Green Infrastructure and the MS4 Permit: A Compendium of Case Studies

Green Infrastructure Webcast Series

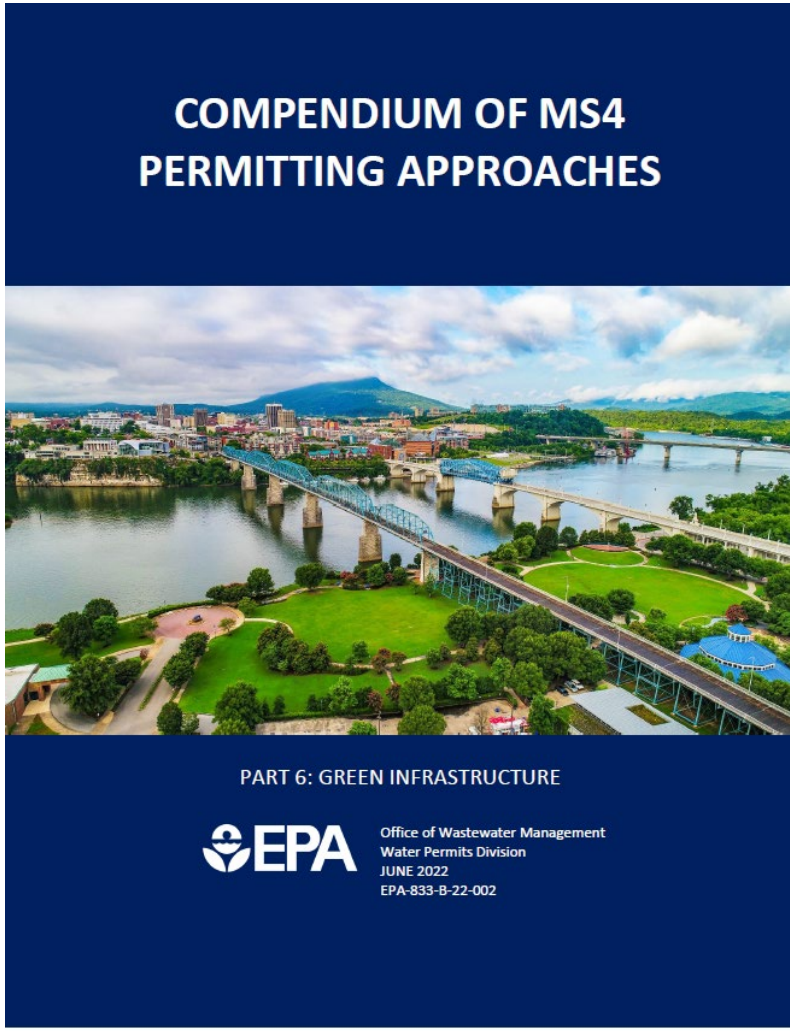
January 25, 2023

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.

EPA's Compendium of Green Infrastructure MS4 Permitting Approaches

Permitting approaches that encourage or require green infrastructure in municipal separate storm sewer systems (MS4s) along with examples of how permittees implemented those requirements.



Visit EPA's website:
https://www.epa.gov/npdes/municipal-sources-resources

Permits Included in the Compendium

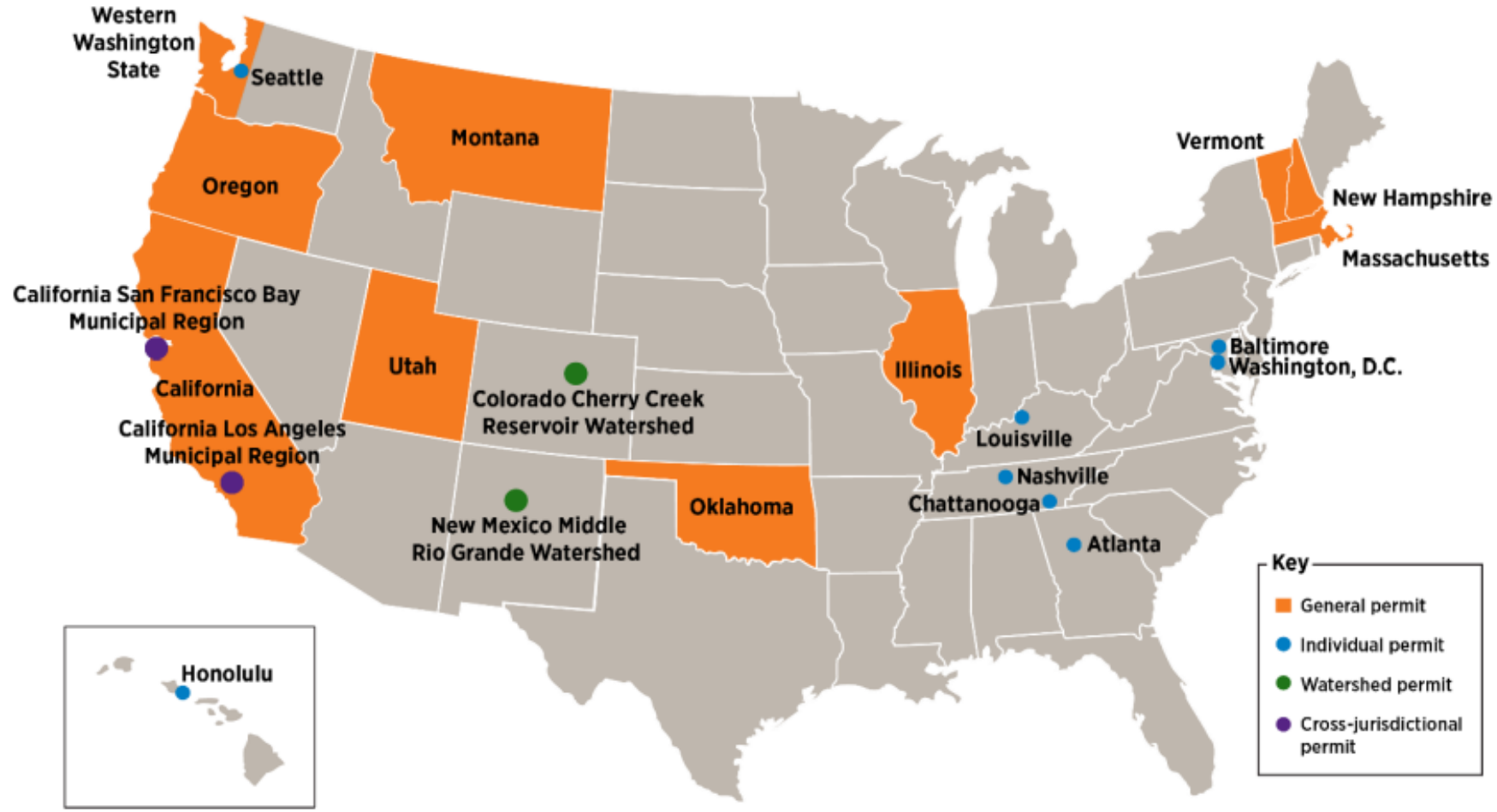


Figure 1. Map of permit excerpts included in the compendium.

Green Infrastructure Compendium Organization

- The compendium is organized by permit excerpt topic. Many of the sections align with the six minimum control measures required in Phase II MS4 permits.

Public Education and Outreach	Illicit Discharge Detection and Elimination	Construction	Post-Construction
Pollution Prevention	Monitoring	Specific Stormwater Pollutants	

BE STORMWATER SMART

Communication Tools to Energize MS4 Public Education and Engagement

Stormwater Smart Goals

https://www.epa.gov/npdes/stormwater-smart-outreach-tools

Increase Awareness

- Know What Happens When it Rains Brochure
- Stormwater Flow infographic
- Social media posts/graphics

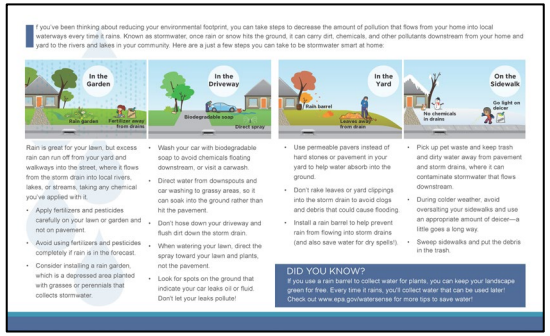
Where stormwater flows, everything goes. Soap from car washing products contains chemicals that can harm fish and other critters. Be #StormwaterSmart!

Where stormwater flows, everything goes. Oil and grease leaked from cars wash down drains and into waterways. Be #StormwaterSmart!

https://www.epa.gov/npdes/stormwater-smart-outreach-tools

Promote Practices

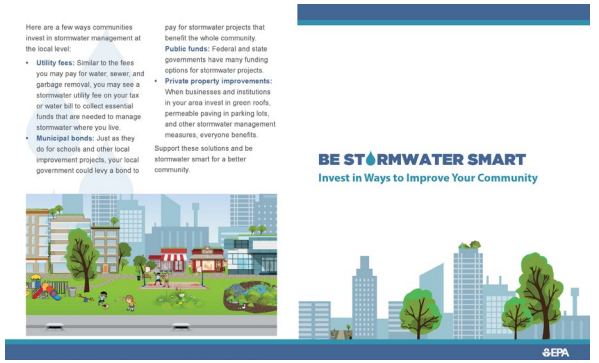
- Take Steps to Protect Our Waterways brochure series
- Stormwater Smart infographic
- Social media posts/graphics
- One page tip sheets for small businesses



https://www.epa.gov/npdes/stormwater-smart-outreach-tools

Inspire Investment

- Invest in Your Community brochure
- Be Stormwater Smart PowerPoint
- Stormwater Investment Benefits infographic
- Social media posts/graphics
- Green Infrastructure in Action Case Studies



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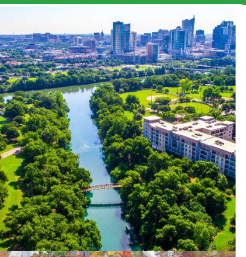
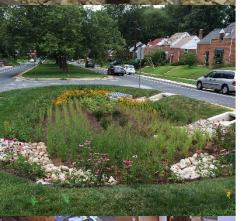







Today's Speakers:

City of Chattanooga Department of Public Works

- **Joshua Rogers,** Water Quality Supervisor
- **Mo Minkara**, Water Quality Manager

Louisville Metropolitan Sewer District

- **Lori Rafferty,** Certified Flood Plan Manager and MS4 Program Lead
- **Brett Clark,** Engineer Technician and Post-Construction Runoff Controls Program Lead

Green Infrastructure and the City of Chattanooga MS4 Permit

Mounir Minkara – Water Quality Manager

Joshua Rogers – Water Quality Supervisor

Discussion Items

- Chattanooga NPDES Permit Development
  - Drivers: EPA Scorecard, Code Change, Consent Decree (GI Master Plan), GI Awards Contest
- Chattanooga Programs
  - RainSmart
  - MyTN → RainSmart Yards
    - NoogaKnox Challenge
  - HomeGRN → ReLeaf
  - Green Grants
  - SOV Market
  - Developing Programs: SFR Ponds, SGI, Understory Gardens

NPDES Permit Development

Pre-2010

- 1993 Stormwater Utility
- 1996 1st NPDES Permit
  - What was the driver for GI during this time?

2010

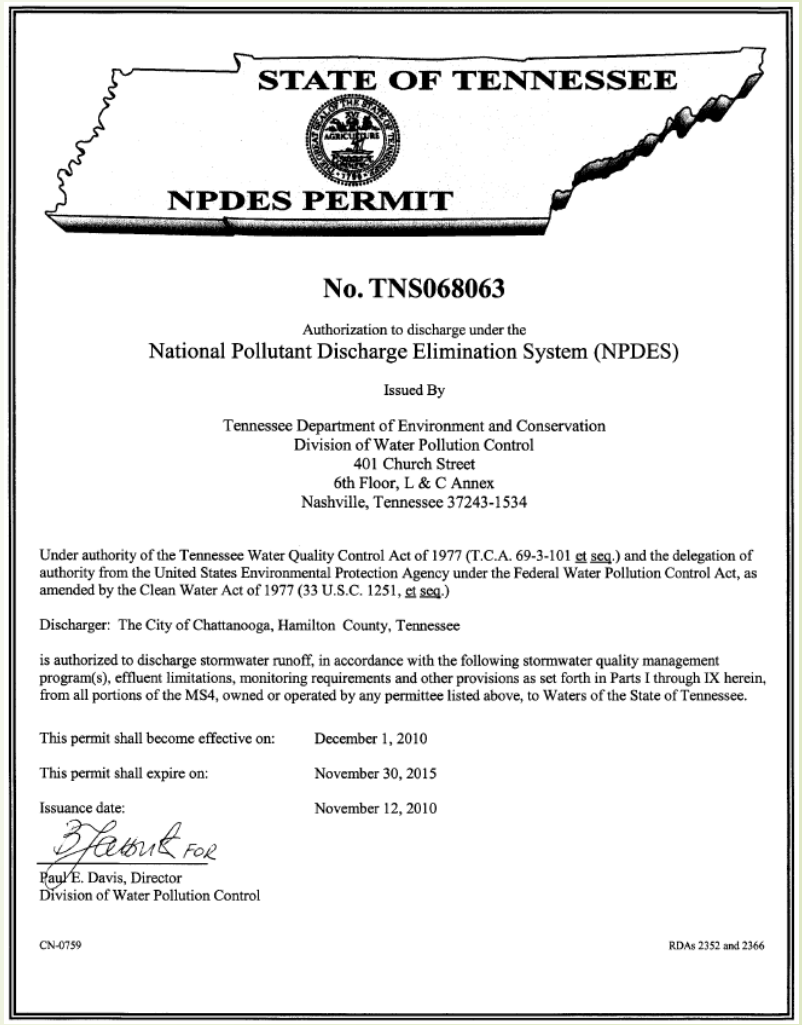
- 2nd NPDES Permit
  - EPA Scorecard
  - Runoff Reduction Requirement

Present

- Expansion of programs & LOS
- Preparation for next permit

GI Drivers 2010-2015

- 2nd NPDES Permit (2010)
  - EPA Scorecard
  - Runoff Reduction Standards
    - www.Chattanooga.gov/ResourceRain
  - Mitigation Options
- LID Design Competition (2013-2014)
  - https://vimeo.com/105672772
- Consent Decree (2013)
  - GI Program Plan for CSS
  - https://clearchattanooga.com/



STATE OF TENNESSEE

NPDES PERMIT

No. TNS068063

Authorization to discharge under the
National Pollutant Discharge Elimination System (NPDES)

Issued By

Tennessee Department of Environment and Conservation
Division of Water Pollution Control
401 Church Street
6th Floor, L & C Annex
Nashville, Tennessee 37243-1534

Under authority of the Tennessee Water Quality Control Act of 1977 (T.C.A. 69-3-101 et seq.) and the delegation of authority from the United States Environmental Protection Agency under the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 (33 U.S.C. 1251, et seq.)

Discharger: The City of Chattanooga, Hamilton County, Tennessee

is authorized to discharge stormwater runoff, in accordance with the following stormwater quality management program(s), effluent limitations, monitoring requirements and other provisions as set forth in Parts I through IX herein, from all portions of the MS4, owned or operated by any permittee listed above, to Waters of the State of Tennessee.

This permit shall become effective on: December 1, 2010

This permit shall expire on: November 30, 2015

Issuance date: November 12, 2010

FOR

Paul E. Davis, Director
Division of Water Pollution Control

CN-0759

RDAs 2352 and 2366

GI Drivers 2015-Present
"Green Infrastructure" Incentive Programs

- RainSmart
- MyTN → RainSmart Yards
  - NoogaKnox Challenge
- HomeGRN → ReLeaf

Residential

- Green Grants
- SOV Market

Non-Residential

- Developing Programs: SFR Ponds, SGI, Understory Gardens

RainSmart

Residential Reimbursement

- Rain Gardens
  - 21 rain gardens installed; 558,250 gallons infiltrated annually
- Rain Barrels
  - 1,353 rain barrels sold/reimbursed; 74,415 gallons captured per event
- SupportScapes
  - 15 plantings installed in 2022

RainSmart Yards

Residential Recognition

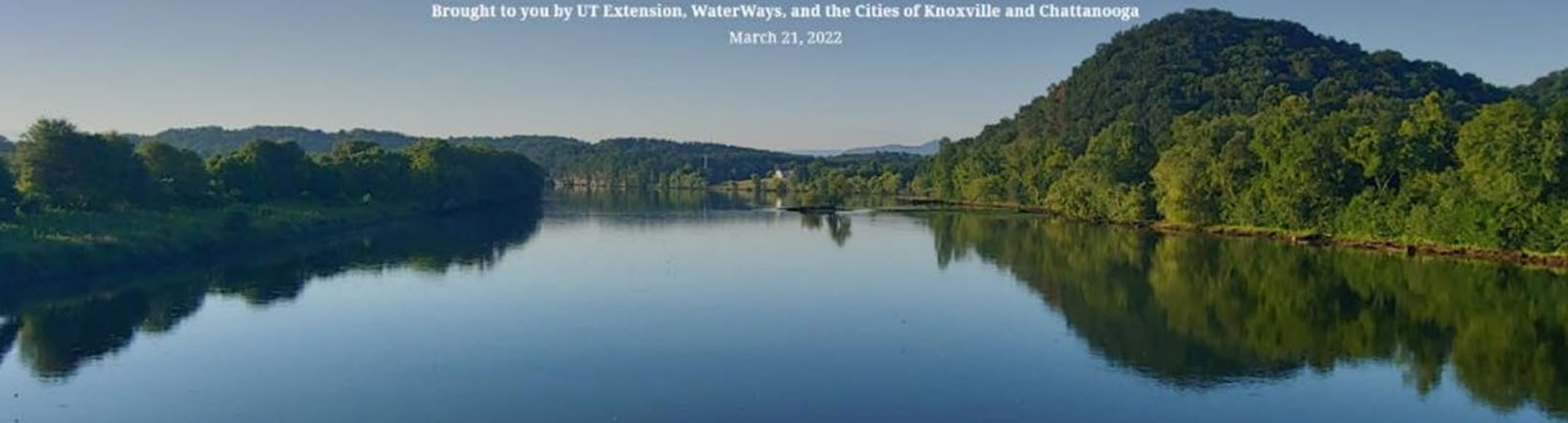
- Began in 2019 as MyTennessee (inspired by other national programs)
- 2021 added fee discount for awardees
- 2022 changed name to RainSmart Yards to better reflect the program's purpose

NoogaKnox Challenge 2022

for a clean Tennessee River, one yard at a time.

Brought to you by UT Extension, WaterWays, and the Cities of Knoxville and Chattanooga

March 21, 2022



TENNESSEE SMART YARDS

CITY OF KNOXVILLE

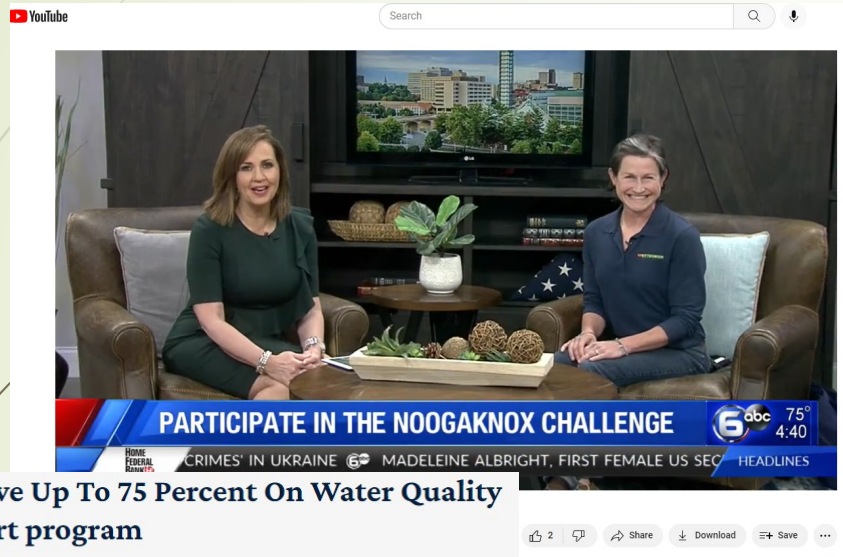
UTEXTENSION
INSTITUTE OF AGRICULTURE
THE UNIVERSITY OF TENNESSEE

WaterWays

CHATTANOOGA SEAL TENNESSEE

RainSmart yards

NoogaKnox Challenge



- Mar 21 (World Water Day) to Sept 22 (first day of fall)
- Open to all homeowners, but tried to focus on elected officials
- PROMOTION was huge: Mayoral support, press releases, media interviews, etc.
  - Highest response rates when pushing the fee discount

https://storymaps.arcgis.com/stories/b700209dd7f94a7ca7ad9a844483a367

ReLeaf Tree Program

- Residential free tree giveaway program
  - Spurred by the Easter tornado of 2020
- Began as HomeGRN (Growing Resilient Neighborhoods)
  - Partnered with Reflection Riding Arboretum and Nature Center
- Now partnering with local Electric Power Board
  - https://epb.com/free-tree-releaf/

Green Grants

- Non-Residential Reimbursement Grant (up to $200K)
  - For the installation of green infrastructure/runoff reduction measures with educational components
- Examples of projects to date:
  - NDHS: bioretention, pervious concrete, infiltration basin, naturalized basin, tree islands
  - Penske: bioretention ponds
  - CCS: bioretention pond and swale
  - CCSE: infiltration basin, disconnected impervious, bioretention
  - Bethlehem Center: bioretention, tree islands

resource: Rain GREEN Grants

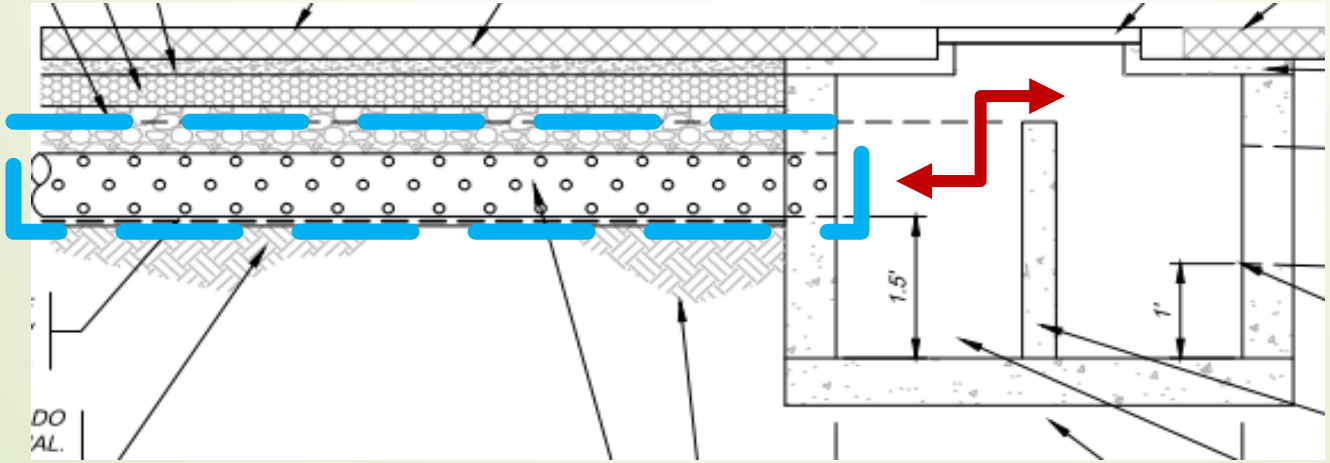
https://www.facebook.com/watch/?v=644527336255753

From Playground to Park

Like Comment Share 82 · 4 comments · 5.4K views

SOV Market

- Stay-On-Volume = runoff reduction requirement in cubic feet for new development and significant redevelopment in Chattanooga
- SOV coupons generated for overdesign or retrofit
- Value of coupon is market based
  - Mitigation Fee = $45/CF
- Coupons given to date = 52,280 CF



Developing Programs

- Single Family Residential Ponds Program
  - City maintenance w/ option to retrofit
- Southern Grasslands Initiative
  - Native grassland installation on City lands
- Understory Gardens
  - Integrated Pest Management

Green Infrastructure and the City of Chattanooga MS4 Permit

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Joshua Rogers

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Louisville MSD's Green Infrastructure Program

Lori Rafferty, PE, CFM
Brett Clark

January 2023

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Louisville, KY

- Largest community in Kentucky with a population of approximately 630,000
- Home of the Kentucky Derby, Muhammad Ali, and Louisville Slugger bats

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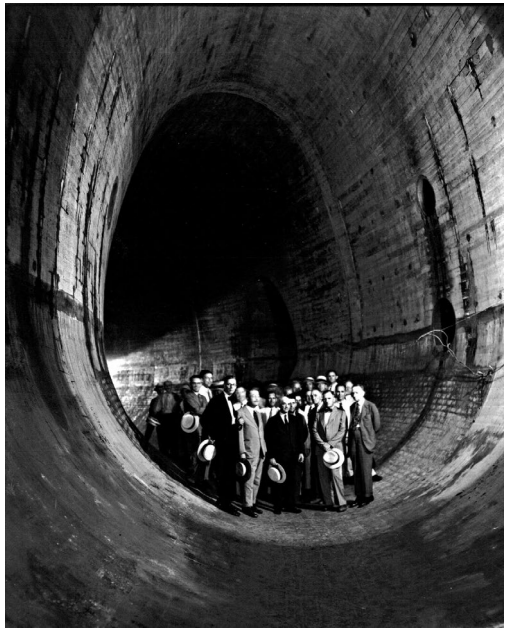
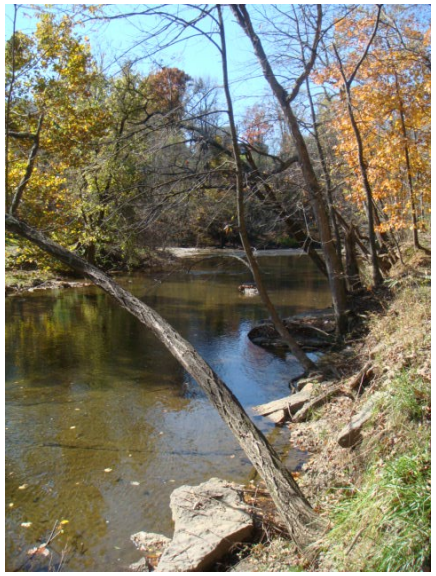
Metropolitan Sewer District

Sanitary Sewers



Stormwater



Flood Protection

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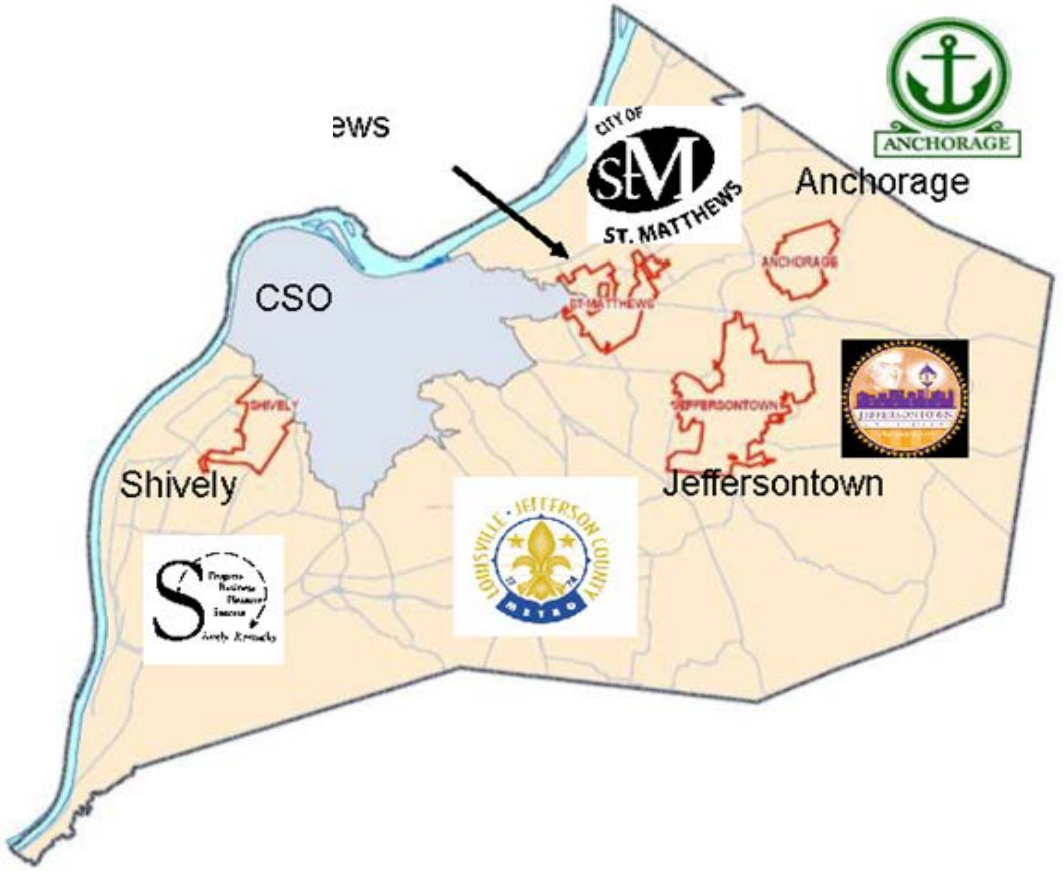
MS4 Permit

- Louisville's 1st MS4 permit was issued in 1990 as Phase 1 community
- Louisville Metropolitan Sewer District is the lead agency
- 5 Co-permittees
  - Louisville Metro Government
  - City of Jeffersontown
  - City of Shively
  - City of St Matthews
  - City of Anchorage



MSD and Co-Permittees MS4 Service Area

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Post-Construction & the MS4 Permit

- 1st included in 2011 MS4 permit
- Required to develop, implement, and enforce a program to address post-construction stormwater runoff
- Develop and adopt a post-construction ordinance
- Conduct site plan reviews
- Maintain an inventory and map
- Require long maintenance agreements from property owners
- Provide at training for inspectors, plan reviewers, and plan preparers
- Implement Green Infrastructure Demonstration Projects

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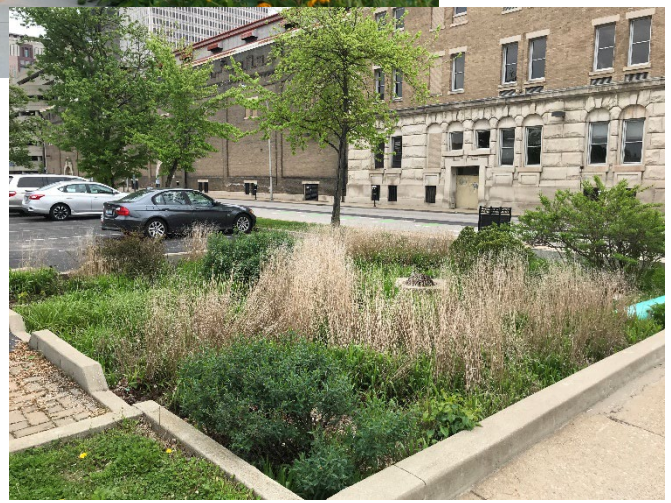
Post-Construction Runoff Controls

- Permit requires treatment of the 80th percentile rain event (0.6”) runoff volume from impervious surface
- Applicable to developments >= 1 acre of disturbance (including greater common development)
- Post Construction Chapter added to Design Manual in 2011 (updates in 2016 & 2020)
- Private development requirement started in 2013
- Post-construction requirements are required throughout the county (including the combined sewer area)



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Post-Construction Water Quality BMP Options

- Rain gardens
- Constructed wetlands
- Green wet & dry basins
- Green roofs
- Permeable Pavers
- Tree Boxes
- Vegetated Buffers
- Water Quality Units
- Infiltration Trenches
- Infiltration Basins

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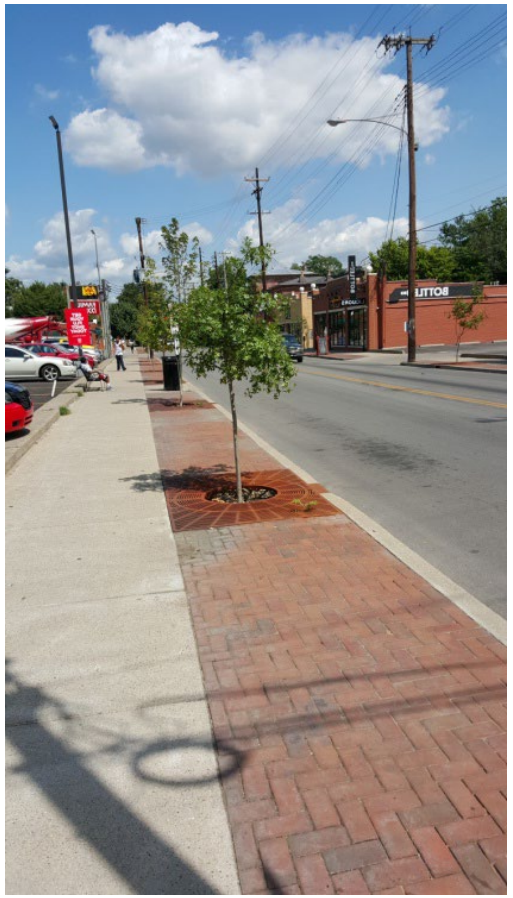
Demonstration Projects

- MSD partnered with private groups to construct approximately 100 post-construction water quality infrastructure demonstration projects
- Projects were intended to show the public, engineers, and contractors that green infrastructure was feasible
- Approximately $45 million spent since 2010



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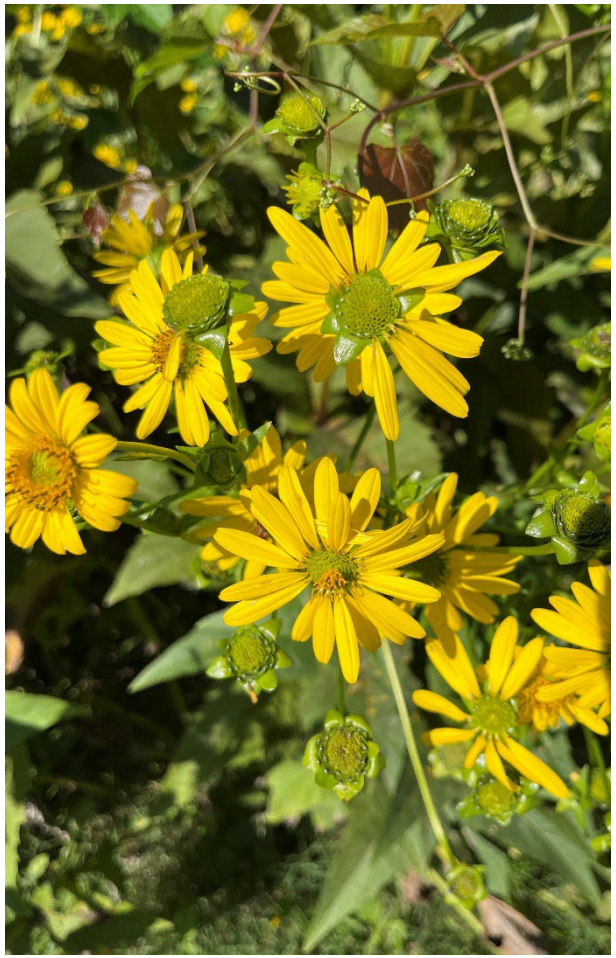
Design Manual Updates



- Updates to the original design manual were completed for program improvements (2016, 2020)
- 2020 Updates included:
  - Removal of pervious concrete and asphalt as BMPs
  - Required better accessibility for BMPs for long-term maintenance
  - Required pretreatment and underdrains
  - Improved exhibits showing standards for each BMP
  - More specific requirements, instead of suggestions, i.e. “must” instead of “should”

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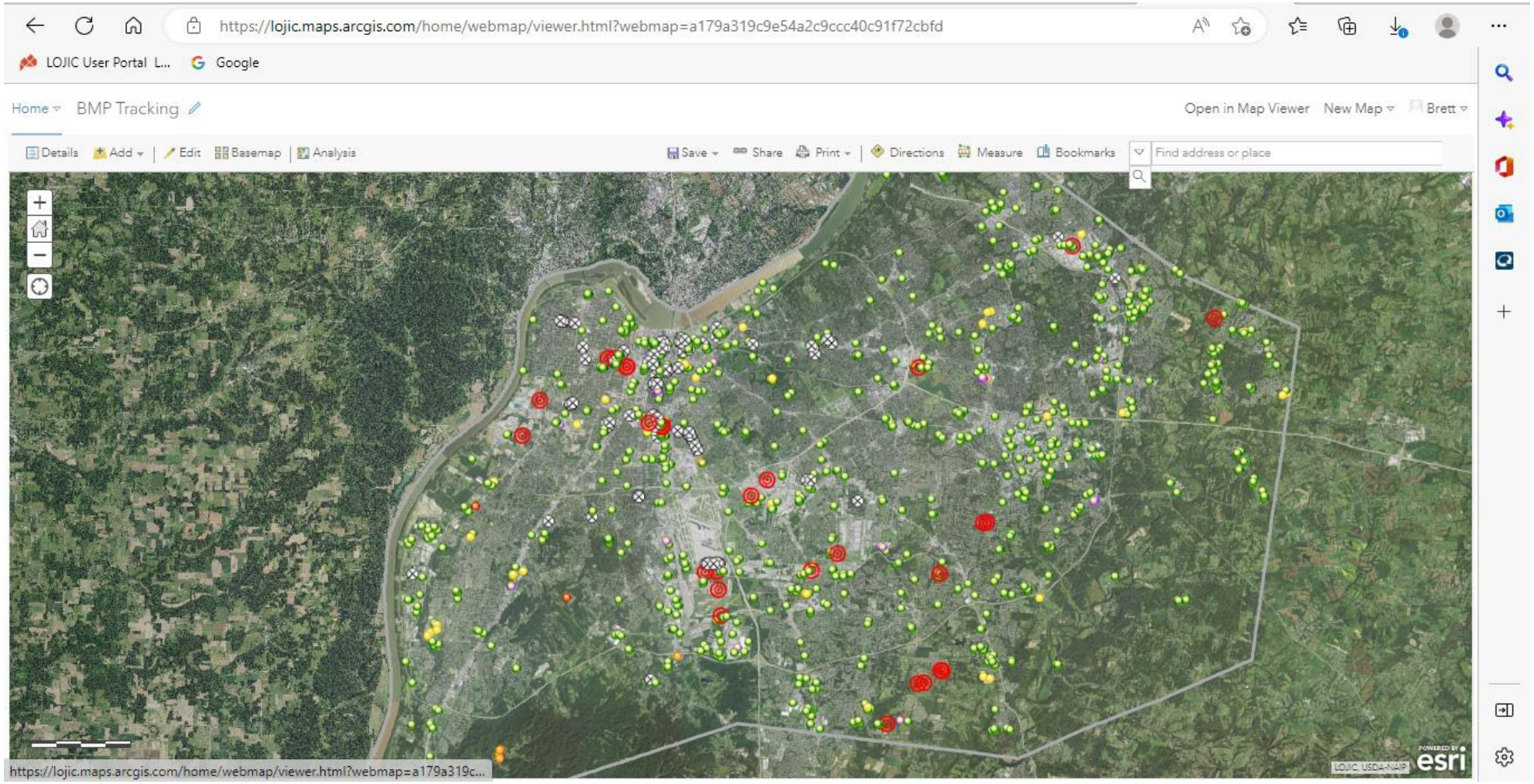
Over 1,100 Post-Construction BMPs & Growing…



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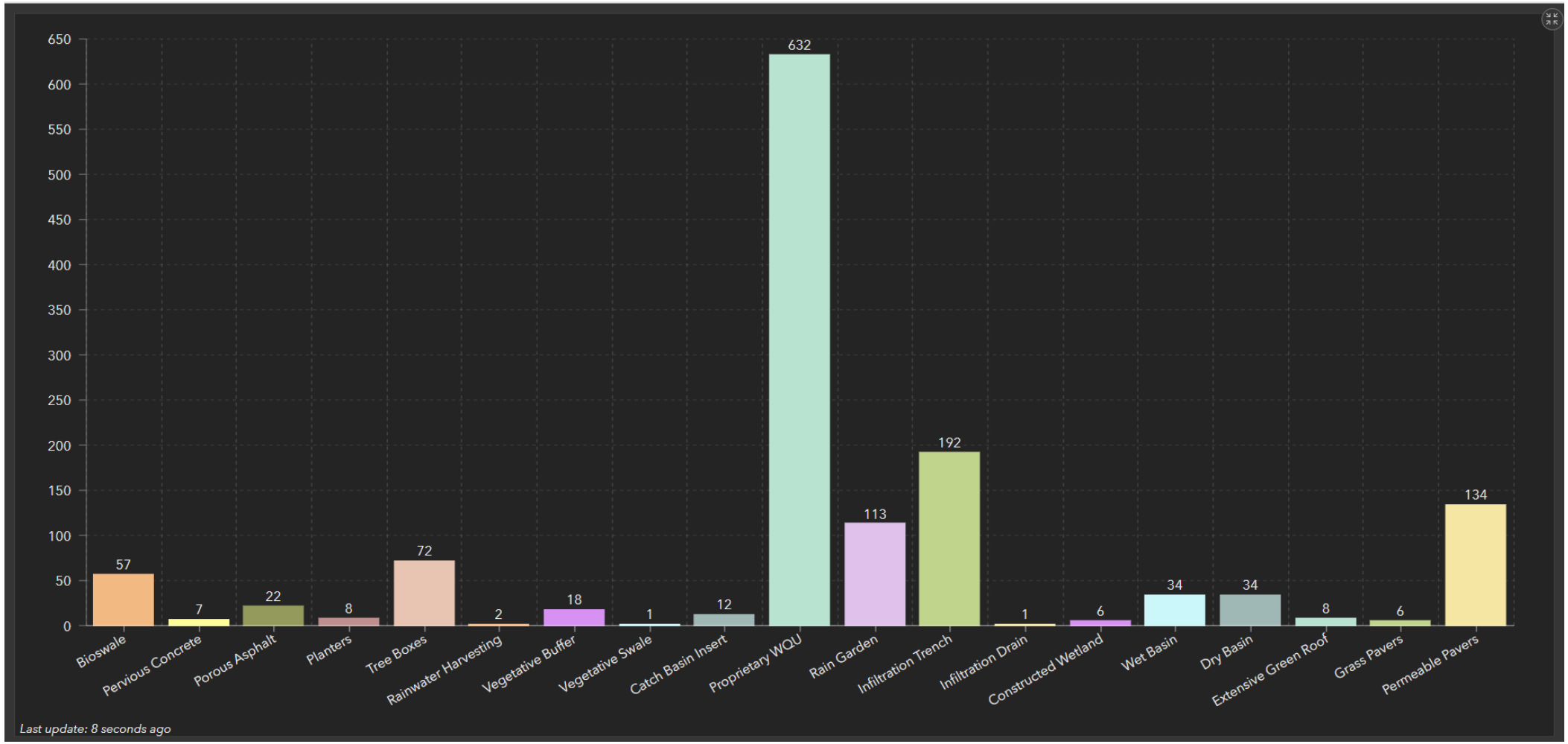
Over 1,100 Post-Construction BMPs & Growing…



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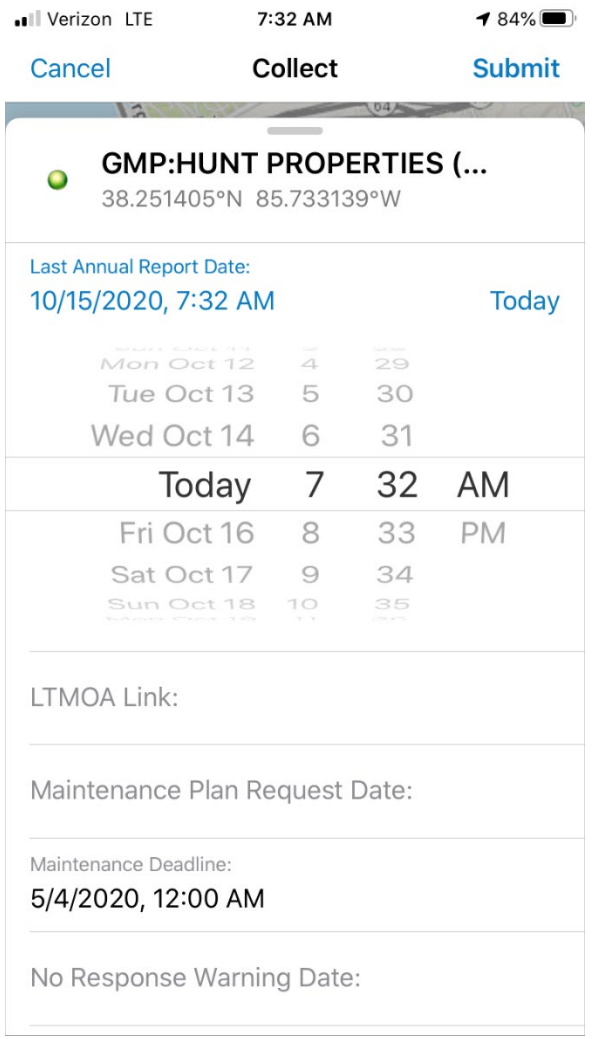
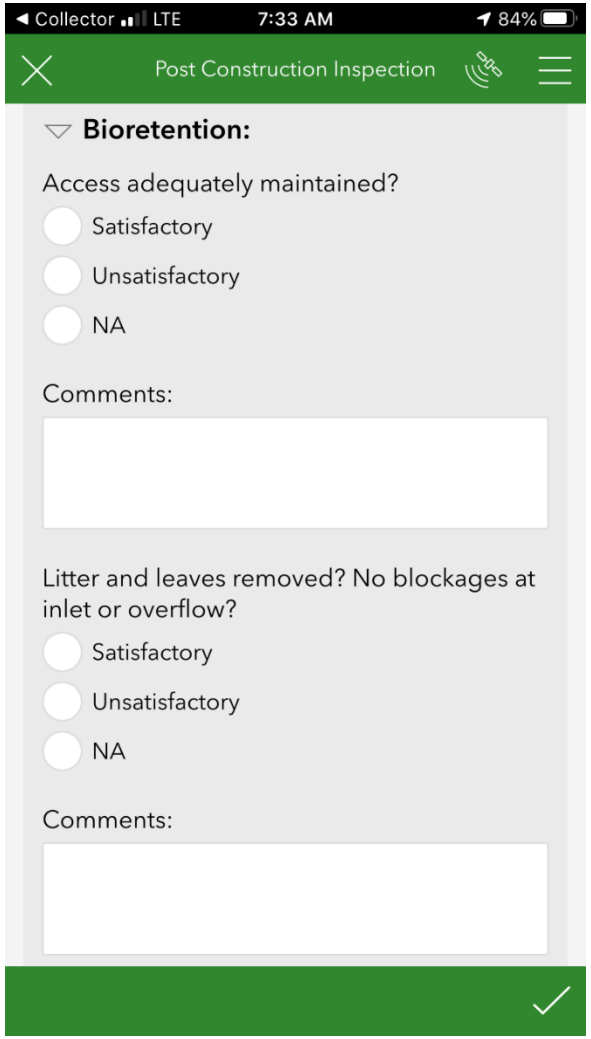
Inspection

- Required at least every 5 years
- Goal is every 3 years
- Updated inspections forms
- Mobile inspection app
- Annual Self Inspection REQUIRED
- 3rd Party inspection assistance





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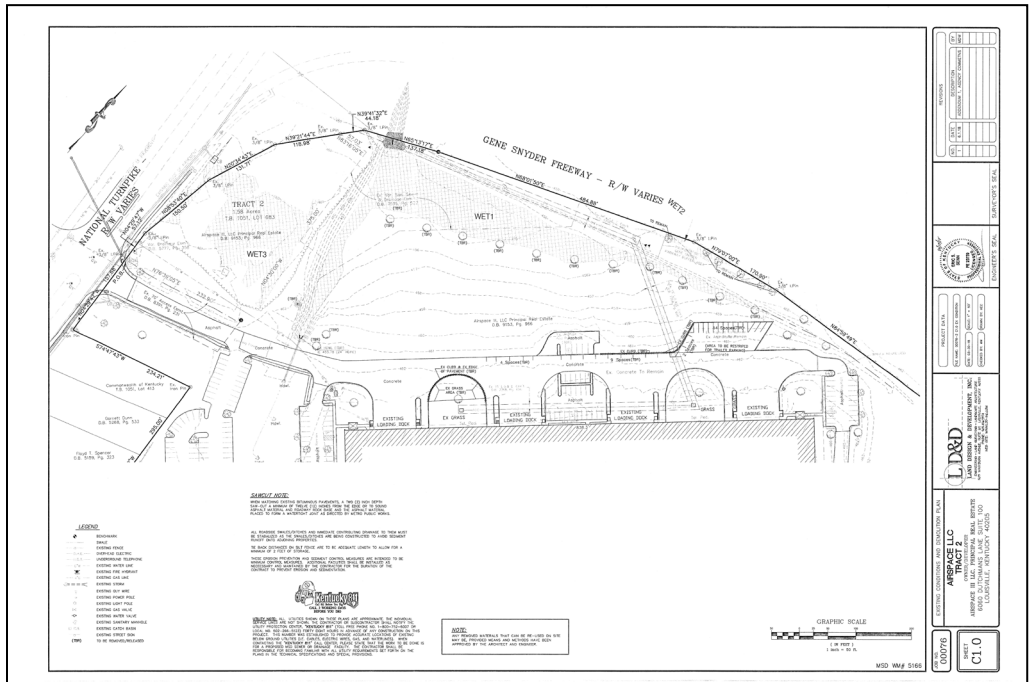
Design Challenges

- Infiltration testing
- BMP location/accessibility
- Water quality unit depth
- Pre-construction field conditions



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Maintenance Challenges

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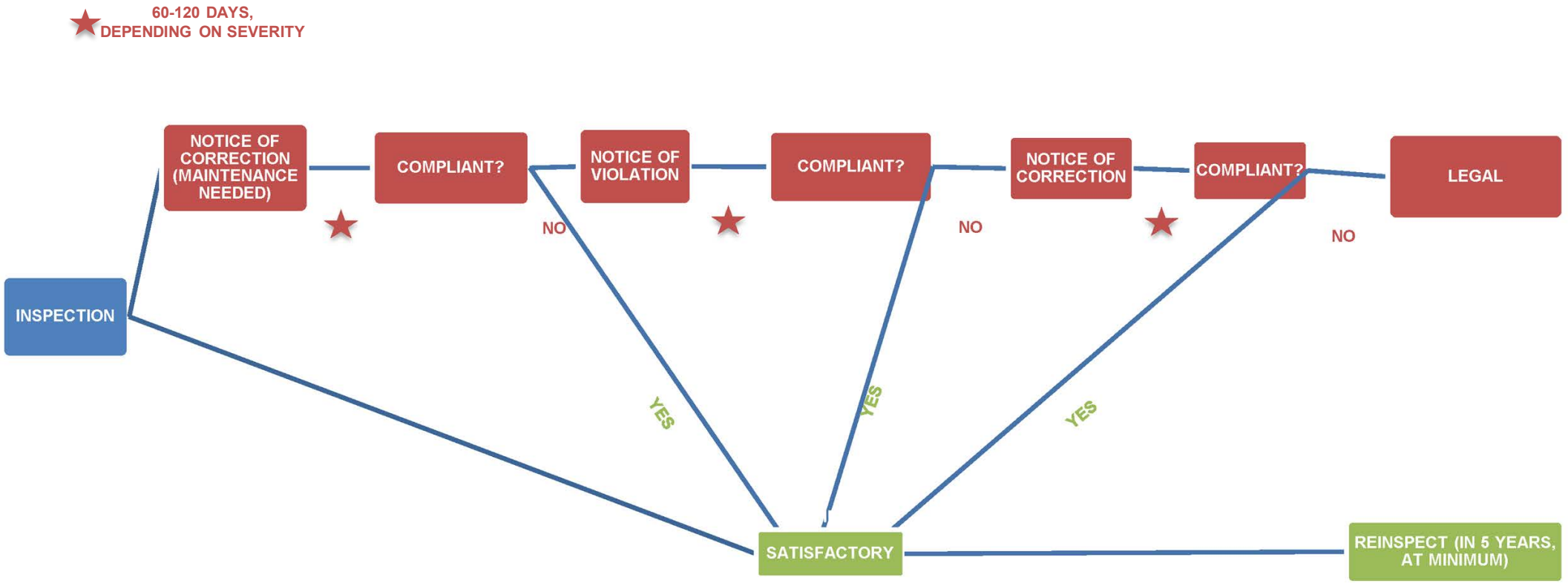
Inspection/Enforcement Flowchart



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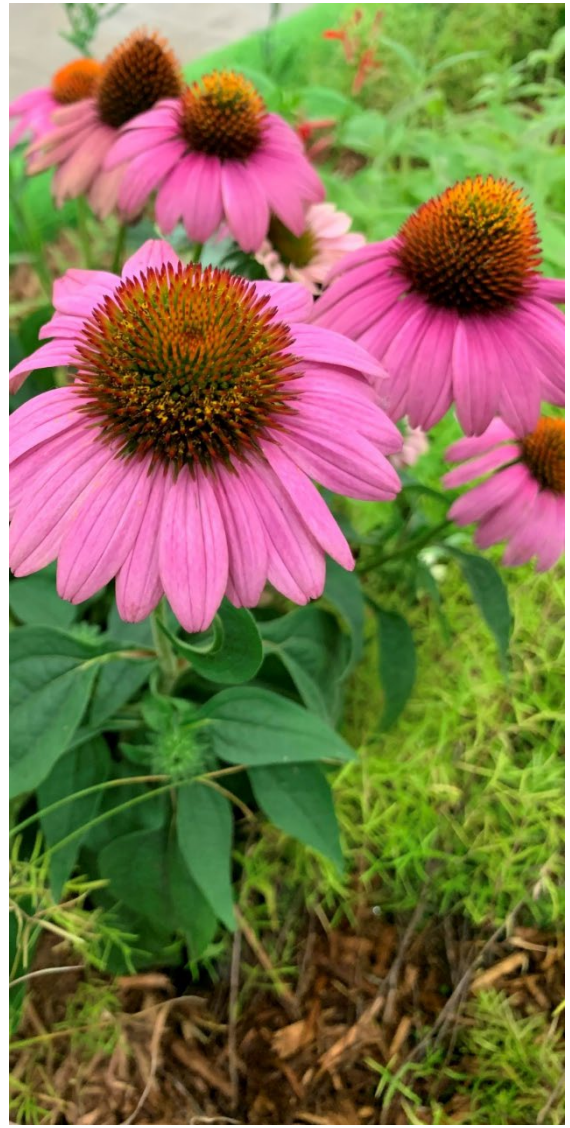
Fee-In-Lieu-Of Option

- Alternative to meet water quality requirements
- Option approved in 2022
- Funds used to construct regional green infrastructure projects to meet the water quality requirements
- Fee is based on square footage of impervious area
- Use of Fee-In-Lieu-Of Option must be approved, preference is to use on-site BMPs



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Fee-In-Lieu-Of Example – St. Mary & Elizabeth Hospital

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Fee-In-Lieu-Of Example – SW Cell Tower

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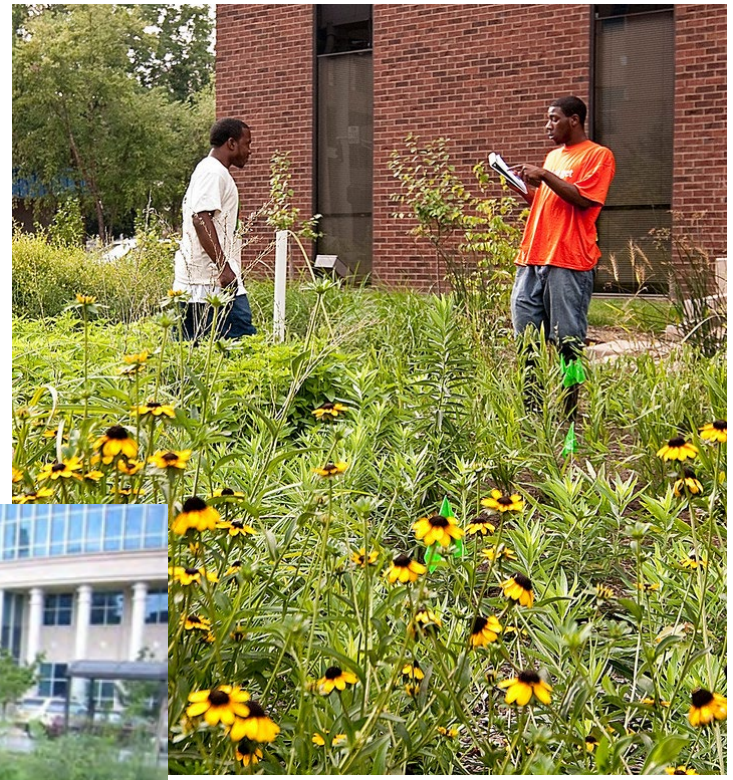
MSD Main Office Rain Garden Pilot Project

- Two rain gardens installed
- 10,855 sq ft of roof area treated
- Installed in 2009



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MSD Main Office Rain Garden

2020

2022

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Proposed MSD Main Office Rain Garden

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Churchill Downs Demonstration Projects

- Churchill Downs participated in MSD's Financial Incentive Program to construct two underground infiltration basins
- Large parking lots underlain with sandy soils in the combined sewer system
- Basins designed for 2.13" of rainfall
- Drainage area = 54 acres, 92% impervious

*GOOGLE EARTH

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Churchill Downs

- System manufactured by Contech Engineering Solutions, LLC
  - 8’ dia. perforated CMP pipes and header rows
- Outfall to combined sewer 5’ above invert of system
- Volume is about 6 MG (2.7 MG infiltration/3.3 MG detention)
- Basins are estimated to reduce overflows by 7MG and flow through the treatment plant by 27MG in an average year

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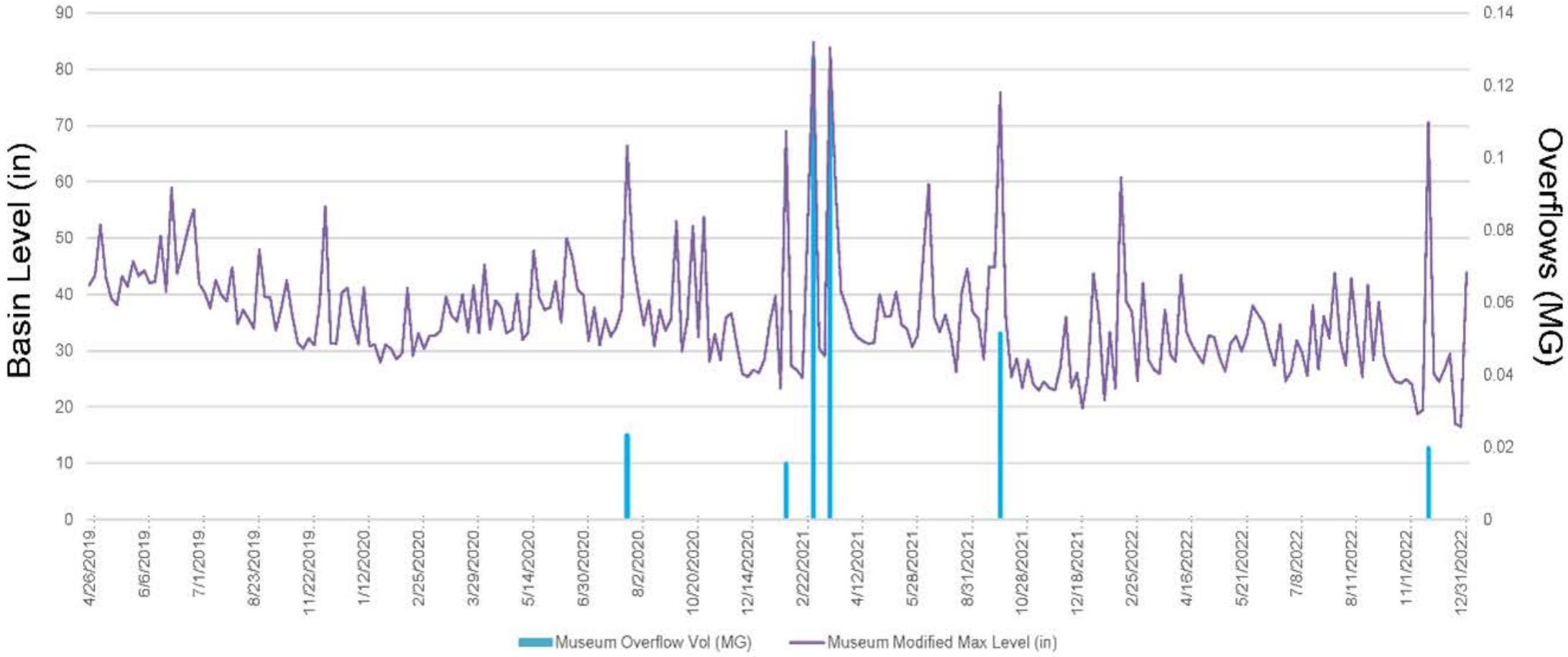
Churchill Downs Museum Basin



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Questions?

msd Safe, clean waterways | WATER QUALITY & FLOODPLAIN

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- **Brett Clark**
  brett.clark@louisvillemsd.org

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