

Green Infrastructure Impact Assessment Louisville Metropolitan Sewer District NACWA 2012 Winter Conference

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February 14, 2012

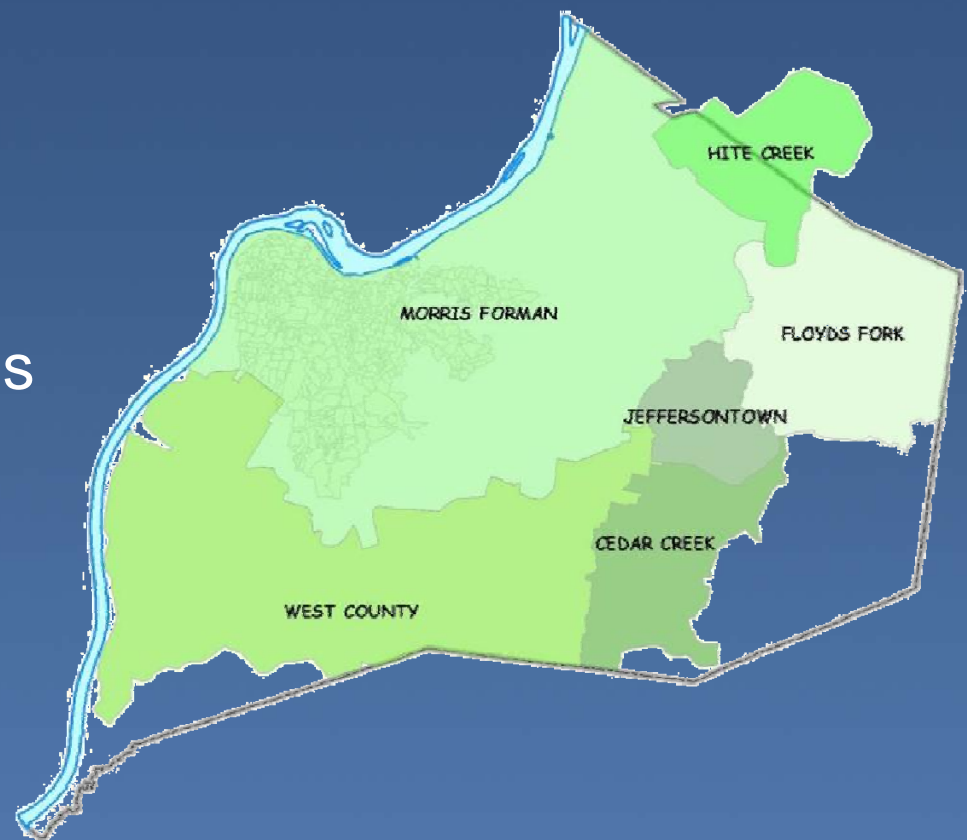
MSD Overview

- Flood protection
- Wastewater treatment
- Stormwater management



MSD Facilities

- 385 sq. miles
- Pop. 700,000
- Ohio River Flood Protection System
- 16 flood pump stations
- 29 miles of floodwall
- 6 regional WQTCs
- 14 small WQTCs
- 286 pump stations
- 3,200 miles of sewers



Louisville MSD's Green Program

Practice Types

- Downspout disconnection
- Pervious pavement
- Tree boxes
- Green alleys
- Bio-infiltration
- Rain gardens
- Urban reforestation

Impervious Surfaces in the CSS

The following is a breakdown of the primary landuse types and distribution of the total impervious area throughout the CSS.

- | | |
|-----------------------|-----------------------|
| • Roads | 26 percent impervious |
| • Single Family | 27 percent impervious |
| • Industrial Property | 17 percent impervious |
| • Commercial Property | 13 percent impervious |
| • Other | 17 percent impervious |

Goals and Objectives of Green Program

- Optimize green practice opportunities
 - ✓ Green to gray cost effectiveness
 - ✓ Maximize GMP drainage capture
 - ✓ Meet IOAP requirements
- Develop right sizing approach for future basins

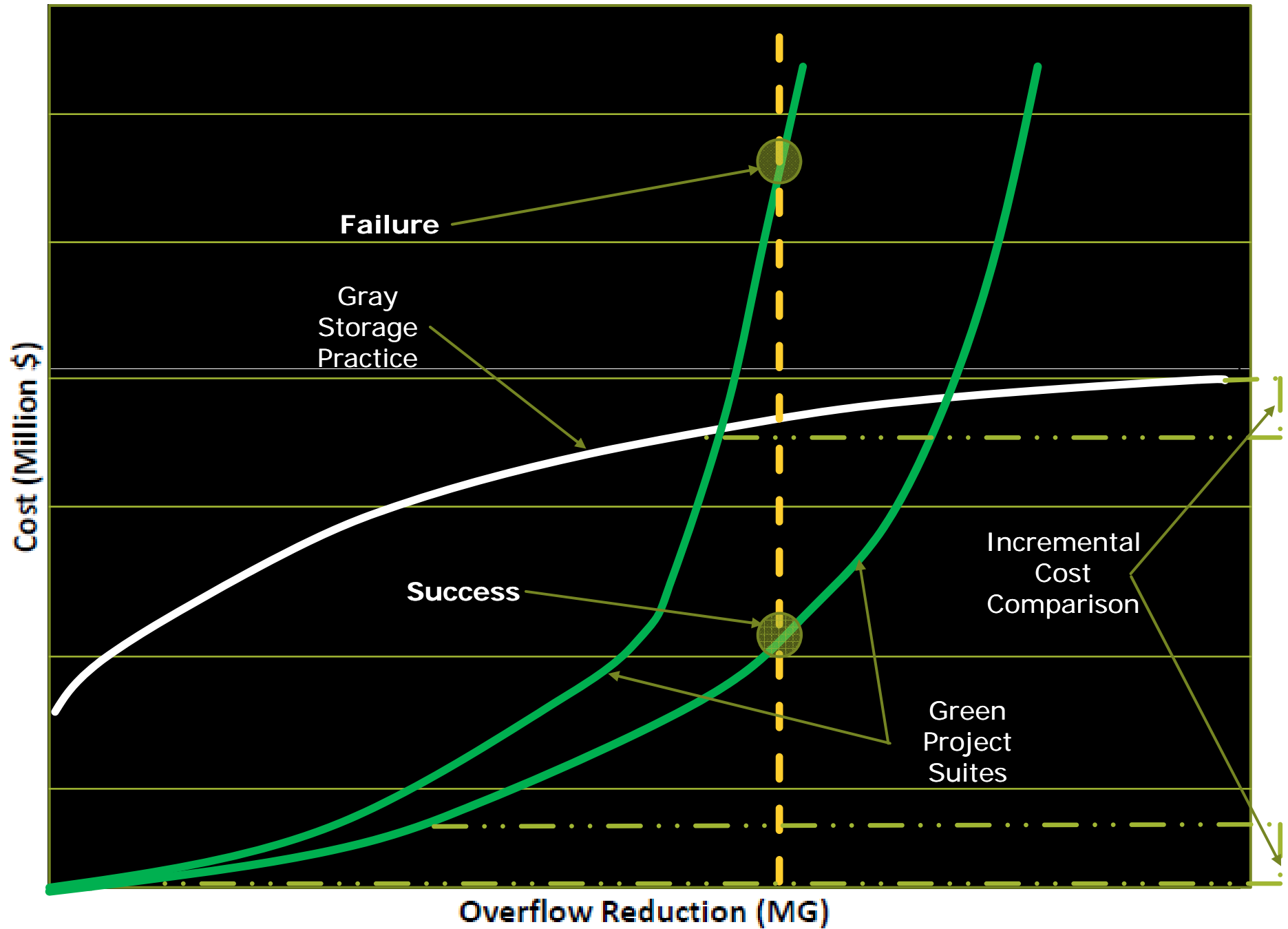


Collaboration on Green

First CRADA Community

- 3 year effort-potential for up to 10 years
- EPA's involvement in GI validation process
- Establish gallons removed compared to gray
- Evaluate and establish long term trends
- Standardize design criteria/O&M
- Standardize modeling parameters
- Other ancillary benefits
- Partner with University of Louisville

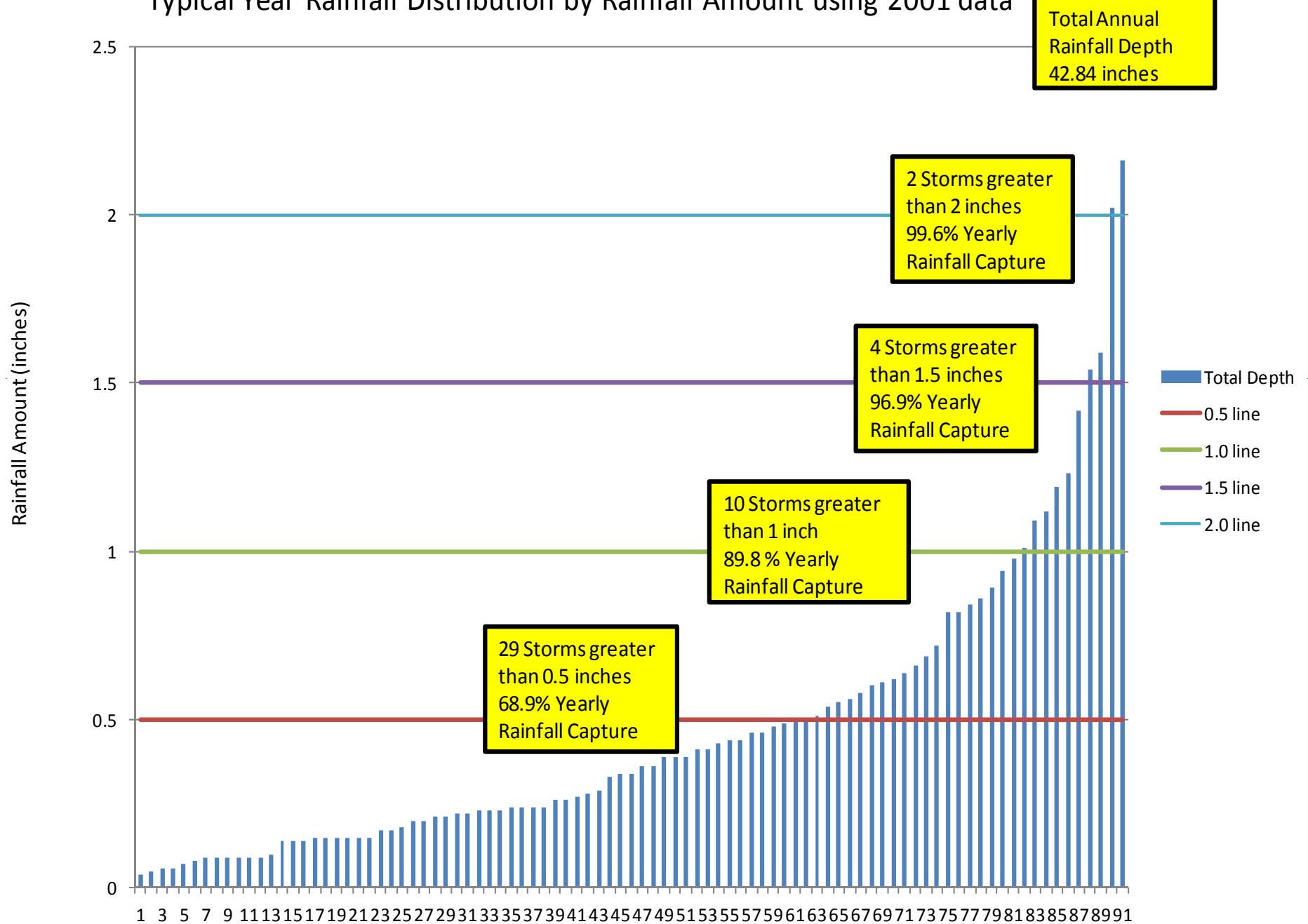
Gray to Green Right Sizing Trend

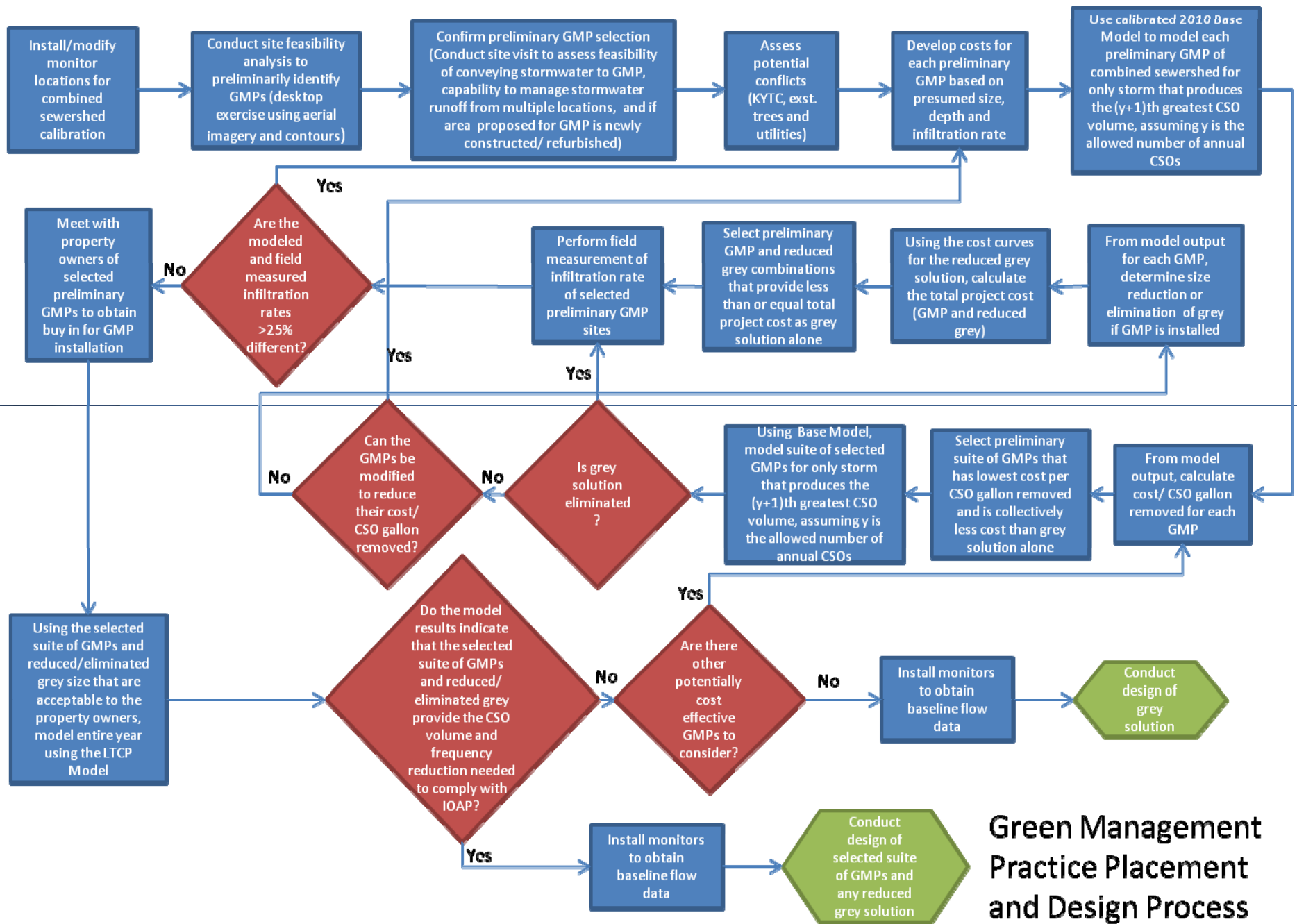


Key Project Components

- Site selection criteria
- Modeling
- Sewer flow monitoring/GMP practice monitoring
- Outreach and education
- Business case analysis
- Practice survey and infiltration testing
- Design and construction

Typical Year Rainfall Distribution by Rainfall Amount using 2001 data

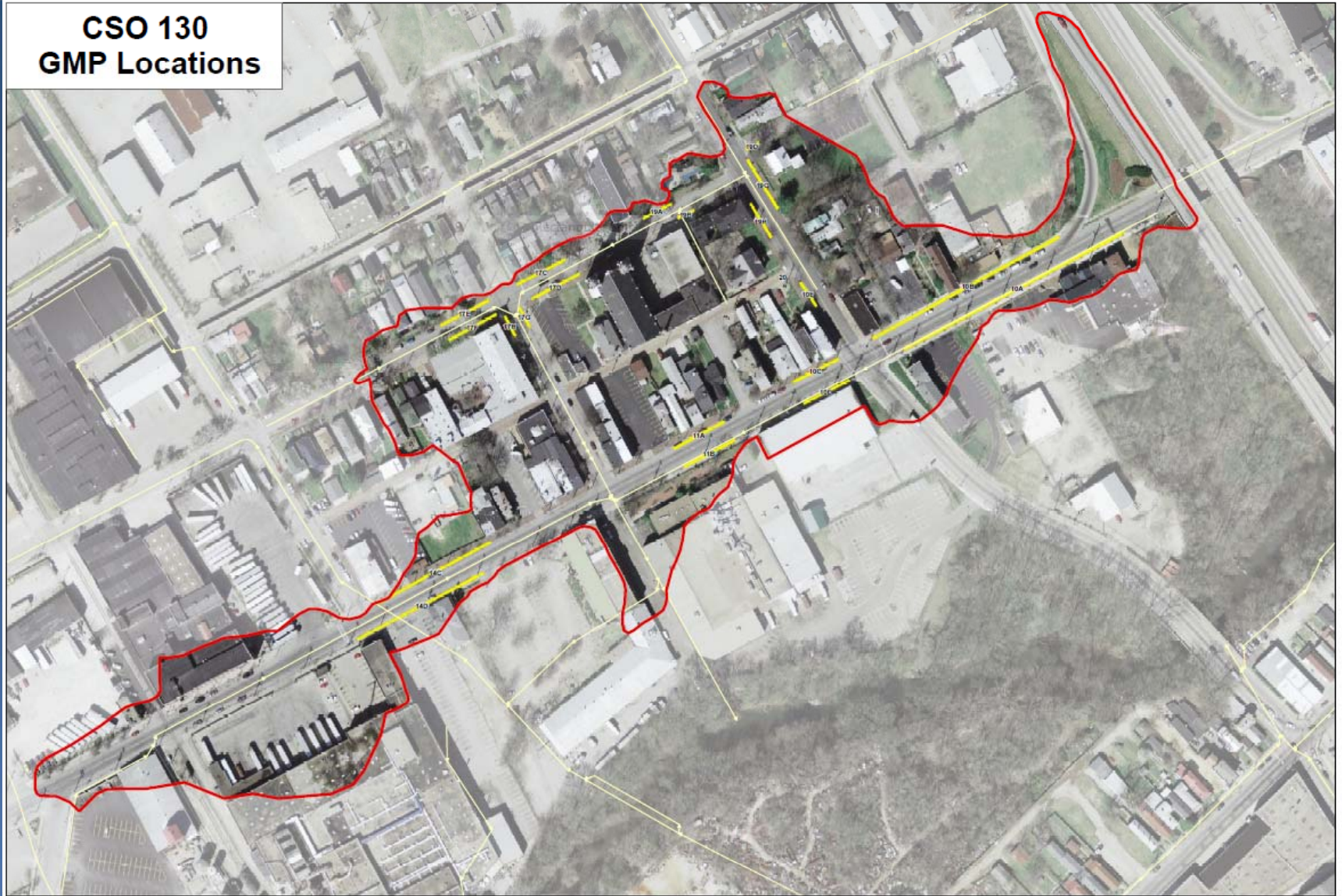




Private vs. Public

- 10% or 16 Practices on Private Property in CSO 190
- All 22 Practices in CSO 130 are in Public Right of Way
- Private Drainage Area Routed to a Practice
 - Property Owner Cooperation to Disconnect Downspouts and Drain Over Surface
 - Re-routing Directly Connected Downspouts Directly into the GMP

CSO 130 GMP Locations



CSO 130 GMP Model Results

CSO 130 Spill Occurrences

Date/Event		Existing Conditions Vol (MG)	Post GMP Solutions (MG)
11/29/01 08:29:41 AM	1	0.1973	0.14018
09/09/01 11:57:20 PM	2	0.1895	
05/07/01 11:58:20 PM	3	0.1826	
09/07/01 11:59:50 PM	4	0.1489	
12/16/01 04:50:34 PM	5	0.1329	
10/14/01 09:59:34 AM	6	0.1208	0.06379
10/12/01 06:59:26 AM	7	0.1124	0.05749
10/05/01 07:58:49 PM	8	0.0843	0.03535
11/27/01 06:58:32 AM	9	0.0397	0.00353

*2001 Typical Year; Start = 10/5/1001; Duration = 8 weeks

**6 storms triggering overflows in the existing conditions model occurred during this time period

Final CSO 130 Practice Suite

GMP ID	Description	Length (ft)	Width (ft)	Infiltration Loss (in/hr)	Estimated Cost
10A	Tree Boxes	88	5.17	20	\$102,700
10B	Tree Boxes	88	5.17	20	\$102,700
10C	Pervious Strip	110	8	1.5	\$36,100
10D	Pervious Strip	120	8	1.5	\$39,100
10E	Pervious Strip	75	8	1.5	\$25,700
11AB	Pervious Strip	140	8	1.5	\$45,100
14C	Pervious Strip	100	8	6	\$33,100
14D	Pervious Strip	80	8	6	\$27,100
17C	Pervious Strip	40	8	40	\$15,200
17D	Pervious Strip	45	8	40	\$16,700
17E	Pervious Strip	40	8	40	\$15,200
17F	Pervious Strip	55	8	40	\$19,700
17G	Pervious Strip	70	8	40	\$24,200
17H	Pervious Strip	70	8	40	\$24,200
19AB	Pervious Strip	100	8	1.5	\$33,100
19D	Pervious Strip	75	8	1.5	\$25,700
19G	Pervious Strip	120	8	1.5	\$33,800
19H	Pervious Strip	55	8	1.5	\$15,500
20	Pervious Strip	20	20	1.5	\$17,600
				TOTAL:	\$652,500

CSO 130 Results

- Volume and Overflows Predicted Doubled
- Total Green Project Costs Still Below Original IOAP
- 10,760 Square Feet of Permeable Pavement
- 34 Tree Boxes

Option	Total Cost	POST AAOV	POST # OF / YR
Gray Only	\$1,576,476	0.67 MG	8
Green Only	\$652,500	0.28 MG	8



STORY AVE./ADAM ST. INTERSECTION LOOKING SOUTHWEST (BEFORE)



STORY AVE./CABEL ST. INTERSECTION LOOKING SOUTHWEST (BEFORE)



STORY AVE./ADAM ST. INTERSECTION LOOKING SOUTHWEST (AFTER)



STORY AVE./CABEL ST. INTERSECTION LOOKING SOUTHWEST (AFTER)

Adams Street Installation



Adams Street Installation



CSO 190 GMP Model Results

CSO 190 Spill Occurrences

Date/Event		Existing Conditions Vol (MG)	Post GMP Solutions (MG)
05/07/01 03:00:03 PM	1	2.28	
09/09/01 01:00:04 PM	2	2.23	
11/28/01 03:00:08 PM	3	2.19	
10/12/01 03:00:02 AM	4	2.00	0
09/07/01 01:00:03 PM	5	1.95	
10/05/01 03:00:04 PM	6	1.66	0
10/14/01 02:00:03 AM	7	1.66	0
12/16/01 01:00:06 PM	8	1.39	
11/27/01 03:00:02 AM	9	1.35	0

*2001 Typical Year; Start = 10/5/1001; Duration = 8 weeks

**6 storms triggering overflows in the existing conditions model occurred during this time period

CSO 190 Results

- 440 Tree Boxes
- 41,020 Square Feet Permeable Pavement
- 180 Linear Feet on Infiltration Trench
- 345 Bioswales
- 2,038 Square Feet of Rain Garden

Option	Total Cost	POST AAOV	POST # OF / YR
Gray Only	\$5,201,140	3.65 MG	8
Green Only	\$5,242,000	0.70 MG	8

CSO 190 GMP Locations



Project Feasibility & Implementation Plan

- Property owner participation
- Phased construction approach
- Long-term community project
 - Tree planting expansion CSO 130
 - Park and open space
 - Vacant land usage

Community Park Opportunities



Tree Planting Opportunities



Monitoring Lead – USEPA ORD



Detailed QAPP

Helps document the steps necessary for compliance with the Integrated Overflow Abatement Plan (IOAP)

The goals of the QAPP:

- Document the process and monitoring of each GMP's hydrologic performance to reduce CSO discharge volume and frequency
- Develop specific objectives for determining the effectiveness of each GMP
- Transportability of data

Implementation and Monitoring

- Infiltration Rates at Various Depths
- Individual GMP & Collective Stormwater Reductions
- Anticipated & Measured Overflow Reductions
- Long Term Inspection & Maintenance
- Local Rainfall Gages
- Ambient and Surface Temperatures
- Amended Soil Moisture Conditions
- Process & Case Study Development

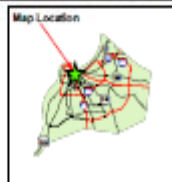
Monitoring in Louisville



U of L Belknap Campus



Legend
Sewer Lines
 — SANITARY SEWER
 — COMBINED STORM & SANITARY
 — FORCE MAIN
 — OVERFLOW



**University of Louisville
 Belknap Campus**
 Green Infrastructure Performance Assessment
 Conceptual Green Management Practices (GMPs)

Map Created: 3/1/2011

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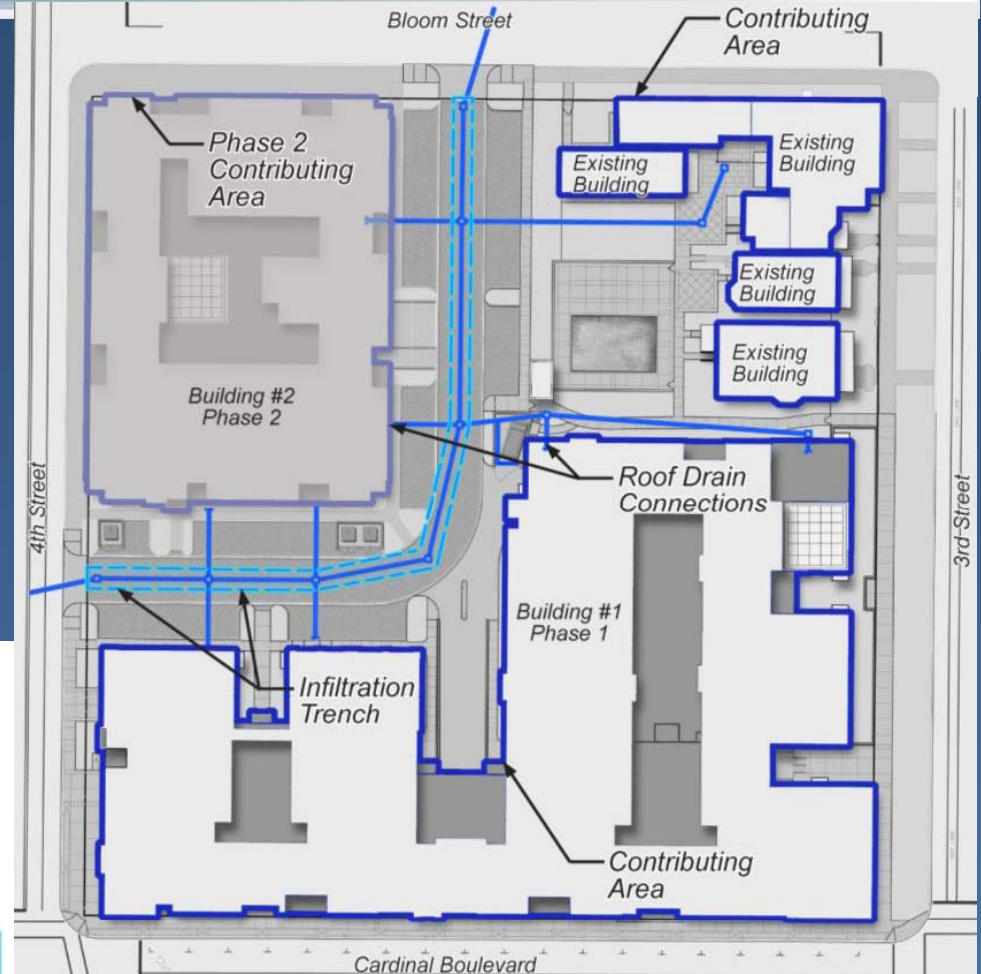
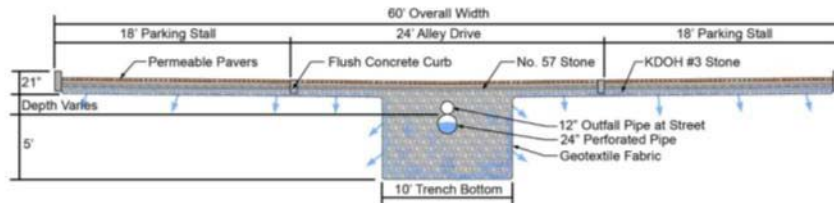


Infiltration Trench

INFILTRATION TRENCH

Phase 1 Contributing Surface Area: 74,559sf
 Less Green Roof: -12,570sf
 Net Contributing Surface Area: 61,989sf
 Storage Volume Provided: 8,826cf

Gallons of Water Treated: 66,018gal
 (The gallons treated are based on a 3/4" 1st flush rain event.)



Next Steps

- Regulatory check in
- Project construction
- Monitoring equipment installation
- Post construction impact analysis
- Relative cost from gray to green
- Long term maintenance & function
- Ancillary benefits of green?
- Expand Implementation to Other Areas

Thank you

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