BUFFALO
SEWER AUTHORITY

SPDES Permit No. NY0028410

Long Term Control Plan Semi-Annual Status Report
Reporting Period: *July through December 2019*

Amended Administrative Order
CWA-02-2014-3033

(Amends CWA-02-2012-3024)

March 2020

Long Term Control Plan Semi-Annual Status Report

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1. INTRODUCTION

The Buffalo Sewer Authority (Authority) received approval of its Long Term Control Plan (LTCP) from the United States Environmental Protection Agency (USEPA) and New York State Department of Environmental Conservation (NYSDEC) on March 18, 2014. The Authority entered into an Amended Administrative Order on April 16, 2014 (herein after referred to as the AO), with the USEPA. This AO establishes a schedule for implementation of the Authority's LTCP, approved by the USEPA and NYSDEC.

The AO in part requires that the Authority submit written Semi-Annual Status Reports to the USEPA and NYSDEC by September 1st for current year January 1– June 30 reporting period, and March 1st for the previous calendar year July 1 – December 31 reporting period. The AO requires that the following be provided in each Semi-Annual Status Report:

- The project milestones, deadlines and other terms that the Authority is required to meet since the date of the last Semi-Annual Status Report, whether and to what extent the Authority has met those requirements, and the reason for any anticipated delays and/or noncompliance.
- A general description of the work completed during the reporting period and the applicability of the work to meet indicated design criteria, as well as the projection of work to be performed during the next reporting period and any anticipated delays for the upcoming work. Any changes in key personnel must also be noted.
- Enclosure of public meeting (if held) materials including: advertisements, handouts, formal meeting notes, and a summary of the meeting (see Attachment C).
- Copies (to USEPA only) of all monthly monitoring reports or other reports pertaining to combined sewer overflows (CSOs) and bypasses that Authority submitted to the NYSDEC during the reporting period. Please note DMRs are now submitted electronically directly to the USEPA and no dry weather overflows occurred during this period, so this item does not apply during this reporting period.

This report covers July through December 2019 which serves as Semi-Annual Report No. 12.

2. REQUIREMENTS DUE IN REPORTING PERIOD

Attachment A provides the current status of all projects listed in the Administrative Order. Issues with implementing these projects are detailed in Section 4 of this document.

This document serves as the March 1, 2020 semi-annual report.

Certificates of Acceptance and Occupancy for fully completed projects for this reporting period are included in Attachment D.

3. WORK COMPLETED IN CURRENT REPORTING PERIOD AND PROJECTION OF WORK TO BE PERFORMED NEXT REPORTING PERIOD

A general description of the work completed on LTCP projects during the current reporting period and the work projected to be performed during the next reporting period is provided in Attachment A. Items that have been completed have been highlighted orange.

A more detailed description of each project including the location and the goal to be achieved through each project is provided in Attachment B.

4. IMPLEMENTATION ISSUES

4.1 Hamburg Drain Optimizations

Preliminary design for the Hamburg Drain Optimizations was begun prior to January 1, 2014; however, detailed design was delayed due to high water levels in Lake Erie. As a result of this delay the March 18, 2016 Notice to Proceed deadline was exceeded. The Authority completed a model recalibration and submitted the model calibration report to the EPA and DEC on January 8, 2019. The Authority is moving forward with conducting new SWMM modeling and until this modeling is completed, the Authority is unable to set a deadline for completing the Hamburg Drain Optimizations Updated deadline dates will be requested via formal request following the additional modeling of this area. Design of the Mill Race In-Line Storage project has commenced.

4.2 WWTP Improvement Project Alternative C2

Design of this project has been delayed due to the presence of extensive quantities of grit that have accumulated in the system reducing WWTP capacity. Before further upgrades are considered, the existing issues must first be rectified to allow for accurate measurements of existing capacity. The cleaning of the A-side influent channels, aeration basin 3 and both the A-side and B-side effluent channels was completed in two separate contracts for the facility. Phase 1 removal of the grit in the secondary system included the removal and disposal of over 1,210 wet tons of grit. Phase 2 of the grit removal project continued with grit removal for the remaining influent and effluent channels and consisted of the removal of an additional 240 wet tons of grit.

The Authority worked with a consulting engineer to begin the next phase of removing grit from the aeration tanks in the secondary system, and issued bidding documents for the removal and associated tank isolation activities. The bids received ranged from $6.7 to $12.2 million, which are much higher figures than the Authority anticipated. After reviewing the bids and considering the costs solely of grit removal, the Authority determined that it would

be more prudent to replace the entire 24-year old aeration system in order to ensure its longevity and to improve energy efficiency.

On June 28, 2019, the Authority submitted to USEPA and NYSDEC, for review, a revised schedule for completion of the WWTP Improvement Project, which includes replacement of the aeration system. The Authority has continued to discuss a revised timeline with USEPA and NYSDEC since this time, while moving forward with engineering for part of the project. Following this reporting period on January 28, 2020, the Authority submitted to NYSDEC the Engineering Report for the Secondary System Rehabilitation and Upgrade. This report included both a $16 million and $30 million alternatives that the Authority is currently contemplating.

4.3 North Relief-Interceptor

Preliminary subsurface investigation in conjunction with the North Relief-Interceptor concept has revealed concerns with the location of bedrock and the feasibility of the proposed tunnel location. Due to the noted concerns, the Authority has phased the proposed project. The initial phase, the Bird Avenue Underflow Sewer Project has been completed. Engineering analysis for additional phases is currently focused on the implementation of real time control technology and short circuit methodologies with the intention of reducing the scale of a North Relief-Interceptor project. The Authority is moving forward with the CSO 13 project which is planned to be significantly upsized in order to realize system wide benefits, including a potential reduction in the scope of the North Relief-Interceptor project.

5. CHANGES IN KEY PERSONNEL

There have been no changes in personnel during the reporting period.

6. PUBLIC MEETINGS

A presentation regarding Green Infrastructure in Buffalo was given to PUSH Buffalo in July 2019. A presentation on Green Infrastructure was given to Vision Niagara in August 2019. A lunch and learn presentation on Nature Based Green Infrastructure Solutions for Stormwater Management and Climate Change Resilience was given to the Western NY APWA chapter. A presentation on Green Infrastructure Planning was given at the NYWEA Stormwater Specialty Conference. The slides used in all of the presentations are included in Attachment C.

7. MODEL MODIFICATIONS

The Authority is moving forward with utilizing the January 2019 model for LTCP project planning purposes. All projects that were implemented or designed and underway for implementation in 2019 will be added into the model during the next reporting period.

8. GREEN INFRASTRUCTURE

A private property green infrastructure grant program will be issued during the next reporting period.

9. CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Oluwole A. McFoy, P.E., General Manager _____ Date

Attachment A to the Semi-Annual Status Report: March 2020

Work Completed in Current Period/ Projection of Work to be Performed in Next Reporting Period

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Phase I Projects				
CSO 060 GI Project	---	---	Prior to 1/1/2014	Complete.
Bird/Lang RTC Projects	Construction Start	3/17/2014	2/24/2014	Complete
	Completion Date	9/2/2014	5/9/2016	Complete
	Operations/ Optimization (RTC)	9/3/2014 – 9/3/15	10/1/2016	Complete
Bird RTC Project	Construction Start	3/17/2014	2/24/2014	Complete
	Completion Date	9/2/2014	5/6/2016	Complete
	Operations/ Optimization (RTC)	9/3/2014 – 9/3/15	10/1/2016	Complete
Lang RTC Project	Construction Start	3/17/2014	2/24/2014	Complete
	Completion Date	9/2/2014	5/9/2016	Complete
	Operations/ Optimization (RTC)	9/3/2014 – 9/3/15	10/1/2016	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Foundation Projects				
Foundation 1 - Smith Street Storage	Engineering Start	3/18/2014	Prior to 1/1/2014	Complete
	Engineering Completion	3/18/2015	6/10/2015	Complete
	Notice to Proceed	3/18/2015		Complete
	Substantial Completion	3/18/2017	10/9/2017	Complete
CSO No. 026 Sewer Separation	Engineering Start	3/18/2014	Prior to 1/1/2014	Complete
	Engineering Completion	3/18/2015	4/3/2015	Complete
	Notice to Proceed	3/18/2015	7/8/2015	Complete
	Substantial Completion	3/18/2017	6/22/2016	Complete
CSO No. 026 RTC Structure	Engineering Start	3/18/2014	Prior to 1/1/2014	Complete
	Engineering Completion	3/18/2015	6/10/2015	Complete
	Notice to Proceed	3/18/2015	7/13/2016	Complete
	Substantial Completion	3/18/2017	10/9/2017	Complete
Foundation 2 - SPP Optimization (20 projects)	Engineering Start	3/1/2014	Prior to 1/1/2014	Complete
	Engineering Completion	3/18/2015	4/20/2015	Complete
	Notice to Proceed	3/1/2014	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017		
SPP 180 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	4/20/2015	Complete
	Notice to Proceed	---	9/8/2015	Complete
	Substantial Completion	3/18/2017	12/16/2015	Complete
SPP 331 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	3/18/2015	4/20/2015	Complete
	Notice to Proceed	---	9/8/2015	Complete
	Substantial Completion	3/18/2017	12/16/2015	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
SPP 036 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	1/20/2014	Complete
	Notice to Proceed	---	5/30/2014	Complete
	Substantial Completion	3/18/2017	8/4/2014	Complete
SPP 217 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	4/3/2015	Complete
	Notice to Proceed	---	7/8/2015	Complete
	Substantial Completion	3/18/2017	12/21/2015	Complete
SPP 318 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	4/3/2015	Complete
	Notice to Proceed	---	7/8/2015	Complete
	Substantial Completion	3/18/2017	12/21/2015	Complete
SPP 097A Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	4/20/2015	Complete
	Notice to Proceed	---	9/8/2015	Complete
	Substantial Completion	3/18/2017	12/16/2015	Complete
SPP 122 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 163 Optimization	Engineering Start	---	3/1/2014	Complete
	Engineering Completion	---	11/25/2014	Complete
	Notice to Proceed	---	3/1/2015	Complete
	Substantial Completion	3/18/2017	8/6/2015	Complete
SPP 165 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
SPP 165A Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	4/4/2014	Complete
	Notice to Proceed	---	7/25/2014	Complete
	Substantial Completion	3/18/2017	11/3/2014	Complete
SPP 178 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 335B Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 336A Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	4/20/2015	Complete
	Notice to Proceed	---	9/8/2015	Complete
	Substantial Completion	3/18/2017	12/16/2015	Complete
SPP 341A Optimization	Engineering Start	---	1/1/2014	Complete
	Engineering Completion	---		This project is on hold pending the results of post-construction monitoring of Lang and Hazelwood RTCs.
	Notice to Proceed	---		
	Substantial Completion	3/18/2017		
SPP 342B Optimization	Engineering Start:	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 001 Optimization	Engineering Start:	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	3/27/2014	Complete
	Notice to Proceed	---	6/16/2014	Complete
	Substantial Completion	3/18/2017	12/12/2014	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
SPP 183 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 283 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 211 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
Foundation 3 - Remaining RTC (14 sites)	Engineering Start	3/18/2016	8/9/2016	Ongoing
	Notice to Proceed	3/18/2017		
	Engineering Completion	3/18/2023		
	Substantial Completion	3/18/2024		
Hertel Northwest In-Line Storage	Engineering Start	---		
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Hertel South (Hertel at Deer) In-Line Storage	Engineering Start	---	1/19/2018	Complete
	Engineering Completion	---	12/13/2018	Complete
	Notice to Proceed	---	2/9/2019	Complete
	Substantial Completion	3/18/2024		Expected to be complete during next reporting period
Hertel Northeast In-Line Storage	Engineering Start	---		
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Bird East In-Line Storage	Engineering Start	---		
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
East Ferry In-Line Storage	Engineering Start	---		
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Colorado In-Line Storage	Engineering Start	---		
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
North Bailey In-Line Storage	Engineering Start	---	12/8/2017	Complete
	Engineering Completion	---	6/5/2018	Complete
	Notice to Proceed	---	10/16/2018	Complete
	Substantial Completion	3/18/2024		Expected to be complete during next reporting period
South Bailey In-Line Storage	Engineering Start	---		
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Roslyn In-Line Storage	Engineering Start	---		
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Hazelwood (Kay) In-Line Storage	Engineering Start	---	8/9/2016	Complete
	Engineering Completion	---	9/22/2017	Complete
	Notice to Proceed	---	2/2/2018	Complete
	Substantial Completion	3/18/2024	6/19/2019	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Amherst Quarry Off-Line Storage	Engineering Start	---		
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Fillmore North In-Line Storage	Engineering Start	---		
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Gibson CSO Line Storage	Engineering Start	---		
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Montgomery CSO Line Storage	Engineering Start	---		
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Babcock Pump Station In-Line Storage	Engineering Start	---	6/19/2019	Complete
	Engineering Completion	---		Expected to be complete in the next reporting period
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Smith St. and Eagle St. In-Line Storage	Engineering Start	---	4/4/2019	Complete
	Engineering Completion	---		Expected to be complete in the next reporting period
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Broadway at Oak In-Line Storage	Engineering Start	---	4/4/2019	Complete
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Foundation 4 -	Engineering Start	3/18/2015	Prior to 1/1/2014	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Hamburg Drain Optimizations	Engineering Completion	3/18/2017	2/23/2017	Complete
	Notice to Proceed	3/18/2016	5/16/2017	Complete
	Substantial Completion	3/18/2018		
Foundation 4 - Hamburg Drain Storage	Engineering Start	3/18/2028		
	Engineering Completion	3/18/2030		
	Notice to Proceed	3/18/2030		
	Substantial Completion	3/18/2032		
Mill Race In-Line Storage	Engineering Start	---	4/4/2019	Complete
	Engineering Completion	---		Expected to be complete in the next reporting period
	Notice to Proceed	---		
	Substantial Completion	3/18/2032		
WWTP				
WWTP Improvement Project Alternative C2	Engineering Start	11/26/2019		See 4.2. As requested on Nov. 8, 2018, BSA submitted a written Request for Extension that reflects these amended dates. Completion dates are still under review.
	Engineering Completion	10/15/2024		
	Notice to Proceed	5/30/2022		
	Substantial Completion	6/30/2027		

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Green Infrastructure Projects				
Green 1 - Pilot Projects – 267-acres of GI control SEE	Engineering Start	3/1/2014	Prior to 1/1/2014	Complete
	Engineering Completion	3/18/2016		Complete
	Substantial Completion	3/18/2018	12/31/2016	Complete.
2001-2016 Residential (traditional) Demolitions	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2018	12/31/2016	Complete.
2001 - 2016 Commercial and Industrial Demolitions	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2018	12/31/2016	Complete.
Green 2 – 410 acres of GI Control	Engineering Start:	3/18/2019	Prior to 1/1/2014	Complete
	Engineering Completion:	3/18/2023		
	Substantial Completion:	3/18/2024		
2017 - 2024 Demolitions	Engineering Start		Prior to 1/1/2014	Complete.
	Engineering Completion:			
	Substantial Completion:	3/18/2018		
Green Demolition Pilot Project	Engineering Start		Prior to 1/1/2014	Complete
	Engineering Completion			Complete
	Substantial Completion		7/31/2017	Complete.
PUSH Blue Projects	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2018	7/1/2015	Complete.
Carlton Street Porous Asphalt	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2018	7/25/2014	Complete.
Fillmore Avenue Porous Parking and Green Lots	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2018	4/23/2015	Complete.
Ohio Street	Engineering Start	---	Prior to 1/1/2014	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2018	12/1/2014	Complete.
Kenmore Avenue	Engineering Start	---	4/30/2014	Complete
	Engineering Completion		4/20/2015	Complete
	Substantial Completion	3/18/2018	3/1/2017	Complete.
Genesee Street	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	6/8/2015	Complete
	Substantial Completion	3/18/2018	6/1/2017	Complete.
Allen Street	Engineering Start	---	Prior to 1/1/2014	Green infrastructre will no longer be implemented as part of the Allen Street streetscape project due to site constraints.
	Engineering Completion	---		
	Substantial Completion	3/18/2018		
Willert Park	Engineering Start	---	6/1/2016	Complete
	Engineering Completion	---	2/1/2017	Complete
	Substantial Completion	3/18/2018	4/26/2019	Complete
Northland Ave	Engineering Start	---	7/1/2016	Complete
	Engineering Completion	---	3/1/2017	Complete
	Substantial Completion	3/18/2018		
612 Northland Ave	Engineering Start	---	1/1/2019	Complete
	Engineering Completion	---	6/1/2019	Complete
	Substantial Completion	---	12/1/2019	Complete
Niagara Street Phase 1: Elmwood Street to Virgina Street	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	3/19/2014	Complete
	Substantial Completion	3/18/2018	12/1/2016	Complete.
Niagara Street Phase 2: Virgina Street to Porter Avenue	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	6/3/2015	Complete
	Substantial Completion	3/18/2018	11/16/2017	Complete.
Niagara Street Phase 3: Hampshire Street to	Engineering Start	---	10/28/2015	Complete
	Engineering Completion	---	3/21/2018	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Scajaquada Expy	Substantial Completion	3/18/2024		
Niagara Street Phase 4a: Scajaquada Expy to Hertel Ave	Engineering Start	---	10/28/2015	Complete
	Engineering Completion	---	6/13/2018	Complete
	Substantial Completion	3/18/2024		

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Niagara Street Phase 4b: Hertel Ave to Ontario St	Engineering Start	---	10/28/2015	Complete
	Engineering Completion	---	6/13/2018	Complete
	Substantial Completion	3/18/2024		
Niagara Street Phase 5: Porter Avenue to Hampshire Street	Engineering Start	---	10/28/2015	Complete
	Engineering Completion	---		
	Substantial Completion	3/18/2024		
Green 3 – 375 acres of GI Control	Engineering Start:	3/18/2023		
	Engineering Completion:	3/18/2028		
	Substantial Completion:	3/18/2029		
Green 4 – 263 acres of GI Control	Engineering Start:	3/18/2028		
	Engineering Completion:	3/18/2033		
	Substantial Completion:	3/18/2034		
Gray Projects				
CSOs 014/15 – Erie Basin In-line storage and optimization projects	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	3/18/2014	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2015	12/29/2014	Complete
SPPs 206A&B	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	5/30/2014	Complete
	Substantial Completion	3/18/2015	12/29/2014	Complete
SPP 035	Engineering Start	---	Prior to 1/1/2014	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2015	5/31/2014	Complete
SPP 036	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	5/30/2014	Complete
	Substantial Completion	3/18/2015	12/5/2014	Complete
CSO 013 – Satellite storage, conveyance, FM & PS	Engineering Start	1/1/2020		Will be completed during the next reporting period
	Engineering Completion	1/1/2021		
	Notice to Proceed	1/1/2021		
	Substantial Completion	1/1/2023		
North Relief – Interceptor	Engineering Start	3/18/2019	5/15/2015	Complete; See 4.3.
	Engineering Completion	3/18/2022		
	Notice to Proceed	3/18/2022		
	Substantial Completion	3/18/2026		
CSOs 010, 008/010, 061, 004 – Underflow capacity upsizing	Engineering Start	3/18/2021		
	Engineering Completion	3/18/2023		
	Notice to Proceed	3/18/2023		
	Substantial Completion	3/18/2024		
SPP 337 (CSO 053) – Satellite storage, conveyance, FM & PS	Engineering Start	3/18/2023		
	Engineering Completion	3/18/2025		
	Notice to Proceed	3/18/2025		
	Substantial Completion	3/18/2027		
SPP 336A&B (CSO	Engineering Start	3/18/2024		

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
053) – Satellite storage, conveyance, FM & PS	Engineering Completion	3/18/2026		
	Notice to Proceed	3/18/2026		
	Substantial Completion	3/18/2029		
Jefferson Avenue & Florida Street (CSO 053) – Satellite storage,	Engineering Start	3/18/2025		
	Engineering Completion	3/18/2027		
	Notice to Proceed	3/18/2027		
	Substantial Completion	3/18/2030		
CSO 055 – Satellite storage, conveyance, FM & PS	Engineering Start:	3/18/2027		
	Engineering Completion:	3/18/2030		
	Notice to Proceed:	3/18/2030		
	Substantial Completion:	3/18/2034		
CSOs 028/044/047 - Satellite storage, conveyance, FM & PS	Engineering Start:	3/18/2028		
	Engineering Completion:	3/18/2031		
	Notice to Proceed:	3/18/2031		
	Substantial Completion:	3/18/2034		
CSO 052 – Satellite storage, conveyance, FM & PS	Engineering Start:	3/18/2030		
	Engineering Completion:	3/18/2032		
	Notice to Proceed:	3/18/2032		
	Substantial Completion:	3/18/2034		
CSO 064 – Satellite storage, conveyance, FM & PS	Engineering Start:	3/18/2030		
	Engineering Completion:	3/18/2032		
	Notice to Proceed:	3/18/2032		
	Substantial Completion:	3/18/2034		

Attachment B to the Semi-Annual Status Report: March 2020

Detailed Project Descriptions

Project Name	Project Description	Project Purpose*
Phase I Projects		
CSO 060 GI Project	This project consisted of the construction of 4768 CF of rain garden on Windsor, Parkdale and Elmwood Avenues between Bird and Forest Avenues and 39,600 SF of permeable pavement on Clarendon and Claremont Avenues between Bird and Forest Avenues, installation of a Stormceptor unit at Bird Avenue and Granger Place and a total of 6,125 LF of 12-30 inch sewer designed to carry street flow to the existing storm overflow sewer on Forest Avenue from the above mentioned street segments. Additionally, weirs were raised in SPPs 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, and 240.	This project was designed to treat 13,600 cf of stormwater runoff from the 0.9 inch water quality storm event and remove 49.5 cfs of peak flow from the combined sewer system. Thereby reducing overflows through SPPs 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, and 241 to CSO 060. Together with other LTCP projects, this project is projected reduce CSO 060 discharges to Scajaquada Creek based on the 1993 Modified Typical Year (TY) to negligible activations and flow.
Bird/Lang RTC Projects	These RTC projects utilize available capacity of large sewers to provide flow control measures during wet weather events through the use of gates which allow continuous dry weather underflow.	
Bird RTC Project	The Bird RTC Project is located on Bird Avenue between Parkdale Avenue and Hoyt Street.	The Bird RTC project is designed to provide 1.01 MG of storage volume, thereby reducing discharges through SPP 013 to CSO 004. Together with other LTCP projects, this project is projected reduce CSO 004 discharges to the Black Rock Canal based on the TY to 3 activations.
Lang RTC Project	The Lang RTC Project is located on Lang Avenue between Courtland Avenue and Hagen Street.	The Lang RTC project is designed to have a storage volume of 0.84 MG, thereby reducing discharges through SPP 340 to CSO 053. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the 1993 Modified Typical Year (TY) to 4 activations.

Project Name	Project Description	Project Purpose*
Foundation Projects		
Foundation 1 - Smith Street Storage	Originally envisioned as a single project, these two projects have been separated to realize cost advantages due to the different levels of skill required for the projects and to expedite the sewer separation component.	
CSO No. 026 Sewer Separation	This project consisted of the installation of collection sewers for street receiver flows on Leddy Street, South Park Avenue, Owahn Place, Prenatt Street, Bolton Place, St. Stephen's Place, and Buffalo River Place, tributary to to SPP 88 and 90, in order to discharge these storm flows downstream of regulators, in conjuction with the optimization projects for SPP 217 and SPP 318.	Together with the Smith Street in-line storage project, the Smith Street partial sewer separation project is designed to divert storm flows directly to the Smith Street Drain thereby reducing CSO 026 discharges. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 6 activations or less.
CSO No. 026 RTC Structure	The second contract consists of an in-line storage project which is designed to detain wet weather flows along the western side of Smith Street using a weir structure between the I-190 and the I-190 off ramp within the Smith Street Drain for discharge to the South Interceptor thereby diverting combined sewer flows from CSO 026.	Together with the Smith Street partial sewer separation project, the Smith Street in-line storage project is designed to divert and detain the equivalent of a storage volume of 1.94 MG, thereby reducing CSO 026 discharges. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 6 activations or less.
Foundation 2 - SPP Optimization (20 projects)	Project consists of multiple smaller projects that will overlap in engineering and construction. SEE DETAILS FOLLOWING FOR SPECIFIC PROJECTS	In general, these projects will reduce discharges to the CSOs by detaining flows within the BSA's system through the modification of existing control structures.
SPP 180 Optimization	This project consisted of raising of the weir associated with SPP 180 by 2.0' along its entire length. SPP 180 is located on Delaware Avenue at the intersection with West Delavan. As part of the revised SPP 331 Optimization, this weir will be raised an additional 1.75' along its entire length.	The SPP 180 Optimization project was designed to increase the capacity of the CSS at SPP 180 thereby decreasing CSO 006 discharges. Together with other LTCP projects, this project is projected to reduce CSO 006 discharges to the Black Rock Canal based on the TY to 4 activations.

Project Name	Project Description	Project Purpose*
SPP 331 Optimization	SPP331 is located at the intersection of Elmwood Avenue and West Delavan Avenue. Preliminary plans were for the diversion of flows from this point through a new sewer to Bird Avenue along the centerline of Elmwood Avenue. This would have required major disruption of a very high traffic commercial area and was deemed impractical. Plans have been developed to instead divert the same flow that was to have been diverted through this project through a system of localized weir modifications rather than extensive pipe installation. These modifications include raising the weir at SPP 180 by 1.75' and the bench located in SPP 332 on the northeast quadrant of Gates Circle which currently directs dry weather flows into the interceptor will be removed and replaced with a 6.2' weir and restored sewer trough which will direct dry weather flows into the Bird Avenue trunk sewer.	The SPP 331 Optimization project is designed to increase the underflow capacity at SPP 331 thereby decreasing CSO 006 discharges. Together with other LTCP projects, this project is projected to reduce CSO 006 discharges to the Black Rock Canal based on the TY to 4 activations.
SPP 036 Optimization	This project consisted of the reconstruction of 35' of 30" sewer associated with SPP 036 to reverse the slope. It was located on Church Street between the off and on ramps of the Skyway (State Route 5).	The SPP 036 Optimization project was designed to increase the underflow capacity at SPP 036 thereby decreasing CSO 015 discharges. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Erie Basin through CSO 015 to 0 activations.
SPP 217 Optimization	In association with the Smith Street partial sewer separation project, this project consisted of the removal of two bottom orifice plates totaling 1.42' in height, increasing the orifice size and conveyance capacity of the Emslie Street Sewer. SPP 217 is located on Emslie Street at its intersection with Eagle Street.	The SPP 217 Optimization project is designed to increase the underflow capacity at SPP 217 thereby decreasing CSO 026 discharges. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 3 activations.

Project Name	Project Description	Project Purpose*
SPP 318 Optimization	In association with the Smith Street partial sewer separation project, this project consisted of the removal of an orifice plate, increasing the orifice size and conveyance capacity of the Clinton Avenue Sewer. SPP 318 is located east of the intersection of Fillmore Avenue and Clinton Street.	The SPP 318 Optimization project is designed to increase the underflow capacity at SPP 318 thereby decreasing CSO 026 discharges. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 3 activations.
SPP 097A Optimization	This project consisted of abandoning an inactive combined sewer, converting another to a storm sewer and abandoning the underflow connection. SPP 097A is located at the intersection of the extension of Prenatt and Orlando Streets.	The SPP 097A Optimization project is designed to eliminate SPP 097A thereby decreasing CSO 026 discharges. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 3 activations.
SPP 122 Optimization	This project consisted of raising of the weir associated with SPP 122 by 0.5' along its entire length. SPP 122 is located on South Legion Drive just north of the intersection with Meriden Street.	The SPP 122 Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 122 thereby decreasing CSO 037 discharges. Together with other LTCP projects, this project is projected to reduce CSO 037 discharges to the Buffalo River based on the TY to 3 activations.
SPP 163 Optimization	The SPP 163 Weir Optimization project consisted of replacing the existing weir with a new weir 0.75' higher. It is located to the East of the intersection of Fillmore Avenue and Northland on Northland Avenue.	The SPP 163 Optimization project is designed to increase the flow volume conveyed by the CSS at SPP 163 thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 165 Optimization	This project consisted of raising of the weir associated with SPP 165 by 0.5' along its entire length. SPP 165 is located on Fillmore Avenue just north of the intersection with East Delavan Street.	The SPP 165 Optimization project was designed to increase the capacity of the CSS at SPP 165 thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 165A Optimization	The weir associated with SPP 165A located at the intersections of Fillmore and Kensington Avenues.	The SPP 165A Optimization project was designed to increase the capacity of the CSS at SPP 165A by raising the weir by 0.75' and upsizing 675' of 15" pipe to 18” pipe to reduce CSOs in association with CSO 053. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.

Project Name	Project Description	Project Purpose*
SPP 178 Optimization	This project consisted of raising of the weir associated with SPP 178 by 0.5' along its entire length. SPP 178 is located on Masten Avenue just north of the intersection with Northland Avenue.	The SPP 178 Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 178 thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 335B Optimization	This project consisted of raising of the weir associated with SPP 335B by 1.0' along its entire length. SPP 335B is located on Hager Street just south of the intersection with Florida Street.	The SPP 335B Optimization project was designed to increase the flow volume conveyed by CSS at SPP 335B thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 336A Optimization	This project has been constructed in association with the SPP 331 optimization. The project consist sof removing a sluice gate and orifice plate and modifying the existing structure by changing the existing side channel opening from 24" to 30". SPP 336A is located on Humboldt Parkway North of the Scajaquada Drain.	The SPP 336A Optimization project is designed to increase the underflow capacity of the CSS at SPP 336A thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 341A Optimization	SPP 341A is located on Genesee Street east of Kerns Avenue. This project is on hold pending the results of post-construction monitoring of Lang and Hazelwood RTCs.	The SPP 341A Optimization project would increase the flow volume conveyed by the CSS at SPP 341A thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations. Field conditions may require modification to this planned optimization.
SPP 342B Optimization	This project consisted of raising of the weir associated with SPP 342B by 1.0' along its entire length. SPP 342B is located on Sprenger Avenue adjacent to Schiller Park.	The SPP 342B Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 342B thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.

Project Name	Project Description	Project Purpose*
SPP 001 Optimization	The weir associated with SPP 001 located at the discharge of Cornelius Creek into the Niagara River and tributary to CSO 055 has been raised 1.0' to reduce CSOs.	The SPP 001 Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 001 thereby decreasing CSO 055 discharges. Together with other LTCP projects, this project is projected to reduce CSO 055 discharges to the Niagara River based on the TY to 9 activations.
SPP 183 Optimization	This project consisted of raising of the weir associated with SPP 183 by 2.0' along its entire length. SPP 183 is located at the intersection of Bradley Avenue and Dewitt Street.	The SPP 183 Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 183 thereby decreasing CSO 059 discharges. Together with other LTCP projects, this project is projected to reduce CSO 059 discharges to Scajaquada Creek based on the TY to 0 activations.
SPP 283 Optimization	SPP 283 is located in the median between the I-190 South ramp to Porter Avenue and a service road near the West Side Rowing Club. This project consisted of removing an orifice plate which restricted flows from entering the Swan Trunk and the installation of a new 1.0' tall weir to restrict flows from discharging through CSO 063.	The SPP 283 Optimization project was designed to increase the underflow capacity of the CSS at SPP 283 thereby decreasing CSO 063 discharges. Together with other LTCP projects, this project is projected to reduce CSO 063 discharges to the Niagara River based on the TY to 4 activations.
SPP 211 Optimization	This project consisted of constructing a weir to an elevation above the overflow raised pipe invert at SPP 211. SPP 211 is located at the South East corner of the intersection of Clinton and South Ogden Streets.	The SPP 211 Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 211 thereby decreasing CSO 066 discharges. Together with other LTCP projects, this project is projected to reduce CSO 066 discharges to the Buffalo River based on the TY to 4 activations.

Project Name	Project Description	Project Purpose*
Foundation 3 - Remaining RTC (14 sites)	These RTC projects propose to utilize available capacity in the CSS to provide flow control measures during wet weather events through the use of active controls.	In general, these projects are designed to reduce discharges to the CSOs through the detention of flows within the BSA's CSS system.
Hertel Northwest In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is within the northern portion of the two large combined sewers which are located under Hertel Avenue.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 055 discharges to the Niagara River based on the TY to 9 activations.
Hertel South (Hertel at Deer) In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is within the southern portion of the two large combined sewers which are located under Hertel Avenue.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 055 discharges to the Niagara River based on the TY to 9 activations.
Hertel Northeast In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. This project will be located within the northern portion of the two large combined sewers which are located under Hertel Avenue.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 055 discharges to the Niagara River based on the TY to 9 activations.
Bird East In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. This project will be located to the east of the above mentioned Bird RTC project along the same Bird Avenue sewer.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 004 discharges to the Black Rock Canal based on the TY to 3 activations.

Project Name	Project Description	Project Purpose*
East Ferry In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is along the Ferry Street sewer upstream of its leaping weir overflow to the Scajaquada Drain north of Florida Street.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
Colorado In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is along the Colorado Avenue sewer which runs underneath the manufacturing facility located at 1001 East Delavan Avenue.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
North Bailey In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is along Bailey Avenue north of Scajaquada Street.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
South Bailey In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is along Bailey Avenue north of Scajaquada Street and south of the afore mentioned North Bailey In-Line Storage project.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
Roslyn In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is near Roslyn Street on Lang Avenue.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.

Project Name	Project Description	Project Purpose*
Hazelwood (Kay) In-Line Storage	This RTC project, now known as Hazelwood, is proposed to utilize available capacity in the CSS capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is on Hazelwood Avenue between East Delavan and Easton Avenues.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
Amherst Quarry Off-Line Storage	This RTC project proposes to utilize available capacity within the active Amherst Quarry to provide flow control measures during wet weather events, once downstream capacity is available, flows will then be pumped back into the system. The Amherst Quarry is located in an area bounded by Parkridge Avenue, East Amherst Street, and Hewitt Avenue.	This RTC project is proposed to utilize available capacity of the quarry to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
Fillmore North In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. This project is proposed to be located on Fillmore Avenue, however pending the results of post-construction monitoring, it may be eliminated depending on the efficancy of the Smith Street Storage project.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 3 activations.

Project Name	Project Description	Project Purpose*
Gibson CSO Line Storage	This project is proposed to utilize the available capacity of the CSO pipe downstream of the SPP, but before the discharge point or outfall. It would be designed to convey water to prevent surface flooding and overflows through upstream SPPs. Once the storm event has subsided, it would be designed to dewater back into the combined system. The dewatering rate would be controlled so that it would not cause overflows downstream from the control structure. The proposed project location is on Gibson Street, however pending the results of post-construction monitoring, it may be eliminated depending on the efficancy of the Smith Street Storage project.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 3 activations.

Project Name	Project Description	Project Purpose*
Montgomery CSO Line Storage	This project is proposed to utilize the available capacity of the CSO pipe downstream of the SPP, but before the discharge point or outfall. It would be designed to convey water to prevent surface flooding and overflows through upstream SPPs. Once the storm event has subsided, it would be designed to dewater back into the combined system. The dewatering rate would be controlled so that it would not cause overflows downstream from the control structure. The proposed project location is along the railroad right-of-way near Montgomery Street, however pending the results of post-construction monitoring, it may be eliminated depending on the efficancy of the Smith Street Storage project.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 3 activations.
Babcock Pump Station In-Line Storage	This RTC project is proposed to modify the function of an existing pump station to utilize available capacity of a large sewer to provide flow control measures during wet weather events. The proposed project location is at the existing pump staion on New Babcock Street at Howard Street.	This RTC project is proposed to utilize available capacity within the collection system to reduce the peak flow into the Swan Trunk. Together with other LTCP projects, this project is projected to reduce CSO 027 discharges to the Buffalo River based on the TY to 6 activations.
Smith at Eagle In-Line Storage	This RTC project is proposed to utilize available capacity in the Smith St Drain to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is upstream of the existing CSO 026 RTC project on Smith St. and Eagle St.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 6 activations.
Broadway at Oak In-Line Storage	This RTC project is proposed to utilize available capacity in the collection system to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is on Broadway St. at Oak St.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 017 discharges to the Buffalo River based on the TY to 6 activations.

Project Name	Project Description	Project Purpose*
Foundation 4 - Hamburg Drain Optimizations	This project will entail several in-system optimizations, e.g. rerouting of flows, installation of weirs, partial sewer separations etc. and/or green infrastructure to reduce the overflow events at a number of upstream SPPs in order to control flows through CSOs 017, 022, and 064. These optimizations would be located within the Hamburg Basin.	These optimization projects are proposed to increase the flow volume conveyed by the CSS upstream of the SPPs and diverting stormwater flows out of the CSS thereby decreasing CSO 017, 022, and 064 discharges. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Buffalo River through CSO 017 to 4 activations, CSO 022 to 5 activations, and CSO 064 to 3 activations.
Foundation 4 - Hamburg Drain Storage	Together with the Hamburg Drain Optimizations, this project would be designed to provide the equivalent of 5 MG of offline storage. This facility would be located within the Hamburg Basin and may involve the installation of RTCs.	This storage project is proposed to provide off-line storage thereby decreasing CSO 017, 022, and 064 discharges. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Buffalo River through CSO 017 to 4 activations, CSO 022 to 5 activations, and CSO 064 to 3 activations.
Mill Race In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is on Larkin Street near Roseville Street.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 017 discharges to the Buffalo River based on the TY to 6 activations.
WWTP		
WWTP Improvement Project Alternative C2	The proposed project is expected to rehabilitate the existing primary clarifiers by adding high rate disinfection and provide additional secondary clarifiers at the Bird Island WWTP.	This project would be designed to provide treatment of wet weather flows and increased secondary treatment capacity.

Project Name	Project Description	Project Purpose*
Green Infrastructure Projects		
Green 1 - Pilot Projects – 267-acres of GI control	Projects consist of multiple green infrastructure projects that will overlap in engineering and construction.	In general, this phase is designed to control stormwater flow from 267 acres of impervious area in the various sewer sheds within the targeted areas.
2001-2016 Residential Demolitions	This project consists of the demolition of vacant houses thereby replacing impervious with pervious surfaces.	This project is designed to remove 256 total acres of impervious area and manage stormwater on site.
2001-2016 Commercial and Industrial Demolitions	This project consists of the demolition of commercial and industrial structures thereby replacing impervious with pervious surfaces.	This project is designed to control stormwater flow from 78 total acres of impervious area.
Green 2 – 410 acres of GI Control	These projects will consist of multiple green infrastructure projects that will overlap in engineering and construction. Details will be provided in future reports.	In general, these projects would be designed to retain stormwater flow from 410 acres of impervious area in the various sewer sheds in the targeted areas.
2017 -2024 Demolitions	This project consists of the demolition of vacant and dilapidated structures thereby replacing impervious surface with pervious surface	This project is designed to control stormwater flow for each post demolition vacant lot. Total acreate TBD on a rolling basis depending upon demolitions completed.
Green Demolition Pilot Project	A three year pilot study where the City of Buffalo's demolition specifications were altered to allow for the use of shallow bioretention to increase onsite infiltration	Over the course of the pilot project the revised demolition specifications/bioretention approach was applied to 221 sites impacting a total of 19.03 acres.
PUSH Blue Projects	PUSH-Buffalo will install rain gardens, porous pavement and a green roof and distribute rain barrels within the CSO 012 sewershed.	This project is designed to control stormwater flow from 1 acre of impervious area.
Carlton Street Porous Asphalt	This project consisted of the installation of pervious pavement to retain stormwater from the area tributary to the Right-of-Way on Carlton Street between Michigan and Jefferson Avenues in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from a 5.9 acre sewershed.

Project Name	Project Description	Project Purpose*
Fillmore Avenue Porous Parking Lots and Green Lots	This project consisted of the installation of porous pavement parking lots and modified rain gardens to retain stormwater from the area tributary to the Right-of-Way of Fillmore Avenue in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 0.4 total acres of impervious area.
Ohio Street	This project consisted of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way on Ohio Street in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 6.1 total acres of impervious area.
Kenmore Avenue	This project consists of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way on Kenmore Avenue in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 5.17 total acres of impervious area.
Genesee Gateway Project	This project consists of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way on Genesee Street in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 2.8 total acres of impervious area.
Allen Street	This project will consist of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the portion of Allen Street between Main Street and Elmwood Avenue in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 2.5 total acres of impervious area.
Willert Park	This project will consist of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the portion of William Street between Michigan and Jefferson in the City of Buffalo.	This project is designed to control stormwater flow from 13.9 total acres of impervious area.
Northland Ave	This project will consist of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the portion of Northland Avenue between Fillmore and Grider in the City of Buffalo.	This project is designed to control stormwater flow from 6.1 total acres of impervious area.

Project Name	Project Description	Project Purpose*
612 Northland Ave	The project consists of a rain garden, permeable gravel pavement, and conversion of impervious pavement to lawn/shrubs.	The project is designed to control stormwater flow from 0.26 acres of impervious area.

Project Name	Project Description	Project Purpose*
Niagara Street Phase 1: Elmwood Street to Virgina Street	This project consists of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the length of Niagara Street in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 2 total acres of impervious area.
Niagara Street Phase 2: Virgina Street to Porter Avenue	This project consists of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the length of Niagara Street in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 7.3 total acres of impervious area.
Niagara Street Phase 3: Hampshire Street to Scajaquada Expressway	This project consists of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the length of Niagara Street in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 15 total acres of impervious area in MS4 drainage areas and 25.5 in CSO drainage areas.
Niagara Street Phase 4a: Scajaquada Expy to Hertel Ave		
Niagara Street Phase 4b: Hertel Ave to Ontario St		
Niagara Street Phase 5: Porter Avenue to Hampshire Street		
Green 3 – 375 acres of GI Control	These projects will consist of multiple green infrastructure projects that will overlap in engineering and construction. Details will be provided in the Phase 2 Green Infrastructure Master Plan.	In general, these projects would be designed to retain stormwater flow from 375 acres of impervious area in the various sewer sheds in the targeted areas.

Project Name	Project Description	Project Purpose*
Green 4 – 263 acres of GI Control	These projects will consist of multiple green infrastructure projects that will overlap in engineering and construction. Details will be provided in the Phase 2 Green Infrastructure Master Plan.	In general, these projects would be designed to retain stormwater flow from 263 acres of impervious area in the various sewer sheds in the targeted areas.
Gray Projects		
CSOs 014/15 – Erie Basin In-line storage and optimization	**SEE DETAILS FOLLOWING FOR SPECIFIC PROJECTS**	
SPPs 206A&B	A new 113,000 gallon in-line storage facility was constructed in association with SPPs 206A&B to reduce CSOs at CSO 014. This site is located at Trenton Road/ Village Court north east of Fourth Street.	This project was designed to provide in-line storage thereby decreasing CSO 014 discharges through SPPs 206A&B. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Erie Basin through CSO 014 to 2 activations.
SPP 035	A new 50,000 gallon in-line storage facility was constructed between the Genesee Trunk and Swan Trunk sewers to create additional storage capacity in association with SPP 035 (CSO 015). This project is located to the north west of the intersection of South Elmwood Avenue and West Genesee Street.	This project was designed to provide in-line storage thereby decreasing CSO 015 discharges through SPP 35. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Erie Basin through CSO 015 to 0 activations.
SPP 036	This project consisted of the reconstruction of 35' of 30" sewer associated with SPP 036 to reverse the slope. This site is located on Church Street between the off and on ramps of the Skyway bridge (State Route 5).	This sewer reconstruction project was designed to increase the underflow capacity of the CSS thereby decreasing CSO 015 discharges. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Erie Basin through CSO 015 to 0 activations.

Project Name	Project Description	Project Purpose*
CSO 013 – Satellite storage, conveyance, FM & PS	CSO 013 is located at the extension of Virginia Street, in LaSalle Park, into the Black Rock Canal, the structure is tentatively planned to be built between the last SPP structure and the Canal. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	This storage project would provide off-line storage thereby decreasing CSO 013 discharges. Preliminary design is for a 0.3 MG offline storage facility. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Black Rock Canal through CSO 013 to 4 activations.

Project Name	Project Description	Project Purpose*
North Relief – Interceptor	The original conception of this project was of a deep tunnel relief sewer to run in the vicinity of Niagara Street between Bird Avenue and Albany Street with an additional line connecting the tunnel to the WWTP influent siphon. Preliminary design is for 5,310' of 96"pipe and 571' of 120" pipe. Due to site constraints this project may be redesigned.	The purpose of this project is to reduce discharges through CSOs 004, 011, and 012, by creating a new relief sewer thereby creating offline storage capacity capacity in the CSS. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Black Rock Canal through CSO 004 to 3 activations, CSO 011 to 4 activation, and CSO 012 to 2 activations.
CSOs 010, 008/010, 061, 004 – Underflow capacity upsizing	This project will consist of upsizing of underflow piping to maximize flow to the interceptors. This project is tentatively proposed for between Breckenridge Street and Brace Street along the I-190 with an extension along Brace Street across Niagara Street.	This underflow capacity upsizing project would increase the capacity of the CSS thereby decreasing CSO 010, 008, 061 and 004 discharges. Together with other LTCP projects, this project is projected based on the 1993 Modified Typical Year to reduce discharges to the Black Rock Canal through CSO 004 to 3 activations, CSO 010 to 1 activations, CSO 008 to 0 activations, and CSO 061 to 4 activations.
SPP 337 (CSO 053) – Satellite storage, conveyance, FM & PS	SPP 337 is located at Colorado Street North of Scajaquada Street. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 53 to the Scajaquada Creek. Preliminary design is for a 0.7 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 336A&B (CSO 053) – Satellite storage, conveyance, FM & PS	SPP 336A&B are located on Humboldt Parkway on each side of the Scajaquada Drain. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 53 to the Scajaquada Creek. Preliminary design is for a 4.2 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to Scajaquada Creek based on the TY to 4 activations.
Jefferson Avenue & Florida Street (CSO 053) – Satellite storage, conveyance and FM	The proposed location for this facility is in the vicinity of the intersection of Jefferson Avenue and Florida Street. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 53 to the Scajaquada Creek. Preliminary design is for a 2.6 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to Scajaquada Creek based on the TY to 4 activations.

Project Name	Project Description	Project Purpose*
CSO 055 – Satellite storage, conveyance, FM & PS	For CSO 055, the proposed storage facility would be located upstream of the regulator, near Military Road. At this location, an offline facility would be constructed and flows above 26 MGD (instantaneous peak) would be diverted from the South Hertel Trunk sewer into the storage facility. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 55 to the Niagara River. Preliminary design is for a 7.5 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to the Niagara River through CSO 55 based on the TY to 9 activations.
CSOs 028/044/047 - Satellite storage, conveyance, FM & PS	The proposed location for this facility is underneath the Tops parking lot between South Park Avenue and the Buffalo River. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 28 to the Buffalo River and through CSOs 047 and 044 to Cazenovia Creek. Preliminary design is for a 2.3 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges based on the TY to 6 activations through CSO 028, 2 activations through CSO 044 and 3 activations through CSO 047.
CSO 052 – Satellite storage, conveyance, FM & PS	The proposed location for this facility is in the vicinity of South Ogden Street between Mineral Springs Road and Cazenovia Creek. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 52 to the Buffalo River. Preliminary design is for a 0.6 MG offline storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to the Buffalo River through CSO 052 based on the TY to 3 activations.
CSO 064 – Satellite storage, conveyance, FM & PS	The proposed location for this facility is in the vicinity of the confluence of Ohio, Louisiana and Saint Claire Streets. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 064 to the Buffalo River. Preliminary design is for a 0.1 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to the Buffalo River through CSO 064 based on the TY to 3 activations.

***Note:** Black Rock Canal Performance Criterion is 4 Activations in the Typical Year
Buffalo River Performance Criterion is 6 Activations in the Typical Year
Cazenovia Creek - B Performance Criterion is 4 Activations in the Typical Year
Cazenovia Creek - C Performance Criterion is 6 Activations in the Typical Year
Erie Basin Performance Criterion is 2 Activations in the Typical Year
Niagara River Performance Criterion is 9 Activations in the Typical Year
Scajaquada Creek - Performance Criterion is 4 Activations in the Typical Year

Attachment C to the Semi-Annual Status Report: March 2020

Public Meeting Materials


BUFFALO
SEWER AUTHORITY

BUFFALO
SEWER AUTHORITY

RAINCHECK

POROUS ASPHALT ASSETS

SITE	APPROX. SQUARE FEET
CARLTON ST. - BETWEEN ROSE AND LEMON	38,500
CLARENDON PL. - BETWEEN FOREST AND BIRD	21,500
CLAREMONT AVE. - BETWEEN FOREST AND BIRD	18,500
OHIO ST. - PARKING LANE AND PATH	15,000
WILLIAM ST. - PARKING LANE	30,000
1401 FILLMORE - PARKING LOT	1,800
1384 FILLMORE - PARKING LOT	3,500
KENMORE AVE. - BIKE LANE	23,000
156 TACOMA - NORTH BUFFALO ICE RINK PARKING LOT	21,500
TOTAL:	**173,300**

BUFFALO
SEWER AUTHORITY

RAINCHECK

RAIN GARDEN/BIO-RETENTION/BIO-SWALE ASSETS

SITE	APPROX. SQUARE FEET
Windsor Ave.	1,416
Elmwood Ave.	1,165
Parkdale Ave.	1,277
William St. /JFK/Pratt Willert CC	8,700
Niagara St.	62,782
Northland Ave.	8,100
Genesee St.	4,096
Total:	**166,885**

BUFFALO
SEWER AUTHORITY

RAINCHECK

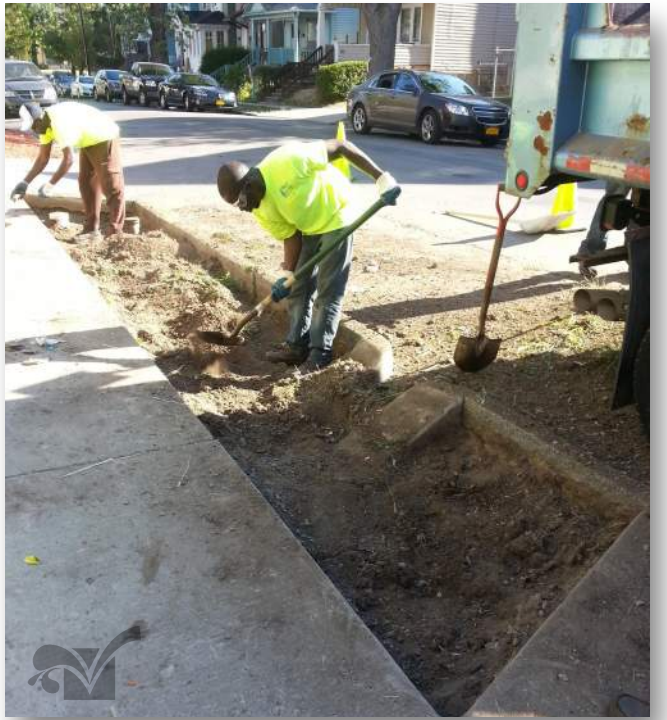
ADDITIONAL ASSETS

Asset	Approx. Quantity/Area
Rain Barrels	1,400 installed
Shoreline Restoration and Wetland Area	2,000 LF Shoreline / 20,000 SF Wetland
Treatment Facility at Bird Island	70 acres
Outlying Stations	12 acres

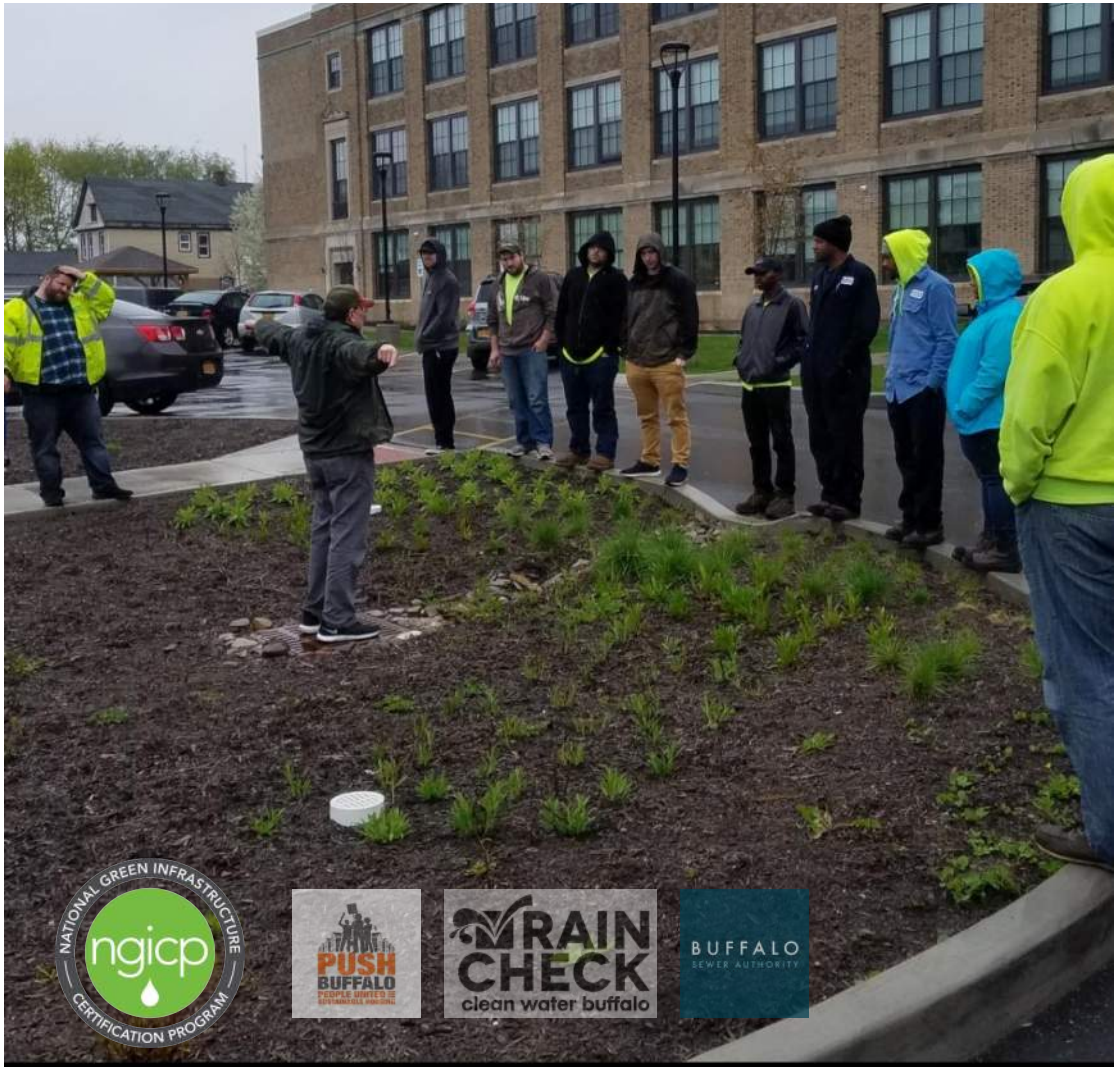
NATIONAL GREEN INFRASTRUCTURE CERTIFICATION PROGRAM
ngicp

BUFFALO
SEWER AUTHORITY

PUSH BUFFALO
PEOPLE UNITED FOR SUSTAINABLE HOUSING




BUFFALO
SEWER AUTHORITY


NATIONAL GREEN INFRASTRUCTURE
ngicp
CERTIFICATION PROGRAM
PUSH
BUFFALO
RAIN
CHECK
clean water buffalo
BUFFALO
SEWER AUTHORITY

BUFFALO
SEWER AUTHORITY

RAIN CHECK
clean water buffalo

RAINCHECK

BUFFALO

SEWER AUTHORITY

When stormwater falls in a natural environment

Natural landscapes, soil and wetlands **can absorb stormwater** because they are **porous.**

When stormwater falls in an urban environment

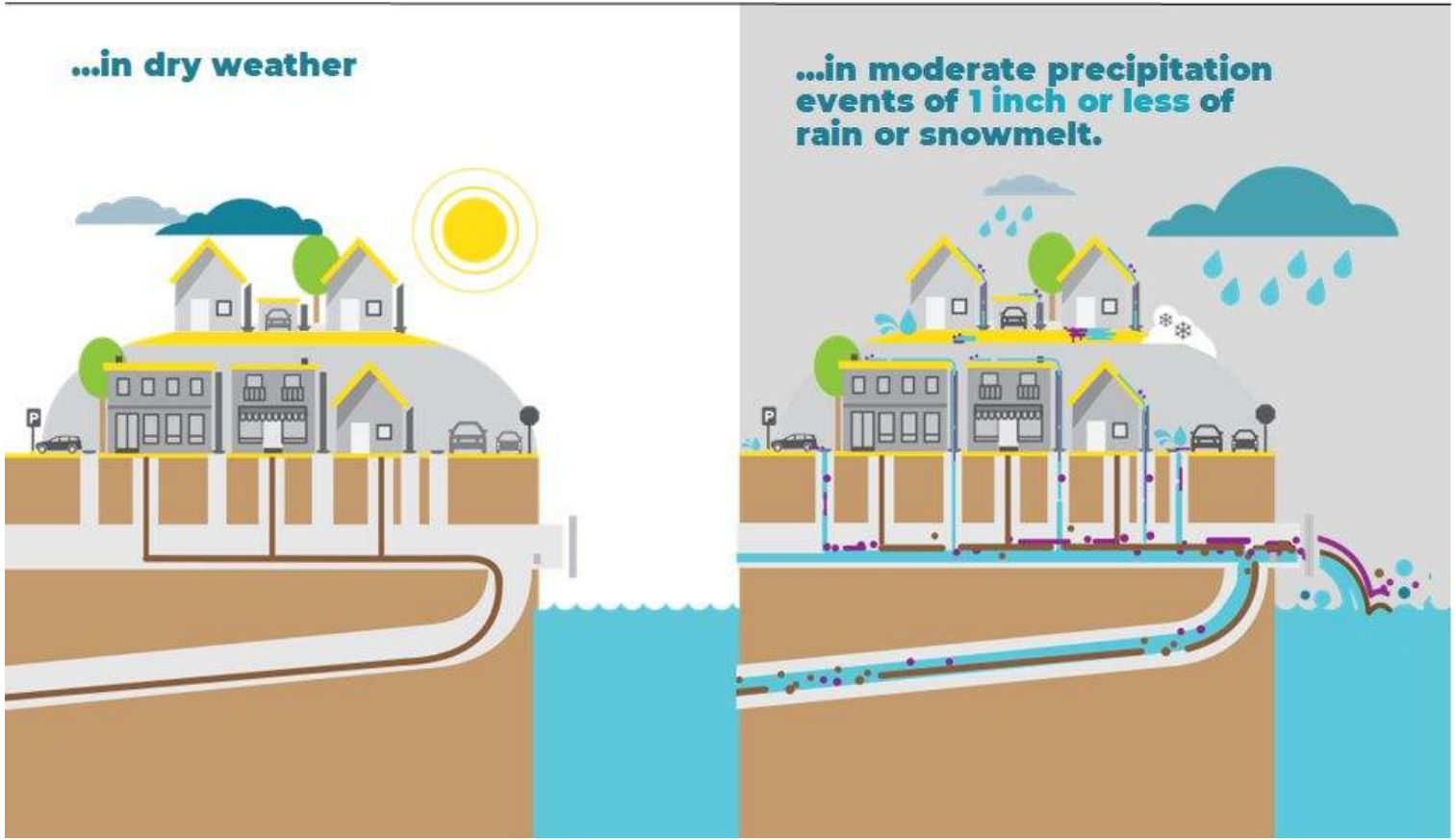
Stormwater needs to be managed because of the streets, buildings, parking lots, **and other hard surfaces we've built. Getting water off these surfaces quickly protects** the health and safety of people and the structural integrity of the things we've built.

Sidewalks, roads, driveways, and roofs can't absorb stormwater because they are **impervious surfaces.**

As stormwater flows across these impervious surfaces, it picks up dirt and **pollutants**, creating runoff.

This **polluted runoff** combines with **wastewater** from homes and businesses, often **overflowing into waterways.**

How our combined sewer system works...



Gray

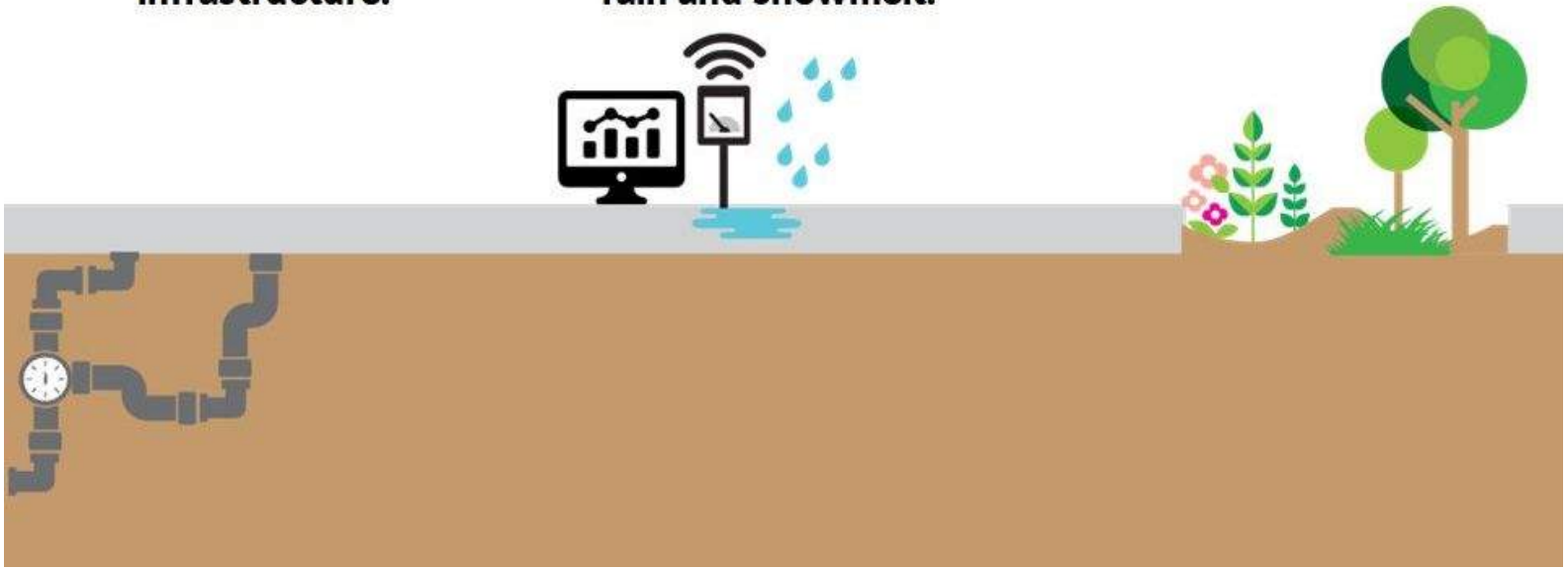
Expanding the capacity and efficiency of our pipes, pumps, and underground infrastructure.

Smart

Using "real time" sensors to move stormwater away from parts of the sewer system hit with lots of rain and snowmelt.

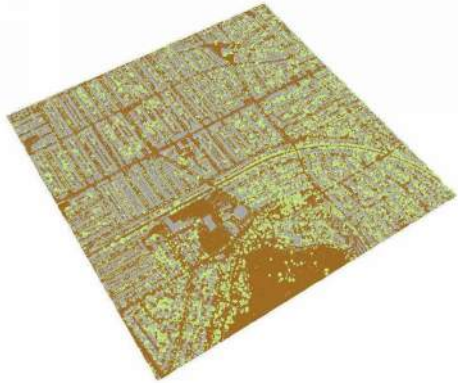
Green

Preventing or slowing water from reaching the sewer system with "green infrastructure."

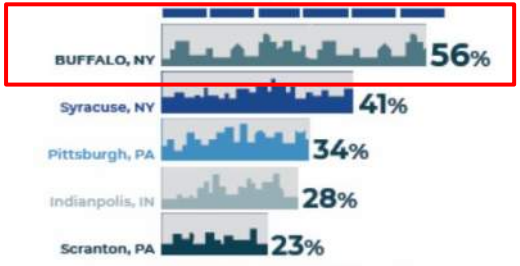


Green infrastructure is designed to mimic how the natural environment manages stormwater.

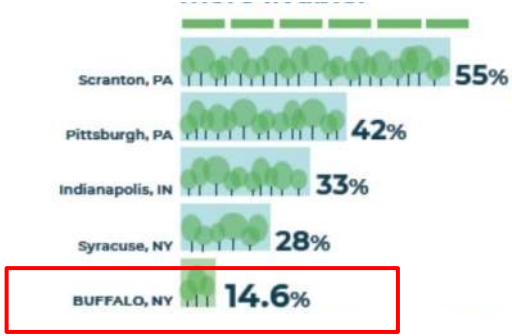
RAINCHECK

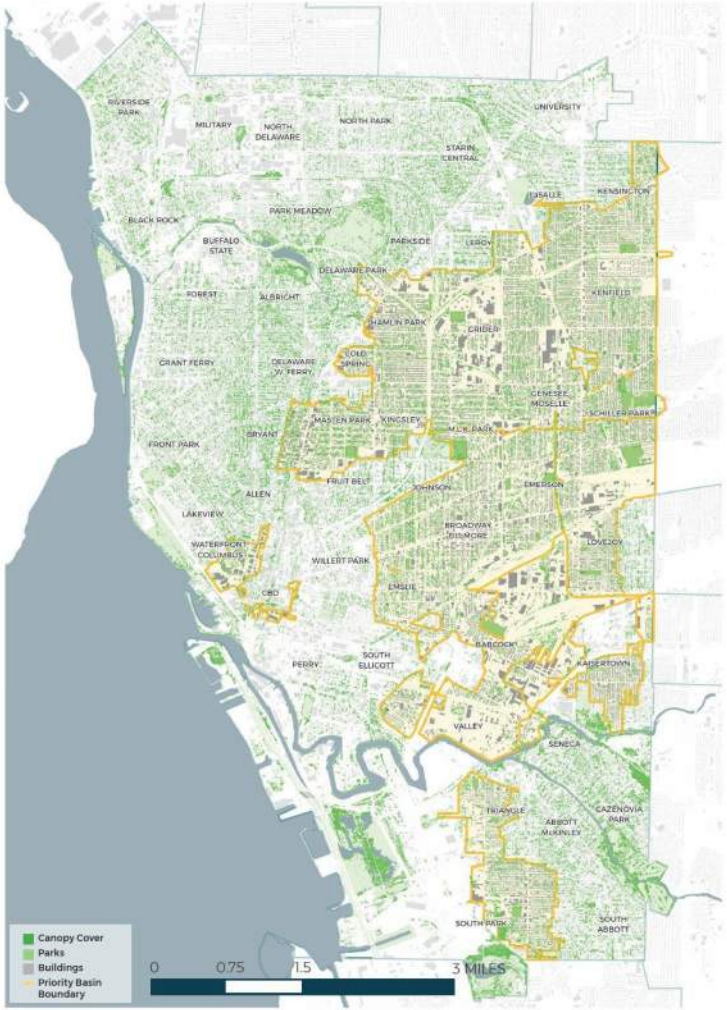


Impervious Area

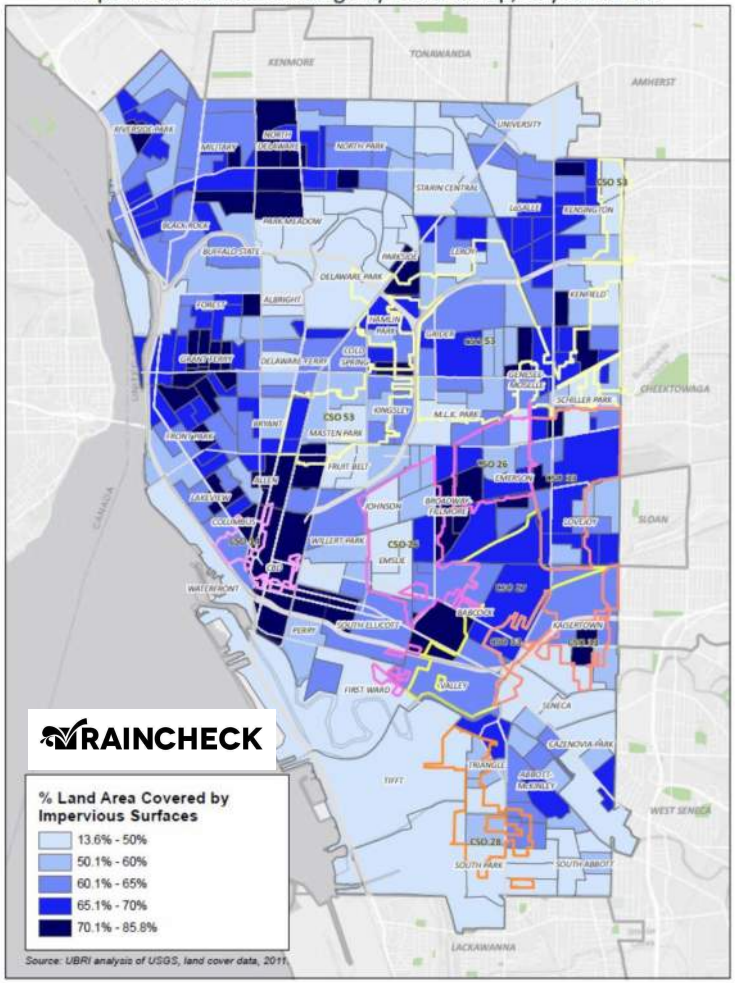


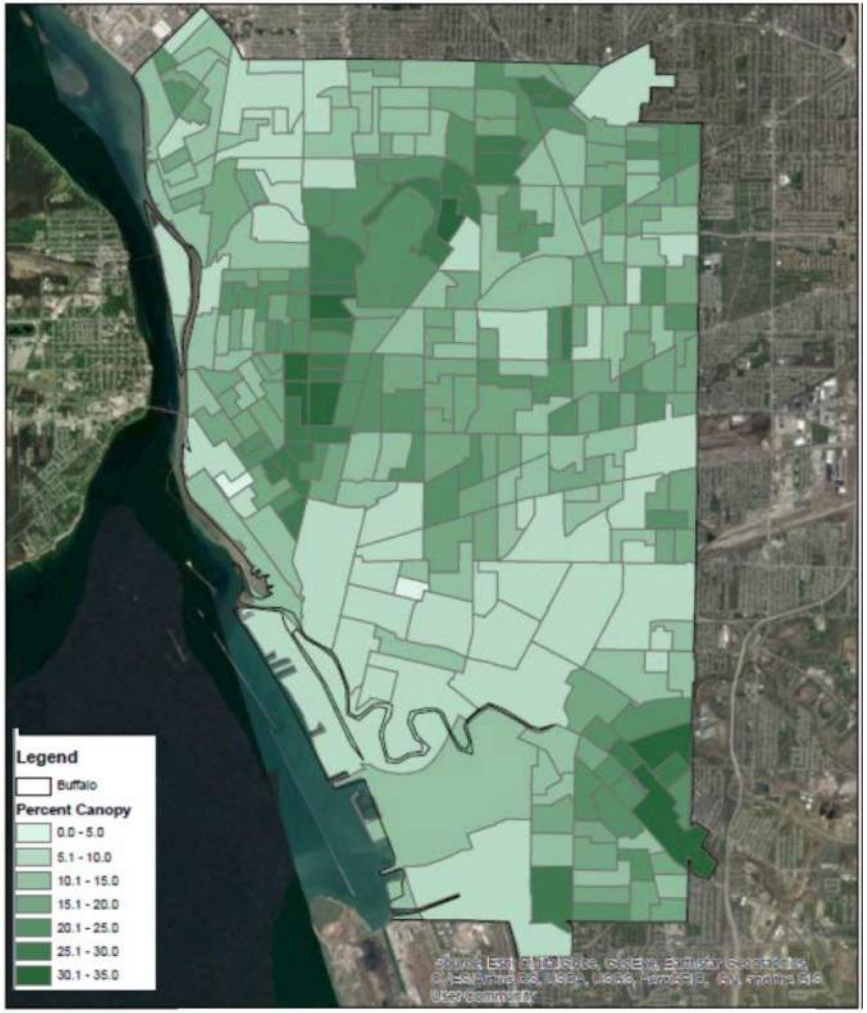
Tree Canopy Area





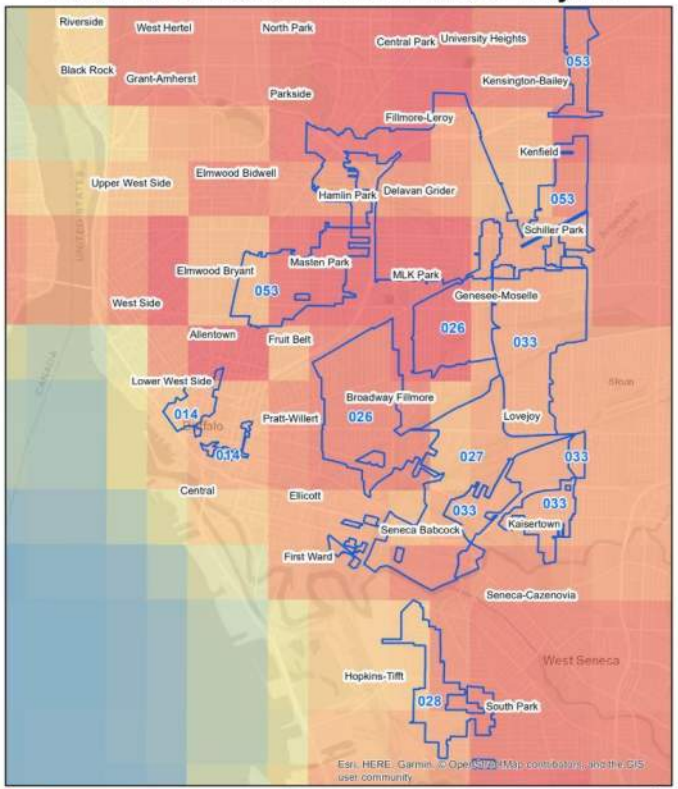
Impervious Surface Coverage by Block Group, City of Buffalo




Legend
Buffalo
Percent Canopy
0.0 - 5.0
5.1 - 10.0
10.1 - 15.0
15.1 - 20.0
20.1 - 25.0
25.1 - 30.0
30.1 - 35.0

RAINCHECK

Urban Heat Island Effect in Buffalo- Daytime



CSO Priority Basins

0 0.250.5 1 1.5 2 Miles

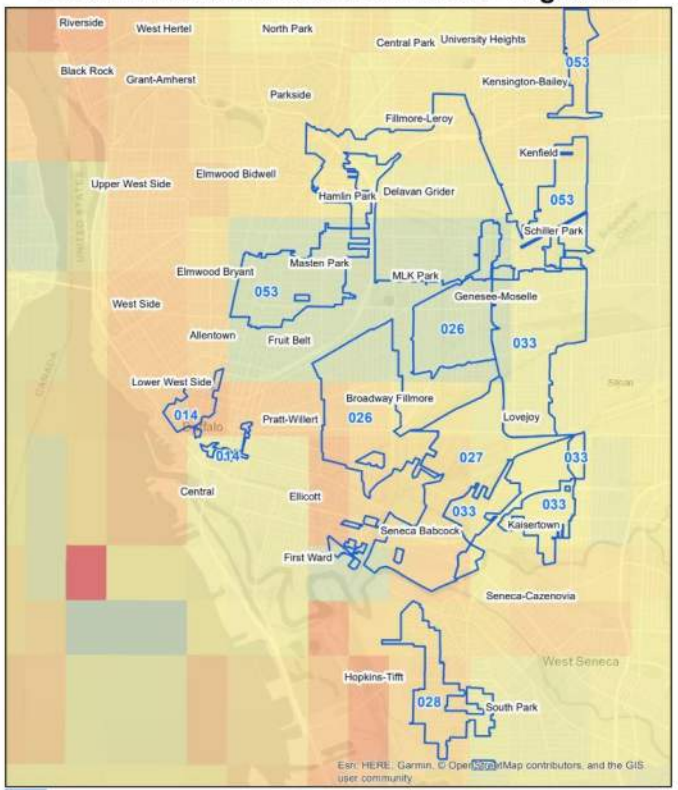
2013 Maximum Daytime Temperature (°F)

Value

- 109
- 100
- 91
- 82
- 73

Center for International Earth Science Information Network (CIESIN), Columbia University. 2016. Global Urban Heat Island (UHI) Data Set, 2013. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC).

Urban Heat Island Effect in Buffalo- Nighttime



CSO Priority Basins

0 0.250.5 1 1.5 2 Miles

2013 Minimum Nighttime Temperature (°F)

Value

- 71
- 65
- 58
- 51
- 45

Center for International Earth Science Information Network (CIESIN), Columbia University. 2016. Global Urban Heat Island (UHI) Data Set, 2013. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC).

RAINCHECK

Green Streets

Green Parking Lots

Demolitions and Vacant Lot Restoration

Rain Barrels and Downspout Disconnections

RAINCHECK

More than 9 miles of green streets across Buffalo

are helping us meet our stormwater challenge

101.5 acres managed for stormwater

15.9 acres of impervious surfaces reduced

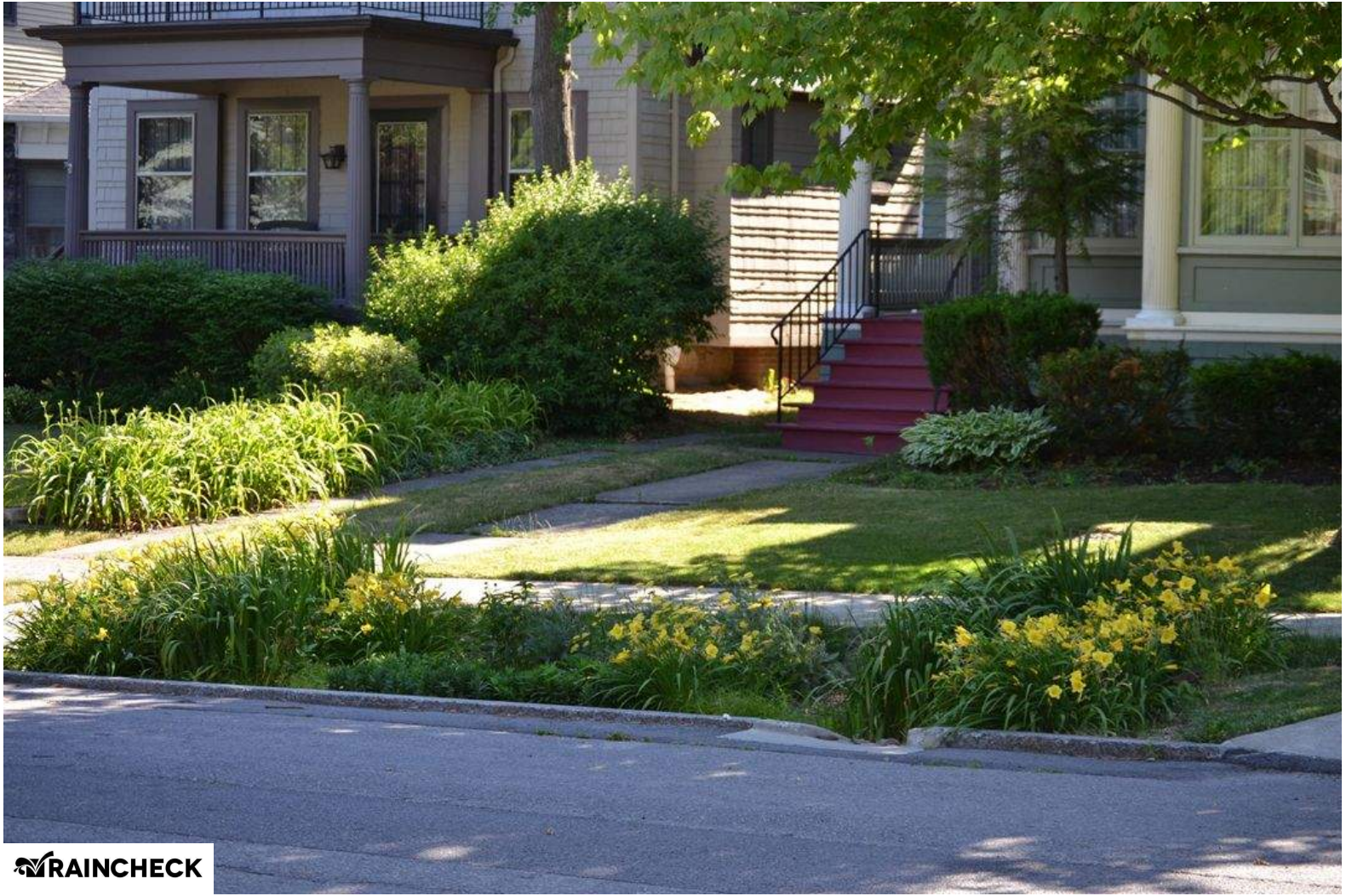
1,908,045

gallons of runoff prevented from entering the sewer system in a typical rainfall event.

1. Kenmore Ave
2. Parkdale Ave
3. Claremont Ave
4. Elmwood Ave
5. Windsor Ave
6. Clarendon Ave
7. Ardmore Place
8. Niagara Street (Phase 3&4)
9. Northland Ave
10. Carlton St
11. Niagara Street (Phase 1&2)
12. Pearl St
13. Genesee St
14. William St
15. Ohio St

RAINCHECK


FOR SALE


RAINCHECK

RAINCHECK

RAINCHECK

GREEN STREETS CURRENTLY IN-CONSTRUCTION

Niagara Phase 3 & 4A

14.7 ACRES IMPERVIOUS AREA MANAGED WITH GI

195 STORM PLANTERS

24 SAND FILTERS

APPROX. 50,000 SF PLANTED AREA

788 TREES

Willert Park

13.88 ACRES IMPERVIOUS AREA MANAGED WITH GI

30,000 SF POROUS ASPHALT

APPROX. 5,000 SF PLANTED AREA

64 TREES

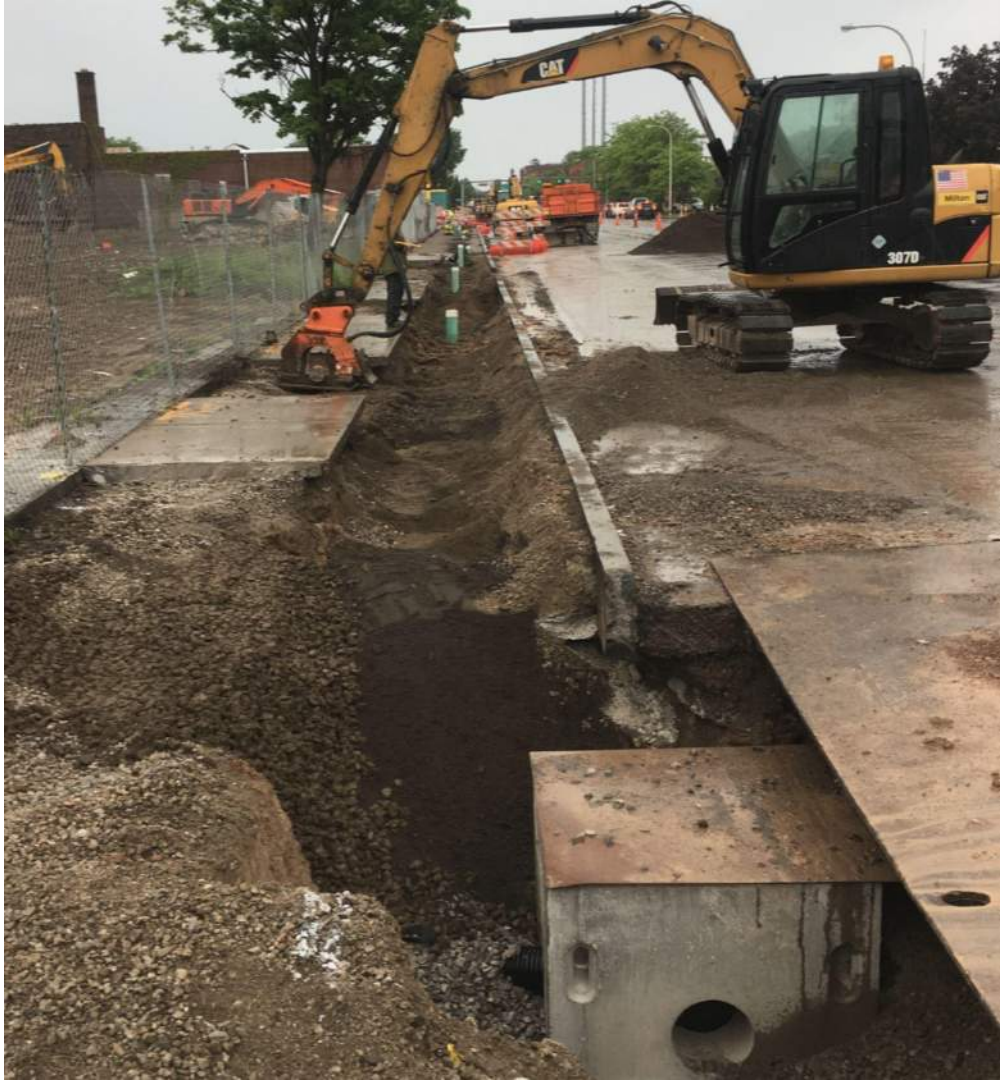
Northland Ave.

6.08 ACRES IMPERVIOUS AREA MANAGED WITH GI

2,268 LF SWALES

APPROX. 5,000 SF BIORETENTION AREA

82 TREES



RAINCHECK

RAINCHECK

2.35 acres of green parking lots across Buffalo

are helping us meet our stormwater challenge

6.8 acres managed for stormwater

2.7 acres of impervious surfaces reduced

257,083

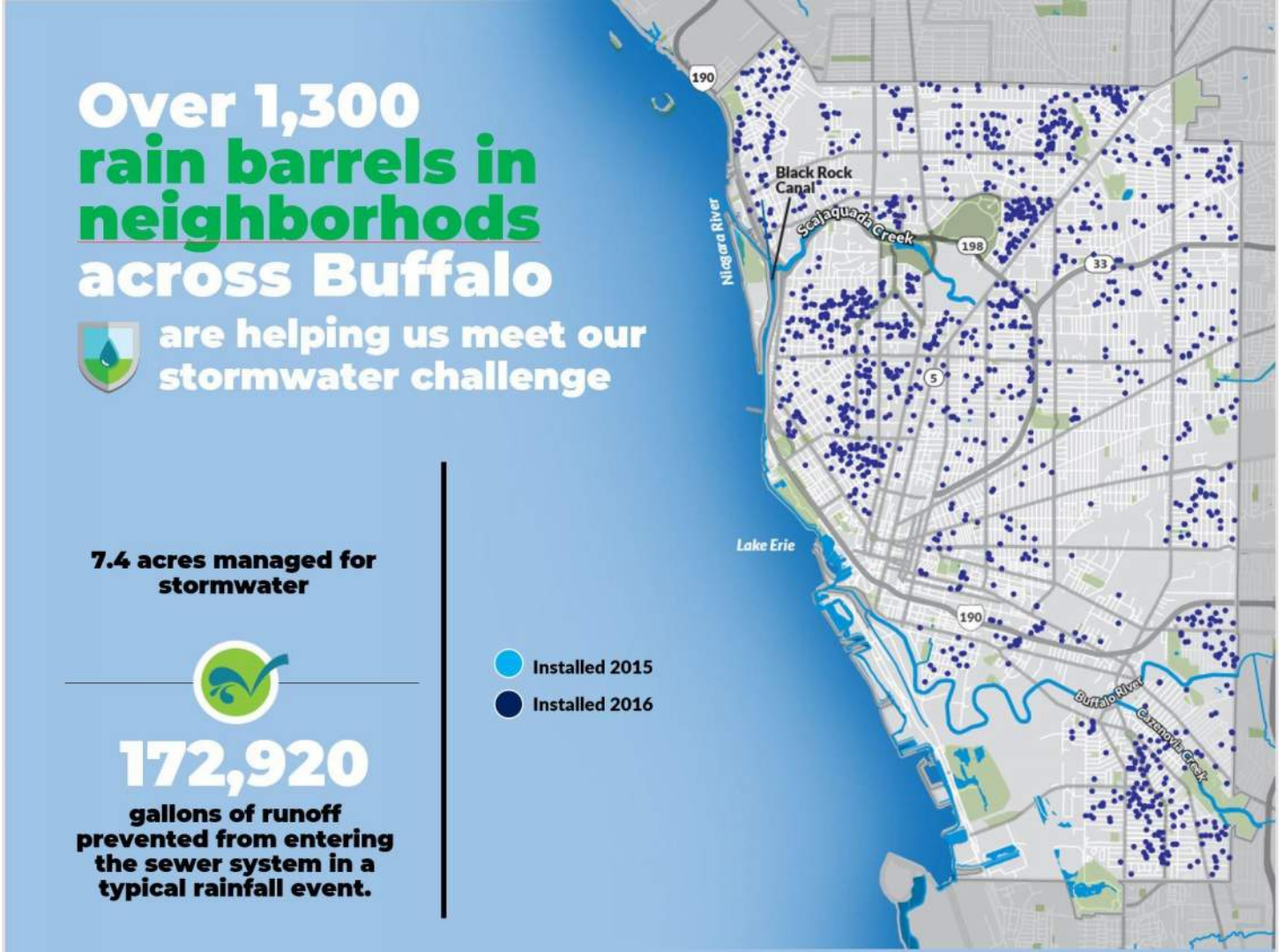
gallons of runoff prevented from entering the sewer system in a typical rainfall event.

6 Green Parking Lot Projects

1. North Buffalo Ice Rink
2. Broderick Park
3. 1401 Fillmore Avenue
4. 1384 Fillmore Avenue
5. Pratt Willert Community Center
6. JFK Community Center

Over 1,300 rain barrels in neighborhods across Buffalo

are helping us meet our stormwater challenge



7.4 acres managed for stormwater

172,920

gallons of runoff prevented from entering the sewer system in a typical rainfall event.

- Installed 2015
- Installed 2016

RAINCHECK


WAS YOUR PROPERTY RECENTLY
RAINCHECK'D?
716.851.4664
raincheckbuffalo.org
SUPER DUTY
NEW YORK
Buffalo Sewer Authority
A4320
ERIE
RAINCHECK

RAINCHECK

6,681 demolitions including 224 green-post demolitions across Buffalo

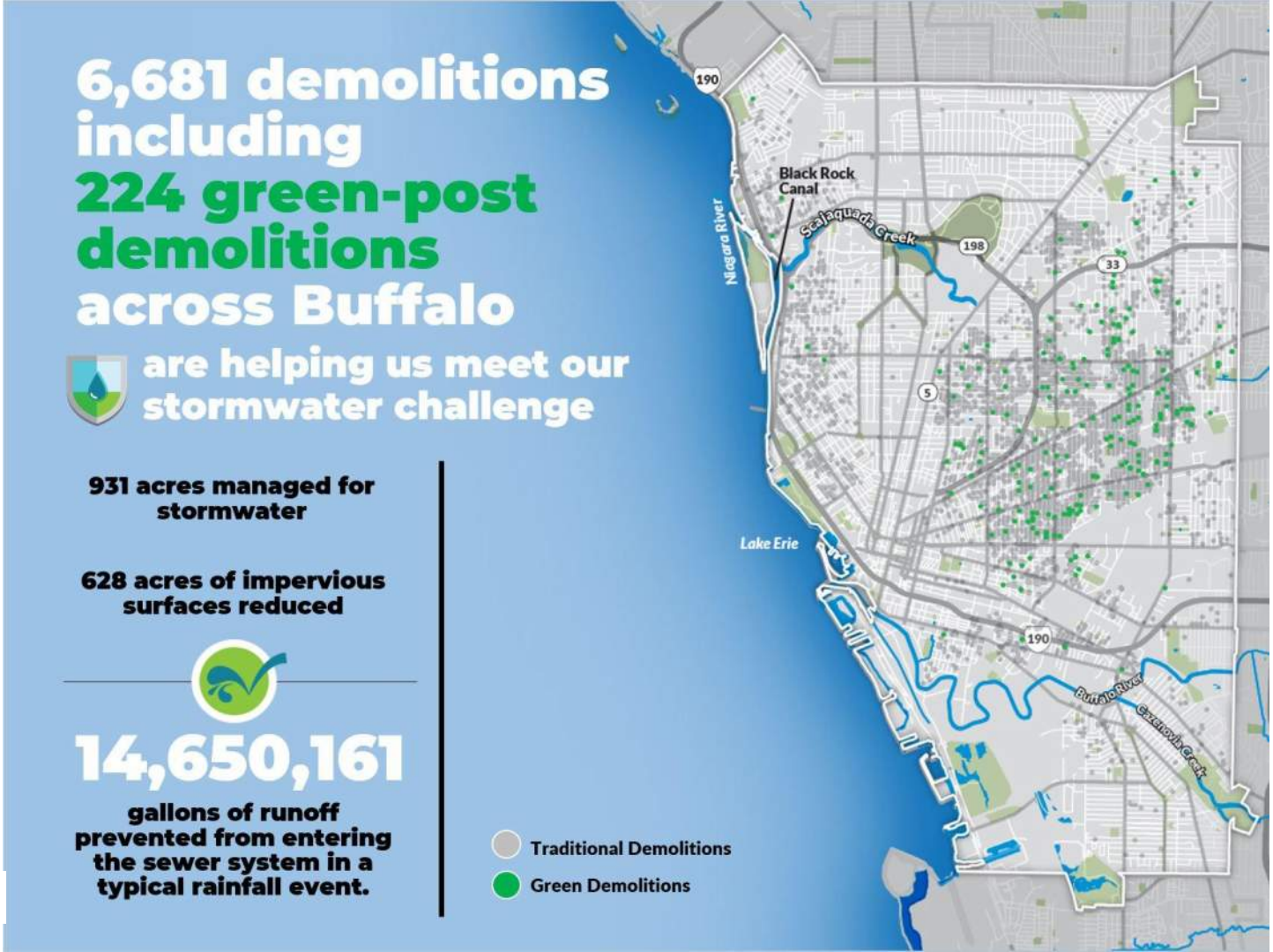
are helping us meet our stormwater challenge

931 acres managed for stormwater

628 acres of impervious surfaces reduced

14,650,161

gallons of runoff prevented from entering the sewer system in a typical rainfall event.

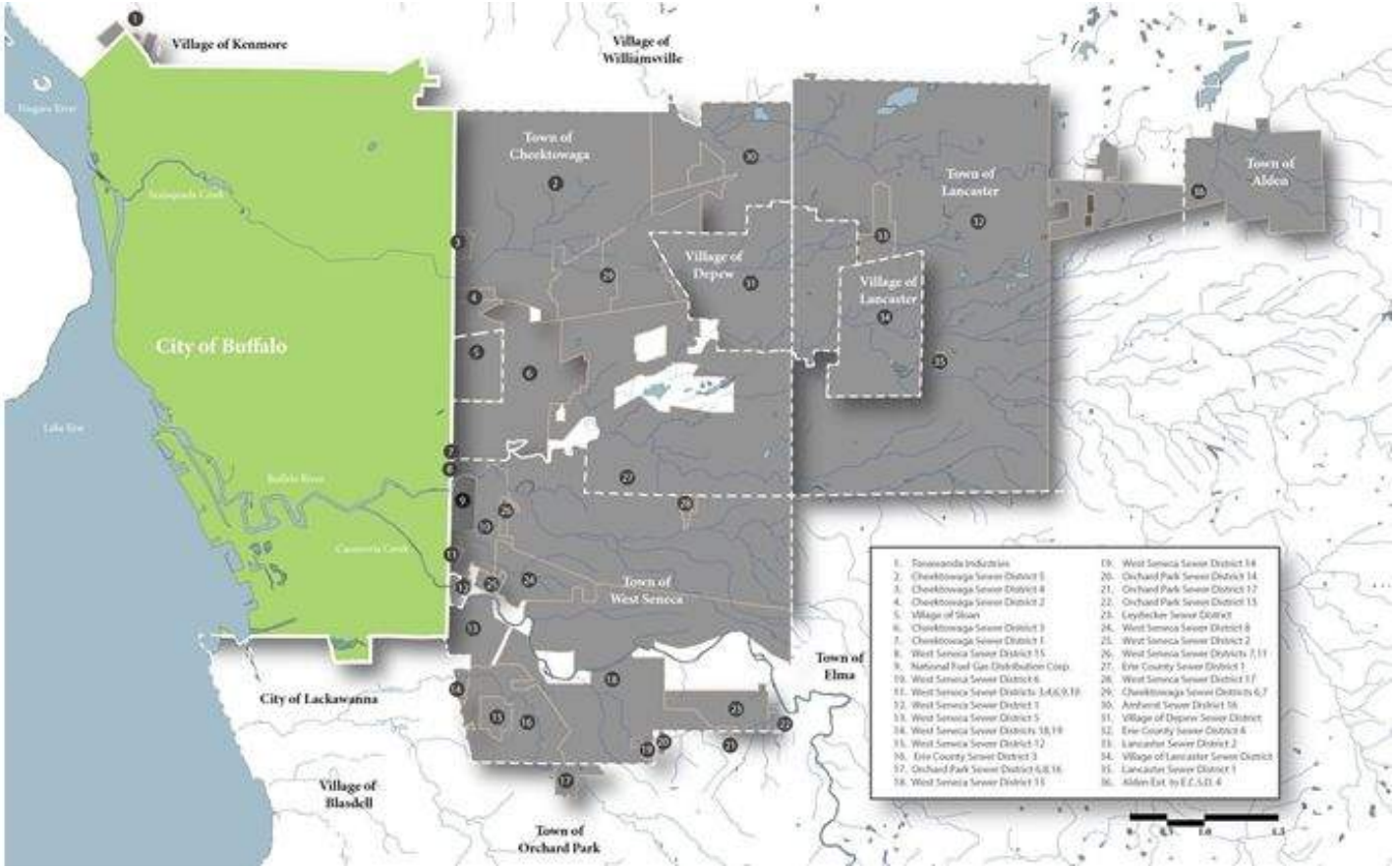


RAINCHECK


THIS PROPERTY
HAS BEEN
RAIN
CHECK'D
RAINCHECKBUFFALO.ORG


CITY OF BUFFALO
GREEN INFRASTRUCTURE
RAIN BARRELS
GREEN SPACE
WETLAND & SHORELINE BUFFER
GREEN STREET
STORM PLANTER
PERMEABLE PAVERS
BIO-SWALE
RAIN GARDEN
POROUS ASPHALT

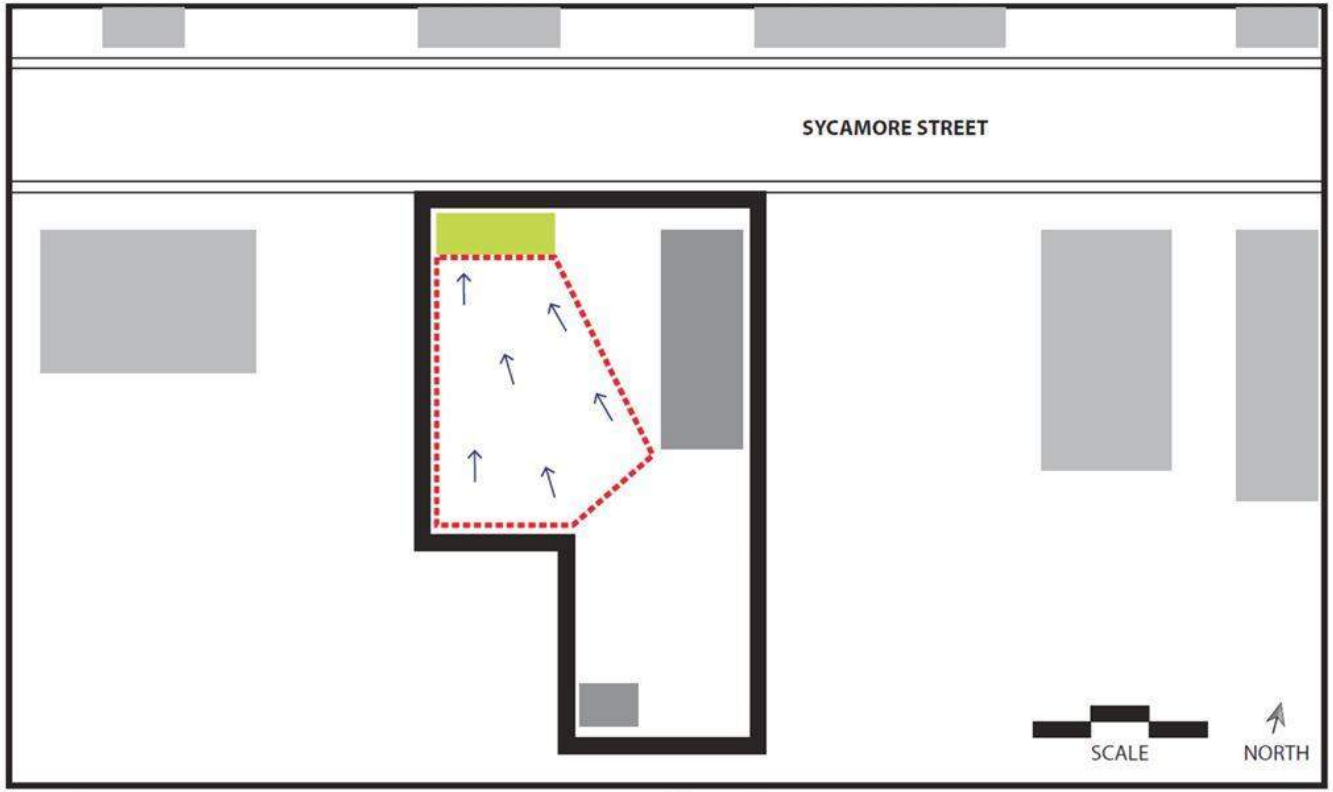
- Established in 1938
- Services the City of Buffalo, NY and 11 Surrounding Municipalities
- 110 Square Miles of Coverage, 850 miles of sewer pipe
- Serves Over 550,000 People
- Annual Operating Budget of $54.9 Million
- Undertakes Over $20 Million in Capital Projects Annually



RAINCHECK

- Long Term Control Plan (LTCP) Approved by Agencies in 2014
- 20 year plan to be completed by March, 2034
- BSA Committed to Invest $430 Million Over 20 Years on Projects
- 97% of Wet Weather Flows to be Captured upon Completion of LTCP
- Manage 1,315 acres of impervious surface area with Green Infrastructure

RAINCHECK



LEGEND

- GREEN INFRASTRUCTURE LOCATION
- IMPERVIOUS CONTRIBUTING DRAINAGE AREA
- STORMWATER RUNOFF FLOW DIRECTION
- PROPERTY BOUNDARY
- BUILDINGS

DATA

PROPERTY ADRESS: 123 SYCAMORE ST.

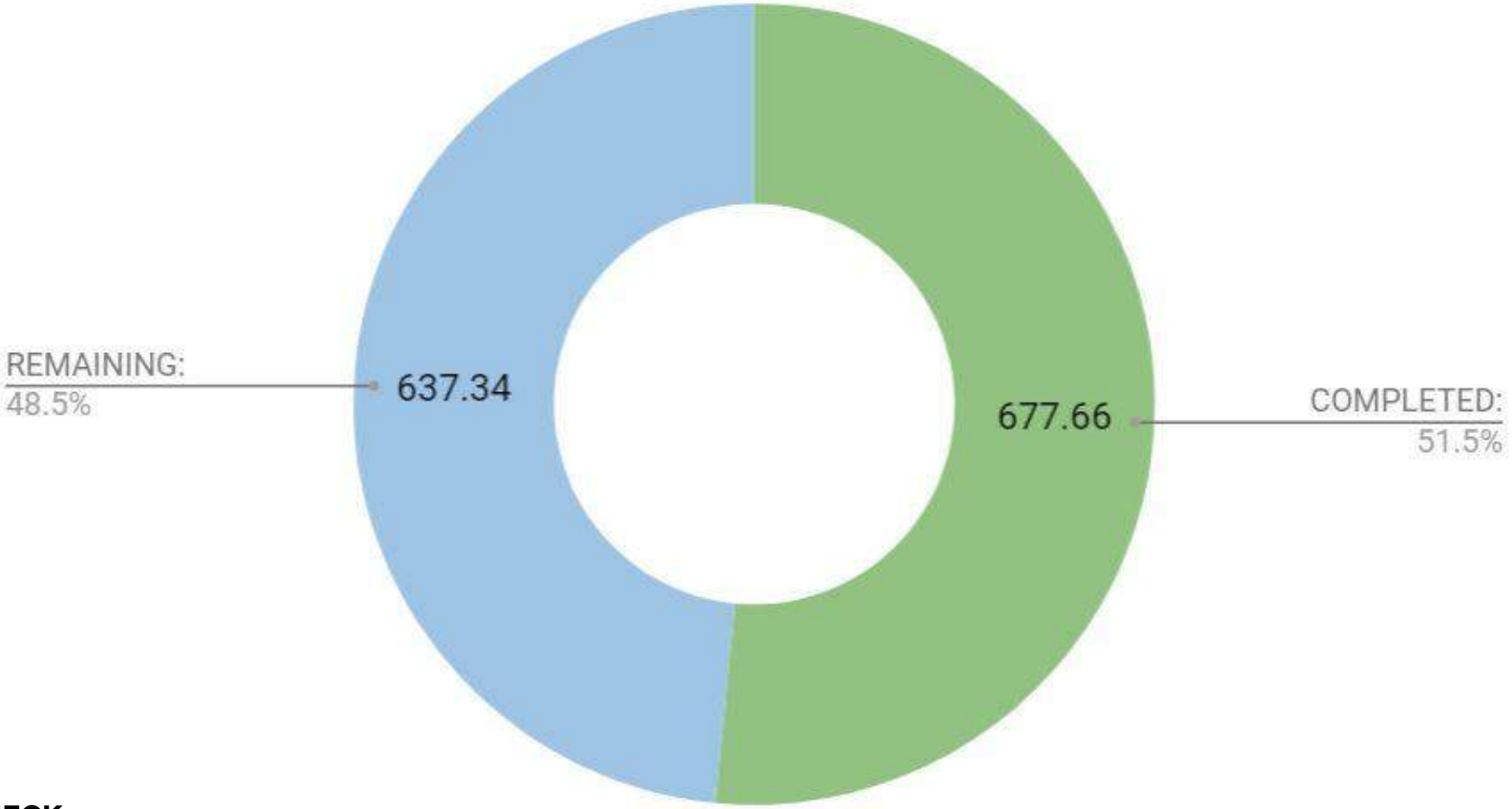
IMPERVIOUS CONTRIBUTING DRAINAGE AREA: 20,000 SF

GREEN INFRASTRUCTURE TYPE: RAIN GARDEN

GREEN INFRASTRUCTURE AREA: 2,000 SF

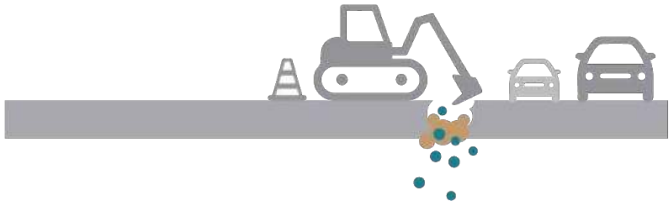
RAINCHECK

LTCP Progress - Impervious Acres Managed

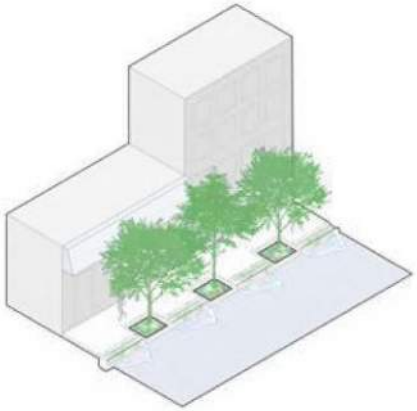


RAINCHECK

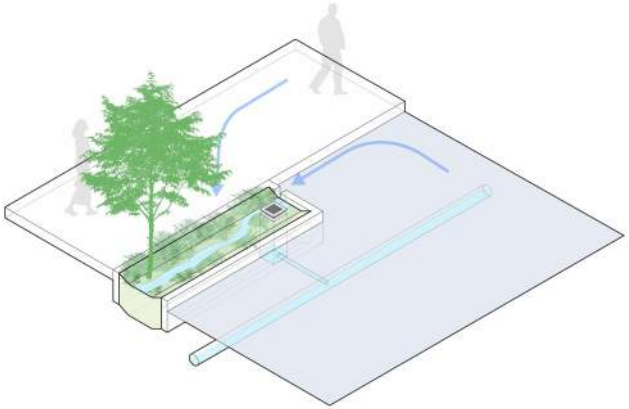
NIAGARA ST. PHASE 3 & 4



IMPERVIOUS SURFACE REMOVAL (DE-PAVE)



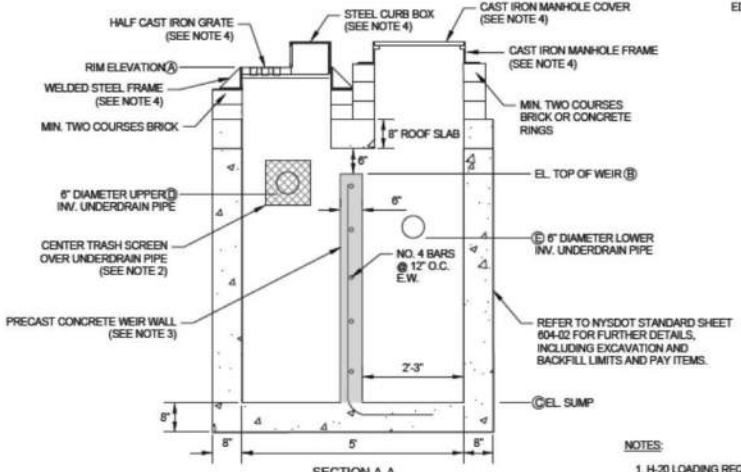
STREET TREES



STORMWATER PLANTERS

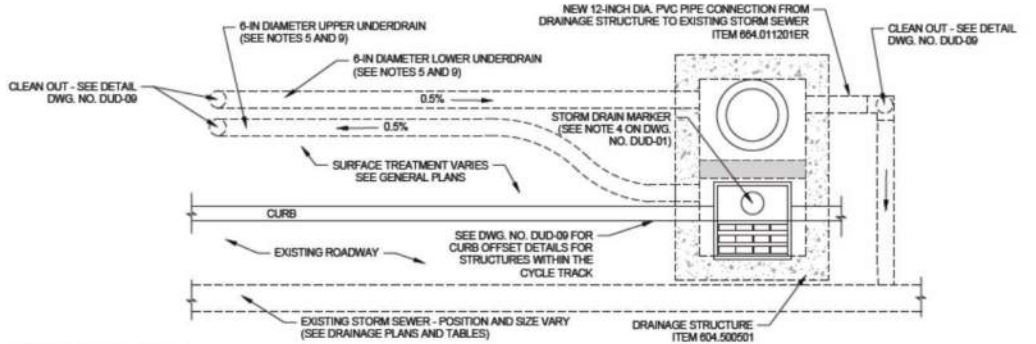
STRUCTURE PLAN

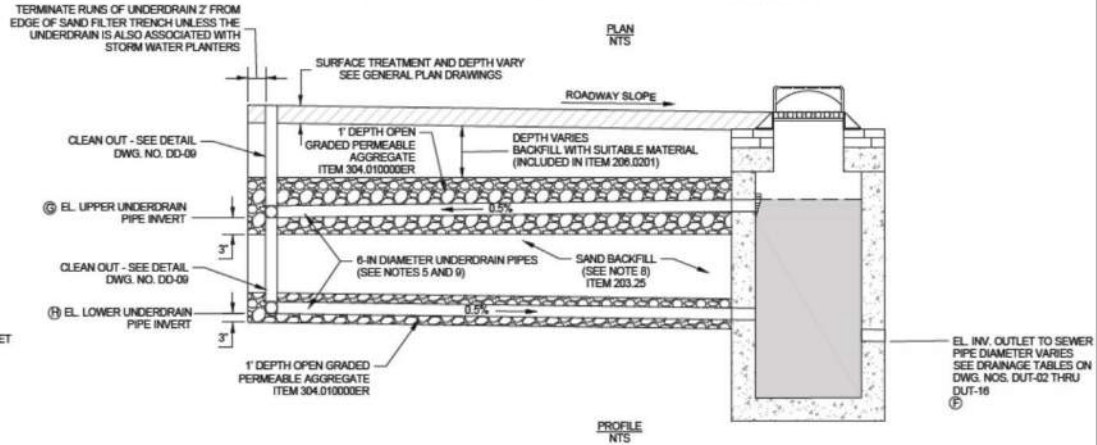
NOTE: SHOWN WITHOUT BRICKS/RINGS, FRAMES, GRATES, AND COVERS FOR CLARITY. SEE SECTION A-A BELOW FOR INFORMATION.



SECTION A-A

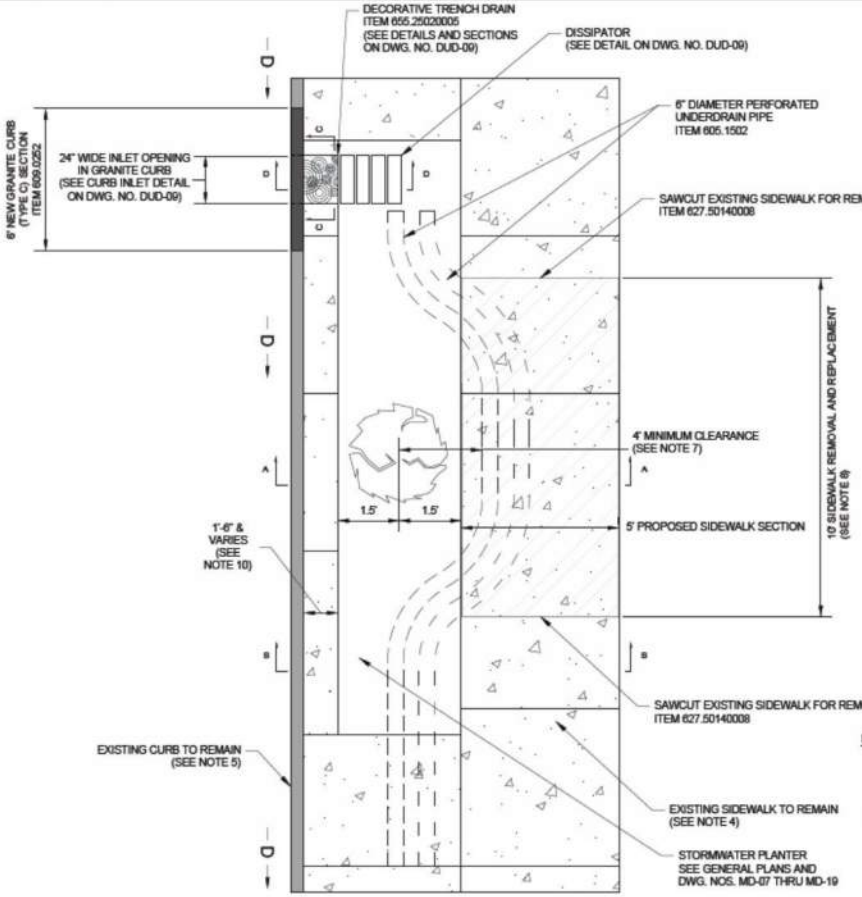
SPECIAL DRAINAGE STRUCTURE
ITEM 604.500501



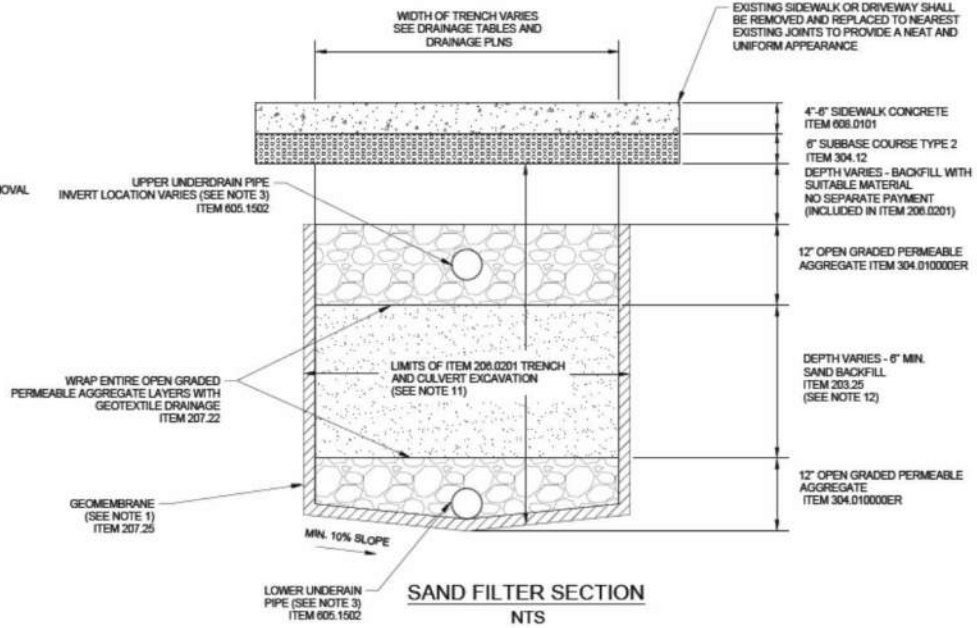


NOTES:

1. H-20 LOADING REQUIRED FOR ALL DRAINAGE STRUCTURES. REINFORCEMENT SHALL FOLLOW THE DESIGN FOR A TYPE C STRUCTURE PER NYSDOT STANDARD SHEET 604-02 (TYP).
2. TRASH SCREEN SHALL BE EFFLUENT DESIGN AND FABRICATE 'AT' SERIES W2" X 2" X $\frac{1}{4}$" BARS TRASH SCREEN AND WEIR WALL INCLUDED IN COST FOR ITEM 604.500501.
3. WEIR WALL CAN BE EITHER REINFORCED CONCRETE AS SHOWN IN SECTION A-A OR STEEL AS
6. SEE DRAWING NOS. DUP-01 THRU DUP-15 FOR DRAINAGE PLAN SHEETS THAT DEPICT THE LOCATION AND LAYOUT OF NEW DRAINAGE STRUCTURES AND THE ASSOCIATED FILTER TRENCHES.
7. SEE DRAWING NOS. DUT-02 THRU DUT-16 FOR DRAINAGE TABLES THAT PROVIDE INFORMATION TO CONSTRUCT EACH TRENCH AND ASSOCIATED DRAINAGE STRUCTURE, INCLUDING ALL INVERTS FOR THE STRUCTURE AND UNDERDRAIN PIPING.



PLAN VIEW
TYPICAL UNDERDRAIN POSITIONING AT TREE

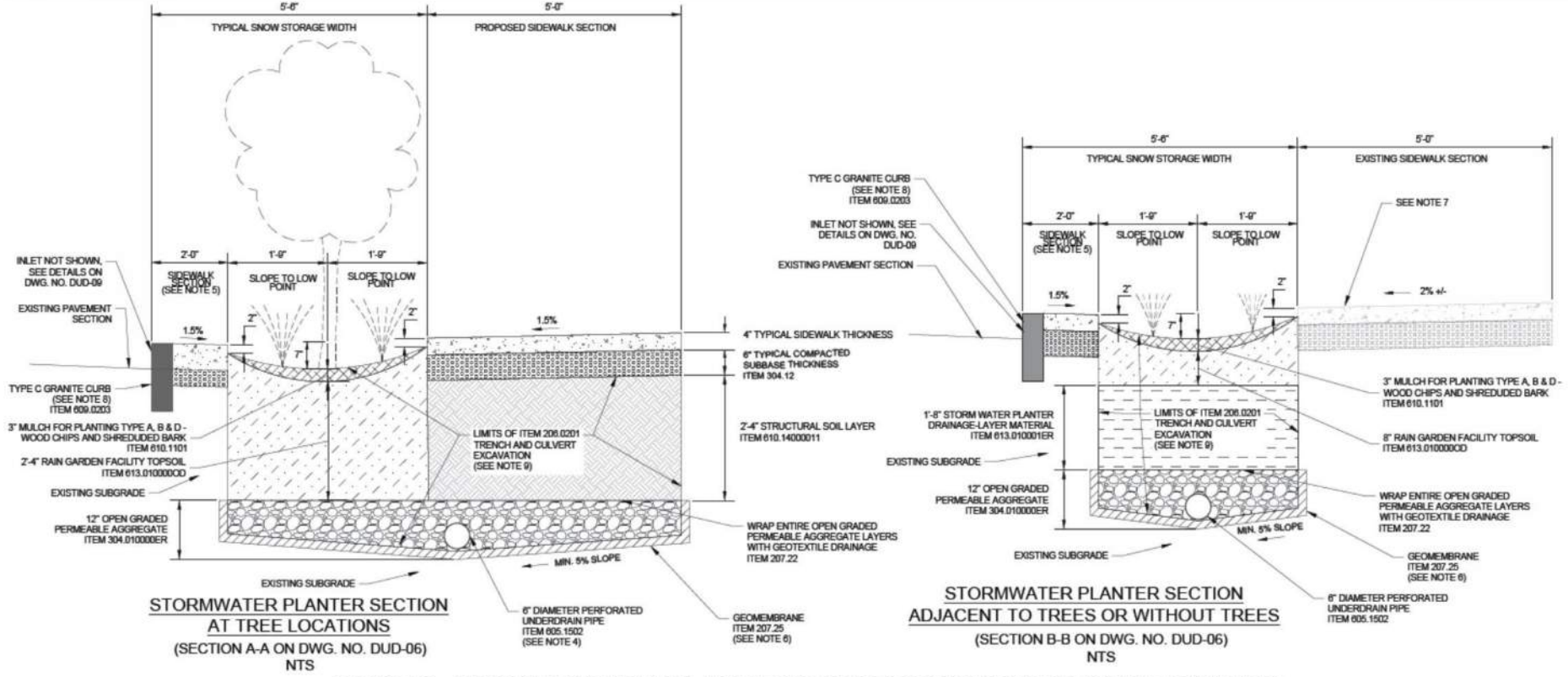


SAND FILTER SECTION
NTS

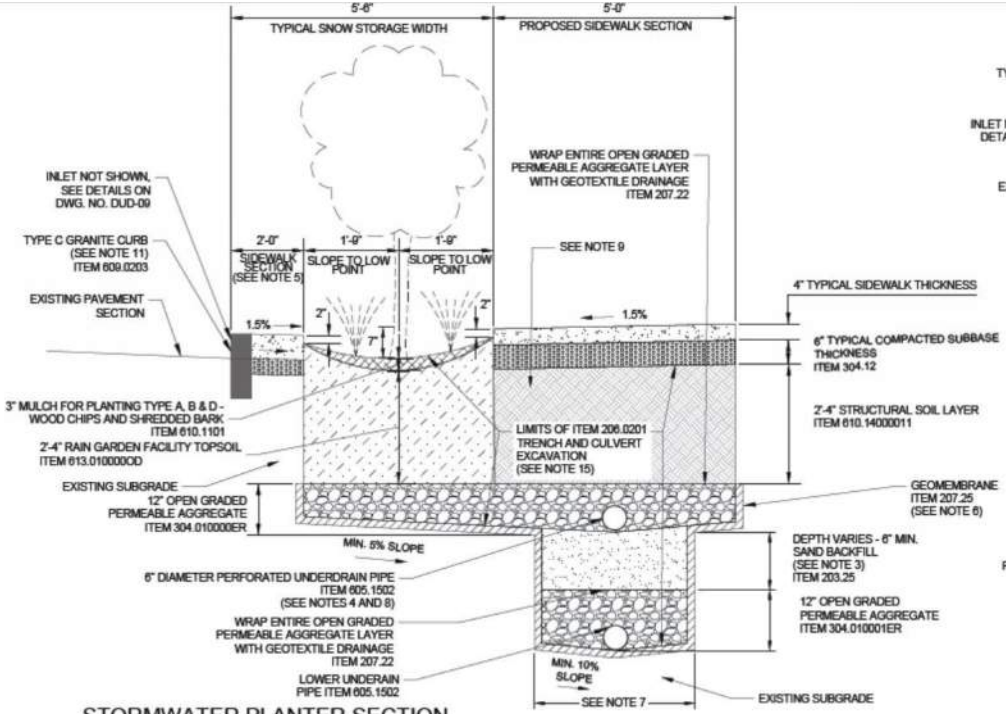
TYPE 1: SAND FILTER INDEPENDENT OF STORMWATER PLANTER

NOTES:

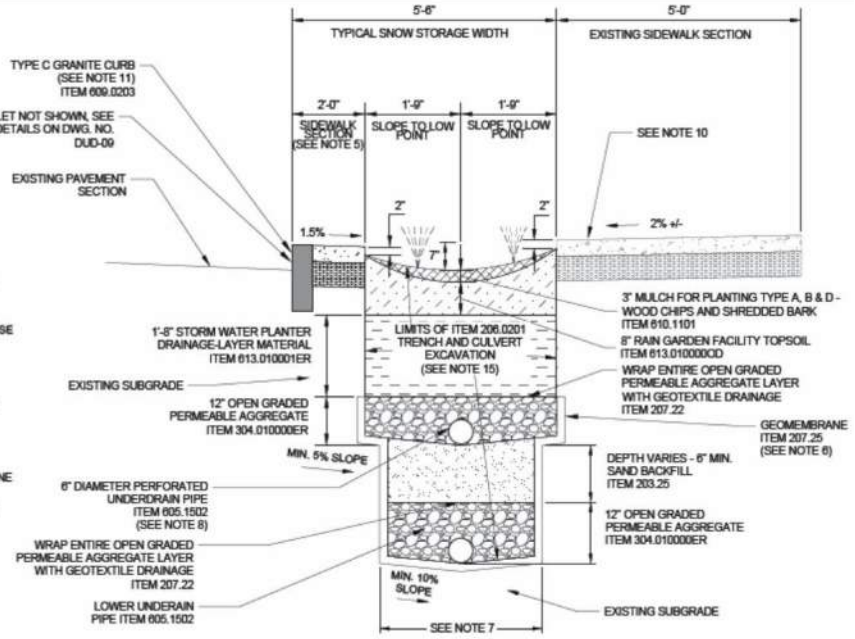
1. GEOMEMBRANE IS REQUIRED FOR ALL STORMWATER PLANTERS AND SAND FILTERS UNLESS OTHERWISE INDICATED ON THE PLANS. INSTALL GEOMEMBRANE AT THE BOTTOM OF THE PROPOSED EXCAVATION AND ALONG THE TRENCH WALLS TO THE TOP OF THE PROPOSED OPEN GRADED PERMEABLE AGGREGATE LAYER AS INDICATED IN SAND FILTER SECTION ABOVE.
2. SEE DWG. NOS. MD-07 THRU MD-19 FOR PLANTING LAYOUT.
3. SEE DWG. NOS. DUT-02 THRU DUT-16 FOR DRAINAGE TABLES.
4. EXISTING SIDEWALK TO REMAIN UNLESS OTHERWISE NOTED ON THE GENERAL PLAN DRAWINGS OR DRAINAGE DETAIL DWG. NOS. DUD-07 AND DUD-08.
5. EXISTING CURB TO REMAIN UNLESS OTHERWISE NOTED ON THE GENERAL PLAN DRAWINGS OR DRAINAGE DETAIL DWG. NOS. DUD-07 AND DUD-08.
6. SEE DRAINAGE DETAIL DWG. NOS. DUD-07 AND DUD-08 FOR SECTION A-A AND SECTION B-B WHERE STORMWATER PLANTERS ARE STAND-ALONE AND WHERE STORMWATER PLANTERS ARE ASSOCIATED WITH SAND FILTERS.
7. ALL RUNS OF UNDERDRAIN SHALL BE PLACED AT A 4-FOOT HORIZONTAL OFFSET FROM EXISTING AND PROPOSED TREES.



TYPE 2: STORMWATER PLANTERS INDEPENDENT OF SAND FILTERS

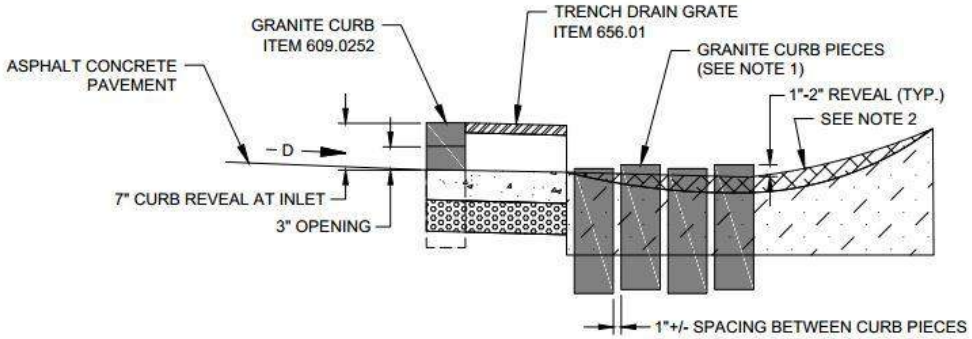


STORMWATER PLANTER SECTION
AT TREE LOCATIONS
(SECTION A-A ON DWG. NO. DUD-06)
NTS

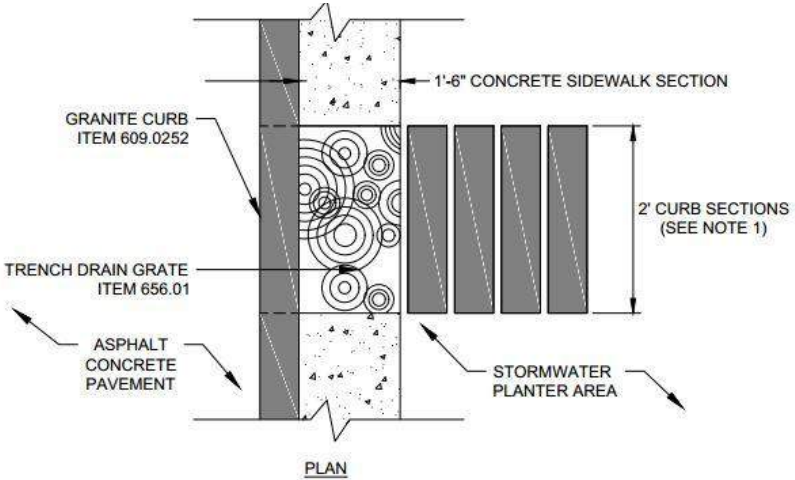


STORMWATER PLANTER SECTION
ADJACENT TO TREES OR WITHOUT TREES
(SECTION B-B ON DWG. NO. DUD-06)
NTS

TYPE 3: STORMWATER PLANTERS WITH ASSOCIATED SAND FILTERS



SECTION D-D
(SEE DWG. NO. DD-06)



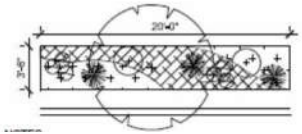
PLAN

DISSIPATOR INSTALLATION DETAILS

NOT TO SCALE

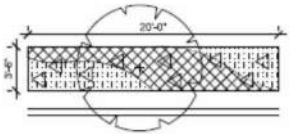
PLANTING BED 8B									
PLANTINGS - HIGH GROWTH 8									
GENUS SPECIES	COMMON NAME	ITEM NUMBER	ITEM NUMBER DESCRIPTION	CONTAINER	SPACING	SPACING DIAGRAM	AREA (SF)	QUANTITY	UNIT
PANICUM VIRGATUM	SWITCH GRASS	611.0651	PLANTING VINES, GROUNDCOVERS - NUMBER 1 CONTAINER, CONTAINER GROWN	1	18"		-	3	EA
HEMEROCALLIS 'STELLA D'ORO'	DWARF DAYLILY	611.0651	PLANTING VINES, GROUNDCOVERS - NUMBER 1 CONTAINER, CONTAINER GROWN	1	18"		-	6	EA
CAREX PRAEGRACILIS	CLUSTERED FIELD SEDGE	611.0651	PLANTING VINES, GROUNDCOVERS - NUMBER 1 CONTAINER, CONTAINER GROWN	1	6" TO 10"		35	79	EA
FESTUCA GLAUCA 'ELIJAH BLUE'	NO MOW GRASS	611.0651	PLANTING VINES, GROUNDCOVERS - NUMBER 1 CONTAINER, CONTAINER GROWN	1	6 TO 10"		35	79	EA
ITEA VIRGINICA	SWEET SPIRE	611.0452	PLANTING - DECIDUOUS SHRUBS - 3 FOOT HEIGHT/SPREAD	3 GAL	24-36"		-	2	EA

PLANTING BED 8B				
MATERIALS				
ITEM NUMBER	ITEM NUMBER DESCRIPTION	AREA (SF)	QUANTITY	UNIT
610.1101	MULCH FOR PLANTING TYPE A, B & D - WOOD CHIPS AND SHREDDED BARK	70	0.65	CY
613.010000OD	RAIN GARDEN FACILITY TOPSOIL	70	2.27	CY
613.010001ER	STORM WATER PLANTER DRAINAGE LAYER MATERIAL	70	4.32	CY



PLANTING BED 8C									
PLANTINGS - LOW GROWTH									
GENUS SPECIES	COMMON NAME	ITEM NUMBER	ITEM NUMBER DESCRIPTION	CONTAINER	SPACING	SPACING DIAGRAM	AREA (SF)	QUANTITY	UNIT
SALIX REPENS	CREEPING WILLOW	611,0651	PLANTING VINES, GROUNDCOVERS - NUMBER 1 CONTAINER, CONTAINER GROWN	1	12"		35	35	EA
HYPERICUM CALYCINUM	ST, JOHNS WORT	611,0651	PLANTING VINES, GROUNDCOVERS - NUMBER 1 CONTAINER, CONTAINER GROWN	1	12"		-	9	EA
LIRIOPE SPICATA 'GIN-RYU'	LILY TURF SILVER DRAGON	611,0651	PLANTING VINES, GROUNDCOVERS - NUMBER 1 CONTAINER, CONTAINER GROWN	1	10"		35	50	EA

PLANTING BED 8C				
MATERIALS				
ITEM NUMBER	ITEM NUMBER DESCRIPTION	AREA (SF)	QUANTITY	UNIT
610,1101	MULCH FOR PLANTING TYPE A, B & D - WOOD CHIPS AND SHREDDED BARK	70	0,65	CY
613,010000OD	RAIN GARDEN FACILITY TOPSOIL	70	2,27	CY
613,010001ER	STORM WATER PLANTER DRAINAGE-LAYER MATERIAL	70	4.32	CY



SWEETSPIRE

ITEA VIRGINICA
‘LITTLE HENRY’

CHOKEBERRY

ARONIA MELANOCARPA
‘MORTON IROQUOIS BEAUTY’

BLUE FESCUE

FESTUCA GLAUCA
‘ELIJAH BLUE’

FIELD SEDGE

CAREX PENSYLVANICA

LILLY TURF

LIRIOPE SPICATA
‘GIN-RYU’

DAYLILLY

HEMEROCALLIS
‘STELLA D’ORO’

CREEPING WILLOW

SALIX REPENS

FEATHER REED GRASS

CALAMAGROSTIS ACUTIFLORA
‘OVERDAM’

SWITCH GRASS

PANICUM VIRGATUM
‘SHENANDOAH’

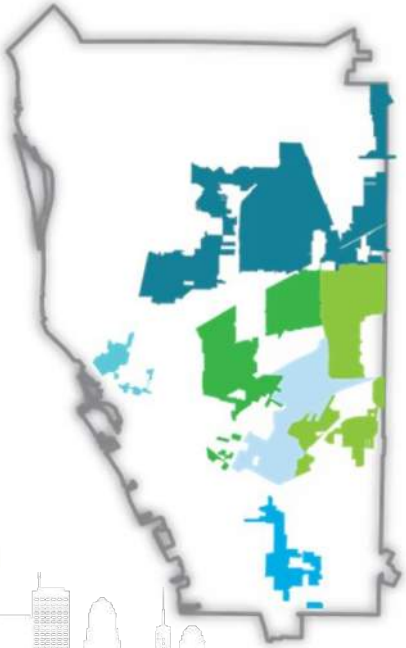
RED OAK

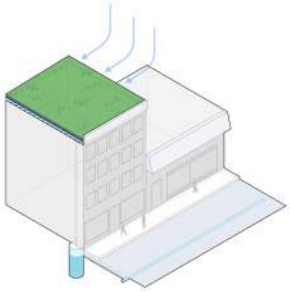
QUERCUS RUBRA

SWAMP WHITE OAK

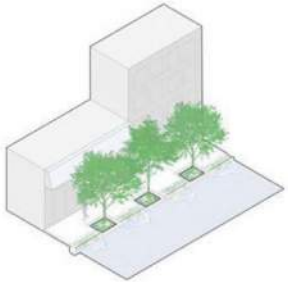
QUERCUS BICOLOR

RAINCHECK 2.0

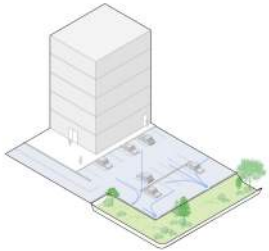




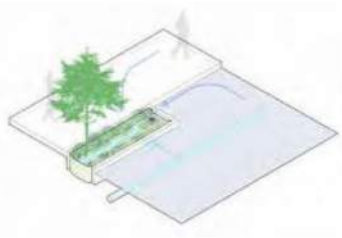
Green Roof



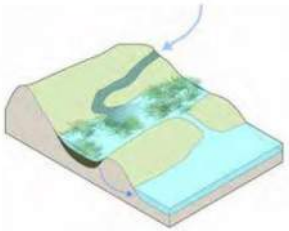
Street Trees /
Tree Trenches



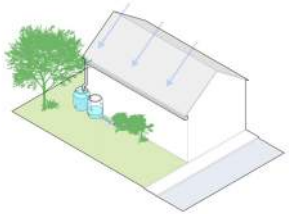
Rain Gardens
and Storm
Planters



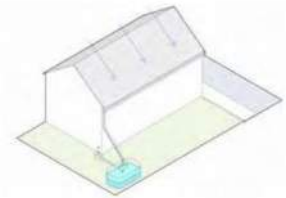
Bio-Swale



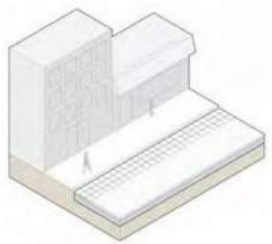
Constructed
Wetland



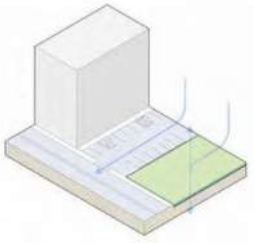
Rain Barrel



Cistern

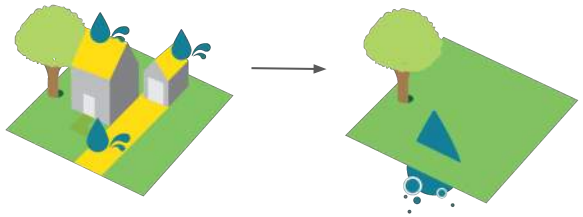


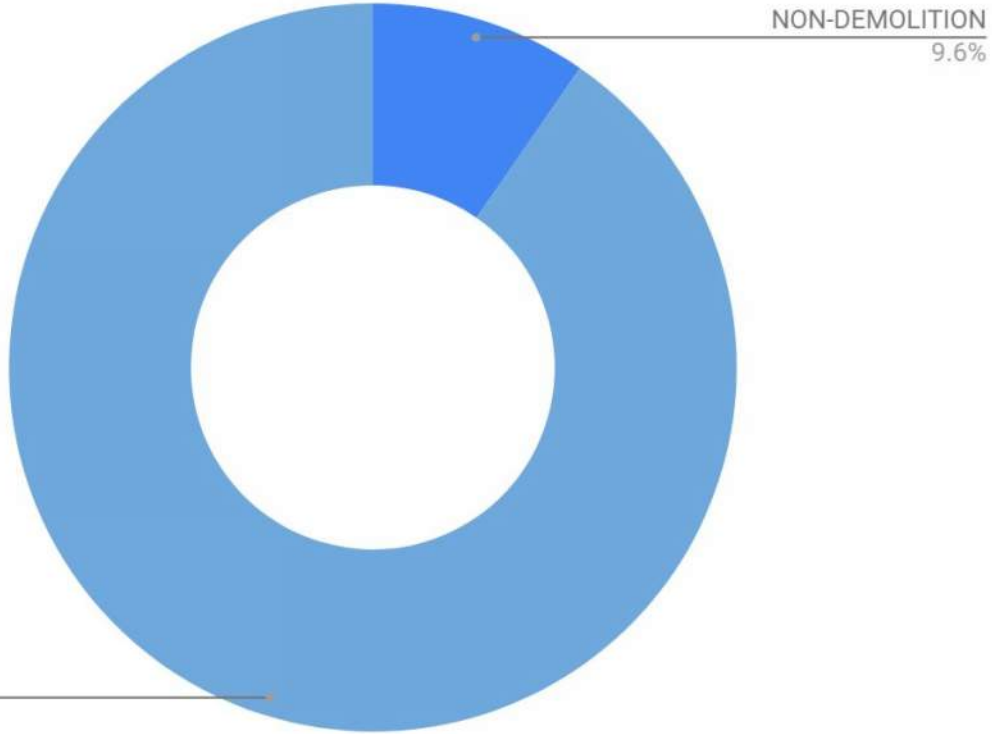
Permeable
Pavement



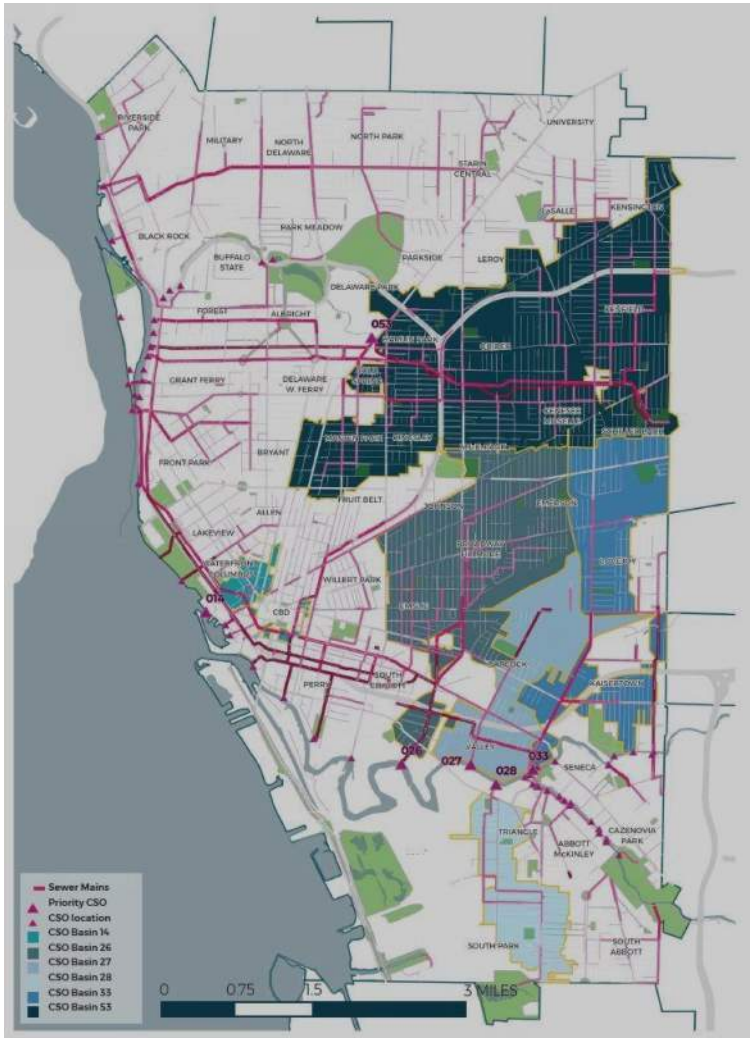
De-Pave

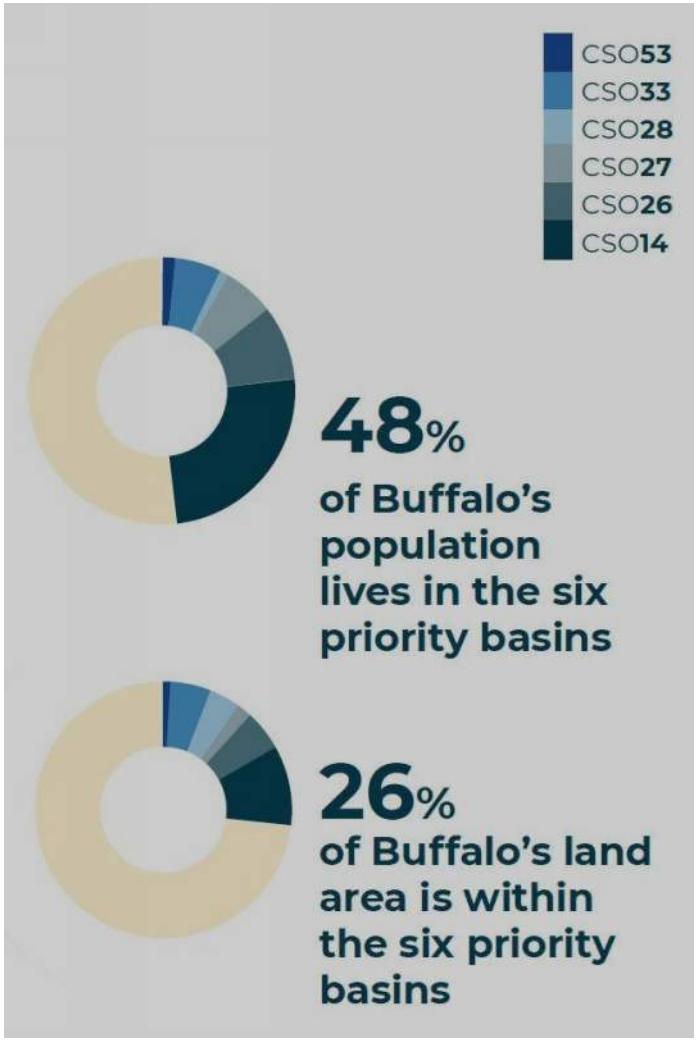
Shoreline
Restoration





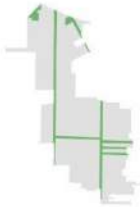
RAINCHECK


Sewer Mains
Priority CSO
CSO location
CSO Basin 14
CSO Basin 26
CSO Basin 27
CSO Basin 28
CSO Basin 33
CSO Basin 53
0
0.75
1.5
3 MILES


CSO53
CSO33
CSO28
CSO27
CSO26
CSO14
48%
of Buffalo's population lives in the six priority basins
26%
of Buffalo's land area is within the six priority basins

RAINCHECK

Opportunity Sites & Networks



Corridors

Hopkins Street and South Park Avenue provide the basis for a networked green infrastructure system and are also current or potential centers of neighborhood centers. Existing medians at Harding, Culver and Ridgewood streets provide opportunities for local networks of green infrastructure that could tie in residential properties and connect to a larger neighborhood network along South Park Avenue.

Sites

The sites analyzed in CSO Basin 28 naturally organize along corridors. Small mid-block parks and open space in the basin and adjacent to it provide additional opportunity for green infrastructure both at their perimeter and below grade. Combining green infrastructure with open space and parks enhances the public realm and provides greater access to green space.

Clusters and Networks

The large cluster of primarily industrial properties surveyed can be combined with corridors into larger clusters or networks. These can be combined with institutions and parks in and adjacent to the basin. Such clusters are based on both physical proximity and programmatic synergies. Program synergies could include, for example, workforce development programs centered around schools or community centers that will assist with the implementation of green infrastructure city-wide.

Key Corridors

- Hopkins Street
- South Park Avenue
- Residential streets with existing medians (Harding, Culver, Ridgewood)

Key Institutions

1. South Park High School
2. South Buffalo Food Pantry
3. Buffalo Police Department
4. South Buffalo Irish Center

Industrial/Commercial

5. Niagara Fiberglass, Inc.
6. Mobile Mini
7. Price Trucking
8. Rite Aid

Key Parks

1. Boone Park
2. Heacock Park
3. Durrant Street Playground
4. Mulroy Park
5. South Buffalo Charter School Playground
6. Buffalo Erie Botanical Gardens

Figure 1.68: CSO Basin 28 Green Infrastructure Opportunity Sites

+ Demolitions declining (<100 sites/year, <10 acres/year)

+ There is only so much publicly owned area that is feasible for GI (site constraints, utility conflicts, competing interests)

+ Public projects are expensive, average cost to date is over $200k/impervious acre and have maintenance burden

+ Around 60% of all impervious area in the City of Buffalo is privately owned

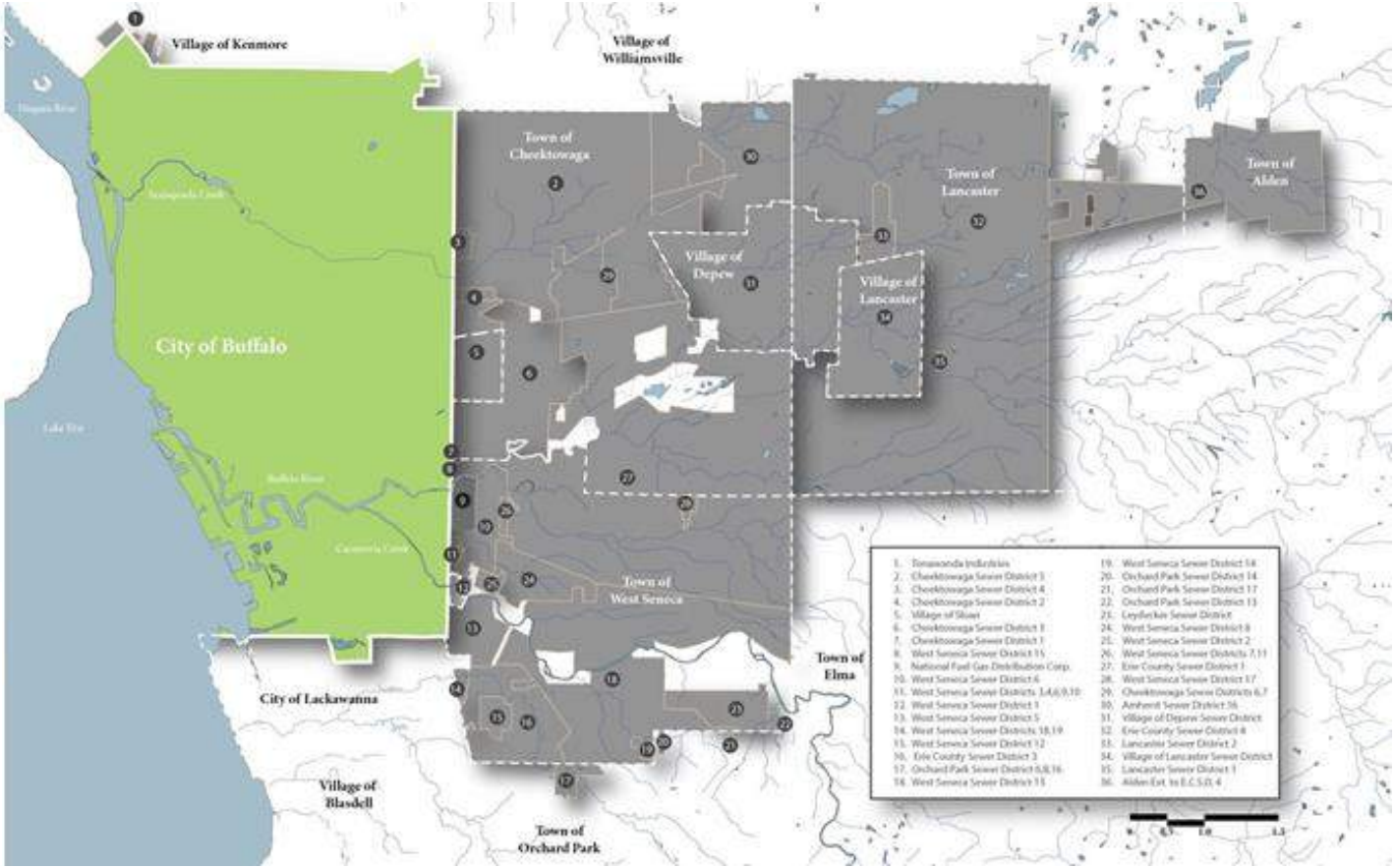
RAINCHECK

GRANT PROGRAM

RAINCHECK

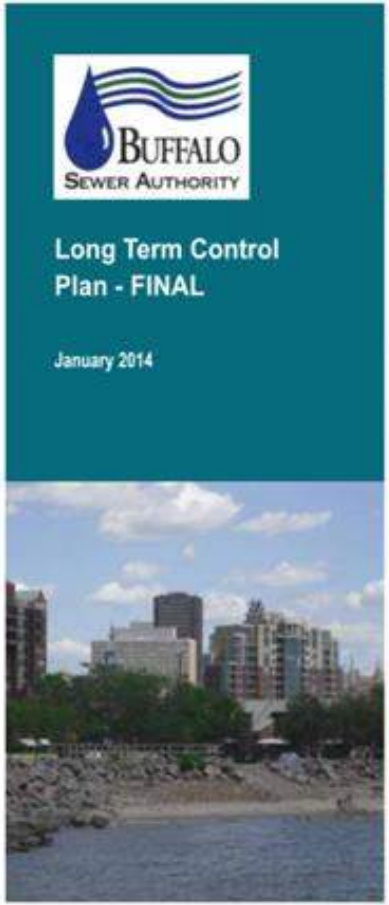
BUFFALO SEWER AUTHORITY

- Established in **1935**
- Services the City of Buffalo, NY and 11 Surrounding Municipalities
- 110 Square Miles of Coverage, 850 miles of sewer pipe
- Serves Over 550,000 People



RAINCHECK

- Long Term Control Plan (LTCP) Approved by Agencies in 2014
- 20 year plan to be completed by March, 2034
- BSA Committed to Invest $430 Million Over 20 Years on Projects
- 97% of Wet Weather Flows to be Captured upon Completion of LTCP
- Manage 1,315 acres of impervious surface area with Green Infrastructure



Gray

Expanding the capacity and efficiency of our pipes, pumps, and underground infrastructure.

Smart

Using "real time" sensors to move stormwater away from parts of the sewer system hit with lots of rain and snowmelt.

Green

Preventing or slowing water from reaching the sewer system with "green infrastructure."

NATURAL CAPITAL: The planetary resources (e.g., plants, animals, air, water, soils, minerals) that sustain life and well-being. Natural capital underpins clean air, water and energy security, shelter, medicine, and more. Natural capital concepts are increasingly applied in national and corporate accounting to keep track of society's dependence and impact on these vital resources.

NATURE-BASED SOLUTIONS: An umbrella term referring to actions that protect, manage, and restore natural capital in ways that address societal challenges effectively and adaptively. These include structural and nonstructural actions, ranging from ecosystem restoration to integrated resource management, green infrastructure, and more.

GREEN INFRASTRUCTURE: A subset of nature-based solutions that intentionally and strategically preserves, enhances, or restores elements of a natural system to help produce higher-quality, more resilient, and lower-cost infrastructure services. Infrastructure service providers can integrate green infrastructure into built systems.

Sources: Adapted from WAVES 2016, Cohen-Shacham et al. 2016, and WWAP 2018.

When stormwater falls in a natural environment

Natural landscapes, soil and wetlands **can absorb stormwater** because they are **porous.**

When stormwater falls in an urban environment

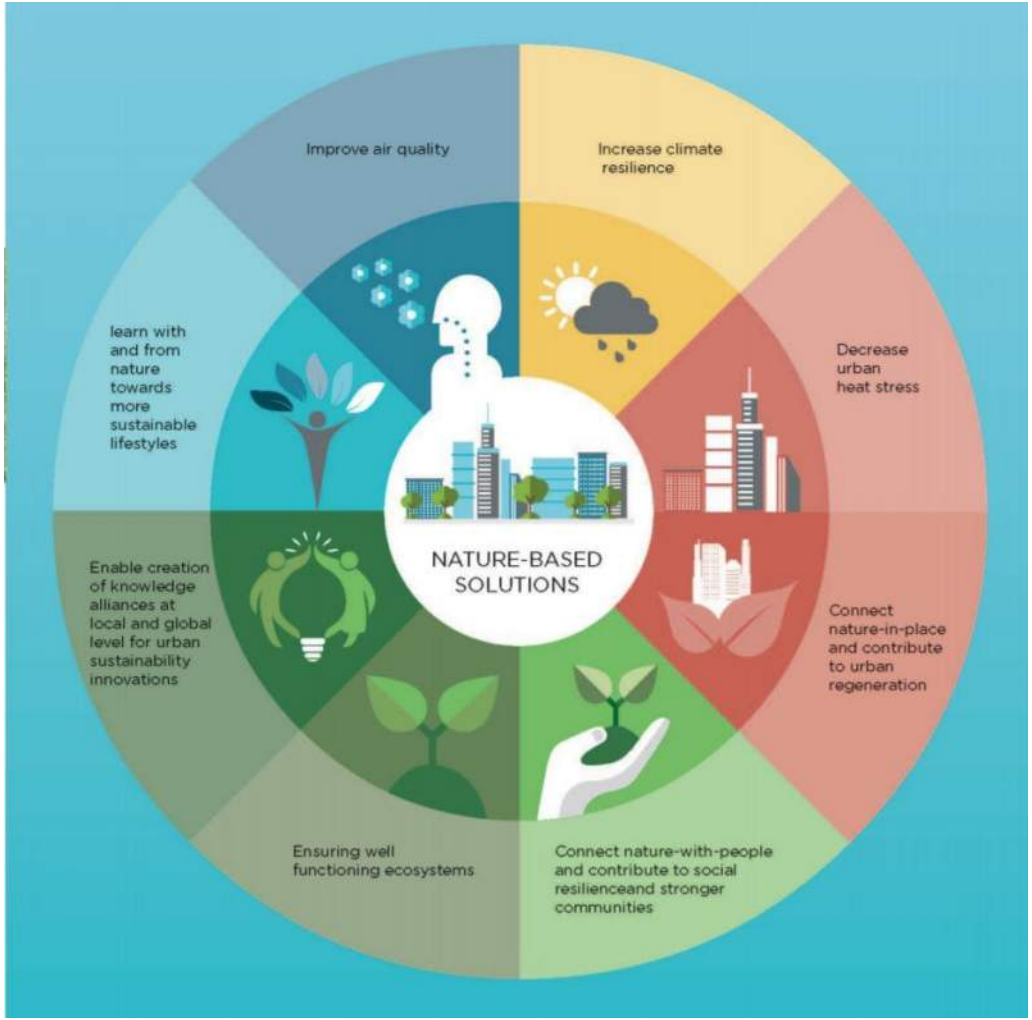
Stormwater needs to be managed because of the streets, buildings, parking lots, **and other hard surfaces we've built. Getting water off these surfaces quickly protects** the health and safety of people and the structural integrity of the things we've built.

Sidewalks, roads, driveways, and roofs can't absorb stormwater because they are **impervious surfaces.**

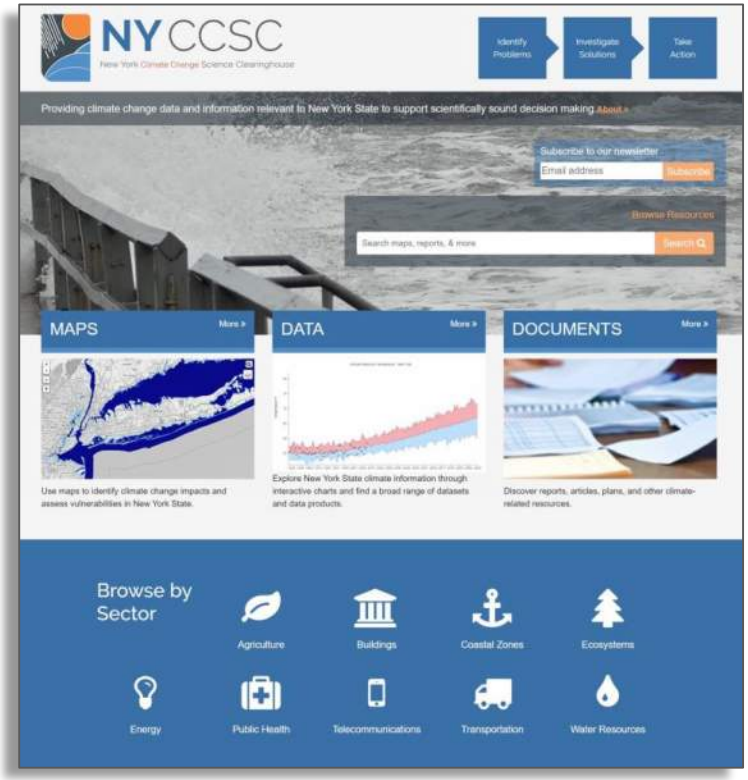
As stormwater flows across these impervious surfaces, it picks up dirt and **pollutants**, creating runoff.

This **polluted runoff** combines with **wastewater** from homes and businesses, often **overflowing into waterways.**

Green infrastructure is designed to mimic how the natural environment manages stormwater.


Improve air quality
Increase climate resilience
Decrease urban heat stress
Connect nature-in-place and contribute to urban regeneration
Connect nature-with-people and contribute to social resilienceand stronger communities
Ensuring well functioning ecosystems
Enable creation of knowledge alliances at local and global level for urban sustainability innovations
learn with and from nature towards more sustainable lifestyles
NATURE-BASED SOLUTIONS

Climate Change Impacts



- **Higher Temperatures**
- **Sea Level Rise and Flooding**
- **More Frequent and Intense Storms**
- **Loss of Biodiversity**

RAINCHECK

Local Climate Change Predictions by 2050

More Wet Weather

- Increased total annual precipitation (especially during winter months)
- Increase in heavy precipitation days (>1.25”)

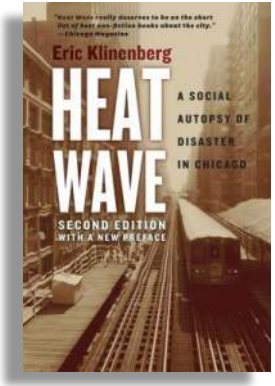
Higher Temperature

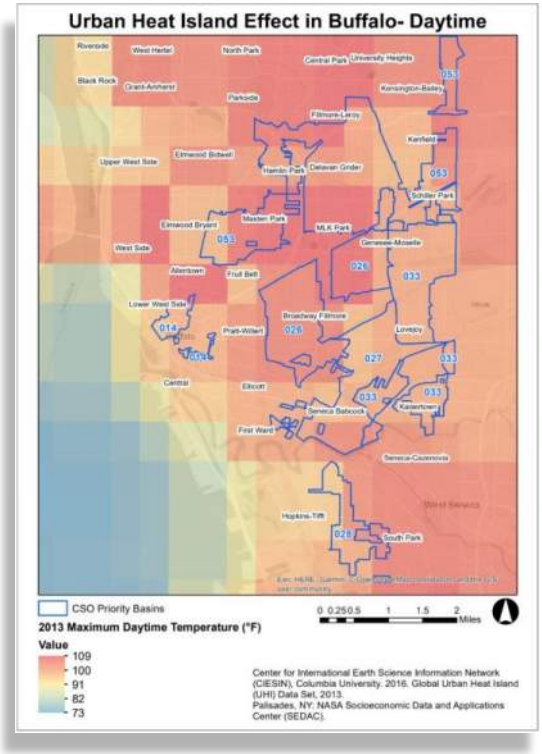
- Increased average temperatures
- Increased high temperature days (>90F)

RAINCHECK

Climate Change Impacts	Nature Based Solutions
Higher Temperatures	Increase vegetation to reduce temps
Sea Level Rise and Flooding	Vegetated shoreline buffers and restored floodplains
More Frequent and Intense Storms	Manage stormwater where it falls
Loss of Biodiversity	Increase biodiversity and habitat

Urban Heat
Vulnerable Populations:



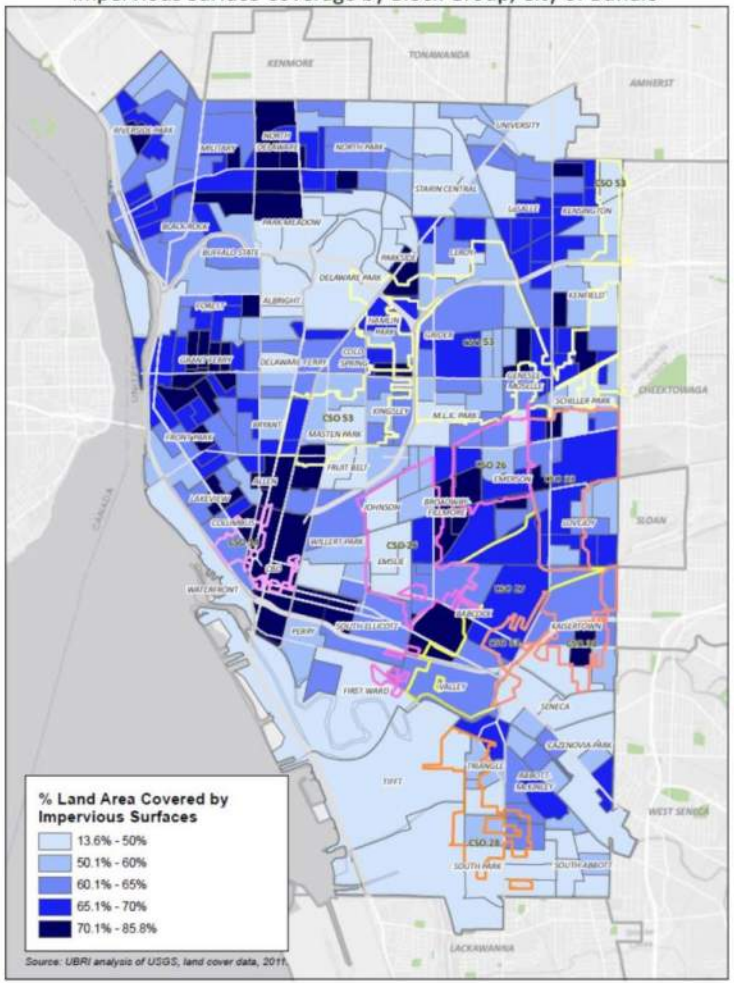


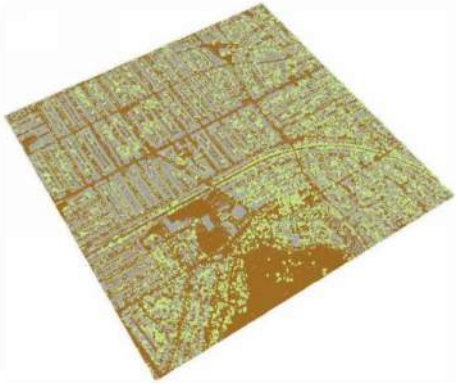
- Under the age of 5
- Over the age of 65
- Disabled
- Low income

RAINCHECK

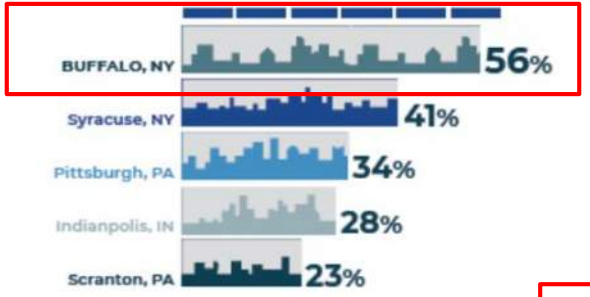
RAINCHECK

Impervious Surface Coverage by Block Group, City of Buffalo

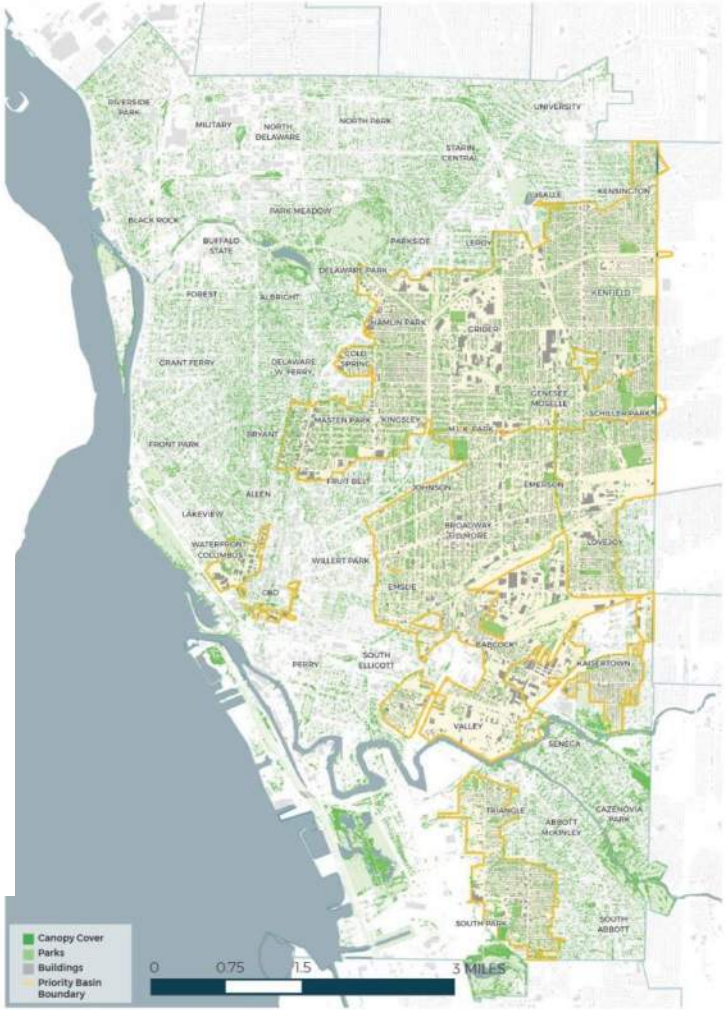


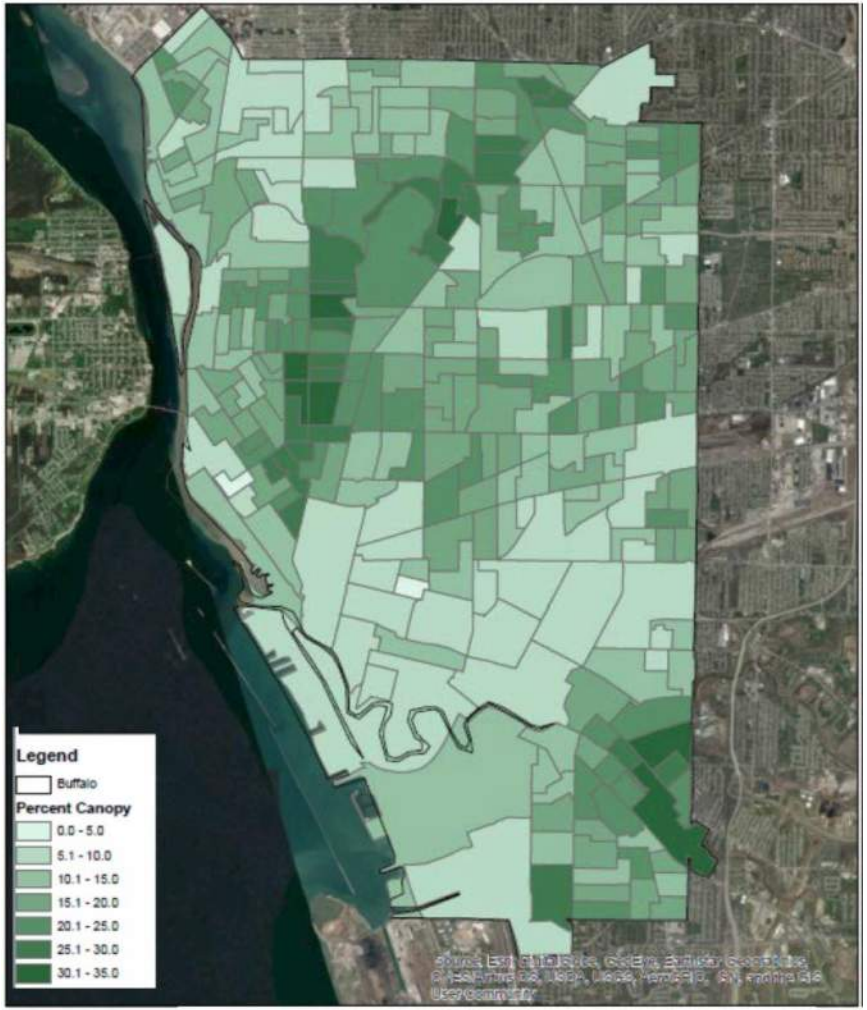


Impervious Area

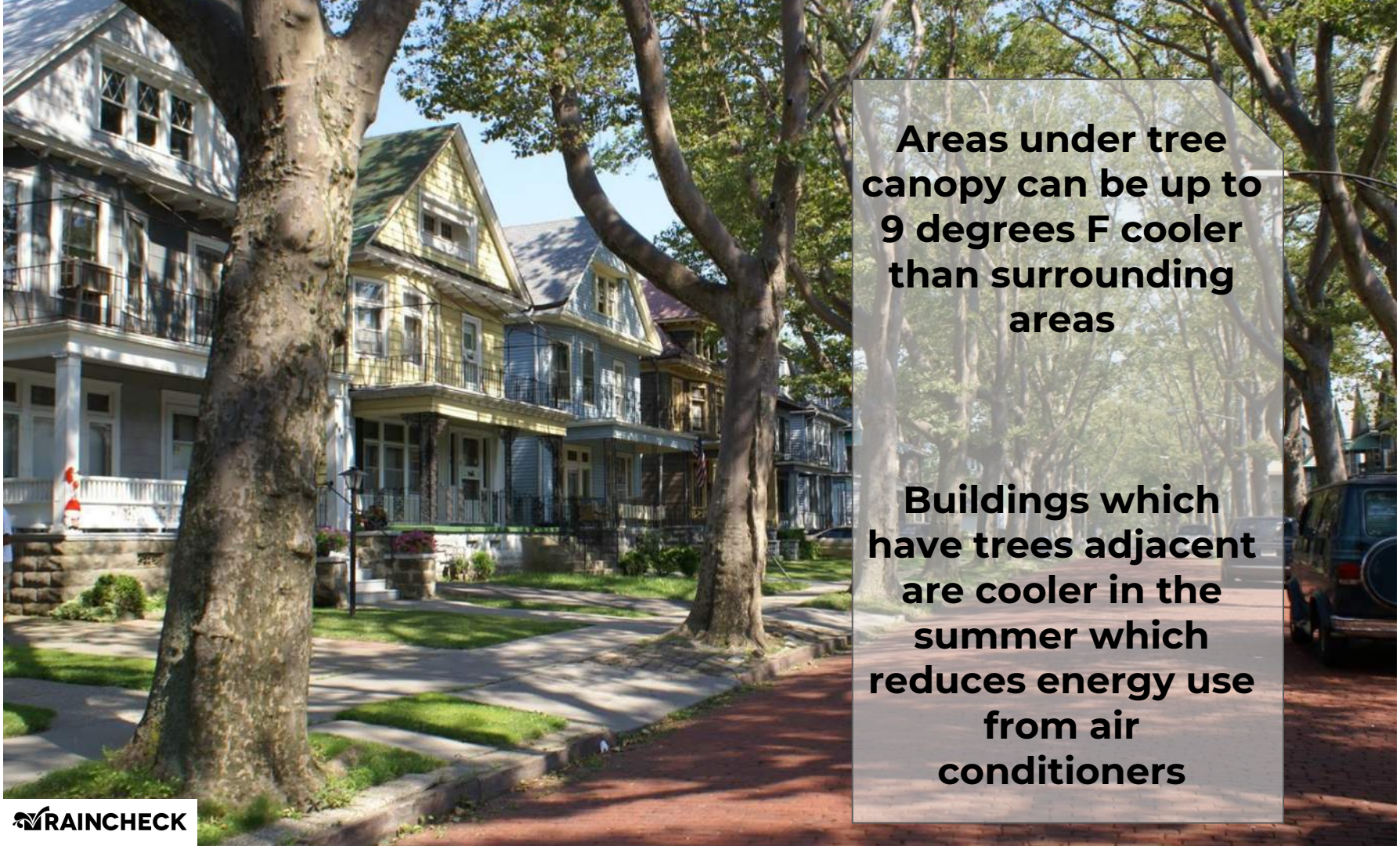


Tree Canopy Area




Legend
Buffalo
Percent Canopy
0.0 - 5.0
5.1 - 10.0
10.1 - 15.0
15.1 - 20.0
20.1 - 25.0
25.1 - 30.0
30.1 - 35.0

RAINCHECK



Areas under tree canopy can be up to 9 degrees F cooler than surrounding areas

Buildings which have trees adjacent are cooler in the summer which reduces energy use from air conditioners

RAINCHECK

LINDEN

Tilia carolinana

A single Linden tree can provide resources for over

150

different species

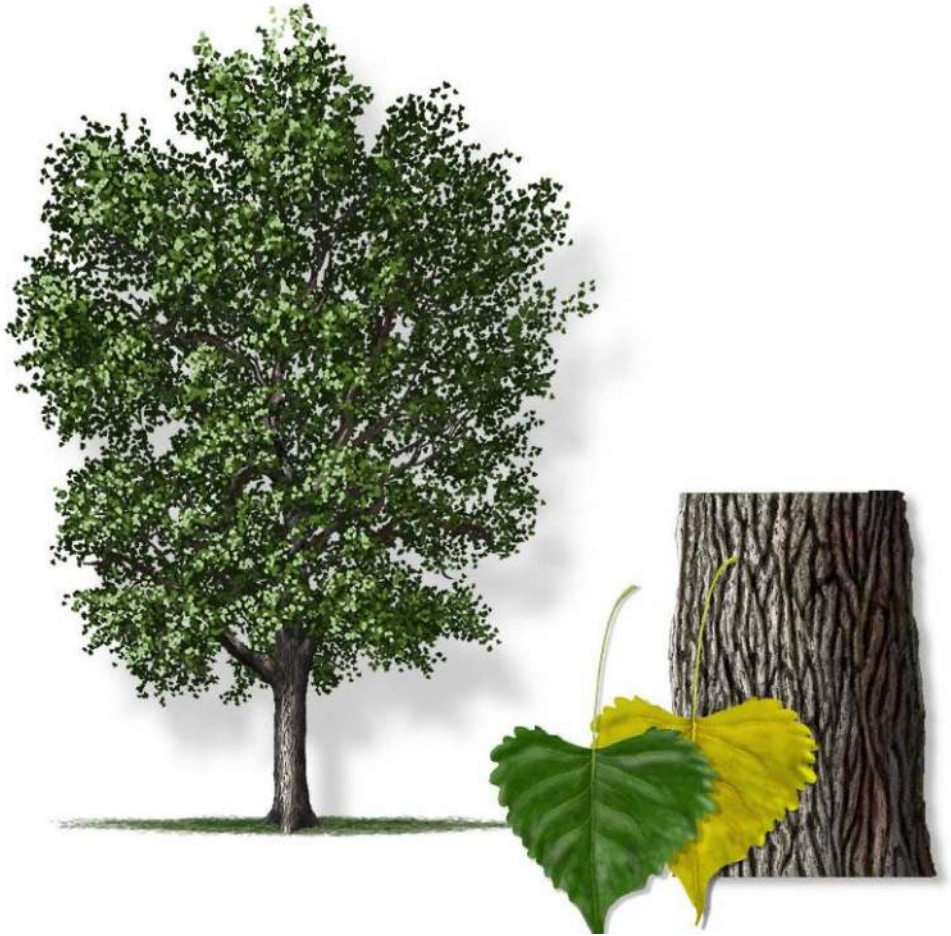
EASTERN COTTONWOOD

Populus deltoides

A single Cottonwood tree can provide resources for over

368

different species



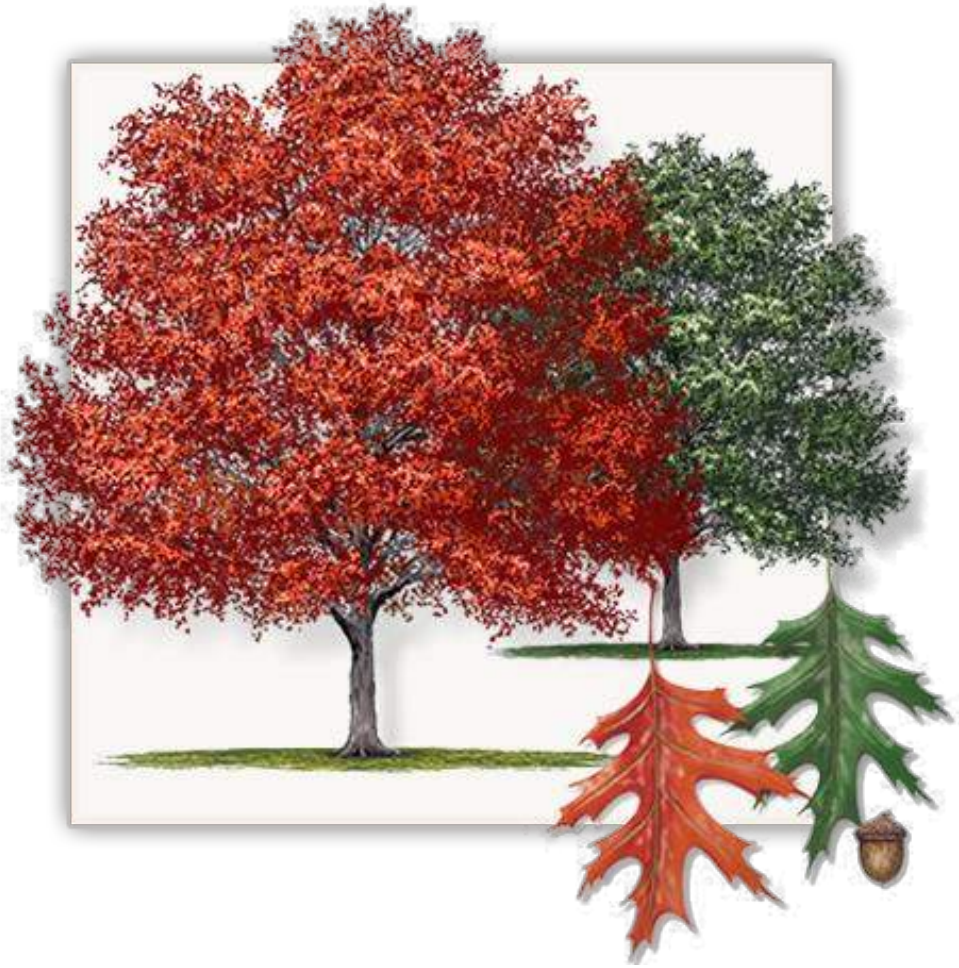
RED OAK

Quercus rubra

A single oak tree can provide resources for over

557

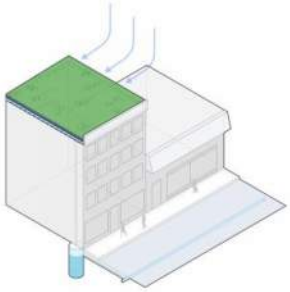
different species



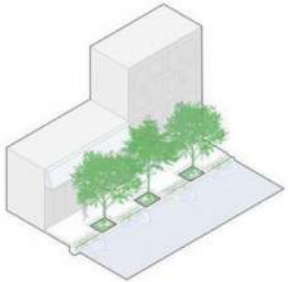
75,033 street trees in Buffalo provide $7,836,034 eco-benefits per year

Greenhouse Gas (GHG) Benefits	Water Benefits	Energy Benefits	Air Quality Benefits	Property Value Benefits
Value: **$22,802** per year	Value: **$418,529** per year	Value: **$3,626,590** per year	Value: **$208,494** per year	Value: **$3,559,618** per year

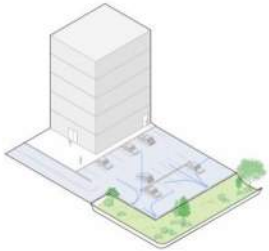
RAINCHECK



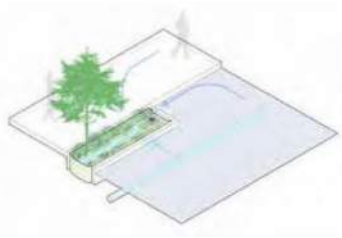
Green Roof



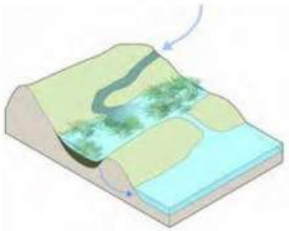
Street Trees /
Tree Trenches



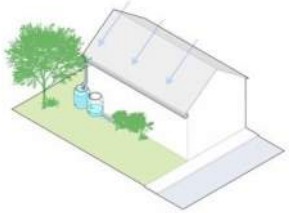
Rain Gardens
and Storm
Planters



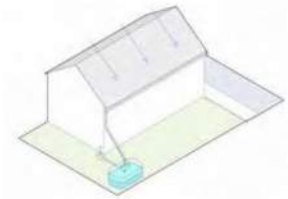
Bio-Swale



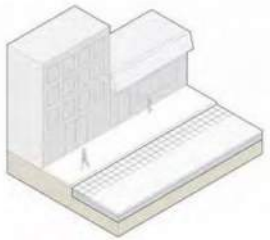
Constructed
Wetland



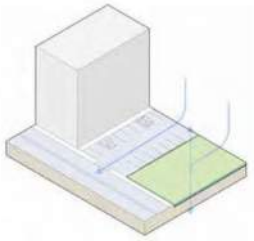
Rain Barrel



Cistern



Permeable
Pavement

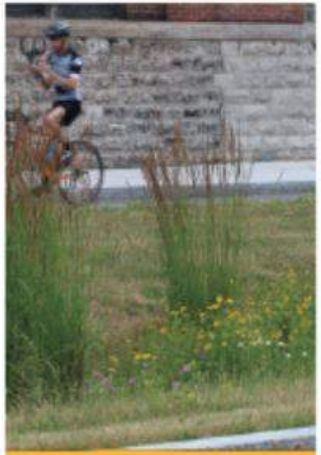


De-Pave

Shoreline
Restoration

RAINCHECK

VEGETATED PRACTICES



BIOSWALE
VEGETATED

A bioswale is a bioretention practice that uses a shallow, open-channel flow pathway. Bioswales use a dense growth of vegetation, along with layers of soil and aggregate to treat, store and infiltrate stormwater runoff.

RAIN GARDEN
VEGETATED

A rain garden is a bioretention stormwater management practice wher a shallow basin is used to capture stormwater runoff. Vegetation and layers of different mulch, soils and aggregates are used to mimic the ecological functions of a natural landscape. Rain gardens capture, filter, treat and infiltrate or transpire stormwater.

GREEN ROOF
VEGETATED

A green roof is a roof of a building that is partially or completely covered with growing media and vegetation on top of a waterproof membrane. Rainwater falling on the rooftop is captured and stored in the media until it is used by the plants or it evaporates.

STORMWATER PLANTER
VEGETATED

A stormwater planter is a type of bioretention designed to manage stormwater runoff from streets and sidewalks.

WETLAND
VEGETATED

Stormwater wetlands are large, shallow, vegetated basins or regions that are designed to collect, temporarily store and treat stormwater runoff from a large contributing drainage area. They mimic the function and performance of natural wetlands.

NON-VEGETATED PRACTICES

DE-PAVE
IMPERVIOUS SURFACE REDUCTION

De-paving involves the removal of impervious surfaces. Buildings, concrete, asphalt and other impervious surfaces that are removed and replaced with soil and vegetation allows water to infiltrate into the ground.

CISTERN
NON-VEGETATED

A cistern is a structure that collects and stores large amounts of rainwater so that the water can be used for non-potable uses such as irrigation, toilet flushing or car washing.

POROUS ASPHALT
NON-VEGETATED

Porsous asphalt is a type of permable pavement that uses uniform, larger aggregate than regular asphalt, which creates small, interconnected pathways through the asphalt pavement. Stormwater passes through the pavement surface and into a stone sub-base where it is stored until it can infiltrate into the soil below.

POROUS CONCRETE
NON-VEGETATED

Pervious concrete is a type of permable pavement where tiny interconnected holes are allowed to form in the concrete during the installation rpocess to allow the water to pass through the concrete and infiltrate through the base layers and soil below.

PERMEABLE PAVERS
NON-VEGETATED

Permeable pavers involve individual concrete or stone shapes that are placed with a small gap in between each other over a permable sub-base. Stormwater passes between the individual pavers and then infiltrates down through the sub-base and soil layers below.


MAINTENANCE
IS CRITICAL!


BUFFALO
greencode

Buffalo Sewer Authority Stormwater Regulations

- Any land development activity that will involve soil disturbance of one-quarter acre (10,890 square feet) or more, *or soil disturbance of less than one-quarter acre that is part of a larger development plan consisting of at least one-quarter acre in area*, requires submission by the applicant of a Stormwater Pollution Prevention Plan (SWPPP) prepared per the requirements of the Buffalo Sewer Authority per Article 7.3 of City of Buffalo's Unified Development Ordinance "Green Code".
- *Applicants proposing land development activity that falls below this threshold must manage construction and post-construction stormwater runoff, but are not required to prepare a SWPPP.*

Buffalo's Unified Development Ordinance "Green Code"

Article 7.3.4A of the Green Code states

Where practicable, stormwater management facilities should utilize Green Infrastructure Best Management Practices (BMPs) according to the following hierarchy of preference:

- ❖ Conservation of natural areas (Tier 1)
- ❖ On-site infiltration practices including, but not limited to, bioretention cells/rain gardens, vegetated swales, filter strips, constructed wetlands and porous pavement (Tier 2)
- ❖ Capture and reuse of runoff through low-impact practices including, but not limited to, green roofs, blue roofs, and rain barrels or cisterns (Tier 3)

Preference Hierarchy	Stormwater Management Practice	Additional Criteria
Tier 1	Conservation of Natural Areas	-
Tier 2	Bio-retention / Stormwater Planters, Rain Garden, Vegetated Swale (bio-swale), Filter Strips, Constructed Wetlands, Porous Pavement	-
Tier 3	Green Roof, Blue Roof, Cistern	-
Tier 4	Off-site GI (within same CSO basin) from Tiers 2 & 3	Requires Documentation and Approval by BSA On Limiting Factors For The Above Tiers.
Tier 5	Subsurface infiltration or underground retention	
Tier 6	Underground detention	

Potential Limiting Factors

- Projects may **not** be approved for Tiers 4, 5 & 6 practices until documentation is provided for limiting factors that prevent utilizing practices from Tiers 2 & 3

Potential Limiting Factors*
Contaminated soils
High groundwater table
Shallow bedrock
Poor infiltration rates (not applicable to Tier 3)
Threat to property or environmental damage

** Where documentation on limiting factors is provided and acceptable to Buffalo Sewer, additional accommodations to incorporate vegetation on site may be negotiated with Buffalo Sewer on a case-by- case basis.*

SWPPP Preparation/ Guidance

- ***The SWPPP must be prepared by a New York State licensed engineer or registered landscape architect, and must be signed and stamped by the professional preparing the plan***

- ***The official guides and specifications for stormwater management:***
  1. New York State Stormwater Management Design Manual (New York State Department of Environmental Conservation).
  2. New York State Standards and Specifications for Erosion and Sediment Control (New York State Department of Environmental Conservation).
  3. TR-55 Urban Hydrology for Small Watersheds (United States Department of Agriculture).
  4. Precipitation Frequency Atlas of the United States (National Oceanic and Atmospheric Administration).

SWPPP Requirements

For connections to storm only or storm overflow sewers (0.25 to 0.99 acres of soil disturbance):

- Background information (i.e. Project scope, existing and final site conditions, soil map, etc.). *Note any changes from the initial SWPPP and site plan submissions.*
- Erosion & Sediment Control Plan (E&SC) in conformance with SPDES General Permit (GP-0-15-002) or latest version
- Site Plan showing the locations of all E&SC practices
- Drainage Map (showing capture areas and location(s) of BMPs)
- Stormwater Calculations for pre- and post- construction 1-, 10-, and 100- year storm event.
- Water Quality Volume and Runoff Reduction Volume Targets
- Post-construction Stormwater Best Management Practices

SWPPP Requirements

For connections to storm only or storm overflow sewers (1 acre or larger of soil disturbance):

- Same requirements as for 0.25 - 0.99 acres
- MS4 Acceptance Form
- Notice of Intent (NOI) signed by owner and SWPPP Preparer Certification (original signatures)
- State Historic Preservation Office (SHPO) determination must be included with report.

SWPPP Requirements

For connections to storm relief or combined sewers (0.25 acres or larger of soil disturbance):

- Background information (i.e. Project scope, existing and final site conditions, soil map, etc.). Note any changes from the initial SWPPP and site plan submissions.
- Erosion & Sediment Control Plan in conformance with GP-0-15-002 or latest version (see minimum requirements)
- Site Plan showing the locations of all E&SC practices
- Drainage Map (showing capture areas and location(s) of BMPs)
- Provide stormwater management calculations utilizing USDA TR-55 and the New York State Stormwater Management Design Manual (NYSMDM) demonstrating that post-construction 25-year storm peak flows to the storm relief/ combined sewer system are less than or equal to pre-construction 2-year storm peak flows.
- Post-construction Stormwater BMPs - see section. A.7a on handout


Buffalo Sewer has
invested over $16M in
Nature Based Solutions
and Green Infrastructure
since 2014


NEW YORK STATE
Responds To Climate Change
New York State is taking bold action to comprehensively address our climate challenges.
What Can I Do About
Climate Change?
Cut your greenhouse gas footprint.
Climate Smart Communities
THE CITY OF
Buffalo
IS A
Bronze Certified
CLIMATE SMART COMMUNITY
2019


RAINCHECK
FOR SALE

RAINCHECK


CITY OF BUFFALO
GREEN INFRASTRUCTURE
RAIN BARRELS
GREEN SPACE
WETLAND & SHORELINE BUFFER
GREEN STREET
STORM PLANTER
PERMEABLE PAVERS
BIO-SWALE
RAIN GARDEN
POROUS ASPHALT

Green Streets

Green Parking Lots

Demolitions and Vacant Lot Restoration

Rain Barrels and Downspout Disconnections

RAINCHECK

More than 9 miles of green streets across Buffalo

are helping us meet our stormwater challenge

101.5 acres managed for stormwater

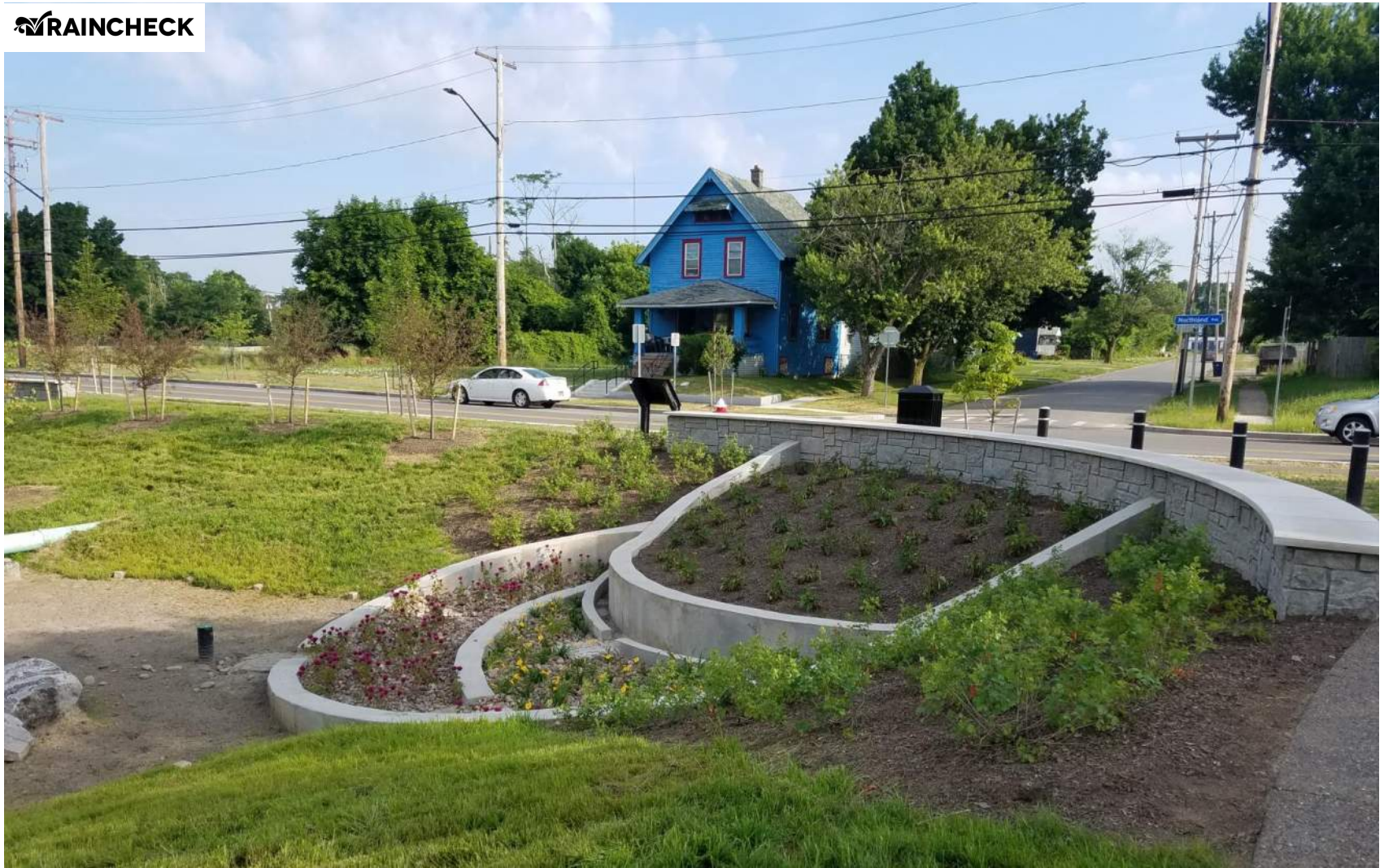
15.9 acres of impervious surfaces reduced

1,908,045

gallons of runoff prevented from entering the sewer system in a typical rainfall event.

1. Kenmore Ave
2. Parkdale Ave
3. Claremont Ave
4. Elmwood Ave
5. Windsor Ave
6. Clarendon Ave
7. Ardmore Place
8. Niagara Street (Phase 3&4)
9. Northland Ave
10. Carlton St
11. Niagara Street (Phase 1&2)
12. Pearl St
13. Genesee St
14. William St
15. Ohio St

RAINCHECK



RAINCHECK


RAINCHECK

2.35 acres of green parking lots across Buffalo

are helping us meet our stormwater challenge

6.8 acres managed for stormwater

2.7 acres of impervious surfaces reduced

257,083

gallons of runoff prevented from entering the sewer system in a typical rainfall event.

6 Green Parking Lot Projects

1. North Buffalo Ice Rink
2. Broderick Park
3. 1401 Fillmore Avenue
4. 1384 Fillmore Avenue
5. Pratt Willert Community Center
6. JFK Community Center


RAINCHECK


RAINCHECK

LIVING SHORELINE:

Emergent and wetland ecologies provide stability and enhance ecological function along the creek banks. As shown in the first picture below, mowing to the edge limits ecological diversity. The addition of rock outcrops (otherwise known as bendway weirs) like those shown in the second picture, promote sediment deposition and protect developing ecosystems.

UPPER FLOODPLAIN:

This area will seldom be inundated with floodwater (the picture below shows the existing condition and elevation profile) but it serves as additional flood protection during extreme rain events. This area also provides opportunities for ecological exploration and education, as well as above ground cemetery memorials.

LOWER FLOODPLAIN:

Each level of the existing retaining wall (shown in picture above) has been pulled back from the edge, creating four tiers. The lower tiers help re-establish shoreline ecologies which mitigate flooding and regulate stream fluctuations.

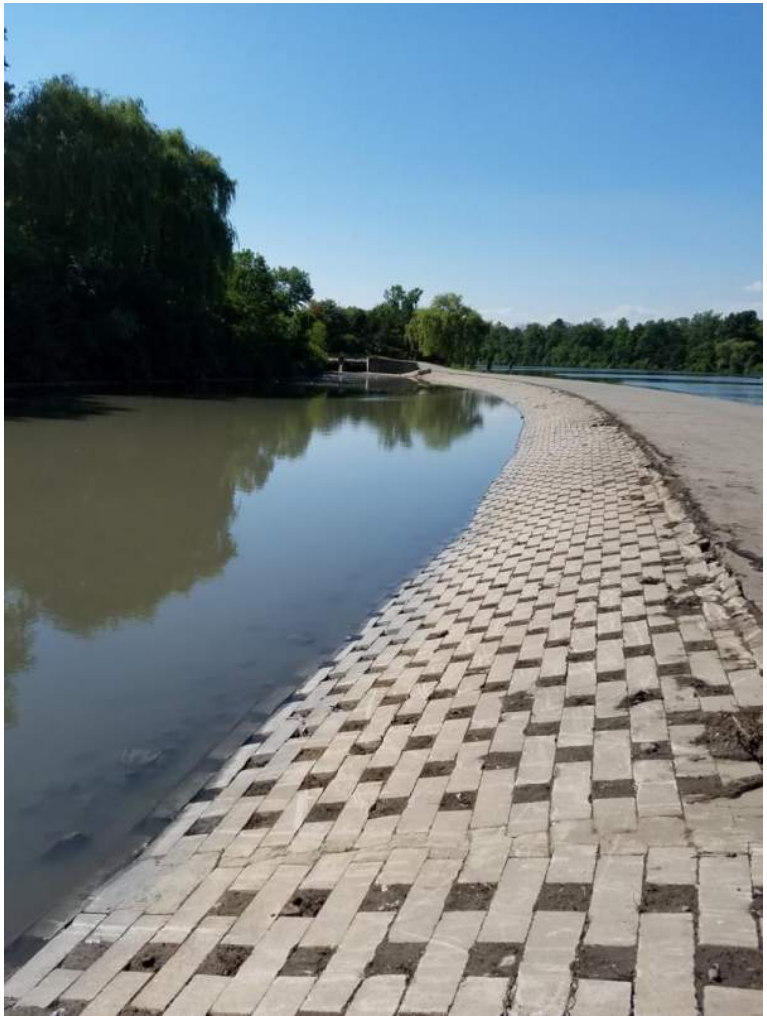
This layer will be comprised of mostly emergent vegetation (i.e. sedges, rushes, and reeds) and will frequently be inundated with floodwater.

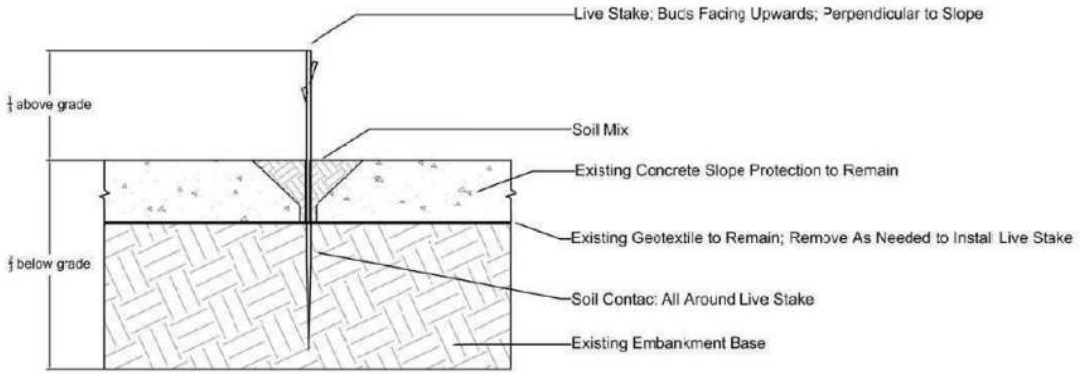
REACH TWO | DESIGN VISION

The graphic representation of this design strategy at right showcases some of the unique features envisioned. Stepping back the existing stone retaining wall into three tiers softens the transition between land and water to promote benefits listed above. Enhanced pedestrian access via a boardwalk allows naturalization of the shoreline to occur beneath. The boardwalk feature also offers unique memorial opportunities such as benches and/or other monuments which can be incorporated into the upper and lower floodplains.

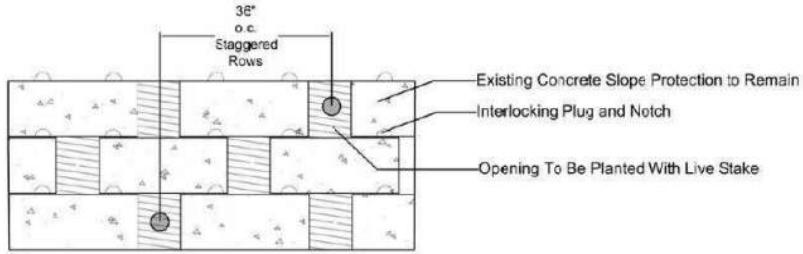
REACH TWO | DESIGN FEATURES

- A BENDWAY WEIR
- B ROCK WALL
- C MEMORIAL BENCH
- D EDUCATIONAL SIGNAGE
- E BOARDWALK
- F LEGACY TREES

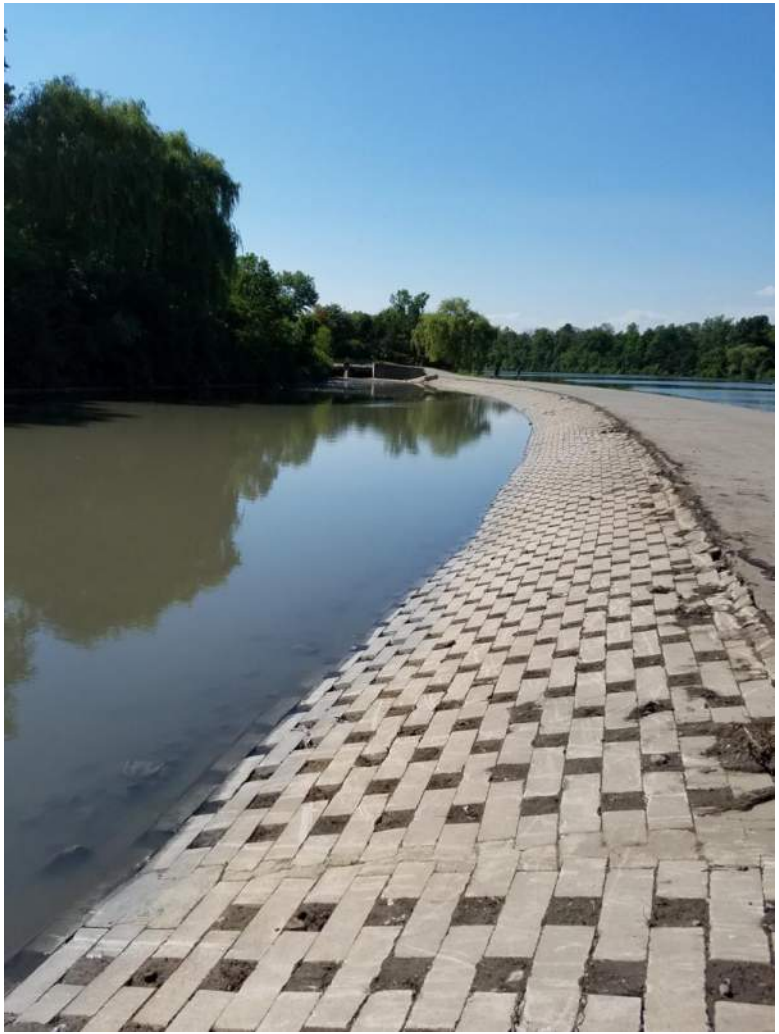


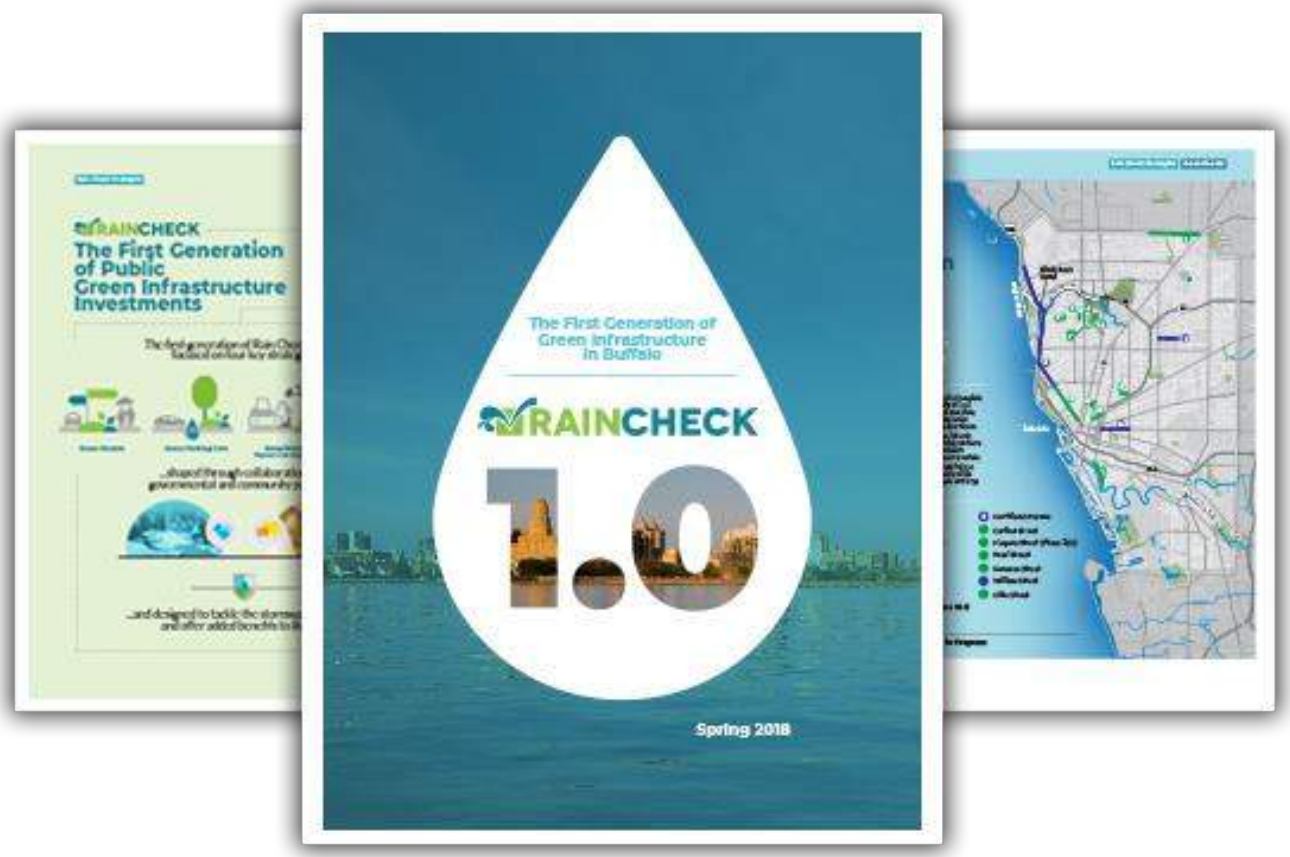


BSA1 / LA1 **Live Stake Planting on Concrete Slope Protection**
Not to Scale



Typical Plan
Not to Scale

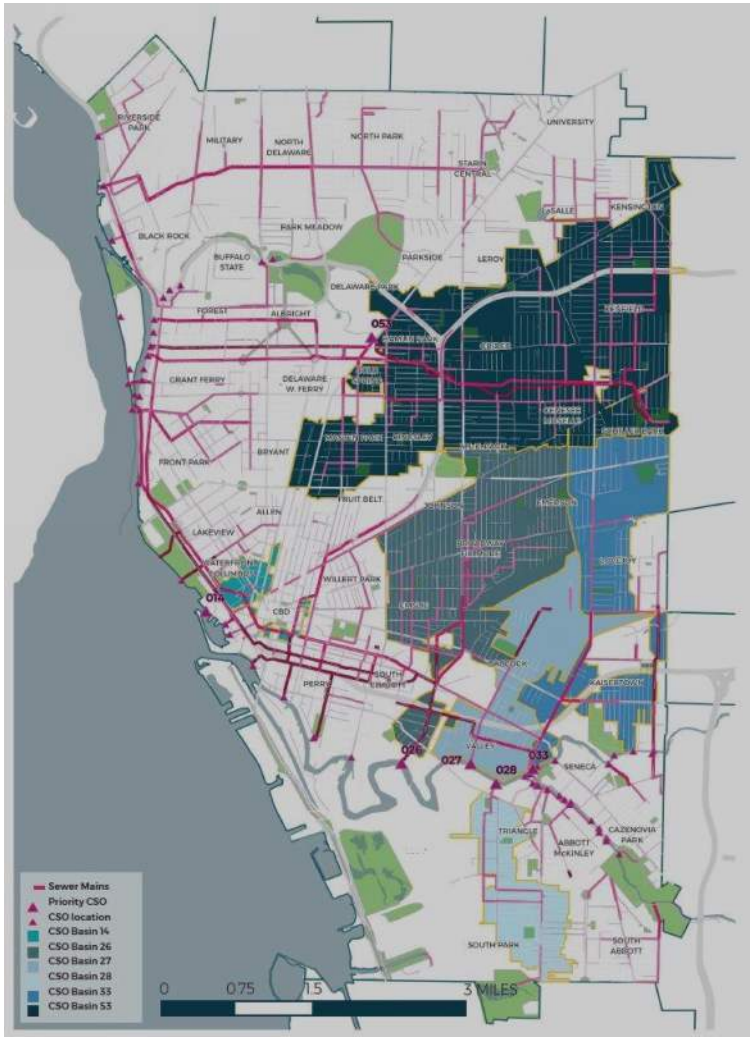


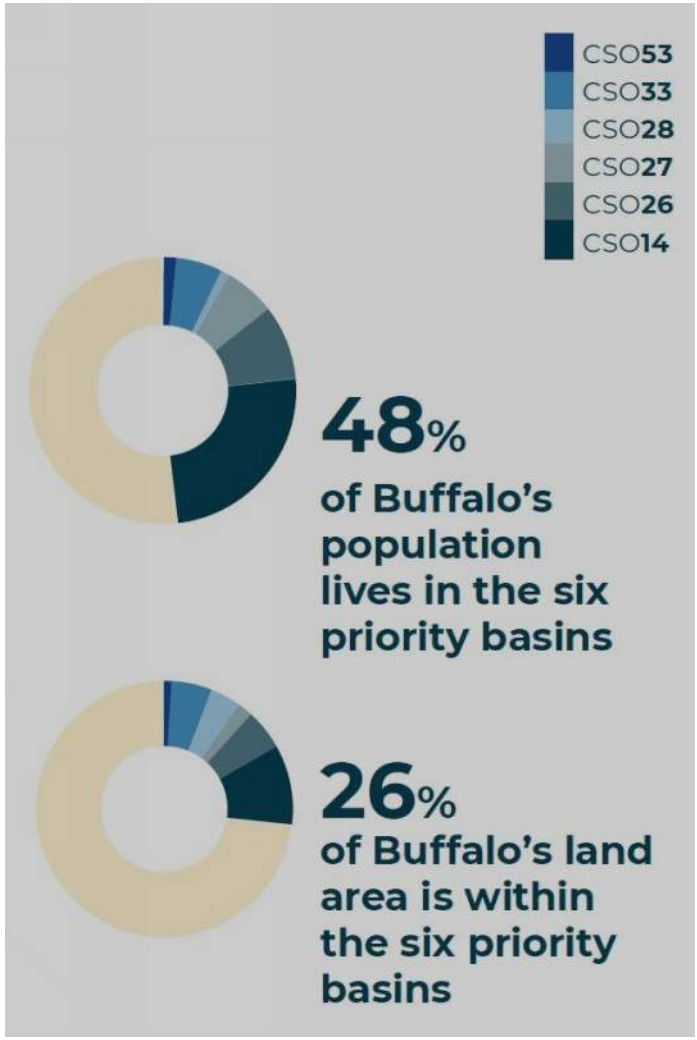

RAINCHECK
The First Generation of Public Green Infrastructure Investments
The First Generation of Green Infrastructure in Buffalo
RAINCHECK
1.0
Spring 2018

GREEN INFRASTRUCTURE IN BUFFALO

Take a Tour of Buffalo'sGreen Infrastructure

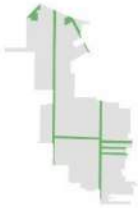
Tour highlights of Buffalo's green infrastructure projects.


Sewer Mains
Priority CSO
CSO location
CSO Basin 14
CSO Basin 26
CSO Basin 27
CSO Basin 28
CSO Basin 33
CSO Basin 53
0
0.75
1.5
3 MILES
053
033
028
027
026
014
RIVERSIDE PARK
MILITARY
NORTH DELAWARE
NORTH PARK
UNIVERSITY
STARIN CENTRAL
LASALLE
KENSINGTON
BLACK ROCK
PARK MEADOW
BUFFALO STATE
PARKSIDE
LEROY
DELAWARE PARK
FOREST
ALBRIGHT
GRANT FERRY
DELAWARE W. FERRY
FRONT PARK
BRYANT
ALLEN
FRUIT BELT
LAKEVIEW
WATERFRONT
WILLERT PARK
CBD
SOUTH LIBERTY
SENECA
TRIANGLE
ABBOTT MCKINLEY
CAZENOVIA PARK
SOUTH PARK
SOUTH ABBOTT


CSO53
CSO33
CSO28
CSO27
CSO26
CSO14
48%
of Buffalo's population lives in the six priority basins
26%
of Buffalo's land area is within the six priority basins


DRAINAGE AREA
POTENTIAL GI LOCATION

Opportunity Sites & Networks



Corridors

Hopkins Street and South Park Avenue provide the basis for a networked green infrastructure system and are also current or potential centers of neighborhood centers. Existing medians at Harding, Culver and Ridgewood streets provide opportunities for local networks of green infrastructure that could tie in residential properties and connect to a larger neighborhood network along South Park Avenue.

Sites

The sites analyzed in CSO Basin 28 naturally organize along corridors. Small mid-block parks and open space in the basin and adjacent to it provide additional opportunity for green infrastructure both at their perimeter and below grade. Combining green infrastructure with open space and parks enhances the public realm and provides greater access to green space.

Clusters and Networks

The large cluster of primarily industrial properties surveyed can be combined with corridors into larger clusters or networks. These can be combined with institutions and parks in and adjacent to the basin. Such clusters are based on both physical proximity and programmatic synergies. Program synergies could include, for example, workforce development programs centered around schools or community centers that will assist with the implementation of green infrastructure city-wide.

Key Corridors

- Hopkins Street
- South Park Avenue
- Residential streets with existing medians (Harding, Culver, Ridgewood)

Key Institutions

1. South Park High School
2. South Buffalo Food Pantry
3. Buffalo Police Department
4. South Buffalo Irish Center

Industrial/Commercial

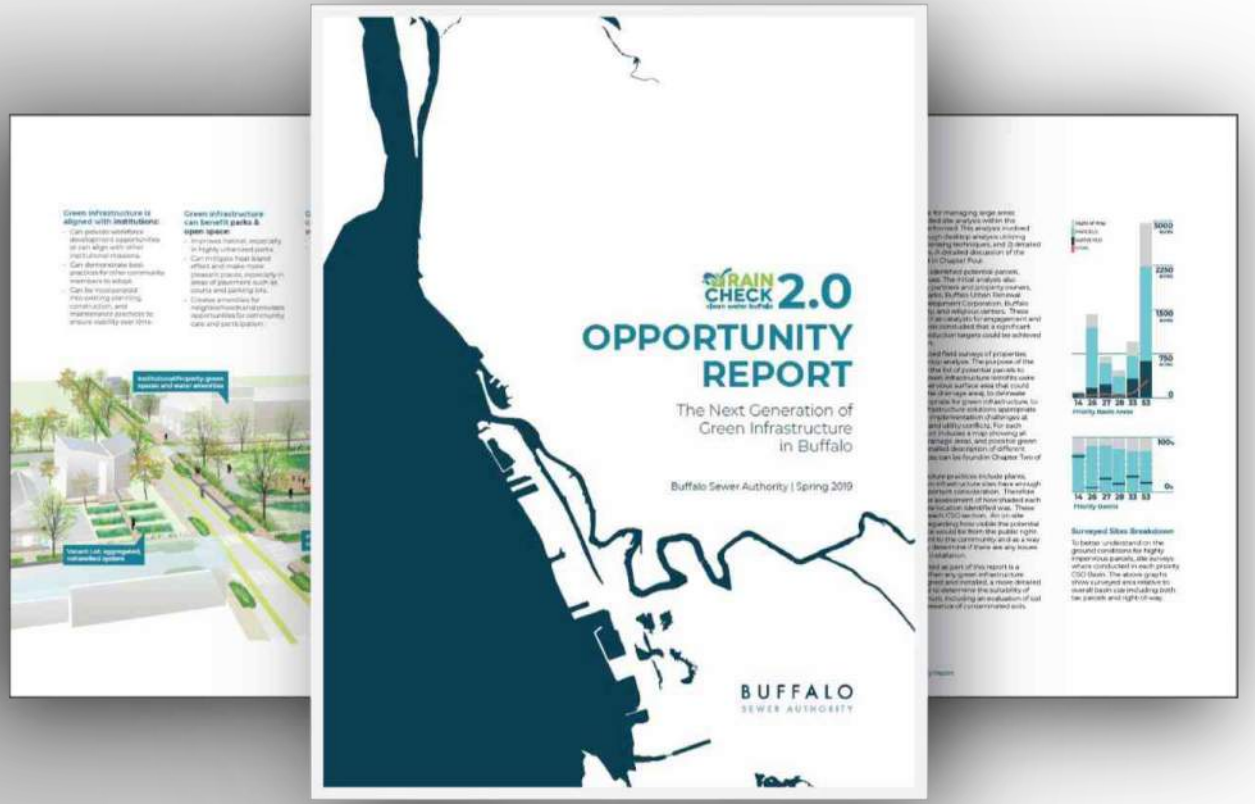
5. Niagara Fiberglass, Inc.
6. Mobile Mini
7. Price Trucking
8. Rite Aid

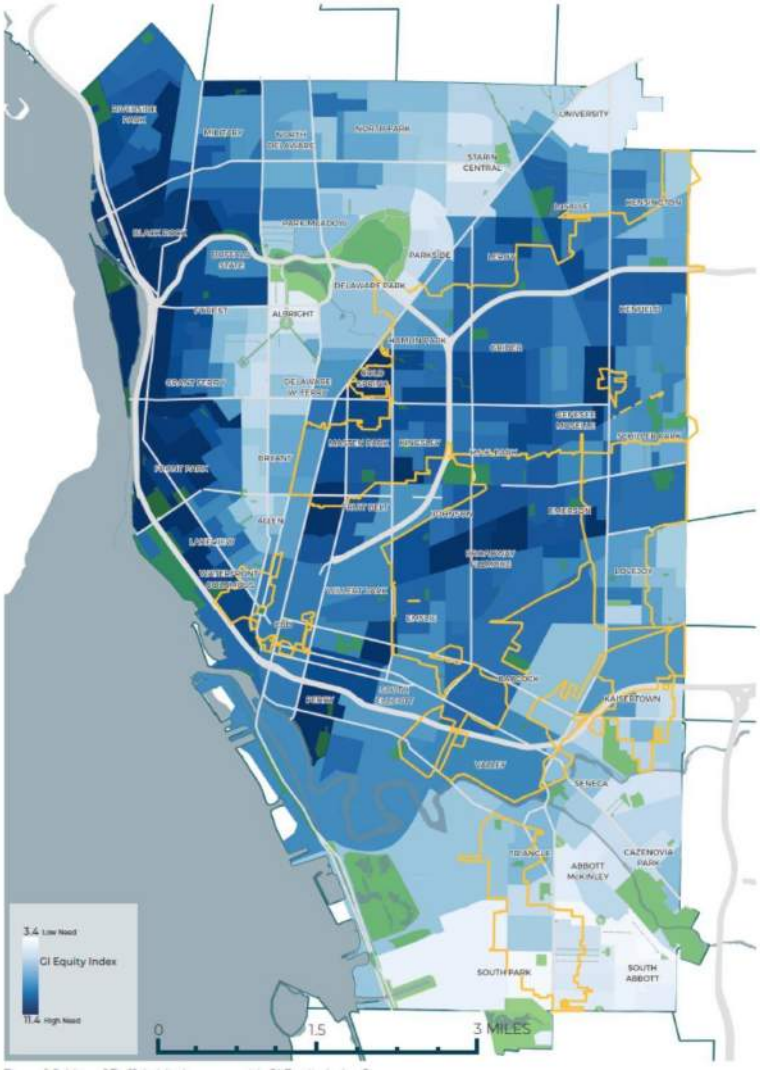
Key Parks

1. Boone Park
2. Heacock Park
3. Durrant Street Playground
4. Mulroy Park
5. South Buffalo Charter School Playground
6. Buffalo Erie Botanical Gardens

Figure 1.68: CSO Basin 28 Green Infrastructure Opportunity Sites

RAINCHECK


RAIN CHECK
clean water buffalo
2.0
OPPORTUNITY REPORT
The Next Generation of Green Infrastructure in Buffalo
Buffalo Sewer Authority | Spring 2019
BUFFALO
SEWER AUTHORITY



GI Equity Index Factors

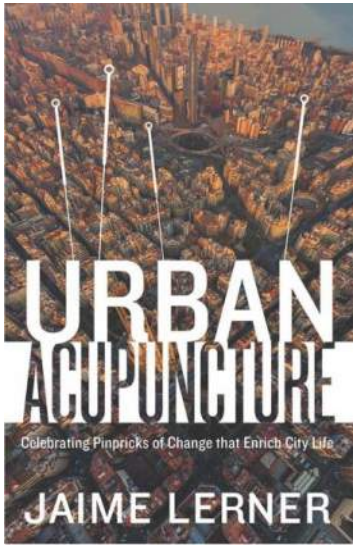
RAINCHECK

Socio-economic factors:

- Race and ethnicity
- Income
- Education attainment
- Young children
- Older adults
- Owner occupancy
- Limited English speakers
- Unemployment and labor force participation

Built environment factors:

- Traffic proximity
- Ozone levels
- Particulate matter
- Access to public open space
- Tree canopy cover
- Impervious surface cover
- Vacant land
- Residential vacancy rates
- Commercial vacancy rates


URBAN
ACUPUNCTURE
Celebrating Pinpricks of Change that Enrich City Life
JAIME LERNER

RAINCHECK

Table 6 Summary of Economic Impacts

Impact Type	Employment	Labor Income ($)	Value Added ($)	Output ($)
Direct Effect	8.7	476,980	613,516	828,588
Indirect Effect	1.5	86,317	132,728	235,590
Induced Effect	3.3	148,173	274,474	456,769
Total Effect	**13.5**	**711,470**	**1,020,719**	**1,520,947**

The Green Infrastructure Workforce in Buffalo

The $1 million project would be expected to generate approximately 13 jobs during its design and construction, primarily in the construction, water/sewer systems, and landscaping industries.

As of May 2017, the Buffalo Metropolitan Area had approximately 13,840 jobs in industry sectors related to green infrastructure design, construction, and maintenance (the total number of jobs in all occupations in the Buffalo MSA in 2017 was 547,750, according to BLS). These jobs had an average median hourly wage of $23.04, which is 30 percent higher than the median hourly wage for the Metropolitan Area as a whole, $17.77.[1]

Table 4: Green Infrastructure Workforce statistics for Buffalo MSA, Courtesy US Bureau of Labor Statistics

Standard Occupational Classification (SOC) Code	Occupation	Total Employment in Buffalo MSA (rounded to nearest 10)	Employment per 1,000 of total jobs in Buffalo MSA	Location Quotient	Hourly median wage
17-3025	Environmental Engineering Technicians	40	0.068	0.55	$21.28
37-1012	First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	220	0.406	0.58	$23.05
37-3011	Landscaping and Groundskeeping Workers	3,360	6.14	0.96	$14.16
37-3013	Tree Trimmers and Pruners	60	0.105	0.37	$23.70
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	1,550	2.834	0.73	$33.80
47-2051	Cement Masons and Concrete Finishers	470	0.854	0.68	$18.60
47-2061	Construction Laborers	3,860	7.039	1.04	$17.16
47-2071	Paving, Surfacing, and Tamping Equipment Operators	160	0.286	0.82	$30.18
47-2073	Operating Engineers and Other Construction Equipment Operators	890	1.633	0.64	$28.85
47-2151	Pipelayers	30	0.06	0.22	$27.08
47-3015	Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters	90	0.166	0.43	$13.32
47-3016	Helpers--Roofers	**	**	**	$14.36
47-4011	Construction and Building Inspectors	540	0.985	1.42	$27.96
47-4071	Septic Tank Servicers and Sewer Pipe Cleaners	70	0.119	0.64	$20.82
49-9012	Control and Valve Installers and Repairers, Except Mechanical Door	360	0.661	1.98	$34.31
51-8031	Water and Wastewater Treatment Plant and System Operators	430	0.778	0.94	$24.70
53-7051	Industrial Truck and Tractor Operators	1,710	3.122	0.78	$18.29
TOTAL		13,840	25	**	(Average) $23.04


NATIONAL GREEN INFRASTRUCTURE
ngicp
CERTIFICATION PROGRAM

RAINCHECK

RAINCHECK

RAINCHECK

GRANT PROGRAM

RAINCHECK

GRANT PROGRAM

- LOCATED IN PRIORITY CSO BASIN
- CURRENT AND IN GOOD STANDING WITH LOCAL TAXES AND FEES
- OWNERSHIP OF PROPERTY OR AUTHORIZATION FROM OWNER
- DESIGN FOLLOWS NYS STORMWATER DESIGN MAUAL
- AT LEAST 1/4 ACRE OF IMPERVIOUS AREA MANAGED IN TOTAL
- APPROVED MAINTENANCE PLAN

RESOURCES

NYS DEC Stormwater Design Manual: https://www.dec.ny.gov/chemical/29072.html

NYS Climate Smart Communities: https://climatesmart.ny.gov/

Buffalo Street tree Inventory and Calculator: https://buffalony.treekeepersoftware.com

National Green Infrastructure Certification Program (NGICP): https://ngicp.org/

New York Climate Science Clearinghouse: https://www.nyclimatescience.org/

Oxford University Nature-Based Solutions Initiative: https://www.naturebasedsolutionsinitiative.org/

EPA Green Infrastructure Design and Implementation Resources: https://www.epa.gov/green-infrastructure/green-infrastructure-design-and-implementation

Local Governments for Sustainability: https://www.iclei.org/

World Resources Institute: https://www.wri.org/

NYSERDA Technical Reports: https://www.nyserda.ny.gov/About/Publications/Research-and-Development-Technical-Reports/Environmental-Research-and-Development-Technical-Reports

Naturally Resilient Communities: http://nrcsolutions.org/

EPA Soak Up The Rain: https://www.epa.gov/soakuptherain

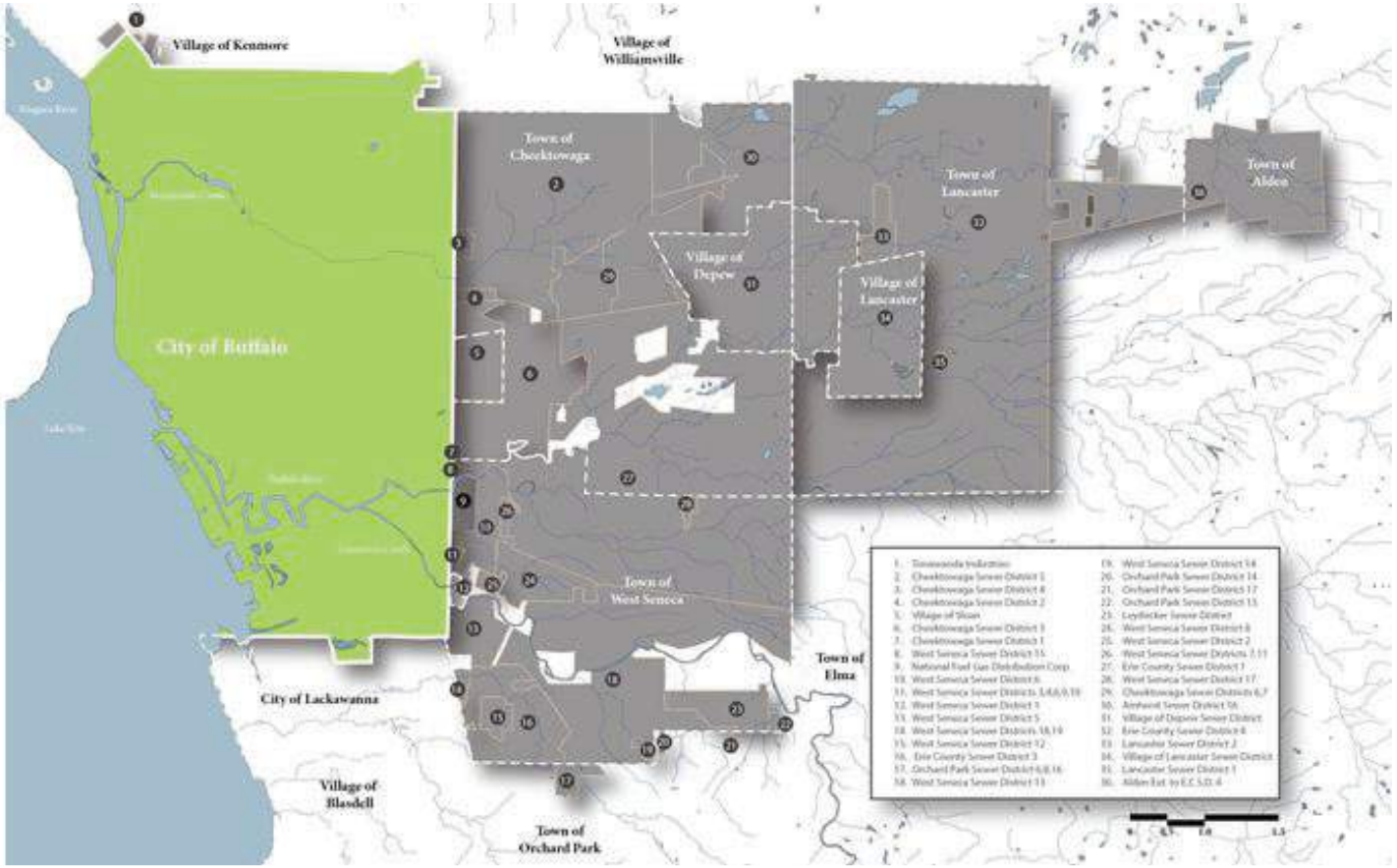
RAINCHECK

BUFFALO

SEWER AUTHORITY

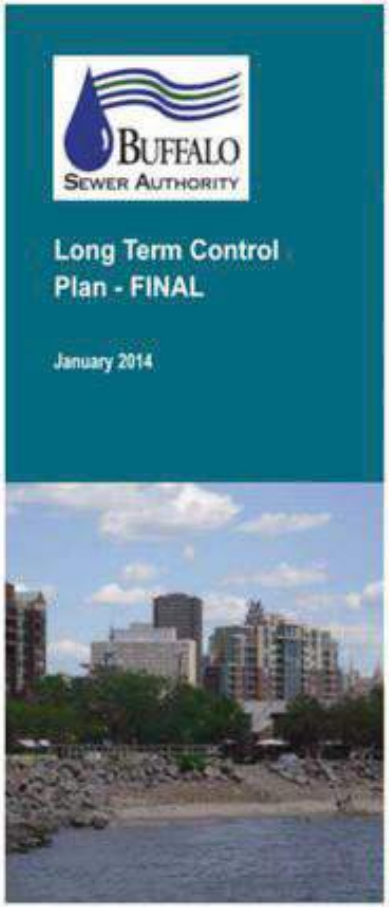

CITY OF BUFFALO
GREEN INFRASTRUCTURE
PLANNING
RAIN BARRELS
GREEN SPACE
WETLAND & SHORELINE BUFFER
GREEN STREET
STORM PLANTER
PERMEABLE PAVERS
BIO-SWALE
RAIN GARDEN
POROUS ASPHALT

- Established in **1935**
- Services the City of Buffalo, NY and 11 Surrounding Municipalities
- 110 Square Miles of Coverage, 850 miles of sewer pipe
- Serves Over 550,000 People



RAINCHECK

- Long Term Control Plan (LTCP) Approved by Agencies in 2014
- 20 year plan to be completed by March, 2034
- BSA Committed to Invest $430 Million Over 20 Years on Projects
- 97% of Wet Weather Flows to be Captured upon Completion of LTCP
- Manage 1,315 acres of impervious surface area with Green Infrastructure



Gray

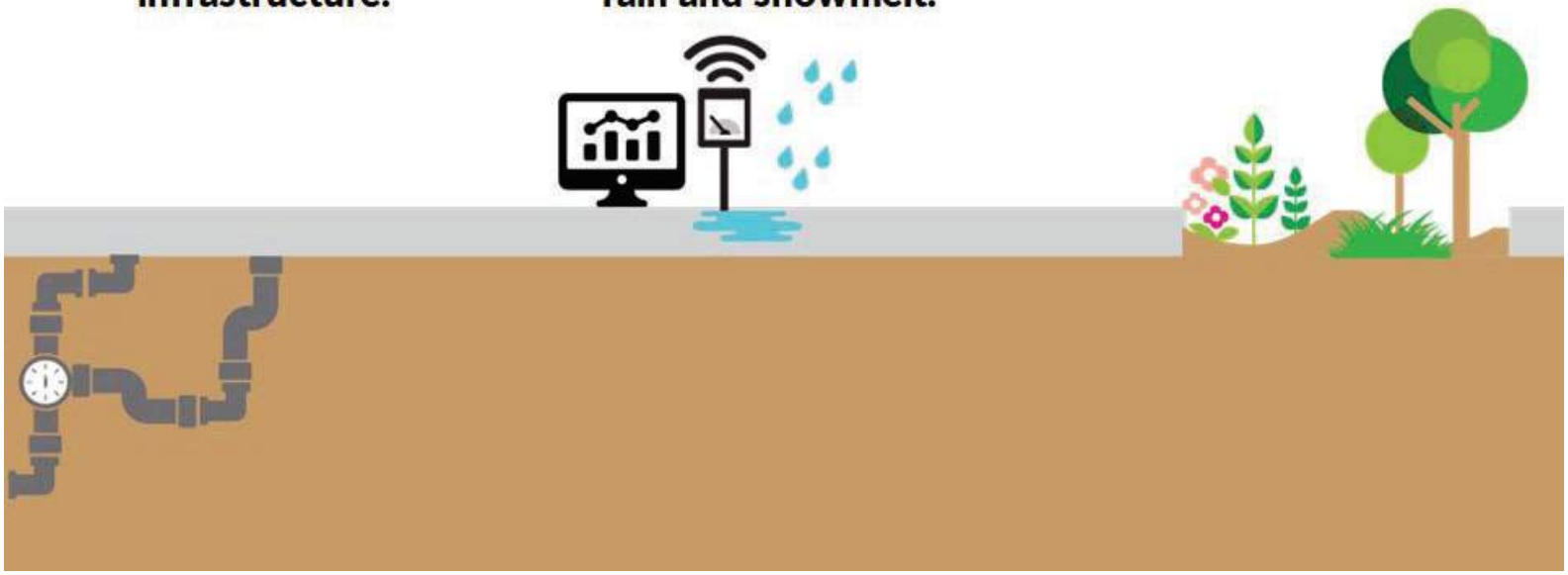
Expanding the capacity and efficiency of our pipes, pumps, and underground infrastructure.

Smart

Using "real time" sensors to move stormwater away from parts of the sewer system hit with lots of rain and snowmelt.

Green

Preventing or slowing water from reaching the sewer system with "green infrastructure."



When stormwater falls in a natural environment

Natural landscapes, soil and wetlands **can absorb stormwater** because they are **porous.**

When stormwater falls in an urban environment

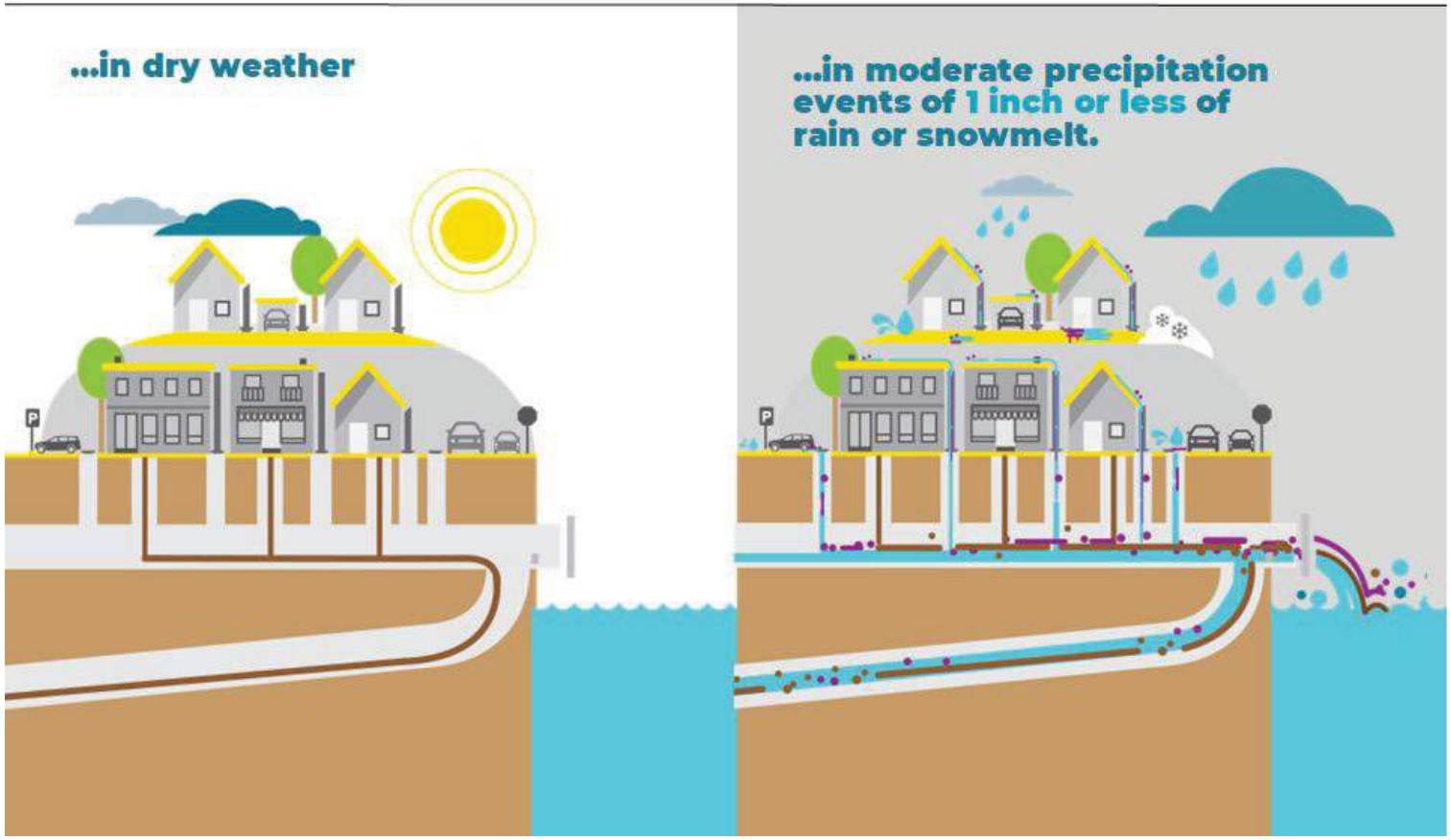
Stormwater needs to be managed because of the streets, buildings, parking lots, **and other hard surfaces we've built. Getting water off these surfaces quickly protects** the health and safety of people and the structural integrity of the things we've built.

Sidewalks, roads, driveways, and roofs can't absorb stormwater because they are **impervious surfaces.**

As stormwater flows across these impervious surfaces, it picks up dirt and **pollutants**, creating runoff.

This **polluted runoff** combines with **wastewater** from homes and businesses, often **overflowing into waterways.**

How our combined sewer system works...



Green infrastructure is designed to mimic how the natural environment manages stormwater.

Green Streets

Green Parking Lots

Demolitions and Vacant Lot Restoration

Rain Barrels and Downspout Disconnections

RAINCHECK

More than 9 miles of green streets across Buffalo

are helping us meet our stormwater challenge

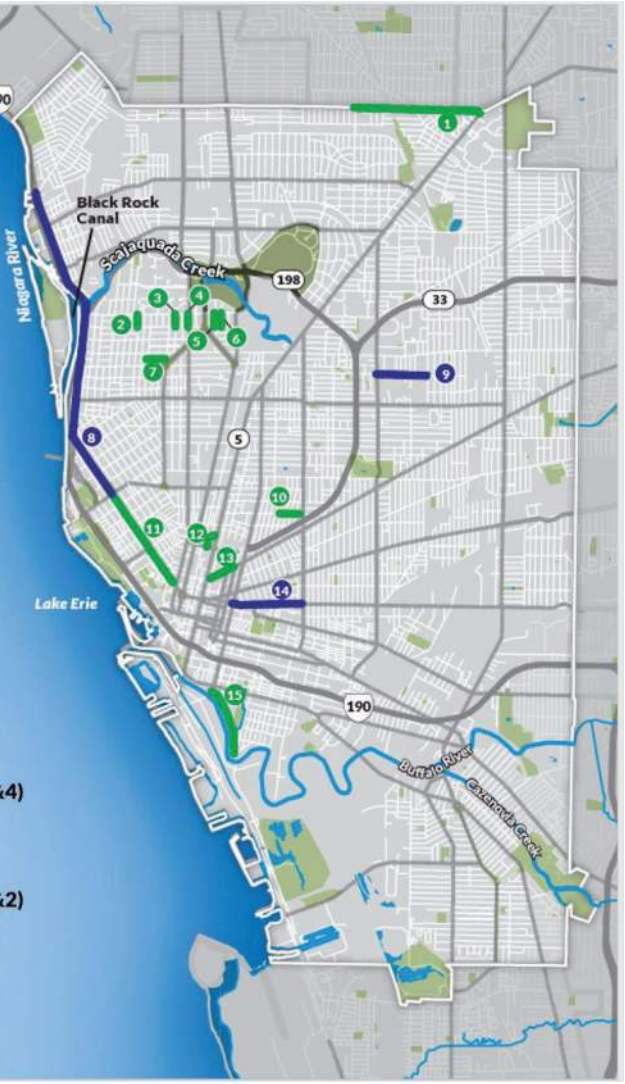
101.5 acres managed for stormwater

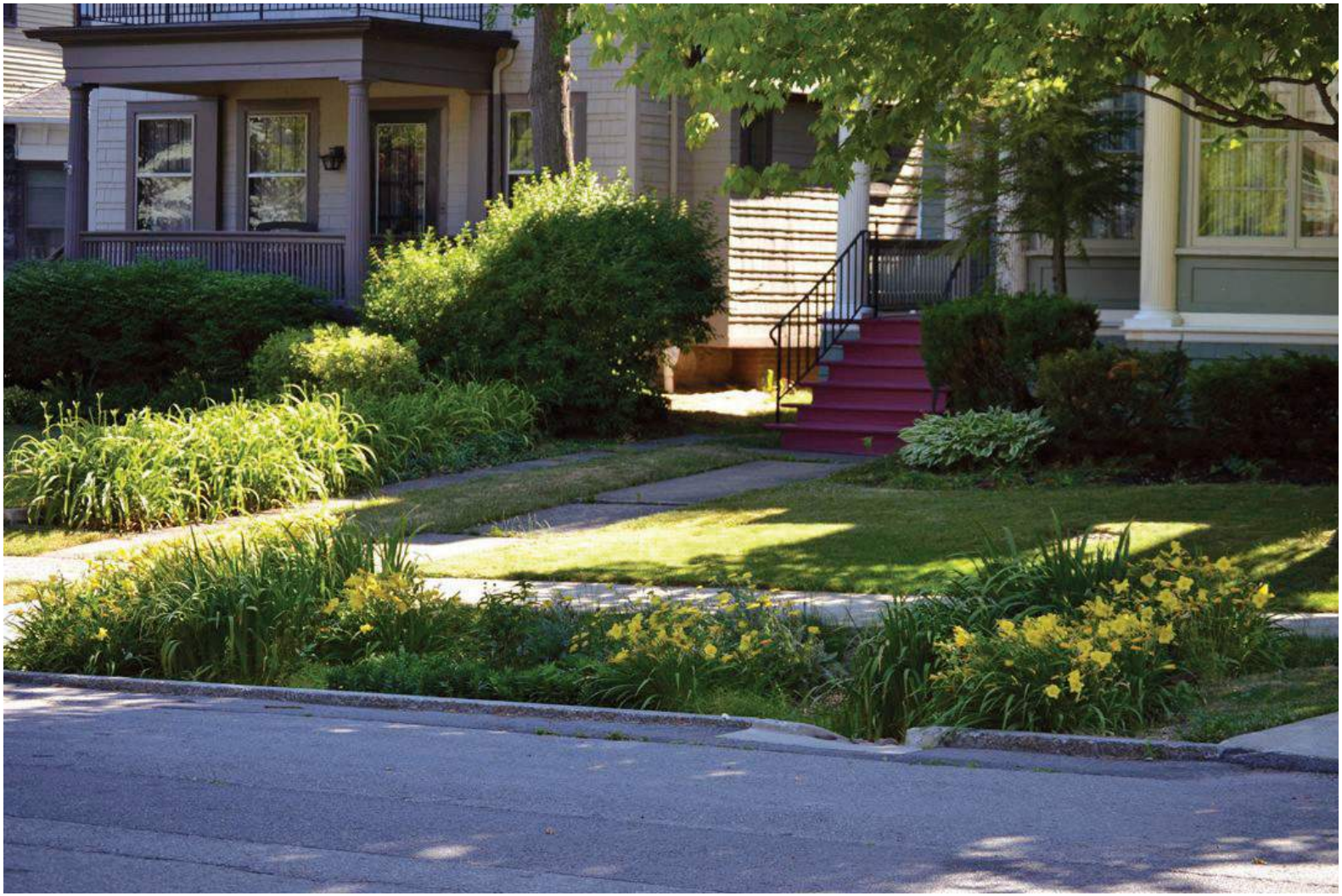
15.9 acres of impervious surfaces reduced

1,908,045

gallons of runoff prevented from entering the sewer system in a typical rainfall event.

1. Kenmore Ave
2. Parkdale Ave
3. Claremont Ave
4. Elmwood Ave
5. Windsor Ave
6. Clarendon Ave
7. Ardmore Place
8. Niagara Street (Phase 3&4)
9. Northland Ave
10. Carlton St
11. Niagara Street (Phase 1&2)
12. Pearl St
13. Genesee St
14. William St
15. Ohio St






PARKING
PAY STATION
PAY
HERE


CROSBY CO
NY


POROUS ASPHALT
RAIN GARDEN
SWALES

2.35 acres of green parking lots across Buffalo

are helping us meet our stormwater challenge

6.8 acres managed for stormwater

2.7 acres of impervious surfaces reduced

257,083

gallons of runoff prevented from entering the sewer system in a typical rainfall event.

6 Green Parking Lot Projects

1. North Buffalo Ice Rink
2. Broderick Park
3. 1401 Fillmore Avenue
4. 1384 Fillmore Avenue
5. Pratt Willert Community Center
6. JFK Community Center

RAINCHECK

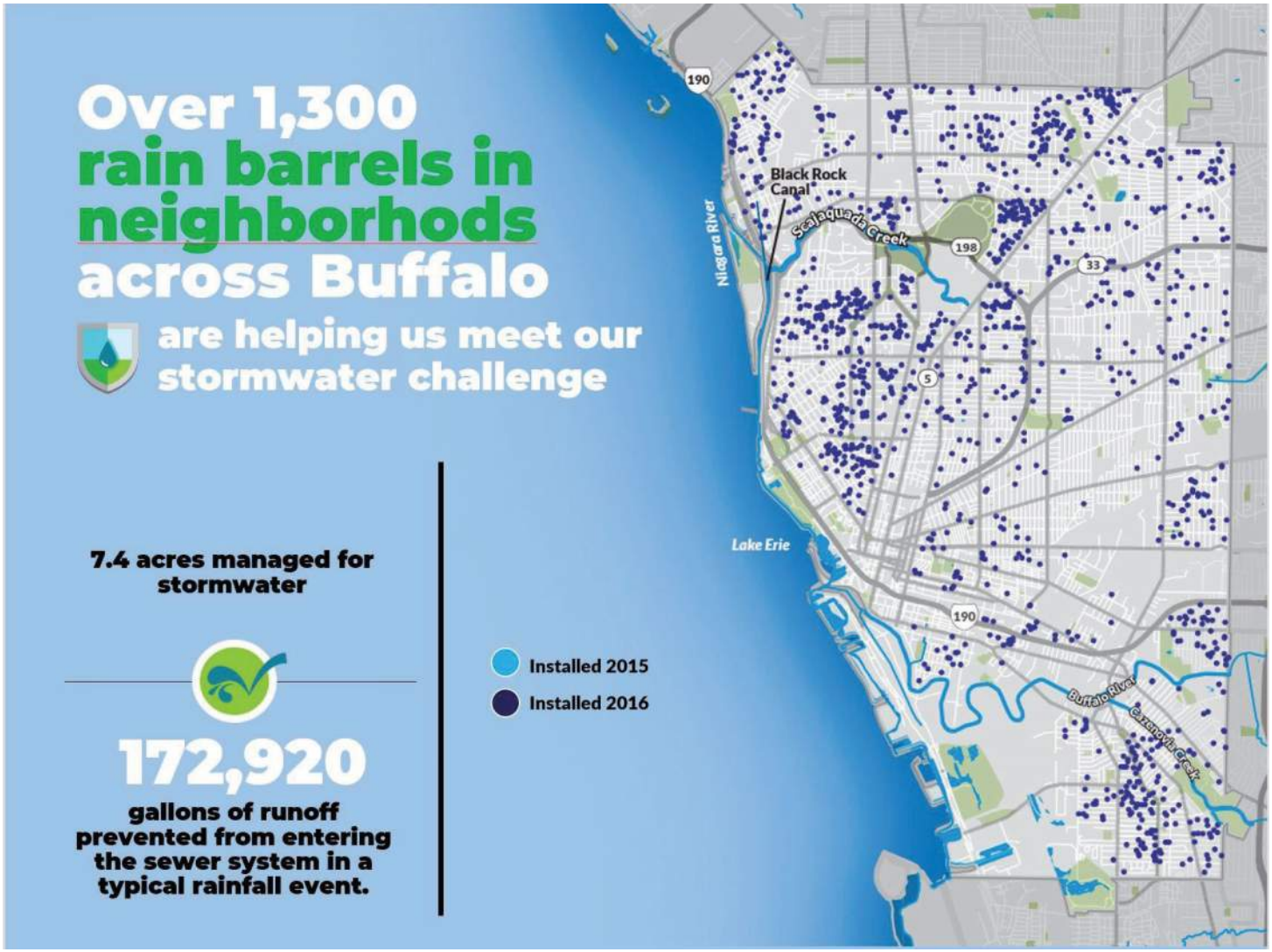
Over 1,300 rain barrels in neighborhods across Buffalo

are helping us meet our stormwater challenge

7.4 acres managed for stormwater

172,920

gallons of runoff prevented from entering the sewer system in a typical rainfall event.



RAINCHECK


HAS YOUR PROPERTY BEEN
RAINCHECK'D?
716.851.4664
raincheckbuffalo.org
SUPER DUTY
NEW YORK
Buffalo Sewer Authority
A B 4320
ERIE
RAINCHECK

RAINCHECK

LIVING SHORELINE:

Emergent and wetland ecologies provide stability and enhance ecological function along the creek banks. As shown in the first picture below, mowing to the edge limits ecological diversity. The addition of rock outcrops (otherwise known as bendway weirs) like those shown in the second picture, promote sediment deposition and protect developing ecosystems.

UPPER FLOODPLAIN:

This area will seldom be inundated with floodwater (the picture below shows the existing condition and elevation profile) but it serves as additional flood protection during extreme rain events. This area also provides opportunities for ecological exploration and education, as well as above ground cemetery memorials.

LOWER FLOODPLAIN:

Each level of the existing retaining wall (shown in picture above) has been pulled back from the edge, creating four tiers. The lower tiers help re-establish shoreline ecologies which mitigate flooding and regulate stream fluctuations.

This layer will be comprised of mostly emergent vegetation (i.e. sedges, rushes, and reeds) and will frequently be inundated with floodwater.

REACH TWO | DESIGN VISION

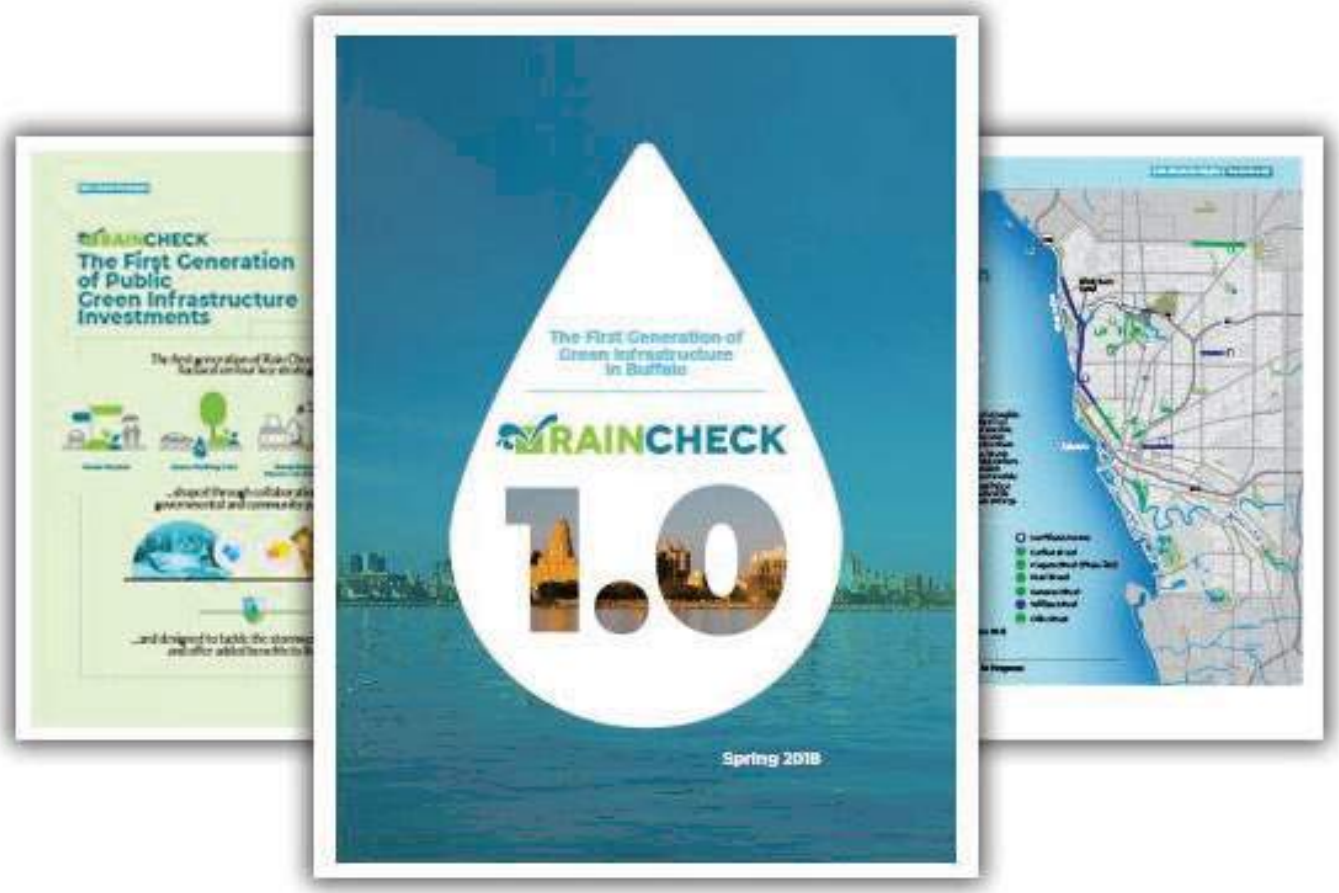
The graphic representation of this design strategy at right showcases some of the unique features envisioned. Stepping back the existing stone retaining wall into three tiers softens the transition between land and water to promote benefits listed above. Enhanced pedestrian access via a boardwalk allows naturalization of the shoreline to occur beneath. The boardwalk feature also offers unique memorial opportunities such as benches and/or other monuments which can be incorporated into the upper and lower floodplains.

REACH TWO | DESIGN FEATURES

- A BENDWAY WEIR
- B ROCK WALL
- C MEMORIAL BENCH
- D EDUCATIONAL SIGNAGE
- E BOARDWALK
- F LEGACY TREES

NEW YORK
STATE OF
OPPORTUNITY.
Environmental
Facilities Corporation

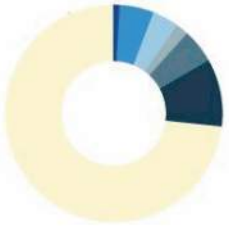
RAINCHECK


RAINCHECK
The First Generation of Public Green Infrastructure Investments
The First Generation of Green Infrastructure in Buffalo
RAINCHECK
1.0
Spring 2018

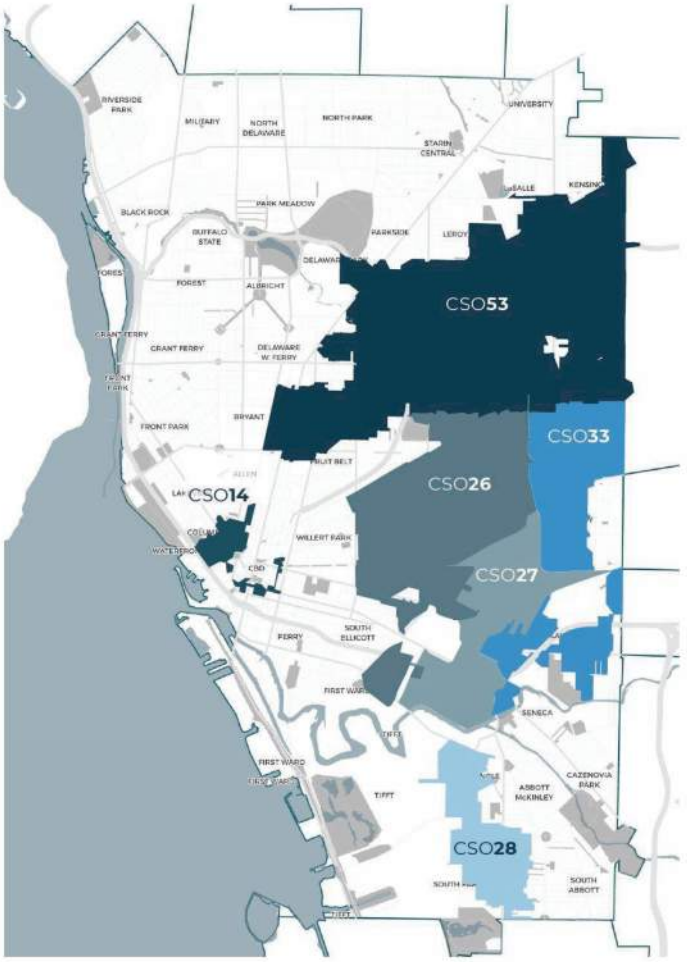
Priority CSO Basins

CSO14
CSO26
CSO27
CSO28
CSO33
CSO53

48%
of Buffalo's population lives in the six priority basins

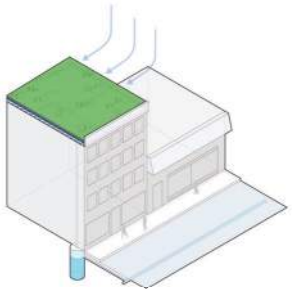


26%
of Buffalo's land area is within the six priority basins

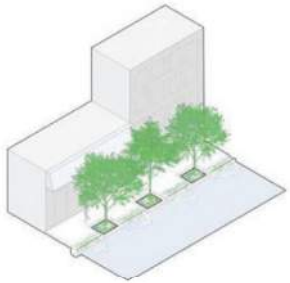


GOAL
569
impervious acres managed

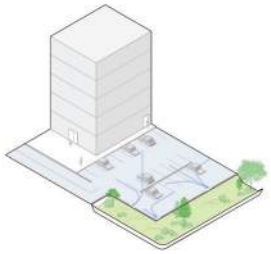
CSO53 298ac
CSO33 94ac
CSO28 27ac
CSO27 73ac
CSO26 64ac
CSO14 13ac



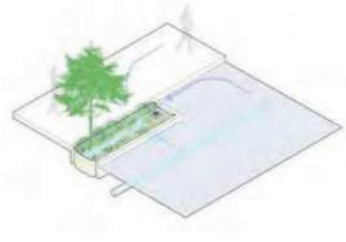
Green Roof



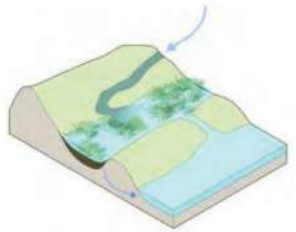
Street Trees /
Tree Trenches



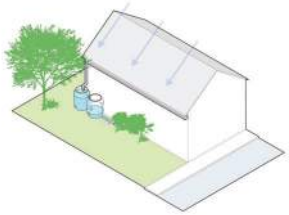
Rain Gardens
and Storm
Planters



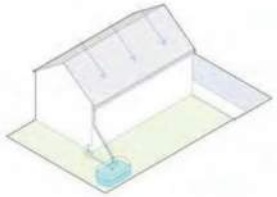
Bio-Swale



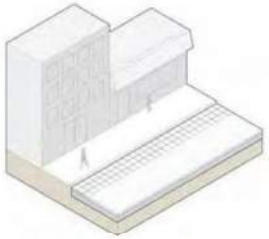
Constructed
Wetland



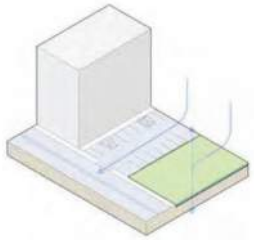
Rain Barrel



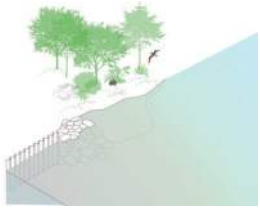
Cistern



Permeable
Pavement



De-Pave



Shoreline
Restoration

RAINCHECK

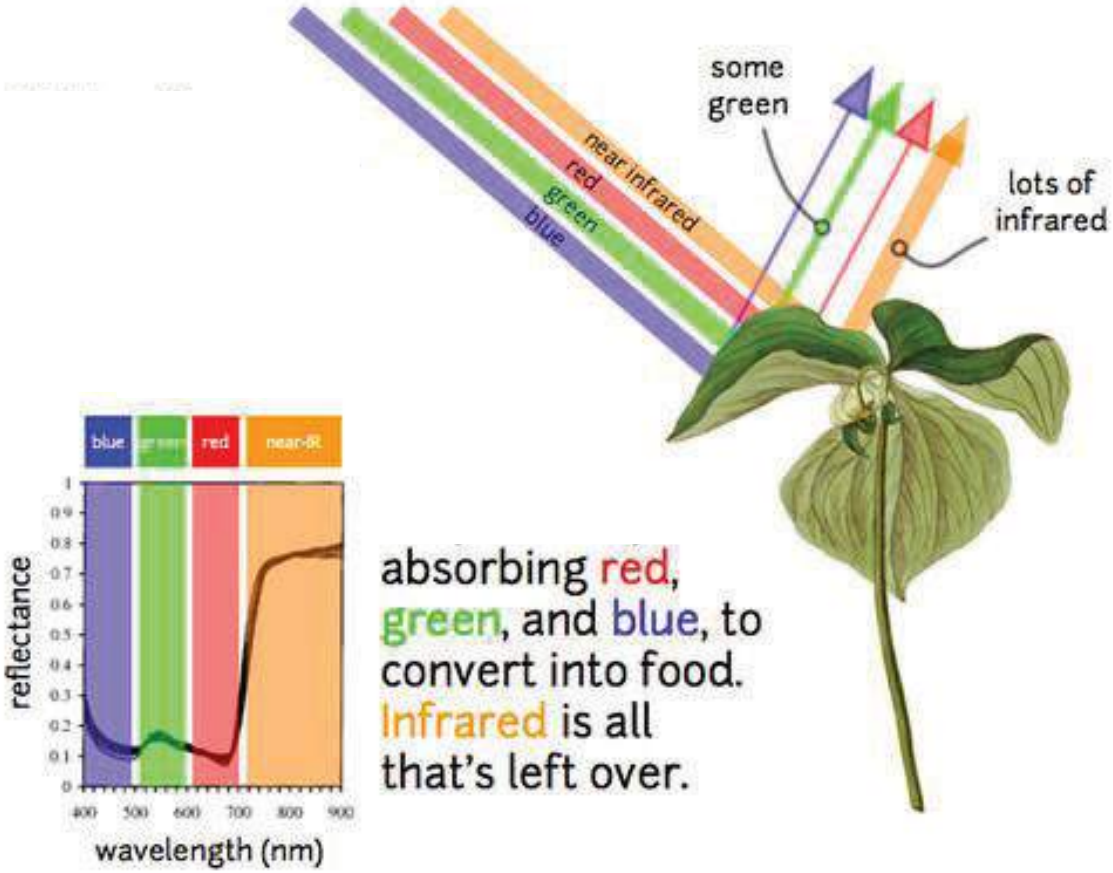
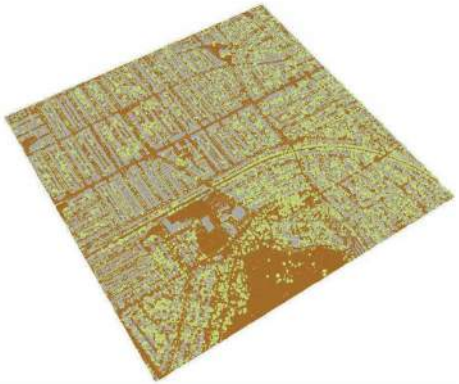


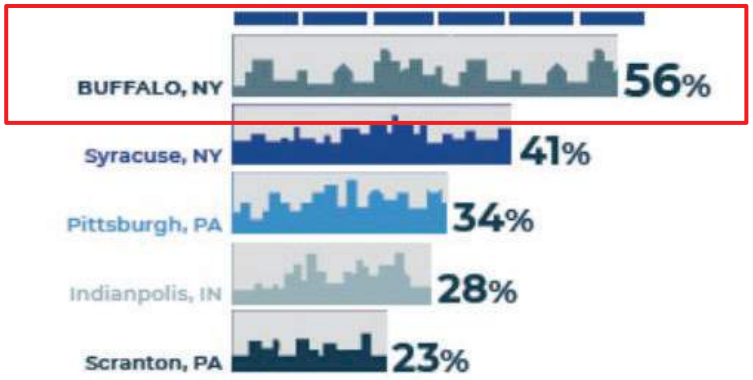
Image source: petapixel.com

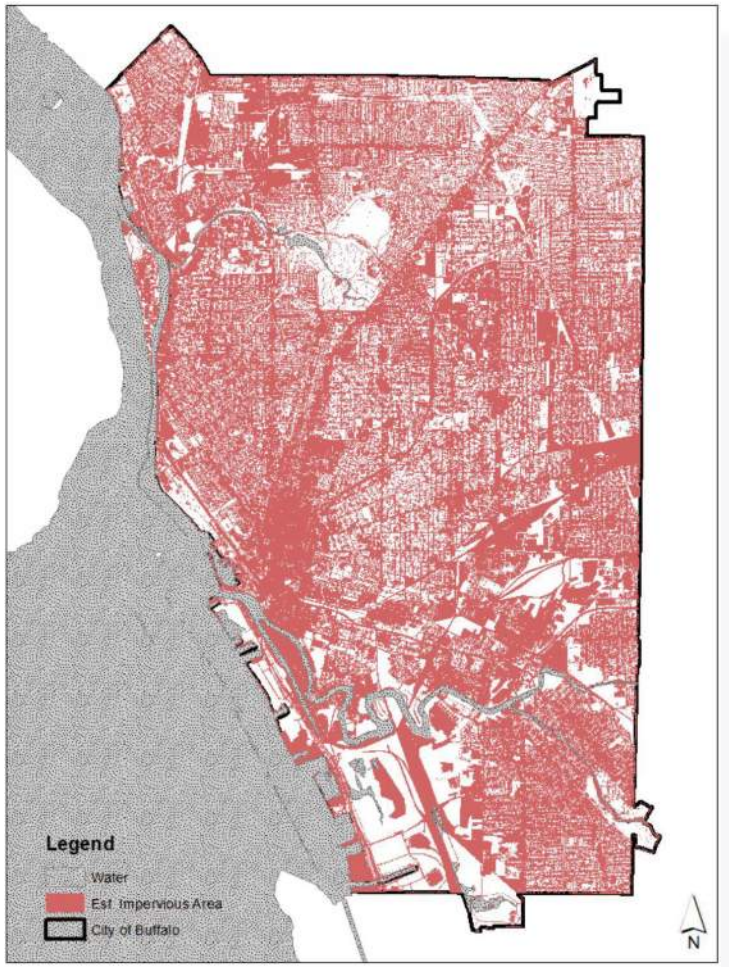
Where are the **impervious areas**?

$$NDVI = \frac{(NIR - Red)}{(NIR + Red)}$$

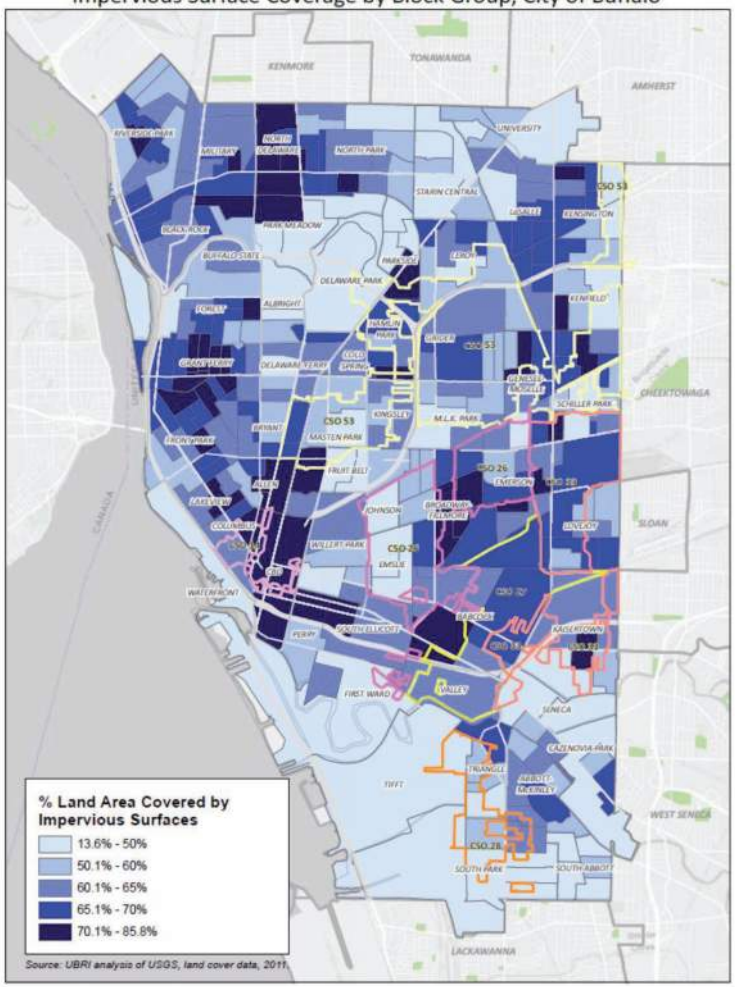


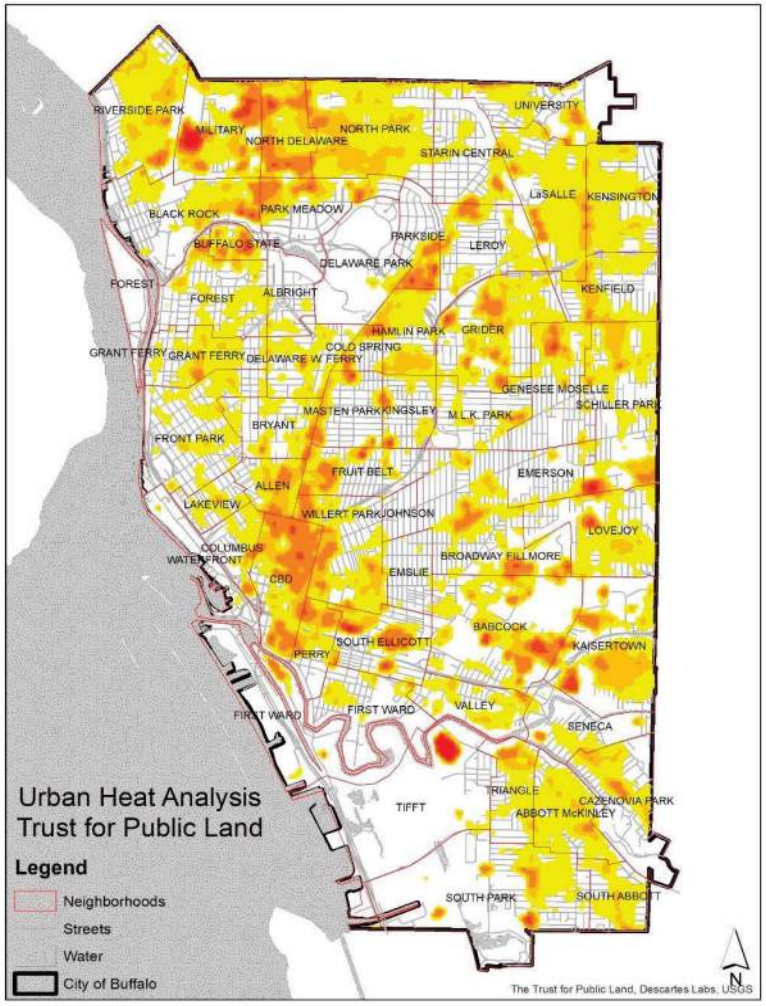
IMPERVIOUS AREA

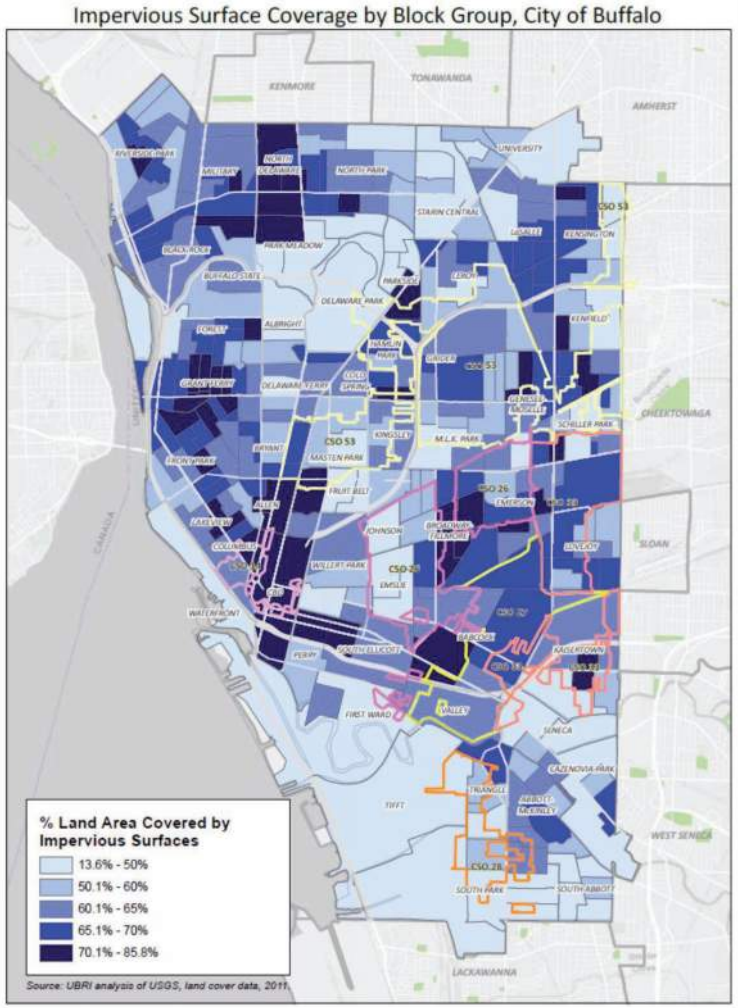


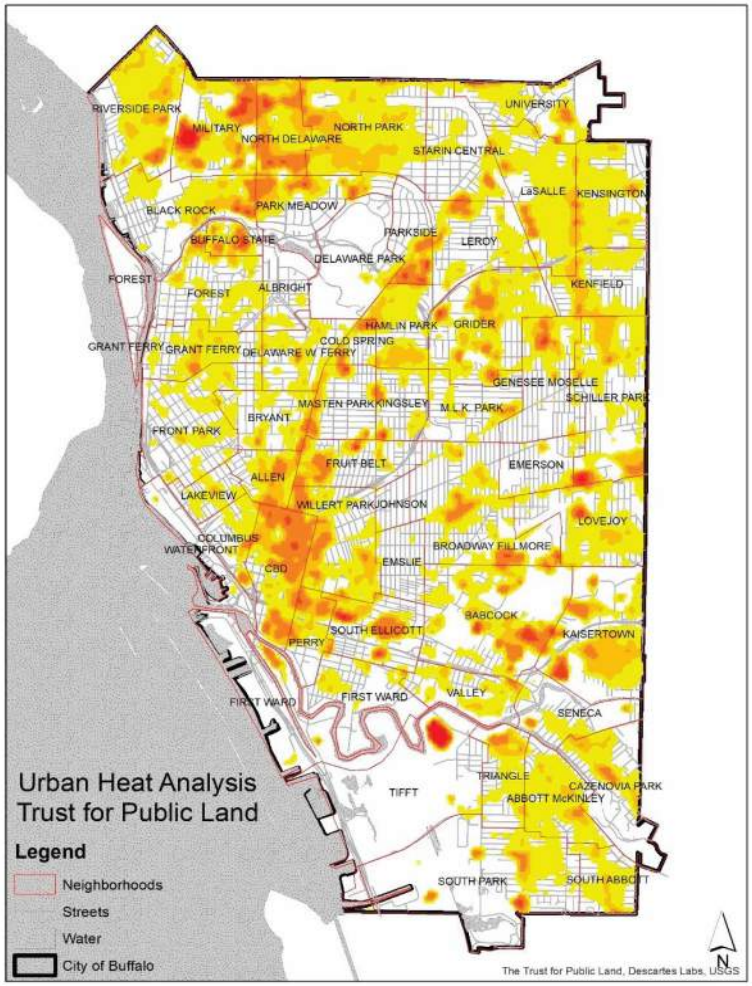


Impervious Surface Coverage by Block Group, City of Buffalo



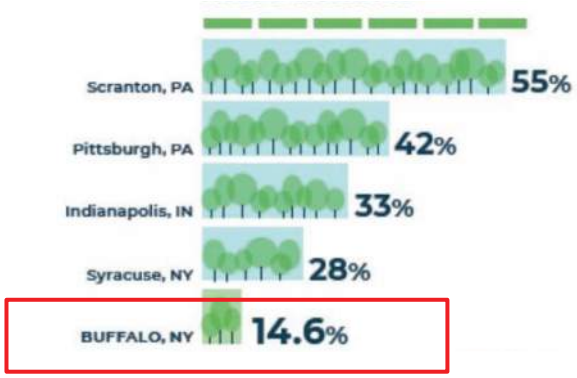

RIVERSIDE PARK
MILITARY
NORTH DELAWARE
NORTH PARK
UNIVERSITY
STARIN CENTRAL
LaSALLE
KENSINGTON
BLACK ROCK
PARK MEADOW
PARKSIDE
LEROY
BUFFALO STATE
DELAWARE PARK
FOREST
ALBRIGHT
KENFIELD
FOREST
HAMLIN PARK
GRIDER
COLD SPRING
GRANT FERRY
GRANT FERRY
DELAWARE W FERRY
GENESEE MOSELLE
SCHILLER PARK
MASTEN PARK
KINGSLEY
M L K. PARK
BRYANT
FRONT PARK
FRUIT BELT
EMERSON
ALLEN
LAKEVIEW
WILLERT PARK
JOHNSON
LOVEJOY
COLUMBUS
WATERFRONT
BROADWAY FILLMORE
EMSLIE
CBD
BABCOCK
SOUTH ELLICOTT
KAISERTOWN
PERRY
VALLEY
FIRST WARD
FIRST WARD
SENECA
TRIANGLE
CAZENOVIA PARK
TIFFT
ABBOTT McKINLEY
SOUTH PARK
SOUTH ABBOTT
Urban Heat Analysis
Trust for Public Land
Legend
Neighborhoods
Streets
Water
City of Buffalo
N
The Trust for Public Land, Descartes Labs, USGS

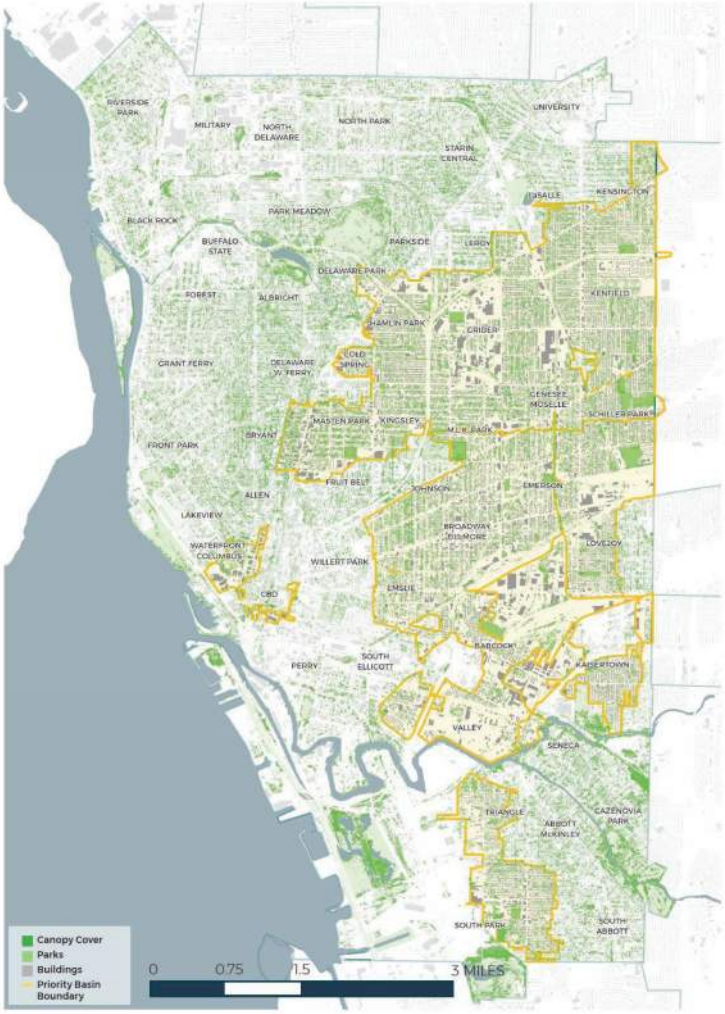

Impervious Surface Coverage by Block Group, City of Buffalo
% Land Area Covered by Impervious Surfaces
13.6% - 50%
50.1% - 60%
60.1% - 65%
65.1% - 70%
70.1% - 85.8%
Source: UBRI analysis of USGS, land cover data, 2011.

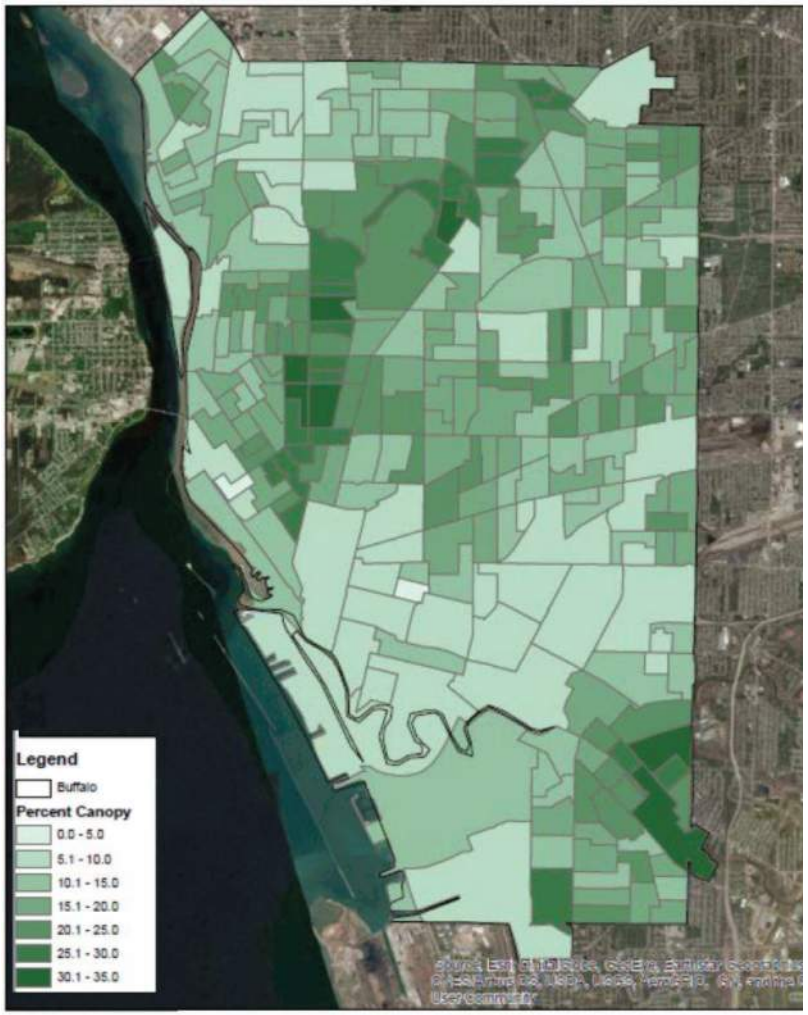

Urban Heat Analysis
Trust for Public Land
Legend
Neighborhoods
Streets
Water
City of Buffalo
The Trust for Public Land, Descartes Labs, USGS


Areas under tree canopy can be up to 9 degrees F cooler than surrounding areas
Buildings which have trees adjacent are cooler in the summer which reduces energy use from air conditioners
RAINCHECK

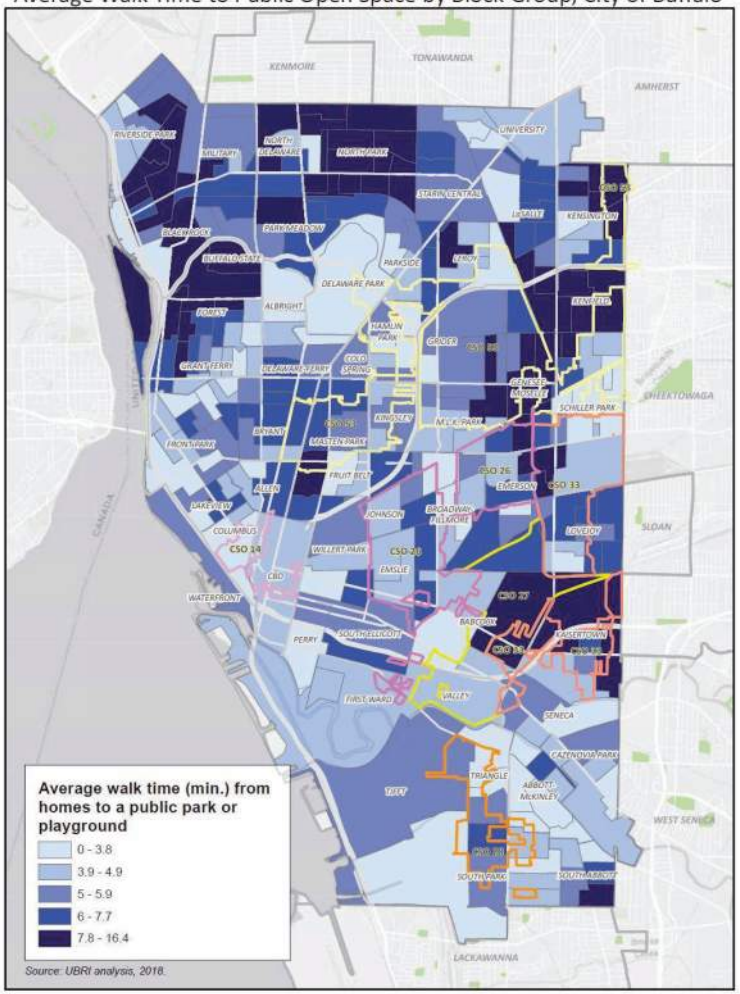
Tree Canopy Area

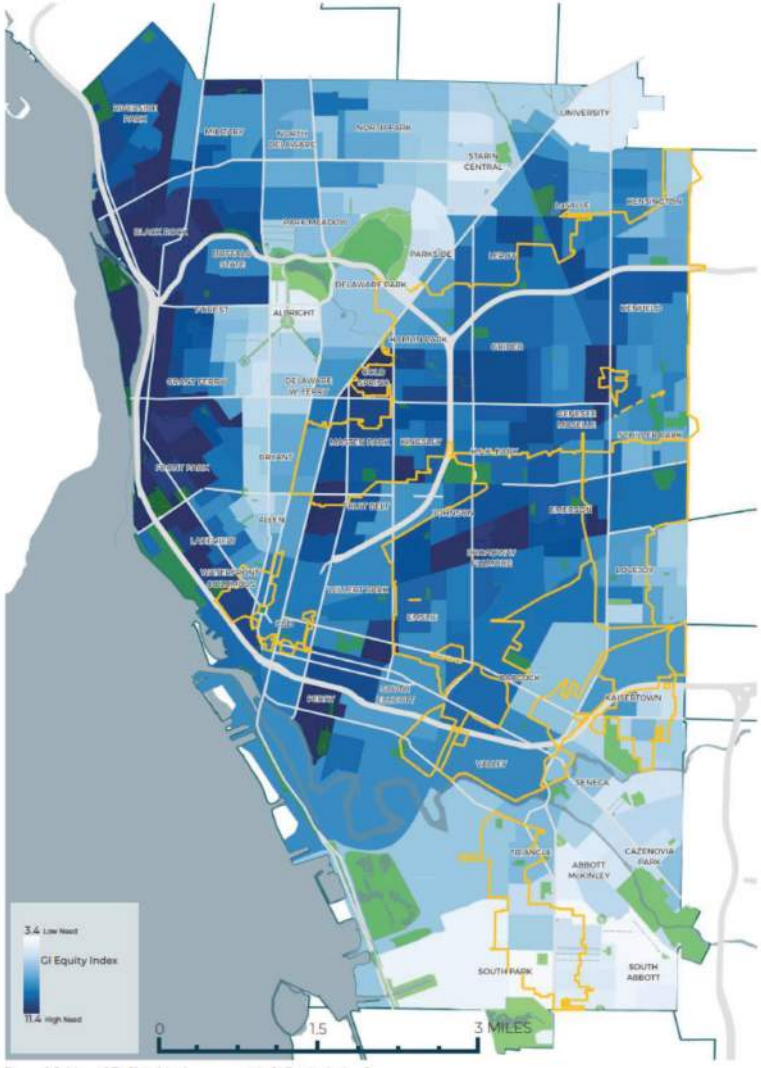





Legend
Buffalo
Percent Canopy
0.0 - 5.0
5.1 - 10.0
10.1 - 15.0
15.1 - 20.0
20.1 - 25.0
25.1 - 30.0
30.1 - 35.0

Average Walk Time to Public Open Space by Block Group, City of Buffalo





GI Equity Index Factors

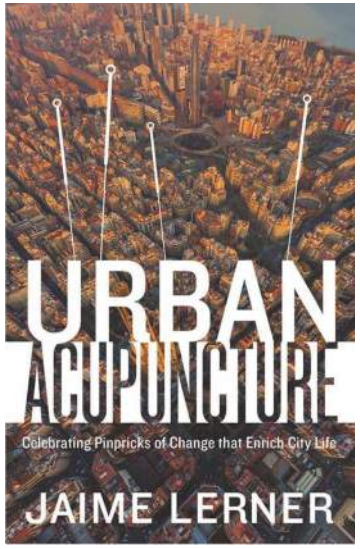
Socio-economic factors:

- Race and ethnicity
- Income
- Education attainment
- Young children
- Older adults
- Owner occupancy
- Limited English speakers
- Unemployment and labor force participation

Built environment factors:

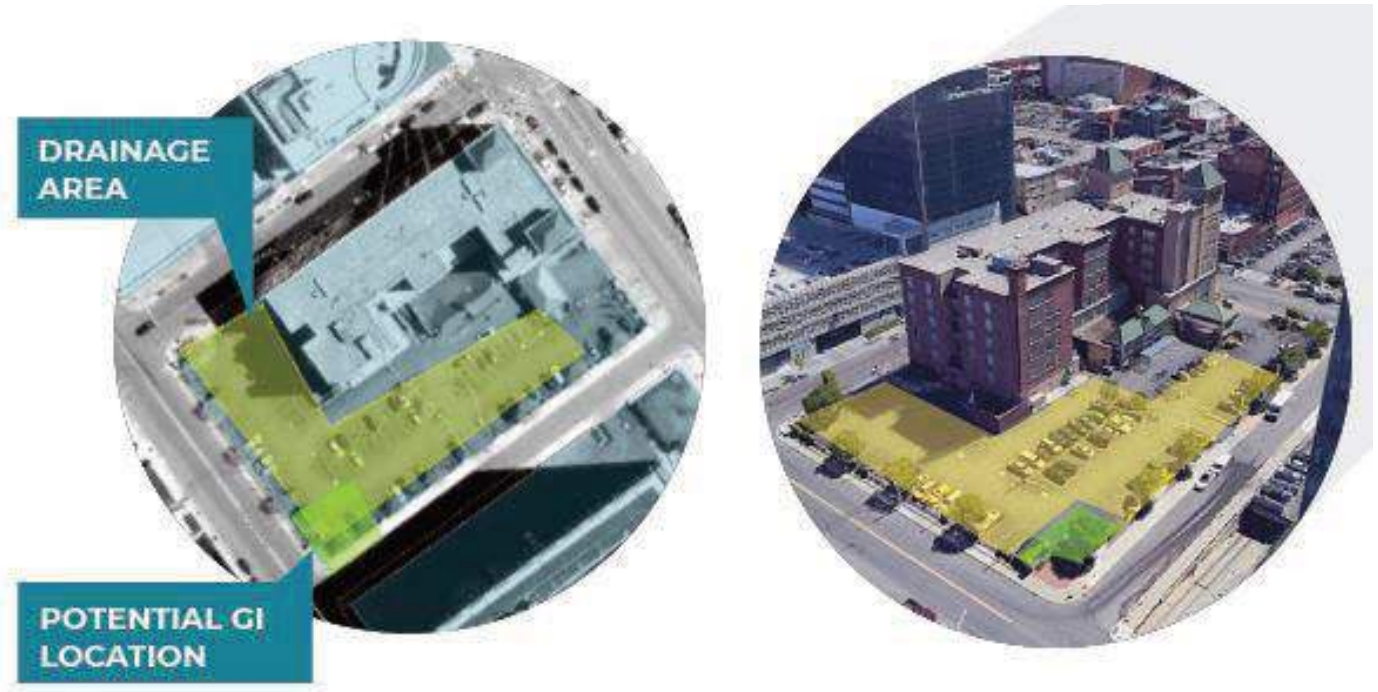
- Traffic proximity
- Ozone levels
- Particulate matter
- Access to public open space
- Tree canopy cover
- Impervious surface cover
- Vacant land
- Residential vacancy rates
- Commercial vacancy rates

RAINCHECK


URBAN
ACUPUNCTURE
Celebrating Pinpricks of Change that Enrich City Life
JAIME LERNER

RAINCHECK

Retrofit Reconnaissance Inventory



Retrofit # 94-1

CSO: 26

Address
60 HOWARD
Buffalo, NY 14206
District: South Central

Owner Name: United House of Prayer
Land Use: Community Service
Neighborhood: EMSLIE

Green Infrastructure Types

Parking Bioswales

Porous Paving

Retrofit Opportunity

Total Parcel Area: 0.66 Acres
Parcel Impervious Area: 0.56 Acres
Receiving Waterbody: Buffalo River
CSO Impervious Ranking: 167
Maximum Head Available: 6.5 Feet
Retrofit Location: Small Parking Lot
Retrofit Practice: Bioretention or Rain Garden
Retrofit Drainage Area: 0.12 Acres
Retrofit Practice Area(s):
Retrofit #1: 395 SF Total: 395 SF
Retrofit Practice Dimensions:
Retrofit #1: 26.56' x 16.82'
Retrofit Description:
small rain garden in corner of lot around catch basin, tie in with existing green space around lot. would require loss of 2-3 parking

Notes on Drainage Area:
parkinglot slopes away from street, has 2 driveways and 2 catch basins at low points in lot.

Light Availability: Partial sun/shade

Visibility: Medium visibility

Annual Air Quality PM10 Removed:
Retrofit #1: 0.17 lbs Total: 0.17 lbs

Annual Carbon Dioxide Sequestered:
Retrofit #1: 229 lbs Total: 229 lbs

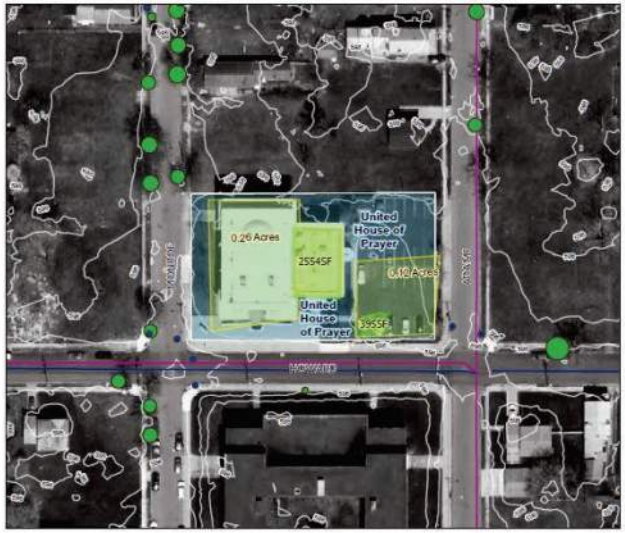
Annual Air Quality Ozone Removed:
Retrofit #1: 0.19 lbs Total: 0.19 lbs

CSO Information

CSO Target Reduction: 63.6 Acres
CSO Total Area: 1901.1 Acres

Site Information

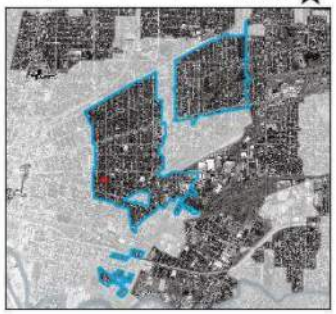
Drainage Area Land Use: Institutional
Potential Site Constraints:
None
Adjacent Land Use Classes:
Residential, Commercial, Institutional
Utility Constraints:
None
Dominant Soil Type: Unknown



0 25 50 100 150 200 US Feet

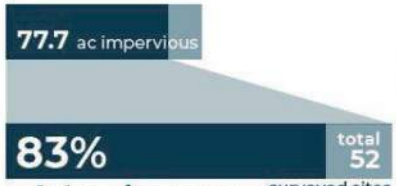
RRI Survey
- Proposed Retrofit Practice
- Retrofit Drainage Area
- RRI Parcel
- Combined Sewer
- Interceptor Sewer
- Storm Overflow Sewer
- Storm Relief Sewer
- Sanitary Sewer
- Existing Street Tree
- Catch Basin / Receiver

RRI Reference Location
- Survey Parcel
- CSO Boundary



RAINCHECK

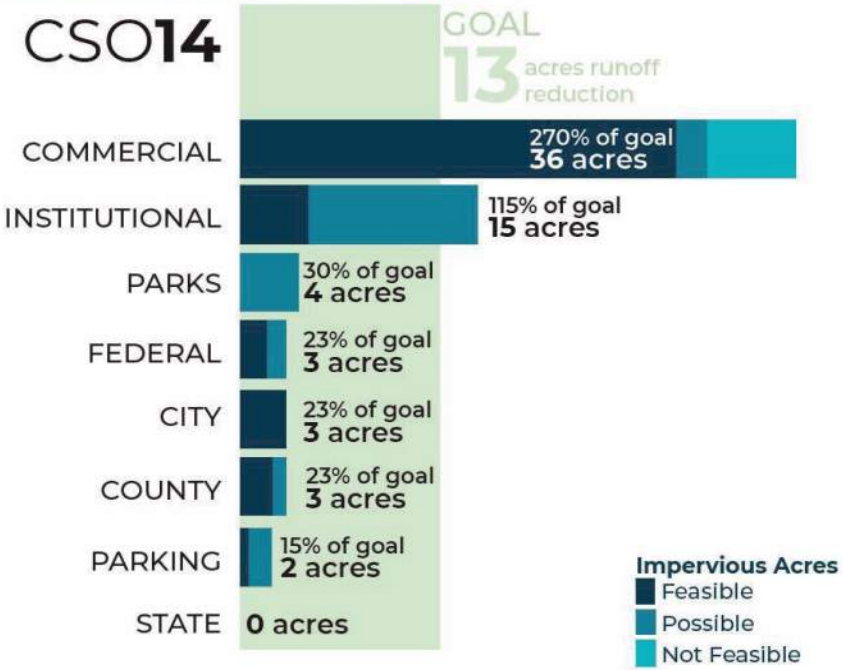
The site analysis reviewed 59% of the basin and found 25.5 acres of potential drainage area.



of the sites were suitable for green infrastructure.

Surveyed Properties by Land Use and Ownership

GIS sources: Erie County data, Buffalo Sewer Authority data



LARGEST PROPERTY OWNERS BY LAND USE AND OWNERSHIP

COMMERCIAL

Blue Cross/Blue Shield of WNY
6.0 Imperv. acres

New Era Store
2.4 Imperv. acres

Delaware North Building
1.7 Imperv. acres

Embassy Suites by Hilton
1.6 Imperv. acres

The Benchmark Group
1.6 Imperv. acres

INSTITUTIONAL

AllPro Parking Lot (Elmwood)
1.4 Imperv. acres

St. Anthony's Parking
1.2 Imperv. acres

Lot 23 Parking
0.6 Imperv. acres

Swan Street Parking
0.5 Imperv. acres

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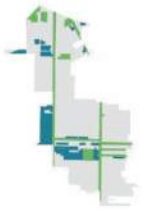
Opportunity Sites & Networks

Corridors

Hopkins Street and South Park Avenue provide the basis for a networked green infrastructure system and are also current or potential centers of neighborhood centers. Existing medians at Harding, Culver and Ridgewood streets provide opportunities for local networks of green infrastructure that could tie in residential properties and connect to a larger neighborhood network along South Park Avenue.



Sites

The sites analyzed in CSO Basin 28 naturally organize along corridors. Small mid-block parks and open space in the basin and adjacent to it provide additional opportunity for green infrastructure both at their perimeter and below grade. Combining green infrastructure with open space and parks enhances the public realm and provides greater access to green space.

Clusters and Networks

The large cluster of primarily industrial properties surveyed can be combined with corridors into larger clusters or networks. These can be combined with institutions and parks in and adjacent to the basin. Such clusters are based on both physical proximity and programmatic synergies. Program synergies could include, for example, workforce development programs centered around schools or community centers that will assist with the implementation of green infrastructure city-wide.

Key Corridors

- Hopkins Street
- South Park Avenue
- Residential streets with existing medians (Harding, Culver, Ridgewood)

Key Institutions

1. South Park High School
2. South Buffalo Food Pantry
3. Buffalo Police Department
4. South Buffalo Irish Center

Industrial/Commercial

5. Niagara Fiberglass, Inc.
6. Mobile Mini
7. Price Trucking
8. Rite Aid

Key Parks

1. Boone Park
2. Heacock Park
3. Durrant Street Playground
4. Mulroy Park
5. South Buffalo Charter School Playground
6. Buffalo Erie Botanical Gardens

Figure 1.68: CSO Basin 28 Green Infrastructure Opportunity Sites

Table 6 Summary of Economic Impacts

Impact Type	Employment	Labor Income ($)	Value Added ($)	Output ($)
Direct Effect	8.7	476,980	613,516	828,588
Indirect Effect	1.5	86,317	132,728	235,590
Induced Effect	3.3	148,173	274,474	456,769
Total Effect	**13.5**	**711,470**	**1,020,719**	**1,520,947**

The Green Infrastructure Workforce in Buffalo

The $1 million project would be expected to generate approximately 13 jobs during its design and construction, primarily in the construction, water/sewer systems, and landscaping industries.

As of May 2017, the Buffalo Metropolitan Area had approximately 13,840 jobs in industry sectors related to green infrastructure design, construction, and maintenance (the total number of jobs in all occupations in the Buffalo MSA in 2017 was 547,750, according to BLS). These jobs had an average median hourly wage of $23.04, which is 30 percent higher than the median hourly wage for the Metropolitan Area as a whole, $17.77.[1]

Table 4: Green Infrastructure Workforce statistics for Buffalo MSA, Courtesy US Bureau of Labor Statistics

Standard Occupational Classification (SOC) Code	Occupation	Total Employment in Buffalo MSA (rounded to nearest 10)	Employment per 1,000 of total jobs in Buffalo MSA	Location Quotient	Hourly median wage
17-3025	Environmental Engineering Technicians	40	0.068	0.55	$21.28
37-1012	First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	220	0.406	0.58	$23.05
37-3011	Landscaping and Groundskeeping Workers	3,360	6.14	0.96	$14.16
37-3013	Tree Trimmers and Pruners	60	0.105	0.37	$23.70
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	1,550	2.834	0.73	$33.80
47-2051	Cement Masons and Concrete Finishers	470	0.854	0.68	$18.60
47-2061	Construction Laborers	3,860	7.039	1.04	$17.16
47-2071	Paving, Surfacing, and Tamping Equipment Operators	160	0.286	0.82	$30.18
47-2073	Operating Engineers and Other Construction Equipment Operators	890	1.633	0.64	$28.85
47-2151	Pipelayers	30	0.06	0.22	$27.08
47-3015	Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters	90	0.166	0.43	$13.32
47-3016	Helpers--Roofers	**	**	**	$14.36
47-4011	Construction and Building Inspectors	540	0.985	1.42	$27.96
47-4071	Septic Tank Servicers and Sewer Pipe Cleaners	70	0.119	0.64	$20.82
49-9012	Control and Valve Installers and Repairers, Except Mechanical Door	360	0.661	1.98	$34.31
51-8031	Water and Wastewater Treatment Plant and System Operators	430	0.778	0.94	$24.70
53-7051	Industrial Truck and Tractor Operators	1,710	3.122	0.78	$18.29
TOTAL		13,840	25	**	(Average) $23.04


NATIONAL GREEN INFRASTRUCTURE
ngicp
CERTIFICATION PROGRAM

RAINCHECK

Technical Advisory Committee

John Bidell - Buffalo Public Works
Hal Sprague – Center for Neighborhood Technologies
Marcella Bondie Keenan – Center for Neighborhood Technologies (CNT)
Anna Wolf – Center for Neighborhood Technologies (CNT)
Dawn Walker – Center for Neighborhood Technologies (CNT)
Jared Pristach – Core Environmental Consultants, Inc.
Deb Caraco – Center for Watershed Protection (CWP)
Bill Stack - Center for Watershed Protection (CWP)
Kevin Connors – Eco Logic
Antonina Semeti – Groundworks Buffalo WNY Environmental Alliance
Dan Seiders – Joy Kuebler Landscape Architect
Joy Kuebler – Joy Kuebler Landscape Architect
Brian Hahn – NYS Environmental Facilities Corporation
Jen Kaminsky – People United for Sustainable Housing (PUSH)
Ken Parker - People United for Sustainable Housing (PUSH)
Es Jimenez – People United for Sustainable Housing (PUSH) Blue
Megan Ziegler – Pittsburgh Water and Sewer Authority (PWSA)
David Majewski – Sustainable Resource Group (SRG)
Krista Kelleher – Syracuse University
Yue (Nina) Chen – The Nature Conservancy
Valerie Strassberg – The Nature Conservancy
Carter Strickland – Trust for Public Lands
Chris Lowry – University at Buffalo
Michael Shelly – University at Buffalo
Susan Clark – University at Buffalo
Zoe Hamstread – University at Buffalo
Alan Rabideau – University at Buffalo
John Whitney – USDA Natural Resources Conservation Service (NRCS)
Bill Schuester – U.S. Environmental Protection Agency (EPA)
Valerie Shao – U.S. Geologic Survey (USGS)
Brett Hayhurst – U.S. Geologic Survey (USGS)
Joseph Gould – Buffalo Niagara Waterkeeper
Kristopher Winkler – Watts Architecture & Engineering
Scott Rybarczyk – Wendel Companies

Tree Technical Advisory Committee

Justin Hynicka – American Forests
Adam Berland – Ball State
Ross Hassinger – City of Buffalo Bureau of Forestry
Andy Rabb – City of Buffalo Bureau of Forestry
Deb Caraco - Center for Watershed Protection (CWP)
Neely Law – Center for Watershed Protection (CWP)
Shannon Hennessey – CORE Environmental Consultants
Lori Brockelbank – Davey Trees
Robert Coville – Davey Trees
Josh Behounek – Davey Trees
Adam Woodburn – Onondaga County Department of Water Environment Protection
Stephen Harris – Syracuse Forester
Mike Traglia – The Nature Conservancy
Bryant Scharenbroch – University of Wisconsin
Nina Bassuk - Urban Horticulture Institute

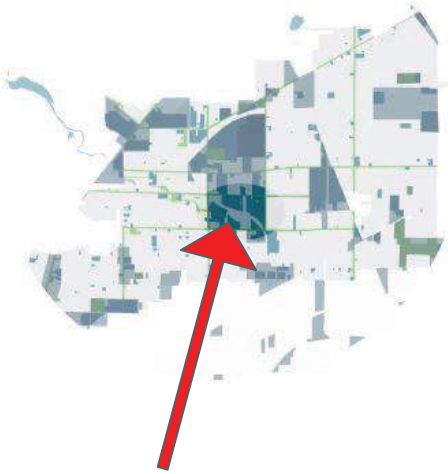
Partner Organizations

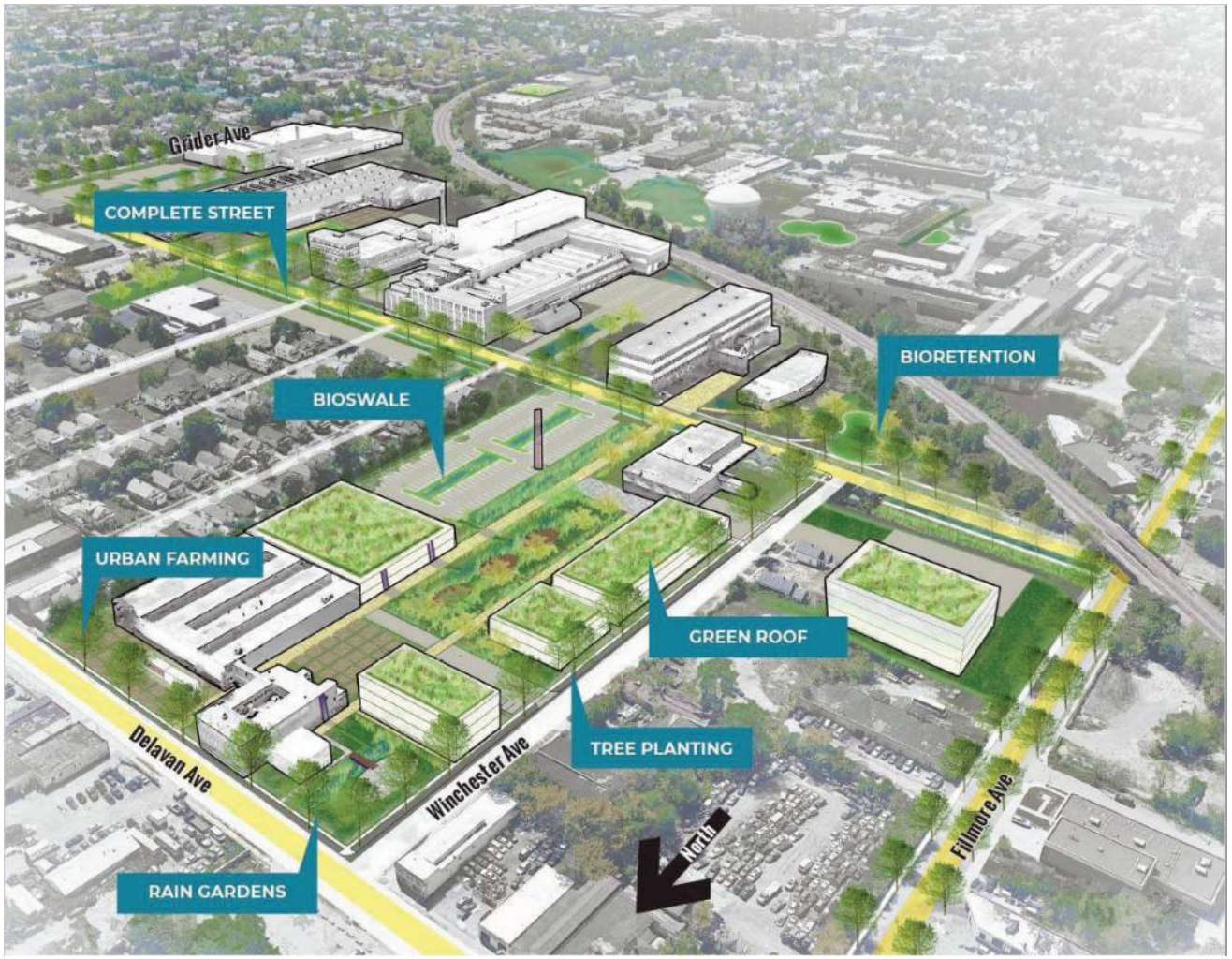
Emily Dyett - Environmental Alliance of Western New York
Antonina Simetti – Groundwork Buffalo
Jill Jedlicka – Buffalo Niagara Waterkeeper
Allie Urbanski – Community Foundation for Greater Buffalo
Cara Matteliano –Community Foundation for Greater Buffalo
Joanna Walczyk – Local Initiatives Support Corporation (LISC)
Brian Dold – Olmstead Conservancy
Gregory Sargis – The Nature Conservancy
Matt Schmidt – Trust for Public Lands
Jeanette Koncikowski – Grassroots Gardens
Nancy Smith – WNY Land Conservancy
Jenifer Kaminsky- PUSH Buffalo
Ken Parker- PUSH Buffalo

Practitioners (Developers/Engineers)

Chris Wood – Carmina, Wood, Morris, PC
Bill Paladino – Ellicott Development
Matt Roland – Hamister Group
Nick Dolpp – Iskalo Development
Leslie Zemsky – Larkin Development Group
Joe Petrella - Larkin Development Group
Rocco Termini – Signature Development
Scott Rybarczyk- Wendel Companies
Dave Majewski - Sustainable Resource Group
Phil Thompson – Labella Associates


Green infrastructure is aligned with institutions:
Green infrastructure can benefit parks & open space:
Institutional/Property green spaces and water amenities
Vacant Lot: aggregated, networked system
RAIN CHECK green water buffalo
2.0
OPPORTUNITY REPORT
The Next Generation of Green Infrastructure in Buffalo
Buffalo Sewer Authority | Spring 2019
BUFFALO
SEWER AUTHORITY
Priority Basins
Surveyed Sites Breakdown




Gäder Ave
COMPLETE STREET
BIOSWALE
BIORETENTION
URBAN FARMING
GREEN ROOF
TREE PLANTING
Delavan Ave
Winchester Ave
North
Fillmore Ave
RAIN GARDENS

RAINCHECK

GRANT PROGRAM

Attachment D to the Semi-Annual Status Report: March 2020

Certificates of Acceptance and Occupancy

ITEM NO. 38
CONTRACT NO. 81700020

CERTIFICATE OF ACCEPTANCE AND OCCUPANCY

PROJECT: Willert Park Green Infrastructure & Miami St. & Louisiana St. Sewer Improvements

BID: $4,814,586.50

CONTRACTOR: CATCO
1266 Townline Road
Alden, NY 14004

WHEREAS: The Principal Sanitary Engineer and Landscape Architect have certified that the Contractor completed the work in accordance with the plans and specifications on September 13, 2019; and

WHEREAS: In Item No. 12, on February 14, 2018 the contract value was increased by $145,142.55; and

WHEREAS: In Item No. 37, on September 25, 2019 the contract value was decreased by $195,700.97.

NOW THEREFORE
BE IT RESOLVED: That the Board of the Buffalo Sewer Authority hereby finds and determines that:

a. The work to be performed under the terms of the Contract has been complete and is accepted;

b. The date of entrance and occupancy be fixed as of September 13, 2019;

c. The maintenance period commence on September 13, 2019;

d. The final cost of the Contract $4,764,028.08.

MOTION TO APPROVE

MADE BY MR. ROOSEVELT

2ND BY MR. KENNEDY

AYES 3 NOES 0

Board Meeting of September 25, 2019