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Inver Grove Heights, MN

ACEC National Grand Award Winner

water ecology community

Designing a City for Zero Stormwater Discharge

Jay Michels, CPESC
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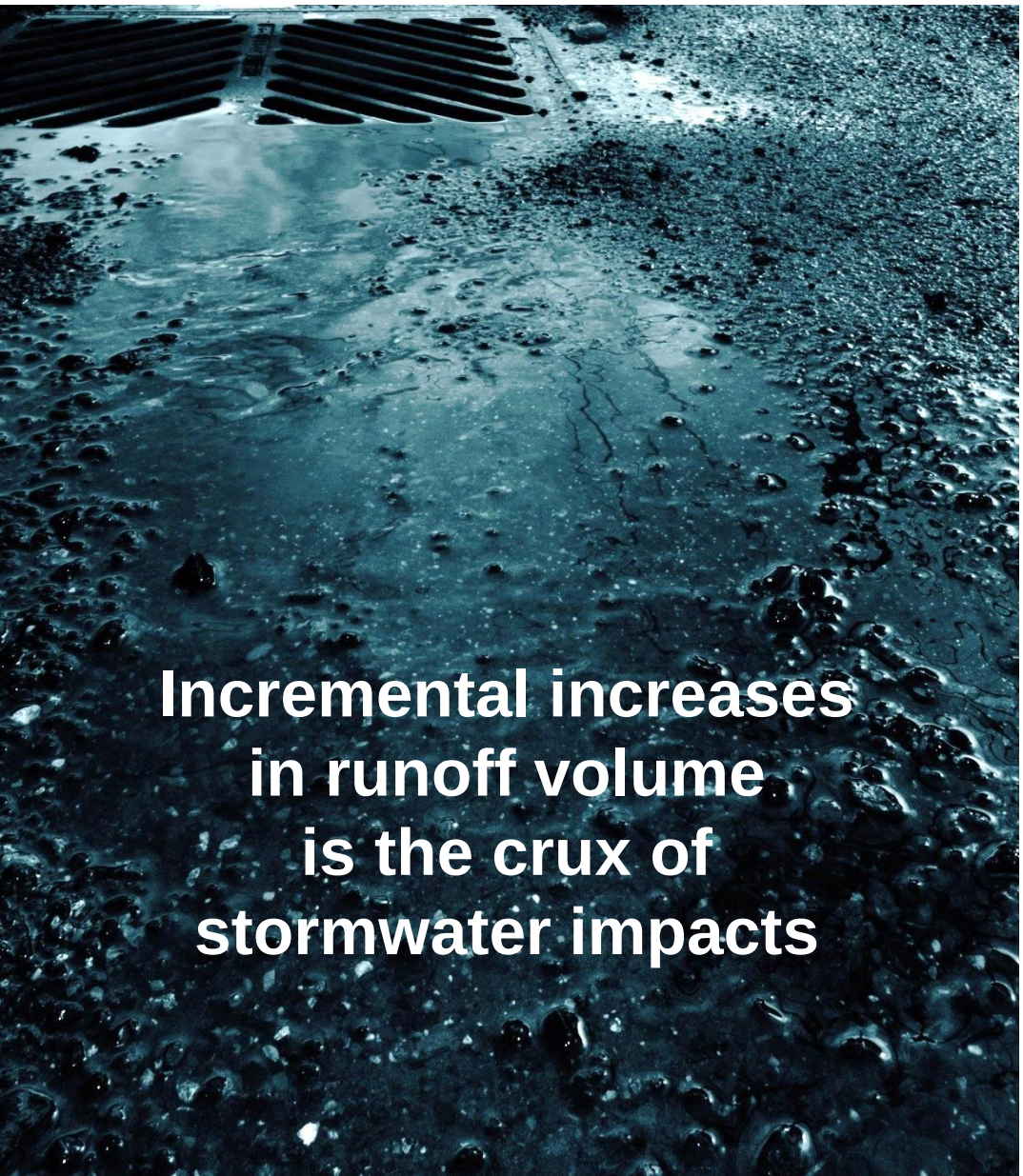
Emmons & Olivier Resources, Inc. (EOR)
www.eorinc.com

Stormwater: *Runoff Volume* has Emerged as "The Issue"

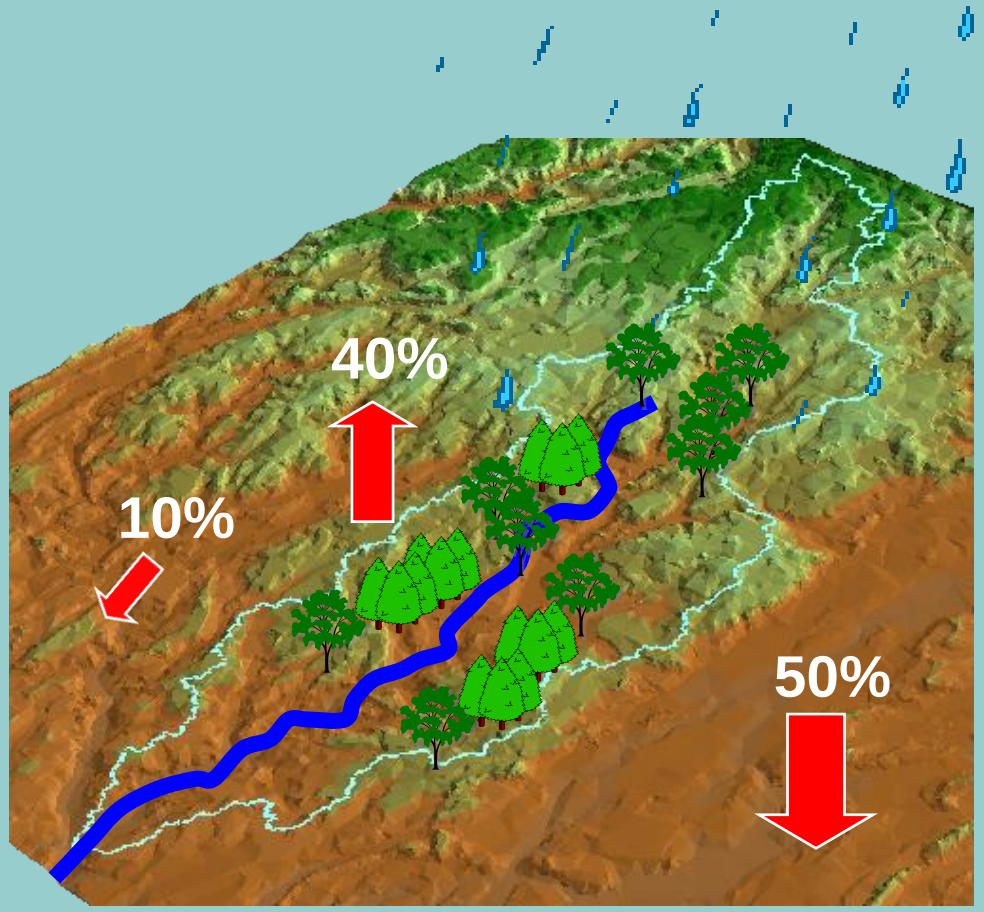
EOR water ecology community



Typical Pre-development Conditions:

Water cycle under natural conditions

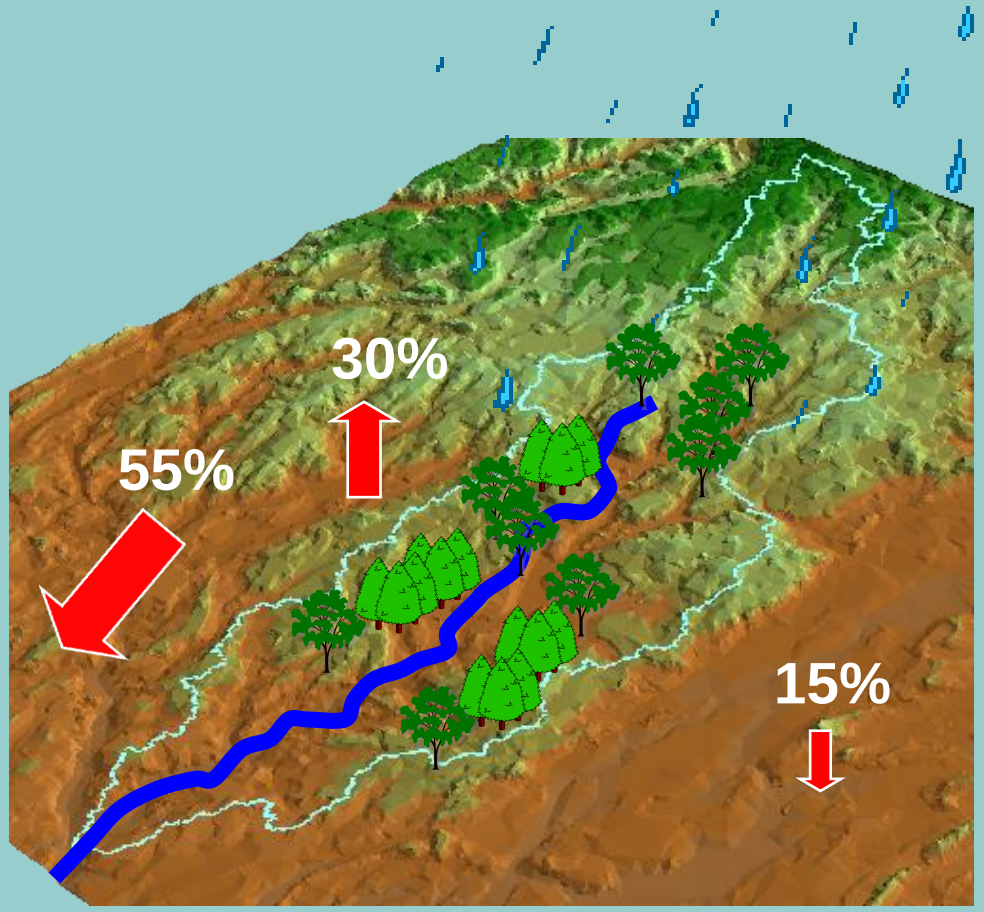
50% ground infiltration
40% vegetation and/or evaporates
10% surface runoff



Typical Post-development Conditions:

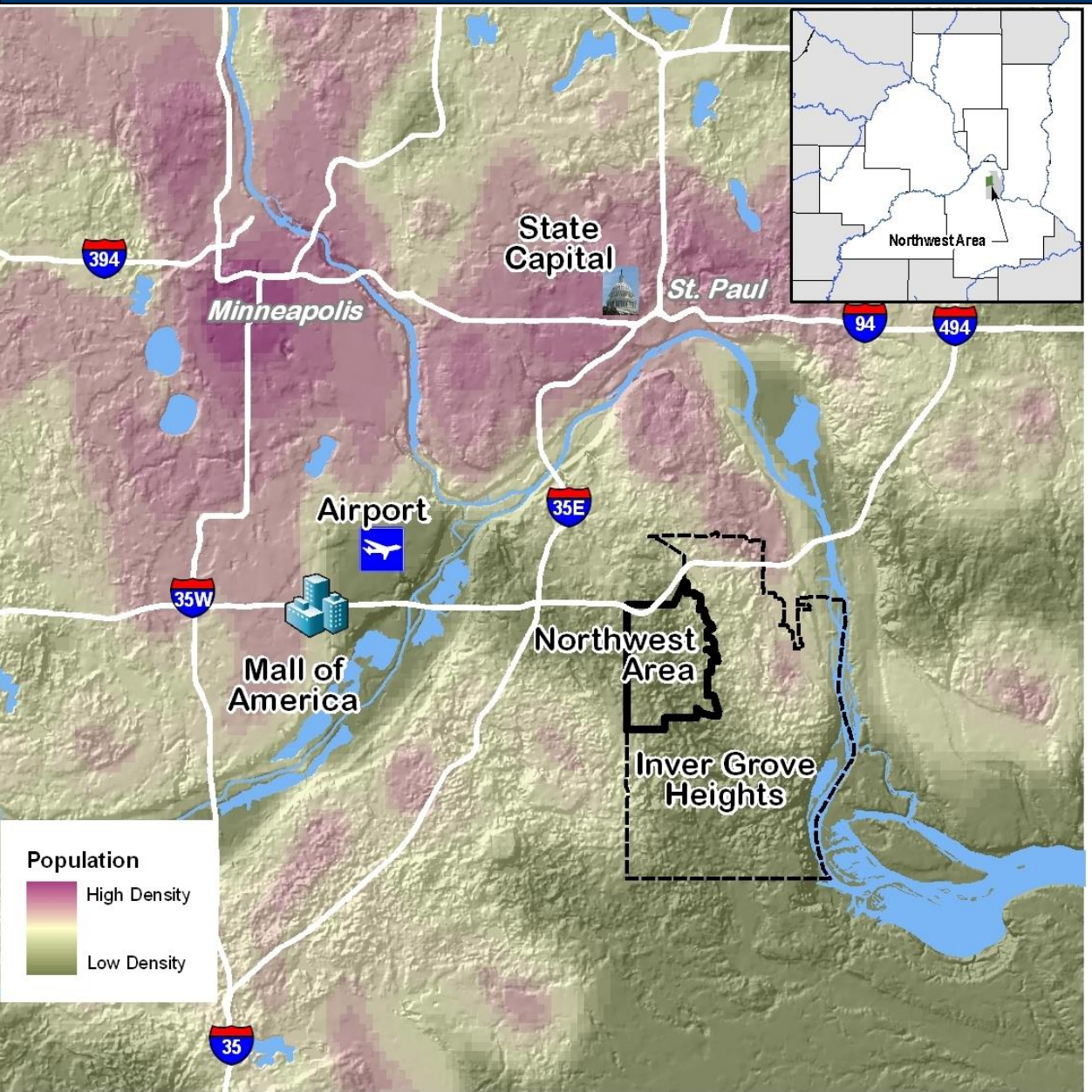
Water cycle under urbanized conditions

- 55% surface runoff
- 30% vegetation and/or evaporates
- 15% ground infiltration



The Inver Grove Heights NW Area Story

Project Location



Near to Urban Core

- Mpls/St. Paul
- Interstate 494
- Airport
- Mall of America

Large Urban Expansion Area for Inver Grove Heights

- ~3,000 Ac.

Challenging Site for Infrastructure

Project Origins

Marcott Lakes

- High value natural resource for the area
- Groundwater-fed lakes

North West Area

- Land locked basins

= Marcott Lakes

Context
Can Water Be Managed Differently?

Concerns:

- Typical “Sprawl” – Character?
- Quality Lakes; New Outlet to Mississippi River
- Costly Infrastructure

Landowner Group Goals:

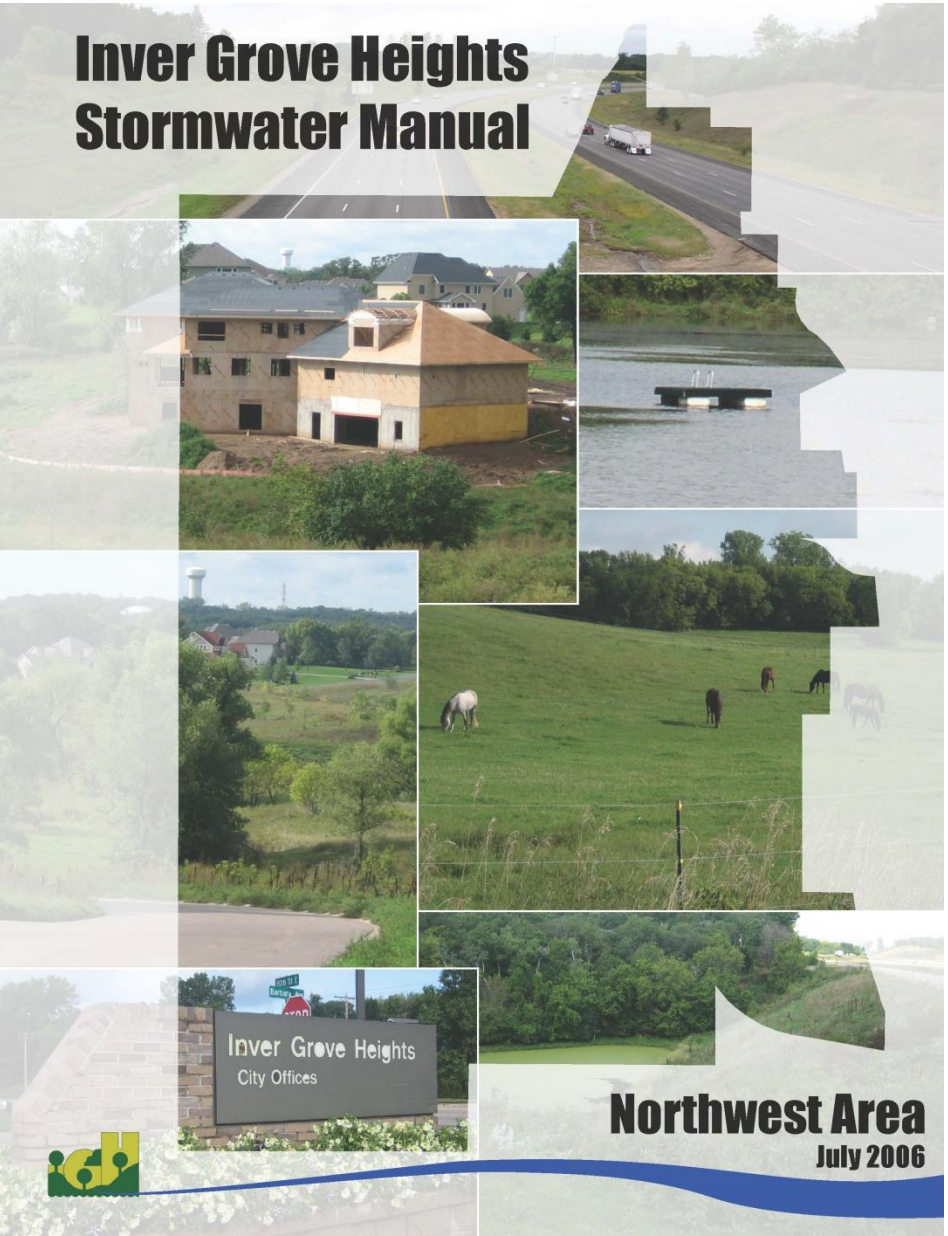
- Reduce Costs
- Why Not Use the Natural Systems that Work Well (without Outlets)?
- Retain Unique “Feel” of Landscape

Policy Development: Model as planning tool

Modeling Studies/Analysis:

- **Hydrologic/Water Budget Modeling at Multiple Scales**
- **Rainfall-Runoff Monitoring**
- **Calibrate Models (Data From a 100-Yr Event)**
- **Planning & Zoning Standards - Encourage LID rather than Barriers**

Policy Development: the first steps



Develop Innovative and Progressive Stormwater Management Policies, such as:

- Creation of a special overlay district for the Northwest Area to address the site's challenges
- Promote Low Impact Design within the Development Guidelines
- Integrate parking surfaces and parking stall quantities with overall stormwater management goals
- Integrate green-infrastructure during the design process
- Reduce expensive pipe-and-pond solutions where appropriate

Policy Development: Unique standards

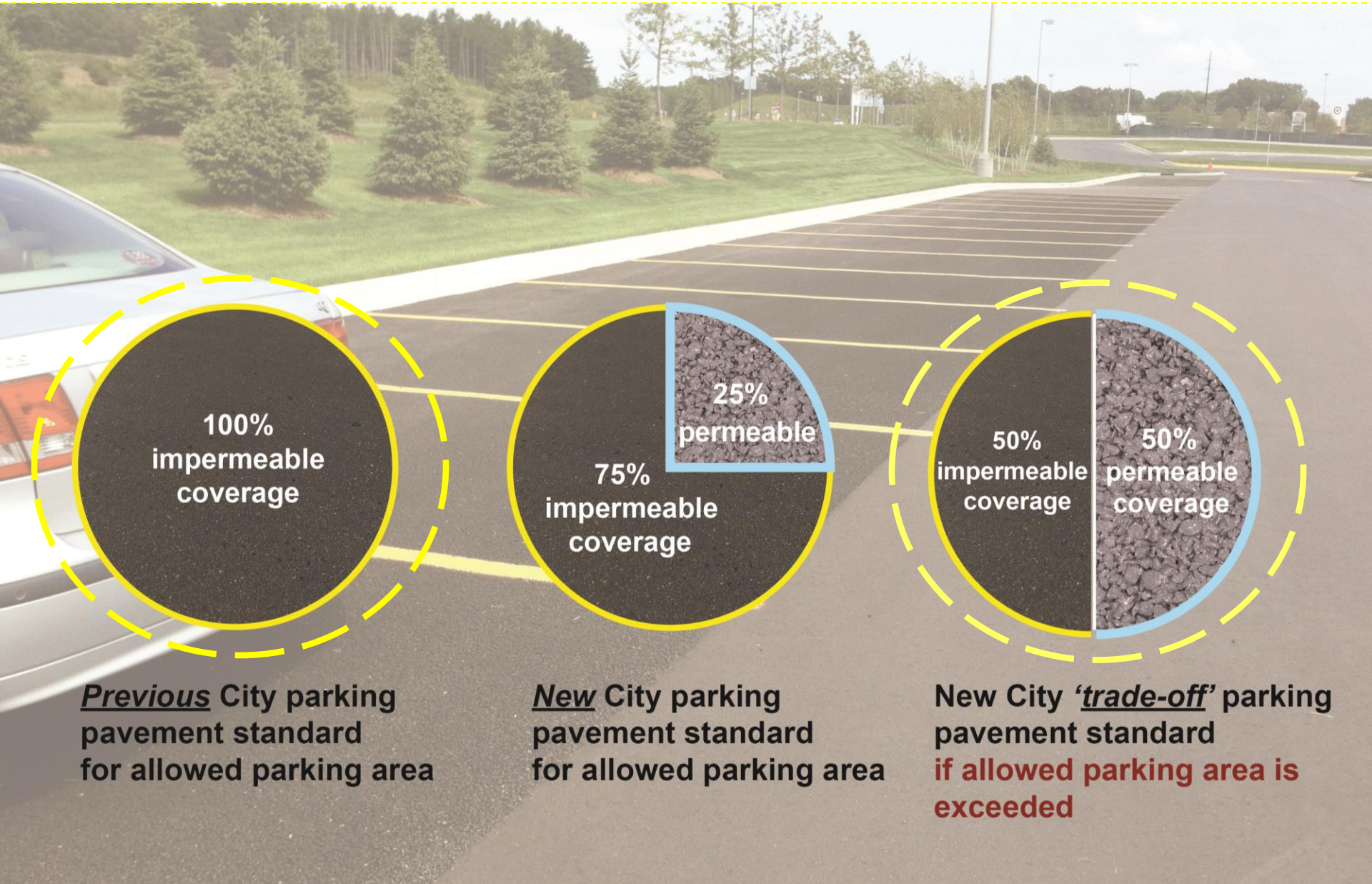
- **New volume control standards for 5-year event by *matching* pre- and post-runoff volumes** - *supported with monitoring and scientific data.*

- **Pretreatment *before* reaching volume control devices** - *ensures longevity and reduces maintenance.*

- ***Natural depressions preserved* via a regional basin map and comprehensive plan** - *provides predictability to developers and City; improves corridors, trails, and neighborhood quality.*

- ***3-tiered freeboard & contingency plan* for extreme flood control created** *- increases flood protection with robust safety zone and "perched" overflows.*

Policy Development: New parking standards



Previous City parking pavement standard for allowed parking area

New City parking pavement standard for allowed parking area

New City '***trade-off***' parking pavement standard if allowed parking area is exceeded

Policy Development: In summary

Green Space Preservation
- 20% contiguous green space required; in addition to lawns/small landscaping

Zoning Flexibility *- unit counts are preserved with flexibility to increase density (Mixed Use), reduced setbacks, and reducing infrastructure.*

Parking Lot Standards *- reduces parking lot sizes, permeable pavement for high parking counts, and reduced development costs for marginally used parking.*

LID Detailed Design Manual *- guides process from planning through design, saving design and review time.*

Cost Analysis & Fees *- system has 70% lower capital/initial cost and 57% lower life-cycle costs (system wide) and provides a fee structure.*

Old Approach vs. LID Plan

Original Plan:

Typical "Pumps & Pipes"

- **13 Pump Stations**
- **24 Miles of Trunk Storm Piping**
- **New Outlet to Miss. River (4 miles)**

Enhanced LID Plan:

- **Utilize New LID/GI Tools**
- **Better Outcomes – W.Q., Volume Control, Open Space**
- **Replenish Groundwater**
- **75% Up-front Cost Savings!**

Cost Comparison in Detail

Total Costs

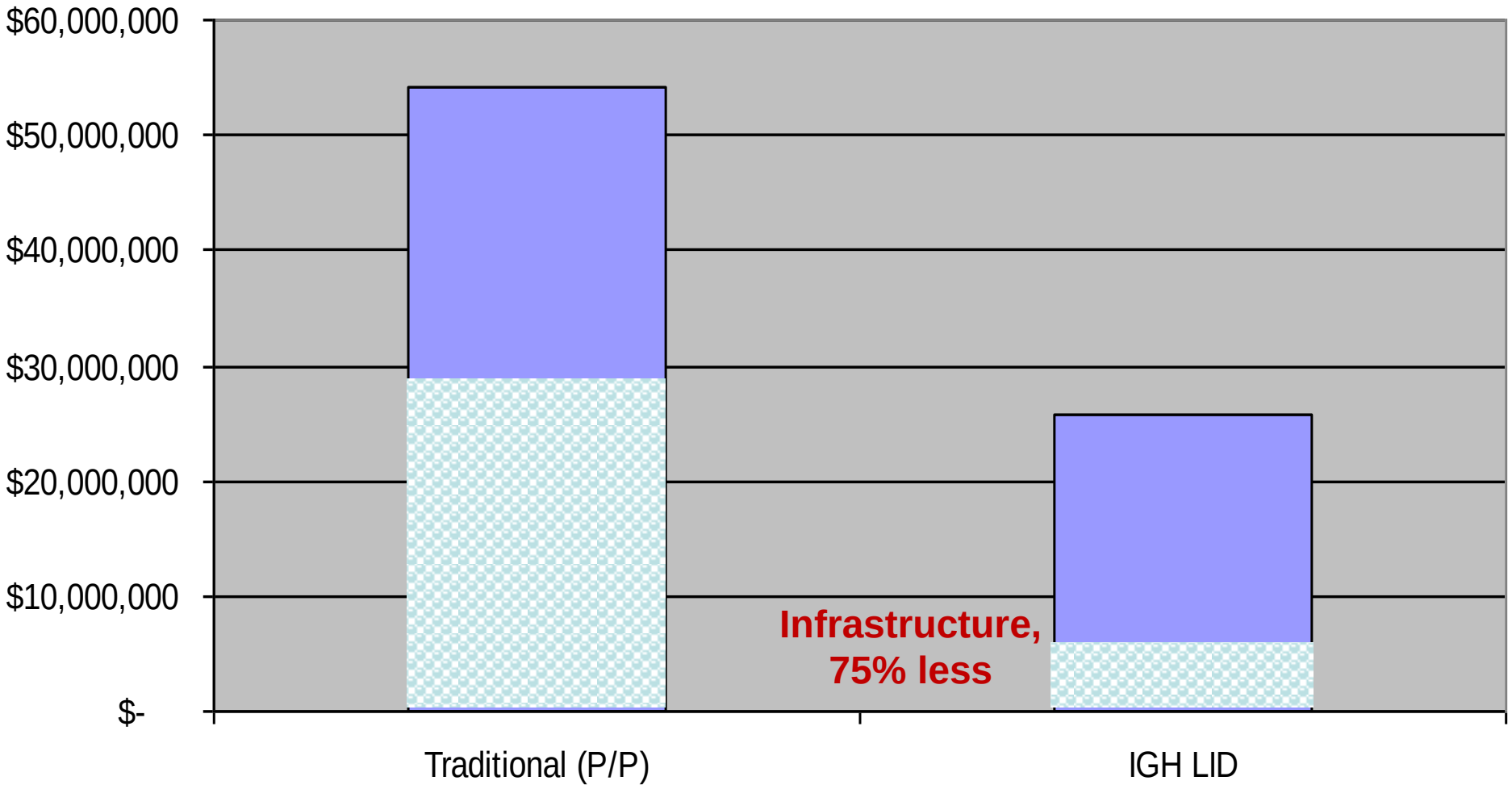
- **Infrastructure Costs**
- **O&M Costs (Present Worth over 30 yrs)**

	Traditional	Proposed (LID)
Infrastructure	**$29,635,000***	**$ 6,520,000**
O & M	**$24,553,000**	**$19,153,000**
Total	**$54,188,000**	**$25,673,000**

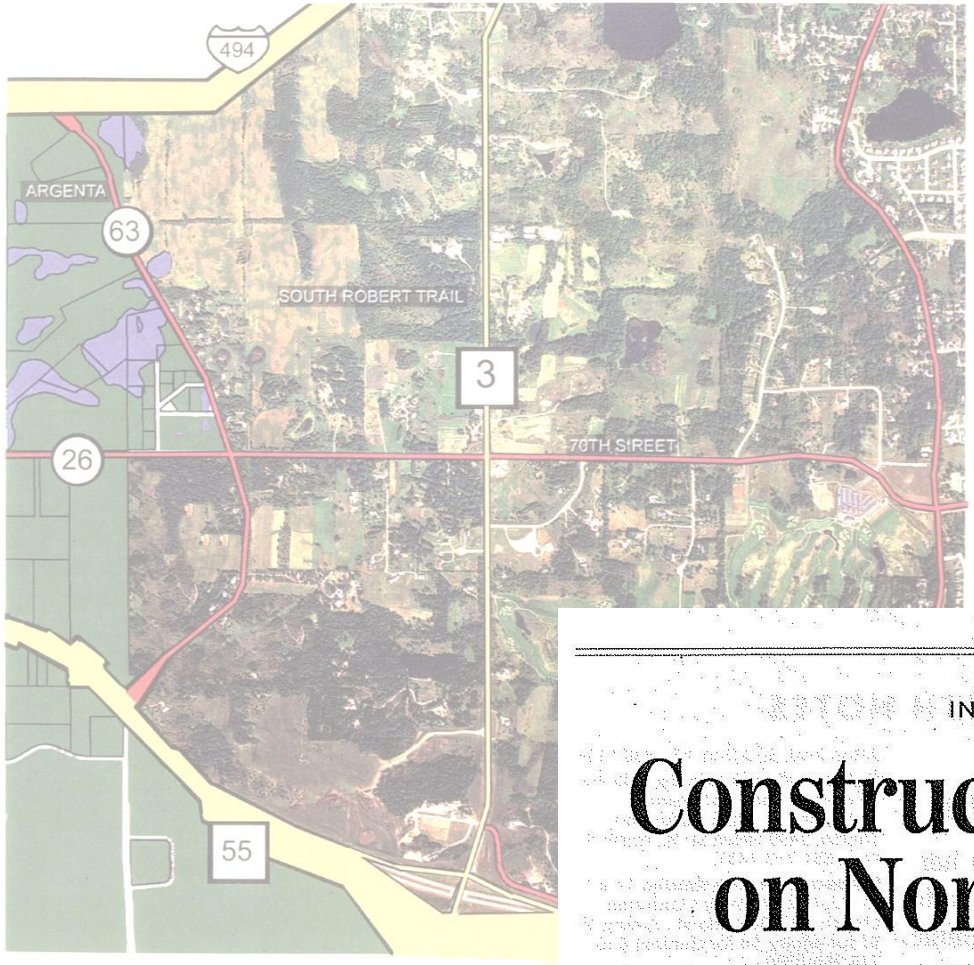
Updated costs, 1/10/07, Jan. 2006 dollars (ENR Index of 7660) *Includes approx. same land costs as LID ($3,750,000)

Cost Comparison in Detail

30 Year Life Cycle Costs (includes O&M)



Policy Commencement: council adoption 2007



Ordinance

- **Section 515, Subd. 39 NWA Overlay District**

Manual

- **Stormwater Manual for the Northwest Area**

SATURDAY, JUNE 23, 2007 A 3B

INVER GROVE HEIGHTS

Construction can begin on Northwest Area

City plans alternative storm-water system

BY LIALA HELAL
Pioneer Press

Now that the planning is in place for the Northwest Area, construction can begin.

"As we went through the studies, we found out that there's a strong environmental benefit to it as well," said Tom Link, the city's community development director. "The

"We'll take advantage of the natural abilities of this land to absorb and evaporate the water."

Implementing Zero Runoff: Locally-Driven, LID Initiative

City & Landowner Goals:

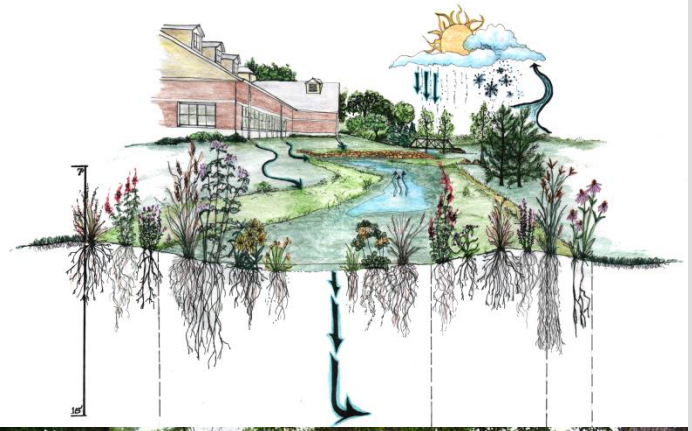
- **Reduce Costs** of Development / Infrastructure
- **Retain Character** of Unique Landscape
- **Use Natural Systems** that Function

Solution:

Use a Low Impact Development (LID) Approach:

1. Land Use
2. Stormwater Management

Summary-
How Zero Runoff Works? (Mimic Hydrology)



Keep Water at the Source (Mimic Natural Hydrology)

Integrate Land Use & Stormwater

Use Natural Landscape/Assets – Depressions, Soils

Strong Resources – Ordinances, Manual, O&M, Fees

Benefits of LID Integration

- **Improves Water Quality**
- **Reduces Flooding**
- **Reduces Cost**
- **Preserves Landscapes, Stream, Wetlands, etc.**
- **Replenishes Aquifers**
- **Uses less area**

Case Study: Argenta Hills Development

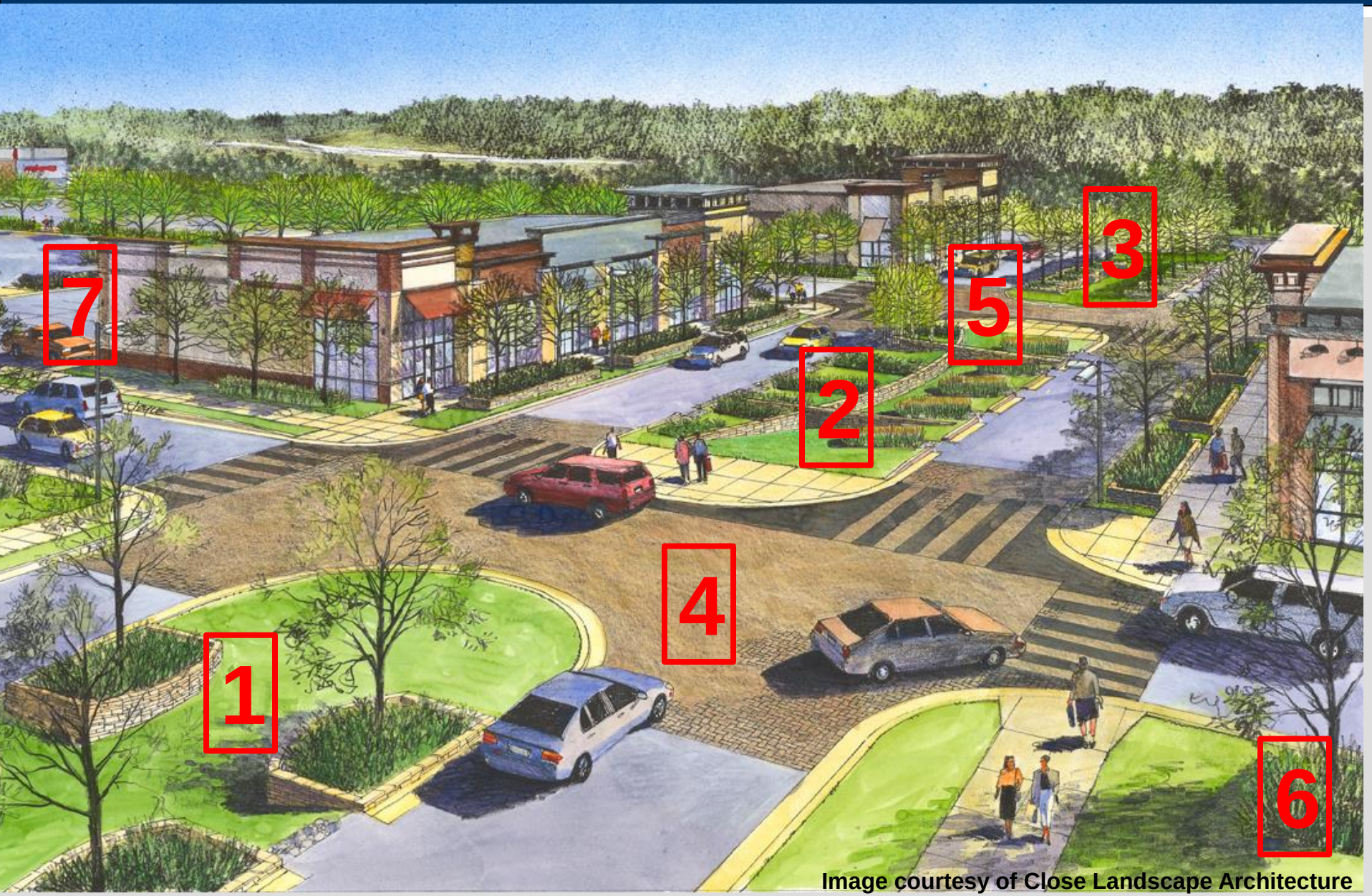
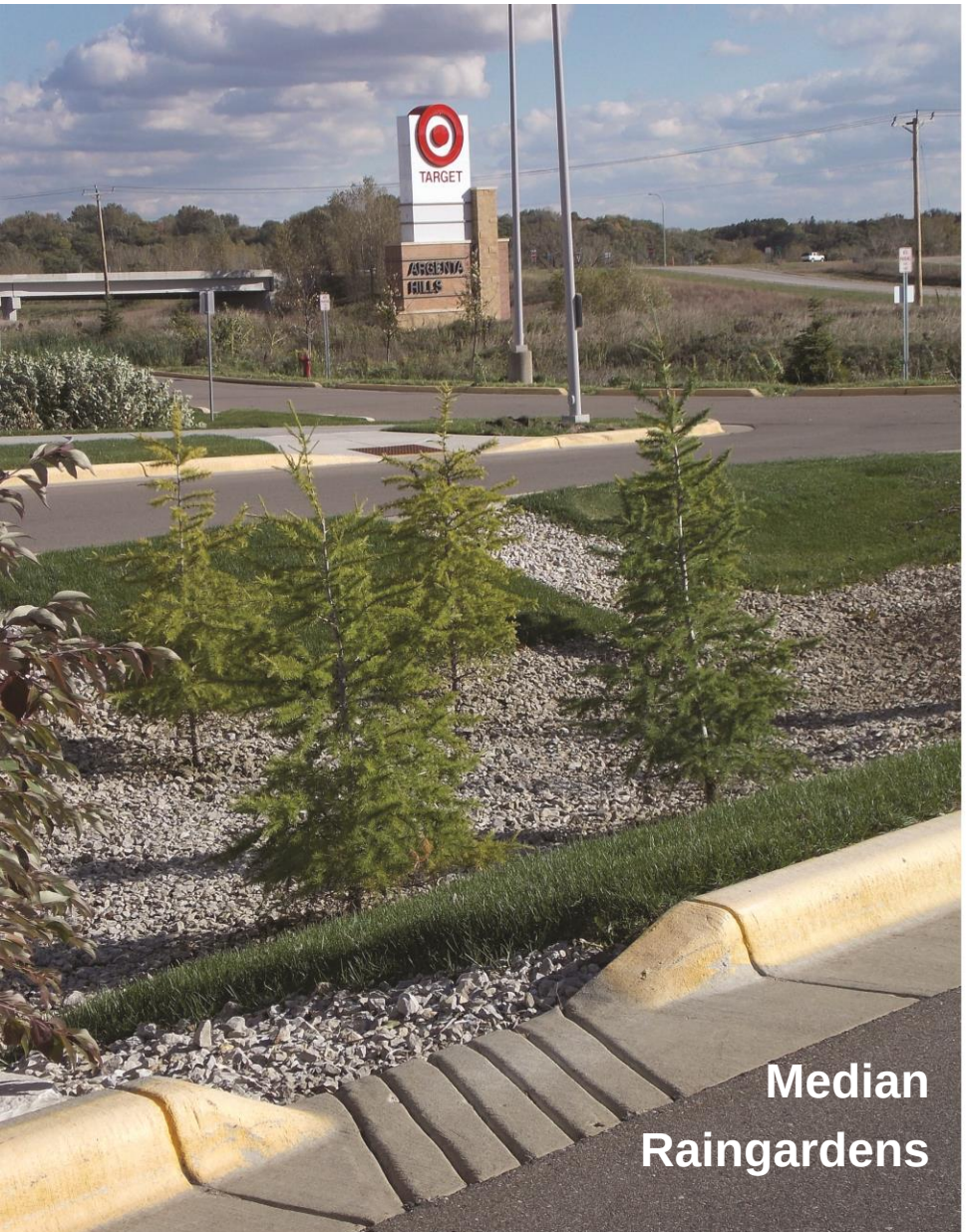


Image courtesy of Close Landscape Architecture

Argenta Hills Phase 1

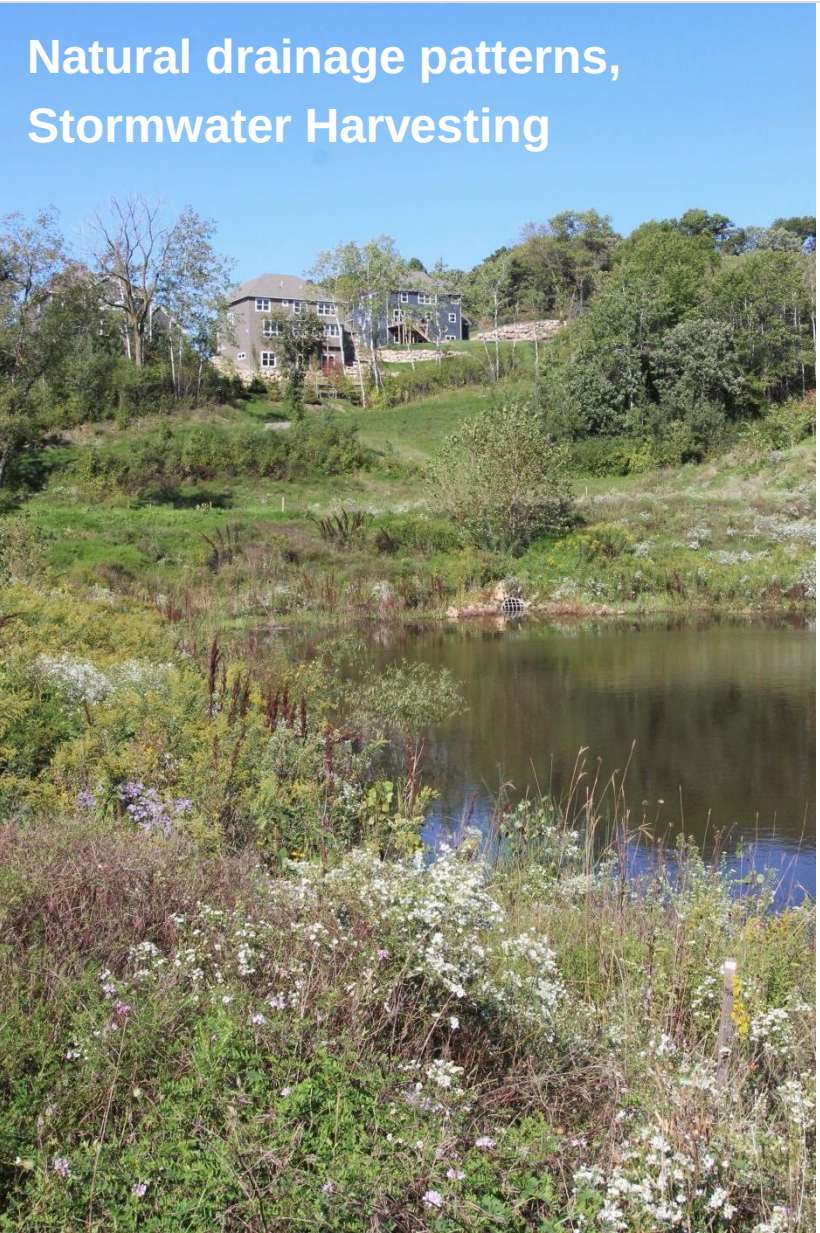
Argenta Hills Phase 1



Argenta Hills Phase 2-4

water ecology community

Natural drainage patterns, Stormwater Harvesting



Cul-de-sac filtration gardens

Open/green space planning

LID Tools Implemented

Raingardens:

Integrated into over 35 sites, adding amenity-rich commercial center.

Infiltration Basins:

Roof runoff directly routed to infiltration basins.

Reuse for Irrigation:

“Waste product” of runoff becomes a resource.

LID Tools Implemented

Permeable Asphalt:
Overflow parking (275 stalls) and reduced parking field size with the ordinance facilitating the commercial stores to re-evaluate and reduce their parking lot size and use newer permeable parking they had limited experience with.

Permeable Pavers:
Strategically located in a high traffic, amenity-rich intersection, the pavers created pedestrian cross walks effectively treating runoff while enhancing aesthetics and not using up valuable additional land for stormwater.

Natural Resource Preservation:
30% of the residential site's rolling woodlands preserved, protecting the landscape's character and enhancing the home sites' marketability.

ACEC 2015 National Grand Award

NW Area Plan Honored

- American Council of Engineering Companies (ACEC)
- Prestigious, National Award
- 1 of 8 Grand Awards across U.S.
- IGH is National Model
- Melding Land Use Planning and Green Infrastructure
- This is the Trend of the Future

Acknowledgements

- **Client:**
  Inver Grove Heights
  City Council and City Staff
- **Planners:**
  Hoisington Koegler Group Inc.
- **Contractors:**
  McGough, Tradition,
  Kimley-Horn, and Enebak

A Desirable Community:

"This brand new neighborhood is just minutes from downtown, yet you feel as though you're in the country with acres of trees and preserved open space, and trails… a perfect place for you and your family to call home."

Thank You

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