

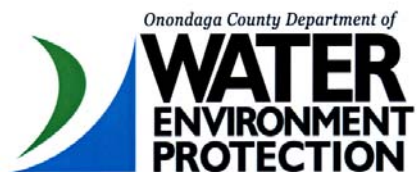
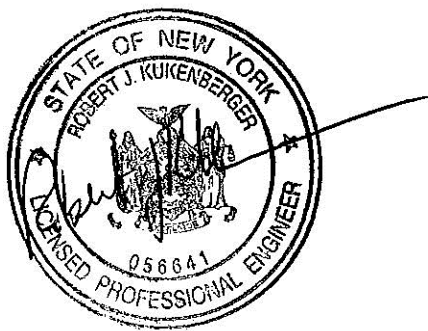
# Onondaga County, New York ACJ 4<sup>th</sup> Stipulation 2011 Annual Report

Joanne M. Mahoney, County Executive



Prepared for  
Onondaga County, New York

Prepared by



December 2012

Save the Rain 



**A J o i n t V e n t u r e**

Salina Industrial Power Park, One General Motors Drive  
Syracuse, New York 13206 - Ph: 315/434-3200 - Fx: 315/463-5100

---

December 21, 2012

Ms. Valarie Ellis Stephenson  
Onondaga Lake Monitor  
New York State Department of Environmental Conservation (NYSDEC)  
615 Erie Boulevard West  
Syracuse, NY 13204-2400

Re: 2011 Annual Report, ACJ 4<sup>th</sup> Stipulation

Dear Ms. Stephenson,

On behalf of Onondaga County, please find attached, for your approval, three (3) copies of the revised pages to 2011 Annual Report based upon comments listed in your November 27, 2012 letter. We have included (3) CD-ROMs with electronic versions of the revised report and appendices.

Sincerely,

A handwritten signature in blue ink that reads 'Christopher C. Schmidt'.

Christopher Schmidt  
CDM/C&S

cc: Tom Rhoads, Commissioner, OCDWEP (hard copy)  
Samuel Sage, ASLF (hard copy)  
Kenneth Lynch, P.E., NYSDEC - Region 7 (e-copy via email)  
Mark Klotz, NYSDEC - Albany (e-copy via email)  
Mary Jane Peachey, NYSDEC - Region 7 (e-copy via email)  
Scott Crisafulli, NYSDEC - Albany (e-copy via email)  
Thomas Vigneault, NYSDEC - Region 7 (e-copy via email)  
Joseph Zalewski, NYSDEC - Region 7 (e-copy via email)  
Debra Banks, NYSDEC - Region 7 (e-copy via email)  
John Ferrante, NYSDEC/CNYRPB (e-copy via email)  
Norman Speigel, NYS Office of Attorney General (e-copy via email)  
John Davis, NYS Office of Attorney General (e-copy via email)  
Matt Millea, Onondaga County Executive Office (e-copy via email)  
David Coburn, Onondaga County Office of the Environment (e-copy via email)  
Gordon Cuffy, Onondaga County Attorney (e-copy via email)  
Kathy Dougherty, Onondaga County Law Department (e-copy via email)

Luis Mendez, Onondaga County Law Department (e-copy via email)  
Carrie Vanderhoof, NYSEFC (e-copy via email)  
Jimmy Ng, NYSEFC (e-copy via email)  
Mike Lannon, OCDWEP (e-copy via email)  
Nick Capozza, OCDWEP (e-copy via email)  
Jeanne Powers, OCDWEP (e-copy via email)  
Janaki Suryadevara, OCDWEP (e-copy via email)  
Kathleen McGrath, ASLF (e-copy via email)  
Hongbin Gao, ASLF (e-copy via email)  
Chuck Dworkin, ASLF Counsel (e-copy via email)  
Douglas McKenna, USEPA - Region II (e-copy via email)  
Seth Ausabel, USEPA - Region II (e-copy via email)  
Christopher Deere, USEPA - Region II (e-copy via email)  
Michael Shaw, USEPA - Region II (e-copy via email)  
Diane Gomes, USEPA - Region II (e-copy via email)  
Larry Gaugler, USEPA - Region II (e-copy via email)  
Robert Kukenberger, CDM/C&S (e-copy via email)  
Robert Palladine, CDM/C&S (e-copy via email)  
Matthew Marko, CH2M HILL (e-copy via email)  
Rita Fordiani, CH2MHILL (e-copy via email)  
BJ Adigun, CH2MHILL (e-copy via email)

# Table of Contents

<b>List of Abbreviations</b> .....	<b>iii</b>
<b>Executive Summary</b> .....	<b>ES-1</b>
<b>Section 1 Introduction</b> .....	<b>1-1</b>
1.1 The 4 <sup>th</sup> Stipulation of the ACJ.....	1-1
1.2 Report Sections.....	1-2
<b>Section 2 CSO Overview and Monitoring</b> .....	<b>2-1</b>
2.1 Combined Sewer System Overview.....	2-1
2.2 Ambient Monitoring Program.....	2-4
2.2.1 CSO Monitoring.....	2-5
2.2.1.1 Work Completed in 2011.....	2-5
2.2.1.2 Proposed Work for 2012.....	2-6
2.2.1.3 Post-Construction Monitoring Program.....	2-6
2.2.1 Water Quality Monitoring.....	2-6
2.2.1.1 Work Completed in 2011.....	2-7
2.2.1.2 Proposed Work for 2012.....	2-10
<b>Section 3 CSO Project Status</b> .....	<b>3-1</b>
3.1 Gray Infrastructure.....	3-1
3.1.1 CSO 044 Conveyances.....	3-2
3.1.2 Harbor Brook Interceptor Sewer Replacement.....	3-4
3.1.3 Erie Boulevard Storage System Gate Chamber Modifications.....	3-6
3.1.4 Clinton CSO Storage Facility.....	3-7
3.1.5 Lower Harbor Brook CSO Storage Facility.....	3-10
3.1.6 Sewer Separation of CSO Areas 022 and 045.....	3-12
3.1.7 Proposed New Projects for 2012.....	3-14
3.1.8 Gray Infrastructure O&M Requirements.....	3-15
3.2 Green Infrastructure.....	3-16
3.2.1 Current GI CSO Reduction Methodology.....	3-16
3.2.2 Projects Completed/Under Contract in 2011.....	3-16
3.2.3 Proposed Projects for 2012.....	3-16
3.2.4 Summary of Proposed Projects Beyond 2012.....	3-26
3.2.5 Gray Infrastructure O&M Requirements.....	3-28
3.3 Facility Planning.....	3-29
3.3.1 Floatables Plan.....	3-29
3.3.2 CSO 022, 027, 029, 052, 060, 077 and 067 Facility Plan.....	3-29
<b>Section 4 Public Outreach</b> .....	<b>4-1</b>
4.1 Save the Rain Program.....	4-1
4.1.1 Branding/Advertising.....	4-1
4.1.2 Public Outreach Activities.....	4-1
4.2 Project Specific Outreach.....	4-2
4.3 Public Relations/Media/National Recognition.....	4-3

<b>Section 5 Intergovernmental Cooperation .....</b>	<b>5-1</b>
5.1 City-County Green Infrastructure Initiatives .....	5-1
5.2 Public Private Partnership .....	5-1
5.3 Inter-municipal Agreements .....	5-2
5.4 Sewer Ordinances .....	5-2
<b>Section 6 SWMM Updates .....</b>	<b>6-1</b>
6.1 2011 Model Summary .....	6-1
6.1.1 Planned Storage Facility Updates .....	6-1
6.1.2 Planned CSO Wetland Facility .....	6-1
6.1.3 Modeling Log .....	6-2
6.1.4 Capture Adjustments .....	6-3
6.2 Green Infrastructure Modeling Plan .....	6-3
6.2.1 Modeling Green Infrastructure in SWMM .....	6-3
6.2.2 Technical Approaches for Onondaga County Green Infrastructure Model .....	6-5
6.2.3 Hydraulic Modeling Tasks .....	6-7
<b>Section 7 Conclusions .....</b>	<b>7-1</b>
7.1 CSO Compliance Schedule .....	7-1
7.1.1 SWMM CSO Capture Results .....	7-1
7.1.2 ACJ Milestone Compliance .....	7-2
7.2 Program Assessment .....	7-3
7.3 Recommendations .....	7-3

## Appendices

- Appendix A – Proposed Modifications to the Ambient Monitoring Program – Final Revised Workplan
- Appendix B – Ambient Monitoring Program, 2011 Data Summary
- Appendix C – Ambient Monitoring Program, Tributary Non-Compliance Summary
- Appendix D – Ambient Monitoring Program, Sampling Events Summary
- Appendix E – Technical Memorandum, Onondaga County CSO Loading Evaluation, Brown and Caldwell, July 29, 2011
- Appendix F – EBSS Final Gate Set Adjustment Letters, Brown and Caldwell, October 4, 2011 and December 21, 2011

## List of Abbreviations

ACJ	Amended Consent Judgment
AMP	Ambient Monitoring Plan
ASLF	Atlantic States Legal Foundation
BMP	Best Management Practices
cfs	cubic feet per second
CMOM	capacity, management, operation and maintenance
CSO	combined sewer overflow
CSS	combined sewer system
DEC	New York State Department of Environmental Conservation
DPW	City of Syracuse Department of Public Works
EBSS	Erie Boulevard Storage System
EOY	end of year
EPA	United States Environmental Protection Agency
FCF	Floatables Control Facility
GI	Green Infrastructure
GIF	Green Improvement Fund
GIS	geographic information systems
HB	Harbor Brook
HBIS	Harbor Brook Intercepting Sewer
IMA	Inter-Municipal Agreement
Metro	Metropolitan Syracuse Wastewater Treatment Plant
LC	Ley Creek
LF	linear feet
LHB	Lower Harbor Brook
LID	Low Impact Development
MG	million gallons
MIS	Main Intercepting Sewer
N/A	not applicable
NRDC	Natural Resource Defense Council
NYS	New York State
OC	Onondaga Creek
OCDWEP	Onondaga County Department of Environmental Protection
OEI	Onondaga Environmental Institute
PLC	programmable logic controller
RTF	Regional Treatment Facility
SCADA	supervisory control and data acquisition
SF	square feet
STR	Save the Rain
SUN	Syracuse United Neighbors
SWMM	the stormwater management model
TBD	to be determined
TOGS	the Technical & Operational Guidance Series
WEF	Water Environment Federation
WERF	Water Environment Research Foundation

# Executive Summary

## Save the Rain Program

Onondaga County's Save the Rain (STR) Program was created in response to 4<sup>th</sup> Stipulation of the Amended Consent Judgment (ACJ), entered into by Onondaga County, New York State and Atlantic States Legal Foundation (ASLF) on November 16, 2009, which specifically identified Green Infrastructure (GI) as an acceptable technology to significantly reduce or eliminate the discharge of untreated combined sewage into Onondaga Lake (Figure ES-1) and its tributaries, and bring the County's effluent discharges into compliance with the applicable water quality standards for the receiving waters.



**Figure ES-1: Onondaga Lake**

In 2011 the program continued its rapid implementation of green infrastructure through the implementation of Project 50, which set the goal of commencing at least 50 Green Infrastructure projects over the course of the calendar year.

In addition, the County commenced, continued or completed a number of gray infrastructure construction projects including the Harbor Brook Interceptor Sewer (HBIS) Replacement and CSO Abatement, CSO (Combined Sewer Overflow) 044 Conveyances, Clinton Street Storage Facility, Erie Boulevard Storage System Gate Chamber Modifications, and Lower Harbor Brook Storage and Conveyances.

The Project 50 program incorporated all CSO abatement efforts (including gray infrastructure projects) under the STR program umbrella and featured a comprehensive outreach approach to support "Project 50" green infrastructure construction efforts; reinforced STR as a vital community resource; established the campaign as a national leader in green infrastructure implementation; and helped publicize the development of key projects in the program.



**Figure ES-1: STR  
"Project 50" Logo**

(Metro), and elimination of CSO discharge points.

In 1998 the County estimated it was capturing 74% of combined sewage by volume and at the time the latest installment of the ACJ was agreed to the County had increased that to 84.1% through a number of CSO projects. The County must capture approximately 436 million gallons (MG) of additional combined sewage annually between 2010 and 2018. To meet this new goal the County initiated the "Save the Rain" program which will implement a combination of green and gray infrastructure that focuses on the removal of stormwater from the combined sewer system through GI, CSO storage with conveyance to the Metropolitan Syracuse Wastewater Treatment Plant

## Combined Sewer System (CSS) Update

The combined sewer system tributary to Metro includes an area of 6,547 acres, or approximately 10 square miles. Dry weather flow from the two major combined sewer areas are transmitted to Metro via the HBIS and the Main Interceptor Sewer (MIS), with additional flow from the upper

Butternut/Grant Trunk Sewer and the Hiawatha Trunk Sewer. During periods of heavy rainfall and snowmelt, the combined sewer system can become overwhelmed and the excess combined sewage is discharged to Harbor Brook, Ley Creek and/or Onondaga Creek. Table ES-1 details the pre-abatement and current number of active CSO locations, as well as drainage areas tributary to Metro and how the Metro drainage has changed since 1998, the inception of the lake cleanup program.

**Table ES-1 Pre-ACJ and Current CSOs and Drainage Area Tributary to Metro**

Basin	Pre-ACJ # of Active CSO Locations (1998)	Current # of Active CSO Locations	Combined Sewer Area (acres)	Percentage of Total Combined Sewer Area	Storm Sewer Area (acres)	Total Area (acres)
Harbor Brook	19	16	1,174	18%	21	1,195
Onondaga Creek	50	29	5,111	78%	637	5,748
Ley Creek	2	2	262	4%	628	890
<b>Total</b>	<b>71</b>	<b>47</b>	<b>6,547</b>	<b>100%</b>	<b>1,286</b>	<b>7,833</b>

The abandonment of two CSOs (013 and 016) in 2011 means the County has now closed 24 of 71, or 34%, of the Pre-ACJ active CSO locations since 1998.

### Ambient Monitoring Program

The County's modified Ambient Monitoring Program (AMP) is detailed in the Workplan, approved by NYSDEC in December 2011. The Workplan includes a proposed enhanced monitoring program of the CSOs and the receiving waters, and represents additions to the tributary component of the County's established lake monitoring program, in response to the regulatory and judicial requirements to document the effectiveness of improvements to the Combined Sewer Overflow (CSO) system realized by construction of gray and green infrastructure.

**Table ES-2 Representative CSO Flow Monitoring and Sampling Locations**

Outfall	Receiving Water	Metering Device	Sampling Location
003	Harbor Brook	Flow Meter	FCF on Harbor Brook
004	Harbor Brook	Flow Meter/ Ultrasonic Level Sensor	Upstream side of Hiawatha Blvd. bridge
014	Harbor Brook	Flow Meter	Brook access at Fowler High School
018	Harbor Brook	Flow Meter	Dam at end of DePalma Avenue
027	Onondaga Creek	Flow Meter	Upstream side of Water Street bridge
030	Onondaga Creek	Flow Meter	Upstream side of Walton Street bridge
034	Onondaga Creek	Flow Meter	Upstream side of Dickerson Street bridge
036	Onondaga Creek	Ultrasonic Level Sensor	N/A
044	Onondaga Creek	Flow Meter / Ultrasonic Level Sensor <sup>(1)</sup>	N/A
052	Onondaga Creek	Flow Meter	Upstream side of West Colvin Street bridge
060/077	Onondaga Creek	Flow Meter	Upstream side of South Avenue bridge
063	Harbor Brook	Flow Meter / Ultrasonic Level Sensor <sup>(1)</sup>	N/A
080	Onondaga Creek	Flow Meter	Upstream side of West Genesee Street bridge

Note: (1) – Ultrasonic sensors to be installed after completion of gray infrastructure project

(2) – Location requires manhole modifications

The County was required under the ACJ to, no later than December 31, 2011, install flow meters or other monitoring devices at representative CSOs which were listed in the approved AMP Workplan.

From August 2011 to December 2011, flow monitoring devices were installed and calibrated at representative outfall locations in the combined sewer system. The AMP Workplan also included an in-stream sampling program to measure the water quality of the tributaries the CSS discharges to. Due to Onondaga Creek and Harbor Brook's listing as impaired water bodies by the New York State Department of Environmental Conservation (DEC) and requirements regarding Best Management Practices for impaired surface water bodies from the United States Environmental Protection Agency (EPA), the County is required to test samples for conventional parameters consistent with Part 703.2 and Technical & Operational Guidance Series (TOGS) 1.6.3, and for the concentrations of total phosphorus and total nitrogen. The County must also evaluate historical CSO monitoring data and implement a sampling program to test for priority pollutants, toxic substances that may be present in the receiving waters due to CSOs. The metering and sampling locations are detailed in table ES-3.

## Gray Infrastructure Projects

The ACJ requires the County to construct and commence operation of the specific gray infrastructure projects to assist with meeting the CSO capture compliance goals. The projects are listed in Table ES-4 along with their CSO capture projections, specific milestone requirements, and compliance status.

**Table ES-3 ACJ and Additional Gray Infrastructure Milestone Schedule and Compliance Status**

Project	Estimated CSO Volume Capture	Milestone or Task Description	Milestone Type	Milestone or Proposed Completion Date	Compliance Status
CSO 044 Conveyances	0.3%	Plans and Specs to NYSDEC for review and approval	Minor	06/01/2010	Achieved
		Commence construction	Minor	12/31/2010	Achieved
		Complete construction and commence operation	Major	12/31/2011	Achieved
Harbor Brook Interceptor Sewer Replacement	0.9%	Plans and Specs to NYSDEC for review and approval	Minor	08/17/2009	Achieved
		Commence construction	Minor	01/01/2010	Achieved
		Complete construction and commence operation	Major	12/31/2013	In Progress
EBSS Modifications	0.2%	Plans and Specs to NYSDEC for review and approval	Minor	09/01/2010	Achieved
		Complete required modifications	Major	12/31/2011	Achieved
Clinton 3.7 MG Storage Facility	2.9%	Plans and Specs to NYSDEC for review and approval	Minor	02/01/2011*	Achieved
		Commence construction	Minor	10/01/2011*	Achieved
		Complete construction and commence operation	Major	12/31/2013	In Progress
Harbor Brook 3.2 MG Storage Facility	1.4%	Plans and Specs to NYSDEC for review and approval	Minor	04/29/2011*	Achieved
		Commence construction	Minor	12/31/2011*	Achieved
		Complete construction and commence operation	Major	12/31/2013	In Progress
CSO 022/045 Sewer Separation Project	0.1%	Plans and Specs to NYSDEC for review and approval	N/A	06/06/2011	N/A
		Commence construction	N/A	01/24/2012	N/A
		Complete Construction and commence operation	N/A	09/30/2012	N/A
CSO 063 Conveyances	Included in Harbor Brook Storage Facility above	Submit Draft Design Report	N/A	05/01/2012	N/A
		Submit Final Design Report and 50% Design	N/A	08/01/2012	N/A
		Plans and Specs to NYSDEC for review and approval	N/A	11/01/2012	N/A
		Advertise for Bid	N/A	03/01/2013	N/A
		Commence construction	N/A	07/01/2013	N/A
		Complete Construction	N/A	10/01/2014	N/A

\* - Date reflects ACJ Milestone extension approved by the NYSDEC on November 4, 2010

N/A – Milestone component not applicable to this item

In addition, where possible the gray infrastructure projects included a “Greening the Gray” component which allowed the constructed facilities to operate more sustainably and further manage the stormwater to connected systems within the project footprint. A brief synopsis of the major gray

projects is provided below including the general scope, greening the gray component where applicable, and the status of the project.

### **CSO 044 Conveyances Project**

**Project Location:** West Castle Street between South Avenue and Midland Avenue in the City of Syracuse.

**Scope of Work:** 500 linear feet (LF) of 96-inch diameter conveyance pipeline connected to Midland RTF, CSO 044 regulator structure with 48-inch outfall to Onondaga Creek, and two flushing chambers.

**Greening the Gray:** Bioretention area, two rain gardens, a butterfly garden, a path from South Avenue to the Midland Avenue Bridge over Onondaga Creek, and educational kiosks.

**Project Status:** Conveyance pipeline is substantially complete. Surface restoration is to occur in 2012.

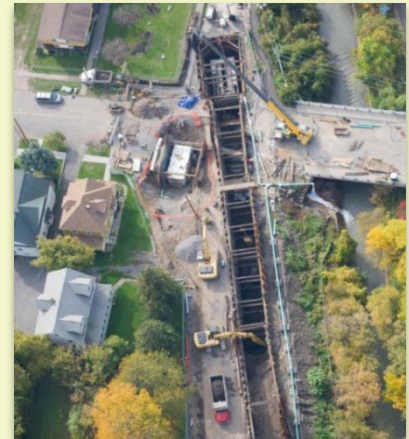


Figure ES-2: CSO 044 Project Site

### **HBIS Replacement and CSO Abatement Project**

**Project Location:** Along Harbor Brook between West Fayette Street and Velasko Road in the City of Syracuse.

**Scope of Work:** 7,503 LF of interceptor sewer, 5,222 LF of local sewers, rehabilitation of 1860 LF existing sewers; abandonment of CSOs 013 and 016 via sewer separation; rehabilitation or replacement of 2500 LF of Harbor Brook Culvert; and 4,100 LF of water mains.

**Greening the Gray:** Approximately 70 tree basins with enhanced infiltration and a rain garden and bio-retention basins at Delaware and Grand Avenue

**Project Status:** 95% complete with a mid-2012 completion date.



Figure ES-3: Delaware-Grand Rain Garden

### **Clinton Street CSO Storage Project**

**Project Location:** The Former Trolley Lot in Downtown Syracuse near Armory Square.

**Scope of Work:** 6 MG underground storage facility, above ground structures at either end for servicing and maintenance, odor control, on site conveyance piping, force main to transmit flow to the MIS, and restoration of the parking lot.

**Greening the Gray:** Green roof and bioretention basins to collect stormwater from the west structure and its surrounding surfaces, and reuse of the stormwater from the eastern half of the parking lot to flush the storage tanks.

**Project Status:** Approximately 15% complete. Completion by

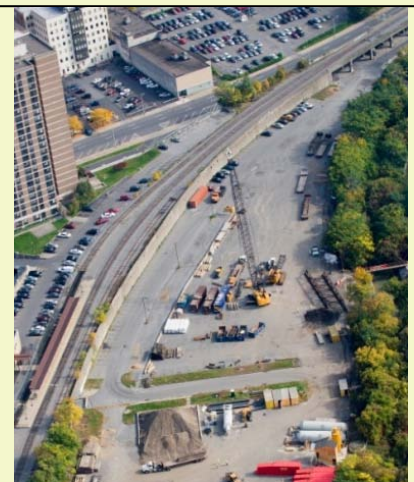


Figure ES-4: Trolley Lot Site

December 31, 2013.

### Lower Harbor Brook (LHB) CSO Conveyances and Storage Project

**Project Location:** State Fair Blvd. at Harbor Brook in the City of Syracuse.

**Scope of Work:** 4.9 MG partially underground storage facility, odor control, 1,200 LF of conveyance piping, 830 LF of regulator sewers, force main to transmit flow to the HBIS, and restoration of the site.

**Greening the Gray:** Storm water reclamation system to collect, store, and reuse storm water for tank cleaning

**Project Status:** Just underway. Completion by December 31, 2013.



Figure ES-5: Rendering of LHB Storage Facility

In 2011, the County also completed the Gate Modifications to the Erie Boulevard Storage System (EBSS) which maximizes the capacity of the facility and began the CSO 022 and 045 Sewer Separation Project which will abandon two more outfall points. The CSO 063 Conveyance Project will commence in 2012 with the design phase and construction will extend into 2013.

### Green Infrastructure Projects

The County memorialized its commitment to Green Infrastructure and the Save the Rain program by proposing to complete 50 projects in 2011 through the announcement of Project-50. The County exceeded that goal by initiating 55 projects in 2011, completing 23 and having 32 projects under contract or substantially completed. Additionally, 26 projects are under contract to receive Green Infrastructure Fund grants. The projects manage approximately 83 acres of impervious area.



Figure ES-6 2011 Green Infrastructure projects part of the Project-50 program: (From Left to Right) Connective Corridor Forman Park, Green Roof at the OnCenter, porous parking lot for the Sunnycrest Arena, and Skiddy Park porous basketball courts.

The County has identified over 160 GI opportunities for 2012, however some of these opportunities may not materialize or may take additional time to develop. About 45 projects are already progressing toward construction in 2012 and these projects manage an impervious area of

approximately 58 acres resulting in a calculated CSO reduction of 64MG (see section 3.2.1 for the description of the calculation).



**Figure ES-7 Potential 2012 Green Infrastructure projects:** (From Left to Right) Rendering of the SUNY Upstate Cancer Center, Harbor Brook Wetland rendering, rendering of the Pocket Park at Clinton and West Genesee Streets, and Otisco Street greenscape rendering.

## Facility Planning

The ACJ requires the County to prepare an assessment and characterization of the floatables component of each CSO in addition to preparing a facilities plan to address the abatement of CSOs 022, 027, 029, 052 and 060/077, as well as assess the Newell Street Facility (CSO 067) for reconstruction or replacement. The floatables plan is on hold while the County continues to evaluate existing data; however the CSO Facilities Plan was submitted to and approved by DEC on August 5, 2011.

## Public Outreach

The 2011 Save the Rain Public Outreach Campaign engaged the general public to raise awareness and educate the community on the green infrastructure efforts implemented by the County. The campaign featured rain barrel workshops, GI presentations, demonstration projects, and school outreach.



**Figure ES-8: Rain Barrel Workshop**

Several projects received focused outreach efforts, such as: the Harbor Brook Constructed Wetland Pilot Treatment System Project, Rain Garden at Delaware Street and Grand Avenue, the CSO 044 Conveyances Project site restoration, Skiddy Park Restoration, and the Otisco Street Green Corridor. The projects provided great opportunities for targeted public engagement and input from community members. Outreach included public meetings, design charettes and informational sessions and the enhanced communication provided a platform to incorporate design elements requested by the community, address questions/concerns and update construction schedules.



**Figure ES-9: War Memorial Cistern System re-uses rainwater to make ice**

The Save the Rain Program also received national recognition by the EPA as one of ten model green infrastructure communities in the United States, and was featured in case studies by the EPA, Natural Resources Defense Council (NRDC) and Water Environment Federation (WEF). Extensive local coverage for signature projects such as the OnCenter Green Roof, War Memorial Cistern System, and Skiddy Park Basketball Courts was also provided.

## Municipal and Private Cooperation

Many of the projects, green or gray, associated with the Save the Rain Program required cooperation between the County and the City of Syracuse or other municipalities. Bi-weekly meetings were held with the City of Syracuse to discuss GI implementation and develop a consensus approach to design, construction, and maintenance issues and achieve repeatable standards with clear responsibilities. The result from this cooperation, the City of Syracuse's Green Infrastructure Permission Ordinance, produced significant efficiencies for both the City and County in the way projects are administered and approved for construction.

In addition, Inter-municipal Agreements (IMAs) were used as another tool by the City and County to deal with property access or transference, utility work, mitigation, or fund transfers. The IMAs, negotiated between City and County Departments with assistance from their respective legal groups, have been necessary for both green and gray initiatives and projects including the Clinton, Harbor Brook and Midland CSO Abatement Projects; each individual sewer separation project; joint City-County Arborist position; and GI Projects including the Connective Corridor Phase 1 and Joint School Construction Board project at Dr. Week's Elementary.

Currently, the County is advancing legislation that would affect the amount of stormwater entering the sewers of the sanitary district, modify City of Syracuse codes to allow for the implementation of GI on properties within City boundaries, and provide access to the County to construct GI on City owned property. Local Law #1 of 2011 establishes a program to promote capacity, management, operation and maintenance of the public sewers and related purposes. The County and the City of Syracuse are also coordinating three pieces of City legislation which will implement additional GI within City boundaries and addresses stormwater management for development activities, tree planting, and sidewalks.

The County has also developed a Green Improvement Fund (GIF) to provide incentives for private property implementation of GI that divert storm water runoff from the combined sewer system.

## Stormwater Management Model (SWMM) Update

The County, each year, evaluates the model used to determine compliance with the phased CSO capture goals in the ACJ (Table ES-4) and to assist with design of new facilities. Many times the evaluations resulted in changes to the model and in 2011 the future conditions model, the simulation used to predict future CSO capture, was revised to incorporate the new capacities of the Clinton and Lower Harbor Brook Storage Facilities, the planned CSO 018 Wetland Facility, the new weir level at CSO 044, and the new gate chamber elevations in the EBSS (see section 6 of the subsequent report).

**Table ES-4 CSO Capture Compliance Schedule**

Compliance Stage	Percent capture CSO by volume	Compliance deadline
Stage I	89.5 %	December 31, 2013
Stage II	91.4 %	December 31, 2015
Stage III	93.0 %	December 31, 2016
Stage IV	95.0 %	December 31, 2018

The County is also required to develop an approach to modeling GI and how to fully incorporate GI into SWMM. This approach will be determined through the evaluation of the results from the initial

years of GI implementation and will most likely undergo refinement each year leading up to the Stage II compliance determination discussed in the 2015 Annual Report. The GI modeling approach will utilize newly developed SWMM functionalities (i.e., the Low Impact Development module) to better represent the characteristics of green infrastructure. A green infrastructure monitoring program will eventually be implemented to evaluate the effectiveness of the GI projects and monitoring data will be used to calibrate the model for better predictability of the green program.

## SWMM CSO Capture Results

The CSO capture projections are based upon the evaluation of three SWMM scenarios: pre-abatement (Pre-1998), existing conditions (as of 12/31/2011), and future conditions (full implementation of green and gray CSO abatement in 2018). The average annual capture of combined sewage has been calculated for each of the three model scenarios based upon the current and future understanding of the combined sewer system and the proposed abatement improvements, and the typical year (1991) rainfall. A summary of the three model scenarios is shown in Table ES-5 below.

**Table ES-5 CSO Capture Status**

Model Scenario	Combined Sewage Generated (MG)	Pre-Abatement Combined Sewage Conveyed to Metro (MG)	Additional Combined Sewage Eliminated or Captured for Treatment (MG)	Total Combined Sewage Eliminated or Captured for Treatment (MG)	Percent Capture
	[1]	[2]	[3]	[4]	[5]
Pre-abatement (1998)	3,754	2,799	0	2,799	74%
Current (as of 12/31/11)	3,754	2,799	428	3,227	86%
Future (projected 2018)	3,754	2,799	767	3,566	95%

## Program Assessment

Onondaga County's "Save the Rain" program progressed significantly in 2011. The goals of the Project 50 campaign were exceeded and all ACJ stipulated gray projects were either in construction or have been completed. The County is also progressing with its water quality monitoring and flow metering program which will obtain samples from points within the receiving waters and data from representative CSOs throughout the system. The metering data combined with the County's approach to incorporating GI into SWMM, to be developed further in 2012, will eventually allow the County to factor into the capture models the benefits of GI implementation as it equates to CSO abatement. The gray infrastructure initiated in 2012 is on time to be complete per their construction schedules and as a result it is anticipated the County will meet the Stage I compliance milestone of 89.5% capture by the end of 2013.

# Section 1

## Introduction

### 1.1 The 4<sup>th</sup> Stipulation of the Amended Consent Judgment

On November 16, 2009, Onondaga County, New York State and ASLF entered into the 4<sup>th</sup> Stipulation of the ACJ which specifically identified GI as an acceptable technology to significantly reduce or eliminate the discharge of untreated combined sewage into Onondaga Lake and its tributaries, and bring the County's effluent discharges into compliance with the applicable water quality standards for the receiving waters. The ACJ included a phased schedule for CSO compliance (Table 1-1) that used an incremental approach to meeting the new goal of capture or elimination of no less than 95% by volume of CSO by 2018. In 1998 the County estimated it was capturing 74% of combined sewage by volume and at the time the latest installment of the ACJ was agreed to the County had increased that to 84.1%. This increase was the result of a number of CSO projects having been completed along with updates to SWMM and reassessment of lands connected to the combined sewer system. The completed projects include:

**Table 1-1 CSO Capture Compliance Schedule**

Compliance Stage	Percent capture CSO by volume	Compliance deadline
Stage I	89.5 %	December 31, 2013
Stage II	91.4 %	December 31, 2015
Stage III	93.0 %	December 31, 2016
Stage IV	95.0 %	December 31, 2018

- **Regional Treatment and/or Storage** at Midland Avenue, Hiawatha Boulevard, and Erie Boulevard,
- **CSO Pipelines** for Midland Avenue and Clinton Street,
- **Sewer Separation** of CSO Areas 024, 038, 040, 046A, 046B, 047, 048, 050, 051, 053, 054, 057, 058, and 059, and
- **Pump Station Upgrades** at Kirkpatrick Street.

Each percentage point of volume represents approximately 40 million gallons of combined sewage, and as a result the County must capture approximately 436 MG of additional combined sewage annually between 2010 and 2018. To meet this new goal the County will implement a combination of green and gray infrastructure that focuses on the removal of stormwater from the combined sewer system through GI, CSO storage with conveyance to Metro, and elimination of CSO discharge points.

Under the ACJ the County is allowed to construct, maintain and implement GI projects necessary to satisfy the CSO discharge limitation set forth in table 1-1. The County will utilize a wide variety of GI technology including, but not limited to: porous concrete and asphalt, rain gardens, infiltration trenches and/or beds, bio-retention trenches, tree basins and/or enhanced street trees, vegetated roofs, rain barrels, and wetland CSO treatment.

In addition, specific gray infrastructure projects were identified in the ACJ whose construction and commencement of operation were critical to meeting the compliance schedule set forth above. The projects, as stated in the ACJ, are the:

- CSO 044 Conveyances
- Harbor Brook Interceptor Sewer Replacement
- Harbor Brook 3.2 MG Storage Facility
- Clinton 3.7 MG Storage Facility
- EBSS Gate Chamber Modifications

These five projects are currently under construction or in the case of the EBSS project complete as of the end of 2011. The County was also required to prepare a plan for the assessment of all remaining County CSOs with respect to floatables control. FCFs have already been constructed at Franklin Street, Harbor Brook, Maltbie Street, and Teall Brook. A detailed facilities plan to address CSO 022, 027, 029, 052, 060/077 and 067 was also required under the ACJ. The plan for CSO 067 assesses the reconstruction or replacement of the Newell Street Facility.

The ACJ also contains specific requirements regarding reporting and determination of compliance. Each year beginning in 2011 the County must submit an annual report which details the work completed or progressed in the previous calendar year and the proposed work for the following calendar year. The County must also, by the end of 2011, install and maintain flow metering or monitoring devices at representative CSOs. The representative CSOs are listed in the Final Revised AMP Workplan dated December 2011 (Appendix A). The County must also update the SWMM on a yearly basis using the monitoring data to verify, reconcile and re-calibrate, as necessary, SWMM values and outputs. The DEC will utilize the data from the CSO monitoring devices, the SWMM, and other models and outputs to determine the County's compliance with the CSO discharge volume reduction obligations. The DEC's annual compliance determination will start in 2014 after the submittal of the 2013 Annual Report.

## 1.2 Report Sections

The 2011 Annual Report will detail the progress made towards meeting the requirements of the ACJ 4<sup>th</sup> Stipulation. The report will present, in detail, the status and progress of various green and gray infrastructure programs and/or projects during the 2011 calendar year. In addition the Annual Report will identify the proposed programs and projects for the 2012 calendar year. The following information required by section 14H of the ACJ is listed below along with its corresponding section in this report:

### Section 2 – CSO Overview and Monitoring

- An overview of the Combined Sewer System
- Discussion of the Ambient Monitoring Program

### Section 3 – CSO Projects Status

- Descriptions of current and proposed green and/or gray project
- Operation and maintenance requirements for the green and/or gray project(s)

- Ownership, control, access and terms of use of the subject properties for the green and/or gray project(s)

#### Section 4 – Save the Rain Program

- A green infrastructure outreach plan to advise the community of the benefits of green infrastructure and encourage cooperation with its implementation

#### Section 5 – Intergovernmental Cooperation

- Specific actions to coordinate and provide incentives for projects to be undertaken with the cooperation and/or participation of the City of Syracuse and private property owners

#### Section 6 – Stormwater Management Model (SWMM)

- SWMM Update

#### Section 7 - Summary

- Program reassessment including estimated CSO capture, compliance with ACJ milestones, and recommendations

## Section 2

# CSO Overview and Monitoring

## 2.1 Combined Sewer System (CSS) Overview

The combined sewer system tributary to Metro includes an area of 6,547 acres, or approximately 10 square miles. The two major combined sewer areas tributary to Metro are the Harbor Brook Service Area, via the HBIS, and the Onondaga Creek Service Area, via the MIS. In addition, the upper Butternut/Grant Trunk Sewer and the Hiawatha Trunk Sewer discharge their excess storm water to Ley Creek. Their dry weather flow, however, is conveyed to Metro via the MIS.

The combined sewer system is utilized to the maximum extent to capture and treat combined sewage. During periods of heavy rainfall and snowmelt, the combined sewer system can become overwhelmed and the excess combined sewage is discharged to Harbor Brook, Ley Creek and/or Onondaga Creek. Table 2-1 below details the pre-abatement and current number of active CSO locations, as well as drainage areas tributary to Metro and depicts how the characteristics of the Metro drainage area have changed since the inception of the County's lake cleanup program in 1998.

**Table 2-1 Pre-ACJ and Current CSOs and Drainage Area Tributary to Metro**

Basin	Pre-ACJ # of Active CSO Locations (1998)	Current # of Active CSO Locations	Combined Sewer Area (acres)	Percentage of Total Combined Sewer Area	Storm Sewer Area (acres)	Total Area (acres)
Harbor Brook	19	16	1,174	18%	21	1,195
Onondaga Creek	50	29	5,111	78%	637	5,748
Ley Creek	2	2	262	4%	628	890
<b>Total</b>	<b>71</b>	<b>47</b>	<b>6,547</b>	<b>100%</b>	<b>1,286</b>	<b>7,833</b>

In 2011, two CSOs (013 and 016) in the Harbor Brook drainage basin were abandoned as part of the HBIS Replacement and CSO Abatement Project. The County has now closed 24 of 71, or 34%, Pre-ACJ active CSO locations since 1998. Since the two CSO basins now have separate sanitary and storm sewers the total combined sewer area for the Harbor Brook basin was reduced by 21 acres. In addition, the acreage of CSO 018 within the Harbor Brook basin was revised decreasing the size of that basin by an additional 24 acres. In all the combined sewer area for Harbor Brook were decreased by 45 acres from the 2010 report. An updated list of all 71 pre-Amended Consent Judgment active CSOs are included in Table 2-2 beginning on the next page. The table includes each outfall number, its location, outfall status (active or abandoned), drainage basin, proposed or implemented CSO abatement strategy, and scheduled CSO abatement completion date, if applicable. In addition, Figure 2-1, at the end of this section, graphically shows the delineation of each CSO basin in the combined sewer system listed in Table 2-2.

Table 2-2 CSO Status

Outfall	Status	Location	Basin	CSO Abatement Strategy <sup>(3)</sup>	Status or Scheduled Completion Date for Abatement <sup>(4)</sup>
003	Active <sup>(1)</sup>	Hiawatha Blvd.	HB	Lower Harbor Brook Storage Facility	12/31/2013
				Green Infrastructure	12/31/2018
004	Active <sup>(1)</sup>	State Fair Blvd.	HB	Lower Harbor Brook Storage Facility	12/31/2013
				Green Infrastructure	12/31/2018
005	Active	W. Genesee and Sackett	HB	Floatables Plan	Plan under review
006	Active	Park Ave. and Sackett (W)	HB	Floatables Plan	Plan under review
				Green Infrastructure	12/31/2018
006A/ 079	Active	Park Ave. and Sackett (E)	HB	Floatables Plan	Plan under review
				Green Infrastructure	12/31/2018
007	Active	Richmond Ave.	HB	Floatables Plan	Plan under review
				Green Infrastructure	12/31/2018
008	Active	Lakeview and Liberty St.	HB	Floatables Plan	Plan under review
009	Active	W. Fayette (west)	HB	Floatables Plan	Plan under review
				Green Infrastructure	12/31/2018
010	Active	W. Fayette (east)	HB	Floatables Plan	Plan under review
				Green Infrastructure	12/31/2018
011	Active	Gifford St. at Fowler	HB	Floatables Plan	Plan under review
				Green Infrastructure	12/31/2018
012	Abandoned		HB	N/A	Completed <sup>(5)</sup>
013	Abandoned	Seymour St.	HB	Separation	Completed 12/31/2011
014	Active	Delaware St.	HB	Floatables Plan	Plan under review
				Green Infrastructure	12/31/2018
015	Active	Herriman and Grand Ave.	HB	Floatables Plan	Plan under review
				Green Infrastructure	12/31/2018
016	Abandoned	Lydell St.	HB	Separation	Completed 12/31/2011
017	Active	Hoeffler St.	HB	Floatables Plan	Plan under review
018	Active <sup>(1)</sup>	Rowland Ave. (at basin)	HB	GI-Wetlands with Floatables Control	12/31/2018
019	Active	Kirkpatrick St.	OC	Kirkpatrick Street Pump Station	Completed 2002
020	Active	Butternut St.	OC	Franklin Street FCF	Completed 2000
				Green Infrastructure	12/31/2018
021	Active	Burnet Ave.	OC	Franklin Street FCF	Complete 2000
				Green Infrastructure	12/31/2018
022	Active <sup>(2)</sup>	West Genesee	OC	Separation	12/31/2012
				Green Infrastructure	12/31/2018
024	Abandoned	Water Street	OC	Separation	Completed 2001
025	Abandoned		OC	Separation	Completed <sup>(5)</sup>
026	Abandoned		OC	Separation	Completed <sup>(5)</sup>
027	Active	West Fayette St.	OC	Fac Plan - Regulator Modification, Screens, Aggressive GI Implementation	8/5/2018
				Green Infrastructure	12/31/2018
028	Active <sup>(1)</sup>	Walton St. (west)	OC	Clinton Street CSO Storage Facility	12/31/2013
				Green Infrastructure	12/31/2018
029	Active	Walton St. (east)	OC	Fac Plan - Regulator Modification, Screens, Aggressive GI Implementation	8/5/2018
				Green Infrastructure	12/31/2018
030	Active <sup>(1)</sup>	West Jefferson (east)	OC	Clinton Street CSO Storage Facility	12/31/2013
				Green Infrastructure	12/31/2018
031	Active <sup>(1)</sup>	West Jefferson (west)	OC	Clinton Street CSO Storage Facility	12/31/2013
				Green Infrastructure	12/31/2018
032	Active <sup>(1)</sup>	Tully St.	OC	Clinton Street CSO Storage Facility	12/31/2013
				Green Infrastructure	12/31/2018
033	Active <sup>(1)</sup>	Dickerson St.	OC	Clinton Street CSO Storage Facility	12/31/2013

Table 2-2 CSO Status

Outfall	Status	Location	Basin	CSO Abatement Strategy <sup>(3)</sup>	Status or Scheduled Completion Date for Abatement <sup>(4)</sup>
034	Active <sup>(1)</sup>	Gifford St. (east)	OC	Clinton Street CSO Storage Facility	12/31/2013
				Green Infrastructure	12/31/2018
035	Active <sup>(1)</sup>	Gifford St. (west)	OC	Clinton Street CSO Storage Facility	12/31/2013
				Green Infrastructure	12/31/2018
036	Active <sup>(1)</sup>	West Onondaga Street	OC	Clinton Street CSO Storage Facility	12/31/2013
				Green Infrastructure	12/31/2018
037	Active <sup>(1)</sup>	East Adams St.	OC	Clinton Street CSO Storage Facility	12/31/2013
				Green Infrastructure	12/31/2018
038	Abandoned	Taylor Street	OC	Separation	Completed 2005
039	Active <sup>(1)</sup>	Tallman East	OC	Midland RTF	Completed 2005
				Green Infrastructure	12/31/2018
040	Abandoned	Tallman West	OC	Separation	Completed 2005
041	Active <sup>(1)</sup>	Oxford	OC	Midland RTF	Complete 2008
042	Active <sup>(1)</sup>	Midland West	OC	Midland RTF	Completed 2008
				Green Infrastructure	12/31/2018
043	Active <sup>(1)</sup>	Midland East	OC	Midland RTF	Completed 2008
				Green Infrastructure	12/31/2018
044	Active <sup>(1)</sup>	South Ave.	OC	Midland RTF	12/31/2011
				Green Infrastructure	12/31/2018
045	Active <sup>(2)</sup>	Hudson Street	OC	Separation	12/31/2012
				Green Infrastructure	12/31/2018
046A/B	Abandoned	Onondaga Ave.	OC	Separation	Completed 2005
047	Abandoned	South Ave. East	OC	Separation	Completed 2006
048	Abandoned	South Ave. West	OC	Separation	Completed 2006
049	Abandoned	Kirk Ave.	OC	Separation	Completed <sup>(5)</sup>
050	Abandoned	Rockland	OC	Separation	Completed 2008
051	Abandoned	West Colvin	OC	Separation	Completed 2009
052	Active	Hunt and Elmhurst	OC	Fac Plan - Regulator Modification, Screens, Flow Management, GI Implementation	8/5/2018
				Green Infrastructure	12/31/2018
053	Abandoned	Marguerite	OC	Separation	Completed 2003
				Green Infrastructure	12/31/2018
054	Abandoned	Brighton	OC	Separation	Completed 2003
055	Abandoned		OC	Separation	Completed <sup>(5)</sup>
056	Abandoned		OC	Separation	Completed <sup>(5)</sup>
057	Abandoned	West Genesee	OC	Separation	Completed 1999
				Green Infrastructure	12/31/2018
058	Abandoned	Tracy Street	OC	Separation	Completed 1999
059	Abandoned	Park Avenue	OC	Separation	Completed 1999
060	Active	West Colvin	OC	Fac Plan - Screens, Aggressive GI Implementation	8/5/2018
061	Active	Crehange St.	OC	Floatables Plan	Plan under review
062	Abandoned	W. Brighton East	OC	Eliminate	Completed <sup>(5)</sup>
063	Active <sup>(1)</sup>	Emerson Ave.	HB	Lower Harbor Brook Storage Facility	10/1/2014
				Green Infrastructure	12/31/2018
065	Active <sup>(6)</sup>	Maltbie St.	OC	Maltbie St. FCF	Completed 1999

**Table 2-2 CSO Status**

Outfall	Status	Location	Basin	CSO Abatement Strategy <sup>(3)</sup>	Status or Scheduled Completion Date for Abatement <sup>(4)</sup>
066	Active	Maltbie St.	OC	Maltbie St. FCF	Completed 1999
				Green Infrastructure	12/31/2018
067	Active	W. Newell St.	OC	Fac Plan - Screens, Aggressive GI Implementation, Demolish Newell St Facility	8/5/2018
071	Active	Spencer St. Bypass	OC	Captured up to 2-year storm	Completed <sup>(5)</sup>
073	Active	Teall Ave.	LC	Teall Brook FCF	Completed 2001
				Green Infrastructure	12/31/2018
074	Active <sup>(1)</sup>	Hiawatha Blvd.	LC	Hiawatha Blvd. RTF	Completed 2001
				Green Infrastructure	12/31/2018
075	Active	Hiawatha Blvd.	OC	Capacity Upgrade	Completed <sup>(5)</sup>
				Green Infrastructure	12/31/2018
076	Active	Brighton and Midland	OC	Floatables Plan	Plan under review
				Green Infrastructure	12/31/2018
077	Active	Midland and W. Colvin (tributary to 060)	OC	Fac Plan - Screens, Aggressive GI Implementation	8/5/2018
				Green Infrastructure	12/31/2018
078	Active	Bellevue and Velasko	HB	Floatables Plan	Plan under review
080	Active <sup>(1)</sup>	Erie Blvd.	OC	Erie Blvd. Storage System (EBSS)	Completed 2002
				EBSS Gate Modifications	12/31/2011
				Green Infrastructure	12/31/2018

**Definitions:**

Active – the outfall point continues to have the potential to discharge combined sewage.

Abandoned – the outfall point has been completely eliminated or converted to a storm discharge point only.

**Notes:**

(1) – Presently or planned for CSO capture

(2) – Presently planned for abandonment/elimination in the future

(3) – GI for areas completed through 2010 or planned for 2011

(4) – Represents status of Gray Infrastructure only

(5) – Actual completion date unknown at this time

(6) – Outfall closed and flow is transmitted to CSO 066 and the Maltbie Street FCF

## 2.2 Ambient Monitoring Program

The AMP Modifications Workplan, Final Revised dated December 2011, as required by the ACJ as amended by the [4th] Stipulation and Order, details the County's proposed enhanced monitoring program of the CSOs and the receiving waters. The workplan represents additions to the tributary component of the County's established monitoring program, in response to the regulatory and judicial requirements to document the effectiveness of improvements to the CSS realized by construction of gray and green infrastructure.

The Final AMP Workplan was developed with support from DEC and ASLF staff and designed to meet the objectives of the ACJ, including the fourth stipulation. The AMP Modifications Workplan submitted to DEC in September of 2011 incorporated responses to the DEC's letter dated August 24, 2011, transmitting comments on the County's May 27, 2011, submittal of a revised draft of the proposed workplan. Following review of the Final Workplan Revised September 2011, the DEC approved the workplan on December 1, 2011, with the incorporation and inclusion of the following reporting requirements:

- **Monthly Reports:** Submit a monthly non-Compliance report of *those results which do not comply with the ambient water quality standards* applicable to those waterbodies sampled. If sampling

results indicate that compliance has not been met, the County shall report the non-compliance to the DEC within thirty (30) days.

- Quarterly Status Reports: Submit a report to the DEC summarizing the status of the AMP tasks completed, as well as the analytical results, commencing on January 1, 2012. The quarterly report for the month of April may be incorporated into the Annual Reports, due April 1st of each year.
- Annual Report: Include the analytical results and measurements from all AMP sampling required throughout 2011 and an evaluation of the effectiveness of the gray and green infrastructure improvements based upon the results of the flow monitoring program - deliverable to the DEC by April 1, 2012.

On December 16, 2011, the County resubmitted a Revised Final Workplan, which incorporates the modifications as requested by the DEC (Appendix A).

### 2.2.1 CSO Monitoring

The Fourth Stipulation and Order Amending the ACJ, Paragraph 14I, Determination of Compliance requires that, no later than December 31, 2011, which shall be a major milestone compliance date, the County shall complete installation of flow meters or other monitoring devices at representative CSOs as directed in writing by DEC, and maintain in working order for the measurement of volume, date and time of effluent being discharged. In accordance with the ACJ Paragraph 14I, the data collected by the flow monitoring program is to be used to verify, reconcile and re-calibrate SWMM.

The approved AMP Workplan lists the representative CSOs as required by DEC for monitoring along with the dates of installation. Flow meters are required to be installed at six (6) CSOs by 12/31/11, two (2) CSOs by 12/31/12, three (3) CSOs by 12/31/13, and dates for two (2) CSOs to be determined, for a total of 12 CSOs to be monitored (note that 060/077 are considered 1 CSO). Onondaga County and its consultants installed flow meters for 11 of the 13 CSO outfalls in 2011 in order to begin collecting representative data for SWMM verification and calibration at as many locations as feasible. One of the remaining overflow points, CSO 027, will need structural modifications prior to installation of a flow meter. The meter installation at CSOs 027 and 036 will be completed prior to December 31, 2013.

#### 2.2.1.1 Work Completed in 2011

In order to efficiently investigate potential monitoring configurations, procure the necessary equipment and complete the flow monitoring installations consistent with the workplan in a timely fashion the County retained a flow monitoring consultant to assist with the work. From August 2011 to December 2011, flow monitoring devices were installed and calibrated at the locations listed in Table 2-3. Two flow meters have been installed for monitoring CSO 060/077 as there are two separate CSO regulator chambers (one for CSO 060 and one for CSO 077) but both CSOs discharge through one outfall to Onondaga Creek.

Each of the monitoring sites were visited, photographed and assessed during the summer of 2011. Once the site data were obtained the findings were reviewed, and a final approach suitable for each location was developed taking into account hydraulic conditions, access, and challenges associated with safely installing and servicing the flow meters in accordance with safety protocols. During the period of August 24 through November 29, 2011, 12 flow metering stations were installed and started up as a part of this effort. Each station includes a monitoring device and wireless modem to transmit

data via the internet to an accessible internet site. The installation testing period, during which time each installed monitor is checked every three days to document performance, concluded on December 21, 2011.

**Table 2-3 Representative CSO Flow Monitoring Locations and Installation Status**

Outfall	Receiving Water	Metering Device	Required Installation Date	Installation Status
003	Harbor Brook	Flow Meter	12/31/2012	Complete
004	Harbor Brook	Flow Meter/ Ultrasonic Level Sensor	12/31/2012	Complete
014	Harbor Brook	Flow Meter	12/31/2011	Complete
018	Harbor Brook	Flow Meter	12/31/2011	Complete
027	Onondaga Creek	Flow Meter	TBD <sup>(2)</sup>	To be installed by 12/31/2013
030	Onondaga Creek	Flow Meter	12/31/2013	Complete
034	Onondaga Creek	Flow Meter	12/31/2013	Complete
036	Onondaga Creek	Ultrasonic Level Sensor	12/31/2013	To be installed by 12/31/2013
044	Onondaga Creek	Flow Meter / Ultrasonic Level Sensor <sup>(1)</sup>	12/31/2011	Complete
052	Onondaga Creek	Flow Meter	12/31/2011	Complete
060/077	Onondaga Creek	Flow Meter	12/31/2011	Complete
063	Harbor Brook	Flow Meter / Ultrasonic Level Sensor <sup>(1)</sup>	TBD	Complete
080	Onondaga Creek	Flow Meter	12/31/2011	Complete

Note: (1) – Ultrasonic sensors to be installed after completion of gray infrastructure project

(2) – Location requires manhole modifications

### 2.2.1.2 Proposed Work for 2012

The County will continue to monitor the 12 installed metering stations for 11 CSOs during 2012. The data including depth in inches, velocity in feet per second, and flow rate in million or gallons per day at each site will be recorded at 15-minute intervals and be transmitted wirelessly for download by the County. In addition, the County will provide any routine maintenance necessary to allow the metering devices to continue to monitor the CSOs.

### 2.2.1.3 Post-Construction Monitoring Program

The modified AMP Workplan, approved by DEC, provides the basis for the post-construction monitoring program. All active CSO locations had a permanent flow monitor, temporary flow monitor or CSO event logging device installed by December 31, 2011. The County will implement an in-stream sampling program which is discussed in the following sections. In addition, the County is developing a post-construction monitoring program specifically designed to verify the separation of sanitary and storm flow performed under Sewer Separation Projects. The program will be further developed in 2012 and presented to the DEC and ASLF for review and DEC approval prior to implementation.

## 2.2.2 Water Quality Monitoring

The DEC identified the following sampling requirements during the AMP Workplan review and comment process, which became part of the approved plan:

- The County is required to test samples for conventional parameters consistent with Part 703.2 and TOGS 1.6.3, and for the concentrations of total phosphorus and total nitrogen in the receiving waters adjacent to the CSOs designated for sampling in the Plan.
- In addition the County shall incorporate a sampling regime for the priority pollutants and analyze the samples using EPA Method 608 (pesticides); EPA Method 624 (volatile organic compounds); EPA Method 625 (acid/base neutral compounds); and the EPA test 13 Priority Pollutant metals (including EPA Method 1631 for mercury) - independent of the County's conclusions in its Toxics Assessment Report of the potential for the presence of toxic substances originating from the CSOs in the receiving waters.

### **2.2.2.1 Work Completed in 2011**

#### *In-stream Sampling:*

Following review of the Final AMP Modifications Workplan Revised September 2011, the DEC approved the workplan on December 1, 2011, with the incorporation and inclusion of the requirements noted above in Section 2.2. The County implemented the water quality monitoring on December 14, 2011.

For the two-year period of 2012 (starting December 14, 2011) and 2013, in-stream sampling for Events #1 through #4 are planned downstream of CSO 080, following the completion of the gate chamber modifications for the EBSS in 2011, as required by the ACJ as amended by the 4th Stipulation and Order. As the timing criteria for the in-stream sampling is weather dependent and based on when the facility overflows, sampling events will be dependent on meeting this criterion. The County estimated the gate chamber modifications would increase system wide CSO capture by at least 0.2% or 8MG on an annual basis. The EBSS is a "real-time control" facility which is fully automated through the use of level sensors and PLC-based controls that utilize telemetry communications for integration into the County's SCADA system at Metro. If maximum storage capacity, based on current set-points, of the EBSS is reached and the MIS conveyance capacity is reached, then the incoming CSO flows to the EBSS are discharged to Onondaga Creek.

No in-stream sampling events were conducted from December 14, 2011, through December 31, 2011, as the facility did not overflow and discharge to the creek during this time period. The Quarterly Performance Reports submitted to the NYSDEC on February 1, 2012, detail the EBSS performance report including the rainfall data and total volume stored for each event and CSO/Stormwater contributions to the EBSS from October 1, 2011 through December 31, 2011.

#### *CSO/Tributary Toxics Assessment Report:*

As part of the AMP Modifications Workplan, Final Revised dated December 2011, the County committed to providing a summary of recent data characterizing the ambient concentrations of toxic substances in the collection system, using Industrial Pretreatment and Metro headworks monitoring data for the period of 2005 to 2011. The draft CSO/Tributary Toxics report was prepared in March 2012.

#### *Annual AMP Data Summary Report (2011):*

As requested by the DEC, attached as Appendix B is a copy of the analytical results and measurements from all AMP related sampling completed in 2011.

**AMP Tributary Non-Compliance Assessment (2011):*****Tributary Bacteria Monitoring:***

One of the objectives of the AMP is to track changes in the inflow of bacteria to Onondaga Lake during wet weather. The abundance of fecal coliform bacteria in the lake tributaries during wet weather is affected by stormwater runoff and functioning of the combined sewer system. Several CSO remedial measures and improved stormwater management measures are underway. The AMP also tracks bacterial abundance during non-storm periods; these data provide a means of identifying potential connections of sanitary waste to the stormwater collection system, or portions of the sewerage infrastructure in need of repair. During 2011, the AMP data confirmed standards of AWQS for fecal coliform in most of the Tributary influent streams were exceeded. The compliance with the AWQS for fecal coliform bacteria is assessed as the geometric mean of a minimum of five observations per month. Appendix C includes a summary of the monthly non-compliance reports from June through December 2011. Assessments are underway by the County to identify potential sources contributing to the elevated bacteria concentration levels observed at several of the Onondaga Creek, Harbor Brook and Ley Creek AMP tributary sampling sites. A detailed evaluation of the 2011 AMP Tributary bacteria data for Onondaga Creek, Harbor Brook and Ley Creek will be included in the 2011 AMP Annual Report. The 2011 AMP Annual Report will include a new section for a separate trend analysis for "dry/weather" and "all" tributary sampling events conducted during the AMP time period.

***Onondaga Lake Bacteria Monitoring:***

The impact of wet weather on bacterial abundance is seen in the Onondaga Lake AMP near shore lake data as well. During 2010, Fecal Coliform bacteria counts were higher during wet weather as compared to dry weather, especially at the southern near shore stations (adjacent to Ley Creek, Onondaga Creek and Harbor Brook) as documented in the Onondaga Lake AMP 2010 Annual Report, Revised March 2012. Over time, there has been a decreasing trend in wet-weather bacterial abundance at the southern near shore stations, as well as at the northern station adjacent to Bloody Brook. These patterns are generally consistent with reductions in storm-related bacteria sources (runoff, CSOs, Metro Bypass). In contrast, the dry weather data indicate increasing trends over time at southern near shore stations near Harbor Brook and the Metro outfall. This increasing trend is consistent with the increasing trend in fecal coliform bacteria measured in Harbor Brook at the Hiawatha Boulevard tributary sampling site. A detailed evaluation of the 2011 AMP Onondaga Lake bacteria data for the near shore stations and the in-lake sampling stations at South Deep and North Deep will be included in the 2011 AMP Annual Report.

***Microbial Trackdown Study:***

A study of pathogens in Onondaga Creek and Harbor Brook undertaken as a joint project of OEI and OCDWEP, with OEI as the principal partner, identified potential bacteria inputs into Onondaga Creek and Harbor Brook during dry weather in 2008 and 2009. The updated version of the Microbial Trackdown Phase II workplan, dated April 5, 2012, outlines a comprehensive study being implemented in 2012 to monitor presence of fecal coliform in Harbor Brook and Onondaga Creek, as a follow-up to the findings of the Phase I study. Follow-up sampling of point sources identified under Phase 1, routine sampling at pre-determined locations to identify potential spatial effects along the stream corridor, temporal sampling to identify site-specific temporal effects, point source identification to locate potential sources of bacteria (including septic system related, avian sources, cross-connections) will be conducted as part of the Phase II scope. Point sources include any pipe, culvert, CSO, storm drain or, on occasion, crack in concrete structures which discharge an "appreciable" amount of water. The dry weather discharge at CSO locations may be attributed to several sources including residual CSO volume remaining in the overflow pipe, ex-filtration into sub-

sewer underdrain pipes, or cross-connections. Dry weather CSO discharges should be confirmed by OCDWEP at the overflow manhole. This will help determine whether the observed discharge from the CSO during dry weather originates from the sewerage system, or represents groundwater flux. In addition to Onondaga Creek and Harbor Brook, several sampling locations on Ley Creek have been included in the Phase II scope, due to the elevated bacteria counts observed at Park Street during the AMP sampling events.

***Harbor Brook Point Sources:***

The Phase I Microbial Trackdown study documents thirteen (13) point sources identified and sampled on Harbor Brook during dry weather, in fall of 2008, of which eleven (11) were characterized by low counts of indicator bacteria. Harbor Brook has low flow, typically less than 10 cfs during dry weather, so dilution of point source inputs is limited and point sources can have a detectable impact on water quality.

Four (4) point sources of potential concern have been identified on Harbor Brook: HB-PS100 (also CSO 078), HB-PS101B (also CSO 018), HB-PS103, and HB-PS112. Two (2) were identified as CSOs, although sampling was conducted under dry weather conditions. Follow-up work has been recommended; any dry weather source should be sampled and analyzed for fecal coliform bacteria. OEI is working with the City of Syracuse and OCDWEP officials to further understand these sources of bacterial release. Lower bacteria levels in 2009 may be the result of work subsequently performed by the City of Syracuse and OCDWEP to eliminate overflow from a Laundromat caused by blockage in a 6 inch pipe. Reconstruction of the HBIS may correct any dry weather release from the system, and thereby eliminate the need for any follow-up study of Harbor Brook. HB-PS101B (also CSO 018) has a GI-Wetlands with Floatables Control planned.

The 2012 AMP bacteria data collected in Harbor Brook will be used to evaluate the efficacy of these remedial measures and repairs in reducing dry weather bacterial counts.

***Onondaga Creek Point Sources:***

Eleven (11) point sources of potential concern were identified on Onondaga Creek: OC-PS25, OC-PS69 (also CSO-067), OC-PS11, OC-PS71, OC-PS70, OC-PS20, OC-PS61, OC-PS21, OC-PS76 (also CSO-028), OC-PS22, and OC-PS23 (also CSO-080). Three of these eleven point sources of potential concern were CSOs; measurable bacteria counts were reported despite the dry weather conditions during sample collection. The Phase I report recommends follow-up work including television camera monitoring and/or sewer dye testing for one of the three (3) priority point sources with the greatest impact to Onondaga Creek (OC-PS21). Two (2) of the major sources seem to have been corrected. OEI is working with City of Syracuse and OCDWEP officials to further understand these eleven (11) sources of bacteria release, while City of Syracuse and OCDWEP officials have already begun to identify the cause and eliminate the three major sources. In particular, corrective measures have been implemented at OC-PS25 and OC-PS69. Follow-up sampling will be conducted as part of the Phase II scope, to confirm the effectiveness of each remedial measure.

In addition to point sources, two (2) Onondaga Creek tributaries of concern have been identified, City Line Brook and Hopper Brook. Each may be a potential significant source of bacteria to Onondaga Creek; however, further investigation is required to confirm the level of importance as a source.

***Storm Water Bacterial Counts:***

A brief literature review to evaluate the range of indicator bacteria that might be present in separate stormwater outfalls was conducted. A 2007 WERF Report titled “Development of a Protocol for Risk

Assessment of Microorganisms in Separate Stormwater Systems” concluded that the concentrations of microbial indicator organisms (e.g., fecal coliform bacteria) in stormwater are highly variable, and some counts are quite elevated.

***AMP Quarterly Status Report (April 2012):***

As requested by the DEC, a quarterly report summarizing the status of the AMP events completed and analytical results (raw data as available from the analytical laboratory) from December 1, 2011 through February 29, 2012, is attached as Appendix D.

**2.2.2.2 Proposed Work for 2012**

The overall in-stream sampling schedule is consistent with the EPA CSO Guidance for Monitoring and Modeling and is designed to coincide with the completion of major Gray or Green Infrastructure projects in a particular CSO basin. As requested by the DEC, the ambient water quality conditions downstream of the representative CSOs, will be conducted as soon as practicable following the completion of the gray improvements.

The majority of the sampling will be targeted following the completion of the Harbor Brook and Clinton Storage Tanks, once the County has received operational control for these facilities. The sampling schedule for CSO discharges from the 014, 018, 027, 052 and 060/077 service areas will be determined based on the approved facility plans. Monitoring and evaluation are required through 2018; design of future years will be modified based on progress with construction and the information obtained from previous efforts. Table 2-4 presents the 10 CSO targeted by the sampling program, the associated gray infrastructure project and completion schedule.

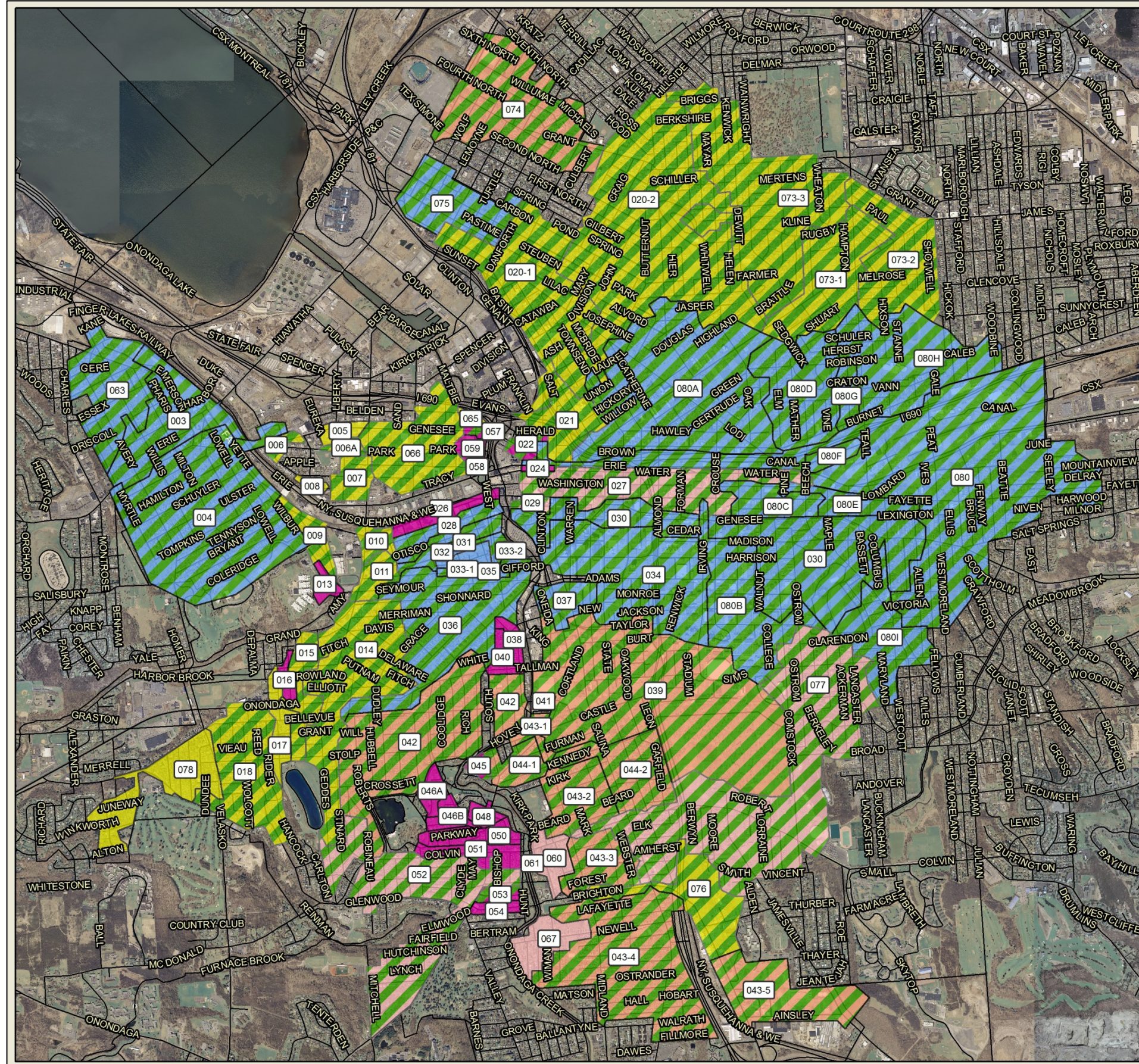
**Table 2-4 In-stream water quality sampling locations for CSOs**

CSO Service Area	CSO	In-stream Sampling Location	Gray Project	Completion Date	Sampling Event Targeted Schedule
Harbor Brook	003	FCF on Harbor Brook	Storage Tank	12/31/2013	2014-2015
Harbor Brook	004	Upstream side of Hiawatha Blvd. bridge	Storage Tank	12/31/2013	2014-2015
Harbor Brook	014	Brook access at Fowler High School	Floatables Plan	TBD	TBD
Harbor Brook	018	Dam at end of DePalma Avenue	Wetlands Treatment w/Floatables Control	TBD	TBD
Clinton	027	Upstream side of Water Street bridge	CSO Facilities Plan	TBD	TBD
Clinton	030	Upstream side of Walton Street bridge	Storage Tank*	12/31/2013	2014-2015*
Clinton	034	Upstream side of Dickerson Street bridge	Storage Tank*	12/31/2013	2014-2015*
Clinton	080	Upstream side of West Genesee Street bridge	EBSS	12/31/2011	2012-2013
Midland	052	Upstream side of West Colvin Street bridge	CSO Facilities Plan	TBD	TBD
Midland	060/077	Upstream side of South Avenue bridge	CSO Facilities Plan	TBD	TBD

Notes:

\* - As required for the two-year period when CSO outfalls 030 and 034 are scheduled to be sampled, stated by the DEC’s April 18, 2011 letter which conditionally approved the engineering report for the Clinton CSO Storage Facility.

For 2012, in-stream sampling continues to be planned, following the completion of the gate chamber modifications for the EBSS in 2011 (CSO 080). As the timing criteria for the in-stream sampling is weather dependent and based on when the facility overflows, sampling events will be dependent on meeting these criteria.



# CSO Basins











Figure 2-1



1 inch equals 3,000 feet

## Legend

### CSO Abatement Technology

-  Storage
-  Storage/GI
-  Floatables Control
-  Floatables Control/GI
-  Sewer Separation
-  Sewer Separation/GI
-  CSO Facilities Plan
-  CSO Facilities Plan/GI
-  Regional Treatment
-  Regional Treatment/GI

## Section 3

# CSO Project Status

The County is required under Section 14H in the 4<sup>th</sup> Stipulation of the ACJ to report the status of the gray and green infrastructure projects annually including a detailed description, location, scope of work, projected CSO capture rate, the methodology used to arrive at that projection, and proposed major and minor milestone dates. The ACJ CSO projects discussed in this section represent the current scope of the County's CSO compliance program. For additional, project specific information please go to the Save the Rain website at [www.savetherain.us](http://www.savetherain.us).

### 3.1 Gray Infrastructure

Sections 14B and 14L of the ACJ require the County to construct and commence operation of the specific gray infrastructure projects in Table 3-1 in accordance with specific milestone requirements. The estimated CSO volume capture listed in Appendix A of the ACJ is also included as a reference.

**Table 3-1 ACJ Gray Infrastructure Capture Estimates and Milestone Schedule**

Project	Estimated CSO Volume Capture	Milestone Description	Milestone Type	Milestone Date
CSO 044 Conveyances	0.3%	Plans and Specs to NYSDEC for review and approval	Minor	06/01/2010
		Commence construction	Minor	12/31/2010
		Complete Construction and commence operation	Major	12/31/2011
Harbor Brook Interceptor Sewer Replacement	0.9%	Plans and Specs to NYSDEC for review and approval	Minor	08/17/2009
		Commence construction	Minor	01/01/2010
		Complete Construction and commence operation	Major	12/31/2013
Erie Boulevard Storage System Modifications	0.2%	Plans and Specs to NYSDEC for review and approval	Minor	09/01/2010
		Complete required modifications	Major	12/31/2011
Clinton 6 MG Storage Facility	2.9%	Plans and Specs to NYSDEC for review and approval	Minor	02/01/2011*
		Commence construction	Minor	10/01/2011*
		Complete Construction and commence operation	Major	12/31/2013
Harbor Brook 4.9 MG Storage Facility	1.4%	Plans and Specs to NYSDEC for review and approval	Minor	04/29/2011*
		Commence construction	Minor	12/31/2011*
		Complete Construction and commence operation	Major	12/31/2013

Note: \* - Date reflects ACJ Milestone extension approved by the NYSDEC on November 4, 2010

**Table 3-2 Additional Gray Infrastructure Projects and Implementation Schedules**

Project	Estimated CSO Volume Capture	Task Description	Date
CSO 022/045 Sewer Separation Project	0.1%	Plans and Specs to NYSDEC for review and approval	06/06/2011
		Commence construction	01/24/2012
		Complete Construction and commence operation	09/30/2012
CSO 063 Conveyances	Included in Harbor Brook Storage Facility above	Submit Draft Design Report	05/01/2012
		Submit Final Design Report and 50% Design	08/01/2012
		Plans and Specs to NYSDEC for review and approval	11/01/2012
		Advertise for Bid	03/01/2013
		Commence construction	07/01/2013
		Complete Construction	10/01/2014

In addition to the required projects listed above, the County has also identified two gray projects that will be implemented under the ACJ (Table 3-2). The CSO 022/045 Sewer Separation Project was detailed in the CSO Facilities Plan and the CSO 063 Conveyances Project was identified during the design of the Lower Harbor Brook Storage Facility and the FCF Plan evaluation.

### 3.1.1 CSO 044 Conveyances

The CSO 044 Conveyances Project provides for the transmission of wet weather flow from CSO 044, which discharges to Onondaga Creek at South Avenue and West Castle Street, to the Midland RTF on the south side of Syracuse. The planned improvements are projected to capture 0.3% or 12 MG of system wide CSO volume annually. The following major and minor milestones were established by the ACJ:

- Submit approvable plans to the DEC for review and approval by June 1, 2010 (minor)
- Commence construction by January 1, 2011 (*minor milestone set when plans and specs were submitted*)
- Complete construction and commence operation by December 31, 2011 (major)

The major milestone for construction completion and commencement of operation was met in 2011 through the issuing of a Notice of Partial Beneficial Occupancy for the project on December 31, 2011. The contractor completed the 500 LF of 96-inch diameter conveyance pipeline from the new CSO 044 regulator structure in South Avenue to the terminus of the 144-inch pipeline installed under the Midland Phase Two RTF and Conveyances Project. As stated the construction of the new regulator structure for CSO 044 in South Avenue was completed along with the two flushing chambers upstream of the regulator and at the terminus of the 144-inch pipeline. Other associated items that were completed include a new 12-inch sewer on Dearborn Street, a new 48-inch outfall to Onondaga Creek, and new 48-inch sewers that connect the South Avenue trunk to the 96-inch pipeline.

Project Snapshot
<p><b>Estimated Annual CSO Volume Capture</b></p> <p>0.3% (12 MG)</p>
<p><b>Compliance status</b></p> <p>Submit plans and specs to DEC by 6/1/10 (achieved)</p> <p>Commence construction by 1/1/11 (achieved)</p> <p>Complete construction by 12/31/11 (achieved)</p>
<p><b>Project Status at EOY 2011</b></p> <p>Conveyance pipeline and 044 regulator work complete which allowed flow to be introduced to pipeline, partial beneficial occupancy issued</p>
<p><b>Proposed Work for 2012</b></p> <p>Install flushing gates and surface restoration by July 2012</p>

The work to be completed in 2012 includes the installation of the flushing gates and electrical equipment, site restoration and re-paving of West Castle Street.

### Greening the Gray

The CSO 044 Project, as bid in 2010, included the installation of bioretention swales along either side of West Castle Street between Dearborn Place and South Avenue, a bioretention basin in the green space between Onondaga Creek and West Castle at Dearborn Place and new plantings along Onondaga Creek between South and Midland Avenues. After the project was bid the residents of the area along with the local Syracuse United Neighbors community group initiated discussions with the County about altering the planned restoration for the site. The community indicated they wanted more of a

park-like setting with an educational component. The revised plan now includes a bioretention area, two rain gardens, a butterfly garden, a path from South Avenue to the Midland Avenue Bridge over Onondaga Creek, and some educational kiosks.



Figure 3-1: CSO 044 Conveyances Location Map



Figure 3-2: CSO 044 Construction



Figure 3-3: Construction at South Avenue & West Castle Street Intersection

### 3.1.2 Harbor Brook Interceptor Sewer Replacement

The HBIS Replacement Project provides for a much needed upgrade to the existing Harbor Brook Interceptor between West Fayette Street and Velasko Road on the west side of Syracuse (Figure 3-4, next page). This portion of the interceptor sewer conveys dry weather and combined flow from CSOs 009, 010, 011, 013, 014, 015, 016, 017, 018 and 078 for conveyance to Metro for treatment. The existing interceptor is a U-shaped cast-in-place concrete pipe constructed in the 1920's and has fallen into disrepair. Due to the shape and age of the HBIS, flow restrictions have developed which have decreased capacity and increased infiltration in some areas.

The County is obligated to construct this project under Section 14L.ii and Appendix A of the ACJ, and replacement of the sewer was estimated to provide capacity to capture 0.9% or 36 MG of additional CSO. The following milestones also apply to this project:

- Complete design and submit approvable plans and specifications to the DEC for review and approval by August 17, 2009 (minor)
- Commence construction by January 1, 2010 (minor)
- Complete construction and commence operation by December 31, 2013 (major)

Construction on this project continued in 2011 and to date the following items have been completed:

- The installation of 7,503 LF of new HBIS ranging in size from 18- to 36-inches in diameter from West Fayette Street to Velasko Road;
- Installation of 5,222 LF of new local sanitary, storm or combined sewers ranging in size from 8- to 42-inches in diameter;
- The rehabilitation of 860 LF of 30-inch brick sewer, and 1,000 LF of 12- to 18-inch clay sewers in CSO Area 013;
- The complete separation of sanitary and storm flow in CSO Areas 013 and 016 which allowed for the elimination of those CSOs;
- The installation of 3 new regulator manholes at CSOs 015, 017, and 018;
- The rehabilitation or replacement of 2500 LF of Harbor Brook Culvert; and
- The installation of 2,000 LF of 36-inch and 2,100 LF of 8-inch water mains.

The work to be completed in 2012 includes the final connections to the new HBIS at Fowler High School and at CSO 010 on West Fayette Street, the installation of a bioretention area and rain garden

Project Snapshot
<p><b>Estimated Annual CSO Volume Capture</b></p> <p>0.9% (36 MG)</p>
<p><b>Compliance status</b></p> <p>Submit plans and specs to DEC by 8/17/09 (achieved)</p> <p>Commence construction by 1/1/10 (achieved)</p> <p>Complete construction by 12/31/13</p>
<p><b>Project Status at EOY 2011</b></p> <p>Construction in progress, 95% complete</p>
<p><b>Proposed Work for 2012</b></p> <p>Complete construction by July 2012</p>

at the intersection of Delaware Street and Grand Avenue, and the installation of additional tree basins. It is anticipated the work will be complete by the middle of the year.

### Greening the Gray

The GI components incorporated into this gray construction project include the installation of approximately 70 enhanced infiltration tree basins, and the construction of the GI at the intersection of Delaware Street and Grand Avenue. The tree basin design included in the original bid documents was revised after discussions between the County’s consultants and with input from the City/County Arborist. A comparison of the original and new design is included as Figure 3-5. The new design removed the trees from the area of inundation allowing a greater number of species to be planted.

The Delaware-Grand Rain Garden went through numerous design changes during 2011. The County received input from its consultants, local residents and community groups, and the ASLF. Numerous workshops and meetings were held and attended to gain suggestions from each of these groups which were incorporated into the final design submitted to DEC for review in December 2011. A plan view of the final design is included as Figure 3-6.



Figure 3-4: HBIS Replacement Location Map

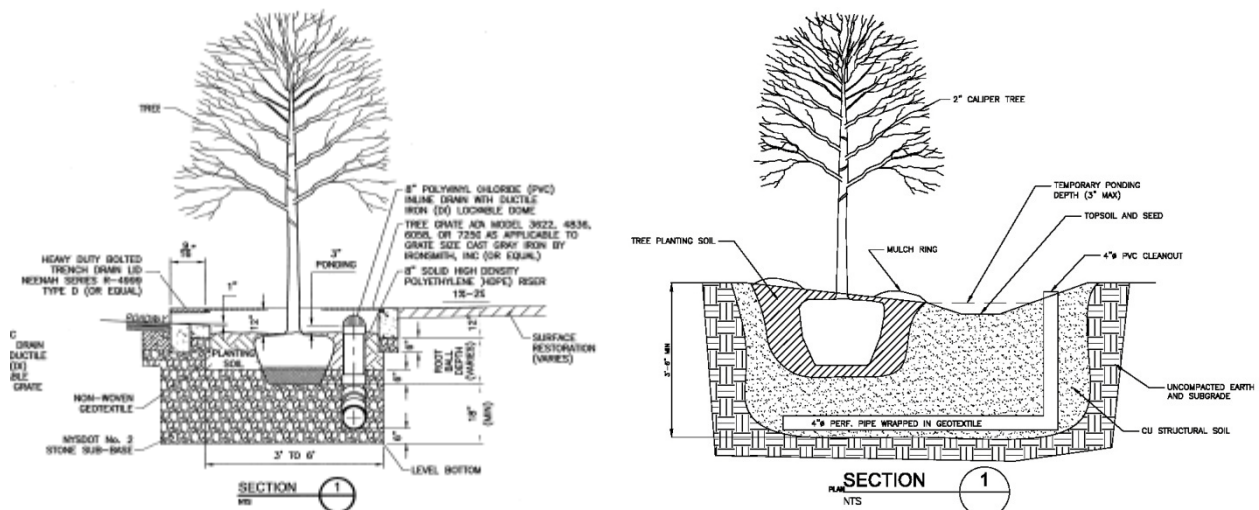


Figure 3-5: HBIS Enhanced Tree Pit Detail – As Bid (left), Revised (right)



VIEW FROM INTERSECTION OF DELAWARE &amp; GRAND



VIEW SOUTH TOWARDS INTERPRETIVE KIOSK



VIEW ALONG PATH, LOOKING NORTHEAST

*Figure 3-6: HBIS Replacement Project – Delaware/Grand Rain Garden Renderings*

### 3.1.3 Erie Boulevard Storage System Gate Chamber Modifications

The EBSS was designed as a temporary wet-weather storage system that captures flows within CSO Area 080, including CSO points 080A-I, up to the 90th percentile storm until there is sufficient capacity at Metro to treat the stored combined sewer flow. The 1.64 mile long storage culvert has approximately 4 MG of capacity and controls capacity and flow to the MIS through a series of gate chambers equipped with automated sluice gates. The County estimated the gate chamber modifications would increase system wide CSO capture by at least 0.2% or 8 MG on an annual basis. Section 14L.iii and Appendix A of the ACJ requires the County to meet the following major and minor milestones to realize this improvement:

- Submit approvable plans to the DEC for review and approval by September 1, 2010 (minor)
- Complete required modifications by December 31, 2011 (major)

The County's engineer prepared a technical memorandum/facility plan that evaluated the operation of the EBSS; updated, calibrated and evaluated the EBSS SWMM; developed and evaluated alternatives to increase CSO capture in the system; and issued a recommended alternative. The recommended alternative proposed implementing operational changes to the set-points of gate chamber #3 and #4.

The Technical Memorandum/Facility Plan was submitted to the DEC for review and approval on September 1, 2010 which met the minor milestone in the ACJ. The DEC approved the plan on October 4, 2010 contingent upon the modifications being completed prior to December 31, 2011. The recommended modifications to the set-points of gate chamber 3 and 4 were implemented in two steps. The first step, implemented in January 2011, raised the set-points for gate chamber 3 and 4 by 1 foot and 0.5 foot, respectively. The second (final) step, implemented in October 2011, raised the set-points for gate chamber 3 and 4 by an additional 1 foot and 0.5 foot, respectively. The changes to the system were confirmed after each step by reviewing the EBSS monitoring data. The data reviews showed the higher gate settings provided increased control of the water elevation in the EBSS. Based on the data reviews and discussion with County staff, increased gate settings did not result in any adverse impacts on the collection system.

### 3.1.4 Clinton CSO Storage Facility

In January of 2011 the County completed design on the 6 MG Clinton CSO Storage Facility and submitted the plans and specifications to the DEC for approval. This facility is being constructed to satisfy the requirements of Section 14L.iv of the ACJ that requires the County to construct a 3.7 MG wet weather storage facility to store flows conveyed from CSOs 028, 030, 031, 032, 033, 034, 035, 036 and 037. The storage volume was increased to 6 MG in 2011 and the plans and specifications were conditionally approved by the DEC on June 15, 2011. In order for the County to maximize the time remaining until the major milestone for construction completion, the project was advertised for bid on May 21, 2011.

The facility will be installed in downtown Syracuse at the Trolley Lot Site previously designated for the Clinton Street RTF (Figure 3-7) and is estimated to result in an increase in system-wide CSO capture of 2.9% or 116 MG annually when completed and made operational. This represents a 125% increase from the 2.3% or 92 MG required by the ACJ. The following

#### Project Snapshot

##### Estimated Annual CSO Volume Capture

0.2% (8 MG)

##### Compliance status

Submit plans and specs to DEC by 9/1/10 (achieved)

Complete modifications by 12/31/11 (achieved)

##### Project Status at EOY 2011

Modifications complete October 2011

##### Proposed Work for 2012

None

#### Project Snapshot

##### Estimated Annual CSO Volume Capture

2.9% (116 MG)

##### Compliance status

Submit plans and specs to DEC by 2/1/11 (achieved)

Commence construction by 10/1/11 (achieved)

Complete construction by 12/31/13

##### Project Status at EOY 2011

Construction commenced in September 2011 and work has progressed on the underground structures for both the east and west chambers.

##### Proposed Work for 2012

Continue construction on the underground facilities and begin construction on the above ground structures.

milestones are attached to the project:

- Complete design and submit approvable plans and specifications to the NYSDEC for review and approval by February 1, 2011 (*Revised by DEC on November 4, 2010*) (minor)
- Commence construction by October 1, 2011 (*Revised*) (minor)
- Complete construction and commence operation by December 31, 2013 (major)

The scope of the project, as advertised in May of 2011, generally consisted of:

- 6 MG CSO storage facility consisting of three, parallel 18-foot diameter tunnels,
- Above ground structures at either end for servicing and maintenance,
- Odor control measures and dewatering and effluent pumps,
- Green roof for storm water capture (“Greening the Gray”),
- 36-, 84-, and 96-inch on site conveyance piping connect the existing CSO pipelines to the facility,
- 16-inch diameter dewatering force main to transmit flow to the MIS for treatment at Metro, and
- Restoration of the parking lot and implementation of storm water control systems.

Bids were received on July 14, 2011 and on August 16, 2011 the County awarded the project to Jett Industries. After award the Contractor began discussions with the County and its consultants for the possibility of using an alternate form of construction for the underground tunnel structures. After careful consideration the County agreed to the delegated design in which the contractor would

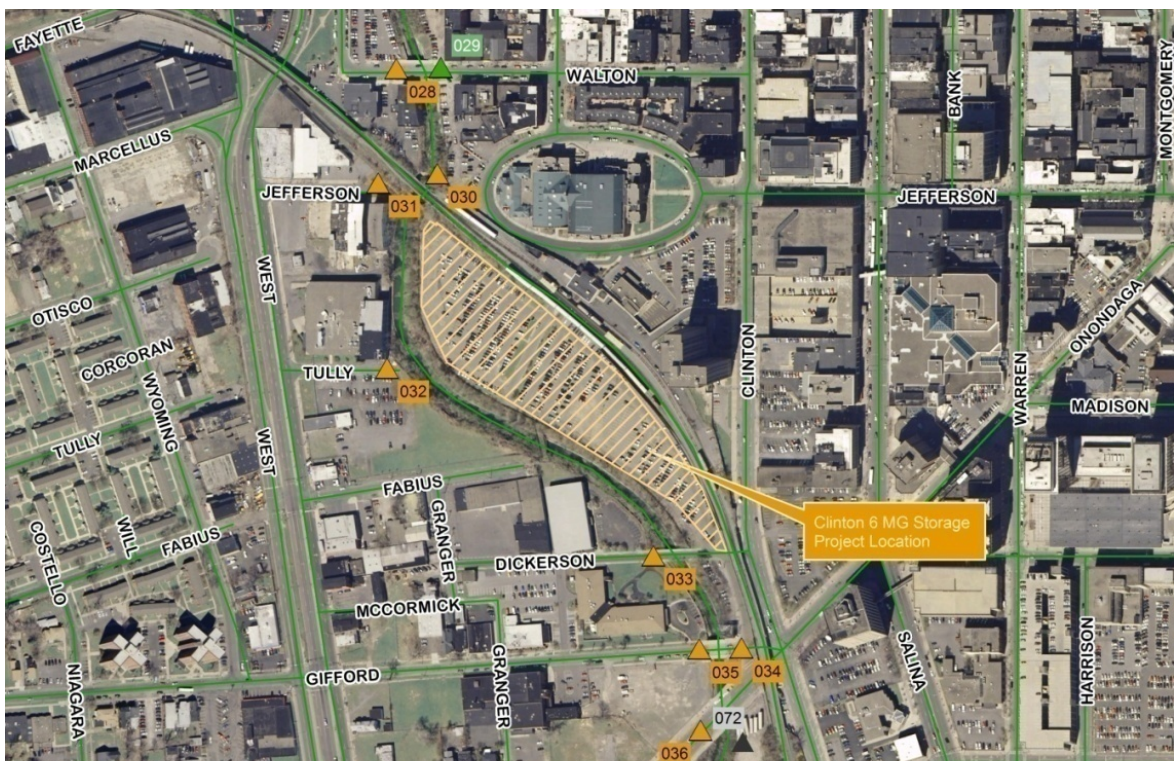
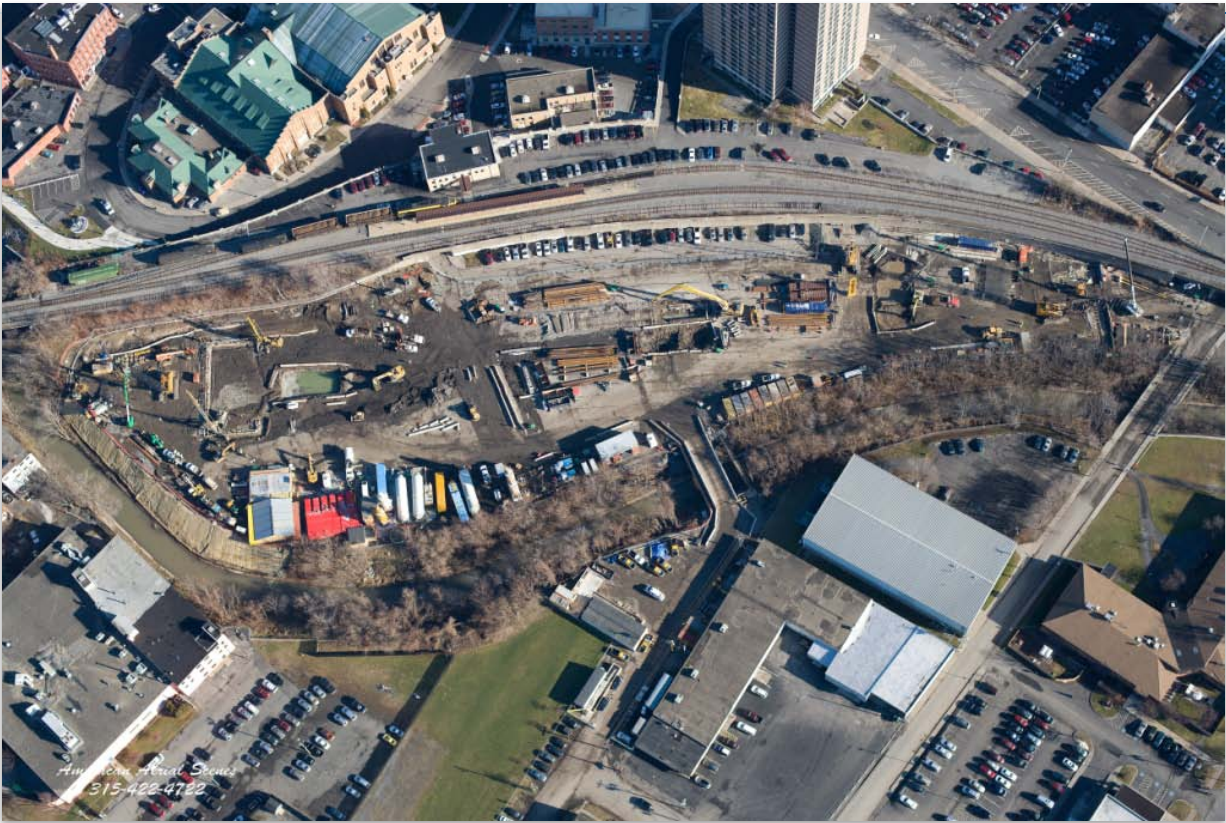


Figure 3-7: Clinton Street CSO Storage Project Location Map



*Figure 3-8: Clinton Street CSO Storage Facility Construction Progress – December 2011*

construct the storage tunnels by open cut in lieu of utilizing a tunnel boring machine. The County and the contractor coordinated the development of the delegated design as construction began and it is anticipated the revised design will be complete in early 2012.

The contractor began to mobilize for construction activities in early September 2011. Construction on the east and west chambers which sit below the above ground buildings began with the slurry wall installation in October. The temporary access bridge over Onondaga Creek at Fabius Street was also completed. This will allow truck traffic to more easily access West Street and limit the heavy equipment traffic on Downtown Streets. Figure 3-8 is an aerial view of the project site under construction.

In 2012, the contractor will completely install the east and west chambers, the site instrumentation, the 36" conveyance sewer by microtunneling from Tully Street, the 84-inch conveyance sewer from West Jefferson Street, and the 96-inch conveyance sewer from Dickerson Street. In addition the installation of the main tunnel, construction on east and west buildings, and installation of the 16-inch force main to the MIS will begin next year.

### **Greening the Gray**

To further enhance the sustainability of the facility, the project includes green infrastructure components. The stormwater runoff from the entire site that measures approximately 275,000 square feet or 6.3 acres will be managed by green infrastructure. The stormwater from the area surrounding the main structure on the western half of the site will be collected by a series of catch basins and stormwater piping that will outfall into two bioretention basins. The bioretention basins will allow the stormwater to infiltrate into the ground rather than immediately runoff to the creek. In addition, stormwater runoff from the eastern half of the project site, to be restored as a parking area, will be

directed to a subsurface collection facility and used to flush the storage tunnels to clear them of grit and debris that may have settled or been left behind after the stored combined sewage was transmitted to Metro. In addition, a green roof will be installed on the west building.

### 3.1.5 Lower Harbor Brook Storage Facility

The Lower Harbor Brook CSO Storage Facility Project is a 4.9 million gallon combined sewer overflow storage facility that will be located on County owned property on State Fair Boulevard between Hiawatha Blvd. and West Genesee Street in the City of Syracuse. The facility will capture and store the overflows from CSOs 003 and 004 (and eventually CSO 063) for up to the 1-year, 2-hour design storm event. After the storm event subsides, the contents of the storage tank will be pumped to the existing HBIS for conveyance to Metro for full treatment. The project was initiated to fulfill the ACJ requirement in Section 14Li which was to construct a 3.2 MG wet weather storage facility to store flows conveyed from CSOs 003 and 004. The facility is to be installed on the property previously chosen for the Lower Harbor Brook RTF which is on State Fair Boulevard at the Harbor Brook crossing (Figure 3-9). The County purchased the property and acquired the necessary easements for the conveyance piping in 2006. The facility is estimated to result in an increase in system-wide CSO capture of at least 1.4% or 55 MG annually, which is 0.2% or 7 MG greater than stipulated in the ACJ. Additionally, the County is obligated to meet the following project milestones:

- Complete design and submit approvable plans and specifications to the DEC for review and approval by April 29, 2011 (*Revised by the DEC on November 4, 2010*) (minor)
- Commence construction by December 31, 2011 (*Revised*) (minor)
- Complete construction and commence operation by December 31, 2013 (major)

In order to divide the work into similar construction methods the County decided to split the project into two contracts. Similar to how the Clinton CSO Storage Facility consisted of separate contracts for off-site conveyance piping and the on-site work, the Lower Harbor Brook Project would be divided as well. The County completed the engineering design of the storage facility and off-site conveyances as two separate construction contracts in 2011, submitting them in accordance with the stipulated date April 29, 2011. Plans and specifications for both contracts were reviewed by DEC and each were conditionally approved in 2011. The conveyances contract plans and specifications were approved on July 19, 2011 and the storage tank contract was conditionally approved on October 3, 2011.

The conveyances contract was advertised for bid on July 28, 2011 and the contract was awarded to Joseph J. Lane Construction on September 27, 2011. The conveyance contract generally includes the following scope items:

Project Snapshot
<p><b>Estimated Annual CSO Volume Capture</b></p> <p>1.4% (55 MG)</p>
<p><b>Compliance status</b></p> <p>Submit plans and specs to DEC 6/1/11 (achieved)</p> <p>Commence construction by 12/31/11 (achieved)</p> <p>Complete construction by 12/31/13</p>
<p><b>Project Status at EOY 2011</b></p> <p>Construction on the conveyance sewers commenced in September 2011 while the Storage Facility began in November 2011. Work through the end of the year included mobilization and site preparation activities.</p>
<p><b>Proposed Work for 2012</b></p> <p>It is anticipated the conveyance pipelines will be complete in September of 2011 and the storage facility will be approximately 50% complete by the end of 2011.</p>

- Site clearing and grubbing, and field office setup for the storage tank contract;
- 615 LF of 48- to 60-inch diameter Hiawatha conveyance sewer;
- 330 LF of 48-inch diameter State Fair conveyance sewer;
- 700 LF of 18-inch diameter CSO 003 regulator sewer;
- 130 LF of 21-inch diameter CSO 004 regulator sewer;
- Miscellaneous repairs to the Harbor Brook culvert at the State Fair Boulevard bridge.



Figure 3-9: Lower Harbor Brook CSO Storage Facility Location Map

Construction began in November with clearing and grubbing at the storage tank site and was completed in December. Construction will begin in 2012 on the conveyance and regulator sewers associated with the project.

The storage tank contract was advertised for bid on August 18, 2011 and the contract was awarded to C.O. Falter Construction on November 15, 2011. The storage tank contract generally includes the following scope items:

- 4.9 MG, partially underground CSO storage tank;
- A junction chamber that combines flow from the conveyances and allows for grit removal;

- Extension of the Hiawatha and State Fair conveyance sewer to the storage facility;
- Utilities building that houses the odor, electrical and motor control rooms;
- Pump station/wet well to dewater the captured CSO to the HBIS via a force main for treatment at Metro; and
- A storm water reclamation system to collect, store, and reuse storm water for tank cleaning (“Greening the Gray”).

The contractor began to mobilize in December and construction will begin in 2012.

### Greening the Gray

The Lower Harbor Brook Storage Project will collect stormwater runoff from the rooftops of the storage tank and controls building will be stored within the CSO storage tank and used for a second and third cleaning flush of the tank. This water will ultimately be treated at Metro eliminating the need for the flushed water to be treated on-site. The additional storage is designed to capture stormwater runoff from the 100-year storm (5.2 inches) from the tank surface and the control building rooftop.

### 3.1.6 Sewer Separation of CSO Areas 022 & 045

The engineering design documents for the separation of CSO areas 022 and 045 were progressed to the contract document phase in 2011. The location of the two CSO areas are described below:

- CSO Area 022 is located in downtown Syracuse and the tributary sewers are located in North Franklin, West Genesee and Willow Streets (Figure 3-10).
- CSO Area 045 is located south of downtown Syracuse with the outfall at the intersection of West Castle Street, Hudson Street and Onondaga Creek (Figure 3-11).

The project consists of two construction contracts, No. 1 – General Construction and No. 2 – Plumbing.

The plans and specifications were submitted to DEC for review on June 6, 2011 and conditionally approved October 28, 2011. The project was advertised for bid October 20, 2011 and the notice to proceed for each contract was issued on January 23, 2012. The proposed work for each CSO area is as follows:

#### CSO Area 022

- 1,545 LF of 8-, 10-, and 12-inch sanitary sewers with manholes and sewer laterals;
- 220 LF of 12-, 15-, and 36-inch storm sewers with manholes, catch basins and sewer laterals;

Project Snapshot
<p><b>Estimated Annual CSO Volume Capture</b></p> <p>0.1% (3 MG)</p>
<p><b>Implementation Schedule</b></p> <p>Submitted plans and specs to DEC on 6/6/11</p> <p>Commenced construction by 1/24/12</p> <p>Complete construction by 9/30/12</p>
<p><b>Project Status at EOY 2011</b></p> <p>General and plumbing construction contracts bid on 10/20/11 and are currently in the award process.</p>
<p><b>Proposed Work for 2012</b></p> <p>It is anticipated the work will commence in January of 2012 and be complete by September 30, 2012.</p>

- 770 LF of 36-inch sewer lining by trenchless methods;
- Internal plumbing modifications to separate the sanitary and storm at 16 private properties;
- Sidewalk, pavement, and curbing installation;
- Construction of the new Pocket Park at the corner of North Clinton and West Genesee Streets;
- Replacement of the street trees along the north side of West Genesee Street and the west side of North Clinton Street; and
- Installation of new street trees along the north side of West Willow Street.

#### CSO Area 045

- 440 LF of 8-inch sanitary sewers with manholes and sewer laterals;
- 840 LF of 12-inch storm sewers with manholes, catch basins and sewer laterals;
- 700 LF of 12-inch sewer lining by trenchless methods;
- Internal plumbing modifications to separate the sanitary and storm at 16 private properties;
- Sidewalk, pavement, and curbing installation; and
- Installation of new street trees along the west side of Hudson Street.

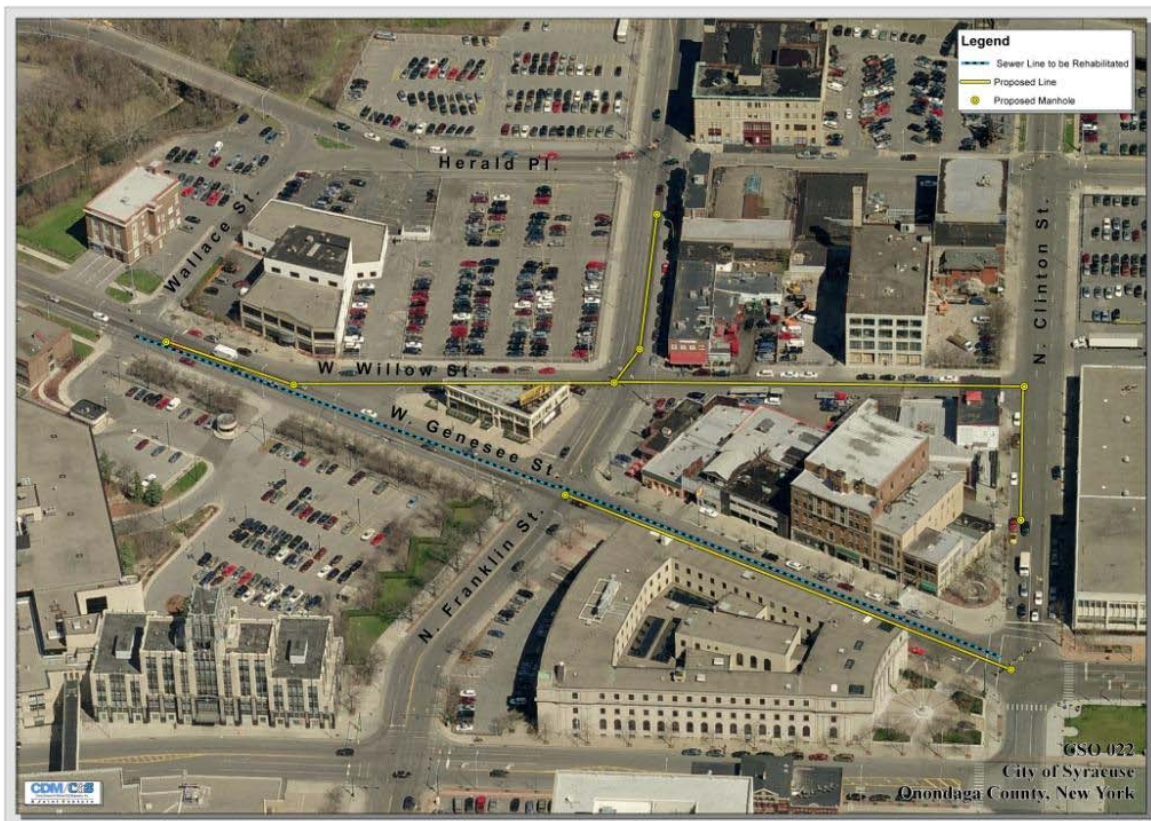


Figure 3-10: CSO 022 Sewer Separation Project Location Map



Figure 3-11: CSO 045 Project Location Map

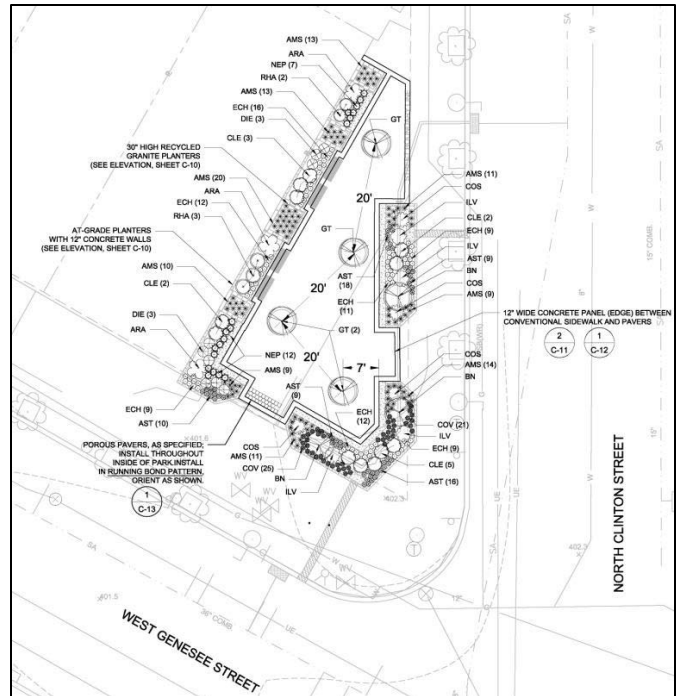


Figure 3-12: CSO 022 – Pocket Park Plan

### Greening the Gray

The County has successfully applied its “Greening the Gray” mission to the project through the implementation of Green Infrastructure as it related to the reconstruction of the Pocket Park on the corner of West Genesee and North Clinton Streets (Figure 3-12). The park had fallen into disrepair due to settlement issues and will be rehabilitated with green components under the CSO 022 project.

In addition, the project will replace existing street trees in CSO area 022 that have had health issues for some time. The replacements will occur along the north side of West Genesee Street between Clinton and Franklin Streets, and on the west side of North Clinton Street between West Genesee and West Willow Streets. Also, new street trees will be installed on the north side of West Willow Street between West Genesee and Franklin Streets. All the new street trees in CSO area 022 will have enlarged areas of topsoil around the root ball and structural soil under the sidewalk to give the trees the opportunity for growth. There will also be street trees installed in CSO area 045 along the west side of Hudson Street.

### 3.1.7 Proposed New Projects for 2012

In 2011, as the design of the Lower Harbor Brook Storage Facility progressed, it was determined that the increased capacity of the new tank would allow for the conveyance of flow from CSO 063 to the new Lower Harbor Brook Facility. CSO 063 had originally been included in the County’s Floatable Control Plan however the County determined the more effective plan for abatement was conveyance, storage, and then treatment at Metro. The proposed implementation schedule is listed below as Table 3-x. The project will include approximately 2,800 LF of new 48-inch conveyance sewer (Figure 3-9) along Erie Boulevard West and the Harbor Brook FCF access road to Hiawatha Boulevard West including one railroad crossing by trenchless methods.

**Table 3-3 CSO 063 Conveyances Project Implementation Schedule**

Project	Task Description	Date
CSO 063 Conveyances	Submit Draft Design Report	05/01/2012
	Submit Final Design Report and 50% Design	08/01/2012
	Plans and Specs to NYSDEC for review and approval	11/01/2012
	Advertise for Bid	03/01/2013
	Commence construction	07/01/2013
	Complete Construction	10/01/2014

### 3.1.8 Gray Infrastructure O&M Requirements

This section provides a summary of the O&M requirements for gray infrastructure projects being implemented to abate CSO discharges in Onondaga County. The specific requirements for each gray project will be identified once the designs and technology selections are complete. The County will track and schedule O&M tasks utilizing its Maximo asset management program. Below is a summary of O&M requirements by project type and are consistent with the EPA's suggested proper operation and maintenance of combined sewer systems and associated facilities.

- Sewer Separation – Typical O&M for sanitary and storm sewers includes routine inspections and cleaning of the sewers. The combined sewers separated within the City of Syracuse are owned by the City. As a result, through an Inter-municipal Agreement between the City and the County, the City shall be responsible for the O&M of the separated basins.
- Interceptor/CSO Conveyance Piping – The County applies a tiered approach to its interceptor pipelines and CSO conveyance sewers. Newly installed large diameter pipelines have flushing chambers which will be exercised and maintained after storm events. Siphons, CSO regulators and regulator sewers connected to existing or new smaller diameter pipelines are inspected and maintained monthly. In addition, CSO conveyance and interceptor manholes are visually inspected for grit deposition, blockages and deterioration. If excessive grit or debris is present, the deposits are removed and the section of sewer is cleaned and flushed. If the problem persists, the section of sewer is televised to determine the problem and repaired if necessary. The grit chambers located along the interceptor sewer alignments are also cleaned and maintained each year.
- CSO Storage and/or Treatment Facilities – During dry weather conditions O&M requirements include: pull and service pumps; inspect, lubricate and exercise mechanical equipment; calibrate flow metering/measuring devices; adjust limits on valves/actuators; service air handling units; calibrate gas detectors; house and grounds keeping; and prepare and review staffing plans. Before, during and after wet weather events additional O&M tasks may be required. Pre-Event tasks include staff planning; check condition/charge chemical feed system (where applicable); record baseline levels and readings; check SCADA system for proper operation; and check equipment fluid levels. During the event tasks include monitoring of flow levels; record start and end times and other data on operational logs; monitor and operate equipment; collect and analyze samples; and dewater. Post-event O&M includes flush and clean basins and wet wells; flush and clean equipment; complete sample analysis; compile/report data; staff debriefing; lubricate equipment; and check fluid levels.
- Floatable Control Facilities – O&M for in-line facilities include: routine visual inspection and cleaning of the facility, specifically the floatables removal equipment; and routine cleaning of associated regulators and chambers. In addition to the routine maintenance discussed above for net bag and trash rack facilities O&M includes the removal and replacement of net bags and removal, cleaning and reinsertion of trash racks following storm events.

## 3.2 Green Infrastructure

### 3.2.1 Current GI CSO Reduction Methodology

The County currently employs a simple method for estimating CSO reduction volumes from GI implementation for project planning and targeting purposes. A detailed GI model using SWMM is currently under development. The simple method utilizes the following 3 steps:

- **Drainage area documentation** - As GI projects are defined, the contributing impervious drainage area and the approximate area that the GI will occupy (i.e. GI footprint) are digitized and measured using the GIS.
- **Estimation of GI technology reduction** - In most cases, and consistent with the NYS Stormwater Guidance Manual, GI is typically sized to capture 1 inch of runoff which is estimated to achieve approximately 90% reduction in annual runoff.
- **Estimation of annual runoff reduction** - The annual runoff reduction capture is multiplied by 71% to develop a preliminary estimate of annual CSO volume reduction (based upon previous SWMM results).

### 3.2.2 Projects Completed/Under Contract in 2011

Many GI projects were completed as part of the Save the Rain Program in 2011. The County memorialized its commitment to complete 50 projects in 2011 through the announcement of Project-50. In fact, Project 50 became Project 60: 23 projects were completed and 32 projects are either under contract and substantially completed. 26 more projects are under contract to receive Green Improvement Fund grants. The projects reflect a total managed impervious area of approximately 83 acres resulting in a calculated CSO reduction of 62 MG. Details including their location, size, and property ownership are provided in Table 3-4.

### 3.2.3 Proposed Projects for 2012

The location, size, and property ownership for the proposed green infrastructure projects for 2012 are provided in Table 3-5. Over 160 GI opportunities are listed; however, it is understood that several of these opportunities may not materialize or may take additional time to develop and may therefore be delayed to future program years. 33 projects are already in design, and another 12 are in field work status; therefore approximately 45 projects are already progressing toward construction in 2012. The projects listed reflect a total managed impervious area of approximately 58 acres resulting in a calculated CSO reduction of 64MG; however, these numbers as explained above are likely high. Presenting values from the 45 projects that are in design and field work status are likely more representative; the 45 projects reflect a total managed impervious area of approximately 30 acres resulting in a calculated CSO reduction of 66MG.

**Table 3-4 Itemized Summary (Annual Stormwater Capture) of GI Projects Constructed or Under Construction up to and Including Year 2011**

Project ID	Project Name	Project Address	Parcel Owner	Year	Basin	GI Technology	Impervious Drainage Area, SF
C-134b	Tree Planting at Union & Demong Parks	Union Pl, Kirkpatrick St, N Salina St	City of Syracuse	2011	020-1	Urban Forestry	2,750
C-137b	Tree Planting at Schiller Park	112 Whitwell Dr	City of Syracuse	2011	020-2	Street Trees	9,100
C-105	GIF#041 CNY Philanthropy Center	431 E Fayette St	Private	2011	027	Porous Pavement Parking Lot Green Roof Bioretention	7,330 240 3,200
C-01	City Parking Lot #21	Southwest corner of W. Washington and Clinton Streets	Syracuse Urban Renewal Agency	2010	027	Bioretention	26,252
C-109	GIF#45 Pemco Montgomery	217 Montgomery Street	Private	2011	027	Infiltration Bed	48,490
C-121	GIF#051 Park Central Presbyterian Church	509 E Fayette St	Private	2011	027	Porous Pavement Parking Lot	3,469
C-20	Green Roof at Center of Excellence	727 E. Washington Street	Syracuse University	2010	027	Green Roof	17,000
C-42	Private Parking Garage: Atrium	S. Franklin St and W Washington St	Private	2011	027	Cistern/Rain Barrel	6,000
C-48	Green Roof at Erie Canal Museum and Visitor Center	318 Erie Blvd. East	County of Onondaga	2011	027	Green Roof	2,200
C-54c	Downtown Streetscape Grant Project @ Water St	200 block E Water	City of Syracuse	2011	027	Tree Trench Silva Cells High	7,433
C-57	GIF#013 The Monroe Building	333 E. Onondaga St.	Private	2010	027	Green Roof	5,200
C-79	GIF#026 Central New York Jazz Arts Fndtn	441 E. Washington Street	Private	2011	027	Bioretention Green Roof	500 2,500
M-25	GIF#017 Create Public Art	713 E. Fayette St	Private	2011	027	Porous Pavement Sidewalk Pavement Removal Porous Pavement Roadway Green Roof	400 600 1,100 3,000
C-103	GIF#039 Home HeadQuarters Marcellus	223 Marcellus St.	Private	2011	028	Street Trees Street Trees Porous Pavement Parking Lot	3,200 1,320 560
C-141	GIF#062 Peace Incorporated	200 Wyoming Street	Private	2011	028	Porous Pavement Parking Lot	3,200
C-22	Flexipave at Home Headquarters #1	N/A	Private	2008	028	Porous Pavement Parking Lot	2,300
C-52	GIF#006 Green Roof at King & King Architects	358 W. Jefferson St.	Private	2010	028, 031	Green Roof	11,200
C-139	GIF#060 Kopp Billing Agency	511 E Fayette St.	Private	2011	030	Infiltration Trench	18,770
C-146	Havens Parking Lot at SU	E Adams St and Comstock Ave	Syracuse University	2011	030	TBD	TBD
C-19	Urban Garden #1	301 to 311 S. Warren Street	Private	2009	030	Urban Garden	24,420
C-21	GIF#004 Jefferson Clinton Commons	500 S. Clinton St	Private	2010	030	Green Roof Porous Pavement Parking Lot	2,000 15,000
C-25	Flexipave at Museum of Science & Technology	NA	Private	2008	030	Flexipave	1,400
C-29c	Forman Park	E Genesee and Almond Streets	City of Syracuse	2011	030	Landscape Restoration Landscape Restoration	953 5,930
C-45	GIF#018 Putnam Properties	210 E. Fayette St.	Private	2011	030	Porous Pavement Parking Lot Green Roof	1,400 3,200
C-58	GIF#007 Hotel Skyler	609 S. Crouse Ave.	Private	2010	030	Porous Pavement Parking Lot	9,800
C-96	GIF#034 Pike Block	S Salina & W Fayette St	Private	2011	030	Cistern/Rain Barrel	28,625
C-54d	Downtown Streetscape Grant Projects @ Montgomery St	300 block Montgomery	City of Syracuse	2011	030, 027	Tree Trench Silva Cells High	9,513
CW-01	Creekwalk: Jefferson to Walton Streets	Creekwalk: Jefferson to Walton Streets	City of Syracuse	2010	030, 029	Porous Pavement Parking Lot Bioretention	6,450 1,200
C-29a	Connective Corridor Phase 1 - Contract 1 (University Ave)	University Ave, from E Genesee to Waverly St	City of Syracuse	2011	030, 080B	Green Street	293,130
C-59	GIF#015 Near West Side Initiative: Artist Studio	109-115 Otisco & Wyoming St	Private	2010	031	Porous Pavement Sidewalk Vegetated Infiltration Basin Bioretention	900 5,400 1,100
C-74a	Otisco Street Green Corridor - Phase 1	from Ontario St to Seneca St	City of Syracuse	2011	031	Curb Extension	145,402
C-31	GIF#010 Near Westside Initiative Lincoln Supply	109 Otisco St	Private	2010	031, 032	Bioretention	27,000
C-101	Green Park: Skiddy Park (Site)	Tully St between Oswego and Tioga	City of Syracuse	2011	032	Pavement Removal Flexipave	10,000 17,000

**Table 3-4 Itemized Summary (Annual Stormwater Capture) of GI Projects Constructed or Under Construction up to and Including Year 2011**

Project ID	Project Name	Project Address	Parcel Owner	Year	Basin	GI Technology	Impervious Drainage Area, SF
C-23	Flexipave at Home Headquarters #2	NA	Syracuse Housing Authority	2008	032	Flexipave	400
C-92	GIF#040 Courts4Kids: Skiddy Park Porous Basketball Courts	Tully St between Oswego and Tioga	City of Syracuse	2011	032	Porous Pavement Parking Lot	10,321
						Porous Pavement Parking Lot	9,217
C-07	Municipal Parking Garage: OnCenter	817 - 835 S. State Street and E. Adams Street	County of Onondaga	2011	034	Bioretention	72,500
C-09	County Parking Lot B at S. Townsend Street	431 Harrison St & Townsend Street	County of Onondaga	2010	034	Infiltration Trench	55,370
C-11	Commercial Green Streets: Harrison Street	Harrison Street, from Montgomery to State Streets	City of Syracuse	2011	034	Stormwater Planter - Sidewalk	10,200
C-120	GIF#050 Plymouth Congregational Church	232 E. Onondaga St	Private	2011	034	Bioretention	3,482
						Green Roof	6,818
C-12a	Townsend St Median Revegetation Phase 1	S Townsend St, from E Adams St to E Genesee St	City of Syracuse	2011	034	Enhanced Street Trees	18,000
C-12b	Townsend St Median Revegetation Phase 2	E. Adams St to E. Taylor St	City of Syracuse	2011	034	Landscape Restoration	3,000
C-33	Cistern System at the War Memorial	200 Madison Street	County of Onondaga	2011	034	Cistern/Rain Barrel	22,750
C-34	Green Roof at OnCenter	800 S. State Street	County of Onondaga	2011	034	Green Roof	66,000
C-38	County Parking Lot: OnCenter	801 - 813 S. State Street; 422 - 434 Harrison St	County of Onondaga	2011	034	Porous Pavement Parking Lot	131,000
						Tree Trench Standard	3,000
C-56	GIF#012 The Galleries Office Towers	147 E. Onondaga St.	Private	2010	034	Porous Pavement Parking Lot	20,000
C-75a	SUNY Upstate Cancer Center Green Roof	750 E Adams St	Private	2011	034	Green Roof	11,968
C-75b	SUNY Upstate Cancer Center Rain Garden	750 E Adams St	Private	2011	034	Bioretention	1,866
C-75c	SUNY Upstate Cancer Center Tree Planting	750 E Adams St	Private	2011	034	Tree Trench Standard	1,813
C-78	GIF#024 CNY Regional Transportation Authority	624-662 South Warren Street	Private	2011	034	Infiltration Trench	70,567
C-85	SCSD Central Offices	725 Harrison Street	Syracuse City School District	2011	034	Porous Pavement Parking Lot	105,950
						Porous Pavement Parking Lot	8,958
						Infiltration Trench	8,958
						Infiltration Trench	700
C-122	GIF#052 St. Lucy's Parking Lot	432 Gifford Street	Private	2011	035	Porous Pavement Parking Lot	9,124
						Cistern/Rain Barrel	5,673
C-123	GIF#053 St. Lucy's Dry Well	432 Gifford Street	Private	2011	035	Cistern/Rain Barrel	7,200
C-77	GIF#022 Alexander West Properties, LLC	327 Gifford Street	Private	2011	035,036	Bioretention	8,712
C-140	GIF#061 The Spa at 500	500 W Onondaga St	Private	2011	036	Green Roof	5,600
C-24	Flexipave at Catholic Charities	NA	Private	2008	036	Flexipave	120
C-70	GIF#020 St Lucy's Church	316 - 318 - 320 Seymour Street	Private	2011	036	Porous Pavement Parking Lot	20,000
C-93	Seymour School Rain Garden	108 Shonnard Street	Syracuse City School District	2010	036	Bioretention	580
C-99	Vacant Lot Project #2	701 Oswego Street	City of Syracuse	2011	036	Infiltration Trench	13,000
						Urban Garden	1,720
C-26	Flexipave at SUNY Upstate Hospital Day Care	NA	Syracuse University	2008	037	Flexipave	3,500
C-55	Green School: SCSD Institute of Technology	258 E. Adams St.	Syracuse City School District	2011	037	Separation with WQ Treatment	127,800
C-61	Gateway Project at Water Street	300 Water Street		2011	053	Porous Pavement Parking Lot	4,073
						Infiltration Trench	7,790
						Green Street	40,588
C-128	GIF#058 Loon Creek Properties	601 E. Genesee Street	Private	2011	057	Porous Pavement Parking Lot	6,950
						Stormwater Planter - Raised	3,000
						Tree Trench Standard	3,000
						Porous Pavement Parking Lot	5,775
						Porous Pavement Parking Lot	1,640

Table 3-4 Itemized Summary (Annual Stormwater Capture) of GI Projects Constructed or Under Construction up to and Including Year 2011

Project ID	Project Name	Project Address	Parcel Owner	Year	Basin	GI Technology	Impervious Drainage Area, SF
C-129	GIF#059 McMahon-Ryan Child Advocacy Center	601 E. Genesee Street	Private	2011	057	Porous Pavement Parking Lot	33,298
C-117	Tree Plantings in Court Woodlawn	Grant Blvd and Woodlawn Terrace	Private	2011	073-3	Street Trees	1,000
C-41	Private Parking Lot at Islamic Society of NY	925 Comstock Ave	Private	2008	077	Urban Forestry	6,750
C-147	Waverly Parking Lot at SU	805 South Crouse Avenue	Private	2011	080B	Porous Pavement Parking Lot	2,230
C-29b	Connective Corr Phase 1 - Contract 2 (E. Genesee St)	805 South Crouse Avenue	Syracuse University	2011	080B	TBD	TBD
C-29b	Connective Corr Phase 1 - Contract 2 (E. Genesee St)	E Genesee St from University Ave to Forman Ave	City of Syracuse	2011	080B, 030	Green Street	141,601
C-108	GIF#044 American Beech	500 Westcott Street	Private	2011	080i	Porous Pavement Parking Lot	3,870
						Dry Well	1,723
C-51	GIF#001 The Spa at 500 W. Onondaga	500 W. Onondaga St	Private	2010	036	Bioretention	1,000
						Porous Pavement Parking Lot	7,500
M-01	Green Roof at SUNY ESF Walters Hall	Walters Hall, 1 Forestry Drive	SUNY ESF	2008	039	Green Roof	6,700
M-13	Flexipave at SUNY ESF Illick Hall	1 Forestry Drive	SUNY ESF	2008	039	Flexipave	50
M-14	Flexipave at SUNY ESF Moon Library	1 Forestry Drive	SUNY ESF	2008	039	Flexipave	500
M-15	SUNY ESF Parking Project	1 Forestry Drive	SUNY ESF	2008	039	Porous Pavement Sidewalk	10,032
						Bioretention	4,270
M-16	SUNY ESF Gateway Building	1 Forestry Drive	SUNY ESF	2010	039	Green Roof	25,102
M-17	GIF#009 SUNY ESF Residence Hall (Centennial Hall)	1 Forestry Drive	SUNY ESF	2010	039	Porous Pavement Sidewalk	3,500
M-20	GIF#008 Dunbar Association	1453 S. State St.	Private	2010	039	Porous Pavement Parking Lot	12,800
M-21	SUNY ESF Illisk Hall Rain Garden	1 Forestry Drive	SUNY ESF	2010	039	Bioretention	26,000
M-49	Stadium Parking Lot at SU	Stadium Place at E Raynor Ave	Syracuse University	2011	039	TBD	TBD
M-19	GIF#005 Jubilee Homes of Syracuse	601 South Avenue	Private	2010	042	Green Roof	11,588
M-39	Bellevue Academy Tree Plantings	S Geddes and Grant Ave	Syracuse City School District	2011	042	Street Trees	5,000
M-24	GIF#003 Syracuse Model Neighborhood Corp	S Salina and E Kennedy St	Private	2011	042-2	Porous Pavement Parking Lot	9,648
						Bioretention	125
						Porous Pavement Parking Lot	7,900
						Porous Pavement Parking Lot	4,320
M-03	Stormwater Detention Basin at Dunk and Bright	2648 South Salina St	Private	2008	043-3	Bioretention	219,800
M-23	Greening the Grey in Basin 044	400-700 W Castle Street	TBD	2011	044	Bioretention	16,200
						Bioretention	36,000
M-45	Rain Garden at Barnabas Center	1941 S Salina St	Private	2011	044-2	Bioretention	1,982
M-37	Rooftop Disconnect in CSO 045	119 Crescent Ave	Private	2011	045	Downspout Disconnect	3,900
M-41	GIF#049 Swallow's Tavern	1908 South Ave, 1912 South Ave	Private	2011	052	Bioretention	13,900
						Porous Pavement Parking Lot	8,300
M-44	Site Improvements at Bishop Foery Center	Edmund Ave	Private	2011	067	Bioretention	1,494
M-02	Green Church: Church of Latter Day Saints	801 E Colvin St	Private	2008	077	Downspout Disconnect	25,825
M-29	Hughes Magnet School Parking Lot	745 -55 Jamesville Ave	Syracuse City School District	2011	077	Porous Pavement Parking Lot	40,100
						Infiltration Bed	40,100
M-35	GIF#030 The People's Community Development Corporation	2307-2315 S. Salina St	Private	2011	077	Green Roof	4,010
						Tree Trench Standard	1,230
M-36	GIF#033 Matawon Development Group	2221 South Salina Street	Private	2011	077	Infiltration Bed	3,250
E-01	Flexipave at Ross Brothers Office Building	NA	Private	2008	080	Flexipave	500
E-16	Sunnycrest Park Golf Parking Lot	Caleb Ave	City of Syracuse Parks Department	2011	080	Pavement Removal	7,028
						Bioretention	21,623
						Storage Bed	8,963
E-31	Pocket Park at N. Clinton St. and W. Genesee St.	200-202 W. Genesee St.	City of Syracuse	2011	080	Bioretention	5,793
						Porous Pavement Sidewalk	1,327
E-36	Sunnycrest Arena Parking Lot	St. Anne Dr and Robinson St	City of Syracuse Parks Department	2011	080	Bioretention	570
						Bioretention	570
						Porous Pavement Parking Lot	47,600
						Porous Pavement Parking Lot	19,450
						Porous Pavement Parking Lot	38,320

Table 3-4 Itemized Summary (Annual Stormwater Capture) of GI Projects Constructed or Under Construction up to and Including Year 2011

Project ID	Project Name	Project Address	Parcel Owner	Year	Basin	GI Technology	Impervious Drainage Area, SF
E-39	East Water Street Pavement Removal	Intersection of S Beech and E Water at Erie Blvd.	City of Syracuse	2011	080	Pavement Removal	7,427
						Tree Trench Standard	36,173
E-06	City Parking Lot #3	101 Oswego Blvd	Syracuse Urban Renewal Agency	2010	080, 080A	Porous Pavement Parking Lot	38,500
E-10	Road Recon. Project No. 3: Concord Place	Concord Place from Westcott St. to Allen St.	City of Syracuse	2011	080, 080I	Infiltration Trench	38,521
E-03	St. Joseph's Hospital Campus Exp and Redvt	301 Prospect Ave	Private	2010	080A	Green Roof	18,750
E-12	Dr Edwin E Weeks Elementary School	710 Hawley Ave	Syracuse City School District	2011	080A	Bioretention	75,824
						Bioretention	47,828
C-91	SUNY Upstate: Institute of Human Performance Expansion	505 Irving Avenue	Private	2011	080B	Tree Trench Silva Cells Low	23,403
E-29	SU Rain Garden: Waverly & Crouse	801 - 841 S. Crouse Ave.	Syracuse University	2008	080B	Bioretention	3,000
E-35	SU University Ave. Parking Garage Retention System	1101 E. Adams Street and University Ave	Syracuse University	2008	080B	Storage Bed	46,800
E-02	Flexipave at Forest View Retirement Development	NA	Private	2008	080C	Flexipave	1,700
E-34	Rain Garden at Henniger High School	600 Robinson St	Syracuse City School District	2010	080H	Bioretention	1,000
H-05	Green Roof at Hazard Branch Library	1620 West Genesee St	City of Syracuse	2011	004	Green Roof	5,000
H-10	Tree Planting in and around Burnet Park	Harbor Brook Sewershed	City of Syracuse	2010	004	Enhanced Street Trees	4,650
H-11	Avery Ave Greening at Pass Arboretum	Avery Ave and Tompkins St	City of Syracuse Parks Department	2011	004	Bioretention	10,640
						Bioretention	28,130
H-13	Wilbur Avenue Zoo Entrance Enhancement	S Wilbur Ave and Coleridge Ave	City of Syracuse	2011	004	Bioretention	38,610
H-20	Rosamond Gifford Zoo: Primate Exhibit	One Conservation Place	County of Onondaga	2010	004	Bioretention	
						Infiltration Bed	
H-24	GIF#031 ARC of Onondaga County	401 Lowell Ave.	Private	2011	004	Porous Pavement Parking Lot	17,000
H-04	Flexipave at Private Residence #1	NA at W Marcellus St	Private	2008	009	Flexipave	600
H-07	GIF#011 Vibrant Syracuse Spaces	196 S. Geddes St	Private	2010	010	Porous Pavement Parking Lot	10,000
H-08	Road Recon. Project No. 8: Geddes Street	300-500 blocks S. Geddes St	City of Syracuse	2011	010, 011	Bioretention	29,700
H-16	Porous concrete sidewalk on Grand Ave	100 Grand Ave	City of Syracuse	2010	014	Porous Pavement Sidewalk	560
H-17	Rain Garden at Grand & Delaware	Grand Ave & Delaware St	City of Syracuse	2011	014	Bioretention	12,877
H-19	Rosamond Gifford Zoo: Elephant Exhibit	One Conservation Place	County of Onondaga	2011	N/A	Green Roof	6,500
F-01	City Parking Lot at Pearl Street	400 block of Pearl Street	New York State DOT	2010	021	Porous Pavement Parking Lot	73,000
HW-01	DPW Pavement Reduction #1: 100-300 Blocks Burdick Ave	Burdick Ave from Court Street to Murray Ave	City of Syracuse	2008	074	Pavement Removal	3,450
ZZ-02b	Street Tree Planting Fall 2011	various	City of Syracuse	2011	multiple	Street Trees	23,750
C-98a	Greening the Grey at Clinton Storage Facility	Street North to West Jefferson (Trolley Lot)	County of Onondaga	2011	N/A	GI Placeholder	217,000
CW-02	Creekwalk: Walton to E. Fayette Streets	Creekwalk: Walton to E. Fayette Streets	City of Syracuse	2010	N/A	Porous Pavement Parking Lot	6,780
E-42	County Board of Election Building	1000 Erie Blvd W & Liberty St	County of Onondaga	2011	N/A	Stormwater Planter - Raised	4,450
						Stormwater Planter - Sidewalk	1,000
						Stormwater Planter - Sidewalk	1,000
H-27	Greening the Grey at Harbor Brook Storage Facility	State Fair Blvd. and Rusin Ave (near Waite Ave)	County of Onondaga	2011	N/a	Flexipave	800
						Bioretention	7,700
						Bioretention	8,800
IH-01	Infiltration Trench #1	Spencer Street between Liberty Street and Hiawatha Blvd.	City of Syracuse	2009	N/A	Infiltration Trench	10,000
IH-02	Private Parking Lot at Liberty Green	531 Liberty Street	Private	2009	N/A	Porous Pavement Parking Lot	10,800
IH-04	Rain Garden at Syracuse Harbor	Van Rensselear St	New York State	2011	N/A	Bioretention	100
ZZ-01	Model Calibration to Measured Residential Roof/Drive Disconnection	n/a	Multiple	2008	N/A	Downspout Disconnect	TBD
ZZ-02a	Street Tree Planting Spring 2011	various locations	Multiple	2011	N/A	Street Trees	TBD
ZZ-07a	Countywide Rain Barrel Program	n/a	Private	2010	N/A	Cistern/Rain Barrel	51,700
ZZ-07b	Countywide Rain Barrel Program	n/a	Private	2011	N/A	Cistern/Rain Barrel	69,050

**Table 3-5 Itemized Summary (Annual Stormwater Capture) of GI Projects Proposed During Year 2012**

Project ID	Project Name	Project Address	Parcel Owner	Basin	GI Technology	Impervious Drainage Area, SF
M-51	SUNY Upstate Parking Lot	426-502 Harrison Street	Syracuse University		TBD	TBD
C-81	SFD Firehouse #5 Geddes St	110 N Geddes St	City of Syracuse	007	TBD	TBD
C-145	Park at Lodi and N. State	Lodi and N. State	City of Syracuse Parks Department	020-1	TBD	TBD
C-150	GIF#064 Cathedral Academy	915 N McBride St	Private	020-1	TBD	TBD
C-137	Green Park: Schiller Park	112 Whitwell Dr	City of Syracuse Parks Department	020-2	Bioretention	TBD
					Infiltration Trench	TBD
C-163	Vacant Lot: 350 Pond St	350 Pond St	City of Syracuse	020-2	TBD	TBD
F-07b	Green Park: McChesney Park	2308 Grant Blvd	City of Syracuse Parks Department	020-2	Tree Trench Standard	7,000
					Bioretention	2,400
					Landscape Restoration	2,500
					Porous Pavement Parking Lot	20,100
C-116	Greening of Post Standard	1 S Clinton St	Private	021	TBD	TBD
C-152a	GIF#066 Third National Assoc. (Parcel A)	131-57; 121-27 James St	Private	021	TBD	TBD
C-152b	GIF#067 Third National Assoc. (Parcel B)	130, 132, 136 N Salina St; 137 N Warren St	Private	021	TBD	TBD
C-152c	GIF#068 Third National Assoc. (Parcel C)	108-12;114-18; 120-22;126-28 S Salina St.	Private	021	TBD	TBD
C-115	Hanover Square	E Water St and S Warren St	City of Syracuse	027	TBD	TBD
C-153	Center of Excellence Streetscape Improvements	727 E Washington St	Syracuse University	027	TBD	TBD
C-28	SUNY Upstate BioTechnology Center (Kennedy Sq. Redev)	820-900 E. Water St.	SUNY Upstate	027	TBD	TBD
C-53	City Hall Forecourt	233 E. Washington Street	City of Syracuse	027	Infiltration Trench	19,000
					Infiltration Bed	13,300
C-83	SFD Firehouse #7 at Fayette St	1039 E Fayette St	City of Syracuse	027	TBD	TBD
C-86	Bank Alley Enhancement	Alley between E Washington and E Fayette St	City of Syracuse	027	Infiltration Trench	24,659
					Infiltration Trench	10,568
C-90	WCNY and NWSI / Pro Literacy	101-19 Wyoming St & Fayette St W	Private	028	TBD	TBD
C-94	GIF#032 Consuela's Westside Taqueria and BBQ	523 Marcellus St	Private	028	Porous Pavement Parking Lot	1,800
					Pavement Removal	1,700
					Street Trees	800
					Bioretention	1,500
C-97	Marcellus Street Parking Alignment	100 block Marcellus St, b/w Wyoming and West	City of Syracuse	028	Curb Extension	TBD
C-67	Greening West Street Arterial Phase 1	West Street Arterial from Onondaga St to Genesee St	City of Syracuse	028,031,032,035,036	TBD	TBD
C-106	GIF#042 Center for Peace and Social Justice	2013 E. Genesee St	Private	030	Porous Pavement Parking Lot	5,919
					Bioretention	1,000
C-124	GIF#54 Syracuse University Waverly Ave. Parking Lot	306-12 Waverly Ave	Private	030	TBD	TBD
C-136	Green Park: Loguen Park	1801 E Genesee St and Lexington Ave	City of Syracuse Parks Department	030	Bioretention	5,265
					Bioretention	5,205
					Enhanced Street Trees	5,900
					Pavement Removal	2,535
					Infiltration Bed	9,166
C-136b	Pavement Removal along Genesee St at Loguen Park	1801 E Genesee St and Lexington Ave	City of Syracuse Parks Department	030	Bioretention	12,000
					Pavement Removal	12,222
					Curb Extension	5,857
					Landscape Restoration	900
C-142	Pavement Removal in ROW @Walnut ST	500 Block Walnut ST at Genesee	City of Syracuse	030	TBD	TBD
C-149	GIF#063 Brewster Medical Properties	1200-1224 E Genesee St	Private	030	TBD	TBD
C-36b	City / County Criminal Court House Site	505 S. State Street	City of Syracuse	030	Porous Pavement Parking Lot	11,500

**Table 3-5 Itemized Summary (Annual Stormwater Capture) of GI Projects Proposed During Year 2012**

Project ID	Project Name	Project Address	Parcel Owner	Basin	GI Technology	Impervious Drainage Area, SF
C-64	Green Park: Thornden Park	501 Ostrom Ave	City of Syracuse Parks Department	030	Porous Pavement Parking Lot	TBD
					Street Trees Bioretention	TBD TBD
C-84	SFD Firehouse #10 - Genesee St	2030 E Genesee Street	City of Syracuse	030	TBD	TBD
C-54e	East Side of Montgomery Street	Montgomery St	City of Syracuse	030,027	Tree Trench Standard	11,000
C-88	Almond Street Pavement Removal	Between Madison and E. Genesee	City of Syracuse	030,034	Curb Extension	3,368
					Green Street Green Street	6,140 22,301
C-74b	Otisco Street Green Corridor Phase 2	From Oswego St to Wyoming St	City of Syracuse	031	Green Street	184,000
C-82	SFD Firehouse #6 at West St	601 S West St	City of Syracuse	032	TBD	TBD
C-06a	Capture/Reuse at the County Justice Center	555 S. State Street	County of Onondaga	034	Cistern/Rain Barrel	13,000
C-100	Everson Garage / Plaza	788 S Townsend St	County of Onondaga	034	Cistern/Rain Barrel	74,321
C-104	Civic Center Forecourt	E Onondaga St. and Montgomery St.	City of Syracuse	034	Porous Pavement Sidewalk	2,500
					Stormwater Planter - Sidewalk	3,000
					Stormwater Planter - Sidewalk	3,000
C-34a	Green Roof at OnCenter : Phase II	800 S. State Street	County of Onondaga	034	Green Roof	3,500
					Green Roof	6,100
C-47	County Parking Lot at Townsend St. and Justice Center	555 S. State Street	County of Onondaga	034	TBD	TBD
C-87	VA Medical Facility	800 Irving Ave	USA	034	TBD	TBD
C-95	SUNY Townsend Tower	507-523 E Adams Street	Private	034	TBD	TBD
C-80	SFD Firehouse #1 at State St	900 S State St	City of Syracuse	034, 037	TBD	TBD
C-76	GIF#021 Alexander West Properties, LLC	307 Gifford Street	Private	035	Green Roof	4,800
C-110	Seymour Academy Parking Lot	180 Shonnard St	Syracuse City School District	036	Porous Pavement Parking Lot	20,750
					Tree Trench Standard	2,450
C-138	Green Park: Grace Park	200 Grace St and Massena St	City of Syracuse Parks Department	036	Bioretention	3,600
C-156	GIF#070-Onondaga Commons (Slocum Ave)	207-11,213,215 Slocum Ave	Private	036	TBD	TBD
C-157	GIF#071 - Onondaga Commons (Harris Health Center)	301 Slocum Ave	Private	036	TBD	TBD
C-158	GIF#072 Onondaga Commons (Lean On Me Daycare)	422-28 W Onondaga St	Private	036	TBD	TBD
C-159	GIF#073 Onondaga Commons (Rural Metro)	488 W Onondaga St.	Private	036	TBD	TBD
C-160	Vacant Lot: Merriman Ave and Sabine St.	215 Merriman Ave. and Sabine Street	City of Syracuse	036	TBD	TBD
C-161	Vacant Lot: 226 Delaware St.	226 Delaware St.	City of Syracuse	036	TBD	TBD
C-18	Residential Green Street at Kellogg Street (RR-14)	Kellogg Street from Massena Street to Oswego Street	City of Syracuse	036	Bioretention	31,000
C-27	Bioretention at the Rescue Mission	155 Gifford Street	Private	036	Bioretention	29,769
C-60	Green School: Seymour Academy Playground	108 Shonnard Street	Syracuse City School District	036	Tree Trench Standard	6,780
					Bioretention	2,950
C-60	Green School: Seymour Academy Playground	108 Shonnard Street	Syracuse City School District	036	Tree Trench Standard	6,780
					Bioretention	2,950
C-63a	Synapse Project - 658 W Onondaga St	659 W. Onondaga St	Private	036	Porous Pavement Parking Lot	7,600
					Green Roof	170
					Bioretention	400
C-63b	Synapse Project - Urban Tree Nursery	663 & 659 W Onondaga St	Private	036	Cistern/Rain Barrel	TBD
C-63c	Synapse Project - W. Onondaga Street	600 block W Onondaga St	Private	036	Bioretention	12,750
C-63c	Synapse Project - W. Onondaga Street	600 block W Onondaga St	Private	036	Porous Pavement Sidewalk	119,700
C-73	Onondaga Street Corridor/Gateway Project	From W Adams to South Ave	City of Syracuse	036	Green Street	TBD

**Table 3-5 Itemized Summary (Annual Stormwater Capture) of GI Projects Proposed During Year 2012**

Project ID	Project Name	Project Address	Parcel Owner	Basin	GI Technology	Impervious Drainage Area, SF
C-89	Greening of S Salina and S Warren Intersection	600 block S Salina St and 700 block S Warren St	City of Syracuse	037	Curb Extension	14,981
					Curb Extension	7,727
					Curb Extension	15,233
					Tree Trench Standard	5,543
C-155	Carrier Dome Rainwater Harvesting System		Syracuse University	039	TBD	TBD
C-130	State Office Building Parking Lot	333 E. Washington St.	New York State	053	TBD	TBD
C-132	Green Park: Leavenworth/Barker Park	301 Park Ave and Matty Ave	City of Syracuse Parks Department	066	Porous Pavement Roadway	5,300
					Porous Pavement Court	10,000
					Bioretention	54,450
C-111	Pavement Removal: Rugby Rd and Hampton Rd	Rugby Rd and Hampton Rd.	City of Syracuse	073-1	TBD	TBD
C-112	Green School: Lincoln Jr. High School	James St and Hampton Rd	Syracuse City School District	073-1	TBD	TBD
M-46	Green Street: Salina b/w E. Colvin and E. Brighton	Salina b/w E. Colvin and E. Brighton	City of Syracuse	077	TBD	TBD
C-125	GIF#055 Bethany Baptist Church	149 Beattie Street	Private	080	Bioretention	1,300
					Porous Pavement Parking Lot	23,950
					Bioretention	95,000
C-133	Green Park: Westmoreland Park	200-252 Westmoreland Ave	City of Syracuse Parks Department	080	TBD	TBD
C-143	Vacant Lot: Fayette St Orchard	2016-24 E Fayette St	City of Syracuse	080	TBD	TBD
C-151	GIF#065 Housing Visions	116 Hawley Ave	Private	080A	TBD	TBD
E-11	Green Park: Highland Park Greening	421 Highland	City of Syracuse Parks Department	080A	Tree Trench Standard	3,061
					Tree Trench Standard	2,641
					Bioretention	4,804
C-114	Green Street: Waverly St.	Waverly Street from Irving to Comstock St.	City of Syracuse	080b	Porous Pavement Sidewalk	19,000
					Stormwater Planter - Sidewalk	60,000
					Enhanced Street Trees	30,000
E-22	Green Park: Lincoln Park	Intersection of Robinson and Sherwood Ave	City of Syracuse	080D	Green Roof	2,845
					Landscape Restoration	9,482
					Bioretention	4,884
					Bioretention	3,895
C-162	Vacant Lot: 1716 E Fayette St.	1716 E Fayette St. & S Wescott St.	City of Syracuse	080E	TBD	TBD
C-113	Green Street: S. Beech and Judson	S. Beech and Judson Streets	City of Syracuse	080i	TBD	TBD
C-118	GIF#047 Gemmi Boy	508-510 Westcott Street	Private	080i	Cistern/Rain Barrel	650
					Porous Pavement Parking Lot	1,965
C-119	GIF#048 Mister Lady Bug	500-506 Westcott Street	Private	080i	Porous Pavement Parking Lot	7,046
					Bioretention	150
M-52	Road Recon #4: S State Street	From E Castle to E Colvin	City of Syracuse	039; 044-2	TBD	TBD
M-30	Southwest Community Center	401-45 South Ave & Clover St	City of Syracuse	042	TBD	TBD
M-54	Vacant Lot: 115-23 Bishop Ave.	115, 117-19 & 121-23 Bishop Ave	City of Syracuse	042	TBD	TBD
M-55	Vacant Lot: W. Brighton Ave.	156-58 & 162-70 W. Brighton Ave	City of Syracuse	043-3	TBD	TBD
M-05	Stream Inflow Removal #1	I-81 near Woodland Ave.	City of Syracuse	044-2	TBD	TBD
M-42	Greening Vacant Lot near Beauchamp Library	tbd	City of Syracuse	044-2	TBD	TBD
M-50	Basin 052 Stormwater Wetland			052	TBD	TBD
M-56	Vacant Lot: 1506-08 Midland Ave	1506-08 Midland Ave and Colvin St	City of Syracuse	060	TBD	TBD
M-47	Neighborhood GI at Midland 067	Midland Basin 067	Public	067	TBD	TBD
M-31	GIF#025 Salina Shoe Company Inc	2809 S. Salina Street	Private	076	Porous Pavement Parking Lot	3,250
					Green Roof	2,400
					Porous Pavement Sidewalk	550
C-69	GIF#019 Viraj Salina, Inc.	2703-2731 S. Salina St	Private	077	Infiltration Trench	1,400

**Table 3-5 Itemized Summary (Annual Stormwater Capture) of GI Projects Proposed During Year 2012**

Project ID	Project Name	Project Address	Parcel Owner	Basin	GI Technology	Impervious Drainage Area, SF
M-06	Stream Inflow Removal #2	I-81 near Colvin Ave.	City of Syracuse	077	TBD	TBD
M-07	Stream Inflow Removal #3	Oakwood Cemetery near Moore Ave.	City of Syracuse	077	TBD	TBD
M-10b	Green Library: Beauchamp Site Improvements	2111 S. Salina St	City of Syracuse	077	Bioretention	5,000
					Tree Trench Standard	540
					Porous Pavement Parking Lot	2,700
					Porous Pavement Parking Lot	4,500
M-11b	SFD Firehouse #8 at Salina St (Site)	2412 S. Salina St	City of Syracuse	077	Porous Pavers Parking Lot Heavy Duty	2,460
					Bioretention	6,329
M-12a	US Post Office on Salina St: Green Roof	2200 S. Salina St	United States Postal Service	077	Green Roof	12,844
M-12b	US Post Office on Salina Street: Site Improvements	2200 S. Salina St	United States Postal Service	077	Pavement Removal	539
					Enhanced Street Trees	6,419
					Infiltration Trench	6,454
					Enhanced Street Trees	1,335
					Enhanced Street Trees	4,991
					Infiltration Trench	27,633
M-29b	Vacant Lot: 147 Hughes Place	147 Hughes Place	City of Syracuse	077	Bioretention	15,125
					Bioretention	24,000
M-29c	Vacant Lot: 220 Lorraine Ave	220 Lorraine Ave	City of Syracuse	077	Tree Trench Standard	3,700
M-32	GIF#027 People's AME Zion Church	2226-28 South Salina St.	Private	077	Porous Pavement Parking Lot	7,500
M-33	GIF#028 Viraj NY LLC (Deb's Convenience Market)	2419 South Salina St	Private	077	Infiltration Trench	18,000
					Vegetated Infiltration Basin	3,000
M-34	GIF#029 Viraj Salinia Inc. (Factory Direct Furniture and Mattress)	2711-31 and 2703 South Salina St	Private	077	Bioretention	35,000
M-40	GIF#046 People's AME Zion Church	2306 S. Salina	Private	077	Green Roof	4,100
M-43	Green Park: Comfort Tyler Park	1212-14 E Colvin St and Comstock Ave	City of Syracuse Parks Department	077	Enhanced Street Trees	8,100
					Infiltration Trench	11,000
					Bioretention	17,700
					Bioretention	12,000
M-53	Road Recon #5: Sumner Ave	From Euclid to Stratford	Syracuse University	077	TBD	TBD
H-02	Green School: Porter Magnet School	512 Emerson Ave	Syracuse City School District	003	Pavement Removal	2,648
					Infiltration Trench	9,152
					Green Roof	7,656
					Infiltration Bed	27,371
					Vegetated Infiltration Basin	15,500
					Bioretention	18,066
H-35	Vacant Lot: Everson Ave Rain Garden	701 Emerson Ave & 101 Chemung St	City of Syracuse	003	TBD	TBD
H-05b	Green Library: Hazard Branch Site Improvements	1620 West Genesee St	City of Syracuse	004	Porous Pavement Parking Lot	3,250
					Tree Trench Standard	675
					Bioretention	200
					Porous Pavement Parking Lot	11,175
H-31	Rosamond Gifford Zoo: Waterfowl Exhibits	One Conservation Place	County of Onondaga	004	Constructed Wetland	74,521
H-34	Rosamond Gifford Zoo: Parking Lot	One Conservation Place	County of Onondaga	004	Porous Pavement Parking Lot	32,850
					Porous Pavement Parking Lot	65,400
					Bioretention	43,000
					Bioretention	29,500
					Bioretention	8,100
					Porous Pavement Parking Lot	53,000
					Vegetated Infiltration Basin	42,600

Table 3-5 Itemized Summary (Annual Stormwater Capture) of GI Projects Proposed During Year 2012

Project ID	Project Name	Project Address	Parcel Owner	Basin	GI Technology	Impervious Drainage Area, SF
H-32	Greening of Sackett Tract	W Genesee St., Park Ave., Lakeview Ave.	City of Syracuse	006	Bioretention	3,600
					Bioretention	15,200
					Bioretention	8,650
H-22	Green Street: 800 block Park Ave	800 block Park Ave @ Liberty St	City of Syracuse	006A	TBD	TBD
H-41	GIF#069 Vibrant Syracuse Spaces Green Roof	200 S Geddes St.	Private	010	TBD	TBD
C-68	Street Trees along Marcellus Ave	Marcellus from S Geddes to Seneca	City of Syracuse	010; 028	Enhanced Street Trees	2,250
H-03	Green School: Bellevue Middle School	1607 S. Geddes St	Syracuse City School District	014	Porous Pavement Parking Lot	15,180
H-06	Green Library: Mundy Branch	1204 South Geddes St	City of Syracuse	014	Porous Pavement Parking Lot	7,800
					Stormwater Planter - Sidewalk	630
H-09	Green School: Playground at Delaware School	900 S Geddes St	Syracuse City School District	014	Curb Extension	4,400
					Bioretention	3,400
					Porous Pavement Parking Lot	2,300
H-25	Green Street S Geddes	S Geddes St, Shonnard to W Onondaga St	City of Syracuse	014	TBD	TBD
H-37	Vacant Lot: Delaware/Dudley Orchard	100,102 Dudley & 401 Delaware	City of Syracuse	014	TBD	TBD
H-38	Vacant Lot: Putnam Street	224, 226 Putnam ST	City of Syracuse	014	TBD	TBD
H-44	Vacant Lot: 109 Hartson Street	109 Hartson Street	City of Syracuse	014	TBD	TBD
H-45	Vacant Lot: 409 & 411 Merriman Ave.	409 & 411 Merriman Ave.	City of Syracuse	014	TBD	TBD
H-46	Vacant Lot: 201&203 Sabine St.	201 & 203 Sabine St.	City of Syracuse	014	TBD	TBD
H-30	Vacant Lot Project #3	Arthur St and W Onondaga St	City of Syracuse	015	TBD	TBD
H-14	Harbor Brook CSO 018 Wetland Project	Velasko Rd & Grand Ave	County of Onondaga	018	Constructed Wetland	TBD
H-36	Green Park: Wadsworth Park	1204 Glenwood Ave and Wolcott Ave	City of Syracuse Parks Department	018	Bioretention	23,000
					Bioretention	5,700
H-43	Vacant Lot: 221 Wolcott Ave	221 Wolcott Ave at Stolp Ave	City of Syracuse	018	TBD	TBD
H-23	GIF#023 K & C Auto Body Shop	2104 Erie Boulevard West and 1207 Willis Avenue	Private	063	Porous Pavement Parking Lot	12,200
H-28	GIF#036 Dependable Paving: 945 Emerson	945 Emerson Ave	Private	063	Bioretention	2,440
					Cistern/Rain Barrel	1,450
H-29	GIF#037 Dependable Paving: 947 Emerson	947 Emerson Ave	Private	063	Porous Pavement Parking Lot	3,969
H-33	Green Park: Lewis Park Enhancements	305 Lewis St and 825 Milton Ave	City of Syracuse Parks Department	063,003	Tree Trench Standard	4,500
					Porous Pavers Parking Lot Heavy Duty	12,500
					Tree Trench Standard	2,175
					Infiltration Trench	9,000
F-04	City Parking Lot #4	Butternut and N State Sts	New York State DOT	020-1	Tree Trench Standard	3,169
					Porous Pavement Parking Lot	63,173
					Bioretention	1,958
F-04b	Green Street: N State St at City Lot 4	N State St bw Butternut and Ash	City of Syracuse	020-1	Curb Extension	10,659
					Porous Pavement Parking Lot	57,253
F-02	Green Library: White Branch	763 Butternut St	City of Syracuse	020-2	Cistern/Rain Barrel	860
					Porous Pavement Parking Lot	9,000
					Bioretention	1,400
F-05a	Prospect Park Green Gateway - Phase 1	Prospect Park, E Laurel St to N Salina St	City of Syracuse	020-2	Green Street	108,270
F-05b	Prospect Park Green Gateway - Phase 2	N Salina and 200 Block Butternut St	City of Syracuse	020-2	Green Street	103,280
F-06	Triangle at Grant Blvd and Butternut St	Grant Blvd & Butternut St	City of Syracuse	020-2	Porous Pavement Roadway	TBD
					Tree Trench Standard	TBD
					Bioretention	TBD
F-07	Magnarelli Community Center Green Roof	2308 Grant Blvd	City of Syracuse Parks Department	020-2	Green Roof	10,240

**Table 3-5 Itemized Summary (Annual Stormwater Capture) of GI Projects Proposed During Year 2012**

Project ID	Project Name	Project Address	Parcel Owner	Basin	GI Technology	Impervious Drainage Area, SF
C-148	Sunnycrest Park at Clifton Place	Clifton Place at Sunnycrest Park entrance	City of Syracuse Parks Department	073-2	TBD	TBD
E-05	Commercial Green Streets: Erie Boulevard in EBSS Basin	Teall Avenue to Midler Avenue	City of Syracuse	080	TBD	TBD
E-08	Green Library: Petit Branch	105 Victoria Place	City of Syracuse	080	Porous Pavement Parking Lot	3,640
					Porous Pavement Parking Lot	6,215
					Tree Trench Standard	900
E-13b	US Post Office on Teall Ave: Site Improvements	226 Teall Avenue	United States Postal Service	080	Tree Trench Standard	TBD
E-17	Green School: T.A. Levy School	Fellows Ave and Harvard Place	Syracuse City School District	080	TBD	TBD
E-18	Traffic Triangle Project No. 1: Harvard Pl	Westmoreland and Harvard Place	City of Syracuse	080	Enhanced Street Trees	6,360
					Bioretention	6,580
					Pavement Removal	3,380
					Bioretention	11,625
					Landscape Restoration	4,770
E-21	City DPW Maintenance Building	1200 Canal Street	City of Syracuse	080	TBD	TBD
E-32	Parking Lot at 1101 Erie Blvd. East	1101 Erie Blvd. East	1101 Investors LLC	080	TBD	TBD
E-33	I-690 Disconnection	Leavenworth Ave beneath I-690 Bridge	New York State DOT	080	TBD	TBD
E-40b	Westcott Street Greening	Westcott St from Dell to S. Beech St	City of Syracuse	080	Curb Extension	50,000
E-41	Rose Hill Cemetery	Intersection of Lodi and E Willow St	City of Syracuse	080A	TBD	TBD
E-07	Private Parking Lot-Marshall St and Crouse Ave	801 - 841 Crouse Ave. & Marshall St	Syracuse University	080B	Porous Pavement Parking Lot	12,000
					Bioretention	3,000
E-09	Crouse Hospital: Parking at Hospital Entrance	E. Adams St & S Crouse Ave.	Crouse Health Hospital	080B	TBD	TBD
E-19	Green School: Henniger High School	600 Robinson Street	Syracuse City School District	080H	TBD	TBD
E-20	Green School: Huntington School	Sunnycrest Rd and Stanford	Syracuse City School District	080H	TBD	TBD
E-40a	Westcott Street Green Street: Knoll at S. Beech	Westcott St at S Beech St	City of Syracuse	080i	Tree Trench Standard	4,500
E-43	Westcott Community Center	822-26 Euclid Ave and Westcott St	City of Syracuse	080i	Porous Pavement Parking Lot	8,700
T-01	SFD Firehouse #9 at Shuart Ave	400 Shuart Ave	City of Syracuse	073-1	TBD	TBD

### 3.2.4 Summary of Proposed Projects Beyond 2012

The future projects implemented under the County's Green Infrastructure Program are summarized by type in Table 3-6. The program will identify the specific projects on a year to year basis and detail them in this report in a fashion similar to Section 3.2.3. Some of the projects that do not advance in 2012 may likely move to future annual project lists. In addition, the County's GI Program recognizes the opportunity to capitalize on technological advances, new incentives, and potential changes to City and County regulations that would increase the ability to implement GI and sustain this practice even after the CSO Compliance Milestone is met.

Table 3-6 GI Program Components

Program Component	Definition/Description
Impervious Area Detection	Accounting for land use changes from pervious to impervious and establishing accurate model input parameters for the SWMM is necessary for documenting compliance. In some cases the characteristics of areas contributing to each CSO are changing due to new and improved data. Similarly, new monitoring data and improved calibration have resulted in increased estimates of annual capture. Advances in technology may allow the County to pinpoint CSO capture volume with greater accuracy.
Streets	Green streets use the existing form and construction of roadways to allow the public right-of-way and sometimes adjacent areas to manage runoff through tree trenches, enhanced street trees, porous pavement sidewalks, vegetated curb-extensions, sidewalk planters, etc. Sidewalk programs can reduce runoff volume from uphill adjacent areas with porous pavement materials and street tree plantings, or similar technologies. Cost effectiveness is enhanced when coordinated with street replacement or reconstruction to enhance.
Parks and Open Space	Parks and open space areas provide opportunities to manage runoff from adjacent areas in natural park and vacant lands and can improve the overall setting. Clean runoff from parks can also enter the combined sewer system and limit conveyance capacity of sewage. The program targets the removal of these flows through park enhancements.
Parking Lots	Green parking lots are typically built by installing a stone subsurface infiltration bed in conjunction with porous pavements or water quality inlets redirected into the stone bed. In addition, runoff from adjacent street and sidewalk areas can be redirected into the infiltration beds and/or tree trenches. Other vegetated elements can be integrated into the design to increase tree canopy, thereby promoting evapotranspiration. Cost effectiveness is increased when the parking lot pavement is scheduled for replacement or reconstruction.
Public Facilities	A major opportunity exists to integrate green infrastructure with other capital programs such as the Syracuse City School District Reconstruction Program, the Onondaga County Public Library site improvement projects, County Facilities, and SUNY programs.
Roofs	A vegetated roof cover is a veneer of vegetation grown on and covers an otherwise conventional flat or pitched roof, providing hydrologic characteristics that more closely match surface vegetation than impervious rooftop. The overall thickness of the veneer typically ranges from 2 to 6 inches and may contain multiple layers, consisting of waterproofing, synthetic insulation, non-soil engineered growth media, fabrics, and synthetic components. Through the appropriate selection of materials, even thin vegetated covers can provide significant rainfall retention and detention functions.
Green Improvement Fund (GIF)	The Green Improvement Fund (GIF) is a County funding program to incentivize green infrastructure retrofits on private lands intended to divert storm water runoff that now enters the combined sewer system. The program will continue to receive submittals on a rolling basis as funding allows.
Non-GIF Incentive	Other non-GIF programs may arise to incentivize green infrastructure retrofits on private lands that are not presently or likely to be redeveloped in the foreseeable future. Through this process key partners have been identified that have the opportunity to increase implementation because these partners are significant land owners and have the ability to influence development and redevelopment. This program targets specific strategic projects to advance green infrastructure technology development and implementation.
Voluntary Projects	Voluntary projects are built by private land owners that incorporate green infrastructure on their own. Examples of these types of projects include green roofs, porous pavement driveways and parking lots, and residential and commercial disconnection to pervious areas, rain barrels, cisterns, or capture and reuse functions.
New Ordinances	A revised storm water ordinance is critical to progressing GI implementation and ultimately would enable the CSO program to limit new impervious cover that would negatively impact CSOs, and incrementally reduce the impact of existing impervious areas within the system that are reconstructed over time. An effective stormwater ordinance increases the sustainability of any GI program. The added benefit to the County would be in the form of additional CSO reduction after 2018. Although, new regulations are difficult to enact, the County and the City are currently in the process of reforming their stormwater regulations and this is discussed further in Section 5.3 of this report.
Impervious Area Based Rate Incentive	Other programs may arise to incentivize green infrastructure retrofits on private lands that are not presently or likely to be redeveloped in the foreseeable future. Impervious area-based rate incentives provide incentives for private lands to retrofit green infrastructure by allocating the cost for CSO and wet weather water pollution control services on a cost of service basis by using impervious area as a surrogate for proportionate use of the existing collection and treatment system. For 2011, a peer community summary and comparison will be developed and along with a fact sheet describing potential models for Onondaga County.

**Table 3-7 GI Operation and Maintenance Activities**

GI Technology	Typical Maintenance Activities	NYS Stormwater Management Design Manual Relevant Section(s)
Porous Pavement	<ul style="list-style-type: none"> <li>▪ Clean inlets</li> <li>▪ Vacuum annually</li> <li>▪ Maintain adjacent landscaping/planting beds</li> </ul>	5.3.11 – Porous Pavement
Infiltration Practices	<ul style="list-style-type: none"> <li>▪ Inspect and clean all catch basins and inlets at least twice per year</li> <li>▪ Maintain the overlying vegetation of a subsurface infiltration facility and re-vegetate any bare spots as soon as possible</li> <li>▪ Prohibit vehicular access on subsurface infiltration areas (unless designed to allow vehicles) and avoid excessive compaction by mowers</li> </ul>	5.3.7 – Rain Gardens 5.3.11 – Porous Pavement 6.3 – Stormwater Infiltration
Green Roofs	<ul style="list-style-type: none"> <li>▪ Little to no maintenance needed once vegetation is established</li> </ul>	5.3.8. – Green Roofs
Rain Gardens	<ul style="list-style-type: none"> <li>▪ Water, mulch, trim, prune, weed, and remove litter as needed</li> <li>▪ Inspect for erosion, sediment buildup, and vegetation health</li> <li>▪ Remove organic material approx. 2x/year</li> <li>▪ Biannual inspection of cleanouts, inlets, outlets, etc.</li> </ul>	5.3.7 – Rain Gardens
Tree Trenches, Enhanced Street Trees, and Tree Pits	<ul style="list-style-type: none"> <li>▪ Water, mulch, treat diseased trees, and remove litter as needed</li> <li>▪ Annual inspection for erosion, sediment buildup, vegetative conditions</li> <li>▪ Biannual inspection of cleanouts, inlets, outlets, etc.</li> </ul>	5.3.3 – Vegetated Swale 5.3.4 – Tree Planting/Tree Pit 5.3.9 – Stormwater Planters 5.3.11 – Porous Pavement 6.3 – Stormwater Infiltration 6.5 – Open Channel Systems
Rain Barrels / Cisterns	<ul style="list-style-type: none"> <li>▪ Discharge before next storm event</li> <li>▪ Cisterns, rain barrels, and downspouts should be inspected regularly and cleaned</li> <li>▪ Seals should be inspected periodically to prevent mosquito infestation</li> <li>▪ May require flow bypass valves during the winter</li> </ul>	5.3.9 – Stormwater Planters 5.3.10 – Rain Barrels and Cisterns
Disconnection of Rooftop Runoff	<ul style="list-style-type: none"> <li>▪ Check materials for leaks and defects</li> <li>▪ Remove accumulated debris, especially from gutters</li> <li>▪ If ponding occurs within the receiving pervious area for longer than 24 hours, area should be dethatched and aerated; if ponding persists, re-grade or till to reverse compaction and/or add compost</li> </ul>	5.3.5 – Disconnection of Rooftop Runoff
Inlet Filter Inserts	<ul style="list-style-type: none"> <li>▪ Follow the manufacturer’s guidelines</li> <li>▪ Inspect each water quality device at least twice per year and after all major storm events if possible</li> <li>▪ For areas with high leaf volumes, inserts should be inspected once every 2 weeks during the fall, as leaf litter can affect the operation of the insert</li> </ul>	9.5 – Alternative Stormwater Management Practices – Proprietary Practices

### 3.2.5 GI O&M Requirements

This section provides a summary of the O&M requirements for green infrastructure projects being implemented to reduce CSO discharges in Onondaga County. GI technologies do not typically require any specific operating requirements, however, Table 3-7 provides a summary of typical maintenance

activities for a variety of GI types. This summary is consistent with the NYS Stormwater Management Design Manual, prepared by the Center for Watershed Protection, dated August 2010.

In addition, O&M requirements are expected to be implemented by the property owners unless an agreement is developed, such as projects implemented under an inter-municipal or access agreement with the City of Syracuse which delineates maintenance responsibilities. For GI projects on City property, Clause 20 of the City Permission Ordinance identifies the County's maintenance obligations to include:

- Sweeping
- Landscaping
- Vacuuming of porous pavement and/or concrete
- Repair or replacement of porous pavement and/or concrete
- Maintenance (clean and reset) catch basin filter inlets and sumps

The County will track and schedule GI O&M tasks utilizing its Maximo asset management program.

## 3.3 Facility Planning

### 3.3.1 Floatables Plan

The FCF Facilities Plan, as submitted on November 16th, 2010 to the NYSDEC and ASLF, was not approved. The DEC requested the County conduct an assessment and characterization of the floatables component of each CSO prior to submitting or implementing a revised facilities plan. The County is currently undertaking this task utilizing existing data and determining where new data is needed.

### 3.3.1 CSO 022, 027, 029, 052, 060, 077 and 067 Facility Plan

Section 140(ii) of the ACJ requires a detailed facilities plan to address CSOs 022, 027, 029, 052 and 060/077, as well as assess the Newell Street Facility (CSO 067) for reconstruction or replacement. Onondaga County prepared and submitted the Facilities Plan on November 16th, 2010 to the NYSDEC and ASLF. The plan provided an engineering evaluation of the stated CSOs and an assessment of alternatives for addressing capture of said CSOs.

The facility plan describes the development and evaluation of conceptual level CSO control recommended specific projects and combinations of projects that can provide further control of CSOs 022, 027, 029, 052, 060/077, and 067 should additional CSO volume capture be required beyond 95% to meet water quality standards. A particular emphasis was placed on identifying the most cost-effective options for achieving in-stream water quality benefits through pollutant discharge load reductions. A number of green and gray CSO control technologies were initially identified for application to all of the CSOs. These included full, partial, and sub-basin sewer separation, in-line and offline storage, conveyance, stormwater pumping, wetland creation, and GI related technologies. CSO Area 022 was resolved to be separated prior to the production of the facility plan and is scheduled for construction in 2011 (see section 3.1.6). The facility plan provided proposed projects to address each CSO and an implementation schedule and was conditionally accepted by DEC on August 5<sup>th</sup>, 2011.

Based on the facility plan recommendation to continue green infrastructure implementation to achieve any necessary control beyond the current ACJ prescribed capture volume, implementation

progress and forecasts are itemized in sections 3.2.2 and 3.2.3. CSO-specific progress in 2011 developed a conceptual design for implementing infiltration tree trenches and bioretention basins in CSO 067 in form of residential green streets shown in Figure 3-13. The conceptual plan is now being evaluated for capture of the 1-yr, 2-hr storm event that would eliminate the need to restore the Newell Street swirl concentrator. Public outreach has been initiated and design will commence in 2012. During the planning process, a drainage area analysis confirmed that the areas contributing to the CSO is significantly less than is presently assumed in the model.



Figure 3-13: CSO 067 – Conceptual Plan for Green Infrastructure

## Section 4

# Public Outreach

### 4.1 Save the Rain Program



Figure 4-1: STR “Project 50” Logo

The Save the Rain (STR) Outreach Program reached new heights in public engagement and outreach in 2011 with the tremendous success of the 2011 “Project 50” campaign. The program incorporated all CSO abatement efforts (including gray infrastructure projects) under the STR program umbrella; featured a comprehensive outreach approach to support “Project 50” green infrastructure construction efforts; reinforced STR as a vital community resource; established the campaign as a national leader in green infrastructure implementation; and helped publicize the development of key projects in the program.

#### 4.1.1 Branding/Advertising

The 2011 Branding Campaign, managed by Retz Advertising, focused on program efforts to clean Onondaga Lake. The campaign featured a distinct brand style highlighted in newspaper, billboard, internet and social media components. The campaign goal was to reinforce the already well-established STR brand throughout the community. Branding efforts also supported the “Project 50”



Figure 4.1.1a: Billboard on I-690

campaign including several high-profile signature projects as well as the construction of the Trolley Lot storage facility.

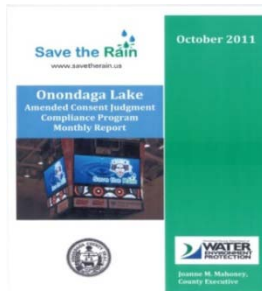


Figure 4-2: ACJ Monthly Report

Additionally, the STR website ([www.savetherain.us](http://www.savetherain.us)) saw major updates in content and resource management in 2011. The site has become the main focal point for program communications. The site now features dedicated content areas for: Green Projects, Gray Projects, News, STR Monthly Report, STR Newsletter, and many more areas. Visitors to the site can also sign up to receive the monthly newsletter or become part of the STR social media pages (Twitter, Facebook, LinkedIn etc.)

#### 4.1.2 Public Outreach Activities

The 2011 STR Public Outreach Campaign, managed by the Environmental Finance Center, was designed to engage the general public and raise both awareness and education throughout the community on the green infrastructure efforts implemented by the County. The campaign featured several program elements including:

### Rain Barrel Workshops

In 2011 the STR Public Education and Outreach team conducted over 18 rain barrel workshops on the proper installation, use and maintenance of rain barrels. As part of the workshop, the County distributed over 336 free rain barrels to City residents.



Figure 4.1.2a: STR Rain Barrel Workshop

### GI Presentations

General presentations on GI were held at several community centers by the Public Education team. These presentations outline what green infrastructure is; how STR and Onondaga County are using GI technologies to help keep local waterways clean; and opportunities to learn about various STR resources such as eNewsletter, rain barrel program and the Green Improvement Fund. In total, over 200 community members participated in the general GI presentations.

### Demonstration Projects

The Public Education team worked with local youth from the Onondaga Earth Corps to construct mini GI demonstration projects throughout the City. The projects were intended to provide real-world, local examples to the community that emphasize the ancillary benefits of GI implementation. Demonstration projects included: 1) the conversion of a vacant lot located at 617 Tully Street (west side of the City) to a small park that included plantings, shrubs and a rain garden; 2) the installation of 4 rain barrels and construction of a small rain garden at the Bishop Foery Center (south side of the City); and 3) the installation of roof gutters that send rain water from the roof to a small rain garden at the Barnabas Center (south side of the City).



Figure 4-4: School Outreach

### School Outreach

The STR program was also involved in school education that focused on the importance of GI in our community. Over 250 high school students and 850 3<sup>rd</sup> graders participated in STR GI programs in 2011. Students learned more about the affects of pollution to local waterways and how GI implementation will help reduce harmful materials from reaching the Lake and its tributaries. Students also participated in summer science camps that provided curriculum on Lake restoration efforts and pollution prevention.

## 4.2 Project Specific Public Outreach

In 2011 there were also several projects that received focused outreach efforts. The nature of these projects provided great opportunities for targeted public engagement and input from community members. Several projects such as the Harbor Brook Constructed Wetland Pilot Treatment System Project, Rain Garden at Delaware Street, the CSO 044 Conveyances Project site restoration, Skiddy Park Restoration, and the Otisco Street Green Corridor all received coordinated outreach support with increased levels of



Figure 4.2: Skiddy Park Project

communication with community members. Various public meetings, design charettes and informational sessions were held to receive feedback on project details and implementation. This enhanced communication also provided a platform to incorporate design elements requested by the community, address questions/concerns and update construction schedules.

As the STR program moves forward with future project implementation, we will be able to incorporate feedback from the project specific outreach accomplished in 2011. Projects that offer a high level of community interaction will provide great opportunities for enhanced input and coordination in local neighborhoods going forward.

### 4.3 Public Relations/Media/National Recognition

2011 was also a banner year for the STR campaign because of the significant amount of recognition the program received. In April, Onondaga County and Syracuse was selected by the US EPA as one of ten model green infrastructure communities in the country. The designation established the STR campaign as a national leader in GI implementation. In 2011, STR was also featured in case studies by the EPA, Natural Resources Defense Council (NRDC) and Water Environment Federation (WEF).

In addition to the national recognition the program received, the completion of several signature projects provided extensive local coverage. The 2011 signature projects are described below.



Figure 4-3a: EPA Announcement Post Standard

#### OnCenter Green Roof

The construction of a 60,000 square foot green roof at the OnCenter Complex is one of the largest green roofs in the country. The project is estimated to capture nearly 1 million gallons of storm water annually.



Figure 4-3c: War Memorial Reuse Project

#### War Memorial Cistern System

One of the year's most innovative projects was the completion of a water re-use system at the War Memorial that takes rain water from the roof of the arena, filters it, and stores the treated water in a cistern storage system. The treated water is used for various purposes around the complex including the production of ice for the skating rink used by the public, area events and the Syracuse Crunch, an American Hockey League team.

#### Skiddy Park Basketball Courts

The City of Syracuse Parks Department in collaboration with the Jim & Juli Boeheim and Carmelo K. Anthony Foundations worked with the STR program on the redevelopment of 2 full length basketball courts at Skiddy Park on the west side of the City. The project was part of the Court-4-Kids program

that renovates basketball courts to provide a safe environment for kids to play and stay active. The courts were constructed using porous asphalt to capture stormwater run-off.

The 2011 Outreach campaign solidified the Save the Rain brand as a community staple. The outlook for 2012 will focus on messaging that will not only engage the general public, but also provide community members with resources and information on ways they can be a part of the program to protect Onondaga Lake.



## Section 5

# Intergovernmental Cooperation

## 5.1 City-County Green Infrastructure Initiatives

The County has been meeting bi-weekly with the City of Syracuse on the Save The Rain Program since January 2010. The goal of these meetings is to work through policy and technical barriers to GI implementation and to develop a consensus approach to design, construction, and maintenance issues and achieve repeatable standards with clear responsibilities. These meetings also serve to generate initiatives that have yielded and continue to yield GI opportunities, which include:

- School property re-development/maintenance
- Library property re-development/maintenance
- Identification of green gateway projects
- Road reconstruction planning
- Stormwater friendly parking lot conversions
- Parkland runoff reduction
- Flat roof conversions to roof-top gardens
- Vacant land management program
- Street Tree installations

The most progressive development resulting from this partnership, is the City of Syracuse's Green Infrastructure Permission Ordinance. This legislation produced significant efficiencies for both the City and County in the way projects are administered and approved for construction. Instead of each of the dozens of GI projects requiring individual review and approval by the City of Syracuse Common Council, a "list" of GI project candidates is approved, for which further review and design/construction approval is delegated to the City Engineer and Commissioner of DPW. The legislation provides details on property access and long term maintenance. Without this advancement, review of each project through the Common Council would have caused a significant backlog, inhibiting advancement of the green program. A new list is generated annually and passed through the Common Council in the Spring. The 2012 Permission Ordinance was passed unanimously by the Syracuse Common Council on March 12, 2012 and will continue to be processed.

## 5.2 Public-Private Partnership

The County has also developed a Green Improvement Fund (GIF) to provide incentives for implementation of GI on private lands. GI projects that divert storm water runoff from the combined sewer system are funded based on multiple metrics, including volume of runoff reduction, quantity of GI installed, and regulatory requirements. The program continues to receive submittals on a rolling basis. Specific GIF project that have been completed or scheduled for 2011 are listed in Table 3-2 and

3-3. Project fact sheets and applications for representative GIF projects are on the Save the Rain website: [www.savetherain.us](http://www.savetherain.us).

## 5.3 Inter-municipal Agreements

The City and the County have had a mostly cooperative relationship throughout the implementation of CSO abatement projects since the 1<sup>st</sup> Stipulation of the Amended Consent Judgment. From time to time, it has become necessary to enter into contracts to address legal issues that arise from the projects. These Inter-municipal Agreements (IMAs) deal with questions of property access or transference, utility work, mitigation, or fund transfers. IMAs are negotiated between City and County Departments with assistance from their respective legal groups. Once negotiated, the IMA must be approved by the City of Syracuse Common Council and Onondaga County Legislature, and then executed by the City Mayor and the County Executive.

Examples of IMAs that have been approved and executed are:

- The July 2007 IMA – This is commonly known as the general IMA that agreed to specific mitigation, property access and coordination items related to the Clinton, Harbor Brook and Midland CSO Abatement Projects. The IMA was amended in 2009 to address changes and additional items.
- Sewer Separation IMAs – each individual sewer separation project undertaken by the County has required a project specific IMA to address the utility work, since for the most part, the County would be improving City owned sewers.
- County-City Arborist IMA – this IMA funds the previously vacant City Arborist position with an employee evenly funded by the County and City. Leadership agreed that this position was too important to leave vacant and the financial burden of this position should be shared by both the County (to steward new tree planting as part of Save the Rain) and City (to manage existing City trees).
- Project Specific GI Project IMAs – For projects that include GI and were passing through the City Common Council agenda for unique reasons (not part of the Permission IMA list), language was tailored to the need of that project. Examples include Connective Corridor Phase 1 (including funding for Forman Park), and a Joint School Construction Board project at Dr. Week's Elementary.

An IMA for the Sewer Separation of CSO Areas 022 and 045 was executed in July of 2011. Additionally property acquisitions and easements associated with the Clinton Storage Facility Project were progressed in 2011 and will be officially obtained soon.

## 5.4 Sewer Ordinances

Currently, the County is advancing multiple pieces of legislation that would affect the amount of stormwater entering the sewers of the sanitary district, modify City of Syracuse codes to allow for the implementation of GI on properties within City boundaries, and provide access to the County to construct GI on City owned property.

Local Law #1 of 2011 establishes a program to promote capacity, management, operation and maintenance (CMOM) of the public sewers and related purposes which complies with environmental

laws and assures that current and future development within the Onondaga County Sanitary District is not hindered by excessive inflow and infiltration. The program provides a mechanism to address wastewater capacity, construction, operation and maintenance through the entire process from planning to post-construction. This legislation will affect and assist the County's requirement to comply with the CSO capture schedule and support the long-term sustainability of development within the district. The law will require revisions to existing IMAs with neighboring communities to reflect the requirements of the new law. It is anticipated the negotiations with satellite municipalities will take place in 2012.

The County and the City of Syracuse are also coordinating three pieces of City legislation which will implement additional GI within City boundaries. The legislation addresses stormwater management for development activities, tree planting, and sidewalks. The work on these ordinances will continue in 2012.

## Section 6

# SWMM Update

### 6.1 2011 Model Summary

Onondaga County implemented several changes to the SWMM in 2011. Most of the changes were for the future condition models which included updates to proposed treatment facilities. Model simulations were run to support CSO infrastructure planning and design for the purpose of developing current CSO volume capture statistics and capture projections of planned program elements. The sections below represent a summary of the work performed in 2011.

#### 6.1.1 Planned Storage Facility Updates

Model flows, volumes and water surface elevations of the proposed Lower Harbor Brook storage tank were developed to support the design of the planned storage facilities. The previously proposed 3.8 MG tank was evaluated and it was determined the capacity could be increased to 4.9 MG and accommodates flows from CSO 003, CSO 004 and CSO 063. Model flows, volumes and frequency charts for the proposed Clinton Storage facility which accommodates flow from CSO's 028, 030, 031, 032, 033, 034, 035, 036, and 037 were also developed. The 6 MG tank was evaluated as well at the proposed design change which would increase the tank capacity to 6.5 MG.

#### 6.1.2 Planned CSO 018 Wetland Facility

Model flows and volumes were provided to assist during design of the wetland treatment system. The proposed wetland treatment system for CSO 018 is a full-scale pilot and is part of the system-wide CSO abatement program for Onondaga County. Based upon more detailed review of the local sewers tributary to CSO 018 it was determined that the model should be modified to incorporate additional details to be more consistent with the wetland project in the design phase. The following modifications were made to the Harbor Brook SWMM to better represent the CSO 018 sewers and tributary area.

- Minor losses were added to the new regulator structure at CSO 018.
- The CSO 018 area was reviewed in detail and updated in the model database. Based on minor differences in the boundary of the drainage areas, the current area was reduced by approximately 15%.
- The modeled sewers in the CSO 018 vicinity were reviewed and compared to the sewers shown on the City of Syracuse Mile Square maps. In the model, all the flow from CSO 018 area was previously conveyed through a single pipe (18-inch sewer) along Bellevue Avenue. Detailed review of the drainage area shows that approximately 84% of the area should be conveyed through that single existing pipe and the remaining 16% of the area is conveyed through two additional existing pipes. This additional existing piping was added to the model. In addition, the CSO 018 area was split from one large area into three existing areas to allow runoff to enter the system at the three different points. This provides a more accurate representation of system.

- Following these changes noted above, the monitoring data from CSO 018 collected in 2004 was re-evaluated and the model calibration for this local area was updated. This updated calibration was incorporated into the pre-abatement and existing condition models.

### 6.1.3 Modeling Log

The model runs and updates performed on the County's SWMM in 2011 are summarized in Table 6-1 along with their results and implemented changes.

**Table 6-1 SWMM Revision Log**

Description	Results	Model Changes Implemented
Utilized the latest models to updated capture tables for pre-abatement, existing conditions, and future conditions based on the typical year rainfall.	Combined sewage volumes were obtained from the models to calculate capture.	None.
Performed evaluations for the proposed Lower Harbor Brook Storage. Evaluated previously proposed 3.8 MG tank and planned 4.9 MG tank. Model simulations included design storm and typical year rainfall.	Provided flows, volumes and expected water surface elevations in the tank and conveyances. Provided technical memorandum and subsequent updates for inclusion with engineering report.	Updated future condition model with latest storage tank and conveyance sizing.
Performed evaluations for the proposed Clinton Storage facility. Evaluated previously proposed 5.0 and 6.0 MG storage, as well as the planned 6.5 MG tank. Model simulations included design storm and typical year rainfall.	Provided tables, figures and other information for the engineering report. Information included expected flows and volumes to enter the facility, as well as flows and volumes expected to discharge the facility.	Updated future condition model with latest storage facility size.
Performed evaluations for the planned CSO 018 Wetland and Grit facility. Updated CSO 018 calibration before performing the evaluations. Model simulations included design storm and typical year rainfall.	Provided flows and volumes expected from CSO 018 regulator and overflow. Provided technical memorandum and subsequent updates to assist in facility design.	Updated the CSO 018 basin area for the HBIS models. Updated the future HBIS model with the planned wetland and grit facility.
Evaluated the planned CSO 044 weir which will divert CSO to the Midland RTF. The weir was lowered by about 0.3' from the previous planned elevation. Weir to the creek was not changed.	Results showed that the planned elevation for the weir was appropriate and would not be impacted by the operating level of the Midland RTF. Slightly more flow will go to RTF from CSO 044.	Updated the future condition model with the planned weir elevation for CSO 044.
Performed an evaluation of METRO Flows and CSO Loadings for to assist others with phosphorous loading study. Developed simple model to represent flows at METRO and calibrated model with METRO monitoring data. Estimated existing and future flows to METRO for the typical year with the SWMM models.	Provided technical memorandum (Appendix E) which included METRO model calibration and expected flows. Also provided estimated CSO trigger intensities for existing and future conditions. The trigger intensities were used in an HSPF model by others to estimate phosphorous loading.	These models were developed and used for this evaluation only, so no changes were made to the SWMM models used for capture calculations.
Updated existing condition MIS model with EBSS gate setting changes as these changes were implemented in the system.	Increased storage in gate chamber #3 and #4. The increases were documented in the 2010 EBSS Facility Plan/Technical Memo. Monitoring data was reviewed to confirm changes. Provided letters documenting confirmation of changes (Appendix F).	Increased gate #3 setting by 2 feet and gate #4 setting by 1 foot.

### 6.1.4 Capture Adjustments

The updated CSO 018 calibration, described above, was incorporated into the pre-abatement, existing, and future condition models for the Harbor Brook watershed. As a result, the estimated total combined sewage generated in the METRO service area was reduced by approximately 0.6% (from 3,777 MG to 3,754 MG). This adjustment has been incorporated into the latest capture table provided in Section 7.

## 6.2 Green Infrastructure Modeling Plan

The approach to modeling GI and its full incorporation into SWMM will be determined through the evaluation of the results from the initial years of GI implementation. The approach will most likely undergo refinement each year leading up to the Stage II compliance determination discussed in the 2015 Annual Report. The GI modeling approach will utilize newly developed SWMM functionalities (i.e., the Low Impact Development module) to better represent hydrologic/hydraulic characteristics of green infrastructure. A green infrastructure monitoring program will also be implemented to evaluate the effectiveness of the implemented projects and the monitoring data will be used to calibrate the model for better predictability of the green program.

### 6.2.1 Modeling Green Infrastructure in SWMM.

On July 30, 2010, EPA released SWMM 5.0.019 that included the ability to explicitly model five different types of LID practices at the subcatchment level. This version of SWMM was further updated on April 21, 2011 (built 5.0.022) with many error fixes and updates that made modeling green infrastructure in SWMM more practical.

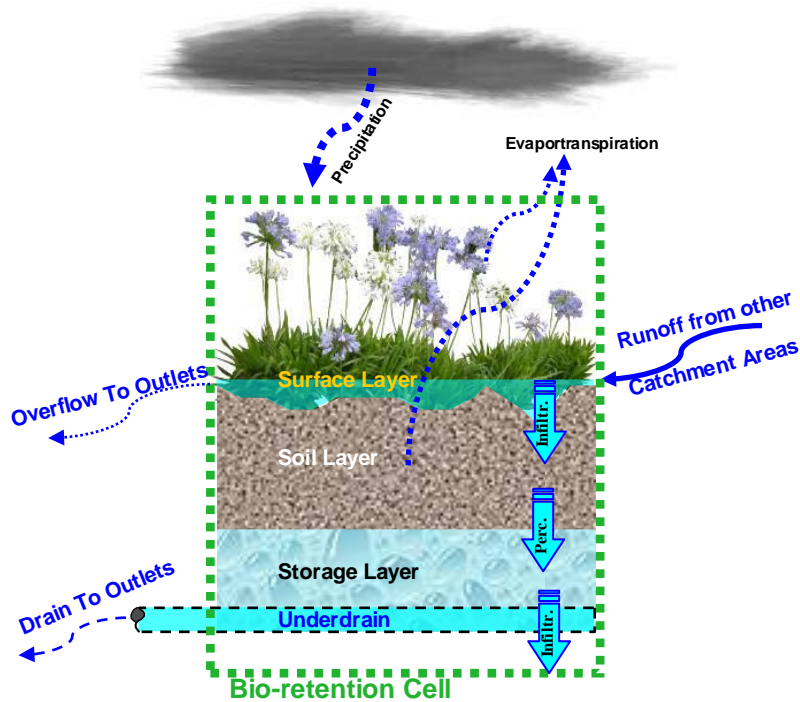
Five different types of GI are included in the LID module: 1) bio-retention cells including rain gardens, green roofs and street planters, 2) porous pavements, 3) infiltration trenches, 4) rain barrels/cisterns and 5) vegetative swales. GI is represented by a combination of four vertical layers (as shown schematically in Figure 6-1 for a bioretention cell) including the surface, soil, storage and underdrain layers. Each of these layers is defined on a per-unit-area basis and not all layers need to be defined for all types of GI. Table 6-2 summarizes required and optional layers for each type of GI.

**Table 6-2 LID simulation layer requirements.**

LID Type	Surface	Pavement	Soil	Storage	Underdrain
Bio-Retention Cell	x		x	o	o
Porous Pavement	x	x		x	o
Infiltration Trench	x			x	o
Rain Barrel				x	x
Vegetative Swale	x				

x: required. o: optional

There are two methods that can be used to simulate green infrastructure: explicit and implicit methods. Figure 6-2 illustrates the modeling processes for these two methods. The explicit method utilizes the recently added SWMM LID module by adding green infrastructure to the subcatchment directly without demarcating the catchment area to a scale that is appropriate for a single or aggregated GI measures. Not all GI technologies are included in the LID module and those not included may be best simulated by an implicit method by adjusting subcatchment properties (imperviousness, depression storage, width, etc.) Therefore, to include all GI technologies in SWMM, both explicit and implicit methods will be utilized. The Implicit method uses SWMM objects (e.g.,



**Figure 6-1 Schematics of flow pathway for a bio-retention cell.** Surface layer receives runoff from catchment areas and provides surface storages to the rainfall excesses in the depression area (e.g., rain garden and planter). Overland overflow occurs once the excess rainfall volume exceeds the capacity of the depression storage and soil infiltration. Some rainfall excess volume infiltrates from the surface to the soil layer where it is retained within the soil void volume (pore water), and the remaining portion percolates into the storage layer (e.g., gravel or crushed stone layer). Percolated water either enters underdrain system or infiltrate into the subgrade soil layer underneath the bio-retention cell.

Explicit Method		Implicit Method		
Define unit-per-area LID controls	Locate and Size Green Infrastructure within Catchment		Define GIs with Subcatchment and SWMM Hydraulic	
Bio-retention Porous Pavement Infiltration Trench Rain Barrel Swale	Is GI type included in SWMM LID Module?  Yes Add LID to the Subcatchment	No	Divide Catchment	GI catchments
Surface Pavement Soil Storage Underdrain	LID Usage Editor	Catchments Not tribute to GIs	Catchments Tributary to GIs	Storage, Weir, Orifice, Controls, etc.
	Number of LIDs Size of LIDs Tributary areas Hydrology		Storage Infiltration Overflow	

**Figure 6-2. LID simulation methods with SWMM.** Explicit methods define green infrastructure as five different types of LID controls. Each type is defined as unit-per-area control through the LID Control Editor. These LID controls can be added to the subcatchment with types, sizes and tributary areas specified by using the LID Usage Editor. The implicit method subdivides catchments into GI and non-GI areas and simulates green infrastructure by using hydrologic and physical parameters to represent the processes of green infrastructure (e.g. storage, infiltration, runoff retention, etc.).

storage nodes, weirs, orifices) to simulate components of a green infrastructure. Typically, a more refined delineation is needed to better represent actual hydraulic conditions. If GI is directly connected to the sewer network (e.g. overflow/underdrain connected to sewer system), the spatially distributed GI within a subcatchment can be aggregated by type and simulated as a single GI without having to further divide the subcatchment into GI catchments and non-GI catchments. However, if GI is not directly connected to the sewer network (e.g., overflow to other GI and/or pervious area or rerouted to another catchment area), it may be necessary to further divide the subcatchment to isolate the GI catchment(s) and route the outflow (overflow or underdrain) to the specific area(s).

### 6.2.2 Technical Approaches for Onondaga County Green Infrastructure Model

The existing SWMM model for the Onondaga County combined sewer system is a planning level model with subcatchment areas ranging from several acres to as large as 630 acres (020-2 subcatchment) with an average size of approximately 117 acres (as shown in Figure 6-3). It is prudent to further delineate subcatchments into smaller sizes to represent hydrologic and hydraulic conditions with more refined resolution. This is particularly important to incorporate green infrastructure into the model as they are normally on much smaller spatial scales (a few acres).

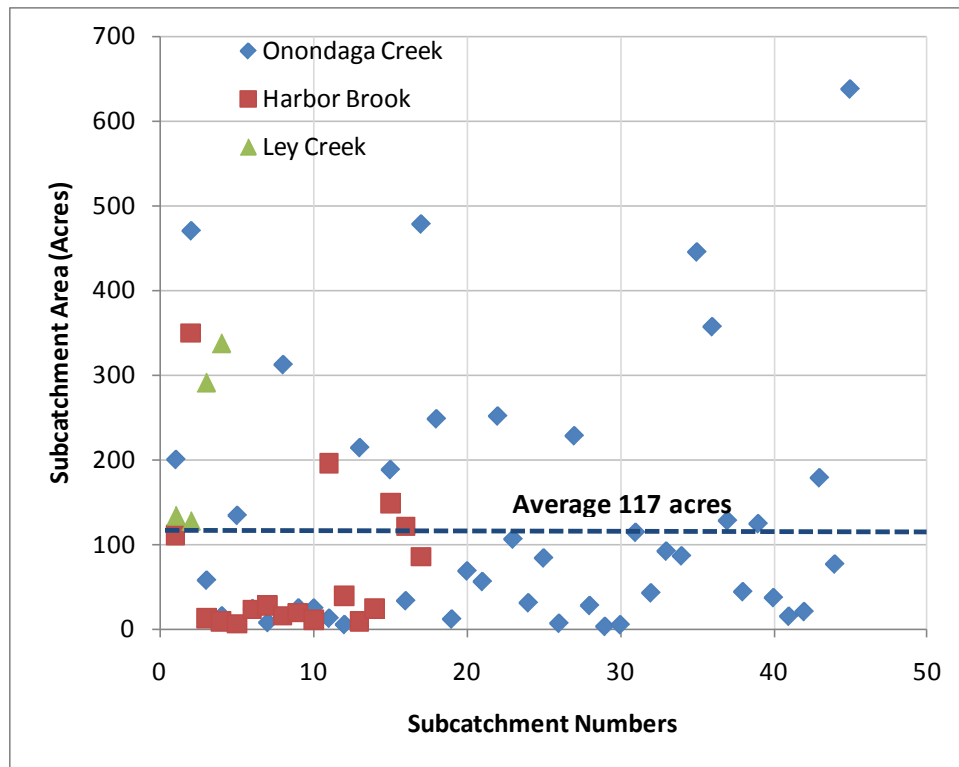
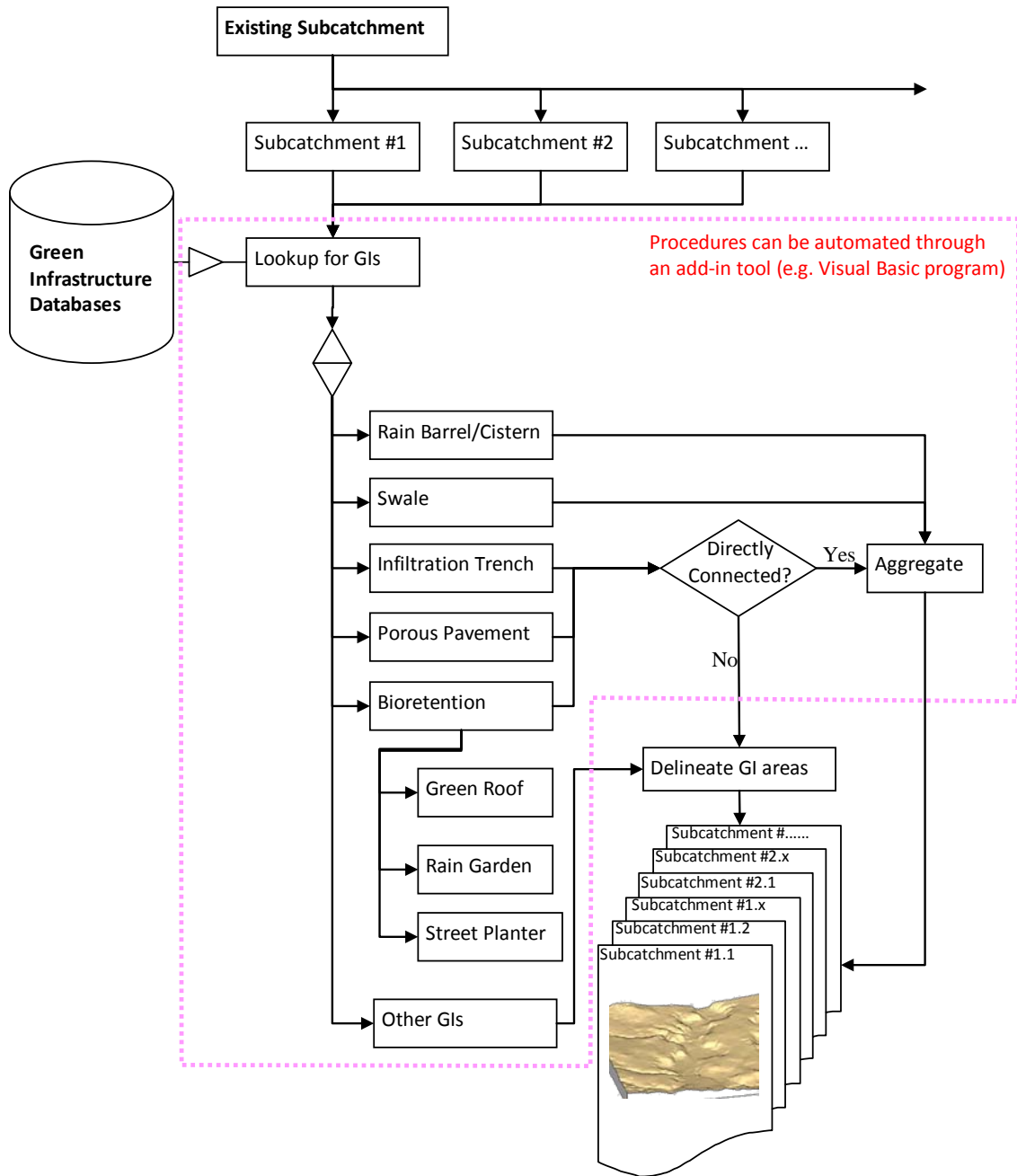


Figure 6-3. Subcatchment sizes in the existing SWMM model.

Figure 6-4 schematizes the green infrastructure modeling procedures for the OC SWMM model. The existing subcatchments will be divided into smaller catchments. Existing green infrastructure information is stored in a database that includes the location, type, size/capacity, tributary area and other hydrologic and hydraulic information. This database information will be imported into the SWMM model.

A green modeling protocol will be developed for this CSO program to ensure long-term consistency as it progresses toward completion. The approved green model can be stored on a secured server controlled by “gatekeeper” (the County and/or designated consultant). With permission from the County, third party entities (consultants, institutions, regulators, etc.) can download the model and use it for planning/study/design by following the green modeling protocol. Third party entities can upload their model/project information to the “gatekeeper” for review and incorporation into the baseline condition model.



**Figure 6-4. GI modeling procedures for Onondaga County CSS model.** The existing subcatchments will be evaluated for further subdivision into smaller catchments. The GI database can be categorized and transferred into these subcatchments. Green infrastructure can be aggregated based on type or modeled separately as a single subcatchment.

### 6.2.3 Hydraulic Modeling Tasks

Figure 6-5 shows the overall modeling tasks for update and calibration of the County’s existing sewer system model. The majority of the work involves updating and revising the SWMM input file with more refined subcatchments and the addition of hydrologic/hydraulic characteristics of green infrastructure. To ensure model consistency and the effectiveness of green projects, recalibration of model will be needed. During flow monitoring, the flow sensors will be checked and calibrated as necessary (under circumstance of observation of abnormal data points) on a biweekly basis. Flow meter data will also be reviewed by the engineer/modeler to check against rainfall data as well as compare the wet weather hydrographs with dry weather data. Prior to performing SWMM calibration runs, a sensitivity analysis will be performed to select parameters in the LID module for calibration of GI(s). Hydrographs will be plotted for pre- and post-GI conditions at the GI project site overflow point. The differences (peak and volume) will be compared with GI design calculations for quality control prior to populating calibrated parameters to other subcatchment areas that do not have flow monitoring data.

The existing flow/level monitoring data will be analyzed and the result will be used to determine the need for additional monitoring locations through-out the system. Future monitoring will likely be located at the overflow pipe and/or immediately downstream of the GI treatment areas. Parameters for each type of BMP will be adjusted to match the hydrographs before being populated to GI in other areas. Calibrated results will also be compared with design calculations and future design calculations will be adjusted accordingly.

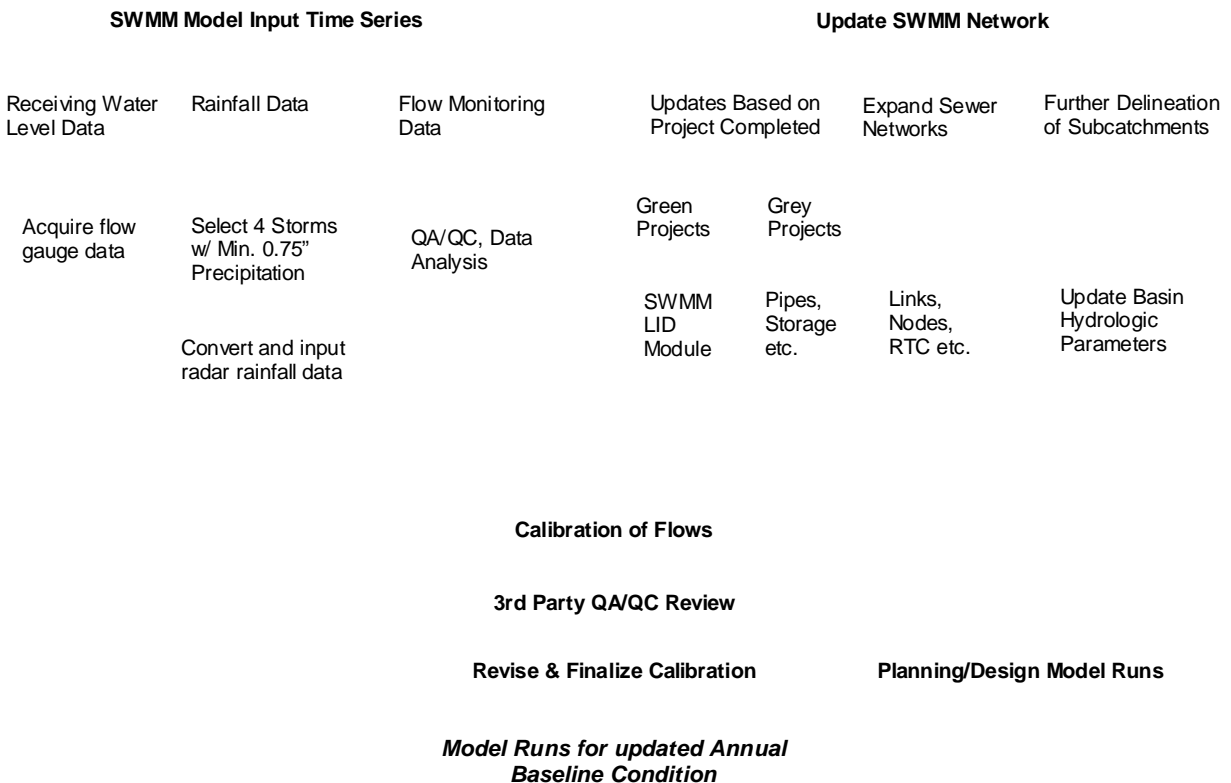


Figure 6-5. Proposed OC SWMM modeling tasks.

# Section 7

## Conclusions

### 7.1 CSO Compliance Schedule

The CSO compliance schedule set forth in the ACJ contains both percent capture by volume and submittal milestones. Table 7-1 details the CSO capture compliance milestones and percentages. The County anticipates meeting the compliance requirements set forth in the ACJ; with the first compliance date related to percent capture being December 31, 2013. This milestone coincides with the anticipated construction completion date for the stipulated gray projects and the implementation of a significant number of green infrastructure projects. In 2011, the county completed the CSO 044 conveyance pipeline, replaced and upsized 7,550 linear feet of the HBIS, separated sanitary and storm flow within CSO areas 013 and 016, and the EBSS gate modifications. These items were factored into the new compliance results discussed in the next section. Compliance with the future CSO capture milestone dates cannot be evaluated completely at this time. The installation of the CSO flow monitoring equipment and subsequent evaluation of the effectiveness of the completed green and gray infrastructure in future reports will provide more insight on the County's ability to achieve the intermediate compliance milestones and capture volumes. The information below represents the County's pre-abatement, current and future CSO volume capture projections according to the current SWMM and project milestone compliance status.

**Table 7-1 CSO Capture Compliance Schedule**

Compliance Stage	Percent capture CSO by volume	Compliance deadline
Stage I	89.5 %	December 31, 2013
Stage II	91.4 %	December 31, 2015
Stage III	93.0 %	December 31, 2016
Stage IV	95.0 %	December 31, 2018

#### 7.1.1 SWMM CSO Capture Results

The CSO capture projections are based upon the evaluation of three SWMM scenarios: pre-abatement, existing conditions, and future conditions. The scenarios are defined as follows:

- **Pre-abatement** – the conditions prior to the implementation of abatement measures under the 1<sup>st</sup> Stipulation of the ACJ.
- **Current Conditions** – represents the current state of the system as of 12/31/11 including the CSO abatement facilities in operation. This row includes the completion of the 044 conveyances, HBIS replacement, the separation of CSO areas 013, and 016, and the modifications made to the EBSS.
- **Future conditions** – represents the full implementation of proposed green and gray CSO abatement measures.

The average annual capture of combined sewage has been calculated for each of the three model scenarios based upon the current and future understanding of the combined sewer system and the proposed abatement improvements, and the typical year (1991) rainfall. A summary of the three model scenarios is shown in Table 7-2 below.

**Table 7-2 CSO Capture Status**

Model Scenario	Combined Sewage Generated (MG)	Pre-Abatement Combined Sewage Conveyed to Metro (MG)	Additional Combined Sewage Eliminated or Captured for Treatment (MG)	Total Combined Sewage Eliminated or Captured for Treatment (MG)	Percent Capture
	[1]	[2]	[3]	[4]	[5]
Pre-abatement (1998)	3,754	2,799	0	2,799	74%
Current (as of 12/31/11)	3,754	2,799	428	3,227	86%
Future (projected 2018)	3,754	2,799	767	3,566	95%

- **Combined Sewage Generated [1]** – provides the average annual combined sewage volume (in million gallons) generated by the Metro service area. Adjusted from 3,777 MG (2011 ACJ Report) to 3,754 MG due to revision of CSO 018 drainage area noted in Section 6.
- **Combined Sewage Conveyed to Metro [2]** - provides the average annual combined sewage volume (in million gallons) conveyed to Metro for treatment.
- **Additional Combined Sewage Eliminated or Captured for Treatment [3]** – provides the average annual combined sewage that is eliminated via sewer separation and GI or captured for treatment at Metro or an RTF.
- **Total Combined Sewage Eliminated or Captured for Treatment [4]** – provides the total average annual combined sewage eliminated or captured for treatment (column 2 plus column 3).
- **Percent Capture [5]** – provides the percent capture of the entire system based upon the combined sewage conveyed to Metro plus the sewage that is eliminated or captured for treatment by implemented green and gray abatement measures divided by the average annual combined sewage volume generated in the Metro service area (Column 4 divided by column 1).

### 7.1.2 ACJ Milestone Compliance

Sections 14B and 14L of the ACJ require the County to design, complete construction, and commence operation of gray infrastructure projects according to a specific and agreed to milestone schedule. The County has initiated all of the stipulated projects and their status toward compliance with the major and minor milestones is listed in Table 7-3. The County has met 11 of the 14 milestones to date. The remaining 3 milestones are not until December 31, 2013, however according to current project schedules the County does not anticipate missing the remaining ACJ gray project milestones.

**Table 7-3 ACJ Gray Infrastructure Milestone Schedule and Compliance Status**

Project	Milestone Description	Milestone Type	Milestone Date	Compliance Status
CSO 044 Conveyances	Plans and Specs to NYSDEC for review and approval	Minor	06/01/2010	Achieved
	Commence construction	Minor	12/31/2010	Achieved
	Complete construction and commence operation	Major	12/31/2011	Achieved
Harbor Brook Interceptor Sewer Replacement	Plans and Specs to NYSDEC for review and approval	Minor	08/17/2009	Achieved
	Commence construction	Minor	01/01/2010	Achieved
	Complete construction and commence operation	Major	12/31/2013	In Progress
Erie Boulevard Storage System Modifications	Plans and Specs to NYSDEC for review and approval	Minor	09/01/2010	Achieved
	Complete required modifications	Major	12/31/2011	Achieved
Clinton 3.7 MG Storage Facility	Plans and Specs to NYSDEC for review and approval	Minor	02/01/2011*	Achieved
	Commence construction	Minor	10/01/2011*	Achieved
	Complete construction and commence operation	Major	12/31/2013	In Progress
Harbor Brook 3.2 MG Storage Facility	Plans and Specs to NYSDEC for review and approval	Minor	04/29/2011*	Achieved
	Commence construction	Minor	12/31/2011*	Achieved
	Complete construction and commence operation	Major	12/31/2013	In Progress

\* - Date reflects ACJ Milestone extension approved by the NYSDEC on November 4, 2010

## 7.2 Program Assessment

Onondaga County's "Save the Rain" program progressed significantly in 2011. From exceeding the goals of the Project 50 campaign to the number of gray projects that are either in construction or have been completed, it is evident the County's Save the Rain program took another tremendous step forward last year. In 2011, the County completed 23 GI projects, another 32 are either under contract or substantially completed, and 26 more GI projects are under contract to receive Green Improvement Fund grants.

The County is also progressing with its water quality monitoring and flow metering program which will obtain samples from points within the receiving waters and data from representative CSOs throughout the system. The metering data combined with the County's approach to incorporating GI into SWMM, to be developed further in 2012, will eventually allow the County to factor into the capture models the benefits of GI implementation as it equates to CSO abatement.

The gray infrastructure arm of the Save the Rain program commenced construction in 2011 on 3 new projects representing nearly \$140 million, and completed or substantially completed 3 others which will increase capture of combined sewage and transmission to Metro by an average of 1.4% or 55 MG annually. All three construction projects initiated in 2012 are on time to be complete per their construction schedules. The CSO 022/045 Sewer Separation Project will be completed in 2012, and the Clinton and Lower Harbor Brook Storage facilities will be complete by December 31, 2013. As a result it is anticipated the County will meet the Stage I compliance milestone of 89.5% capture by the end of 2013.

## 7.3 Recommendations

There are no recommended changes to the current plan.

