Welcome to *The Current*, the North Central Region Water Network’s Speed Networking Webinar Series

**Getting the Green Light for Green Infrastructure: 2pm CT**

Submit your questions for presenters via the Q&A panel. There will be a dedicated Q&A session following the last presentation. The Q&A panel can be found via the Q&A icon at the bottom of the webinar screen.

If you are experiencing technical issues or have questions about the North Central Region Water Network or *The Current* Webinar Series, please use the chat feature. The chat feature is accessible via chat icon at the bottom of the webinar screen.

A phone-in option can be accessed by clicking the up arrow on the mute icon and clicking ‘Switch to Phone Audio’.

This session will be recorded and available at northcentralwater.org.
Today’s Presenters:

- **Paula Conolly**, Director, Green Infrastructure Leadership Exchange: "The Green Infrastructure Leadership Exchange: Challenges and Success Stories"


- **John Watson**, Associate Civil Engineer, Metropolitan Water Reclamation District of Greater Chicago: "Greening Chicagoland for Reduced Flooding"
Paula Conolly

Paula Conolly, AICP, is committed to making green stormwater infrastructure work in communities across North America. She is the Director of the Green Infrastructure Leadership Exchange (Exchange), a peer learning network of municipalities, water utilities, and counties seeking to advance their green stormwater infrastructure programs. Prior to the Exchange, she led policy initiatives for Philadelphia’s renowned Green City, Clean Waters program, helping to change “business as usual” to implement over 30 acres of green stormwater infrastructure on vacant lands, parks, streets and private property. Ms. Conolly helped to spearhead a state-of-the-art drinking water protection program for the City of Philadelphia, helping to raise over $3M to improve and protect the Schuylkill River Watershed. Prior to that, Paula consulted on public health and environmental initiatives at Booz Allen Hamilton. Paula is a graduate of the University of Notre Dame.
The "Current" Webinar Series

Green Infrastructure Leadership Exchange

Challenges and Successes
The Exchange

giexchange.org

MISSION
To accelerate the affordable and equitable implementation of green stormwater infrastructure (GSI) throughout North America by supporting peer learning, innovation and collaboration among cities, counties and utilities.

VISION
Communities with thriving GSI systems that further social equity, public health, and climate resilience.
Discussion Points

- Challenge 1: Centering community needs in GSI design and implementation
- Challenge 2: Funding & financing
- Challenge 3: Knowledge creation
Challenge #1

Centering Community in GSI Work

- **Local Level Solution**: City of Grand Rapids
- **Collective Level Solution**: Equity Evaluation Framework (under development) & Adaptive Management Resources
Challenge #2
Emphasizing co-benefits within financing programs

- **Local Level Solution**: City of Atlanta
- **Collective Level Solution**: giexchange.org/resources/
Challenge #3
Knowledge creation: Costs, co-benefits, performance

- **Local Level Solution**: University Partnerships
- **Collective Level Solution**: Water Research Foundation, State of the Field Report
Harry Zhang

Dr. Harry Zhang is the Research Program Manager on Integrated Water and Stormwater at The Water Research Foundation (WRF) where he directs the research portfolios on Stormwater and Sustainable Integrated Water Management. He is the Section Editor on Water Sustainability for the Encyclopedia of Sustainability Science and Technology (Second Edition). Harry holds a PhD in civil and environmental engineering (water resources) and is a registered professional engineer.
Advancing Green Infrastructure Practices through CLASIC Life Cycle Cost Tool and Co-Benefit Analysis

Harry Zhang, PhD, PE
Research Program Manager on Integrated Water and Stormwater
The Water Research Foundation
Email: hzhang@waterrf.org

September 15, 2021
CLASIC Decision Support System

What is CLASIC?

- CLASIC stands for “Community-enabled Lifecycle Analysis of Stormwater Infrastructure Costs”

- The CLASIC tool is a user-informed screening tool which utilizes a lifecycle cost framework to support stormwater infrastructure decisions on extent and combinations of green, hybrid green-gray and gray infrastructure practices.

- CLASIC tool is part of EPA’s Green Infrastructure Modeling Toolkit.
Questions the CLASIC Tool Seeks to Answer

• How do various scenarios of stormwater infrastructure compare in terms of:
  ▫ Lifecycle cost
  ▫ Runoff volume reduction
  ▫ Pollutant removal
  ▫ Social benefits
  ▫ Environmental benefits

• How does land use and climate change affect future performance of scenarios of green and gray infrastructure?

• How do maintenance and long-run costs compare for user selected scenarios?
## Community-enabled Lifecycle Analysis of Stormwater Infrastructure Costs (CLASIC)

*(https://waterrf.org/CLASIC) and (https://clasic.erams.com/)*

<table>
<thead>
<tr>
<th>Output</th>
<th>Included in CLASIC Life Cycle Cost Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pollutant Load Reduction</strong></td>
<td>- TSS (Total Suspended Solids)</td>
</tr>
<tr>
<td></td>
<td>- TN (Total Nitrogen)</td>
</tr>
<tr>
<td></td>
<td>- TP (Total Phosphorus)</td>
</tr>
<tr>
<td></td>
<td>- FIB (Fecal Indicator Bacteria)</td>
</tr>
<tr>
<td><strong>Hydrologic Performance</strong></td>
<td>- Runoff Volume</td>
</tr>
<tr>
<td></td>
<td>- Volume Infiltrated</td>
</tr>
<tr>
<td></td>
<td>- Volume Evapo-transpired</td>
</tr>
<tr>
<td></td>
<td>- Number of runoff events</td>
</tr>
<tr>
<td><strong>Life Cycle Cost (LCC)</strong></td>
<td>- Net Present Value</td>
</tr>
<tr>
<td></td>
<td>o Construction</td>
</tr>
<tr>
<td></td>
<td>o Maintenance</td>
</tr>
<tr>
<td></td>
<td>o Replacement</td>
</tr>
<tr>
<td></td>
<td>- Average annual cost over design life</td>
</tr>
<tr>
<td></td>
<td>- Unit cost for scenario comparison</td>
</tr>
<tr>
<td><strong>Co-Benefits</strong></td>
<td>- Score of economic, environmental, social benefits based on user-selected importance factors</td>
</tr>
</tbody>
</table>
Web based Decision Support System for Stormwater Management

https://waterrf.org/CLASIC or https://clasic.erams.com/

GIS Interfaced for automated data collection of CLASIC inputs (area characteristics)
CLASIC Tool
Steps

1. Select Study Area
2. Select Climate Data
3. Define Default Parameters
4. Build Scenarios
5. Select Importance for Co-Benefits
6. Set Targets
7. Run Tool
8. View Outputs
BMP Technology Categories in **CLASIC Life Cycle Cost Tool**

- Rain Garden / Bioretention
- Sand Filter
- Infiltration Trench
- Grass or Vegetated Swales
- Permeable Pavement
- Vegetated Buffer
- Grass Strip
- Green Roof
- Extended Detention Basins
- Wet Pond
- Wetland channel
- Stormwater Harvesting
- Rooftop Disconnection
- Storage Tunnel/Vault
Example interface for Stormwater BMP in CLASIC Tool
International Stormwater BMP Database
(https://www.bmpdatabase.org/)

Clean Water Act Goals
Fishable & Swimmable

Urban Stormwater BMPs
(Structural, GI/LID, Source Controls)

Stream Restoration

Urban Stormwater Quality Database (NSQD)

Agricultural BMPs
Stormwater BMP Performance and Cost Database

International Stormwater BMP Database
2020 Summary Statistics

Urban BMP O&M Cost Database (https://bmpdatabase.org/urban-bmp-cost)
Three Outputs from CLASIC Life Cycle Cost Tool

**Performance**
- Water Quality
- Runoff Volume
- Volume Infiltrated
- Volume Evapotranspired

**Lifecycle Cost**
- Cost buildup method
  - Construction
  - Maintenance
  - Rehabilitation
    - Net present value
    - Average annual cost over design life
    - Per unit cost for scenario comparison

**Co-Benefit Analysis**
- Score of economic, environmental, social elements based on:
  - User selected importance factors
  - Performance and cost output
CLASIC Tool Outputs
- Performance
- Life Cycle Cost
- Co-Benefits
Building Climate Scenarios in the CLASIC Tool

Custom

Results for climate change predictions are still being validated and are not final.

Select Climate Model
Custom

Change in Precip (%)

Change in Evap (%)

Use CMIP5 Climate Models

Select Climate Model
Dry (IPSL-CM5A-MR)

Representative Concentration Pathway:
- RCP 4.5
- RCP 8.5

Current Year
2009

Future Year
2075

CALCULATE
CLASIC Scenario Comparison
- Technology
- Climate
- Climate & Technology
Co-Benefit Analysis in CLASIC Tool

(WRF Projects 4852 and 5105)

Social
✓ Improved air quality and related health benefits
✓ Water supply
✓ Enhanced aesthetics and community livability
✓ Flood risk reduction
✓ Reduced urban heat stress and related health benefits
✓ Increased recreational opportunities and enjoyment of green space
✓ Green job creation

Financial
✓ Avoided infrastructure and/or treatment costs
✓ Asset life extension
✓ Energy savings

Environmental
✓ Water quality and associated aquatic habitat improvements
✓ Carbon reduction
✓ Ecosystem benefits

WRF Free Webcast on 9/23/21 (3 to 4:30 PM Eastern Time) – Registration Link is Here
John Watson

John Watson is an Associate Civil Engineer at the Metropolitan Water Reclamation District of Greater Chicago, where he manages green infrastructure stormwater projects and helped to develop their green infrastructure plan to meet the EPA Consent Decrees. He earned his bachelor’s degree in Civil & Environmental Engineering from Valparaiso University and his master’s degree in Environmental Hydrology and Hydraulic Engineering from University of Illinois - Urbana Champaign, where he worked on modeling Chicago’s Deep Tunnel system (TARP). Today, John is a Professional Engineer, a Certified Floodplain Manager, and a committee member for the Water Environment Federation, working in the green stormwater infrastructure program at the MWRD of Greater Chicago.
Greening Chicagoland to Reduce Urban Flooding

"The Current" Webinar
9/15/2021
Agenda

- Summary of previous-year GI program partnerships
- 2021 GI Call for Projects
- Eligibility and Project Prioritization
- Project benefits (in lieu of ROI)
- Funding options
- Example GI projects
GI Project Partnership Opportunity Program

Visit www.mwrd.org
Applications Submitted
32

Projects Selected
16

Estimated Structures Benefitted
1,672

Estimated Total Construction Costs
$10.6M

Estimated Design Retention Capacity
1.6M gallons
Applications Submitted
35

Projects Selected
TBA!

Estimated Structures Benefitted
many

Estimated Total Construction Costs
~$3M

Estimated Design Retention Capacity
~0.4M gallons
1. Project located within District corporate limits (please see the link on the website for a map of these limits.)

2. Project designed to manage stormwater control measures using Green Infrastructure

3. Project must be bid in accordance with District’s Purchasing Act (public ad, bid, and award), labor and diversity requirements

4. Applicant must be willing and capable of contract admin. and maintenance long-term

5. District will consider whether potential partner agency is in compliance with WMO & IICP

6. Cannot use funding to satisfy any stormwater permitting requirements, including WMO requirements for detention or volume control.

More detail at mwrd.org/gi-app
• Applicant must be able to enter into an Intergovernmental Agreement with MWRD
  o Must be a public entity

• Components:
  o Diversity Requirements:
    ▪ 20% Minority Business Enterprises (MBE)
    ▪ 10% Women’s Business Enterprise (WBE)
    ▪ 10% Small Business Enterprise (SBE)
    ▪ 3% Veterans Business Enterprise (VBE)
  o Public Education Requirement
  o Agree to maintain and operate project long-term according to O&M Plan

• Please see website for more information on typical IGA requirements: www.mwrd.org/qi-app
GI Project Prioritization

- **Primary Selection Criteria**
  - $/gal used in determining MWRD funding
  - $/structure benefitted by project
  - Project timeframe: constructed within the next calendar year

- **Other factors**
  - Flooding frequency and severity
  - Combined sewer areas
  - Total cost of project
  - Median income of area
  - Maintenance resources and experience
  - Visibility/Educational opportunity
  - Past receipt of recent MWRD funding for similar projects
Funding Options

• Cost-shares
  o Local match, budgeted and planned ahead for as part of CIP
  o Stormwater utility (Urbana-Champaign, Rolling Meadows, Downers Grove, etc.)
  o Grants: IGIG, IEPA Section 9, HUD, Cook County Disaster Relief, USACE, NWFW, etc.
  o Partnerships like with MWRD, County, State
Blue Island Rain Garden
Riverside Permeable Parking Lot and Bioretention
Evanston Bioswale & Permeable Parking Lot
Virgil Grissom Elementary School

Before

Virgil Grissom Elementary School After
Bioretention Facility Detail

**Vegetated Filter Strip/Other BMPs (See Note 10)**

**Geotextile Fabric, Not to Cover Entire Bottom of Excavation (Or Choking Stone Per Engineer Approval)**

**Seasonally High Groundwater Level (___ NAVD 88)**

**Bottom of the Facility:** ELEV. ____

**Seasonally High Groundwater:** ELEV. ____

**Separation:** FEET ____

### Volume Type

<table>
<thead>
<tr>
<th>Volume Type</th>
<th>Surface Area</th>
<th>Depth</th>
<th>Porosity</th>
<th>Storage Volume</th>
<th>Volume Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA: Surface Storage</td>
<td></td>
<td>1.00</td>
<td></td>
<td>1.00 X VA</td>
<td></td>
</tr>
<tr>
<td>VB: Soil Media Mix</td>
<td></td>
<td></td>
<td>0.25</td>
<td>0.50 X 0.25 X VB</td>
<td></td>
</tr>
<tr>
<td>VC: Coarse Aggregate (Above Invert)</td>
<td></td>
<td></td>
<td>0.36</td>
<td>0.50 X 0.36 X VC</td>
<td></td>
</tr>
<tr>
<td>VD: Coarse Aggregate (Below Invert)</td>
<td></td>
<td></td>
<td>0.36</td>
<td>0.36 X VD</td>
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<tr>
<td>Section</td>
<td>Upstream Drainage Area</td>
<td>Reference (Sheet #, report, etc.)</td>
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<tr>
<td>0</td>
<td>Design soil infiltration rate of surrounding soil</td>
<td>i</td>
<td></td>
<td></td>
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<tr>
<td>1</td>
<td>Elevation of bottom of BMP for infiltration surface (if no adjacent stormwater BMP)</td>
<td>ELEVinter</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>Stormwater detention elevation</td>
<td>Elevest</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3</td>
<td>Depths of separation groundwater level (must be at least 0.5 feet or greater if draining to combined sewer)</td>
<td>Dwar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Dimensions of the bioretention facility (length, width, area)</td>
<td>L, W, A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Depth of prepared soil</td>
<td>Dw</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Depth of aggregate</td>
<td>Dagg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Surcharge storage volume (prior to supporting calculations, mass depth E inches)</td>
<td>Vsur</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Total media void volume ( A_{void} ) ( A_{void} ) ( 16 )</td>
<td>Vvoid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Depth of Prepared Soil</td>
<td>Dw</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Soil Volume Below Drain ( (A_{void}+D_{w})/E )</td>
<td>Vb</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Aggregate Void Volume Below Drain ( A_{void}/E )</td>
<td>Vagg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Infiltrated volume (Vint) ( (A_{void}+D_{w})/E )</td>
<td>Vint</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>SOD of Volume Above Drain ( 0.9 ) ( Vb )</td>
<td>Vabove</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Total Retained and Infiltration Volume ( V_{total} )</td>
<td>Vtotal</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**KEY**  
- *user input*  
- For questions or a digital copy, please contact MVIP Engineer: John Vasquez, John.Vasquez@mvip.com  
- Please reference all user input data on the Reference Column  
- Note: Infiltration rate is conservatively estimated at 0.10 in/hr. Tests or soil classifications are not yet available.
Question and Answer Session

We will draw initial questions and comments from those submitted via the Q&A panel during the presentations.

Today’s Speakers

Paula Conolly – paula@giexchange.org
Harry Zhang – hzhang@waterrf.org
John Watson – watsonj@mwrd.org
Thank you for participating in today’s *The Current*!

Visit our website, [northcentralwater.org](http://northcentralwater.org), to access the recording and our webinar archive!

**Join the Green Infrastructure Community of Practice** – an Extension-Sea Grant collaboration working to support outreach professionals advancing community stormwater management and green infrastructure practices.

More information at [https://northcentralwater.org/green-infrastructure/](https://northcentralwater.org/green-infrastructure/)