



Off-site Stormwater Management to Promote Green Infrastructure

Green Infrastructure Webcast Series

July 26, 2023

Housekeeping

- This presentation is being recorded and will be made available via <https://www.epa.gov/green-infrastructure/green-infrastructure-webcast-series>
- All participants are muted to minimize background noise.
- Technical issues or questions?
 - Contact us via the Q&A Box.



Meet your Hosts:



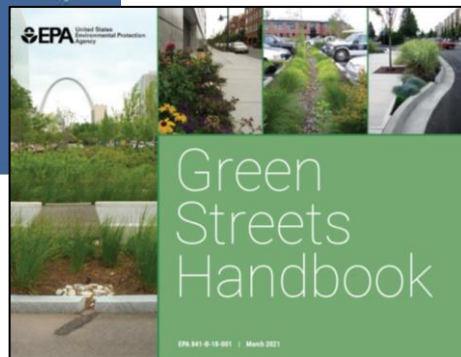
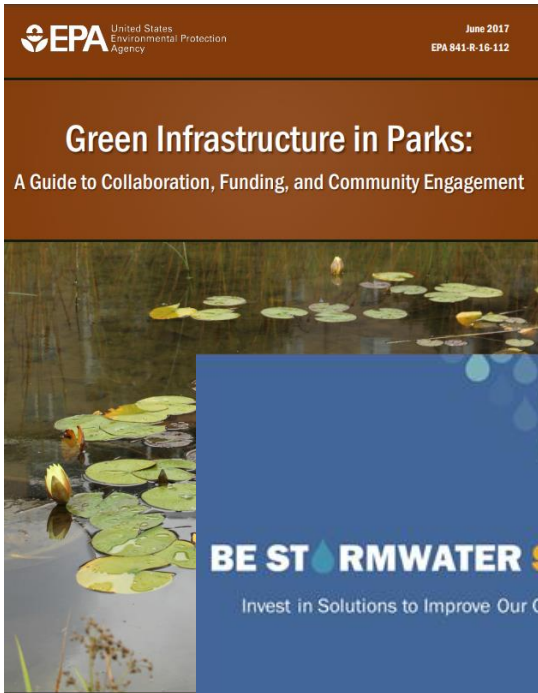
Robyn DeYoung,
U.S. EPA
Green Infrastructure and
Integrated Planning Lead



Heather Goss,
U.S. EPA
Transportation Liaison



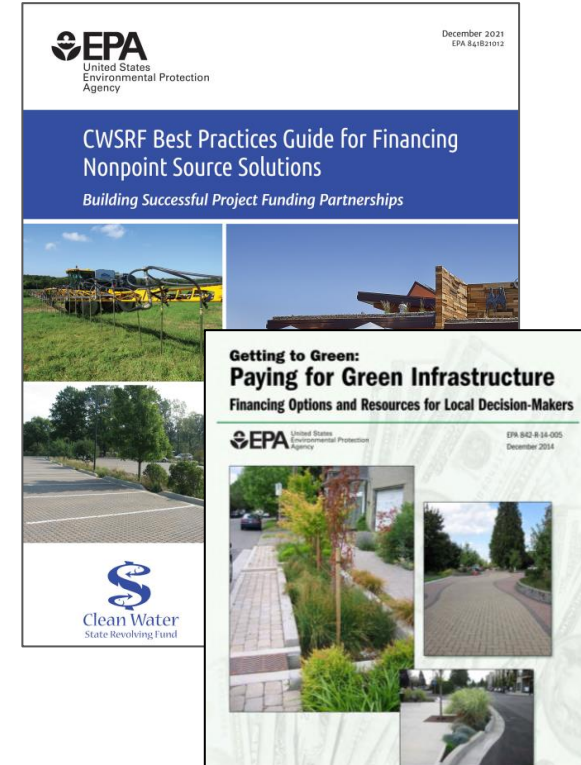
Green Infrastructure Resource Guides



Green Infrastructure in your community



Green Infrastructure in permits and regulations



Green Infrastructure funding

Funding and Technical Assistance Opportunities for Green Infrastructure



Navigating Federal Funding for Green Infrastructure and Nature-Based Solutions

AGENCY	PROGRAM	PLANNING & DESIGN	IMPLEMENTATION OR CONSTRUCTION	OPERATIONS & MAINTENANCE	MONITORING
EDA	American Rescue Plan Program: Economic Adjustment Assistance Funds	YES	YES	NO	NO
EDA	Public Works and Economic Adjustment Assistance Funds	YES	YES	NO	NO
EPA	Clean Water State Revolving Fund (CWSRF)¹	YES	YES	NO	NO
EPA	Environmental Justice Collaborative Problem-Solving Cooperative Agreement Program	YES	YES	NO	YES
EPA	Environmental Justice Government-to-Government (EJ2G) Program	YES	YES	NO	YES
EPA	Brownfields Grants	YES	YES	NO	NO
EPA	Great Lakes Restoration Initiative (GLRI) Funds	YES	YES	NO	NO
EPA	Green Streets, Green Jobs, Green Towns (G3) Grant Program	YES	YES	NO	NO
EPA	Sewer Overflow and Stormwater Reuse Municipal Grants (OSG)	YES	YES	NO	NO
EPA	Section 319 Nonpoint Source Grants	YES	YES	YES	YES
EPA	Water Infrastructure Finance and Innovation Act (WIFIA)	YES	YES	NO	NO
FEMA	Building Resilient Infrastructure and Communities (BRIC)²	YES	YES	NO	NO
FHWA	Surface Transportation Block Grant (STBG) Program – Transportation Alternatives	YES	YES	YES	NO
FHWA	Promoting Resilient Operations for Transformative, Efficient, and	YES	YES	NO	NO

Request Technical Assistance

<https://www.epa.gov/water-infrastructure/water-technical-assistance>

Email: WaterTA@epa.gov

Integrated Planning Technical Assistance

Email: Heather Huddle
huddle.heather@epa.gov

What is Off-site Stormwater Management?

- A way for new development and redevelopment project operators to meet performance or design standards for post-construction stormwater discharges at a location outside the right-of-way (ROW) or limit of the area of development, in some instances.





When might off-site stormwater management be considered?

If it is allowed under local regulations and applicable permits and certain conditions exist, such as...

- The land to install post-construction stormwater controls within existing project boundaries is unavailable/physically infeasible
- Existing structural stormwater management practices on site are insufficient
- The site has impediments to managing stormwater onsite through infiltration
- A green streets or green and complete streets project

Potential Benefits

- Regulatory flexibility
- A means to meet numeric performance standards
- Opportunity for cooperation
- Opportunity to achieve additional environmental/planning goals
- Enhanced ability to quantify volume and pollutant reductions
- Avoids safety concerns of working in the right-of-way
- In some cases, may be more effective and efficient than on-site stormwater management



Where can I learn more?

- [EPA's off-site stormwater management website](#)
 - [Compendium of MS4 permitting approaches](#)
 - [Case Studies](#)— some highlighted on today's webinar
 - Other EPA resources including stormwater finance webinars
 - External resources



Today's Panelists:

Regan Wilhelm, Environmental Protection Specialist, District of Columbia Department of Energy & Environment

Forrest Kelley, Regulatory Division Manager, Capitol Region Watershed District, Minnesota

Dan Taber, Stormwater Manager, City of Grand Rapids, Michigan



DC's Stormwater Rule and Off-Site Compliance Program

Regan Wilhelm

Department of Energy & Environment

Green Infrastructure Incentives
and Assessment Branch



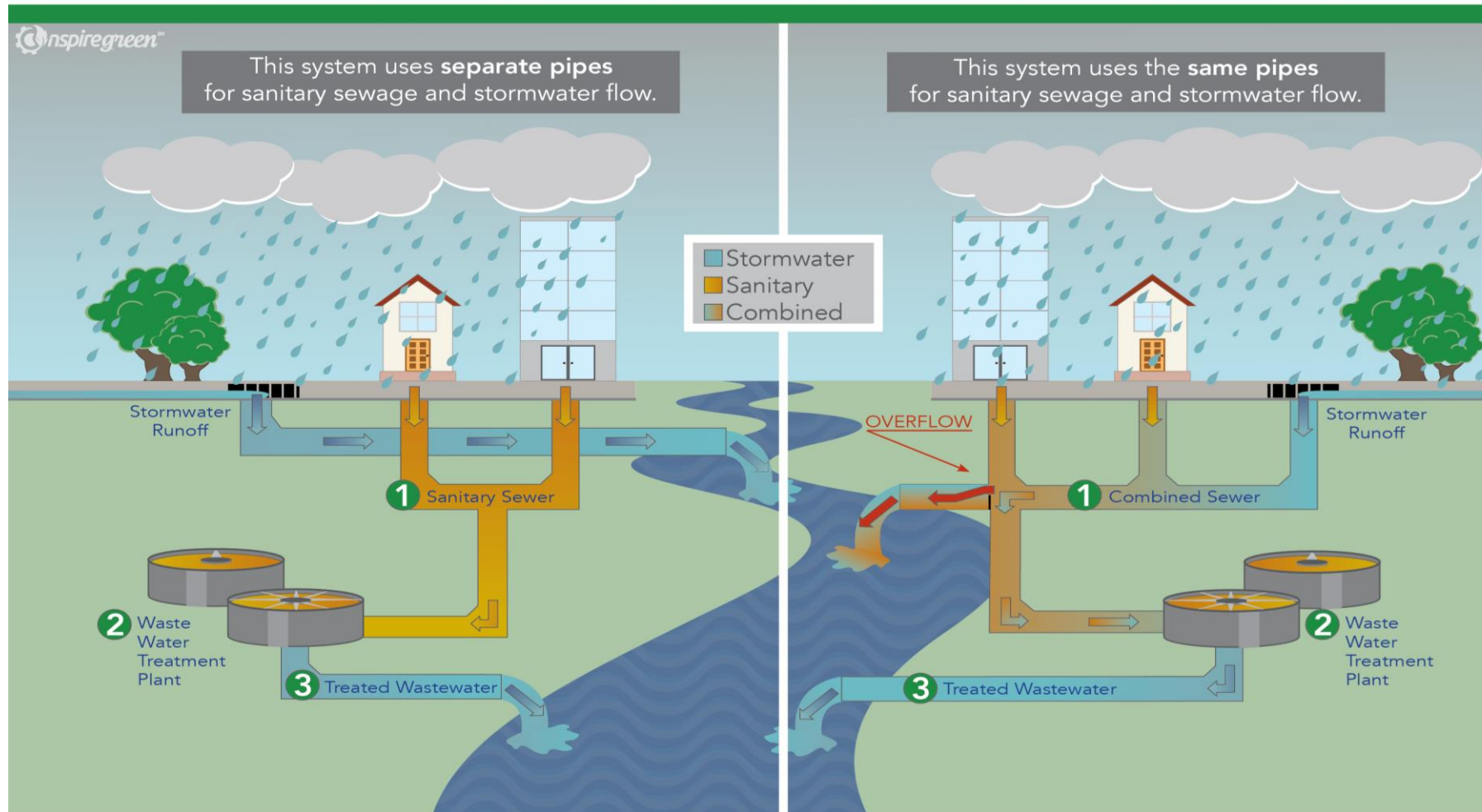


**An Overview of Stormwater Management
in the District**

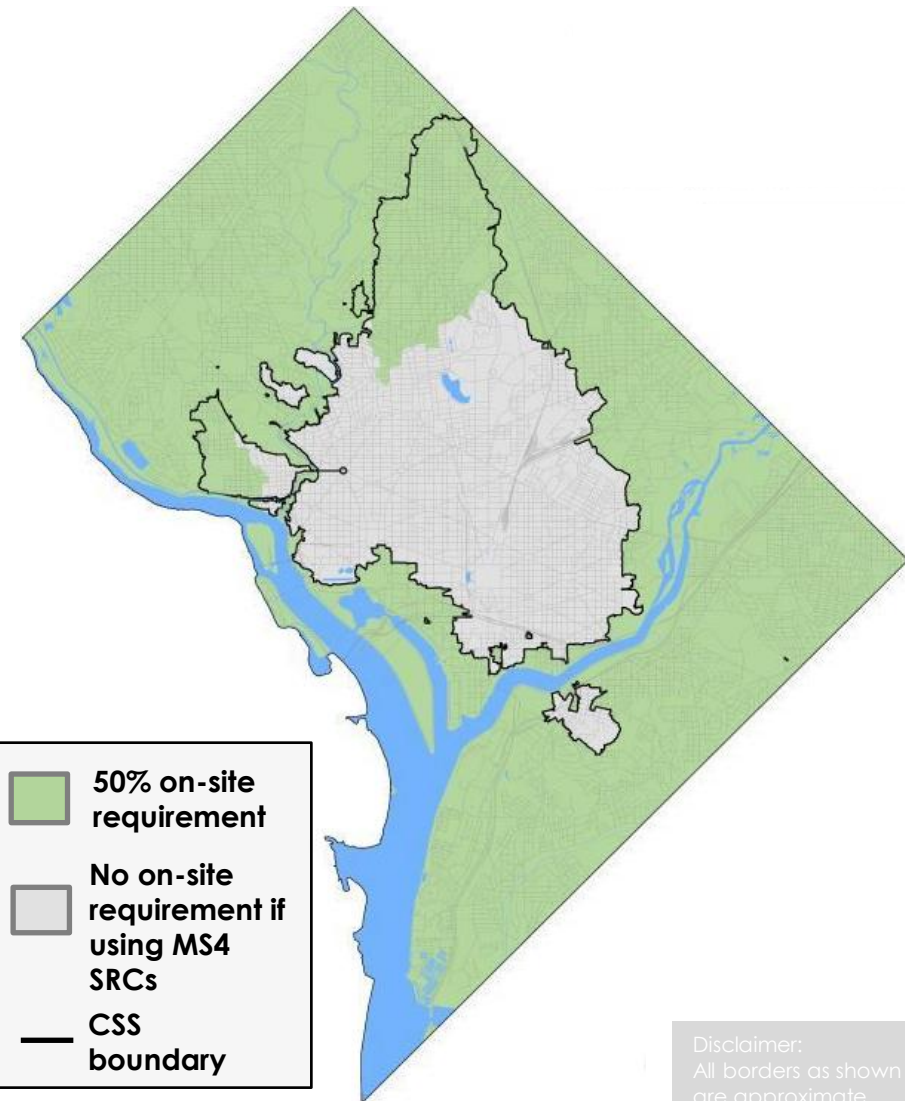
SEWERS IN THE DISTRICT: CSS vs MS4

MS4 MUNICIPAL SEPARATE STORM SEWER SYSTEM

CSS COMBINED SEWER SYSTEM



COMBINED SEWER SYSTEM IN DETAIL



Disclaimer:
All borders as shown
are approximate



The District's Stormwater Management Regulations

STORMWATER REGULATIONS

Stormwater Rule – passed in 2013

- Requires large development projects to retain stormwater
- Largest driver of GI installation in the District
- Compliance flexibility was key to passing the regulations



REGULATORY REQUIREMENTS

Major Land Disturbing

Trigger

- 5,000 ft² land disturbance

- 2,500+ ft² post-project impervious area; OR
- Any pre-project natural area

Requirements

- **1.2-inch retention**

Major Substantial Improvement

Trigger

- 5,000 ft² combined:
 - Land disturbance + renovated building footprint
- Major renovation
(cost ≥50% pre-project assessed value of the structure)

Requirements

- **0.8-inch retention**

These requirements inform the project's **Stormwater Retention Volume (SWRv)**:
the volume of stormwater from a site for which the site is required to achieve retention



Off-Site Compliance and Stormwater Retention Credits

KEY OBJECTIVES OF OFF-SITE COMPLIANCE

Increase Distribution of GI Throughout the District

- Shift GI to priority watersheds
- Incentivize private funding for GI installation

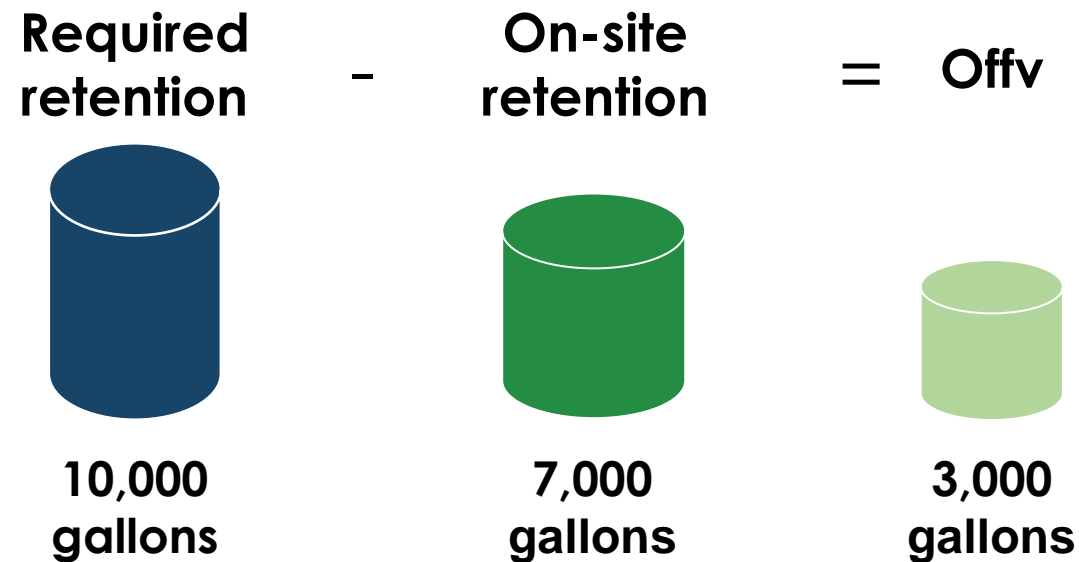
Provide compliance flexibility under the Stormwater Rule

- Regulated projects have the option to:
 - Build GI on-site
 - Use SRCs to meet off-site compliance
 - A combination of on-site and off-site compliance
 - In-lieu fee (ILF)

DEFINITIONS

Off-Site Retention Volume (Offv):

the portion of the required retention that is met by Stormwater Retention Credits (SRCs)

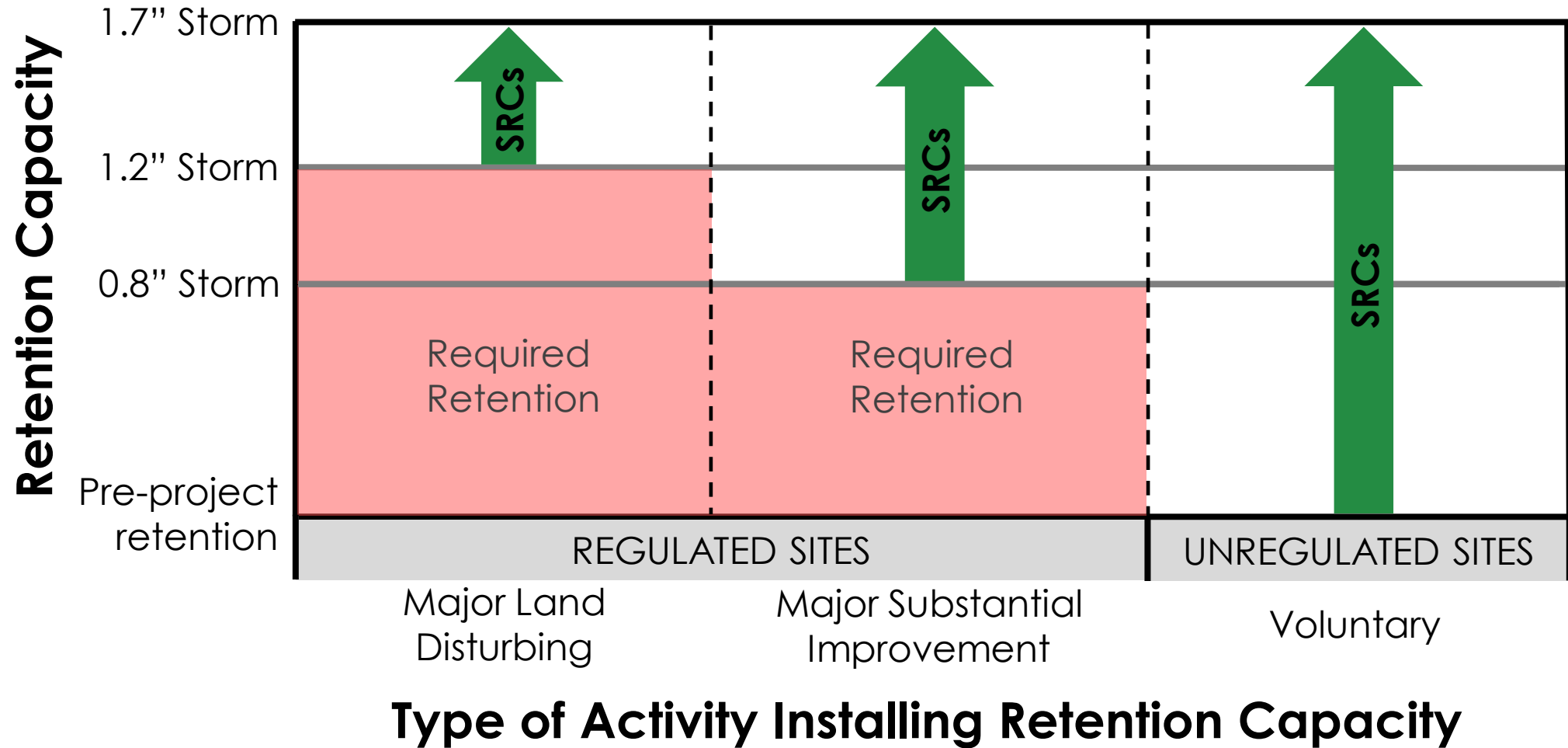


HOW TO MEET YOUR OFFv WITH SRCs

- 1 SRC meets 1 gallon of Offv for 1 year
- SRCs are privately traded on the SRC market
- Prices negotiated between buyer and seller
 - DOEE is not involved
- 2022 average price per SRC was \$1.45



RETENTION CAPACITY FOR DIFFERENT PROJECTS



SRC MARKET SUPPLY AND DEMAND

Two sides to the SRC market:

Supply of SRCs

- Credit generators who voluntarily build GI in the MS4 to generate SRCs
- Regulated projects with excess retention

Demand for SRCs

- Regulated projects with an Offv

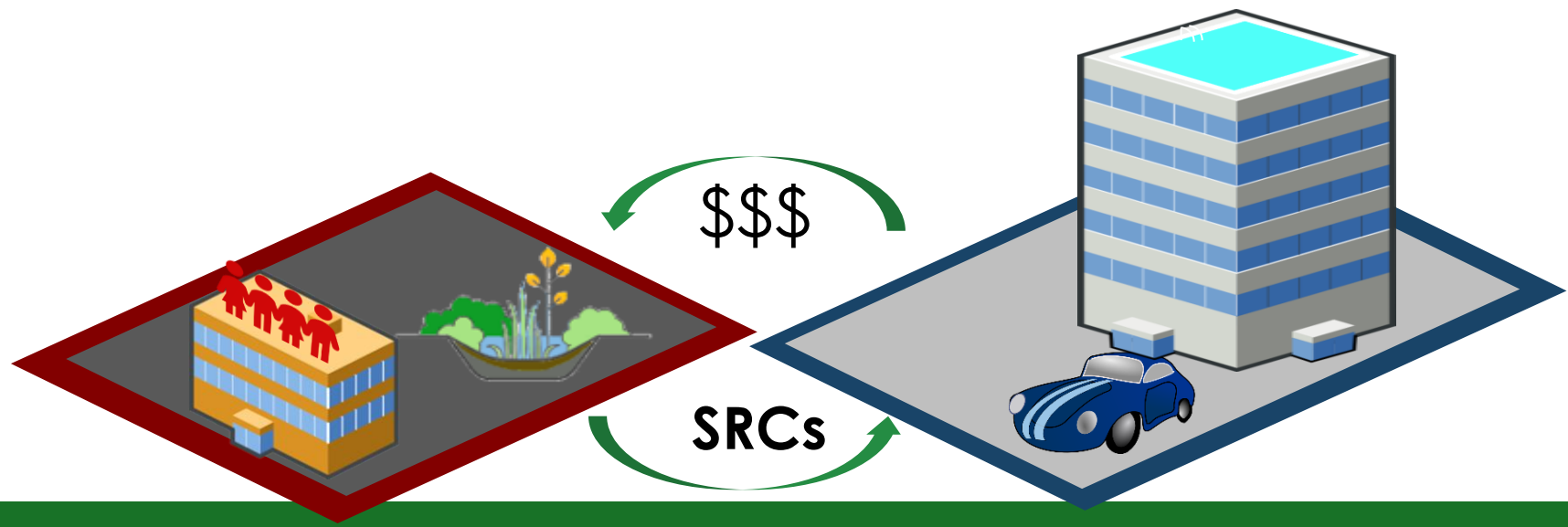
EXAMPLE SRC TRANSACTION

Demand

Supply

Market Transaction

- Condo development in CSS triggers Stormwater Rule
 - Chooses amenities & opts for Offv
- SRC generator partners with a landowner in MS4
 - Installs voluntary GI
- Condo development purchases SRCs





Benefits of the SRC Program to District Waterbodies

TRADING MAXIMIZES SUSTAINABILITY

- Increases retention and first-flush capture which accelerates the restoration of waterbodies
- Increased triple-bottom-line benefits associated with GI
- Maximizes cost savings & flexibility for regulated sites



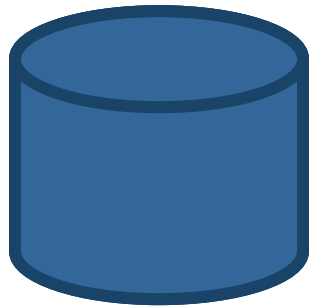
<https://sustain.wisconsin.edu/sustainability/triple-bottom-line/>



POTENTIAL TO INCREASE RETENTION

Scenario 1: 1.2" Storm Event

100% On-Site Retention



10,000 Gallons
On-Site Retention

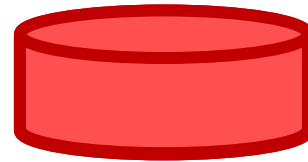
Gallons Retained: 10,000

50% On-Site Retention w/ SRC Trading



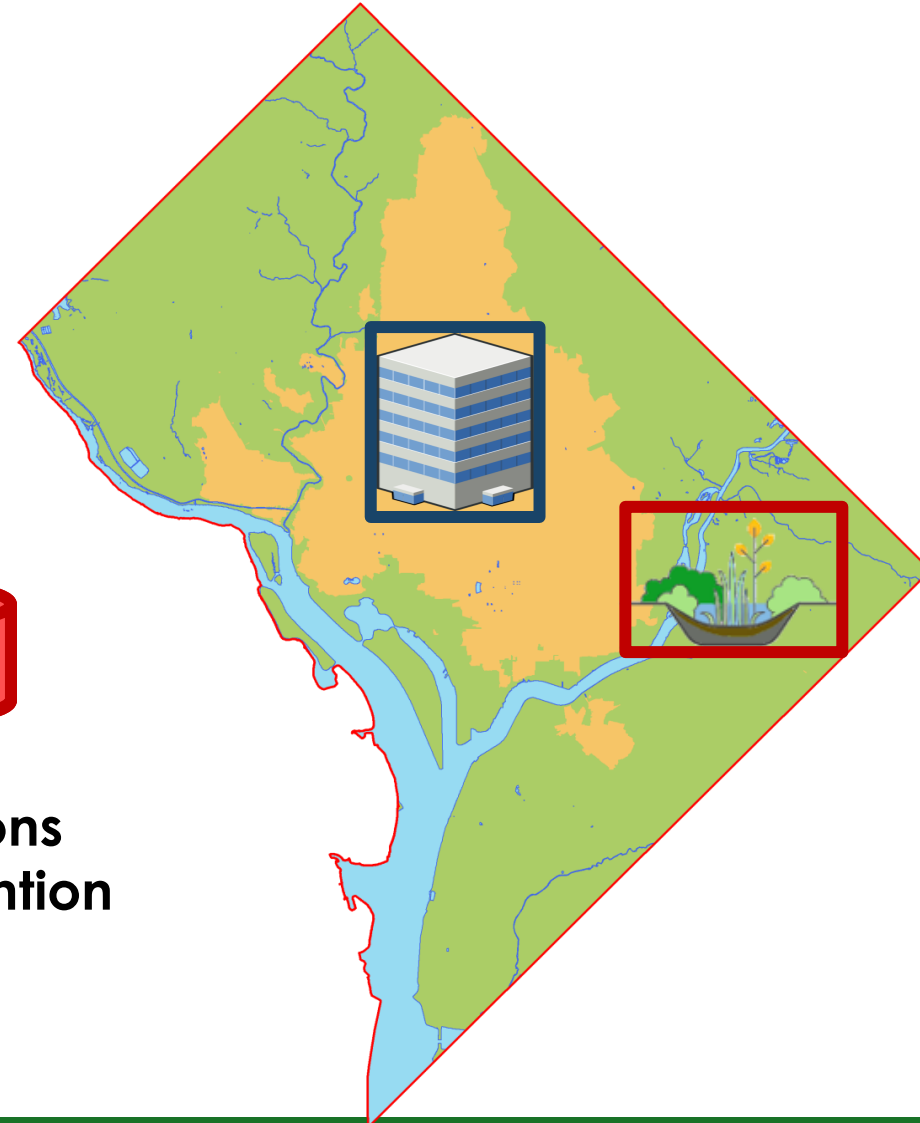
5,000 Gallons
On-Site Retention

Gallons Retained: 10,000



5,000 Gallons
Off-Site Retention

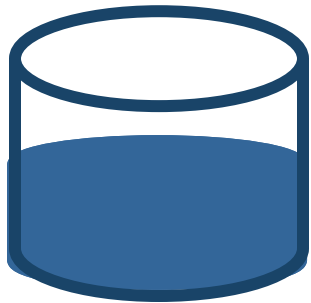
Outcome: Same retention for 1.2" storm



POTENTIAL TO INCREASE RETENTION

Scenario 2: 0.6" Storm Event

100% On-Site Retention



10,000 Gallons
On-Site Retention

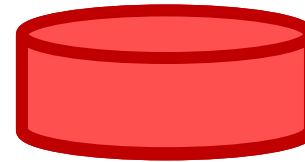
Gallons Retained: 5,000

50% On-Site Retention w/ SRC Trading

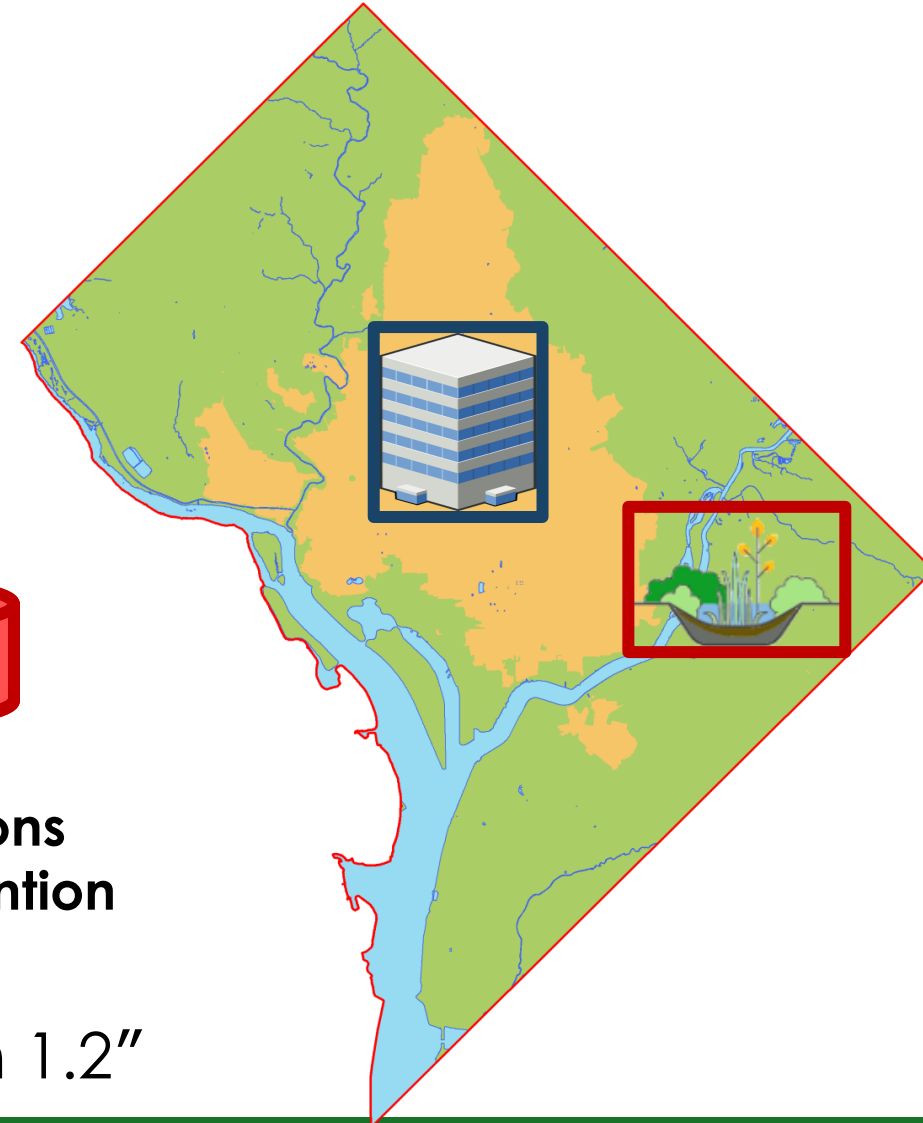


5,000 Gallons
On-Site Retention

Gallons Retained: 10,000



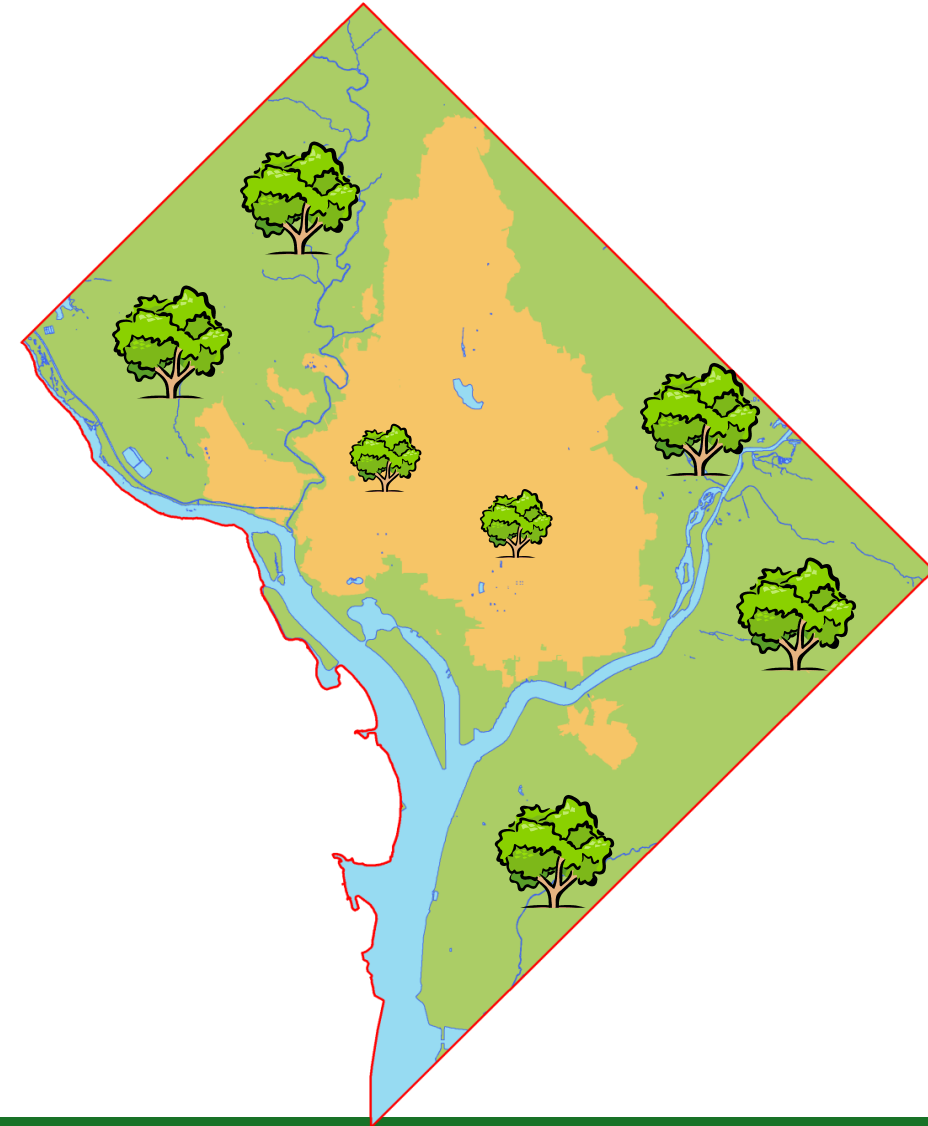
5,000 Gallons
Off-Site Retention



Outcome: Greater retention for storms smaller than 1.2"

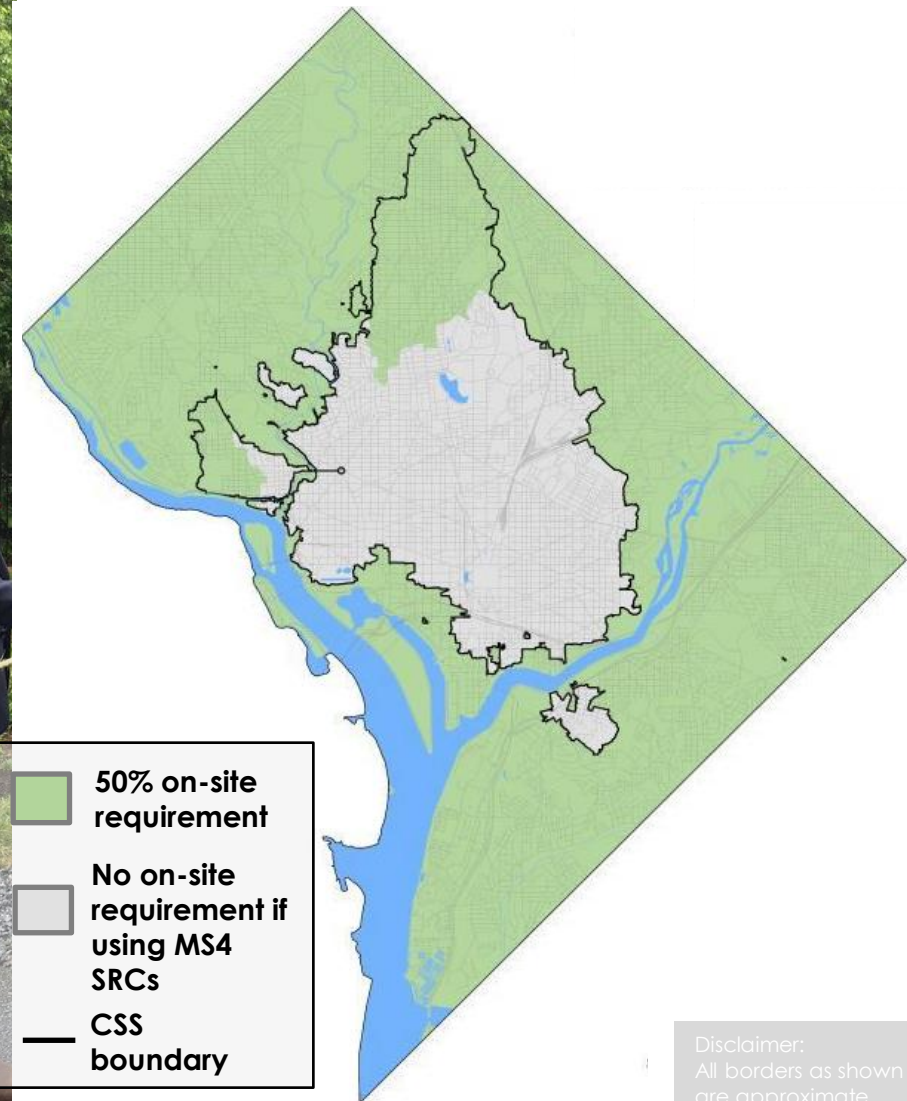
BETTER ENVIRONMENTAL OUTCOMES

- GI provides important water quality benefits wherever it is built
- GI yields greatest water quality benefits in the MS4 area where stormwater would otherwise drain untreated to streams and tributaries
- Trading can shift GI to the most vulnerable tributaries



BETTER COMMUNITY OUTCOMES

- Improves socioeconomic outcomes
- Shifts GI investments into areas of the city not undergoing rapid redevelopment
- Provides co-benefits to communities in these areas



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Lessons Learned

LESSONS LEARNED AND KEY CONSIDERATIONS

- Design programs with a growth mindset
- Flexibility can be key for initial implementation
- Offsite compliance isn't one size fits all
- Have a plan for developing a supply of credits



THANK YOU!

Regan Wilhelm

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(202) 671-5004

For more information about the SRC Program, visit:

doee.dc.gov/src

doee.dc.gov/swregs



“ALTERNATIVE COMPLIANCE”

Offsite Stormwater Mitigation Strategies in St. Paul, Mn

EPA Green-Infrastructure Webinar Series

Forrest Kelley
07/26/2023





What is



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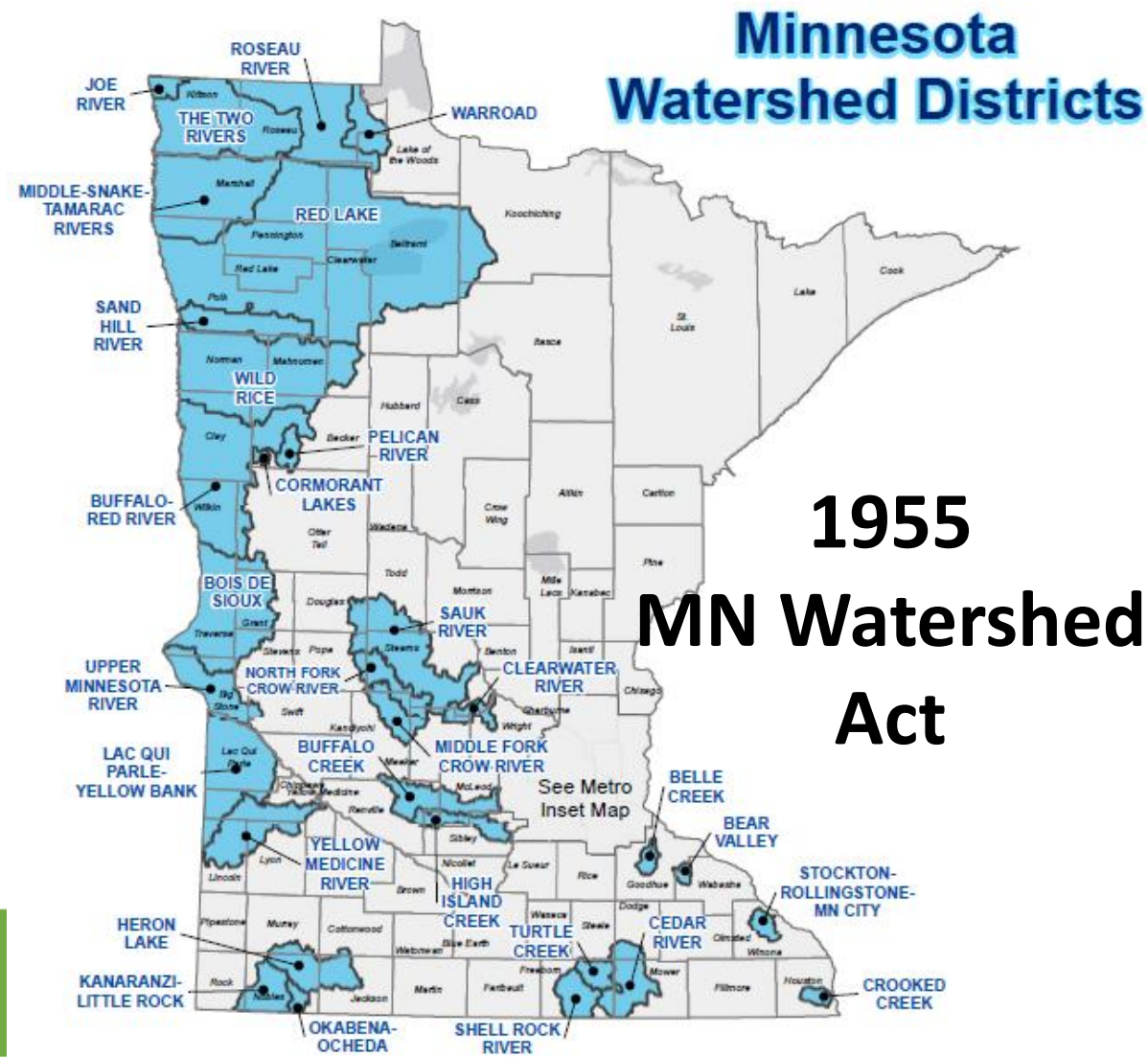
We all live in a Watershed



Mississippi River Watershed

What Is a Watershed District?

- A Special Purpose Unit of MN Local Government
- Established by Watershed District Act of 1955
- Manage water resources through land use planning and conservation
- Boundaries based on drainage patterns
- 47 Watershed Districts throughout Minnesota



Unique Watershed District Authorities

- State approved 10-year plan
- Financing (ad valorem tax levy, assessments, grants, partners)
- Regulatory authority
- Own, operate & maintain drainage systems
- Eminent domain
- Nonpartisan, appointed Board



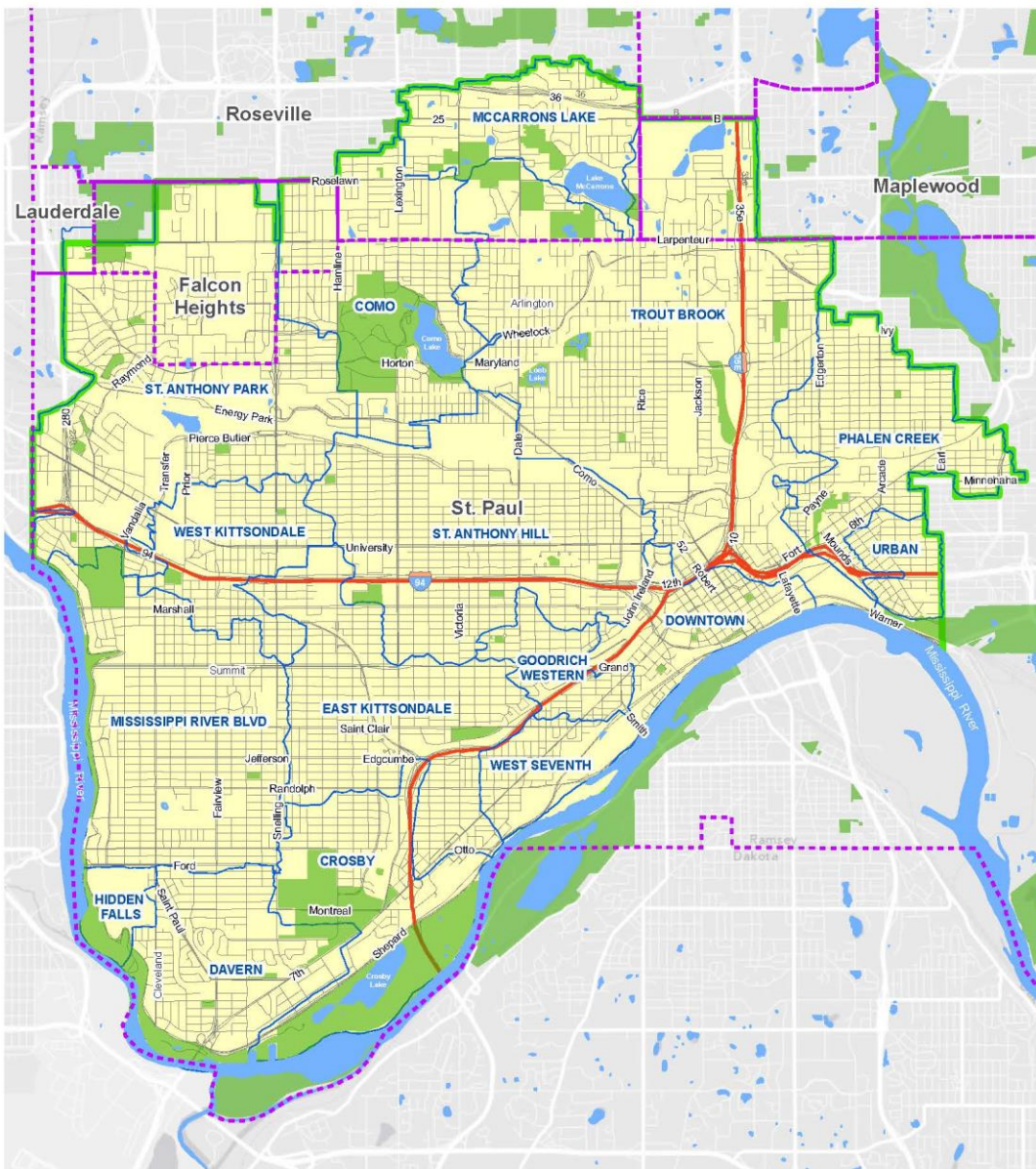
Capitol Region Watershed District



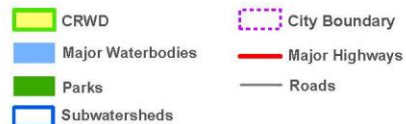
- Mission: **To protect, manage and improve our water resources**
- 5 Board of Managers
- 12 member Citizen Advisory Committee
- 26 staff
- 2023 Budget ~\$11 mil

Our Watershed

- 41 Square Miles
- 5 Cities
- Population ~250,000 (1/20 Minnesotans live in CRWD)
- 5 Lakes
- 42% impervious (paved) surfaces
- Over 500 miles of storm sewers



Capitol Region Watershed District is home to more than 225,000 people and is 42% impervious surfaces.

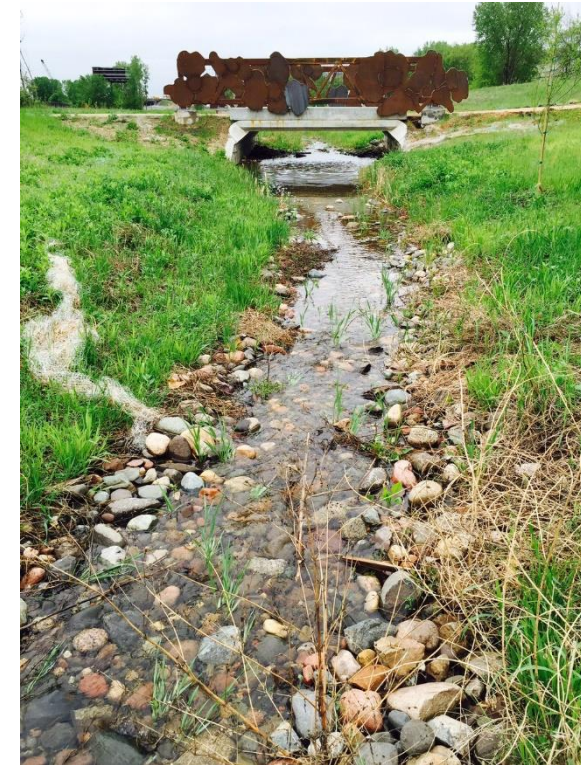




All of CRWD Drains to Mississippi River

What does CRWD Do?

- Capital Improvement Projects
- Development permits
- Stormwater monitoring
- Own & maintain 6 Miles of Trout Brook stormsewer
- Stewardship grants
- Watershed education



CRWD Regulations

- Adopted in 2006
- 1-acre land disturbance threshold
- 1.1-inch volume reduction standard over new and reconstructed impervious
- 90% TSS removal
- No increase in rate for 2, 10, 100-yr rainfall



Stakeholder Input

- Technical Advisory Committee (TAC)
- Required by state statute, includes Cities, Counties, Public Entities
- Created Joint Rules TAC with adjacent watershed District in 2005 prior to rule adoption
- Meet regularly when considering Rule Amendments
- 45-day review and comment period for all changes



Contamination

Land Acquisition

Costs

Utility Constraints

Bedrock

Maintenance



Alternative Compliance Sequencing

Incorporate “Off –Ramps” for flexibility on projects with difficult site conditions

1. Meet infiltration requirement on site
2. Provide on site Filtration (55% credit = 2-inch filtration requirement)
3. Compliance through off-site BMPs (credits)
4. Contribute to Stormwater Impact Fund (SIF)



Stormwater Volume Reduction Credits

- Provided for voluntary volume reduction practices (non-permitted, or excess of requirement up to 2.5 inches)
- 1 cf = 1 credit (or 1 filtration credit = 0.55 cubic feet)
- Most often used by municipalities and road authorities
- Credits tracked for each entity in excel spreadsheet



Credit Tracking

	A	B	C	D	E	F	G	H
1	6/1/2020				Volume Banking Credits			
2		Account:	Saint Paul Public Works					
3								
4	Transaction	Requested	Approved	Permit	Project	Deposit	Withdrawal	Balance (cl
5	Deposit		4/4/2007	NA	Chatsworth-Goodrich	10,532		10,532
6	Withdrawal		4/4/2007	07-009	Davern	0	5,717	4,815
7	Withdrawal		1/22/2008	08-001	Selby Avenue	0	3,790	1,025
8	Deposit		Pending	07-008	Hubbard-Griggs	5,947		6,972
9	Withdrawal		8/20/2008	08-003	Seventh-Bay	0	8,278	-1,306
10	Withdrawal		8/20/2008	08-004	Ashland-Pascal	0	20,069	-21,375
11	Deposit		7/10/2019	08-016	Payne Avenue	1,204		-20,171
12	Withdrawal		3/18/2009	09-004	East Sixth Street	0	6,044	-26,215
13	Deposit		10/17/2018	09-009	Victoria Street	1,991		-24,224
14	Withdrawal		6/3/2009	09-011	Magnolia-Earl	0	18,012	-42,236
15	Deposit		6/5/2019	09-017	Knapp-Ramond	2,141		-40,095
16	Withdrawal	3/16/2010	5/5/2010	10-005	Seventh-Douglas	0	17,462	-57,557
17	Withdrawal	4/14/2010	5/19/2010	10-011	Davern-Jefferson	0	39,308	-96,865
18	Deposit	5/26/2010	9/19/2018	10-014	Front-Victoria	15,059		-81,806
19	Withdrawal	2/2/2011	2/2/2011	11-002	Fairview		18,034	-99,840
20	Deposit	2/25/2011	6/5/2019	11-004	Blair-Griggs	7,318		-92,522
21	Withdrawal	2/25/2011	4/20/2011	11-005	Howell-Goodrich (revised 15,238 to Zero)		0	-92,522
22	Withdrawal	2/25/2011	4/20/2011	11-006	Davern-Jefferson II		25,611	-118,133
23	Deposit	9/7/2011	Expired	11-021	College Park (never built, cancelled)	0		-118,133
24	Transfer	10/14/2011	1/16/2011	09-031	Wells and Russell	116,436		-1,697
25	Deposit	1/16/2011	Pending	11-027	Hewitt-Tatum	4,067		2,370
26	Deposit	1/4/2012	1/4/2012	NA	St. Albans-Arundel Trenches	35,710		38,080
27	Withdrawal	1/4/2012	1/4/2012	11-030	Prior-Goodrich		29,228	8,852
28	Deposit	5/2/2012	7/19/2017	12-004	Wheelock Parkway Bridge	391		9,243
29	Deposit	9/19/2012	Pending	12-018	Hamline Library Pervious Alley, 7,100 cf not fully confirmed			9,243
30	Withdrawal	12/19/2012	12/19/2012	12-029	Arlington-Rice		28,035	-18,792
31	Withdrawal	2/6/2013	2/6/2013	13-001	Hatch-Agate		22,137	-40,929
32	Withdrawal	2/6/2013	2/6/2013	13-002	Hamline Avenue Bridge		6,697	-47,626
33	Deposit	5/15/2013	Pending	13-014	Trout Brook Nature Sanctuary	103,455		55,829
34	Withdrawal	7/10/2013	7/10/2013	13-021	Jefferson-Griggs Bike Routes		5,881	49,948
35	Withdrawal	9/18/2013	9/18/2013	13-018C	Prince Street		7,303	42,645
36	Deposit	2/19/2014	8/5/2015	14-004	Hampden Park	24,908		67,553
37	Withdrawal	3/5/2014	3/5/2014	13-033	Fairview-Bohland		16,626	50,927
38	Withdrawal	3/19/2014	3/19/2004	14-001	Montana-Greenbrier		11,091	39,836
39	Withdrawal	9/3/2014	9/3/2014	14-028	Highland Village Streetscape		487	39,349
40	Withdrawal	2/4/2015	2/4/2015	15-002	Raymond Ave Phase II		7,059	32,290
41	Withdrawal	3/11/2015	4/1/2015	15-017	Kellogg Blvd bridge reconstruction		2,385	29,905
42	Withdrawal	4/1/2015	4/1/2015	15-009	3rd Street		6,044	23,861
43	Permit withdrawn		6/3/2015	15-014	East 7th Streetscape	0	0	23,861
44	Withdrawal	5/20/2015	5/20/2015	15-010	Como-Chatsworth		15,370	8,491
45	Withdrawal	7/22/2015	7/22/2015	15-016	Franklin Avenue		6,628	1,863
46	Withdrawal	2/22/2016	2/22/2016	16-001	University Avenue		14,164	-12,301
47	Withdrawal	1/18/2017	1/18/2017	16-031	Como Avenue		8,914	-21,215
48	Withdrawal	4/19/2017	4/19/2017	17-009	Jackson at University		6,271	-27,486
49	Deposit	8/2/2017	Pending	17-003	Como Park Senior High	19,120	0	-8,366
50	Withdrawal	4/18/2018	4/18/2018	18-007	Woodlawn-Jefferson		12,961	-21,327
51	Withdrawal	6/17/2020	6/17/2020	20-016	Ayd Mill Road		8,345	-29,672
52						348,279	377,951	-29,672
53								
54								

- Separate tab for each entity
- Entries for each project
- Withdrawal and Deposits
- Ability to “Defer” (maintain a negative balance) for two years



Stormwater Impact Fund

- Last option in Alternative Compliance Sequencing
- Amount set by Board Resolution (\$125,000/impervious acre)
- Contributions fund construction of regional treatment systems



Como Golf Course BMP

- 2018 permit – Seal and Sea Lion Zoo Exhibit
- Created 1.6-acres impervious – 6,400 cf req'd
- Limited space
- Complicated utilities (exhibit area drains to sanitary)
- Future regional BMP previously identified



Como Golf Course BMP

- Enlarged existing infiltration basin on golf course (25,000 cubic feet)
- Added 58,000 cubic foot pipe gallery beneath fairway
- Treats 64 acres from Zoo and surrounding residential neighborhood



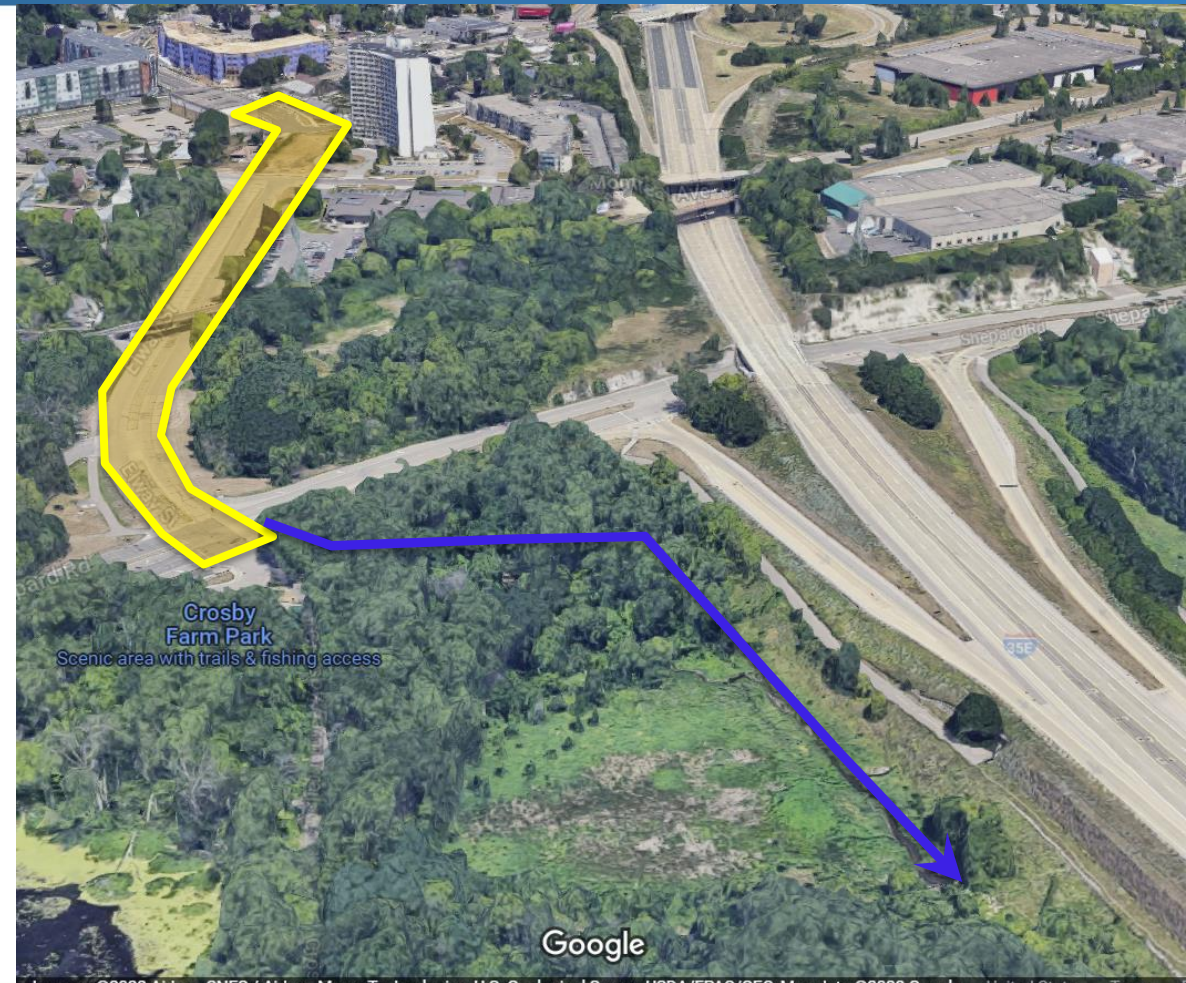
Como Golf Course BMP

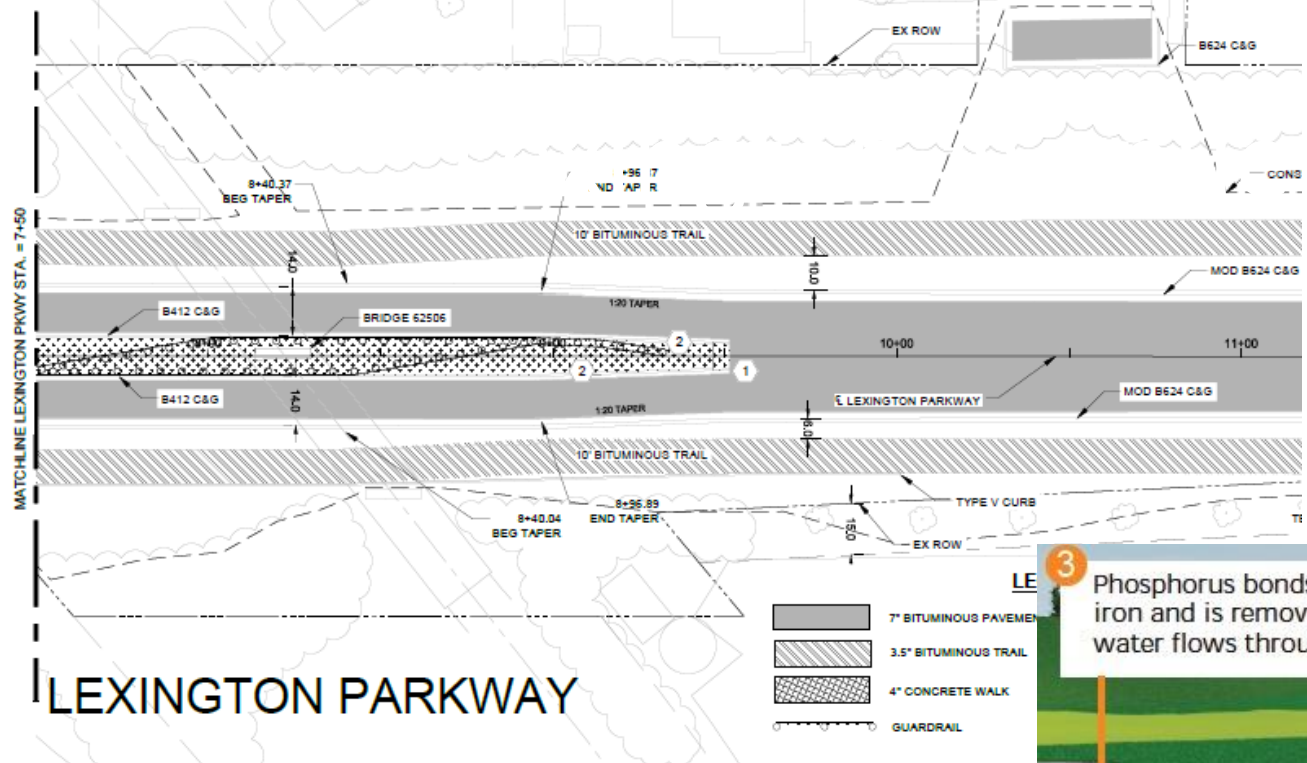
- Worked with golf course landscape architect to improve playability
- Removes 26 lbs TP/yr from 64-acre watershed



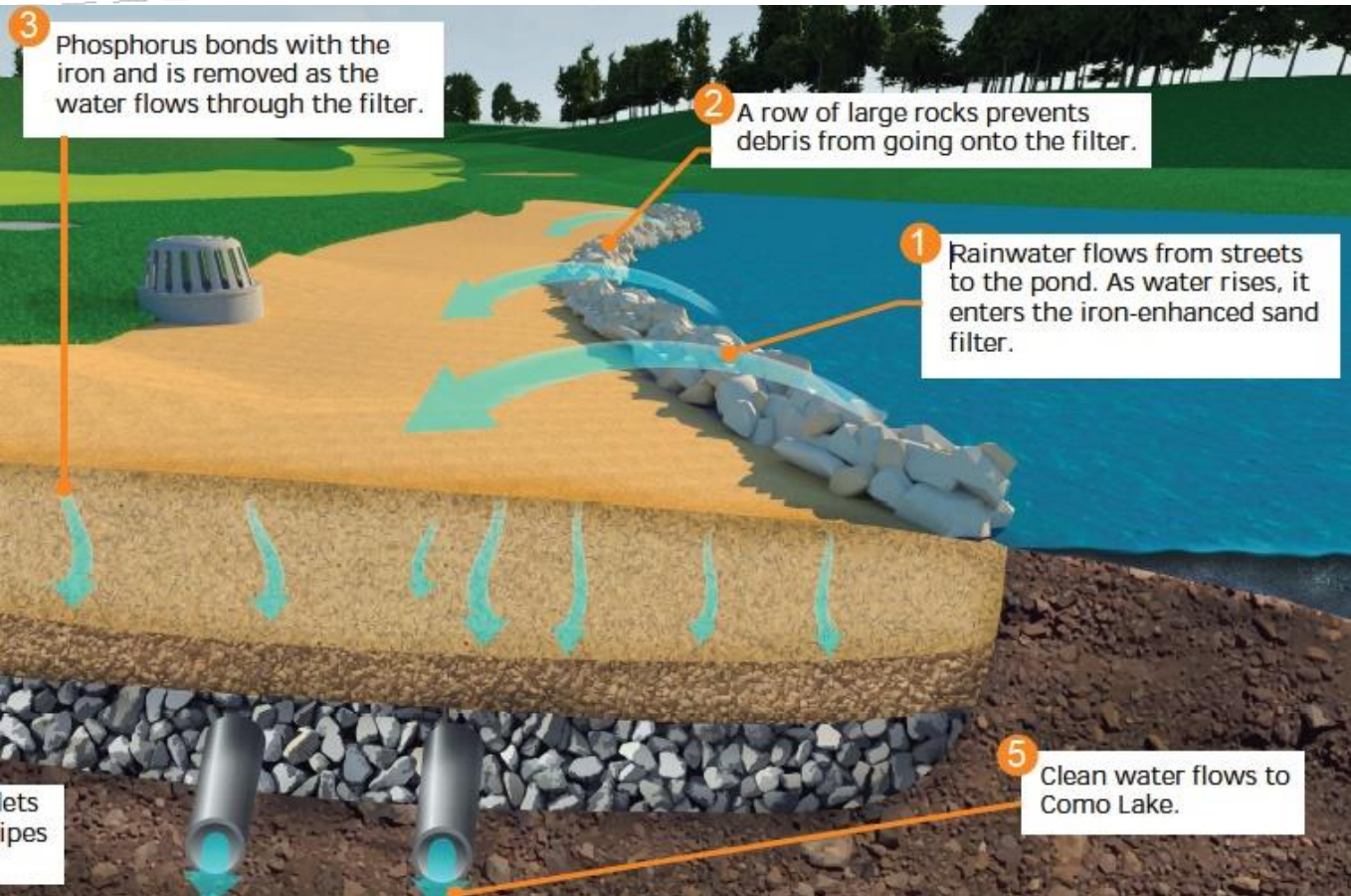
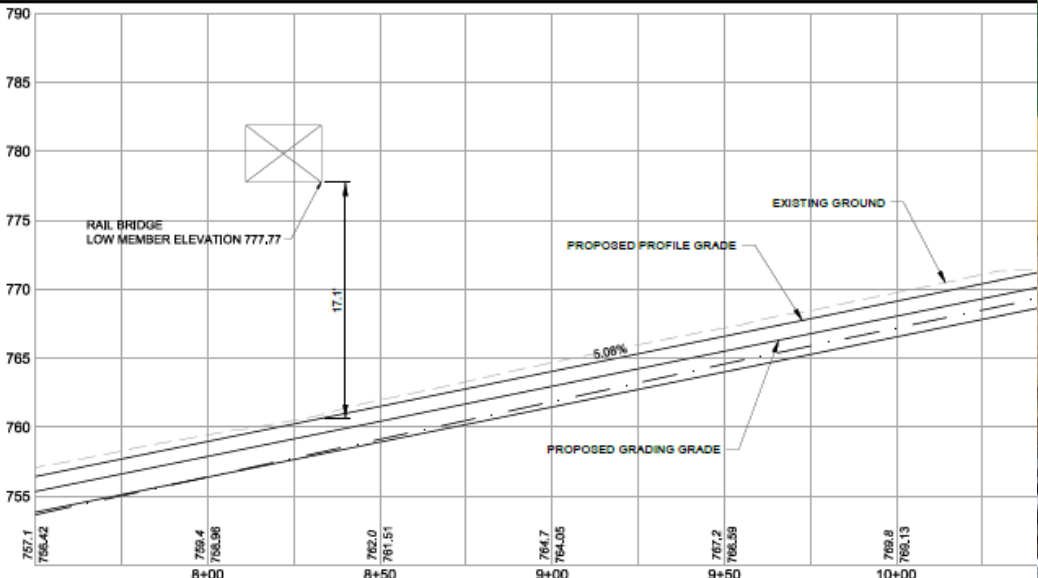
Lexington Avenue Extension

- Ramsey County Project
- Creating 2.86 acres of Impervious
- Project located in area of shallow bedrock, steep slopes, and limited ROW





- 2010 Crosby Lake Management Plan identified stormwater wetland retrofit project
- County contributed \$215,000
- Engineering to begin in 2024



NO.	DATE	BY	DESCRIPTION OF REVISIONS

DESIGNED: LPH
DRAWN: SPB
CHECKED: JMP

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

SIGNATURE: _____ DATE: 5/31/2022
NAME: LARRY POPPLER LIC. NO.: 41005

444 Cedar Street, Suite 1500
Saint Paul, MN 55101
651.292.4400
tkda.com

TKDA

Program Takeaways

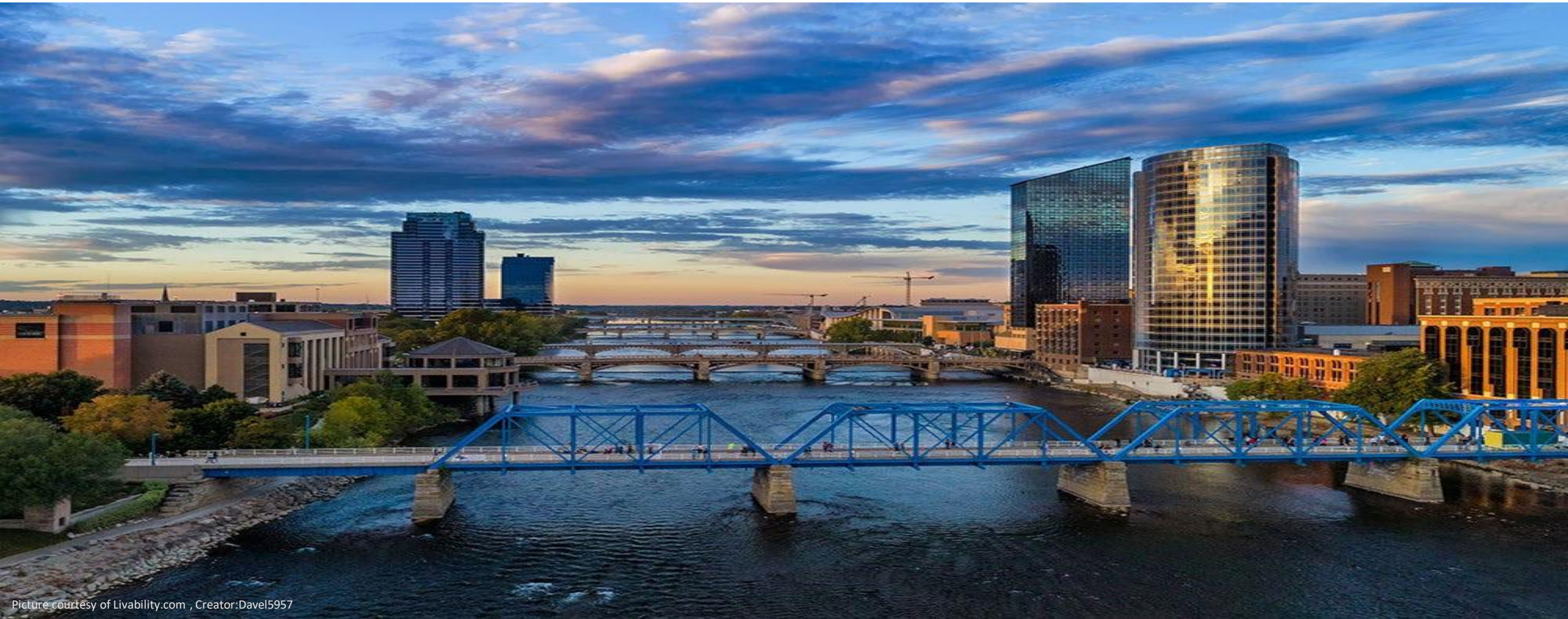
- Advanced planning and feasibility studies critical to identify regional opportunities
- Costs variable based on BMP type and scale
- Current contribution amounts do not account for long term O&M
- Current program has not created a private market for credits – (Cost not considered a site constraint)
- Mainly public entities (repeat applicants)



A man with a beard and glasses, wearing a blue hard hat and a safety vest, is looking into a large, circular tunnel. The tunnel's interior is lined with a perforated metal mesh, and a bright light is visible at the far end, creating a strong perspective effect. The man's hard hat has a logo that says "WATERSHED".

Thank You
Forrest Kelley, PE
fkelley@capitolregionwd.org

Stormwater Credit Trading: Grand Rapids





- 2ND LARGEST CITY IN MICHIGAN, WITH A US CENSUS ESTIMATE OF 198,796 PEOPLE
- LOCATED ON THE GRAND RIVER, LARGEST RIVER IN MICHIGAN
- GRAND RIVER DISCHARGES TO LAKE MICHIGAN APPROXIMATELY 30 MILES TO THE WEST
- LAKE MICHIGAN IS THE SOURCE OF DRINKING WATER FOR THE CITY



Sewer Improvement Project



In 2015 we completed a Sewer Improvement project. This eliminated all Combined Sewer Overflow (CSO) points in the sewer system. Our original, state-mandated deadline was 2019.

- SEPARATED SANITARY / STORM SEWER SYSTEM
- GREEN GRAND RAPIDS PROGRAM
- VITAL STREETS PROGRAM
- NEW MS4 PERMIT

Staying Put AND Moving : How Grand Rapids is adapting for its Seniors
Vital Streets
Infrastructure Improvements for a Safer Healthier City



Streets Are Complex Places



GREEN GRAND RAPIDS



The Future of Managing Stormwater in Grand Rapids



- New MS4 Permit Regulations August of 2022
- Credit Trading : Optional “Market-based” alternative approach to meet new MS4 requirements
- Trading option provides flexibility to project developers and property owners

New MS4 Requirements

NEW Post-construction Stormwater Management Standards

New development and redevelopment projects that increase on-site impervious area by 1,000 square feet or more (relative to pre-project conditions) will be subject to these requirements.

1) Water Quality

- Treat runoff generated from **1 inch** of rain over project site
- Reduce TSS loadings by 80% or discharge at 80 mg/L

2) Channel Protection

Retain increase between predevelopment and post development runoff volume for 2-year/ 24-hour storm (2.56 inches)



Photo courtesy of epa.org

Pathways for Compliance with New Standards

- **On site-retention:** Implement green infrastructure to meet Channel Protection volume on-site (e.g. Rain Gardens, Bioretention, Pervious Pavement)

If site conditions make it infeasible to meet all retention requirements on-site, then options include...

- **Partial retention on-site + credits:** Manage a portion of channel protection volume on-site (0.4" rain event) and purchase credits for remaining requirements, or
- **Purchase all credits:** Purchase credits to meet all requirements off-site, or
- **Offsite mitigation /** use banked credits
- **In lieu fee** payment to City

Offsite Retention Ratios (Credit Ratios):

- Partial retention onsite = 1.5:1
- Entire volume managed offsite = 2:1



Stormwater Credit Trading: The Basics

Market-based compliance option that provides flexibility for meeting Channel Protection requirements.

- 🟡 **Buyers:** Developers/property owners can meet all or some stormwater requirements by buying volume-based “credits”
- 🟡 **Sellers:**
 - 🟡 Property owners who go beyond regulatory requirements to manage additional impervious area, or
 - 🟡 Property owners not subject to regulatory requirements who voluntarily implement BMPs
- 🟡 **Credits** can be banked for future use by same developer



Stormwater Credit Trading: Grand Rapids Fundamentals

- 🟡 **Where:** 3 Trading Areas. Credits must be sourced from within same Trading Area as buyer's project
- 🟡 **When:** credit generating project must be functional by final stormwater permit approval
- 🟡 **How:** use information provided by City to local willing buyers and sellers
- 🟡 **How often?:** credit purchase is "one time."
Provides compliance throughout life of development
- 🟡 **Credit lifespan:** Credit seller guarantees performance "for lifespan" of purchasing development
- 🟡 **Maintenance:** Parallel contract for maintenance between buyer and seller. Can provide long-term revenue stream.
- 🟡 **City oversight:** regular self-inspection, periodic City inspection. Maintenance agreement with City.



Stormwater Credit Trading: Grand Rapids Fundamentals

GR Calculation of In-Lieu Fee Corresponding to One Cubic Foot of Retention Capacity

Costs (per cubic foot)	Tree Grates	Bioswale	Infiltration Basin	Permeable Pavement	Naturalized Landscape	Planter Boxes
Capital Costs						
Capital cost for one BMP life cycle (\$/cu.ft.) ¹	\$ 48.64	\$ 6.86	\$ 51.75	\$ 55.28	\$ 15.57	\$ 592.65
Design costs	\$ 12.16	\$ 1.72	\$ 12.94	\$ 13.82	\$ 3.89	\$ 148.16
Construction management for one BMP lifecycle ²	\$ 9.73	\$ 1.37	\$ 10.35	\$ 11.06	\$ 3.11	\$ 118.53
ESD program management costs for one BMP lifecycle ³	\$ 4.86	\$ 0.69	\$ 5.18	\$ 5.53	\$ 1.56	\$ 59.26
Value of land committed to every cubic feet of storage for BMP installation ((\$/sq.ft.)/(cu.ft./sq.ft)) ⁴	\$ 27.23	\$ 6.47	\$ 2.98	\$ -	\$ 15.89	\$ 153.39
Total of above costs	\$ 102.62	\$ 17.10	\$ 83.20	\$ 85.68	\$ 40.03	\$ 1,071.99
O&M						
Annual maintenance as % of capital	5%	2%	1.60%	0.50%	1.60%	2.60%
Annual O&M cost	\$ 2.43	\$ 0.14	\$ 0.83	\$ 0.28	\$ 0.25	\$ 15.41
Rehabilitation						
Rehab as % of capital	50%	43%	43%	35%	43%	66%
Years to Rehab	25	25	25	25	25	25
Rehab Costs	\$24.32	\$2.95	\$22.25	\$19.35	\$6.70	\$391.15
Annualized rehab costs	\$0.97	\$0.12	\$0.89	\$0.77	\$0.27	\$15.65
Totals						
O&M + Annualized rehab	\$ 3.40	\$ 0.26	\$ 1.72	\$ 1.05	\$ 0.52	\$ 31.05
Volume Retained						
Total cu. Ft. retained by the BMPs	95,960	1,385	240,535	51,614	88,153	130
Percent Weight	20.1%	0.3%	50.3%	10.8%	18.5%	0.0%

In Lieu Fee Initial One-Time Cost **\$79.48**
 In Lieu Fee Annual Maintenance & Rehab Cost **\$1.77**

\$81.25

Assumptions Used in Calculation:

Design as percent of capital costs	0.25
Interest rate	0.0000
Years to Rehabilitation	25
Construction management costs per BMP life cycle as percent of capital cost	0.20
ESD program management costs per BMP lifecycle as percent of capital cost	0.10
Land value (\$/sf) ⁵	\$14.81

Stormwater Credit Trading: Grand Rapids Fundamentals

Stormwater Credit Price Calculator

The City of Grand Rapids developed this tool to help stormwater credit generators determine how to price their credits for sale on the stormwater credit trading market. The Calculator, and the assumptions and equations herein, are for guidance purposes only. Sellers do not have to use the prices calculated. Use of this Calculator is optional. Refer to Credit Seller's Manual Appendix B for more detail on calculations and inputs in this tool.

Dark green cells indicate required user inputs	
Light green cells are assumptions can be adjusted by user when better information is available	
Light blue cells are intermediate calculations that should not be changed by the user	
Dark blue cells are final credit price calculations/formulas that should not be changed	

Step 1. Input capital costs and stormwater management/retention capacity

Key inputs	
Capital cost	\$3,620 <<Enter total capital costs for project including costs associated with project planning/design, permitting, construction, etc.
Annual maintenance	\$500 <<Enter expected annual maintenance costs
Area of GSI Practice in square feet (sq. ft.)	350 <<Enter area of GSI practice in square feet. For cisterns, enter 0
GSI Retention capacity volume in cubic feet (cu.ft.)	670 <<Enter retention volume capacity of your GSI project - this is the same as the number of credits generated by the project

Step 2. Calculate capital costs, annual maintenance costs, and annualized rehabilitation costs per cubic foot of stormwater management capacity

Assumptions	
Maintenance costs annual inflation rate	3.2% << This is the average Consumer Price Index inflation from 2018-2022 for the Midwest region
Years of maintenance to include	30
Rehabilitation costs as a % of capital costs	35%
Years to rehabilitation	30
Value of land per sq. ft.	\$13.50 <<Enter the estimated value per square foot of your land
Retention volume captured by sq. ft. of BMP area ¹	1.91 <<This is equal to the stormwater volume management capacity (Cell C22) divided by GSI practice surface area
Expected Return on Investment ²	7.9%

Cost category	Cost/cu.ft. of retention capacity
Capital costs	\$ 12.46 <<This calculation includes the value of land upon which the project is built. See Credit Seller's manual for more detail on how to determine this value.
Annual maintenance costs	\$ 0.75
Annualized rehabilitation costs	\$ 0.37

Step 3a. Option 1 - Calculate credit price, including upfront capital payment cost + annual maintenance/rehab payment that buyer pays each year

Initial credit price	\$ 13.44
Ongoing/annual credit price (covering maintenance + annualized rehabilitation)	\$ 1.21 << This cost can be updated each year to account for inflation and other factors, depending on contract between buyer and seller

Step 3b. Option 2 - Calculate credit price, including upfront payment to cover capital costs, as well as annual maintenance and annualized

Capital costs	\$ 13.44
Future value maintenance costs	\$ 39.45
Future value rehab costs	\$ 12.03
Total one-time (upfront) credit price	\$ 64.92

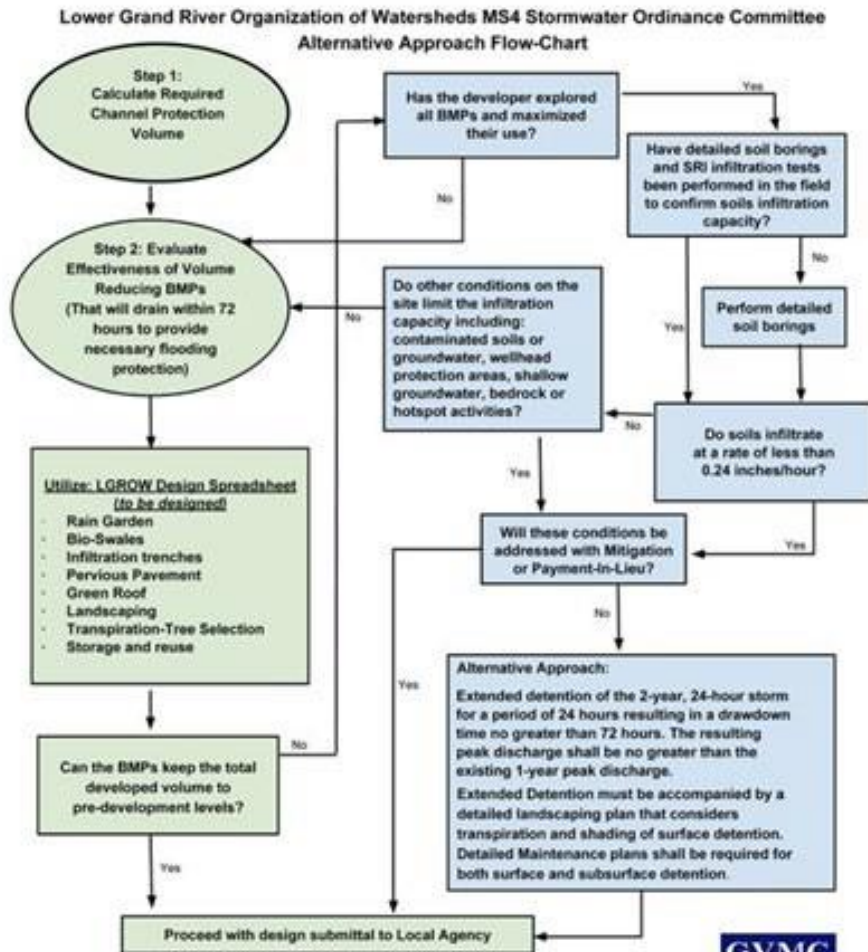
¹This is an intermediate calculation used to estimate the opportunity cost of a GSI project. We do not recommend changing this value.

²The Return on Investment (ROI) should be determined by the seller. A 5% ROI is a relatively low rate of return. A moderate ROI is 7.9%, equal to the inflation-adjusted, compound annual growth rate for the S&P 500 from 1928-2022. For high returns, the S&P grew 13.4% from 2015-2021.

Process for Determining Eligibility/ Infeasibility

Alternative Compliance Options for Channel Protection Volume

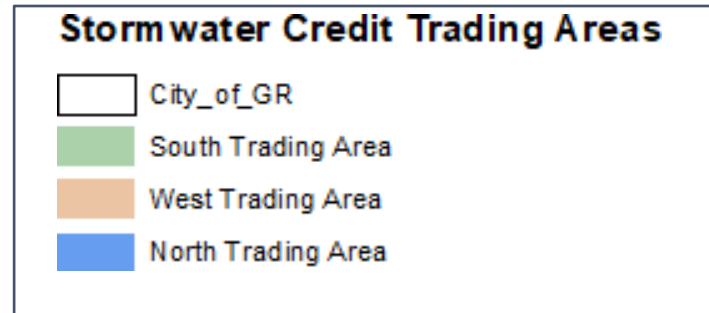
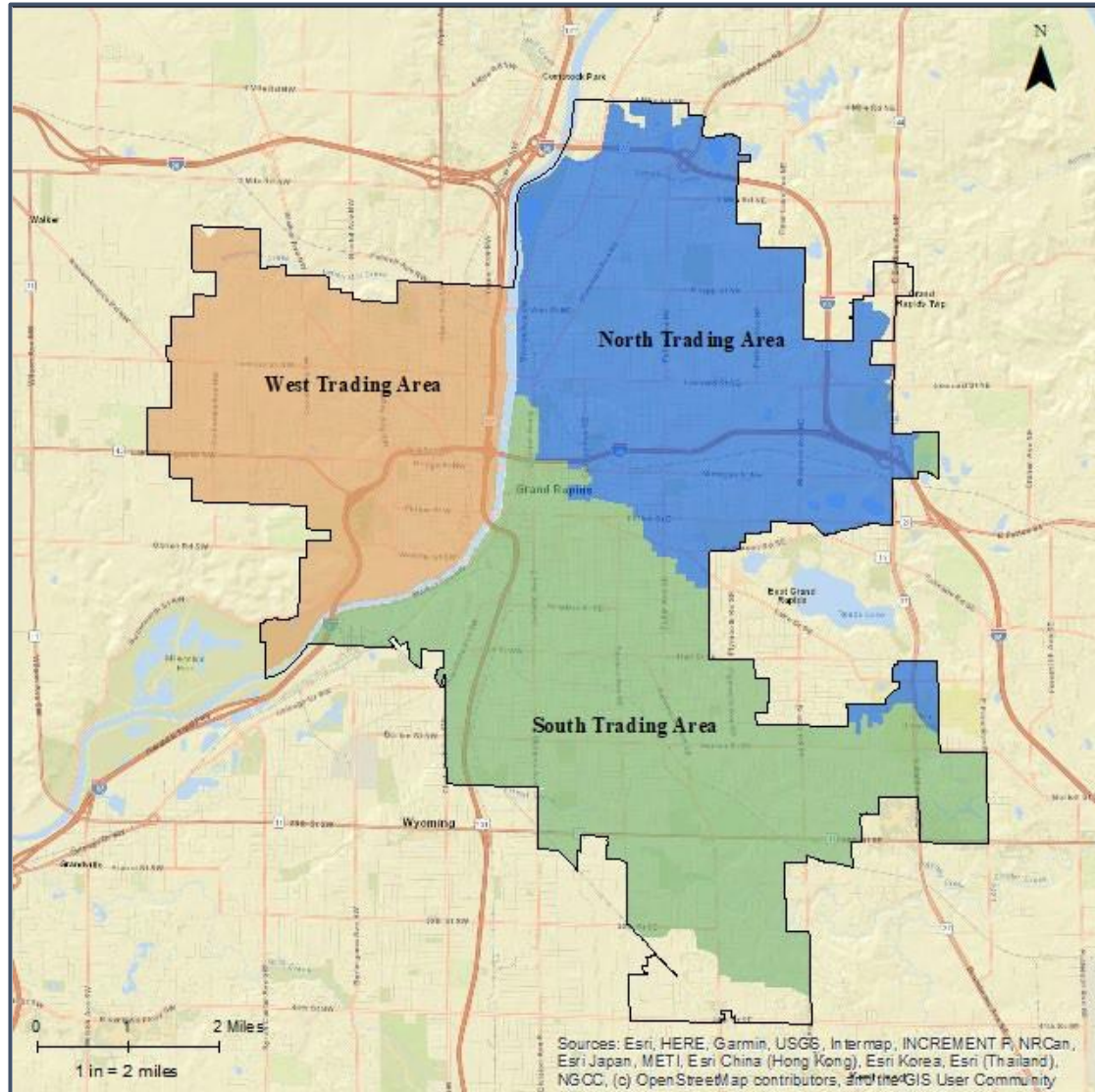
PART 1 – GENERAL PROVISIONS



Infeasibility Requirements Determine Eligibility for Offsite Compliance

- Limited size of the lot outside of the building footprint
- Soil instability
- Poorly draining soils
- Adverse conditions for plantings.
- On-site water quality impacts vs. benefits realized at the offsite location.
- Bedrock that impedes infiltration
- High groundwater, or the potential of mounded groundwater to impair other uses
- Stormwater hot spots (includes Part 201 and Part 213 sites, and areas of soil or groundwater contamination)

Stormwater Credit Trading Areas



- Buy/Sell credits within same Trading Area
- Tied to water quality goals and storm sewer capacity
- Should distribute trading activity across Wards, addressing neighborhood equity and investment

Compliance Assistance & Community Partners



WHAT IS RAINSCAPING?

Rainscaping is a method to promote the use of nature to restore our rivers and improve water quality. Rainscaping highlights the benefits of natural landscaping approaches and demonstrates the skills required for installation and maintenance. Natural systems with plants, grasses, and trees that are designed to absorb rainfall and soak up harmful pollutants are often also referred to as green infrastructure.

WHY RAINSCAPING?

- Reduce Flooding
- Create Outdoor Amenities
- Improve Air Quality
- Reduce Urban Heat Stress
- Improve Health & Water Quality
- Promote Walkability
- Meet Stormwater Requirements

WHERE TO START?

Sign up for a Site Assessment today!

GETTING STARTED



RAIN GARDENS and SWALES take in stormwater runoff from the street and/or curb and gutter system allowing it to infiltrate the ground and are filled with native plants that help infiltrate the water.



TREES

offer a wide array of benefits that include stormwater infiltration, air quality improvements, lowering urban temperatures, and creating valuable habitat.



NATIVE PLANTS

have extensive root systems that stabilize soil, filter pollutants, and absorb stormwater runoff. These plants also support pollinators and other wildlife.



POROUS PAVEMENT

can replace concrete or asphalt with driveways and parking lots to allow water to soak into the ground.

- Maintenance Plans / Simplified As-builts for credit sellers
- Rainscaping Program = potential supply
- Local NGOs as partners

- Residents
- City Commission / Staff
- Engineering Community
- Development Community
- Business Community
- Non-Profits

RAINscaping Small Businesses for Healthy Rivers & Communities

Cities are increasingly turning to green infrastructure solutions to adapt to the needs of growing populations and a changing climate.

May 6, 2021



Rain gardens run along the sidewalk. | Marcela Gara, Resource Media

Stormwater Credit Trading: Buyer Participation Process

Step 1

Determine eligibility based on feasibility criteria and required credits amount through LUDs application

Step 2

Submit Stormwater Management Plan (SWMP) with LUDS application on [Citizen Access](#)

Step 3

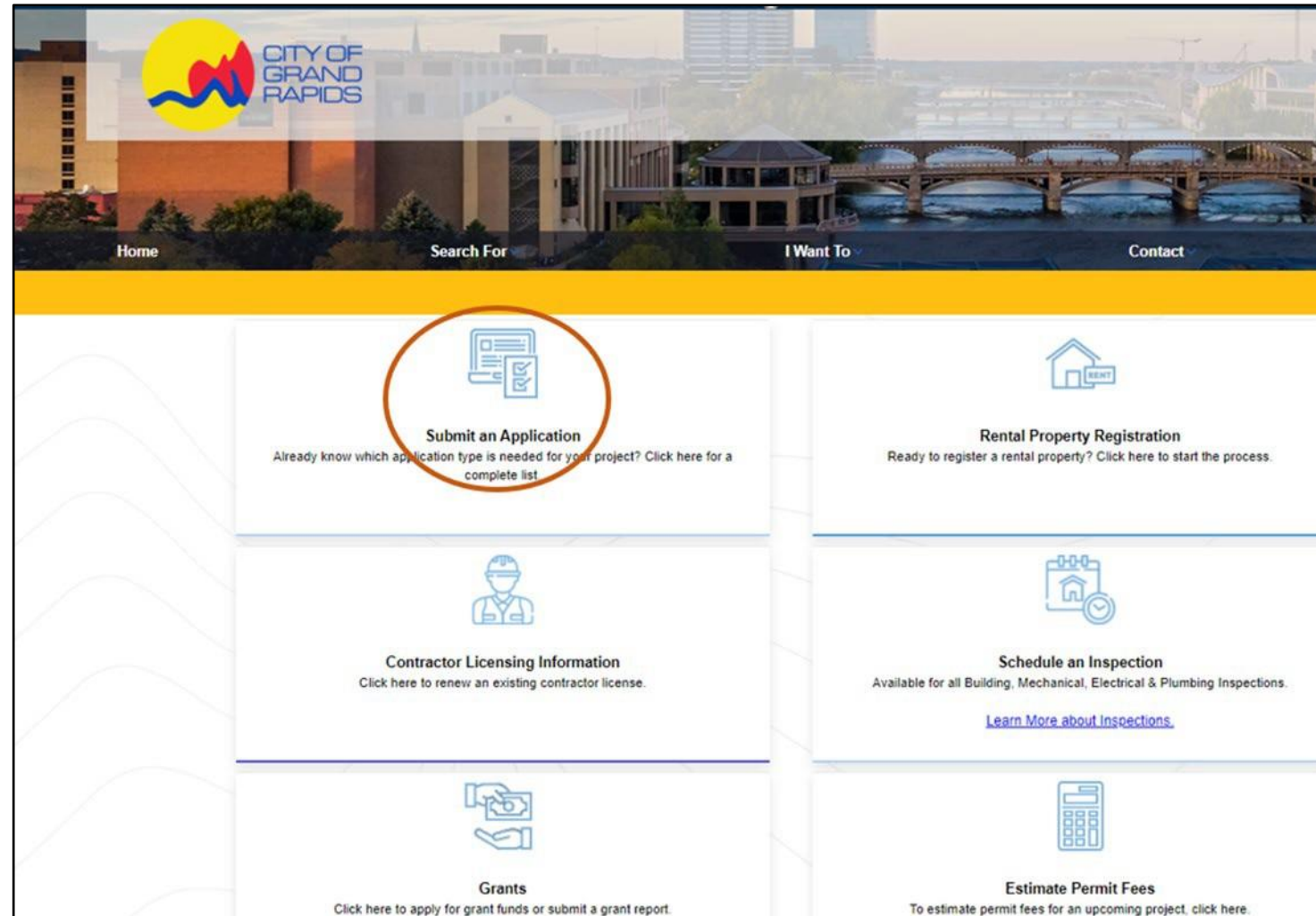
Access Marketplace to identify seller(s) of credits (or use own banked credits)

Step 4

Contact approved seller/negotiate credit purchase for volume required and maintenance agreement

Step 5

Submit Purchase Contract and Maintenance Agreement for permit approval on [Citizen Access](#)





Credit Payments

- No Annual purchase requirement: permanent credits
- One-time upfront payment
(how many in-lieu fee programs work)
- **Hybrid:** One-time upfront payment for capital + annual maintenance payments
- Buyer/seller can work out agreement/payment terms

Stormwater Credit Trading: Credit Generating Process

- New/redevelopment projects implementing GSI to treat more impervious area than required by regulation
- Voluntary GSI projects where construction activities do not trigger stormwater management standards

Step 1

Submit an L-DEV application to generate credits from a green infrastructure project through City portal

Step 2

Build project.

Step 3

Certify SVCs by submitting Project Completion/As Built notification for project on [Citizen Access](#)

Step 4

Approved volume capacity is listed as credits in the Stormwater Marketplace (or banked for future use)

Step 5

Sell credits to approved buyer through Purchase Contracts (if applicable)

Step 6

Maintain and re-certify GSI per permit requirements

Web presence with more resources

https://www.grandrapidsmi.gov/Government/Departments/Development-Center/Stormwater-Credit-Trading-Program

Stormwater Credit Trading Program

Overview

In regulatory compliance with Michigan's *National Pollutant Discharge Elimination System* (NPDES), permit application for discharge of stormwater to surface- waters from a *Municipal Separate Storm Sewer System* (MS4), new and redevelopment projects are required to meet Minimum Post-Construction Stormwater Runoff regulations. Controls for this type of runoff are necessary to maintain or restore stable hydrology in receiving waters by limiting surface runoff rates and volumes as well as reducing pollutant loadings from sites that undergo development or significant redevelopment.

Following its values of Accountability, Collaboration, Customer Service, Equity, Innovation, and Sustainability, the City welcomes creative approaches to stormwater management. Stormwater management has and continues to change. The old way was all about getting it out fast. The new mantra is slow it down, spread it out, and soak it in. The Stormwater Credit Trading Program aligns with all these values and to the new way of doing things.

Stormwater Credit Zone Map

[View larger map](#)

CONTACT US

Phone
311 or 616-456-3000

Email
esd@grcity.us

Location
Water Resource Recovery Facility
1300 Market Ave SW
Grand Rapids, MI 49503

RESOURCES

- [Grand Rapids Green Infrastructure Standards \(the Green Book\)](#)
- [Grand Rapids MS4 Stormwater Management Manual](#)
- [LGROW Rainscaping for Business](#)
- [Link to ESD Website](#)
- [Link to Planning Department Website](#)
- Coming Soon!**
How-to Guide for Stormwater Credit Trading in Grand Rapids
- Minimum Post-Construction Stormwater Requirements
- LGROW Design Spreadsheet
- Purchase Contract Template
- Maintenance Agreement Template

Stormwater Credit Trading Program

The Stormwater Credit Trading Program is a way for property owners to comply

- Credit tracking registry
- Roster of buyers & sellers
- Price information
- Document templates