Website

During FY2018, DWSD will continue to make organizational and content updates and improvements to the stormwater, drainage and GSI credits, city-funded GSI project, and post construction stormwater management ordinance and greening of the municipal code web pages. DWSD will work with the City of Detroit's information technology staff to make additional changes based on anticipated changes to the overall city website. DWSD will continue to work with key partners to determine a strategy for integrating the conceptual green stormwater infrastructure mapping and knowledgebase tool into the DWSD GSI web pages. Anticipated new content includes new CSO and GSI educational videos, GSI starter guides, news articles, project fact sheets, and GSI credit case studies.

Task ID	Activity	Target (or Actual) Start	Target Complete
5-1	Website Updates	Ongoing by program phase	

5-2 Green Credits Program Stakeholder Engagement

DWSD will continue to plan and attend stakeholder engagement events with key groups of drainage charge customers in conjunction with the drainage charge transition schedule. During FY2018, DWSD will focus on stakeholder engagement with business associations, nonprofit organizations, faith-based councils, and residential customers. DWSD will also plan and participate in drainage charge and credit meetings in each district throughout the city, collaborating with city council members and Department of Neighborhood managers. The goal is to tailor the drainage charge credit information to the specific needs and technical capabilities of each key stakeholder group, focusing on credit options that are most likely to be used by that group of customers. DWSD initiated the three-step site assessment process in FY2017 which includes credit consultations. This form of credit stakeholder engagement will continue in FY2018. Many drainage charge customers will be engaged through the drainage charge credit workshops.

Task ID	Activity	Target Start	Target Complete
5-2-1	Engagement Program (identification)	July 1, 2016	September 30, 2016
5-2-2	Engagement Program (input sessions)	October 1, 2016	December 31, 2016
5-2-3	Engagement Program (notification)	January 1, 2016	June 30, 2016

5-3 Green Credits Toolbox

DWSD is developing new components to the existing Credit Toolbox materials developed in FY2017. Key new tools include the GSI Starter Guides to help drainage charge customers begin to select and plan appropriate GSI practices to obtain credits. DWSD will continue working on the credit calculator and return on investment (ROI) calculator initiated in FY2017 with anticipated public release of these tools in FY2018. DWSD is working to release the GSI Capital Assistance Program in early FY2018 to help drainage charge customers finance GSI practices that are eligible for drainage charge credits. These activities also relate to tasks under Activity 1-3, Drainage Charge Credit System.

5-4 Green Infrastructure Credits Training Workshops

DWSD will continue implementation of two types of training workshops to promote implementation of green stormwater infrastructure through the drainage charge program to earn credits. The first type of training is for city department staff and other local partners that will help educate drainage charge customers on the Drainage Charge Program and associated credit process. An initial city department training took place in FY2017 for city departments that own property and pay for drainage, with the goal of providing information on credit opportunities and the credit application process. The training workshop in FY2018 will focus on providing city department staff with an understanding of the Drainage Charge Program and the credit process to ensure these departments are able to provide accurate information to Detroit property owners.

The second type of training is for drainage charge customers, building off of the drainage charge credit workshops provided by DWSD throughout FY2017. DWSD will continue providing monthly drainage charge credit workshops to nonresidential property owners, as well as other key customer groups including nonprofit/tax-exempt customers, residential customers, and key subgroups in these categories, including faith-based customers, condo associations, and business associations. DWSD will continue to tailor drainage charge credit workshops to specific audiences.

The schedule for these activities will parallel those mentioned in Activity 1-3, drainage charge credit system development. Initial expectations include:

Task ID	Activity	Target Start	Target Complete
5-4-1	Internal City Department Workshop	Initial workshop in FY2017; second workshop scheduled for July 2017	Ongoing as needed
5-4-2	Drainage charge credit workshops for nonresidential, nonprofit/tax exempt, residential property owners	Series began October 2016	Ongoing monthly workshops throughout FY2018

5-5 Green Stormwater Infrastructure Case Studies and Demonstration Projects

DWSD will continue to highlight examples of public and private GSI projects through case studies, distributed as fact sheets on the DWSD GSI city-funded project web page and GSI credit web page, as well as through presentation materials. DWSD will continue to update existing project fact sheets with new project information and details as available and will create new fact sheets for new DWSD funded projects. DWSD will continue to plan and facilitate GSI tours for stakeholders. During FY2018, DWSD will provide a tour for residents within the Oakman Boulevard GSI project area to view examples of bioretention. DWSD will plan and facilitate similar tours for other key GSI projects.

The milestone schedule for these efforts is:

Task ID	Activity	Target Start	Target Complete
5-5-1 and 5-5-2	Case Studies	**Ongoing**	Ongoing
5-5-3	GSI stakeholder tours	Ongoing	Ongoing

5-6 Green Stormwater Infrastructure Forum

DWSD recognizes the importance of sustaining communication and coordination among City department staff and key green stormwater infrastructure partners throughout the city that play a role in green stormwater infrastructure implementation. During FY2017, DWSD worked with key city departments to begin the transition of the existing Interdepartmental GSI coordination group to a more formalized citywide GSI subcommittee under the City of Detroit Office of Sustainability. During FY2018, DWSD will continue to facilitate the citywide GSI subcommittee and assist in finalizing a shared citywide vision and definition of GSI, as well as goals and metrics that will help drive citywide GSI education. The GSI subcommittee will also be the appropriate group, with leadership from DWSD, to plan and host a citywide GSI forum during FY2018 that harnesses the energy of Detroit's GSI efforts, showcased at the MDEQ Great Lakes and St. Lawrence Green Infrastructure Conference during FY2017. The city-focused Detroit GSI Forum will highlight existing and future GSI projects and roll-out the city's shared GSI vision. DWSD will serve as a lead coordinator among city departments to plan and host this Detroit GSI Forum, with assistance from other key green infrastructure partners. The Detroit GSI Forum could parallel the rollout of the Detroit Sustainability Action Plan to be developed through the Office of Sustainability starting in late 2017. DWSD will initiate discussions about the Detroit GSI Forum in July 2017. The Detroit GSI Forum could occur in spring 2018, depending on the work of the GSI subcommittee and the overall Sustainability Office.

The milestone schedule for these efforts is:

Task ID	Activity	Target Start	Target Complete
5-6-1	FY2018 green stormwater infrastructure forum planning	July 2017	May 2018
5-6-2	FY2018 green stormwater infrastructure forum and highlights report	May 2018	July 2018

5-7 Stakeholder Involvement and Education Strategy

DWSD will continue to update and adjust existing stakeholder involvement and education strategies related to the drainage charge program and GSI credits, DWSD-funded GSI projects, and overarching citywide GSI outreach efforts. These individual strategies are based on DWSD's overall stakeholder involvement and education strategy initially developed in 2014. In FY2018, DWSD will continue to review and adapt these strategies based on stakeholder feedback. For green stormwater infrastructure project stakeholder involvement and education strategy implementation, the focus in FY2018 will include a ribbon cutting celebration for Liuzzo Park, continued stakeholder involvement and education for Oakman Blvd., Crowell Recreation Center, O'Shea Park, and the next phase of work at two of the eco-restoration sites. DWSD will continue to develop project-specific involvement and education strategies for FY2018 GSI projects and implement these strategies with input and coordination from city

and community project stakeholders. These activities will include, at a minimum, project input and informational meetings, project fact sheet development, and educational mailings.

The milestone schedule for these efforts is:

Task ID	Activity	Target Start	Target Complete
5-7-1	Review existing strategies	**Ongoing**	**Ongoing**
5-7-2	Update strategies	Documents remain evolving drafts	

5-8 Overarching Green Stormwater Infrastructure Educational Campaign

DWSD will continue to coordinate with key partners to develop and implement overarching green stormwater infrastructure educational messages and a citywide GSI branding logo. This work will happen internally through the interdepartmental GSI subcommittee and externally through work with existing groups including the Erb Family Foundation Blue/Green Infrastructure Workgroup and the City Council Green Task Force Blue/Green Subcommittee. These activities represent an ongoing effort.

The milestone schedule for these efforts is:

Task ID	Activity	Target Start	Target Complete
5-8-1	Overarching green stormwater infrastructure educational campaign	Ongoing	

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