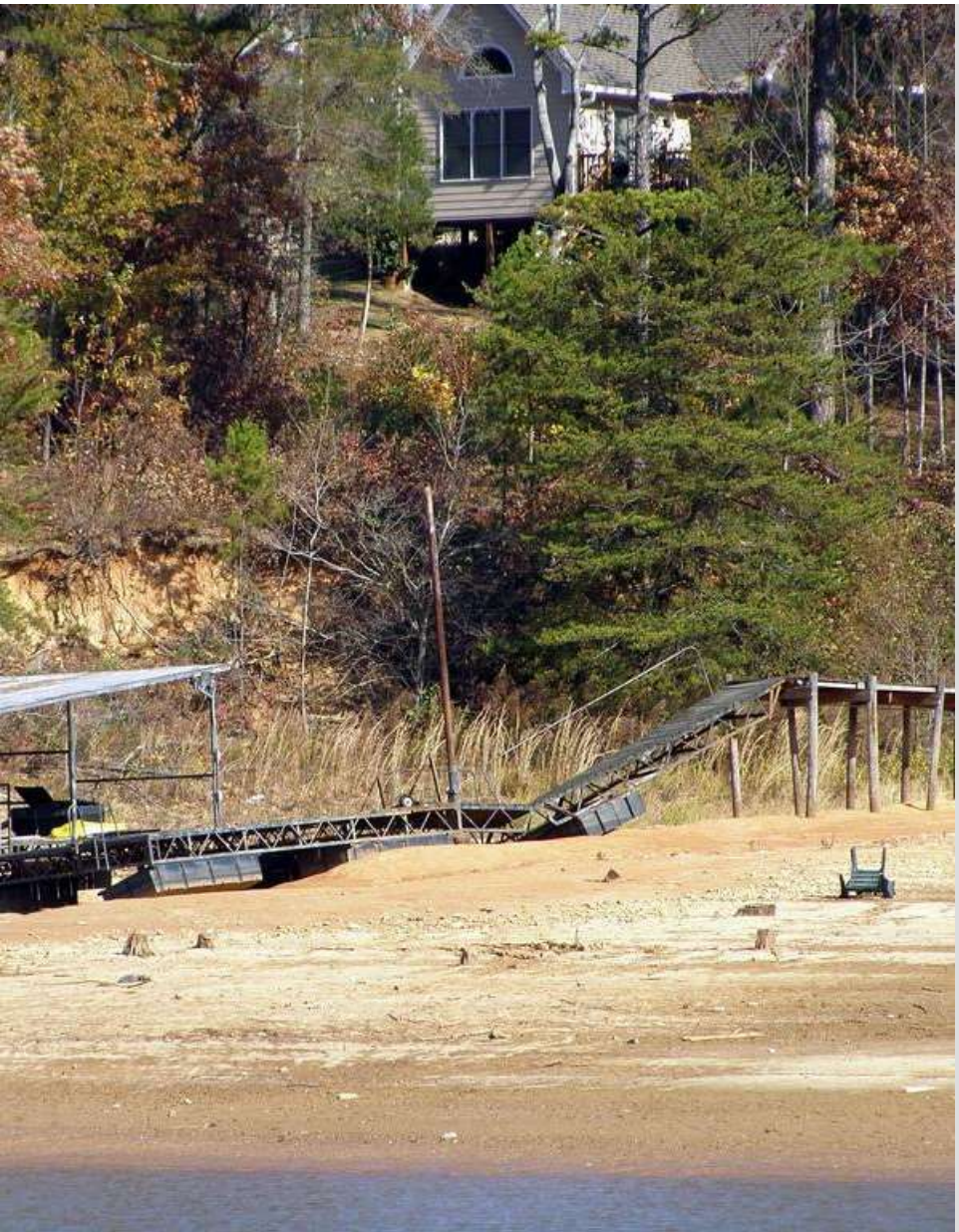
Planning for Resilient Cities: Climate Adaptation and Surface Water Plans

Workshop for
Dakota County Communities
Tuesday June 27, 2017

Co-Presented by
Brett H. Emmons, PE, ENV SP & Camilla Correll, PE
of Emmons & Olivier Resources, Inc. (EOR)

Presentation Outline



- Impacts of a Changing Climate
- Resilient communities
- Sustainable Water Supply
- Incorporating in Comprehensive Plans
- Local Resources:
  - *Local Planning Handbook*
  - *MN Stormwater Manual*
  - *MPCA Stormwater Reuse*

Impacts of a Changing Climate

Changes in Precipitation

Health Impacts

Drought

Invasive Species

Impacts of a Changing Climate: Stormwater Runoff

POLLUTION:

Increased stormwater runoff carries a greater volume of pollutants to our rivers and lakes which contributes to closed lakes and habitat degradation."

EROSION:

Increased stormwater runoff can accelerate streambank erosion and road washouts.

FLOODING:

Excessive stormwater runoff can lead to the flooding of infrastructure.

Comprehensive Plans: Resilient Communities

- Infrastructure
  - Stormsewer
  - Water Supply
  - Transportation
- Community
  - Parks and Recreation
  - Community Development
- Environment
  - Surface Water Management
  - Natural Resources Management

Comprehensive Plans: Resilient Communities

What brings people to your community (social)

- Livability/desirable place
- Foresighted (staying ahead of vulnerabilities)

Economic (save $ by tackling issues now vs. waiting to fix problems)

- Flooding/Stormsewer upgrade costs
  - *damage to lands*
  - *open space impacts*
- Walkable Communities, Transit

Environmental

- Human Health (air, water supply, walkability)
- Better lakes
- Less GHGs
- Better parks/trails
- Inviting/Livable Streets

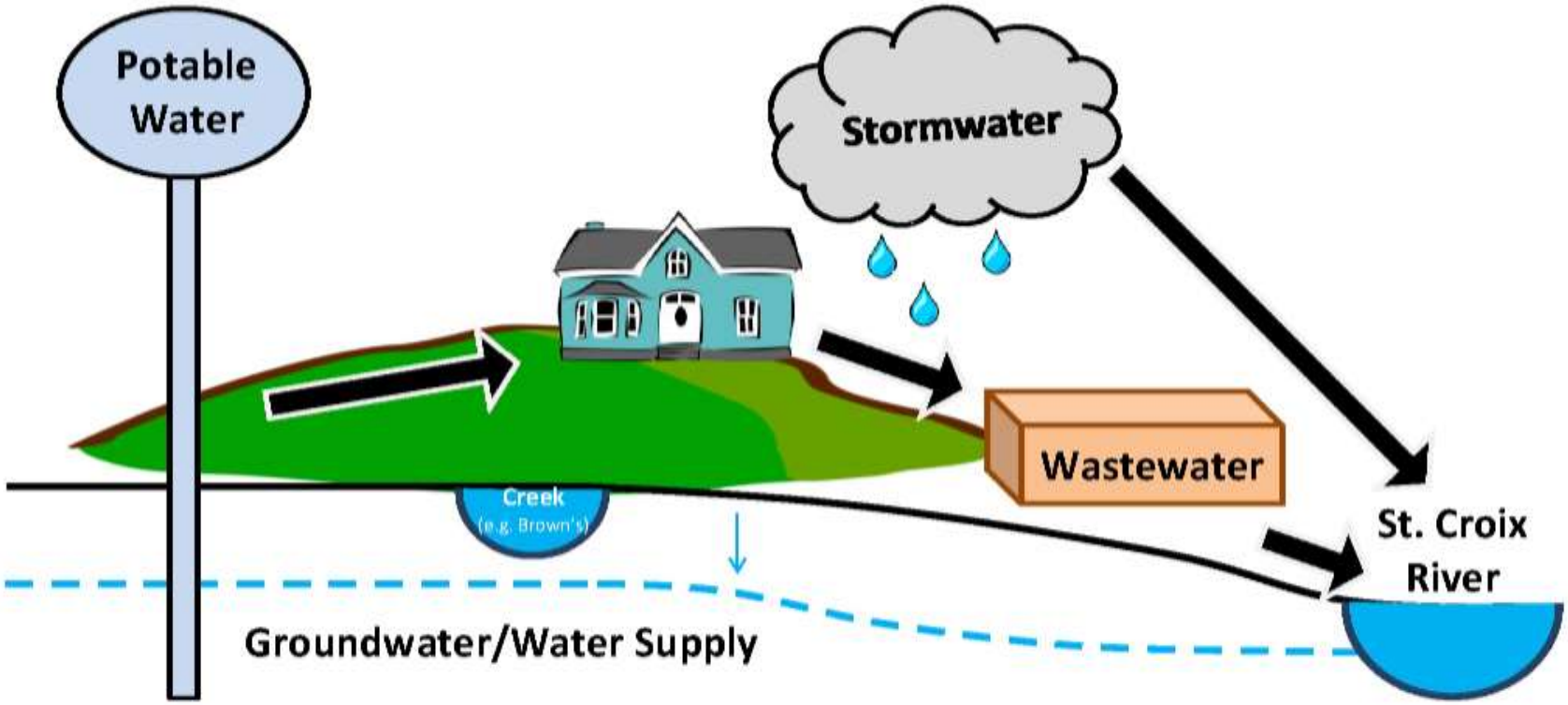
Comprehensive Plans: Resilient Communities

Goal Setting

Net Zero Water (NZW)

- Sustainable balance between water availability and demand.
- Involves:
  - limiting consumption
  - returning clean, treated water and surplus water to the watershed.
- Concept aims to change the way water resources are managed: focus on making water resource planning decisions based on local conditions rather than demand.

Sustainable Water Supply:
Past Approach to Water Management

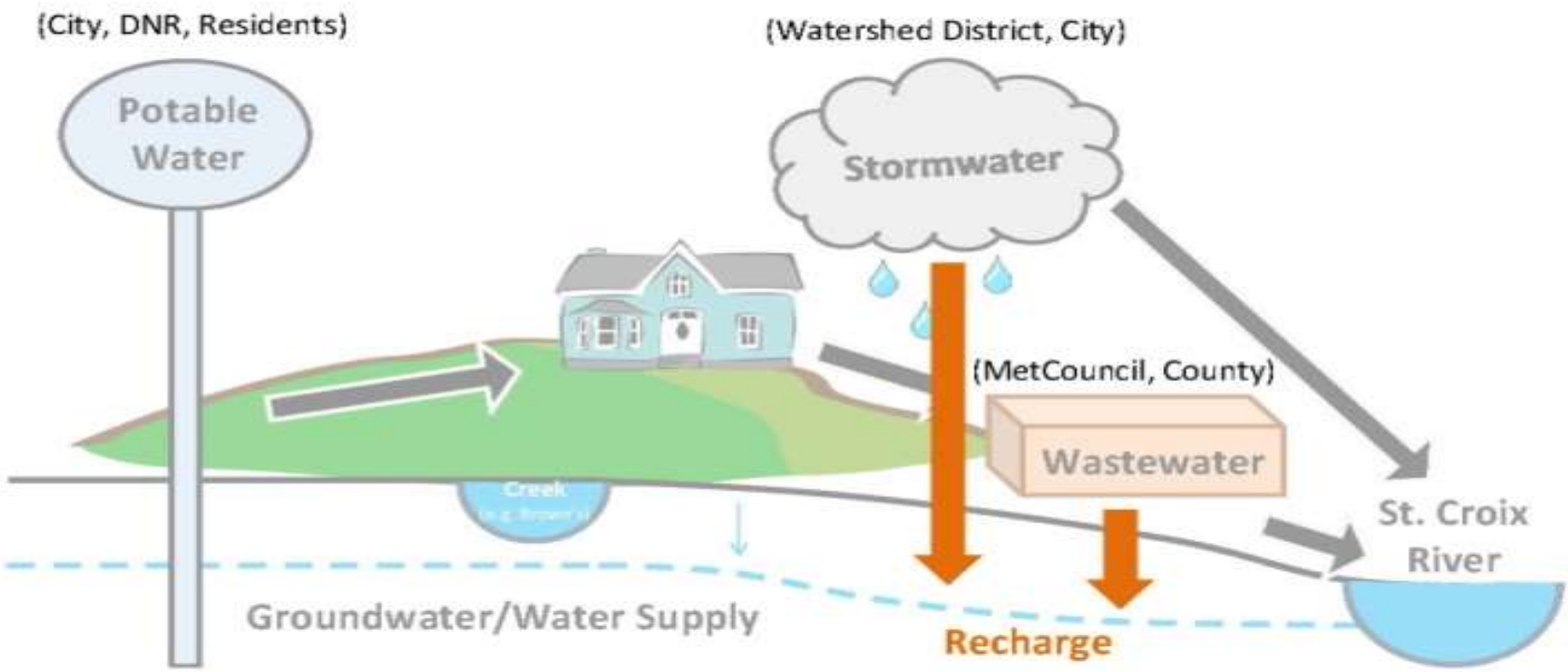


Declining GW due to:
- GW Pumping
- Climate Change
- Reduced Recharge

Image courtesy of Emmons & Olivier Resources, Inc.

Sustainable Water Supply:
Past Approach to Water Management

Sustainable Water Supply: Progress Toward Integrated Water Mgmt



Sustainable Water Supply: Progress Toward Integrated Water Mgmt

EOR water ecology community

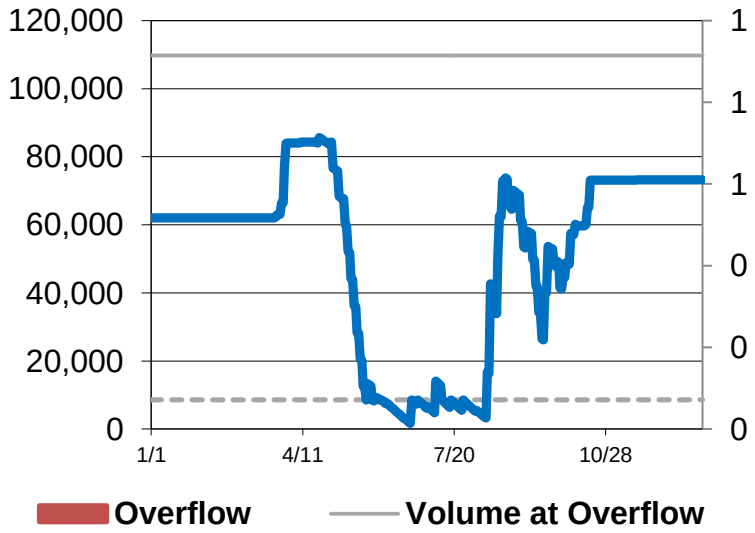
Median Raingardens

Curb Cut Raingardens

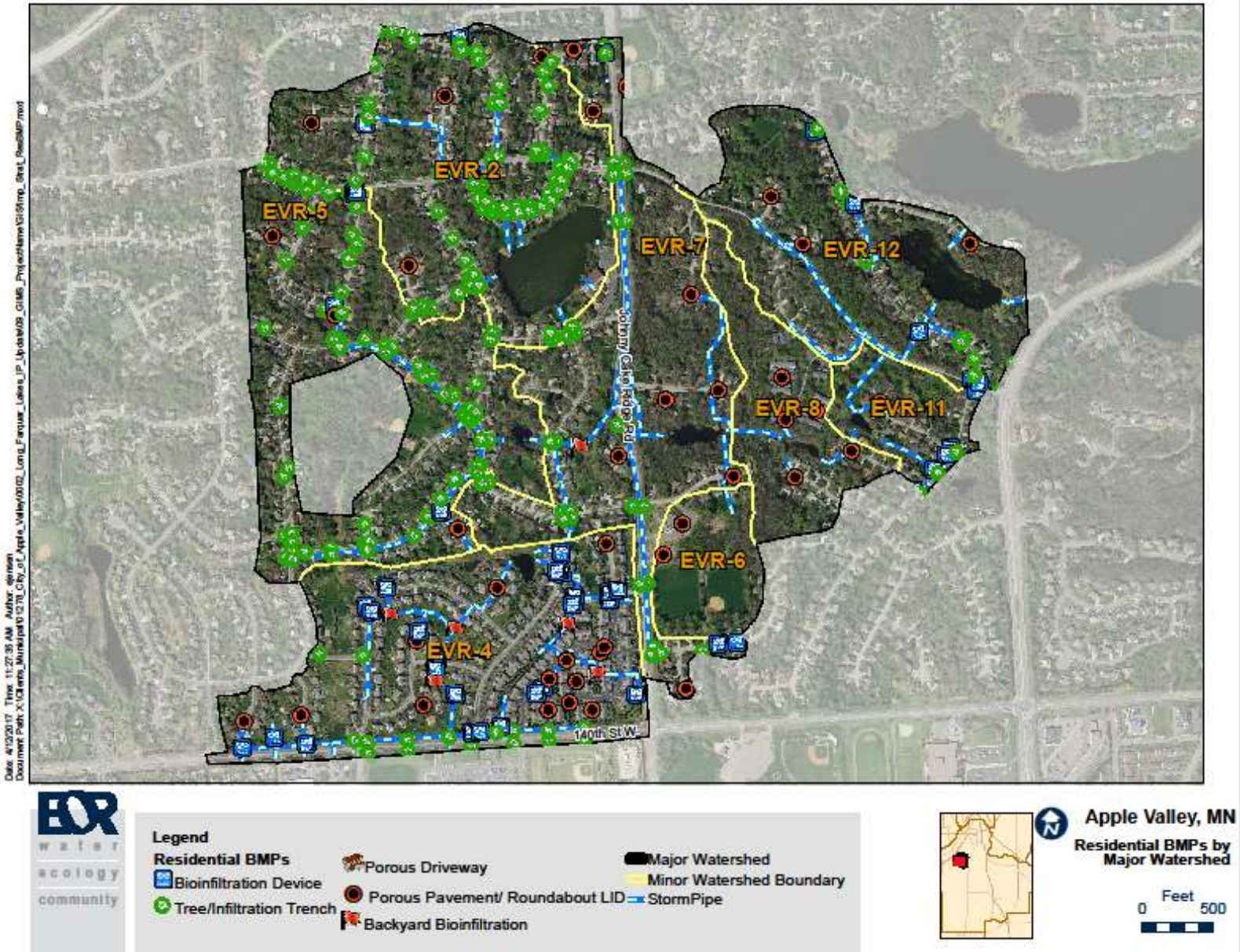
Permeable Asphalt

Sustainable Water Supply: Progress Toward Integrated Water Mgmt

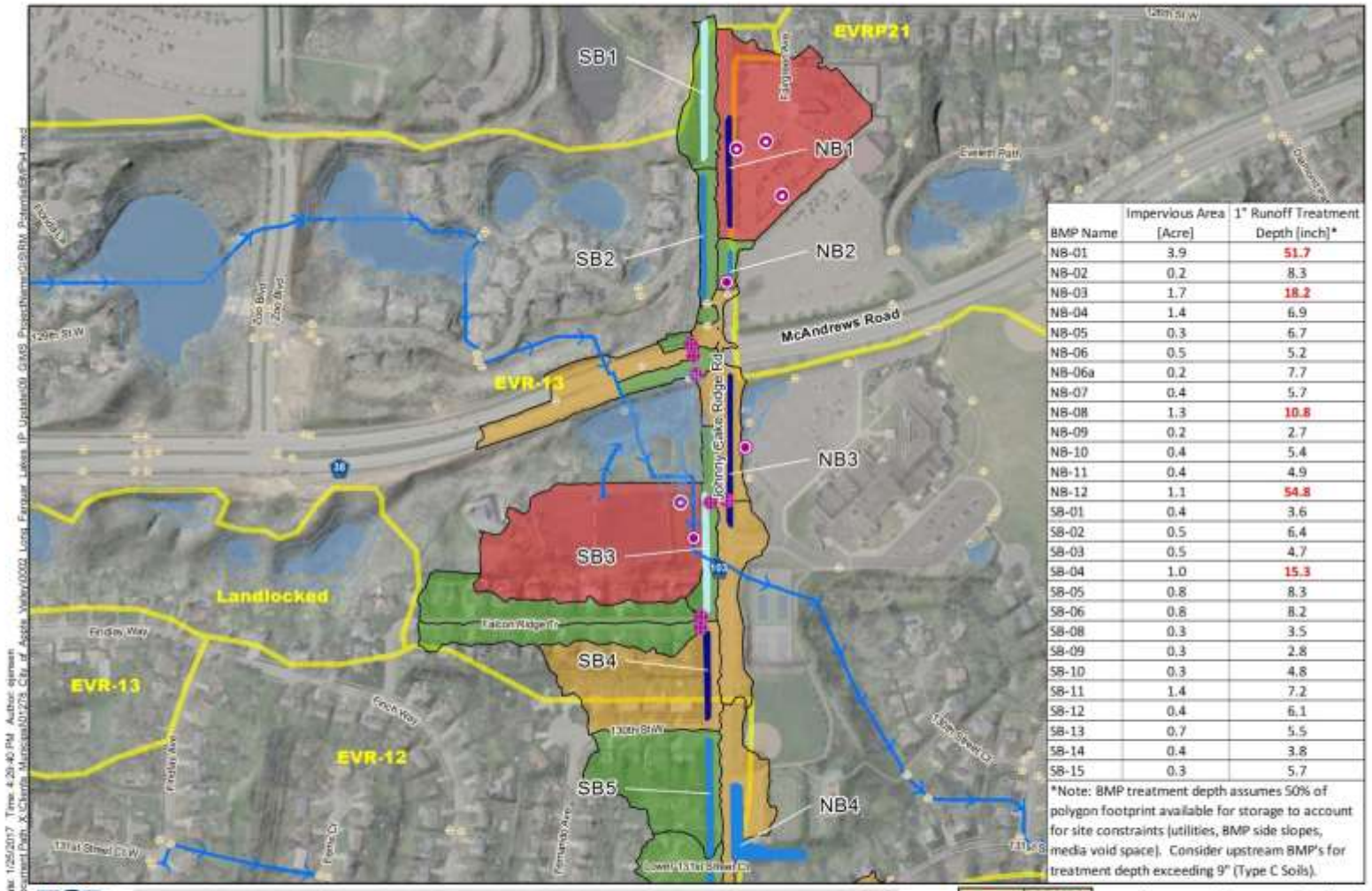
EOR water ecology community



Sustainable Water Supply: Apple Valley Lake Protection



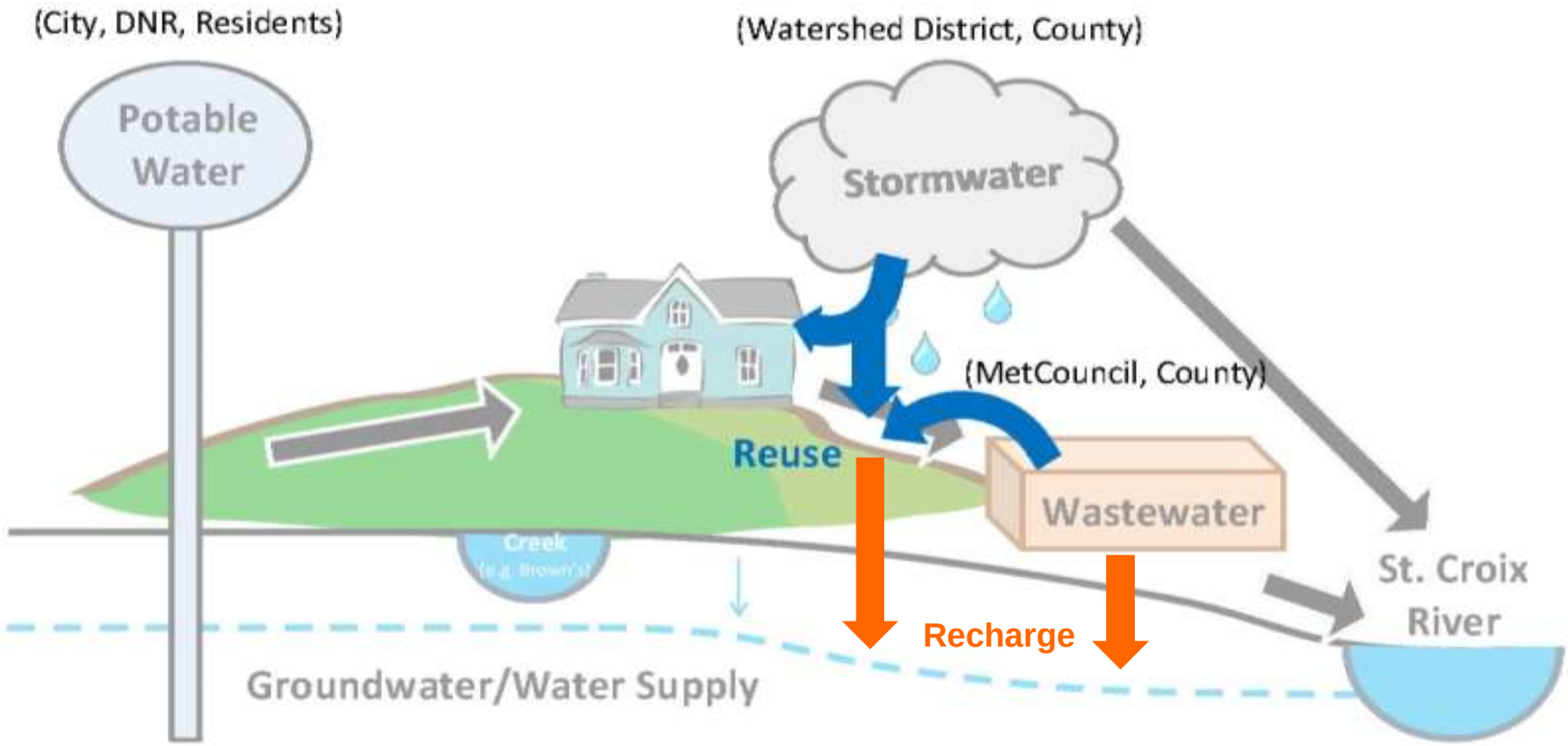
Sustainable Water Supply: Apple Valley Lake Protection (Roads)



BMP Name	Impervious Area [Acre]	1" Runoff Treatment Depth [inch]*
NB-01	3.9	51.7
NB-02	0.2	8.3
NB-03	1.7	18.2
NB-04	1.4	6.9
NB-05	0.3	6.7
NB-06	0.5	5.2
NB-06a	0.2	7.7
NB-07	0.4	5.7
NB-08	1.3	10.8
NB-09	0.2	2.7
NB-10	0.4	5.4
NB-11	0.4	4.9
NB-12	1.1	54.8
SB-01	0.4	3.6
SB-02	0.5	6.4
SB-03	0.5	4.7
SB-04	1.0	15.3
SB-05	0.8	8.3
SB-06	0.8	8.2
SB-08	0.3	3.5
SB-09	0.3	2.8
SB-10	0.3	4.8
SB-11	1.4	7.2
SB-12	0.4	6.1
SB-13	0.7	5.5
SB-14	0.4	3.8
SB-15	0.3	5.7

*Note: BMP treatment depth assumes 50% of polygon footprint available for storage to account for site constraints (utilities, BMP side slopes, media void space). Consider upstream BMP's for treatment depth exceeding 9" (Type C Soils).

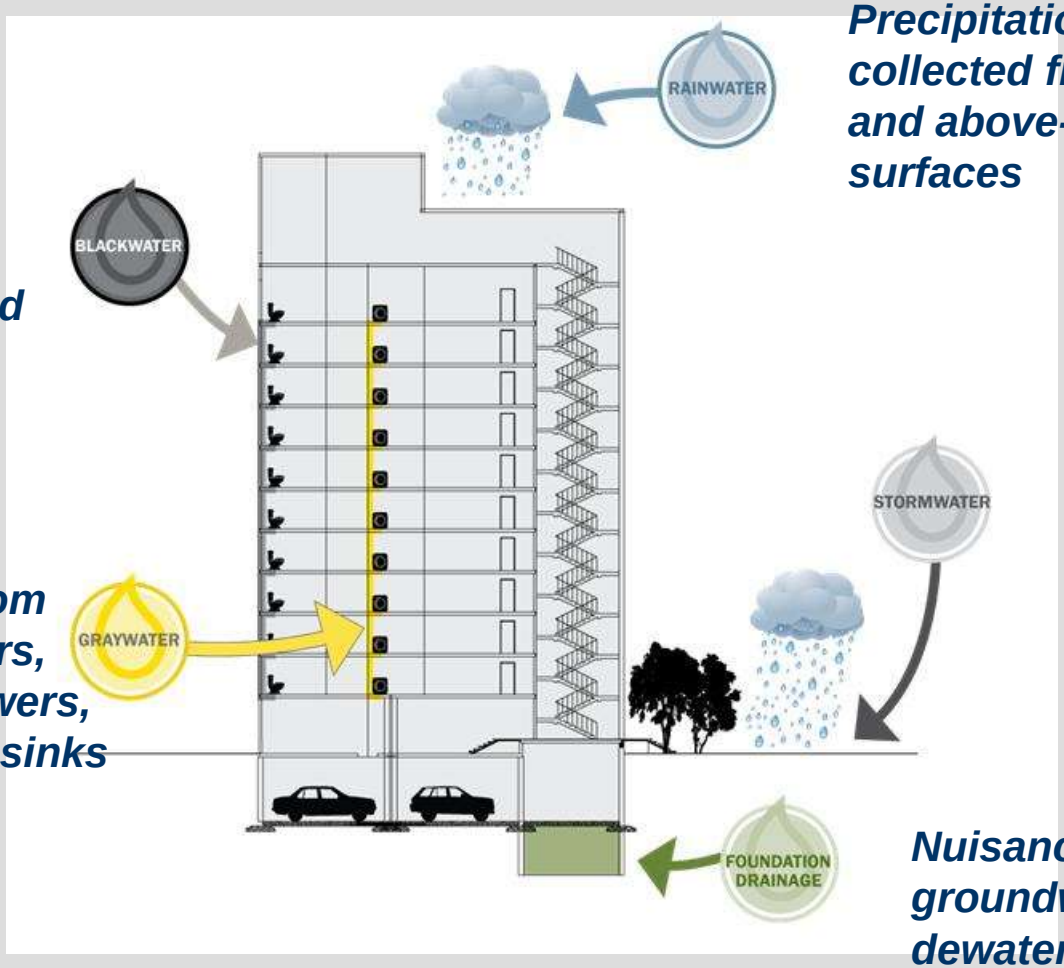
Sustainable Water Supply: Future Approach to Water Management



Types of Alternate Water Sources for Non-potable Applications

Wastewater from toilets, dishwashers, kitchen sinks, and utility sinks

Wastewater from clothes washers, bathtubs, showers, and bathroom sinks



Precipitation collected from roofs and above-grade surfaces

Precipitation collected at or below grade

Nuisance groundwater from dewatering operations

Provided by SFPUC

San Francisco's Non-Potable Examples

Whole Foods Mixed-use Development — 38 Dolores Street

38 Dolores Street (image courtesy of BAR Architects)

Project Status: Online

SFDPH Permit Issued: N/A (a rainwater harvesting project for non-spray irrigation does not need a permit)

Size: 195,000 square feet

Alternate Water Sources:
- Rainwater

End Uses:
- Subsurface irrigation
- Drip irrigation

Volume: 26,000 gallons/year

Potable Water Use Reduction: 26% for irrigation; 1.3% total project reduction

Driver(s): LEED Points, Sustainable SITES Pilot Project Certification, and mandate (San Francisco Stormwater Management Ordinance)

System Cost: Not available

Annual O&M Cost: Negligible

Owner: The Prado Group (Market Dolores LLC)

Project Description:

In fall 2013, the Prado Group (Market Dolores LLC) completed construction on a new 195,000 square-foot mixed-use development containing 81 residential rental units and a 30,000 square-foot Whole Foods grocery store on the ground level. Targeted for LEED Gold, the development – located between Market Street, Dolores Street, and 14th Street – contains a 16,200 gallon cistern that collects rainwater from all rooftop surfaces (traditional roofs, green roof, and flow-through planters). The harvested rainwater is used to irrigate all landscaping within the development via subsurface and drip irrigation systems. The cistern is sized to hold the required average annual detention volume associated with the San Francisco Stormwater Management Ordinance design storm event, while also taking into consideration the project's monthly irrigation demand. The project will offset an estimated 26,000 gallons of potable water annually.

The project does not have a permit from the San Francisco Department of Public Health because rainwater systems that, at a minimum, include both a first flush diverter and a 100 micron filter, and are used for subsurface irrigation, drip irrigation, or non-spray surface irrigation, do not need one.

Drivers for Non-potable Water Reuse:

The project team installed the rainwater harvesting system to meet the requirements of the San Francisco Stormwater Management Ordinance. The Stormwater Management Ordinance requires projects disturbing 5,000 square feet or more of the ground surface to decrease the project's post-construction stormwater runoff rate and volume by 25% for the 2-year 24-hour design storm. Installing a rainwater harvesting system with a 16,200 gallon cistern enabled the project to meet these requirements.

The project also installed the rainwater harvesting system to obtain LEED points to help the project achieve LEED Gold Certification. Additionally, the project was designed and certified as a Sustainable SITES Pilot Project, which also was a driver for installing the system. Sustainable SITES certification is given to projects that use sustainable practices that enable built landscapes to support natural ecological functions by protecting existing ecosystems and regenerating ecological capacity where it has been lost.

Ownership Model:

The rainwater harvesting system is owned, operated, and maintained by the Prado Group (Market Dolores LLC), which owns the development and leases the commercial spaces and residential units to tenants.

Project Cost:

The total hard cost for the project was $48 million. The contractor did not break out the cost of the rainwater harvesting system as a discrete item.

Annual Operations & Maintenance Cost:

The cost to operate and maintain the rainwater harvesting system is negligible.

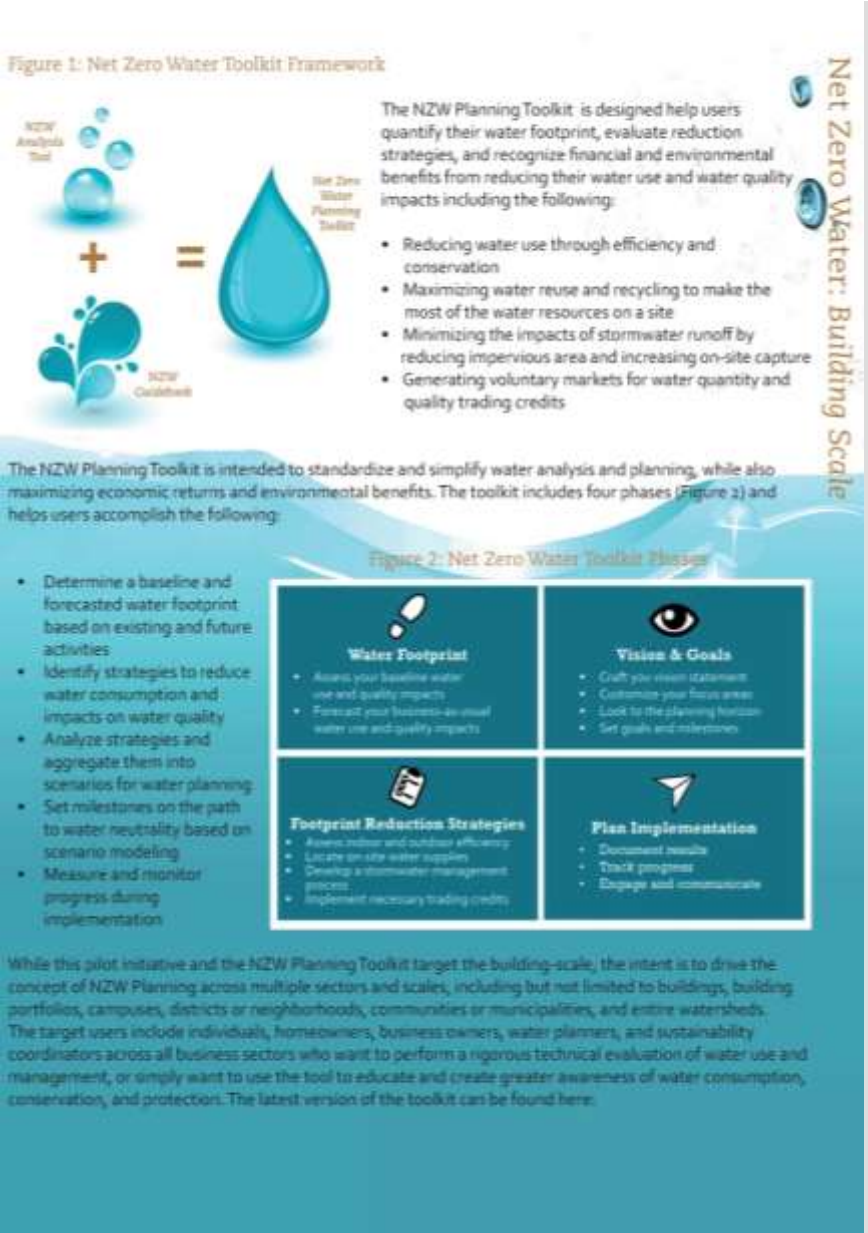
Service Costs to Residents or Tenants:

There are no service costs to the commercial or residential tenants for use of the rainwater.

Reference: Jon Yolles, The Prado Group (jyolles@pradogroup.com); Eric Girod, BKF Engineers (egirod@bkf.com)

38 Dolores Street (image courtesy of BAR Architects)

Sustainable Water Supply: Future Approach to Water Management



Zero Water Examples

City of Seattle

- Regulatory Pathways to Net Zero Water

City of Port Phillip

- Water Plan: Toward a Water Sensitive City

Cascadia Green Building Council

- Toward Net Zero

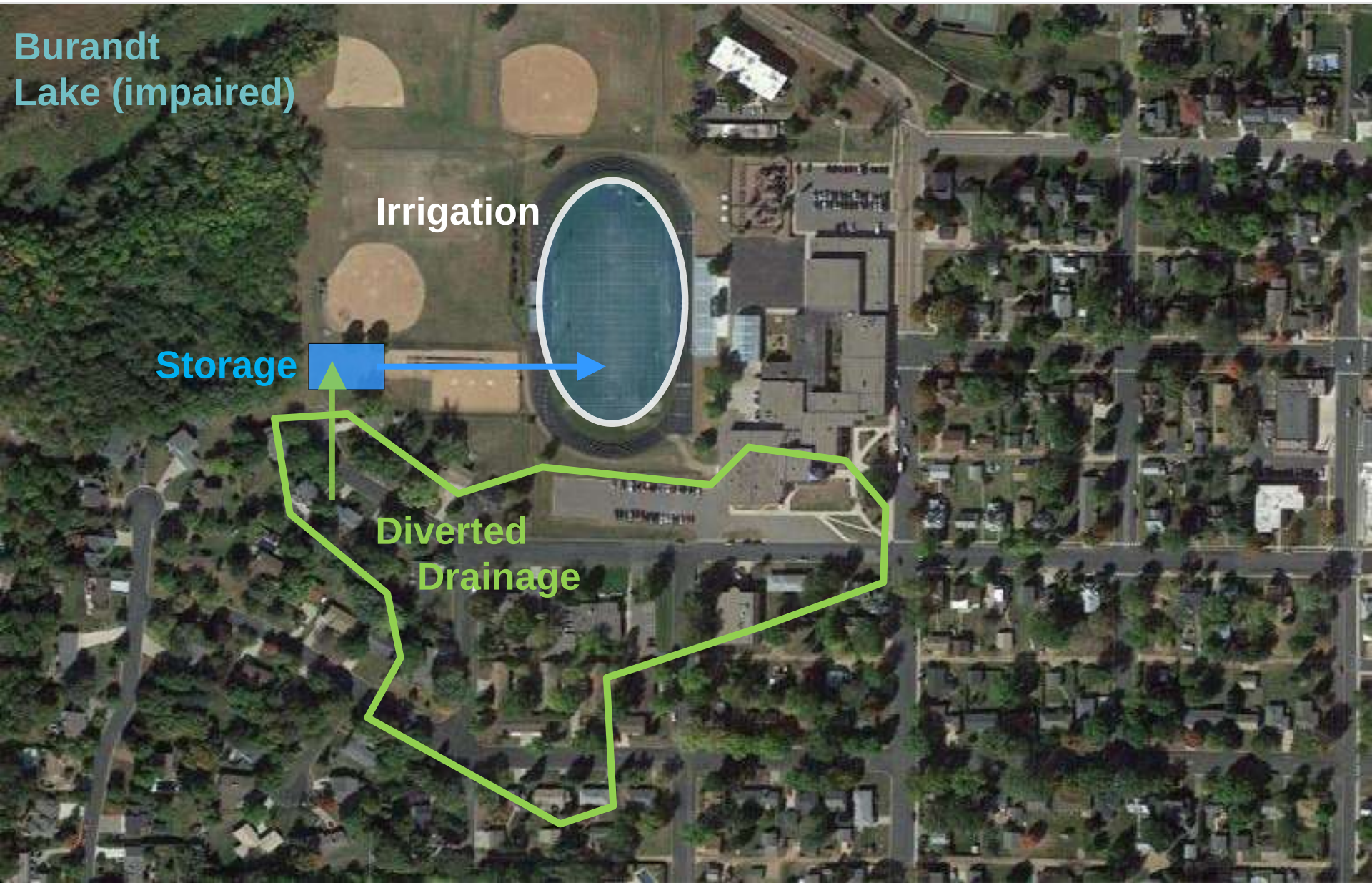
Brendle Group

- Net Zero Water Toolkit (shown here)

Sustainable Water Supply: Future Approach to Water Management

- **Reuse Tool for Reuse interest**
- **Integrated water management –** ***"waste products" become a source in a regenerative, circular system***
- **Cities could consider water budgets as a community and look for conservation, efficiencies and reuse opportunities**
- **New trends include stormwater harvesting for reuse –** ***reduces flooding; reduces water quality impacts to lakes, streams and wetlands; preserves groundwater supplies***

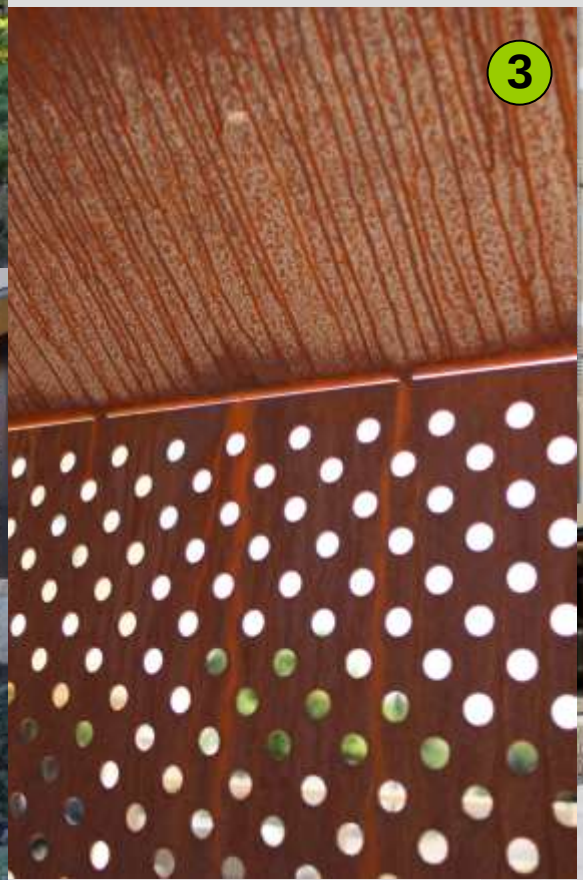
The Reuse Calculator:
Bayview School, Waconia, MN:



The Reuse Calculator:
Bayview School, Waconia, MN:

The Rose – Stacked Function

1. Community Garden with stormwater reuse system for irrigation
2. Native landscaping with stormwater storage
3. Interpretive Water Wall



Sustainable Water Supply: Create Multi-Functional Landscapes

Concept:

1. Integrate practices into the landscape
2. Think micromanagement
3. Stack functions
4. Recharge and Use the water instead of “waste”

Incorporating in Comprehensive Plans: Example Actions

Infrastructure:

- **Identifying potential areas of flooding**
- **Increasing capacity of stormwater systems (atlas 14)**
- **Stormwater reuse**
- **Green infrastructure/ MIDS**

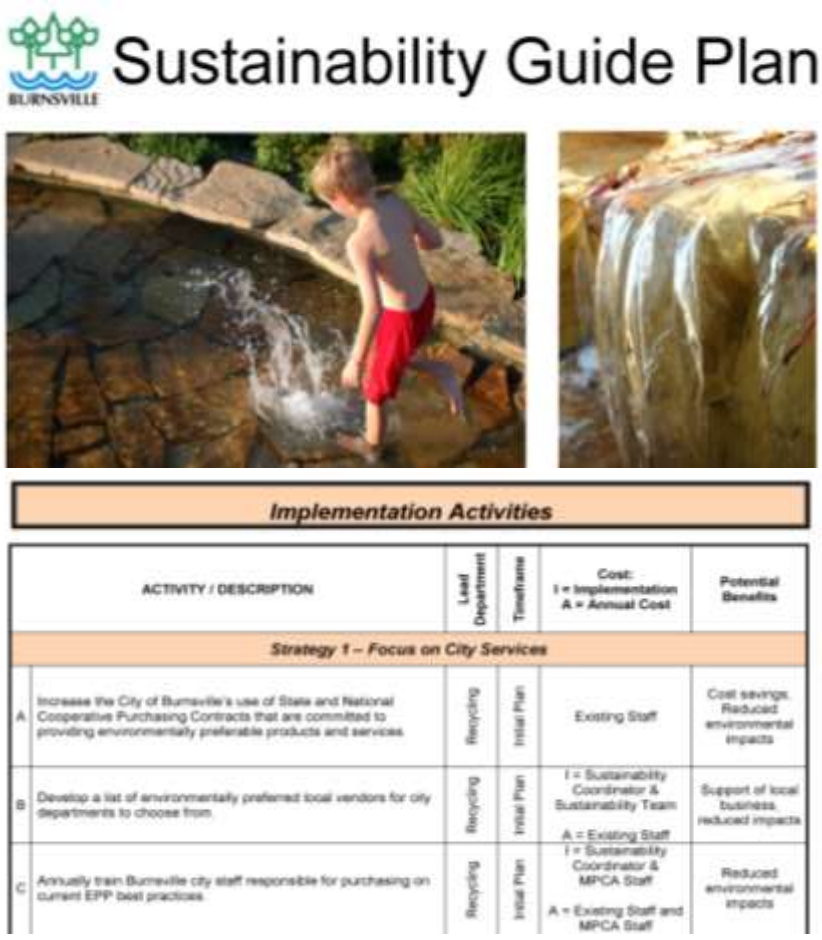
Community

- **Identifying vulnerable populations**

Environment

- **Stream bank stabilization**
- **Urban forestry policies**

Sustainability Plan



For every chapter in the Burnsville Plan, the following sub-chapters were featured:

- ✓ *Strategies*
- ✓ *Implementation Activities*
- ✓ *Possible Partners & Funding Sources*
- ✓ *Performance Indicators*

Burnsville's 2008 Sustainability Guide Plan Update

Table of Contents
Introduction
Chapters

- Environmentally Preferable Purchasing
- Product Stewardship
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- Sustainable Land Use
- Possible Partners & Funding Sources
- Performance Indicators
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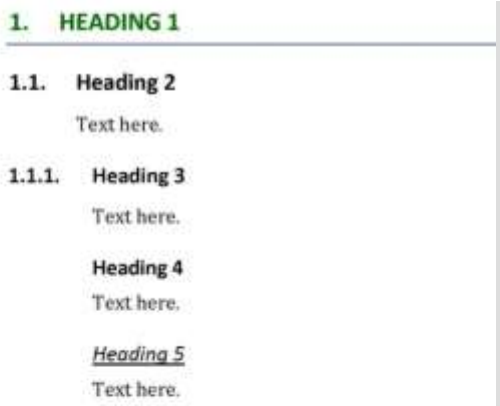
- Energy Efficiency
- Sustainable Building Practices
- Community Health
- Recycling and Waste Reduction
- Healthy Urban Forests
- Sustainability Education
- Surface & Groundwater Resources
- Innovative Opportunities

Chapter Highlights/Icons



Sidebars Used to Highlight Main Plan/Chapter Features

- **Key Goals: related sustainability drivers**
  - ✓ Green = active drivers
  - ✓ Grey = inactive drivers
- **Actions/Strategies**
  - ✓ Numbered Actions
  - ✓ Numbered Strategies
- **Measuring Success**
  - ✓ Quantifiable Matrices
  - ✓ Tracking Progress

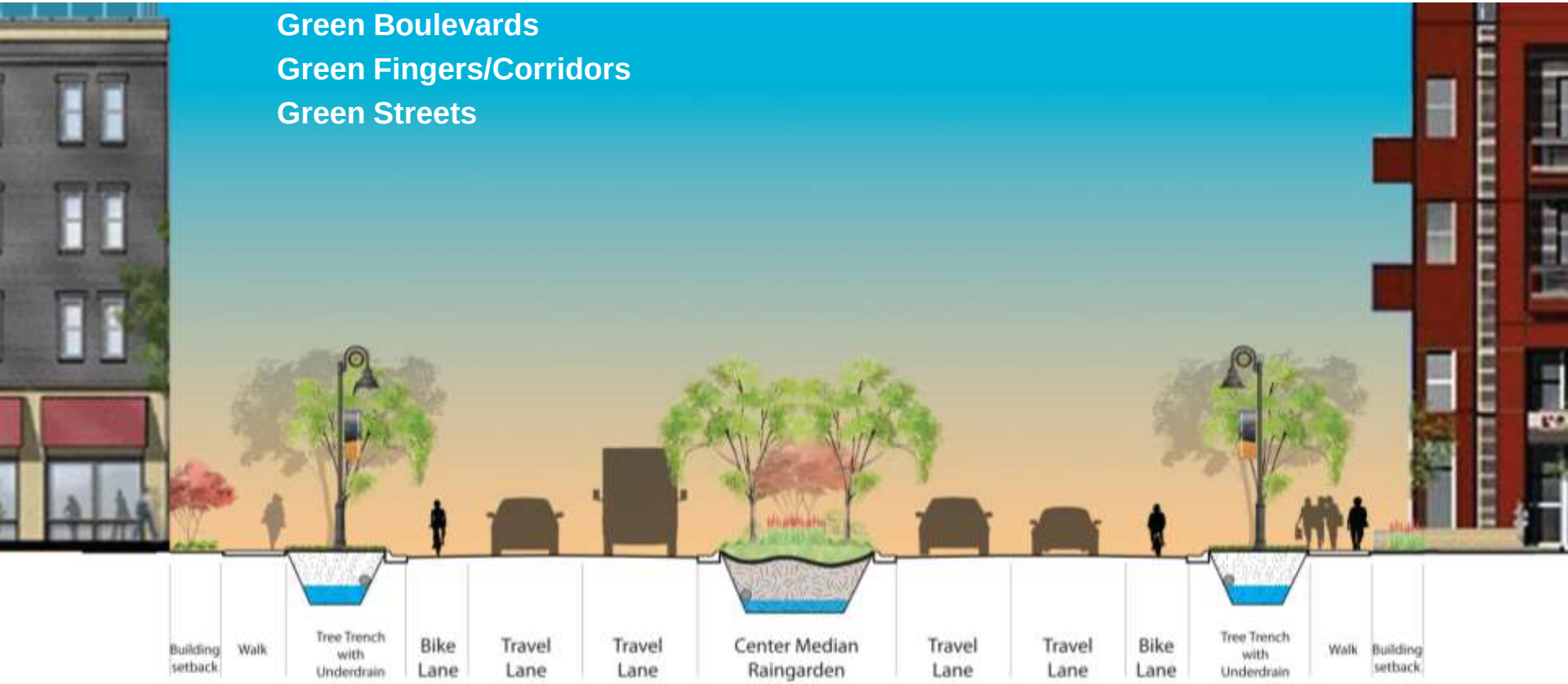
Example: West Side Flats – Green Boulevards

Figure 5.10. Green Boulevards

Example: West Side Flats – Urban Redevelopment Zone

Green Infrastructure Approach

- Green Boulevards
- Green Fingers/Corridors
- Green Streets



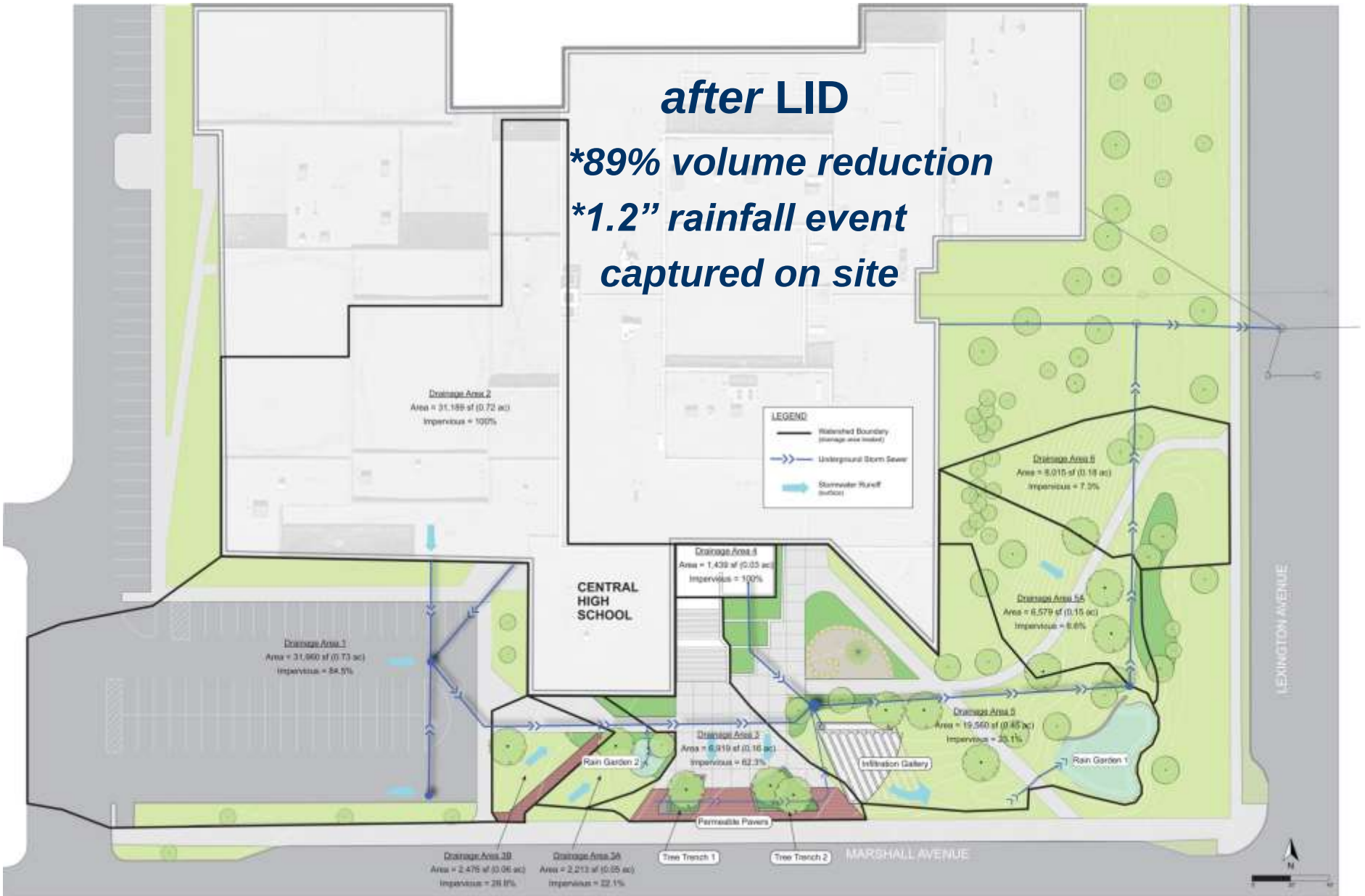
Examples: Central High School

Transforming Central High School

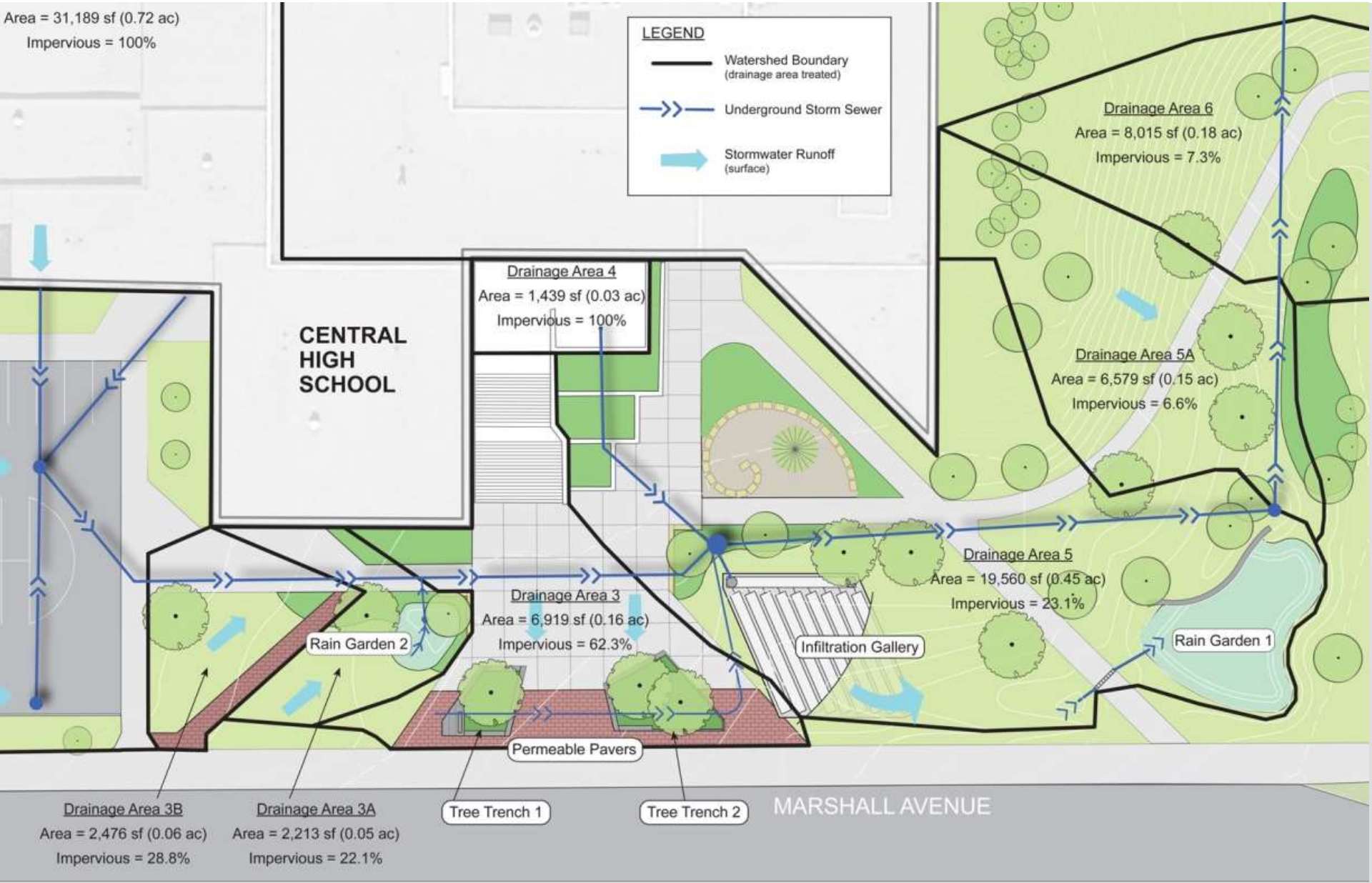
Example: Central High School

Example: Central High School

Central High School



Central High School



Central High School: *After*

LID Tools Utilized:

1. Infiltration Tanks
2. Planter Boxes (with seating)
3. Bioretention/ Rain Gardens
4. Permeable Pavers

Examples: CRWD Siteworks

Site Improvements

Resources: ISI's Envision Rating System

The following maximum improvements to achievement levels[2] have the highest priority:

- *QL1.1 Improve Community Quality of Life*
- *LD3.3 Extend Useful Life*
- *RA3.1 Protect Fresh Water Availability*
- *NW2.1 Manage Stormwater*
- *NW3.4 Maintain Wetland and Surface Water Functions*

The following maximum improvements have the next highest priority:

- *QL2.4 Improve Community Mobility and Access*
- *QL2.5 Encourage Alternative Modes of Transportation*
- *LD1.1 Provide Effective Leadership and Commitment*
- *LD1.2 Establish a Sustainability Management System*
- *LD3.2 Address Conflicting Regulations and Policies*
- *NW1.1 Preserve Prime Habitat*
- *NW1.2 Protect Wetlands and Surface Water*
- *NW2.2 Reduce Pesticide and Fertilizer Impacts*
- *CR2.1 Assess Climate Threat*
- *CR2.2 Avoid Traps and Vulnerabilities*
- *CR2.3 Prepare for Long-term Adaptability*
- *CR2.4 Prepare for Short-term Hazards*

As noted above, goals for high priority improvements were defined as the maximum possible level of achievement. The interrelationships between Envision credits may result in overlapping

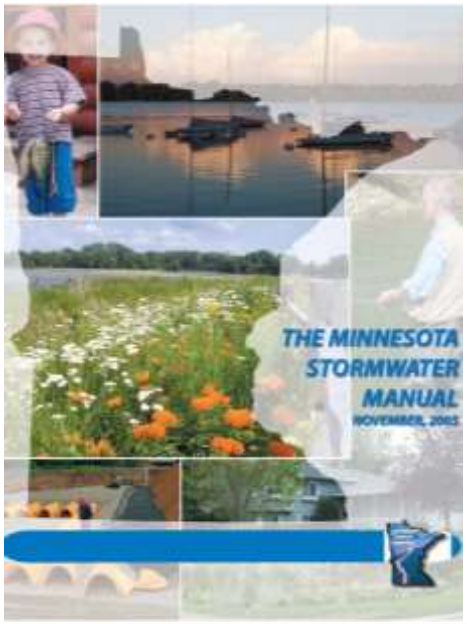
[2] Achievement Levels:

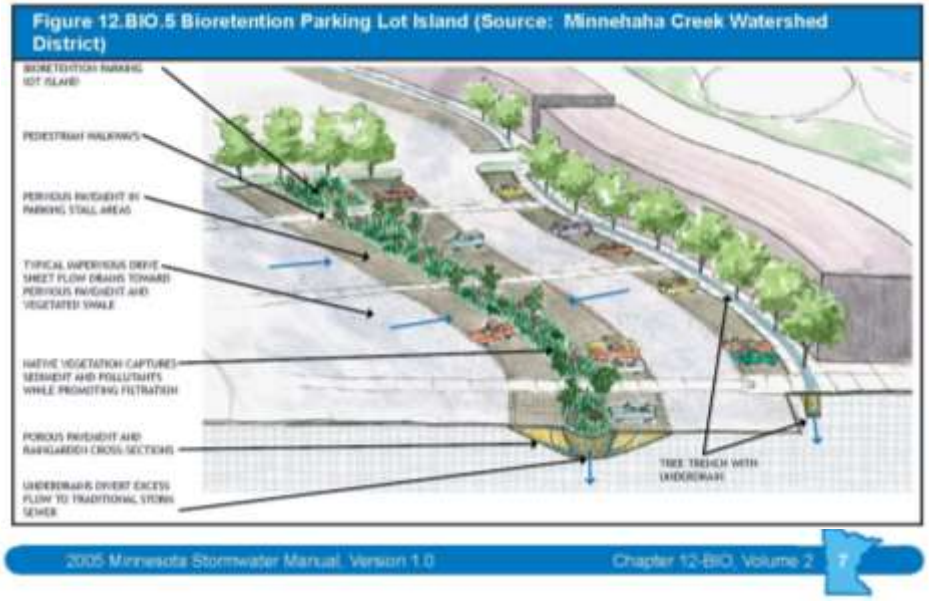
ISI's Envision – rating system and tool for City Infrastructure

ISI is Partnership of:

- **ASCE**
  - **Amer. Society of Civil Engineers**
- **APWA**
  - **Amer. Public Works Assoc.**
- **ACEC**
  - **Amer. Council of Engineering Co.s**
- **Harvard**

Local Resources





Metropolitan Council

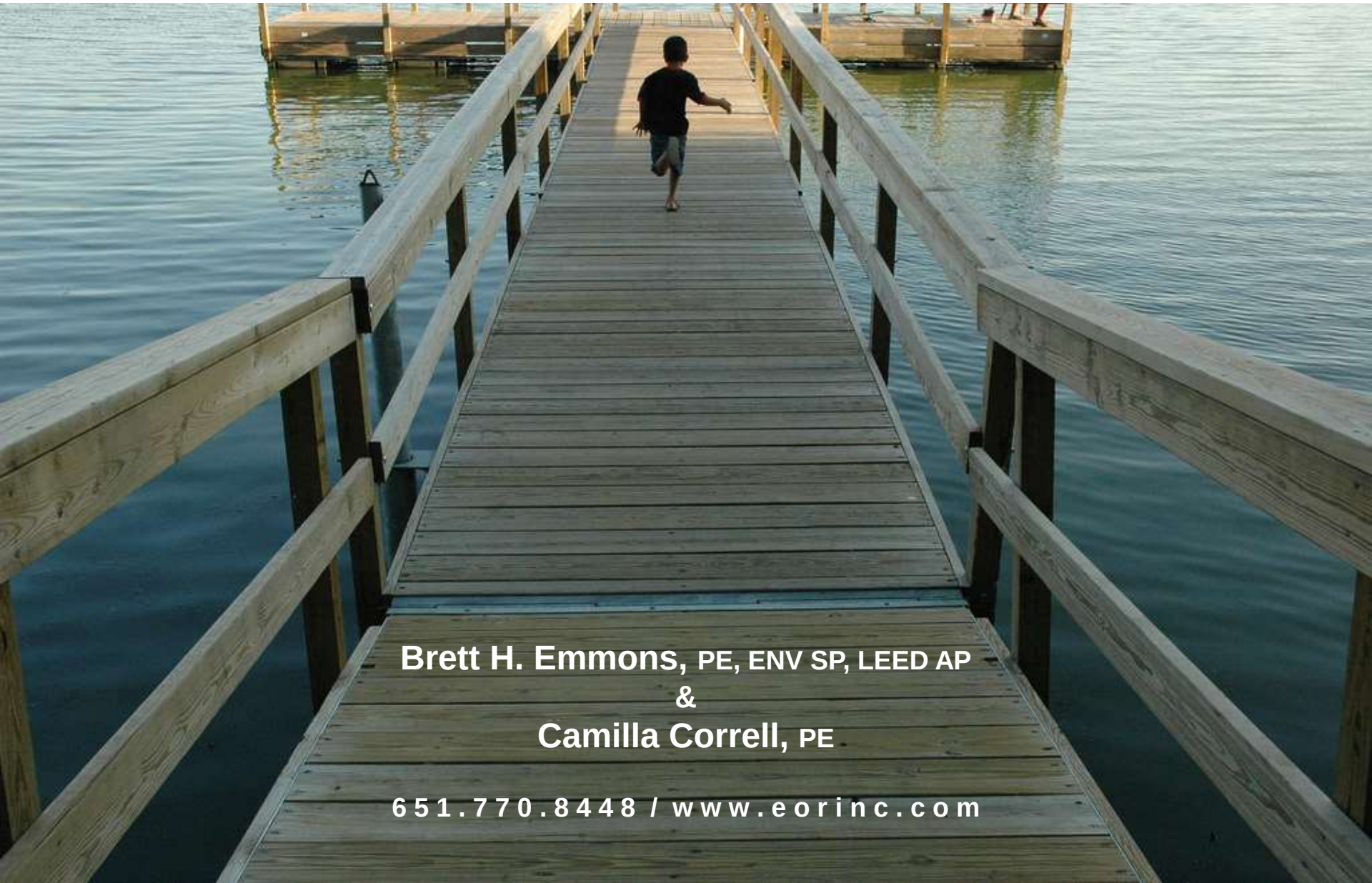
- **Local Planning Handbook**
- **Upcoming Workshops**
  - a) ***Climate Vulnerability Assessment: Local Application July 21, 2017***
  - b) ***Planning for the Environment, Including Resiliency July 27, 2017***

MN Stormwater Manual

Stormwater/Reuse Calculator

Local Watershed Districts have funding

Thank you



Brett H. Emmons, PE, ENV SP, LEED AP

&

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651.770.8448 / www.eorinc.com