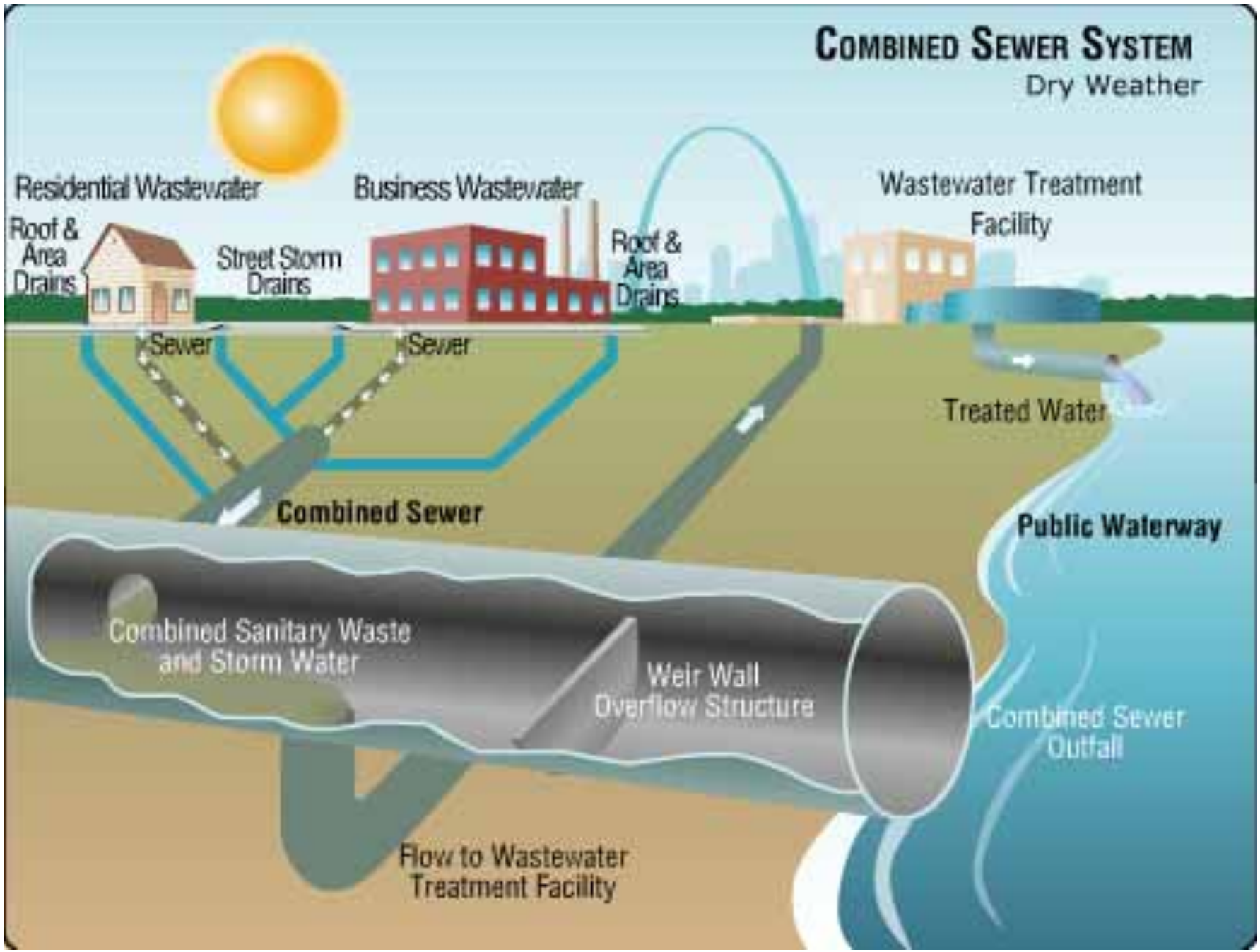
Lord Street Basin CSO Green Infrastructure Retrofit Project

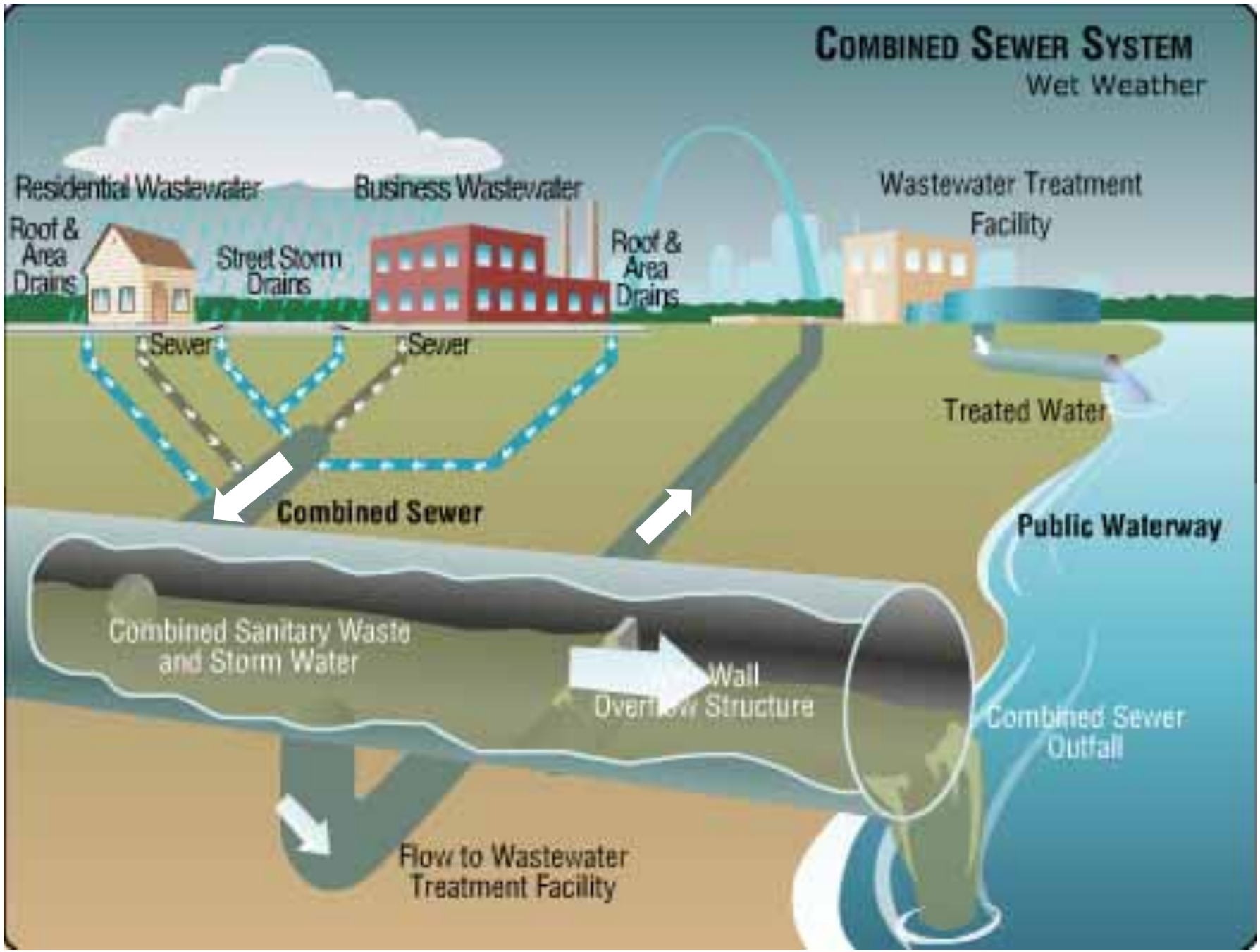
Aaron Cosentino
City of Elgin

Rob Linke, P.E., CFM
Trotter & Associates, Inc.

Green Infrastructure Grant

Funding for this project provided, in part, by the Governor of Illinois and the Illinois Environmental Protection Agency through the Illinois Green Infrastructure Grant Program.


COMBINED SEWER SYSTEM
Dry Weather
Residential Wastewater
Roof & Area Drains
Street Storm Drains
Business Wastewater
Roof & Area Drains
Wastewater Treatment Facility
Sewer
Sewer
Treated Water
Combined Sewer
Public Waterway
Combined Sanitary Waste and Storm Water
Weir Wall Overflow Structure
Combined Sewer Outfall
Flow to Wastewater Treatment Facility

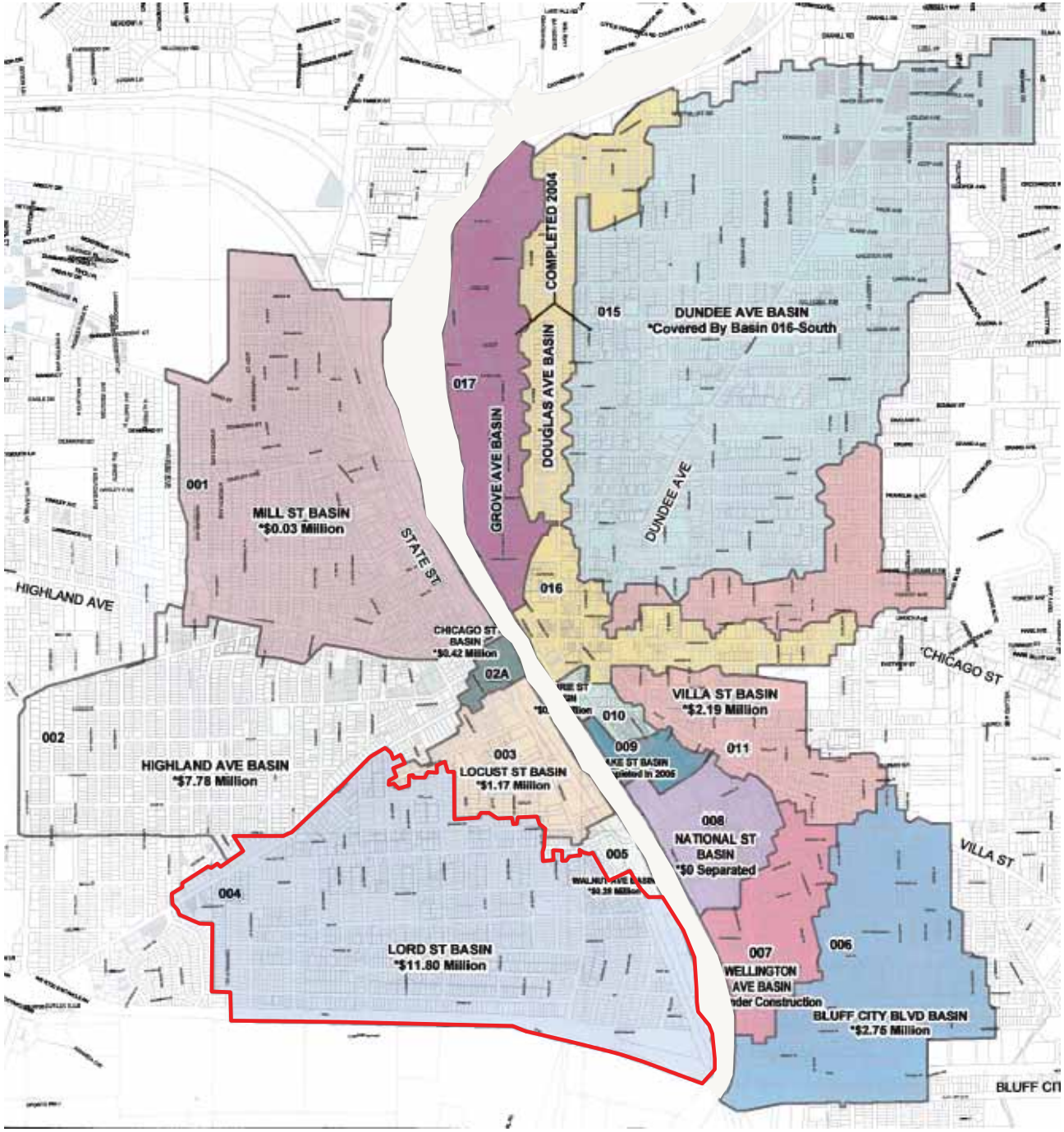


Graphics: Metropolitan St. Louis Sewer District

Combined Sewer Overflows

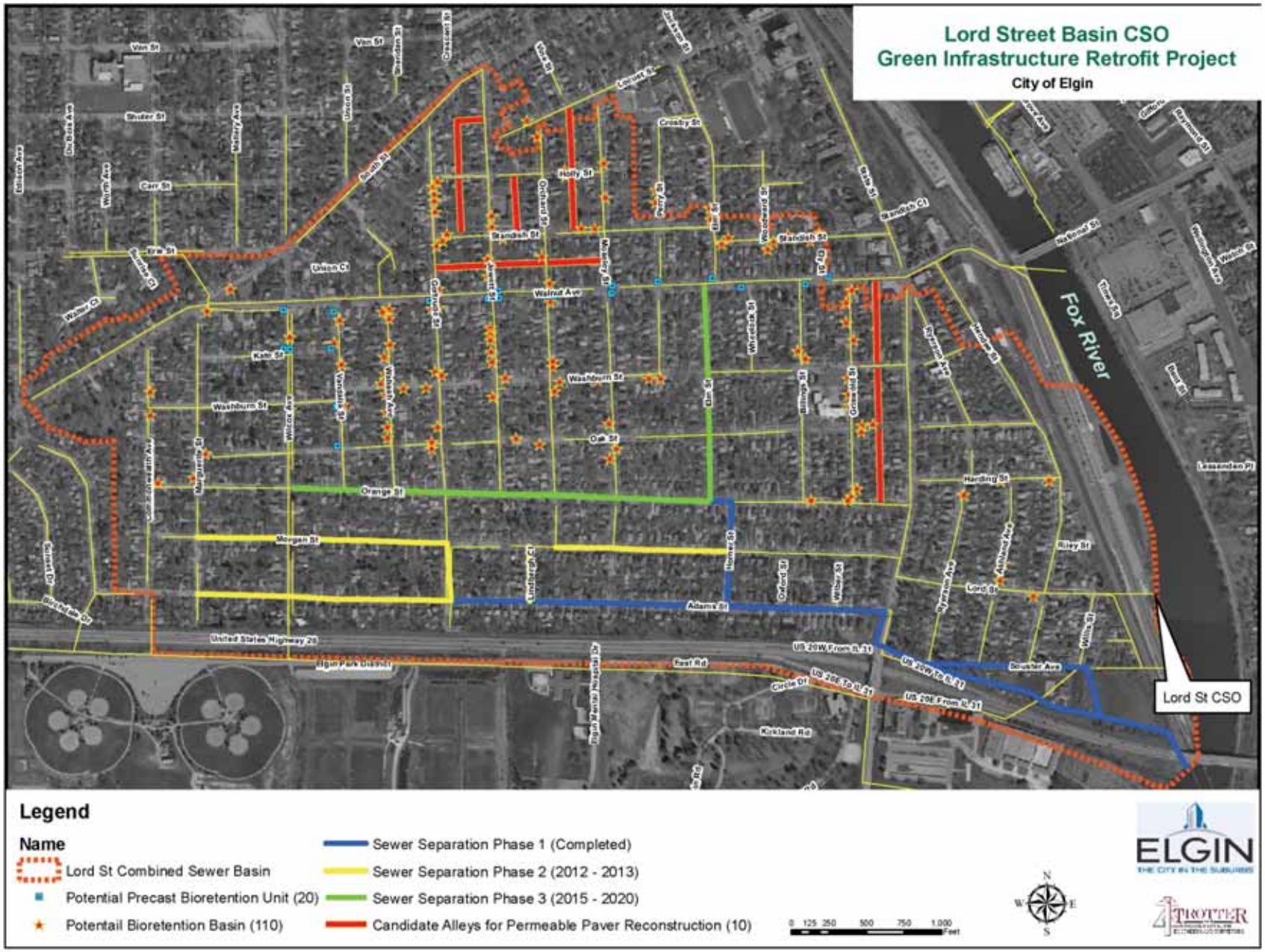
in the City of Elgin

- 3000+ acres
- 11 CSO discharges to the Fox River
- $20+ Million spent so far in sewer separation
- $3 Million/year budgeted for sewer separation projects
- Full street reconstruction planned as sewers are separated; Total Cost = $110+ Million
- LTCP lays out prioritized plan for full separation over a 35 year period.



Lord Street CSO IGIG Scope

- ***Construct BMPs in right-of-way to maximize infiltration of stormwater runoff***
- ***Pilot project to evaluate potential BMPs for application city-wide***
- ***IGIG Deliverables:***
  - ***Construct 20 bioretention basins (~9,000 FT^2)***
  - ***Reconstruct two alleys using permeable pavement***


Lord Street Basin CSO
Green Infrastructure Retrofit Project
City of Elgin
Fox River
Lord St CSO
Legend
Name
Lord St Combined Sewer Basin
Potential Precast Bioretention Unit (20)
Potentail Bioretention Basin (110)
Sewer Separation Phase 1 (Completed)
Sewer Separation Phase 2 (2012 - 2013)
Sewer Separation Phase 3 (2015 - 2020)
Candidate Alleys for Permeable Paver Reconstruction (10)
0 125 250 500 750 1,000 Feet
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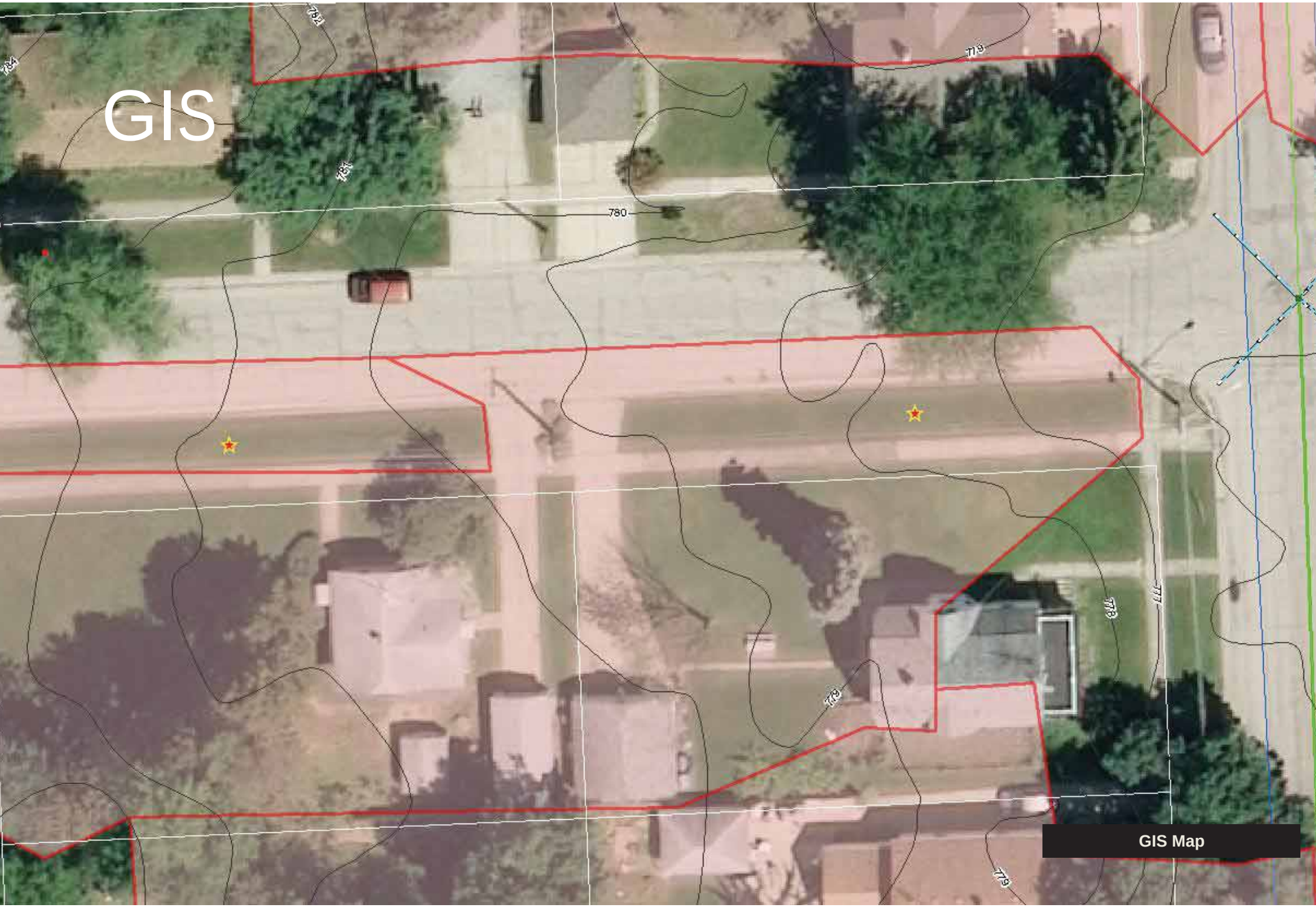
ELGIN
THE CITY IN THE SUBURBS
TRAUTNER

Preliminary Screening


Bing Maps - Bird’s Eye

Google Maps Street View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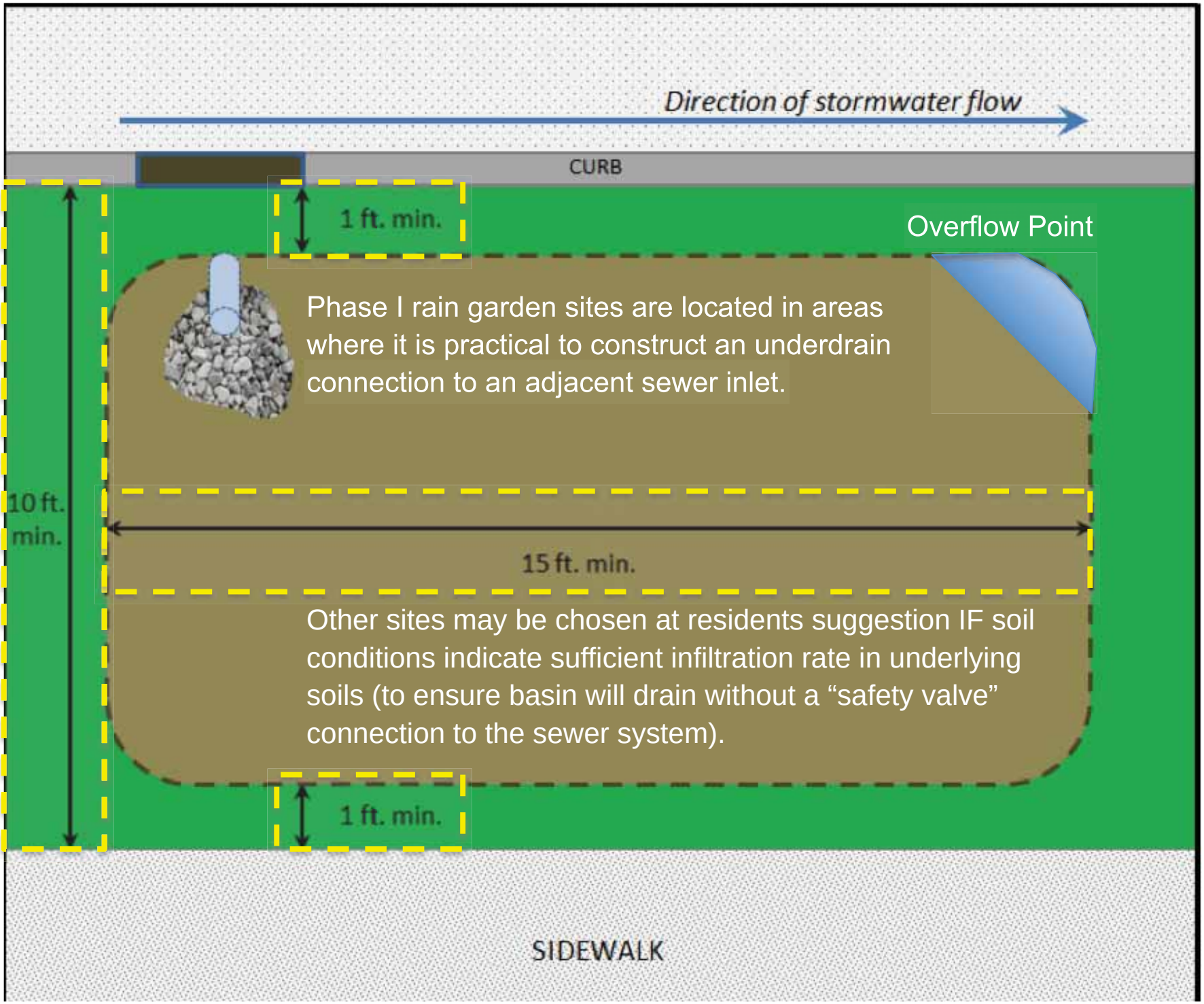
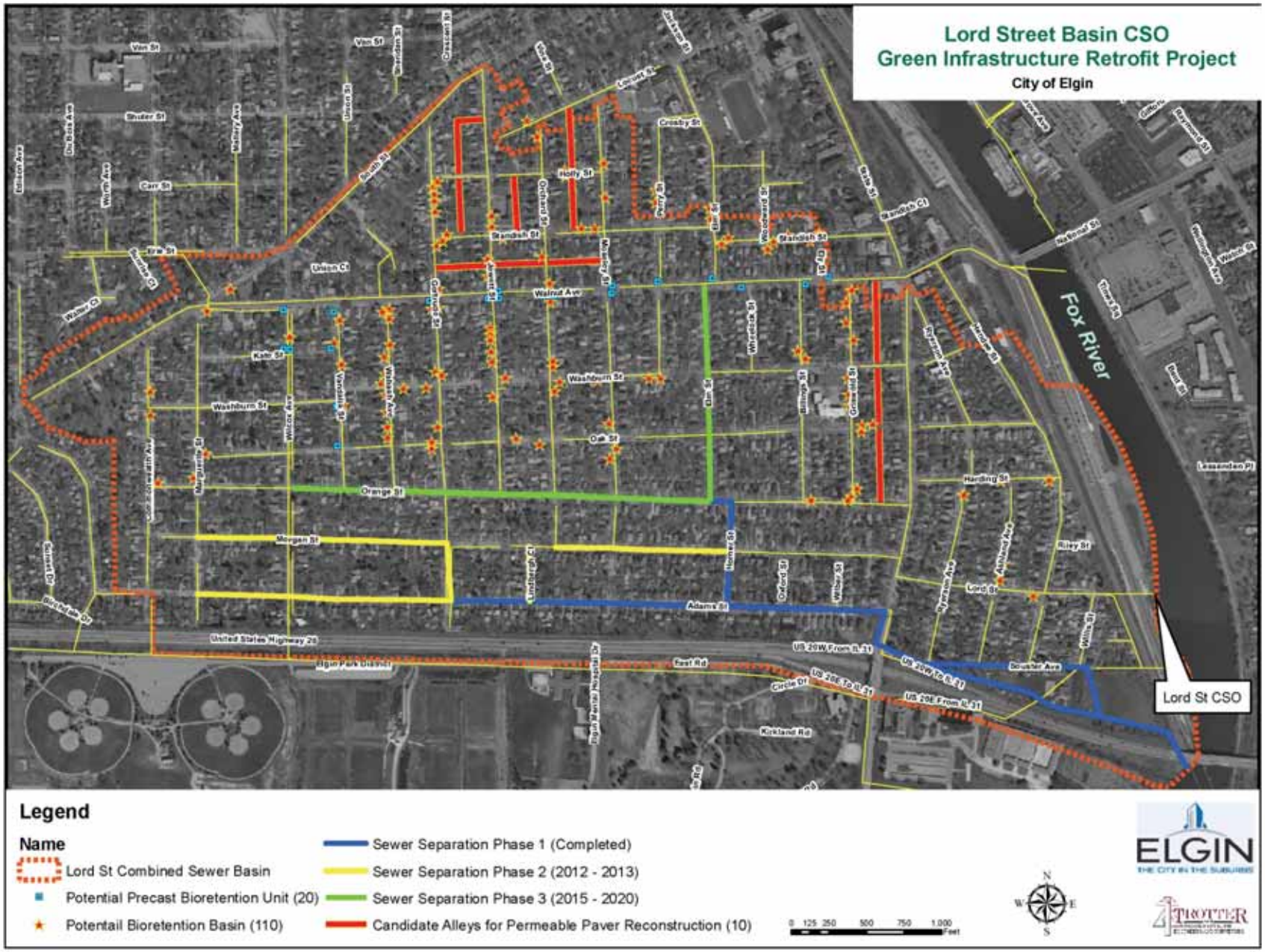
GIS Map


Direction of stormwater flow
CURB
1 ft. min.
Overflow Point
Phase I rain garden sites are located in areas where it is practical to construct an underdrain connection to an adjacent sewer inlet.
10 ft. min.
15 ft. min.
Other sites may be chosen at residents suggestion IF soil conditions indicate sufficient infiltration rate in underlying soils (to ensure basin will drain without a “safety valve” connection to the sewer system).
1 ft. min.
SIDEWALK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0 125 250 500 750 1,000 Feet
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ELGIN
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140
As identified by project team

Help give Elgin **Green** Streets

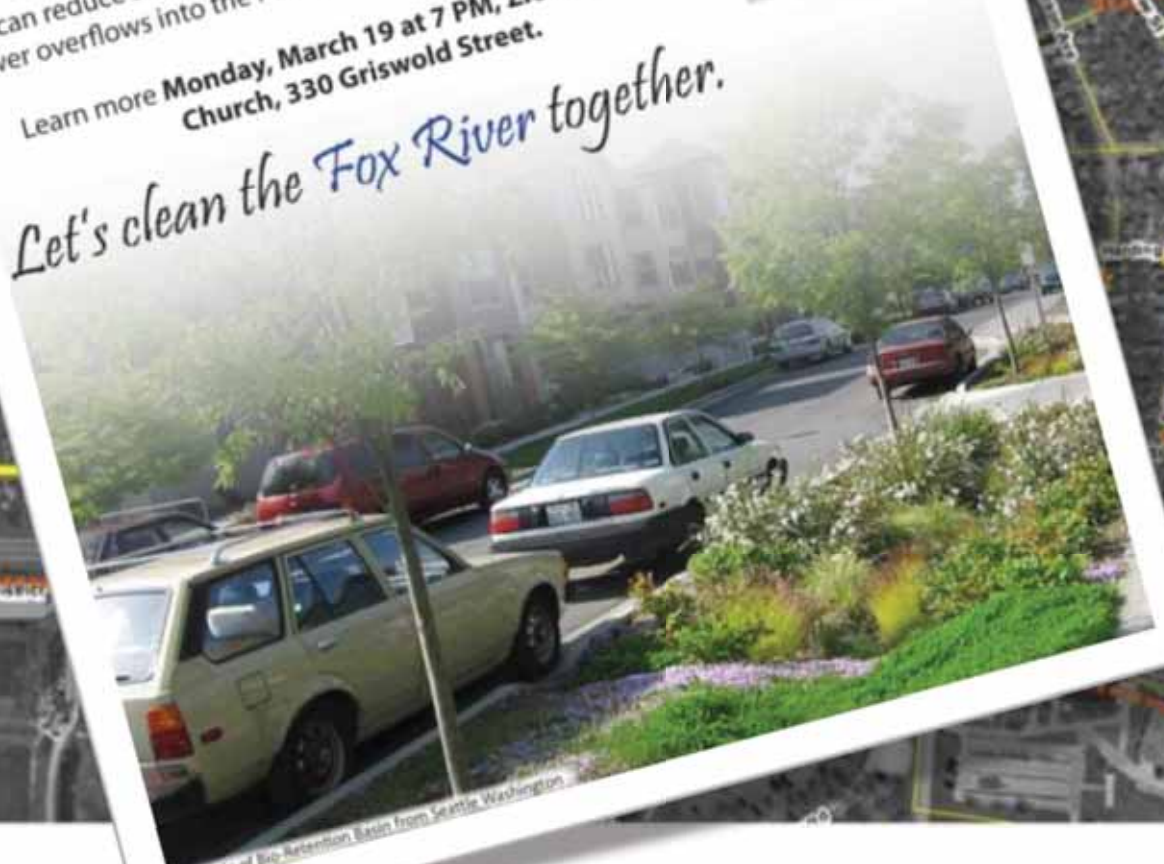
The Illinois Environmental Protection Agency awarded Elgin more than $634,000 to install green infrastrcuture in the Southwest and Northwest Area Neighborhoods.

Using:
- Bio-retention Basins
- Modular 'pre-cast' basins
- Permeable Paver Alleyways

We can reduce stormwater runoff and harmful combined sewer overflows into the Fox River.

Learn more **Monday, March 19 at 7 PM, Zion Lutheran Church, 330 Griswold Street.**

Let's clean the Fox River together.



Example of Bio-Retention Basin from Seattle Washington

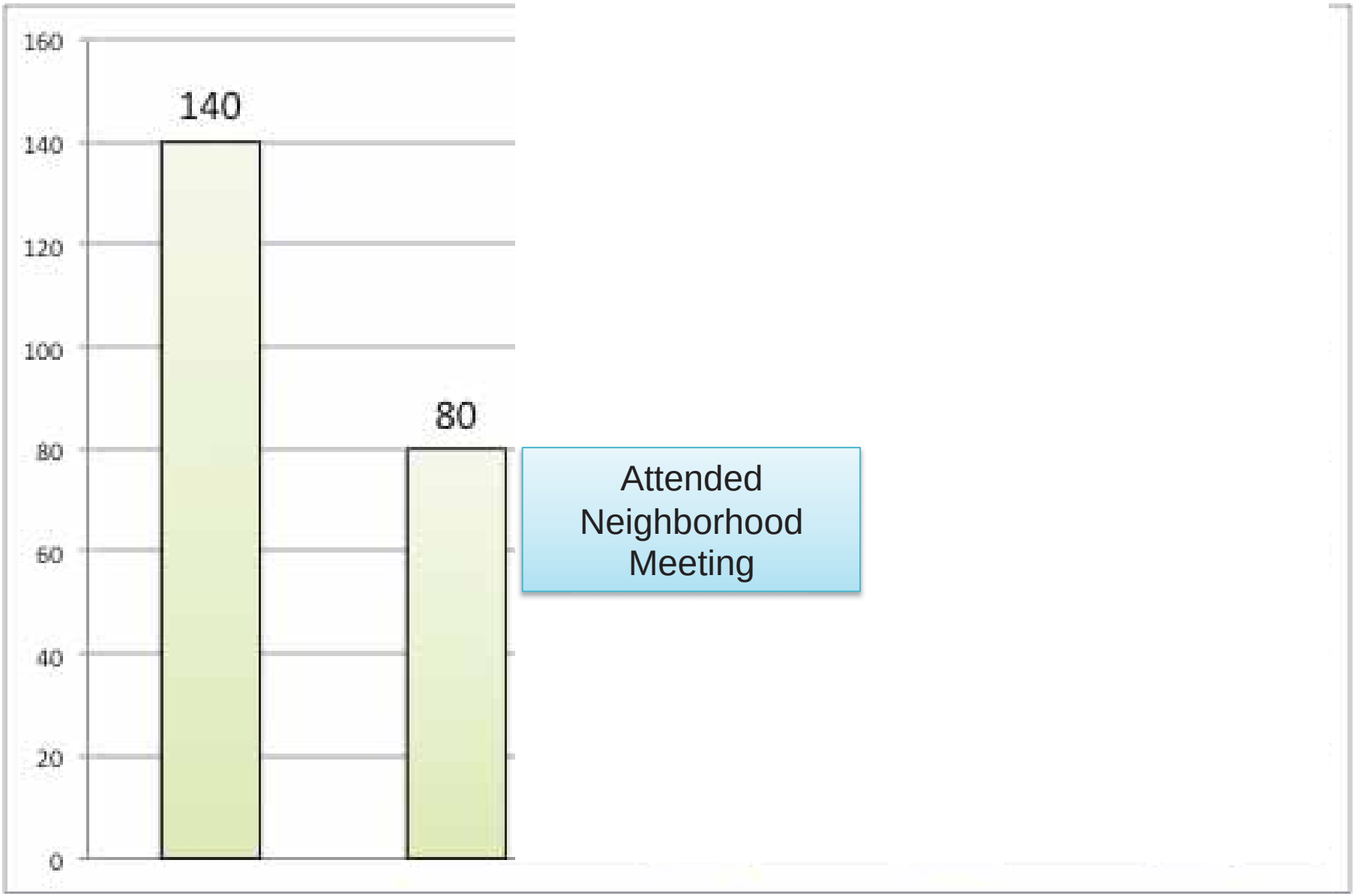
Lord Street Basin CSO Green Infrastructure Retrofit Proje

City of Elgin

Fox River

Lord St C


EVIN'S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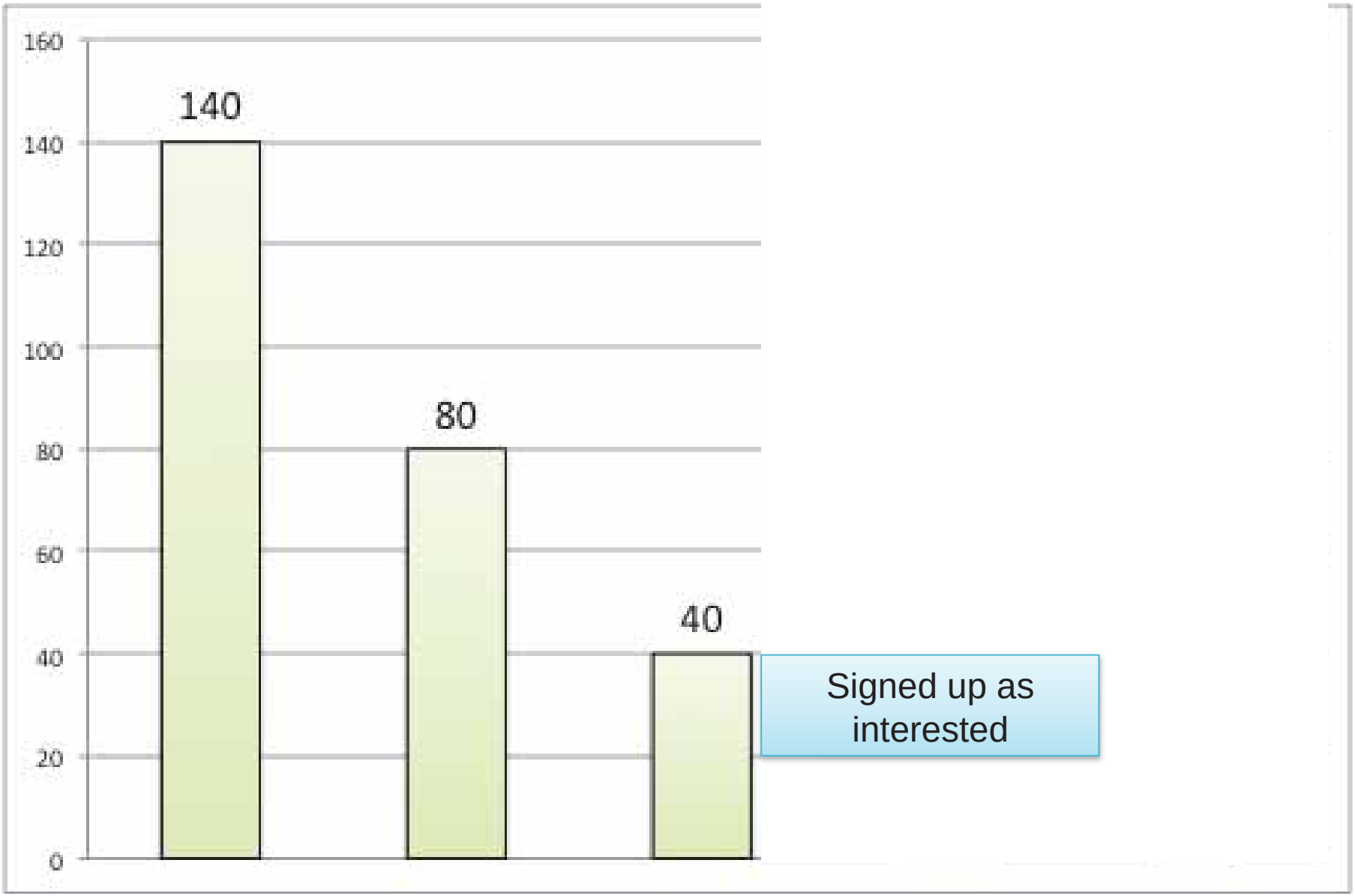
Attended Neighborhood Meeting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Signed up as interested

Public Outreach

Elgin – Lord St.

- Phase I – needed a site meeting with interested residents
- Phase II – site meeting not needed (mailer sent out & interested residents s

Phase II Letter to Residents


ELGIN

February 25, 2013

Current Resident
572 Standish Dr
Elgin, IL 60123

Dear Resident,

The city of Elgin is offering the chance to have **a rain garden designed, installed and planted at no cost to property owners.**

The city of Elgin has committed to protect its natural resources, especially the Fox River. And thanks to a grant from the Illinois Environmental Protection Agency, you can help!

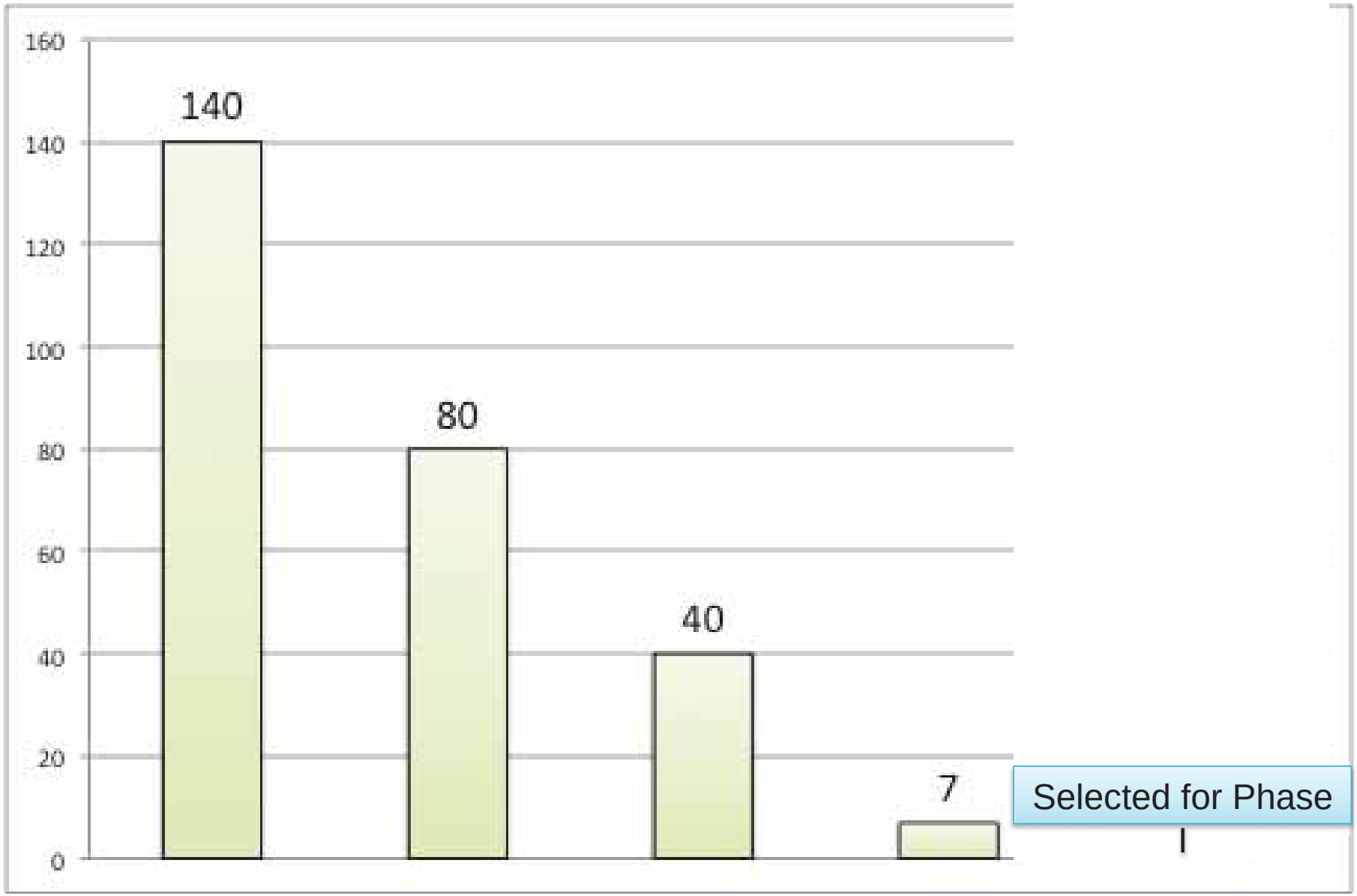
The city received a grant to help your neighborhood soak up rainwater and reduce the chance of a combined sewer overflow. Through the Illinois Environmental Protection Agency's Green Infrastructure Grant Program, Elgin was awarded funds to install more than twenty rain gardens in the Southwest and Near-west Area Neighborhoods.

We have identified your property as a possible place for a parkway rain garden.

To find out more or to sign up to have a rain garden installed please contact Aaron Cosentino, Sustainability Coordinator at 847.214.5861 or via email at cosentinoa_e@cityofelgin.org.

Thank you. We look forward to hearing from you!

Volunteers planting a parkway rain garden at the corner of Perry and Washburn Street, Elgin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Selected for Phase
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Underdrain or no Underdrain?

Elgin – Lord St.

Geotechnical Investigation

- J.U.L.I.E. Utility locate
- Soil Boring to 10 feet
- Infiltration testing
  - 5 foot depth

Filling monitoring well for measurement after pre-wetting 24 hrs earlier.

Soil boring & monitoring well installation in alley selected for permeable pavers.

Measuring water level to calculate infiltration rate.

Elgin – Lord St.

Parkway Rain Garden Design

Infiltration Testing Results

Site Location	2" Dia. Infiltration Test (in/hr)[1]	4" Dia. Infiltration Test (in/hr)[2]
705 Walnut Avenue	0.3	2.8
354 Gertrude Street	0.3*	12.8
377 Gertrude Street	0.3	1.05
553 Walnut Avenue	0.1	0.14
315 Orchard Street[3]	30+	30+
342 Perry Street	0.3	NA
373 Standish Street	0.3*	4.9

[1] Two inch diameter PVC pipe installed via soil drilling rig to depth of 5 ft

[2] Four inch diameter PVC pipe installed via 2-man auger to depth of 4.3 ft

[3] Site soil borings indicated VERY sandy gravel below 3 feet of overlying soil

* 2" Monitoring well drilled with rig and located in street

Lesson Learned: 2” Dia. Boring used for infiltration may not be large enough to provide infiltration data representative of the entire basin.

Elgin – Lord St.

Parkway Rain Garden Design

Typical Planting Plan

City of Elgin

Parkway Rain Garden Program

342 Perry Street Planting Plan

Plant List

Abbreviation	Common Name	Abbreviation	Common Name	Abbreviation	Common Name
ALC	Nodding Wild Onion	IVS	Blue Flag Iris	SCS	Little Bluestem
ASI	Marsh Milkweed	LIP	Prairie Blazing Star	SLR	Stiff Goldenrod
AST	Butterfly weed	MOF	Wild Bergamot	SPH	Prairie Dropseed
ANA	New England Aster	PAV	Switch Grass	TRO	Ohio spiderwort
BAA	Blue Wild Indigo	PHD	Wild Blue Phlox	VEH	Blue Vervain
ECP	Purple Coneflower	PYV	Mountain Mint	ZZA	Golden Alexanders
EUM	Joe Pyeweed	RUH	Black-Eyed Susan		

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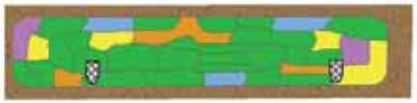
0 5 Feet

Bloom Schedule (not to scale)

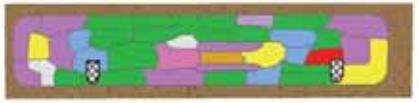
May



June

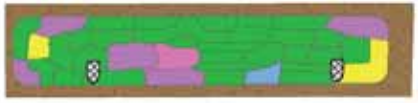
July

August



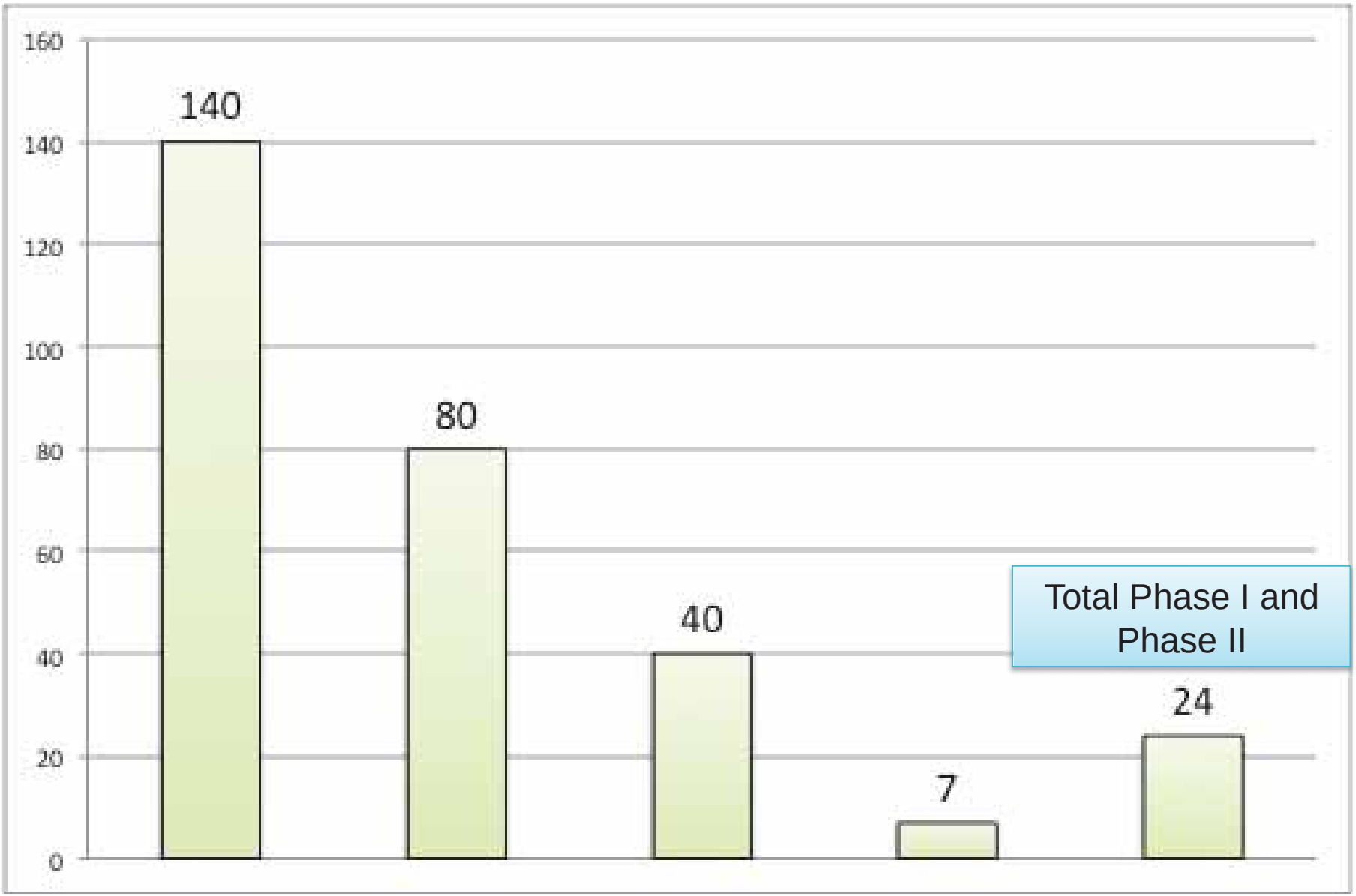
September

October



Prepared by Trotter and Associates, Inc. St. Charles, IL


FERRY ST
SCHULTZ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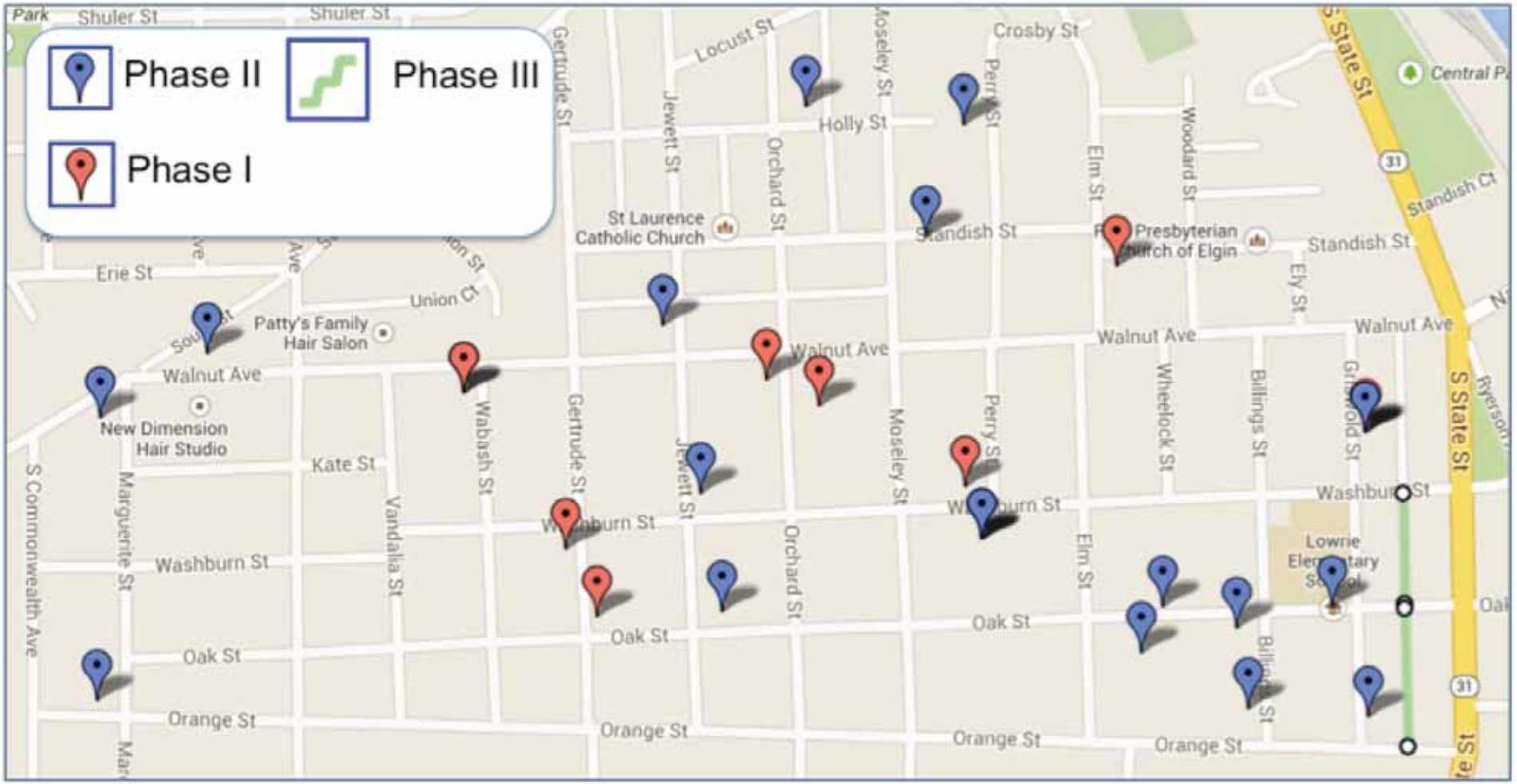
Total Phase I and Phase II


Phase II
Phase III
Phase I
Park
Shuler St
Shuler St
Gertrude St
Locust St
Moseley St
Crosby St
Holly St
Perry St
Elm St
Woodard St
S State St
Central P
31
Standish Ct
St Laurence
Catholic Church
Jewett St
Orchard St
Standish St
Presbyterian
Church of Elgin
Standish St
Ely St
Erie St
Union Ct
Patty's Family
Hair Salon
Walnut Ave
Walnut Ave
Walnut Ave
Wheelock St
Billings St
Ryerson
New Dimension
Hair Studio
Kate St
Wabash St
Gertrude St
Jewett St
Moseley St
Perry St
Washburn St
Washburn St
Washburn St
Lowrie
Elementary
School
Oak St
Oak St
Oak St
Orchard St
Elm St
Billings St
S Commonwealth Ave
Marguerite St
Vandalia St
Orange St
Orange St
Orange St
Orange St
31


STOP

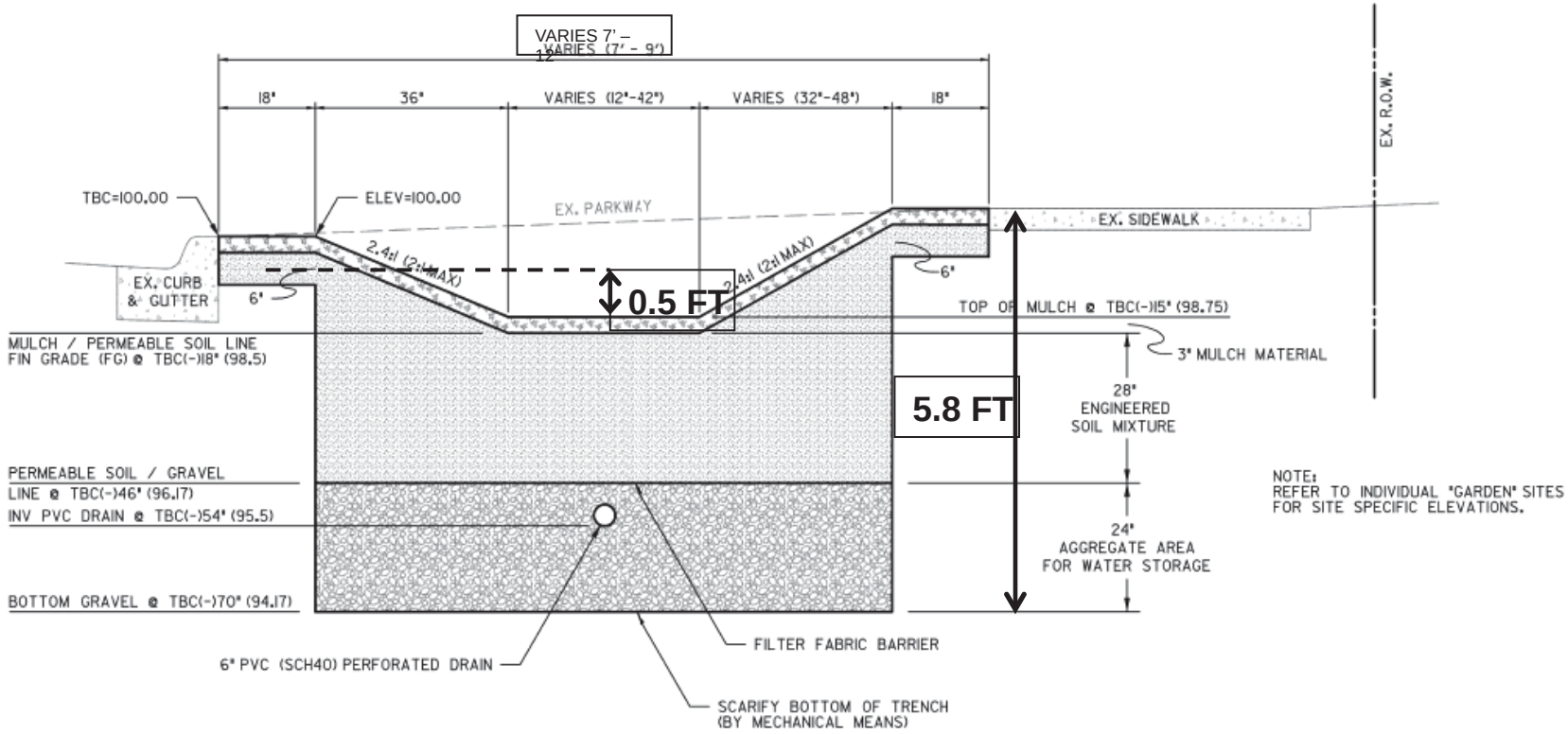
Cost Information

Parkway Rain Garden

Initial Proposed Design

Parkway Rain Garden

Initial Proposed Design



Rain Garden - Typical Cross Section

Phase I Parkway Rain Garden

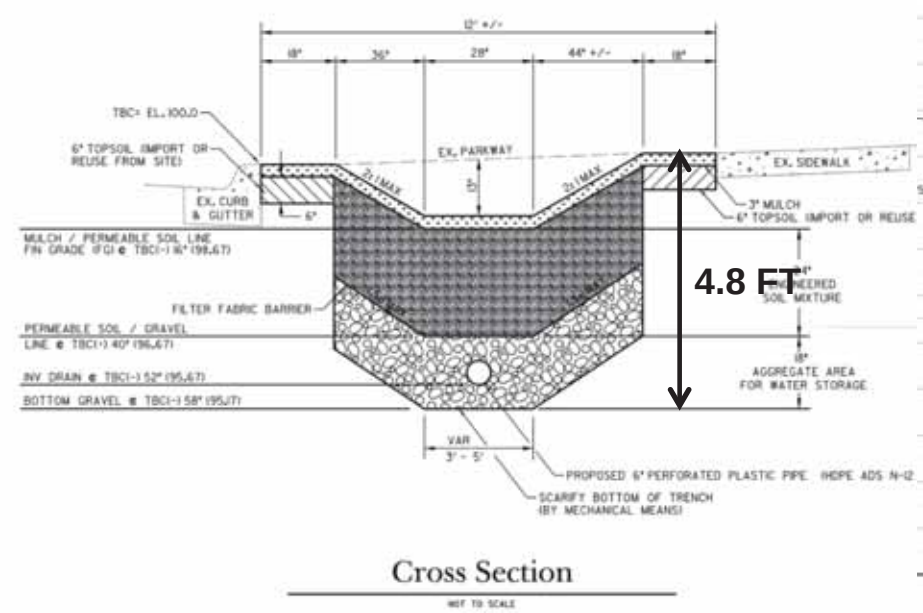
- Bidding advertised & coordinated by City of Elgin in June 2012
- Phase 1 Bids Opened
  - Engineer's Estimate: $122,000
  - Bids Received: $155,000 - $235,000

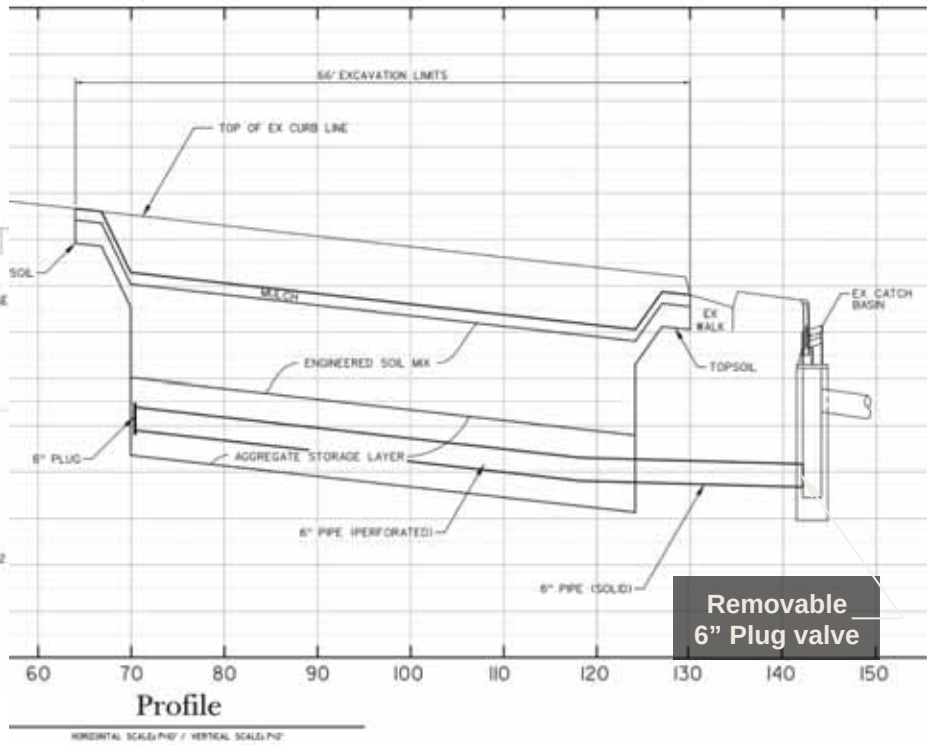
Back to the drawing board!

Phase I Parkway Rain Gardens

Changes to Reduce Cost

- Eliminate valves & piping
- Reduce aggregate stone layer
  - Also reduced total excavation depth!





Phase I Parkway Rain Garden Re-Design

- Project Re-Bid in October 2012
- One basin bid separately to allow plant installation in 2012.
- Phase 1 Bids Opened
  - Engineer's Estimate: $94,000
  - Bids Received: $103,000 - $135,000

However, lowest bid did not meet Elgin's bidder requirements; next lowest price was $127,000, added $4,000 to the cost of each basin!

Phase II Parkway Rain Garden

- Project Re-Bid in July 2013
- Phase 2 Bids Opened
  - Engineer's Estimate: $189,900 (19 basins)
  - Bids Received: $304,110 - $316,590
  - Est. $35/sq ft, came in at $50 - $60 per sq ft

Why?

Item	Original Scope	Revised Scope	Notes
Parkway Rain Gardens (Qty. 24)	$308,291	$444,677	Prices revised from $25 per sq ft, to $50 - $60 a sq ft
Structural Rain Gardens (Qty. 10)	$194,710	$-	Eliminated due to budget constraints
Permeable Paver Alleys (Qty. 2)	$112,000	$160,160	Prices revised from $10/sq ft to $16/sq ft
TOTAL CONSTRUCTION	**$615,001**	**$604,837**	
Engineering & Soil Infiltration Testing Cost	$131,150	$168,565	Change Order #1 included additional engineering services for phase I re-bid
CCDD Soils Cost per 2011 IEPA Requirement	$-	$13,385	
Total Project Amount	**$746,151**	**$786,787**	
Grant Reimbursement		$637,500	
Net Project Cost to City		**$149,287**	

Resident Guide

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A homeowners how-to guide for planting and maintaining a rain garden

Major Components of a Parkway Rain Garden

Rain gardens can either be a simple, depressed basin or a more labor-intensive multi-layered system. Multi-layered rain gardens will be constructed with the 2011 IGIG funding received by the City of Elgin. This funding will be used to implement stormwater reduction practices which include many parkway rain gardens. These parkway rain gardens are designed to achieve the greatest amount of infiltration to effectively store stormwater runoff and where feasible, an underdrain system will be installed to allow for sufficient drainage.

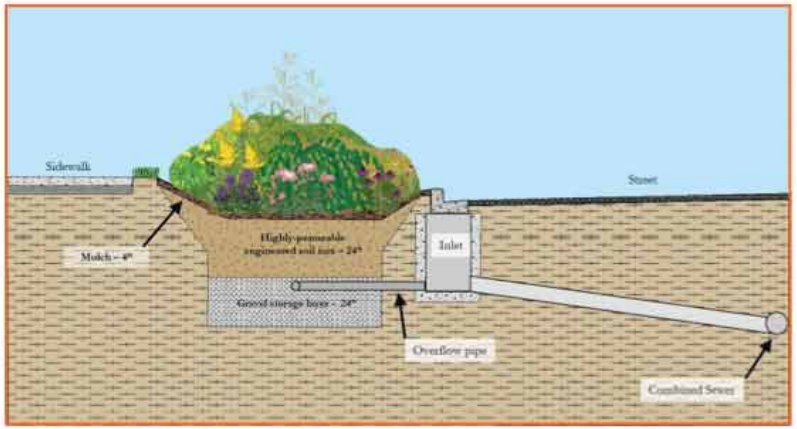
Structural Features:

- **Curb cuts or inlet structures**—Located in the curb line of the adjacent street. The curb cuts allow stormwater flow to enter each rain garden before being captured directly into the existing combined sewer inlets. Cuts made into the curb will typically be 2 feet long. Inlet structures look similar to sewer inlet structures with a grated cover and a pipe connection into the ponding area of the rain garden.


Rain garden in Madison, WI

- **Vegetated ponding area**— This area is the depressed portion of the rain garden which provides the surface storage for the runoff and the opportunity for it to infiltrate. The ponding area depth will be 12-18 inches below the existing ground surface. Parkway rain gardens are planted with native flowers, grasses and shrubs. Native plants are able to handle the different environmental conditions of a rain garden. The key function of the plants is to uptake nutrients and other pollutants as well as to increase the infiltration rate by creating paths for the water to flow along the roots. Small stone is placed around the outlet of the pipe to help prevent erosion from occurring within the basin.


City of Madison Rain Garden Program



- **Groundcover Perimeter**—To assure ample space is provided between the edge of a sidewalk, driveway, or curb and the edge of the rain garden when it begins to slope downward, 1.5-3 ft of level land will around the rain garden. A groundcover will be planted to surround the perimeter on the level land to provide a border.
- **Mulch layer**— The mulch used should be a hardwood to prevent it from floating and should be spread in an even layer 2-4 inches thick. The mulch layer protects the soil from excessive drying, regulates the soil temperature (keeping it cool in the warm summer months), and helps to control weeds.
- **Engineered soil layer**—The engineered soil layer is a mixture of sand and compost. Topsoil can also be used in the mixture. The combination of sand and compost allows for maximum infiltration and storage of water but includes enough organic material for the vegetation to grow well. The engineered soil layer is 24-36 inches thick.
- **Storage layer**—The storage layer promotes infiltration and is typically gravel. The storage layer is 24-48 inches thick.
- **Underdrain**—An underdrain is used in rain gardens as an outlet for the runoff that cannot be infiltrated and to ensure proper drainage for plants. The underdrain system consists of a perforated pipe that runs along the bottom of the rain garden at the top of the storage layer. To prevent clogging, the pipe is protected with a filter fabric for a filter sock.

Note: An underdrain will only be installed in rain gardens that have an adjacent sewer inlet. The connection to the sewer inlet will be made but will initially be blocked with a plug. Unless the rain garden does not fully drain within 24 hours after a storm event will the plug be removed by City Public Works personnel.

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Parkway Rain Gardens – Criteria for Location

Is my parkway suitable for a rain garden?

The criteria used for selecting the location of a parkway rain garden are:

1.The terrace must be at least 10 feet wide from the back of curb to the edge of sidewalk.

2.The rain garden must be a minimum of 15 feet long.

3.Trees, power poles, and light poles need to be at least 10 feet from the edge of the rain garden.

4.Driveways and sidewalk ramps need to be at least 3 feet from the edge of the rain garden.

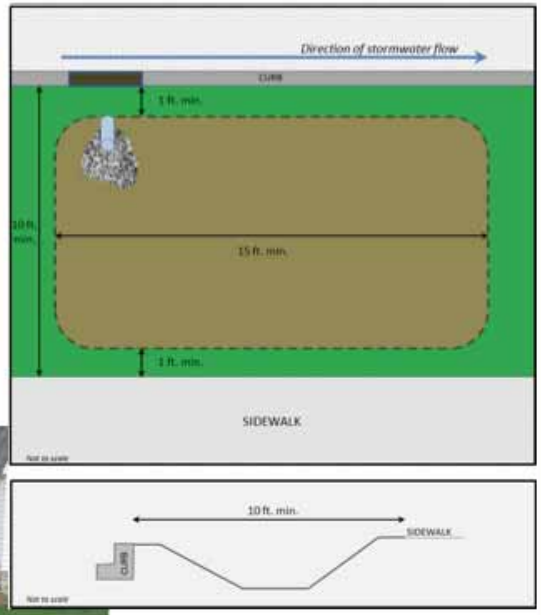
5.The rain garden will need to overflow back into the curb, away from the sidewalk/house. Therefore, the lowest ground surface needs to be as close to the curb as possible.

6.The terrace cannot be too steep in either direction (lengthwise or crosswise).

7.Parkways located near where sewer inlets are present are preferred for Phase I rain garden selection. Rain gardens constructed in Phase I will be equipped with an underdrain connection to an adjacent sewer inlet.

Other sites that are not adjacent to a sewer inlet may be chosen at a resident's suggestion IF soil conditions indicate sufficient infiltration in underlying soils (to insure basin will drain without a "safety valve" connection to the sewer system).

If you are unclear as to a site's suitability, contact the Project Team to do a site visit and make a determination based on the above criteria.



A plan and profile view of a typical parkway rain garden layout.

A well qualified parkway for a potential rain garden.

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Shorter Rain Garden Plants

1 feet- 4 feet tall

KEY
- Partial Shade/ Shade
- Full Sun
- Full Sun/ Partial Shade

1 Dense Blazing Star
(*Liatris spicata*)
Height: 2-3 feet
Light: ○
Moisture: Medium to Moist
Blooms: June to frost

2 Black-Eyed Susan
(*Rudbeckia hirta*)
Height: 1-2 feet
Light: ○ ◐
Moisture: Medium to Moist
Blooms: May to frost

3 Blue Wild Indigo
(*Baptisa australis*)
Height: 2-4 feet
Light: ○ ◐
Moisture: Medium
Blooms: May - July

4 Butterfly Weed
(*Asclepias tuberosa*)
Height: 1-2 feet
Light: ○ ◐
Moisture: Dry to Medium
Blooms: May-June

5 Nodding Wild Onion
(*Allium cernuum*)
Height: 1-2 feet
Light: ○
Moisture: Medium to Moist
Blooms: June - August

6 Wild Bergamot
(*Monarda fistula*)
Height: 2-3 feet
Light: ○ ◐
Moisture: Dry to Medium
Blooms: Late May to Fall

7 Purple Coneflower
(*Echinacea purpurea*)
Height: 3 feet
Light: ○ ◐
Moisture: Medium to Moist
Blooms: June - frost

8 Mountain Mint
(*Pycnanthemum virginianum*)
Height: 2-3 feet
Light: ○ ◐
Moisture: Medium to Moist
Blooms: June to September

9 Blue Flag Iris
(*Iris virginica shrevei*)
Height: 2-3 feet
Light: ○ ◐
Moisture: Moist to Wet
Blooms: May – July

10 Cardinal Flower
(*Lobelia cardinalis*)
Height: 2-4 feet
Light: ○ ◐
Moisture: Moist to Wet
Blooms: July - September

11 Jacob's Ladder
(*Polemonium reptans*)
Height: 1-2 feet
Light: ○ ●
Moisture: Moist to Wet
Blooms: July - September

12 Golden Alexanders
(*Zizia aurea*)
Height: 1-3 feet
Light: ○ ◐
Moisture: Moist
Blooms: April - June

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Common Weeds

The next few pages are meant to help you as a homeowner easily identify common weeds found in gardens and turf grass here in Northeast Illinois.

Crabgrass (*Digitaria sanguinalis)*

Classification: Grassy weed
Appearance: Mat forming, purple stems that can grow usually 15 inches or less.
Life Cycle: Summer annuals

Dandelion (*Taraxacum officinale)*

Classification: Broadleaf weed
Appearance: Dandelions emerge above a long, sturdy tap root. The leaves are deep, jagged lobes and are 2 to 10 inches long. The flowers are yellow, up to 2 inches in diameter and turn into round "puffballs" as they mature. Stems are hollow and can grow up to 20 inches long.
Life Cycle: Cool season perennial

Creeping Charlie or Ground Ivy *(Glechoma hederacea)*

Classification: Broadleaf weed
Appearance: Forms as patches with stems that grow up to 2 ½ feet long. The flowers occur in April to June and are small and lavender in color.
Life Cycle: Cool season perennial

Broadleaf Plantain *(Plantago major)*

Classification: Broadleaf weed
Appearance: Forms a spreading of broad leaves with flowering stalks.
Life Cycle: Cool season perennial

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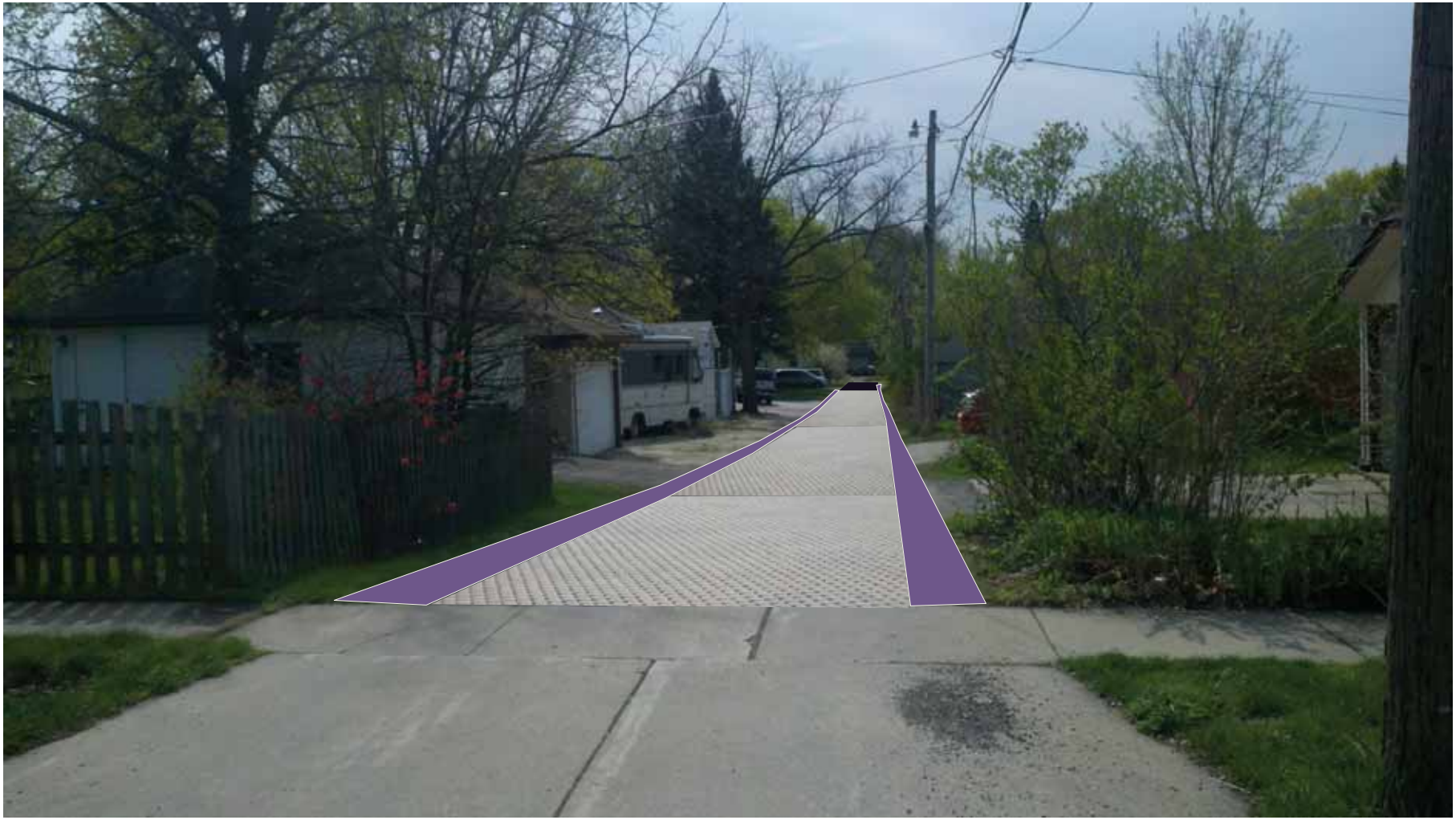
Elgin – Lord St.

Phase III: Alley Reconstruction with Permeable Pavers (Construction in 2014)



South Alley (Looking South)

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Regulatory Information

Chapter 13.21
RIGHT-OF-WAY BIORETENTION BASINS

Sections:

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Activity	Schedule
• Visually inspect rain garden	• Monthly and after significant rain events, noting standing water, areas of erosion, plugged overflow structure.
• Remove trash	• Monthly or as desired.
• Replenish mulch layer	• Minimum every other year; annually is best; 3” thickness over basin area.
• Weeding	• Monthly for new installation, semi-annual in subsequent years
• Replace plants	• Late spring, if needed
• Watering	• Only following initial installation; none thereafter
• Fertilizer	• None

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RIGHT-OF-WAY BIORETENTION BASINS

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13.21.060 ENFORCEMENT:

The City, its representatives, or representatives of the State of Illinois, may inspect any bioretention basins installed in the City right-of-way pursuant to this chapter. In the event a participating property owner fails to perform or inadequately performs the maintenance required in this chapter, as determined by the City, of if the bioretention basin becomes inoperable or falls into a state of disrepair, the City may elect to perform the required maintenance activities or, in its sole discretion, may elect to remove the planted vegetation and replace the same with turf grass or other appropriate groundcover. The City may, in its sole discretion, provide a participating property owner with notice of the required maintenance and allow the participating property owner an opportunity to perform the same. If the planted vegetation is removed and replaced with turf grass, the participating property owner shall remain responsible for routine maintenance of the abutting parkway, including mowing and weed removal in the parkway, as is currently required of property owners pursuant to chapters 9.16 and 16.12 of the Elgin Municipal Code, 1976, as amended.

Chapter 13.21
RIGHT-OF-WAY BIORETENTION BASINS

Sections:

USGS
science for a changing world

Prepared in cooperation with the City of Madison and Wisconsin Department of Natural Resources

Evaluation of Turf-Grass and Prairie-Vegetated Rain Gardens in a Clay and Sand Soil, Madison, Wisconsin, Water Years 2004–08

County, Wis., evaluated the effectiveness of rain gardens with different soil types and vegetative species for stormwater infiltration. Two rain gardens, one planted with turf grass and the other with native prairie species, were constructed side-by-side in two locations of different soil types, sand and clay. Instruments were installed to measure the volumetric mass balance of each rain garden from late 2003 through 2008. Root morphology, soil texture, and other subsurface properties were characterized so that differences in storage capacity and infiltration rates between vegetation and soil type could be understood.

Results of the study show that each rain garden, regardless of vegetation or soil type, was capable of storing and infiltrating most of the runoff during the 5-year study period. Median infiltration rates for rain gardens in sand were greater than those in clay. Within each soil type, rain gardens with prairie vegetation had greater median infiltration rates than those with turf grass. Infiltration was generally highest during spring and summer and lowest during winter. Despite reduced infiltration rates during months when soils were likely frozen, the hydraulic function of the rain gardens did not appear to be appreciably altered.