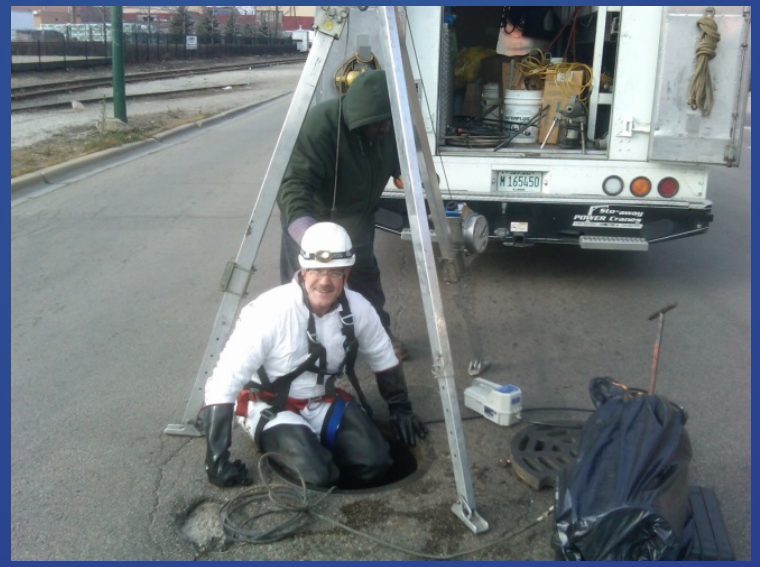
Monitoring Performance and Effectiveness of Urban Stormwater Best Management Practices

Jim Duncker, USGS
Kuldip Kumar, MWRDGC
Janet Attarian, CDOT

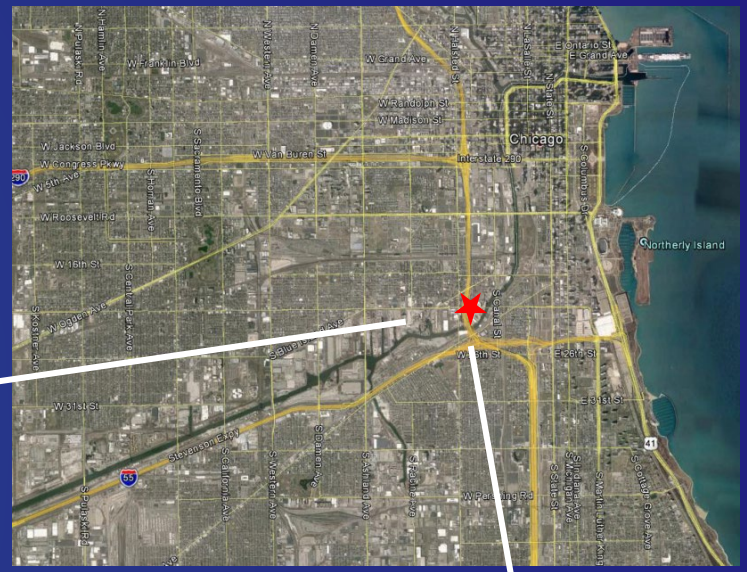


USGS science for a changing world

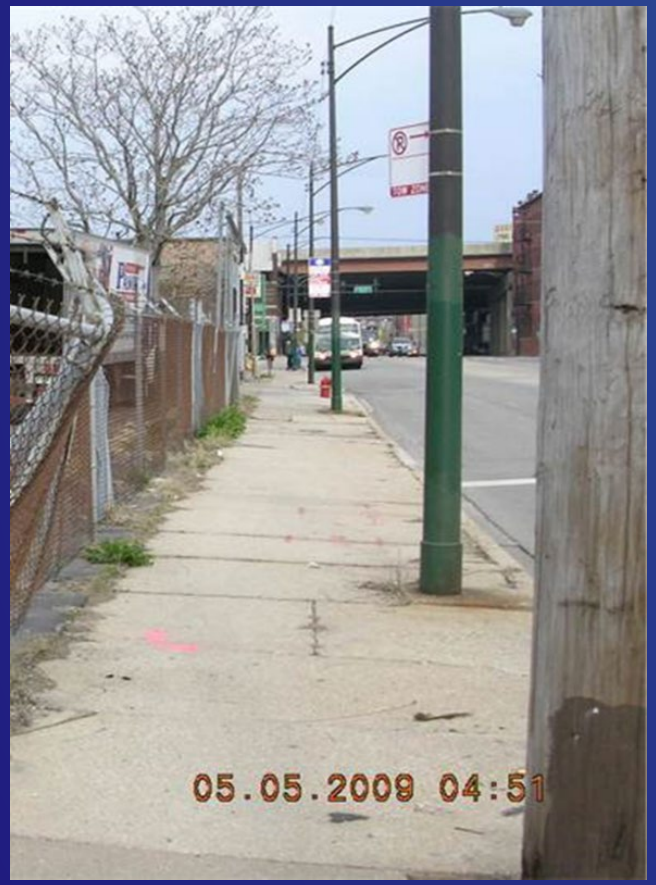
CDOT CHICAGO DEPARTMENT OF TRANSPORTATION

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

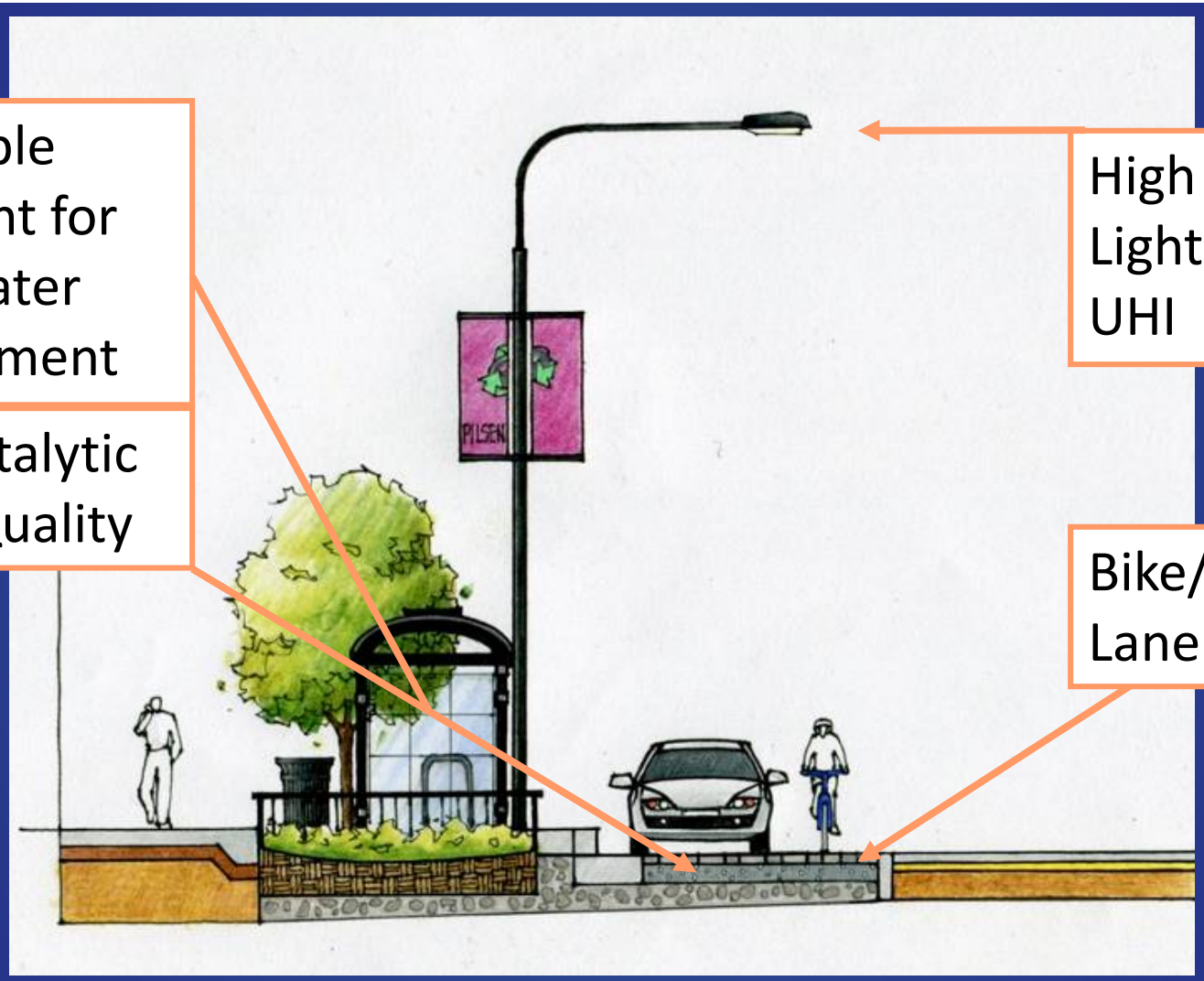
CDOT Cermak/Blue Island Sustainable Streetscapes Corridor



Cermak-Blue Island Corridor
Pre-construction



CDOT Integrated Design: Blue Island Cross Section

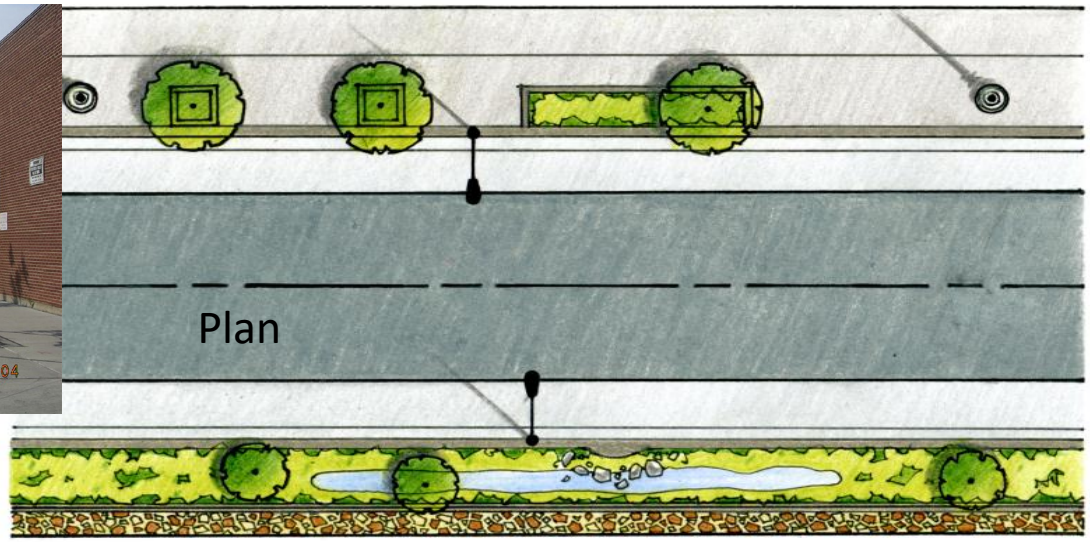


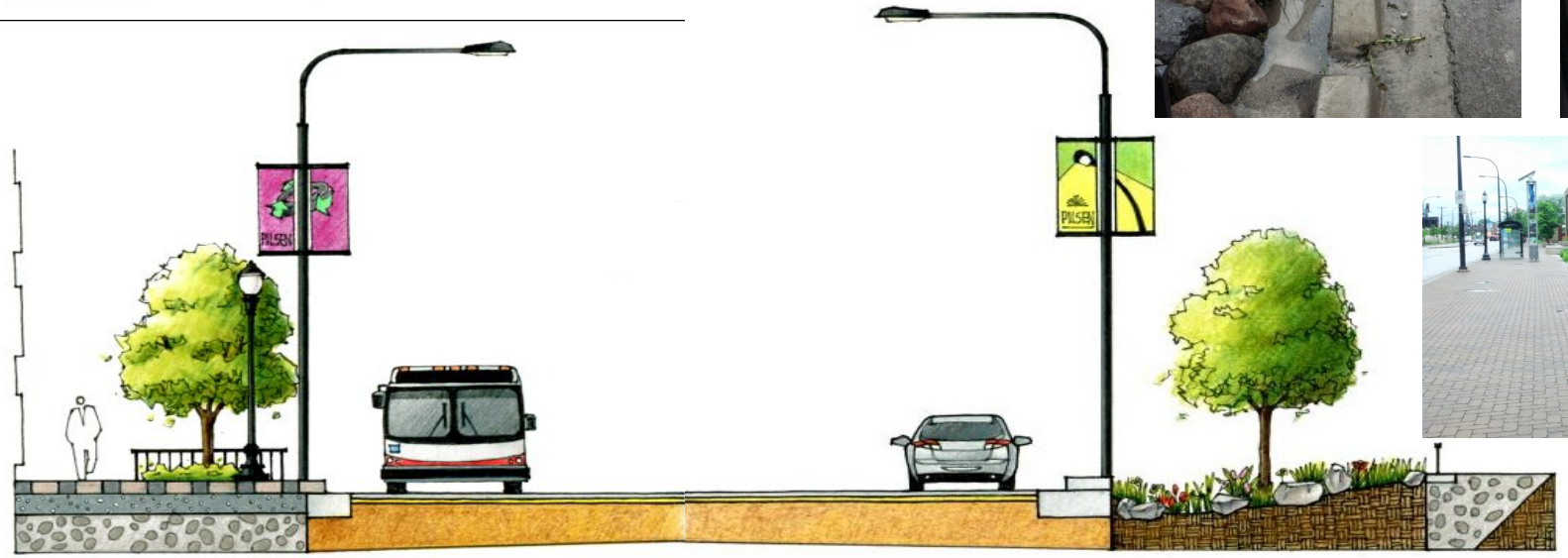
Utilize a wide range of green infrastructure methods to rehabilitate neighborhood public right-of-ways.

Streetscapes Project Sustainable Goals

Stormwater Management	Divert 80% of the typical average annual rainfall and at least 2/3 of rainwater falling within catchment area into stormwater best management practices.
Water Efficiency	Eliminate use of potable water for irrigation, specify native or climate adapted, drought tolerant plants for all landscape material.
Transportation	Improve bus stops with signage, shelters and lighting where possible, promote cycling with new bike lanes, improve pedestrian mobility with accessible sidewalks.
Energy Efficiency	Reduce energy use by min. 40% below a typical streetscape baseline, use reflective surfaces on roads/sidewalks, use dark sky-friendly fixtures. Min. 40% of total materials will be extracted, harvested, recovered, and/or manufactured within 500 miles of the project site.
Recycling	Recycle at least 90% of construction waste based on LEED NC criteria, Post/Pre-Consumer recycled content must be min. 10% of total materials value.
Urban Heat Island, Air Quality	Reduce ambient summer temperatures on streets and sidewalks through use of high albedo pavements, roadway coatings, landscaping, and permeable pavements. Require ultra low sulfur diesel and anti-idling.
Education, Beauty & Community	Provide public outreach materials/self-guided tour brochure to highlight innovative, sustainable design features of streetscape. Create places that celebrate community, provide gathering space, allow for interaction and observation of people and the natural world.
Commissioning	Model Stormwater BMP's in Infoworks to analyze and refine design. Monitor stormwater BMP's to ensure predicted performance and determine maintenance practices.

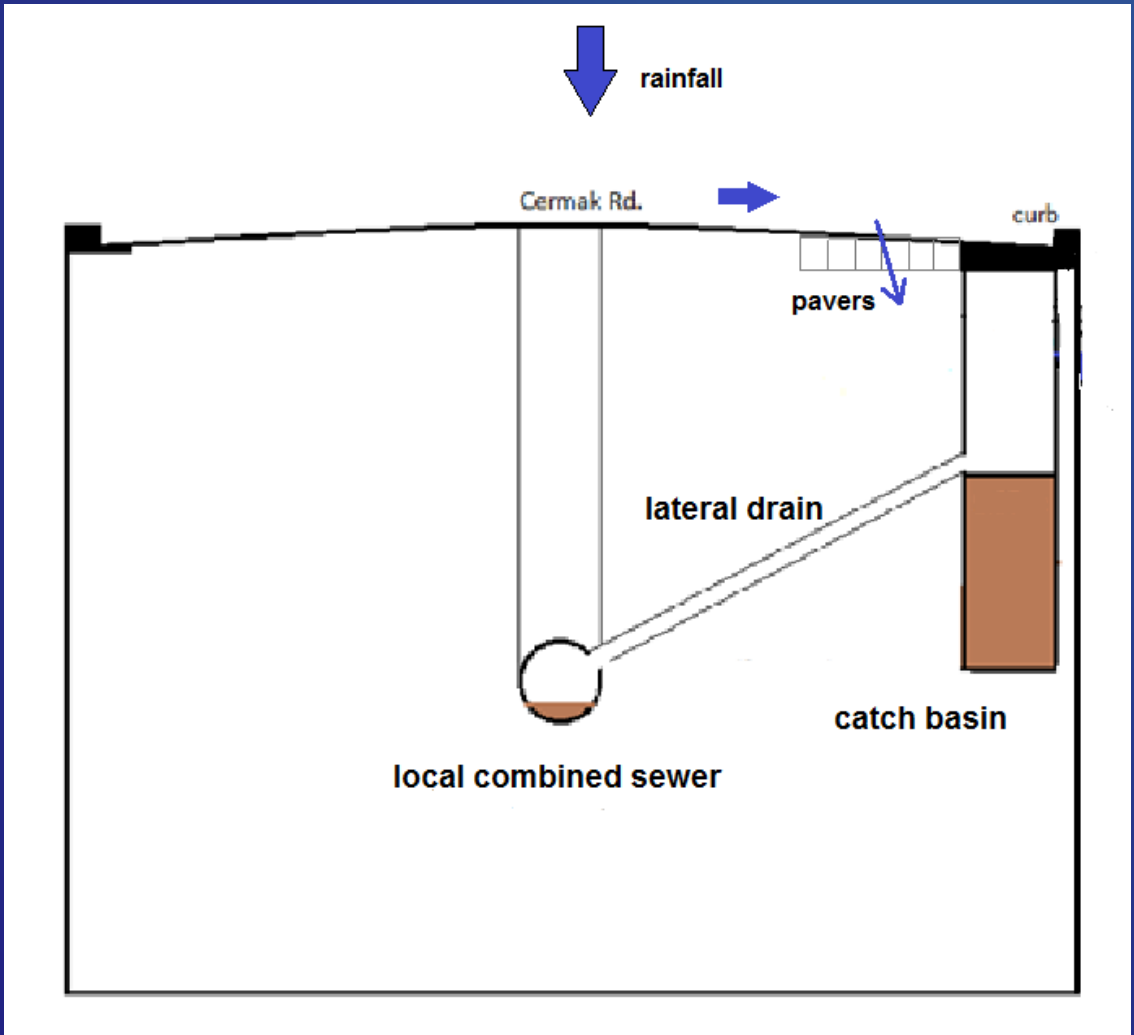
CDOT Integrated Design: Cermak Rd. Cross Section

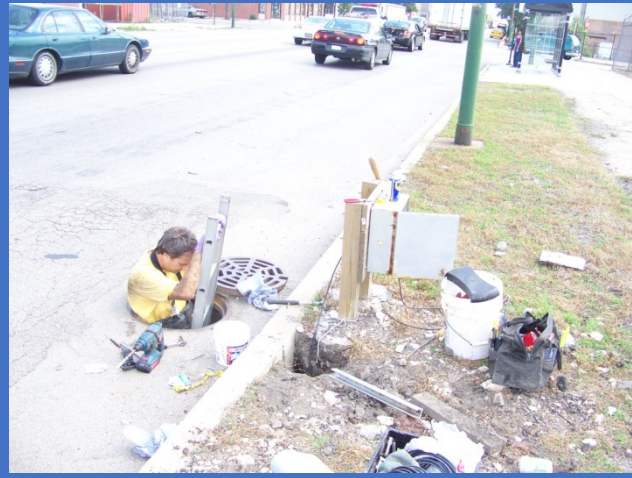




Cross Section

Permeable Pavers and Catch Basins



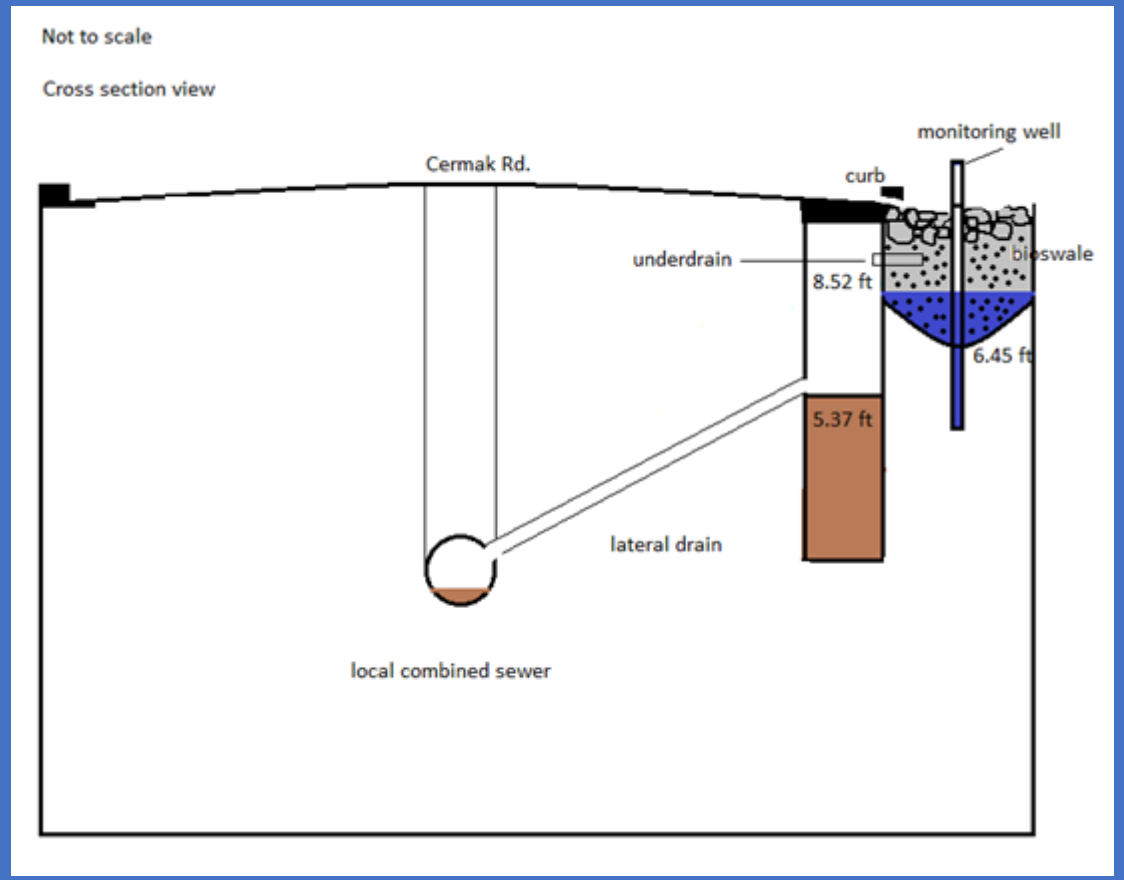


Rain falling onto the crowned road surface flows over permeable pavers and infiltrates before reaching the curb.

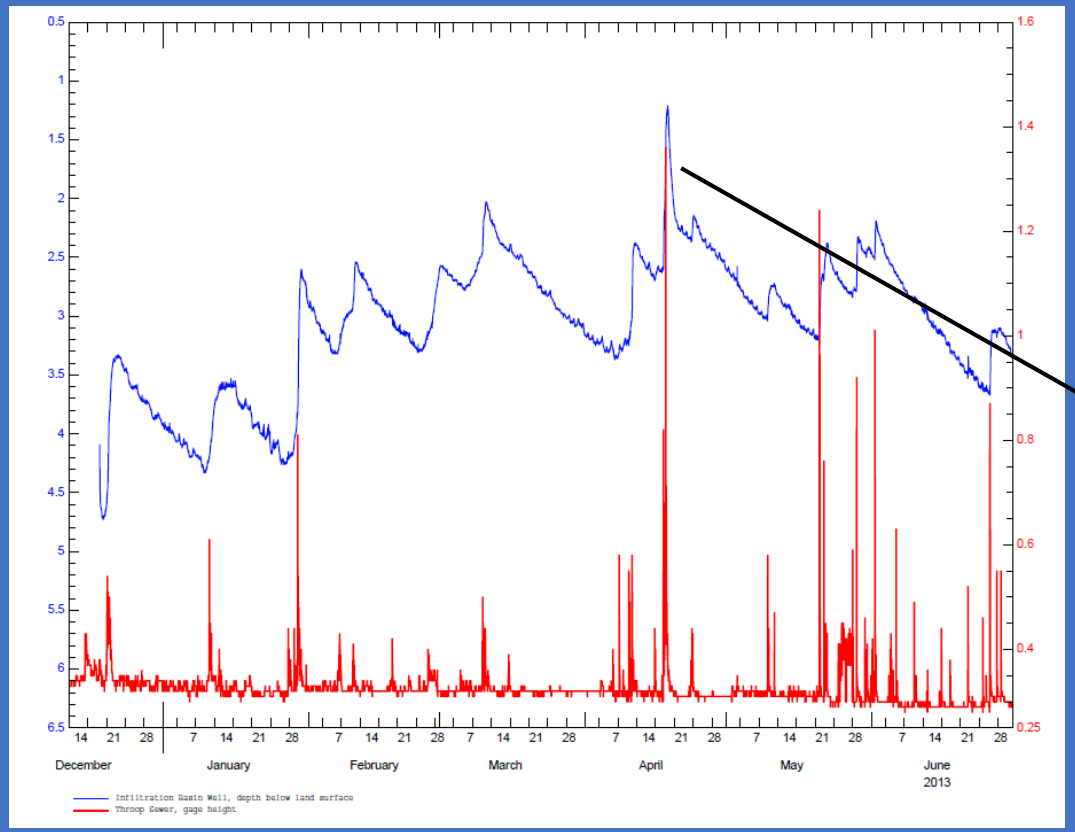
Bioswale

- Leavitt-installed 08-04 2012
- Paulina-installed 08-08-2012

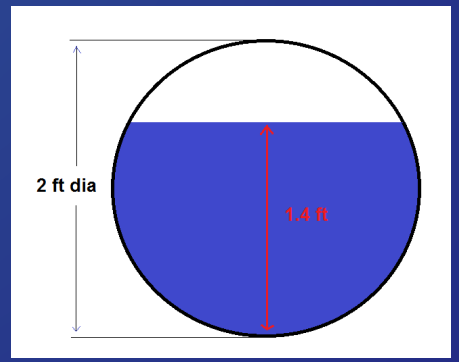
In 3 years of monitoring, the bioswale never returned water to the catch basin through the underdrain.



Bioswale performance



- April 17-18,2013
- 4.7 inches of rain in 24 hrs
- >10-yr recurrence interval
- did not surcharge sewer line.



- Chicago sewers designed for 5-yr event.

Blue - Bioswale, depth below land surface, in feet
Red –Throop Sewer flow meter, water level, in feet

Benefits of increased sewer capacity

Typical Chicago Street

Pilsen Sustainable Street

Chicago April 2013
10+ year event

Average Percolation Rate of Pavers (inches/hr)

Date	Juarez Academy	Blue Island - North	Blue Island - South
Oct, 2012	9.0 ± 1.2	18.2 ± 3.4	20.1 ± 2.2
June, 2013	3.9 ± 0.9	4.1 ± 1.8	8.3 ± 1.9
Pavers cleaning	No	Yes July, 2013	Yes July, 2013
August, 2013	2.7 ± 0.6	44.7 ± 6.9	169.5 ± 22.4
May, 2014	2.4 ± 0.6	21.0 ± 6.0	63.0 ± 14.4
Pavers cleaned	No	Yes July, 2014	Yes July, 2014
August, 2014	2.4 ± 0.6	43.2 ± 10.8	140.4 ± 22.2
May, 2015	1.9 ± 0.9	2.35 ± 0.79	2.63 ± 1.0
Pavers cleaned	No	Yes	Yes
June, 2015	1.6 ± 0.5	20.6±11.8	7.17 ± 4.3

Average Percolation Rate of Bioswale (inches/hr)

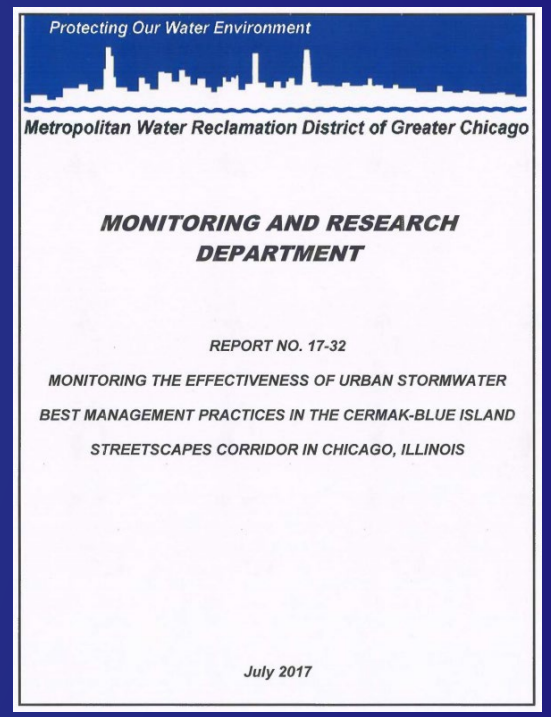
Date	Near Curb Cut	Center
10/31/12	11.4 ± 3.7	61.2 ± 18.3
6/11/13	9.2 ± 3.2	55.3 ± 15.4
8/5/13	7.5 ± 3.6	50.4 ± 11.8

Maintenance of BMP's

- Changes in percolation rates of permeable pavers over time. Requires periodic cleaning.
- Changes in percolation rate of bioswale.
- Sedimentation near bioswale curb cuts.
- Litter.

Summary

- Storm water benefits of volume reduction, reducing peak flows, and retention are clearly observed.
- Benefits go beyond storm water management
  - Improved aesthetics, increased resiliency
- Maintenance of BMPs is important in the long-run
  - Periodic cleaning of permeable pavements
  - Periodic sediment removal from bioswales
- Project completed at cost 21% less per city block than avg of 10 similar conventional projects bid in 2011.
- Community
  - Education
- Report


Protecting Our Water Environment

Metropolitan Water Reclamation District of Greater Chicago

MONITORING AND RESEARCH DEPARTMENT

REPORT NO. 17-32

MONITORING THE EFFECTIVENESS OF URBAN STORMWATER BEST MANAGEMENT PRACTICES IN THE CERMAK-BLUE ISLAND STREETSCAPES CORRIDOR IN CHICAGO, ILLINOIS

July 2017

https://www.mwrd.org/irj/go/km/docs/documents/MWRD/internet/reports/Monitoring_and_Research/pdf/2017/17-32_Monitoring_Effectiveness_Urban_Stormwater.pdf

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