

### **P4** INFRASTRUCTURE

# NMSA – Maximizing Smart Stormwater Infrastructure for Public and Private Benefit

September 30, 2020

P4 Infrastructure, Inc. 622 N. Water Street, Suite 406 Milwaukee, WI 53202 <u>www.p4i.io</u> info@p4i.io

## <u>P4</u> → <u>Products for Public Private Partnerships</u>









**INFRASTRUCTURE (GI)** SAVINGS 1. Schedule a Site Visit **3. Receive Preliminary Design** 4. Authorize Final Design 5. Green Compass Builds &

**6 STEPS TO GREEN** 

Maintains GI for 12+ years 6. Save on water bill without upfront or ongoing costs!

#### **GREEN INFRASTUCI** SAVINGS FOR Develo

Multi-tenant Nonprofit

8000 8000 8000 8000

About Us What We Do What You Can Do Careers Procurement Gow me / About Us / News / MMSD Accelerating Green Program to Reduce Overflows and Protect Lake Michigan f y 🛅 Commercial Education 

#### **MMSD Accelerating Green Progra** and Protect Lake Michigan

Your Sustain 01/27/20 02:00:pm

(Milwaukee, WI) - Efforts to increase green infrastructure in the region received a major boost toda days.

(MMSD) approved a new program that will help capture and manage millions of gallons of water ev Green infrastructure comes in many forms and sizes to help manage water where it falls to reduce. For example, the unanticipated ravages of Hurrican gallons of water. Green roofs, rain gardens, porous pavement, and other techniques help capture a or in the sanitary sewer system



POROUS PAVEMENT

#### **Daily Environment** Bloomberg **Report**<sup>™</sup>



BNA

NUMBER 198 B-1

ENHANCES BY Google

#### Financing

#### Green Infrastructure

The frequency and intensity of storms, whether they are events, pose significant challenges for communities, including water controls to meet Clean Water Act requirements and to public health and the environment.

Authors Dominique Lueckenhoff and Seth Brown discuss r solutions for building a comprehensive integrated green storm that combines the strengths of green and grey solutions to prov efits, including mitigation and rehabilitation of critical infrast wet weather events.

#### **Financing Integrated Green Stormwater Infrastructure** Health, Resiliency - Getting the Best Deal for the Money

By Dominique Lueckenhoff and Seth Brown at least nine peopl 20,000. As of May s storms sweep across the United States with more derstorms contiequency and greater intensity, the need to ad-Missouri, Nebrask ress the impacts of flooding increases. These leaving many per one can hardly escape constant news of crippling all matter of facil storms and flash flood emergencies from a growing transportation, number of extreme weather events around the country mounting costs to Obama declared a Matthew along the Southeastern seaboard last week is lowing the sever already estimated to have mult-billion dollar impacts. ing 23 people and Houston experienced unprecedented rainfall volumes earlier this year, including 17.6 inches within a 24-hour And who can e

sweeping and un the Caribbean an period in April, which impacted over 1,000 homes, required over 1,200 rescues, led to eight deaths and October 2012, caused over \$5 billion worth of infrastructure and property damage. In August, Baton Rouge, La., saw two feet homeless and t rain fall within 24 hours, inundating the city, killing Travel and com

> To get the job done. MMSD is entering a public/private artnership with Corvias, a consulting firm that specializes in infrastructure needs through design. financing, construction, maintenance, and community

Corvias has delivered more than 900 green infrastructure projects across 15 states, from Florida to Alaska. The company has worked on similar large-scale stormwater programs that are most applicable to MMSD's new program, including a 30-year project in Prince George's County, MD.





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How fast does my storage gallery discharge?

Permeable

Pavement

Does my subgrade infiltration rate change over time?

> How much stormwater am I capturing?

When should I perform maintenance?

Do I have excess pollutant removal to allow Water Quality Trading?

Wet Ponds



Cisterns

Biofiltration



Which type of BMP do I build? Can I increase the efficiency of my existing and new BMPs using technology?

How many BMPs do I need to build to meet EPA regulations?

How effective is my BMP in removing pollutants?



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### **INFIL-Tracker & Flow-RTC**





















### <u>Source</u> <u>Load</u> <u>and</u> <u>Management</u> <u>Model</u>



#### Land Use

- Pollutant Source
- Pollutant Load (lbs/cf)

#### **Stormwater and Pollutant Quantity**

- Rainfall Volume
- Runoff Coefficient
- Stormwater Runoff Volume (cf)
- Pollutant Load (lbs)

Baseline Pollutant Concentration (lbs/cf)



### Source Load and Management Model



#### Land Use

- **Pollutant Source** •
- Pollutant Load (lbs/cf) •

#### **Stormwater and Pollutant Quantity**

- **Rainfall Volume** •
- **Runoff Coefficient** •
- Stormwater Runoff Volume (cf)
- Pollutant Load (lbs)

#### **Pollutant Treatment**

- **Gallery Media** •
- Underdrain •
- Infiltration (cf) ٠
- Stormwater Pass-Through Volume (cf) ٠
- Pollutant Load (lbs) at Outfall ٠

Baseline Pollutant Concentration (lbs/cf)



#### <u>Source</u> <u>Load</u> <u>and</u> <u>Management</u> <u>Model</u>

Filterable Phosphorus

Total Phosphorus

0.1219

0.4238

0.1256

0.2214



WinSLAMM Output Summary		Runoff Volume (cu ft)	Percent Part Runoff Volume Reduction	iculate Part Solids Conc. (mg/L)	ticulate Solids Pa Yield (lbs)	Percent articulate Solids Reduction		
Total of all Land Uses without Controls:		113630	-	106.4	754.8	-		
Outfall Total with Controls: Annualized Total After Outfall Controls:		107304 110952	5.57%	31.44	210.6 217.8	72.10%		
Pollutant	Concentration - No Controls	Concentration With Controls	- Conc. Units	Polluta No Con <sup>.</sup>	ant Yield trols	Pollutant Yield With Controls	Pol. Y Units	eld Percent Reduction
Particulate Solids	106.4	31.44	mg/L	754.8		210.6	lbs	72.10 %
Filterable Solids	64.24	64.24	mg/L	455.7		430.3	lbs	5.57 %
Total Solids	170.6	95.68	mg/L	1210		640.9	lbs	47.05 %
Particulate Phosphorus	0.3019	0.09285	mg/L	2.141		0.6220	1bs	/0.95 %
Total Phosphorus	0.1219	0.1219	mg/L mg/l	3 006		1 /38	1DS 1bs	5.03 %
Permeable Pavement		UD@Bo	ttom	Subg	rade	Seepage =	2.5 ir	n/hr
		Runoff	Percent Par	rticulate Pa	rticulate	Percent		
Mincl ANANA Outer		Volume	Runoff	Solids	Solids	Particulate		
winslawiw Output Summary		(cu ft)	Volume	Conc.	Yield	Solids		
			Reduction	(mg/L)	(lbs)	Reduction		
Total of all Land Uses without Controls:		113630	-	106.4	754.8	-		
Outfall Total with Controls:		27878	75.47%	32.26	56.14	92.56%		
Annualized Total After Outfall Controls:		28825			58.05			
Pollutant	Concentration -	Concentratio	n - Conc.	Pollutant Yield		i Pollutant Yield	Pol.	Yield Percent
	No Controls	With Control:	s Units	No Co	ntrols	With Controls	Unit	Reduction
Particulate Solids	106.4	32.26	mg/L	754.8		56.14	lbs	92.56 %
Filterable Solids								
	64.24	65.07	mg/L	455.7		113.3	lbs	75.15 %
Total Solids	64.24 170.6	65.07 97.33	mg/L mg/L	455.7 1210		113.3 169.4	lbs lbs	75.15 % 86.01 %

mg/L

mg/L

0.8650

3.006

0.2185

0.3854

Permeable Pavement | UD@Bottom | Subgrade Seepage = 0.04 in/hr

# P4 INFRASTRUCTURE

74.74 %

87.18 %

lbs

lbs





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# **City of Cudahy**

- 150-year-old City in southeastern Wisconsin
- Highly urbanized
- MS4 and TMDL community









KK-4 TMDL Watershed - Cudahy

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- Design criteria: 100-yr storm event
- Reduced storm water utility fee down to the base ERU
- Achieves 100% TSS and TP removal
- Increased revenue with additional land for more storage units
- Eliminated costly pond maintenance
- Created a more user friendly and environment, reduced ice and no water ponding
- Runoff does not affect Cities stormwater facilities





#### **P4 Dashboard ERSI/ArcGIS**





### P4 Sunburst Technology – BMP Management





#### **BENEFITS**

**City of Cudahy - Public EZ Storage - Private Clean Water Clean Water** Infrastructure is Performing Properly **Data-Driven Maintenance** Confidence in Lower Base ERU Save Money More Valuable Development Improved Performance of Existing BMPs Capitalize on Privately-Owned BMPs Save Money Community **Clean Water** 

Transparency





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Revolutionizing the way we address civil infrastructure