



Indianapolis *Gregory A. Ballard, Mayor*  
**SUSTAININDY**  
Department of Public Works

# **Integrating Green Infrastructure into Capital Improvement Projects: City of Indianapolis Wet Weather Program**

IWEA

2010 Annual Conference

November 17<sup>th</sup>, 2010

Heather Williams, LEED AP  
AMEC Earth and Environmental





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# Presentation Outline

- Green Infrastructure Program- What does it mean?
- Integrating Green Infrastructure into Drainage Capital Improvement Projects: Norwaldo Phase II Pilot Project
  - Project Planning
  - Project Background
  - Modeling and Design
- Working within existing regulations-What has been changed/updated to address stormwater facilities in the right of way?
  - Transportation Standards Update
  - Weed Ordinance Update



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# Green Infrastructure Program: What does it Mean?





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# Holistic Green Infrastructure Implementation – The Many Pieces

Private  
Development

Capital  
Improvement  
Projects

# Holistic Green Infrastructure Implementation



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What Does Green Really Mean to the City?

Staff

Code Enforcement Updates

Training

Case Studies/ Marketing Materials

SW Design Specs. Manual

Green Supplemental Document

Typical Design Details

Website Resource Center



Transportation Stds Updates

Operations & Maintenance Agreements

Typical Design Details

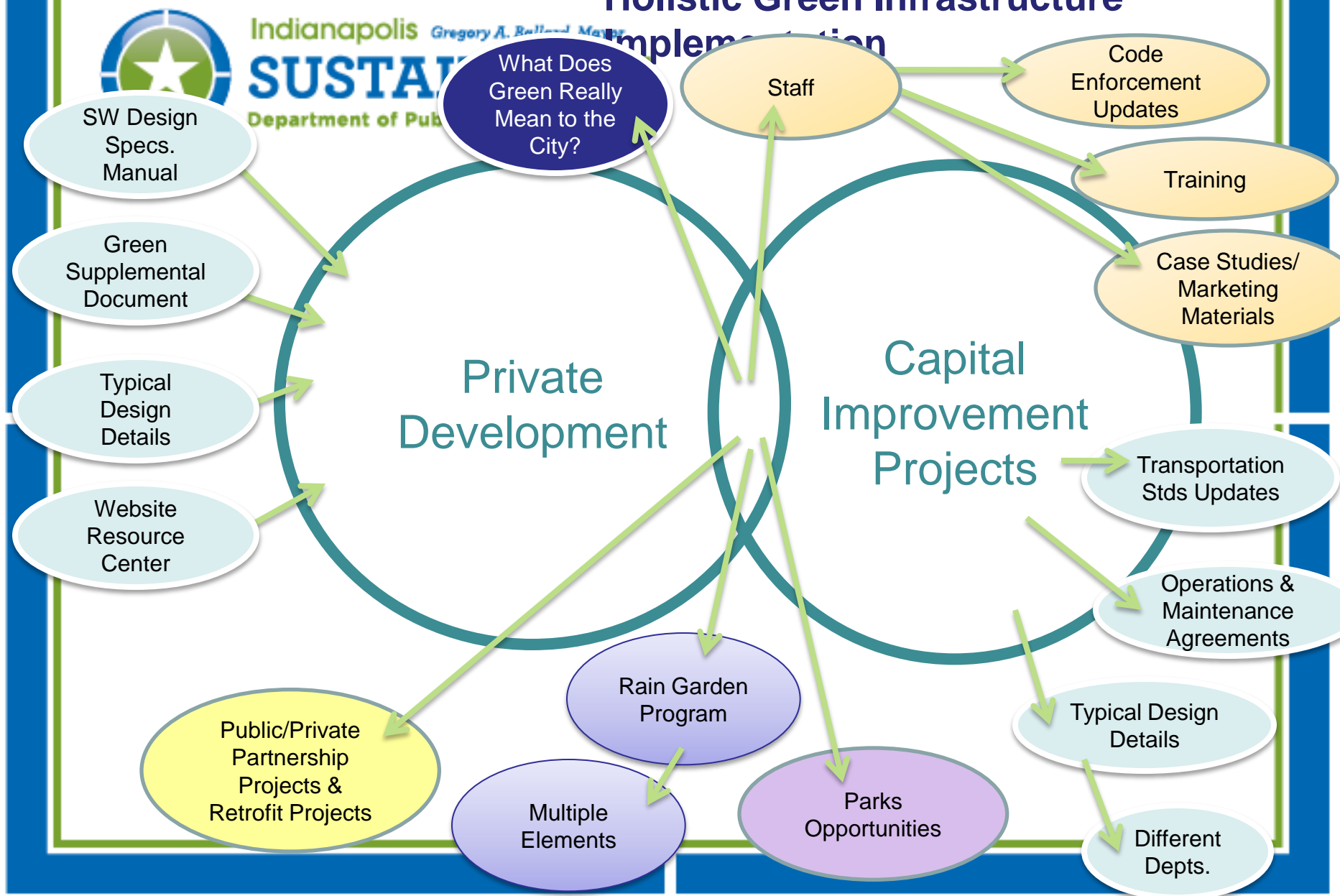
Different Depts.

Public/Private Partnership Projects & Retrofit Projects

Rain Garden Program

Multiple Elements

Parks Opportunities





**Introduction**

The Central Indiana Development Ordinance Review Checklist was created as part of an effort to assist the City of Indianapolis and other nearby communities evaluate existing development codes, regulations and ordinances to identify potential regulatory or planning process impediments that affect the use of or successful implementation of low impact development practices in new development as well as in infill or redevelopment.

This checklist is a tool that land use planners, transportation planners, public works personnel, city engineers, building code enforcement officers, development site plan reviewers, and others can use to evaluate the state of existing codes, regulations, ordinances and practices. Once topics or issues that may hinder use of LID practices are identified, personnel from these entities can work together to modify codes to enable/encourage/promote the use of LID practices by the city departments, builders, developers and property owners to apply low impact techniques while also ensuring high quality development, adequate access and public safety.

**Instructions**

The Development Ordinance Review Checklist consists of 45 main topic questions and is divided into five main categories:

1. Residential Streets, Parking Lots and Other Transportation Infrastructure
2. Lot Development Principles
3. Conservation of Natural Areas
4. Comprehensive Planning, Zoning and Other Regulatory Considerations
5. Stormwater Planning and Practices

This checklist is to be completed by one or more city/community representatives that utilize the following codes, ordinances, or regulations:

- Zoning Ordinance
- Subdivision Codes
- Street Standards or Road Design Manual, Parking Requirements
- Building and Fire Regulations/Standards
- Stormwater Management or Drainage Criteria
- Buffer or Floodplain Regulations
- Environmental Regulations
- Tree Protection and/or Landscaping Ordinance
- Erosion and Sediment Control Ordinances (Indianapolis Code Ch. 561-Drainage and Sediment Control)
- Public Fire Defense Master Plans
- Grading Ordinance
- Stormwater Management Plan

# Ordinance, Policy, Incentive Review

**Residential Streets, Parking Lots and Other Transportation Infrastructure**

Development Feature or Element	Local Criteria
<b>1. Street Width</b>	
What is the minimum pavement width allowed for streets in low density residential developments that have less than 500 average daily trips (ADT)?	_____ feet
If your answer is between 18-22 feet, 1 point ⇔	<input type="text"/>
At higher densities are parking lanes allowed to also serve as traffic lanes (i.e., queuing streets)?	YES / NO
If your answer is YES, 1 point ⇔	<input type="text"/>
Indicate administrative difficulty to change the above requirements/practices	Easy   2   3   4   5   Hard
<b>2. Street Length</b>	
Do street standards promote the most efficient street layouts that reduce overall street length and minimize total paved area?	YES / NO
If your answer is YES, 1 point ⇔	<input type="text"/>
Indicate administrative difficulty to change the above requirements/practices	Easy   2   3   4   5   Hard
<b>3. Right-of-Way Width</b>	
What is the minimum right-of-way (ROW) width for a residential street?	_____ feet
If your answer is less than 45 feet, 1 point ⇔	<input type="text"/>
Does the code allow utilities to be placed under the paved section of the ROW (or immediately adjacent to the road edge permitting use of swales on adjacent land)?	YES / NO
If your answer is YES, 1 point ⇔	<input type="text"/>
Are other LID stormwater management practices permitted in transportation ROW (i.e., protect site hydrology, limit clearing/grubbing, reduce cut & fill, protect natural features)?	YES / NO
If your answer is YES, 1 point ⇔	<input type="text"/>
Indicate administrative difficulty to change the above requirements/practices	Easy   2   3   4   5   Hard
<b>4. Cul-de-Sacs</b>	
What is the minimum radius allowed for cul-de-sacs?	_____ feet
If your answer is less than 35 feet, 1 point ⇔	<input type="text"/>
If your answer is between 36 to 45 feet, 1 point ⇔	<input type="text"/>
Can a landscaped island (bioretention cells) be created within the cul-de-sac?	YES / NO
If your answer is YES, 1 point ⇔	<input type="text"/>
<b>SUBTOTAL PAGE 2</b>	<input type="text"/>



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## Pilot Project Details

- Norwaldo Ph II- Drainage Design
- Project Status: In Design
- Project Schedule:
  - Anticipated construction start:  
April 2011
  - Anticipated construction completion:  
December 2011



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# The Problem

- Standing water on Brouse Avenue
  - Breaks up street pavement
  - Causes traffic delays
  - Health and safety problem
  - Contributes to raw sewage overflows
  - May contribute to sewage backups in homes
  - Causes traffic delays



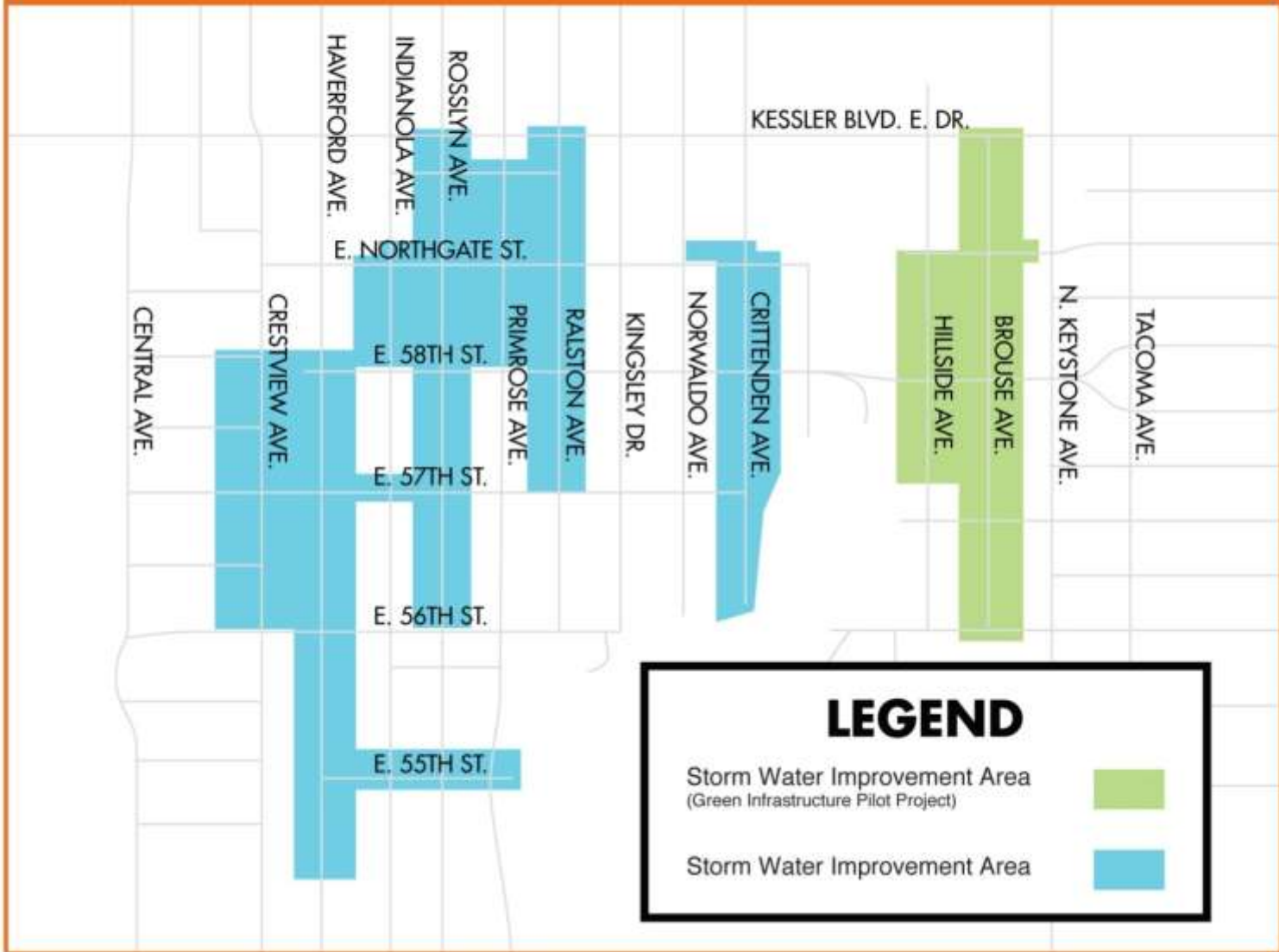


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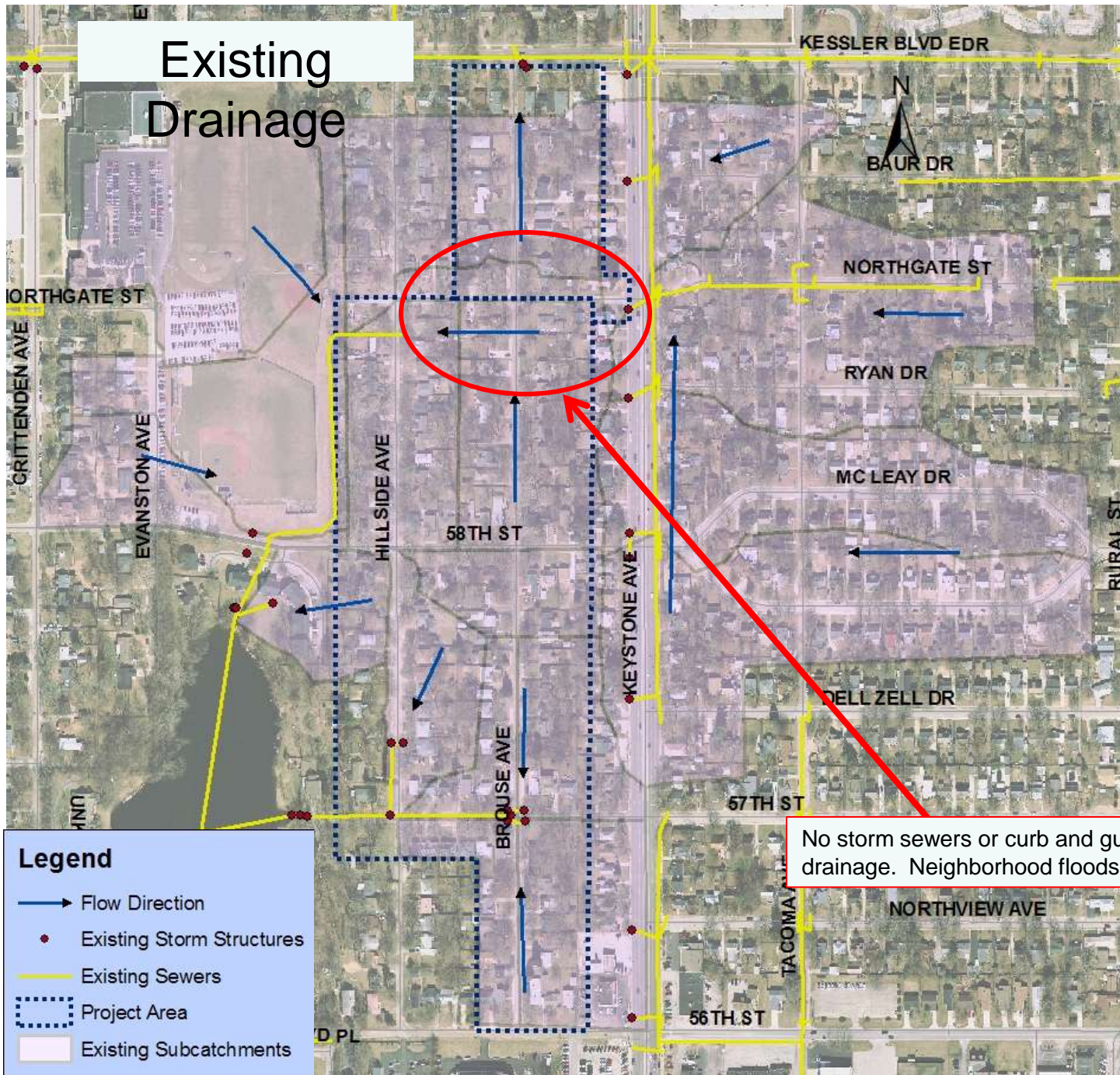
## **Public Input/ Meetings**

- AMEC and the City of Indianapolis held public meetings
- Citizen buy in
- Pilot Project Concept Plan was developed

# Norwaldo Phase II Storm Water Improvements



# Existing Drainage



## Legend

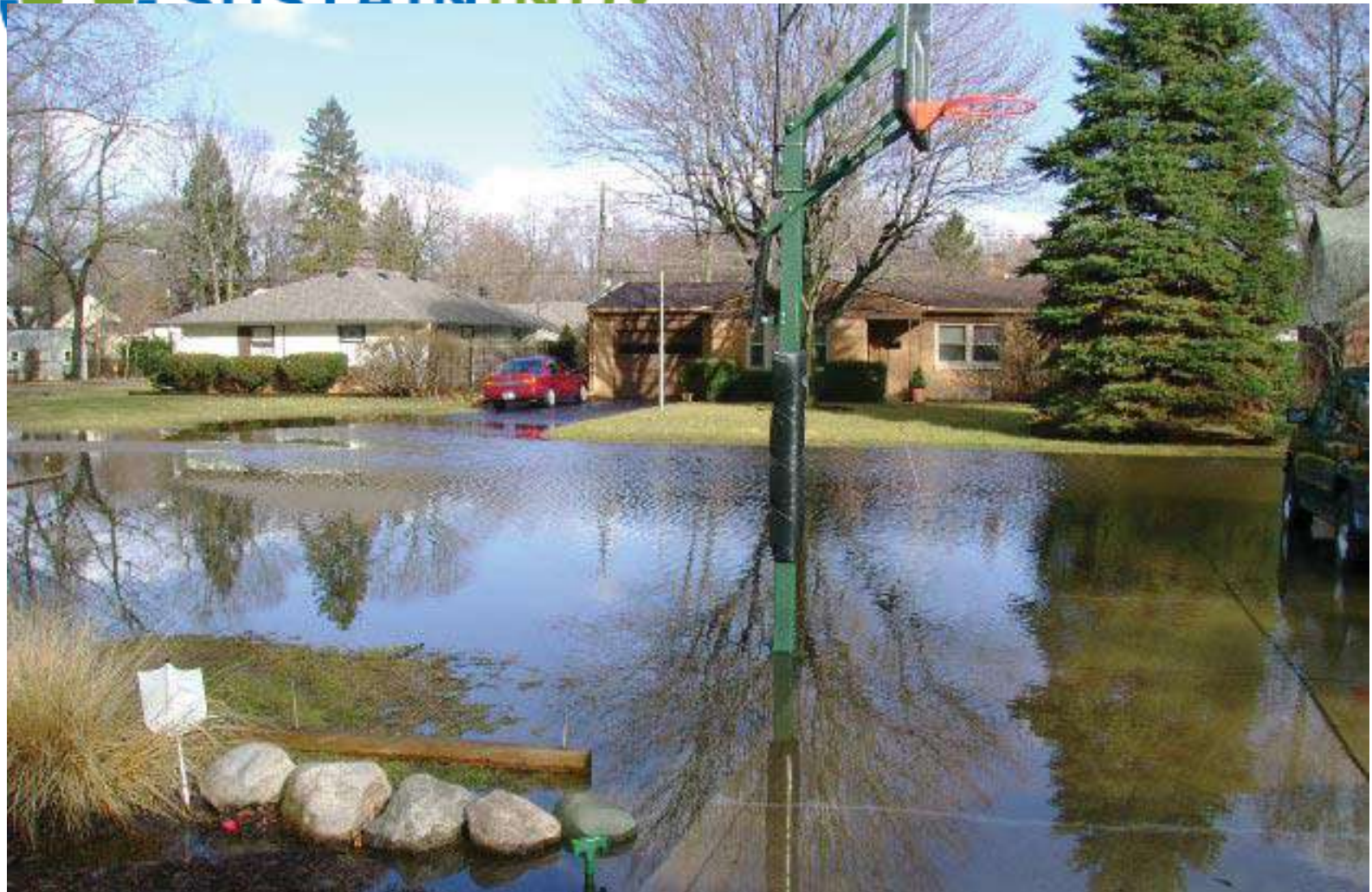
- Flow Direction
- Existing Storm Structures
- Existing Sewers
- - - Project Area
- Existing Subcatchments

No storm sewers or curb and gutter drainage. Neighborhood floods frequently

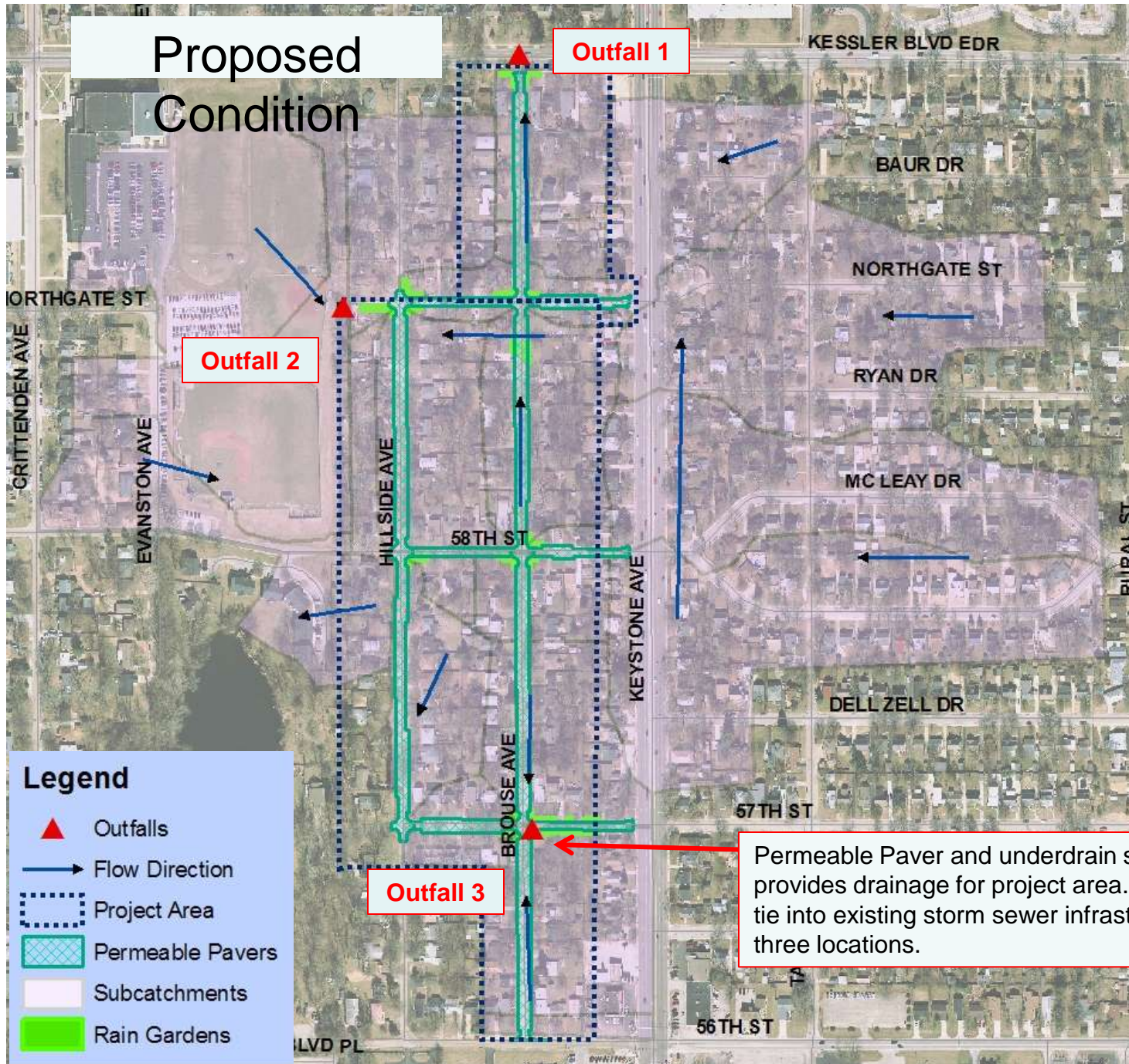


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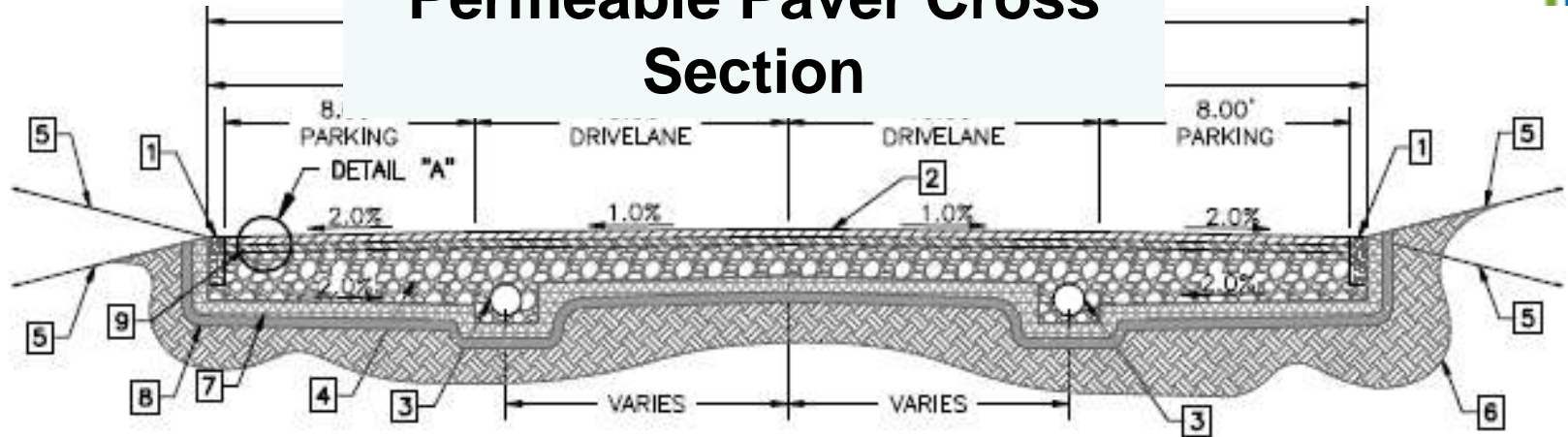
**SUSTAININDY**



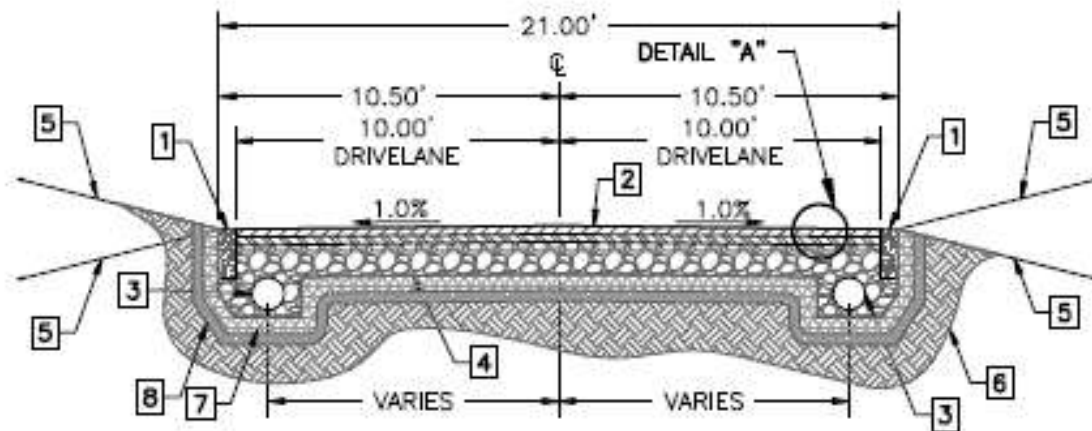
# Proposed Condition



# Permeable Paver Cross Section

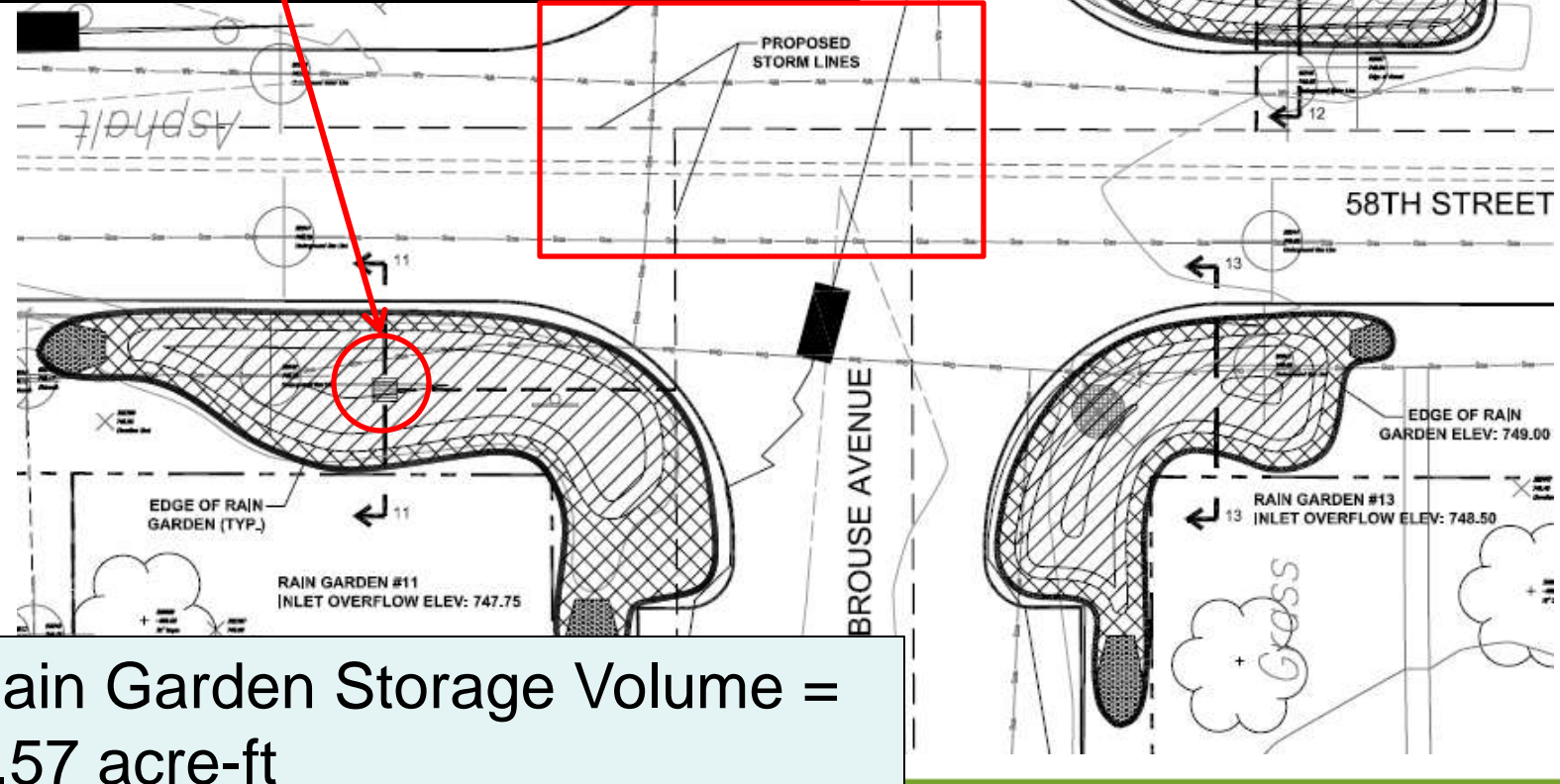
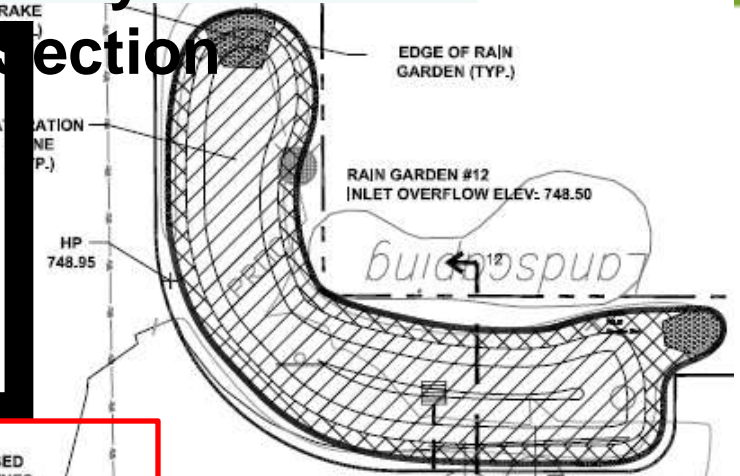
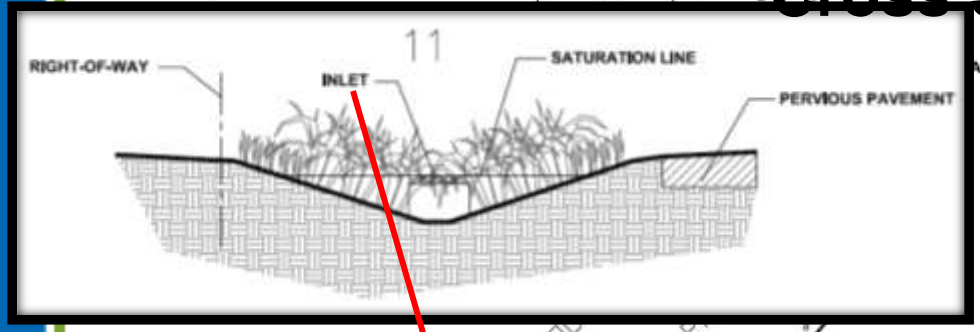


37 FOOT ROADWAY SECTION (SECTION A)  
10 FOOT DRIVELANES, 8 FOOT PARKING BOTH SIDES



Permeable Paver Storage Volume = 1.74  
acre-ft

# Rain Garden Layout and Cross Section



Rain Garden Storage Volume = 0.57 acre-ft



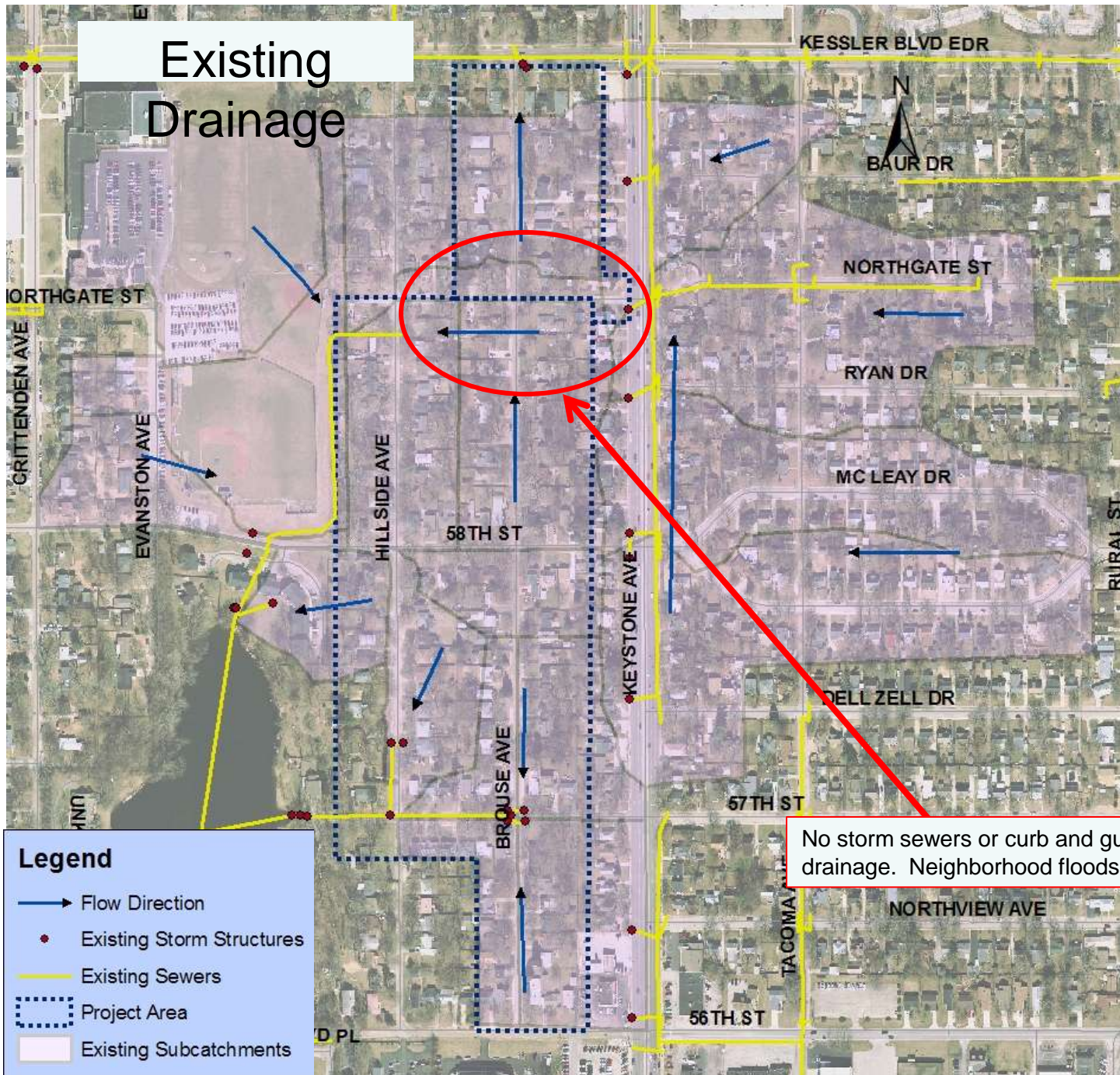
## SWMM 5 Results

<b>Event</b>	10 year - 24 hour
<b>Depth</b>	4.08 inches

<b>Location</b>	<b>Volume (10<sup>6</sup> gal)</b>		
	<b>Existing</b>	<b>Proposed</b>	<b>Difference</b>
Outfall 1 (Brousse Ave. and Kessler Blvd)	N/A	0.391	N/A
Outfall 2 (Hillside Ave and Northgate Ave.)	1.781	1.112	0.669
Outfall 3 (Brousse Ave. and 57th St.)	1.123	0.925	0.198
Bishop Chatard Detention Pond	3.813	3.335	0.478

<b>Location</b>	<b>Maximum Stage (ft)</b>		
	<b>Existing</b>	<b>Proposed</b>	<b>Difference</b>
Outfall 1 (Brousse Ave. and Kessler Blvd)	N/A	743.29	N/A
Outfall 2 (Hillside Ave and Northgate Ave.)	742.97	738.78	4.19
Outfall 3 (Brousse Ave. and 57th St.)	741.5	739.74	1.76

# Existing Drainage



## Legend

- Flow Direction
- Existing Storm Structures
- Existing Sewers
- - - Project Area
- Existing Subcatchments

No storm sewers or curb and gutter drainage. Neighborhood floods frequently



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## Next Steps

- Construction
- Long Term Monitoring for Future Model Calibration
- Operation and Maintenance



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## **Possible Conflicts With Proposed Design?**

- Drainage Facilities not Allowed in the Right of Way
- Operation and Maintenance Tracking and Reporting
- High Weed and Grass Ordinance
- Utility Cut Detail



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# Resources Created

## How is Chapter 1000 Green Streets Organized

- Purpose
- Planning
- Green Street Practice Types
- **Surface Restoration**
- Permitting and Submittal Requirements
- **Operation and Maintenance**

**Chapter 1000 Green Streets**

1000.01 Purpose

1000.02 Planning

1000.03 Green Street Practice Types

1000.03.01 Alternative Surface-Permeable P

1000.03.02 Vegetated Storm Water Facility

1000.04 Surface Restoration

1000.05 Permitting and Submittal Requirements

1000.06 Operation and Maintenance

1000.06.01 Alternative Surface-Permeable P

1000.06.02 Vegetated Storm Water Facility

**Section 1000.03 Green Streets Standard Details**

**1000.03.01 Alternative Surface-Permeable Paving**

1000.03.01 (a) Permeable Pavers

1000.03.01 (b) Pervious Asphalt

1000.03.01 (c) Pervious Concrete

**1000.03.02 Vegetated Storm Water Facilities**

1000.03.02 (a) Bioretention Bump-Out with Planting

1000.03.02 (b) Bioretention Bump-Out with out Plan

1000.03.02 (c) Curb Extension and Inlet/Outlet

1000.03.02 (d) Bioretention Bump-out Full Sun Pla

1000.03.02 (e) Bioretention Bump-out Full Sun Pla

1000.03.02 (f) Bioretention Bump-out Partial Shade

1000.03.02 (g) Bioretention Bump-out Partial Shade

1000.03.02 (h) Swale with Curb

1000.03.02 (i) Swale with Flush Curb

1000.03.02 (j) Swale Full Sun Plant Pallet

1000.03.02 (k) Swale Full Sun Plant Pallet

1000.03.02 (l) Swale Partial Shade Plant Pallet

1000.03.02 (m) Swale Partial Shade Plant Pallet

1000.03.02 (n) Bioretention and Swale Section

1000.03.02 (o) Bioretention and Swale Soil Profile

1000.03.02 (p) Bioretention and Swale Hydrologic

1000.03.02 (q) Bioretention and Swale Recommend

1000.03.02 (r) Bioretention and Swale Recommend

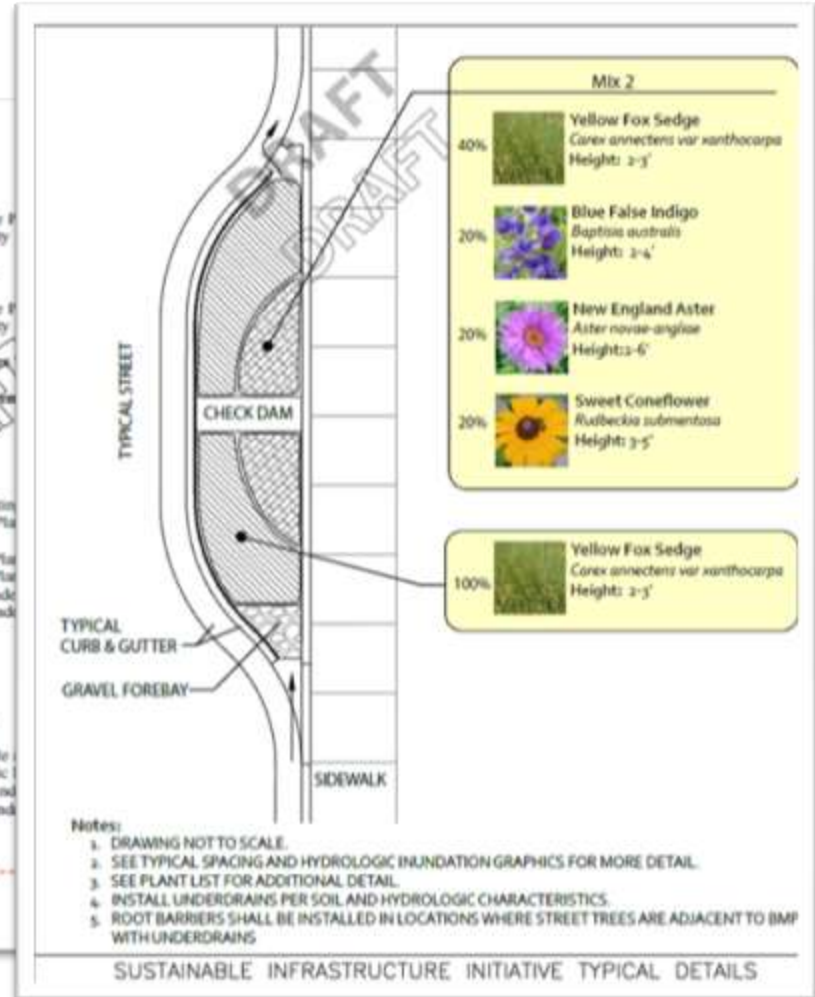
1000.03.02 (s) Hybrid Ditch

1000.03.02 (t) Hybrid Ditch

**1000.03.03 Inlet/Outlet Controls**

1000.03.03 (a) Curb Turnout

1000.03.03 (b) Stormwater Trench





# Resources Created

What information is being collected?

- Facility Number
- Primary Type
- Secondary Type
- Drainage Area
- Impervious Area
- Manufacturer
- Installer

Why is this information being collected?

- Process to collect
- Operation and Maintenance tracking/budgeting
- NPDES storm water permit

How is information being collected and filed?

Who is collecting information?

## City of Indianapolis - Marion County Green Street Facilities Submission Standards

Please read this complete document carefully prior to entering any data.

I. **General:**  
This submittal is required for all City Projects with Storm Water Quality Systems installed in Public Right of Way. This submittal shall be prepared by the designer and submitted as part of 100% plans to the City Project Manager. After completion of the As-builts the form should be updated with any changes that occur. The submittal shall include following items

1. Green Street Facility Summary Form
2. Plan sheet showing facility boundaries
3. Facility Detail Sheets
4. Operation and Maintenance Instructions
5. Restoration Instructions

II. **Green Street Facility Summary Form:**

- Facility Number : Include the ID as identified on plan sheet for each facility
- Primary Type : Primary type of facility
- Secondary Type : Secondary type of facility
- Drainage Area : Drainage area to facility
- Impervious Area : Impervious Area managed by facility
- Manufacturer : Manufacturer name and details
- Installer : Installer name and details

III. **Plan Sheet:**

- Provide plan sheet showing boundaries of each facility and ID each facility
- Include a location map
- File format shall be Drawing Interchange File (DXF) format
- The drawings shall be submitted in State Plane coordinates with two points of geodetic control for spatial reference.

Design Engineer shall provide demolition/ restoration instructions for each facility planned. If standard instructions are applicable, provide corresponding section numbers from specification.

# Outreach/Implementation



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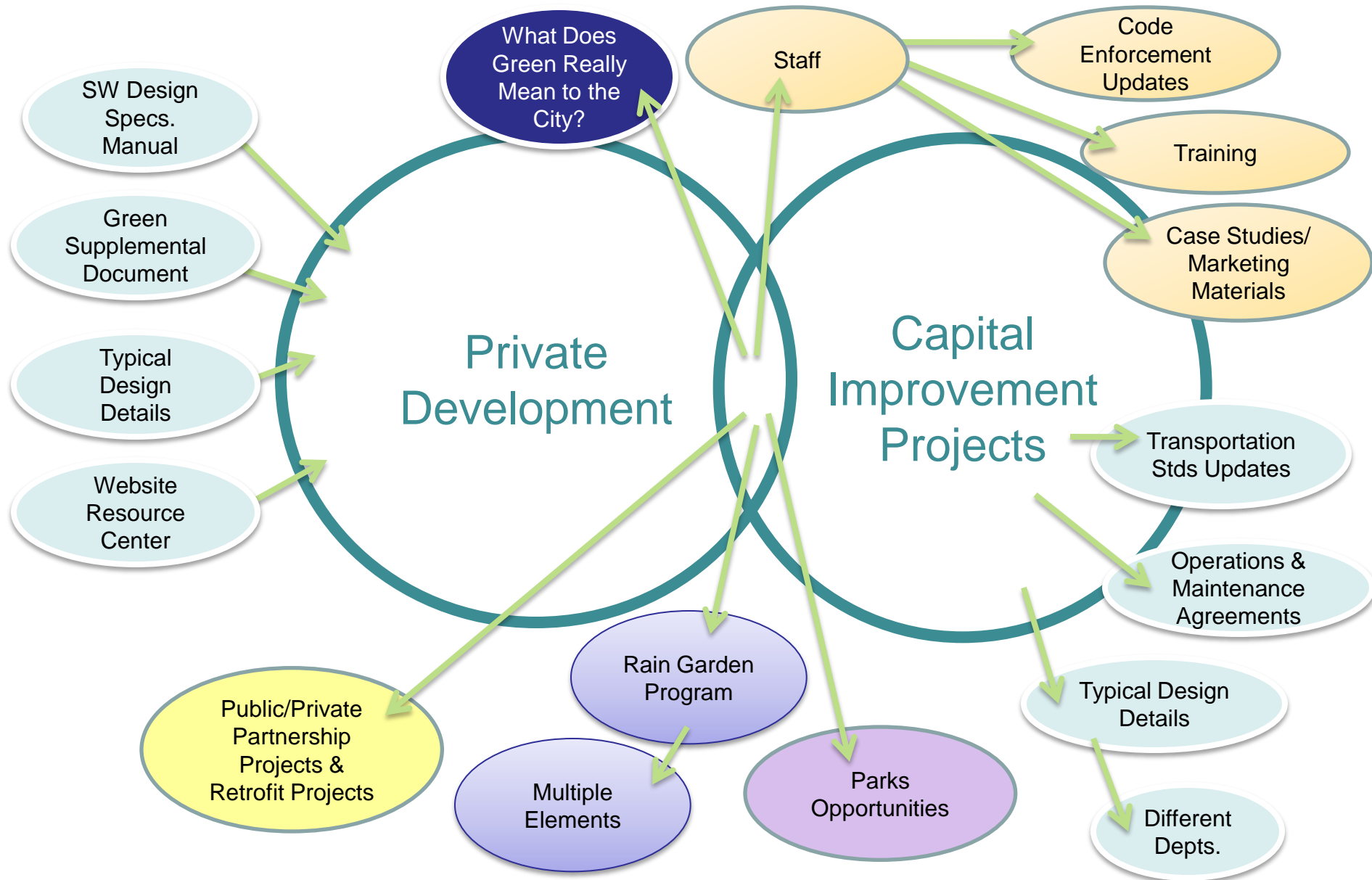
Project Phase	Tasks	Responsibility							
		DM	CM	Indy GIS	DPW O&M	DCE	Designer	RPR	Utilities
Design	Prepare digital submittal						7		
	Review digital submittal, Send it to Indy GIS	7							
	Input data in GIS layers, IMS Hansen Database			7					
Construction	Make sure design plans and specs are followed		7						
	Prepare final digital submittal incorporating changes							7	
	Review digital submittal, Send it to Indy GIS		7						
	Update data in GIS layers, IMS			7					
Operation and Maintenance	Make sure O&M instructions are followed				7				
Restorations	Apply for utility cut permits								7
	Check GIS for existing BMP facilities in the site						7		
	If BMP facilities present, provide restoration instructions to utilities						7		



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## **Update to Chapter 575 Environmental Public Nuisance**

- (6) A rain garden registered with the City of Indianapolis' Rain Garden Registry & Agreement Program and/or determined to be a rain garden by the Marion County Soil and Water Conservation District and/or the Office of Sustainability and/or the Department of Public Works Engineering Division;
- (7) A native wildlife planting registered with the City of Indianapolis' Native Wildlife Planting Registry & Agreement Program and/or determined to be a rain garden by the Marion County Soil and Water Conservation District and/or the Office of Sustainability.





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# Questions?

## Contact:

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