MPCA Stormwater Research: Understanding Stormwater Contaminants and BMP Performance

MINNESOTA POLLUTION CONTROL AGENCY

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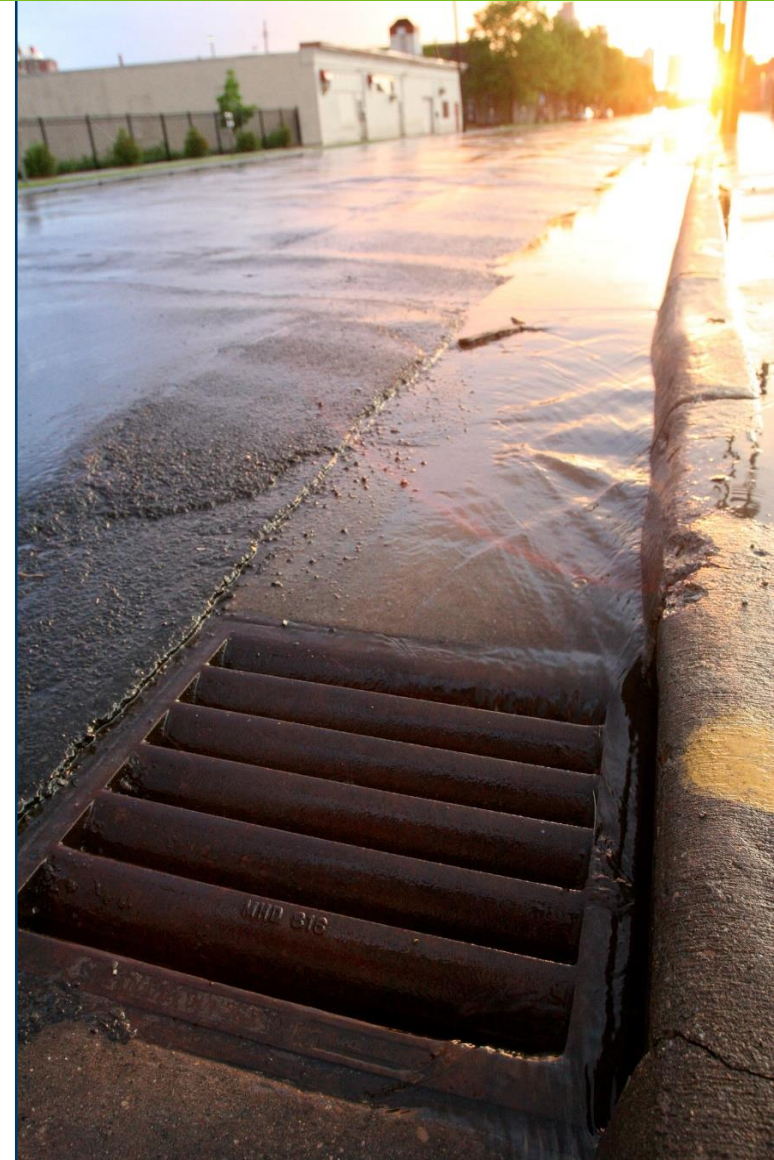
MPCA Stormwater Research: Overview

MPCA Mission

"Protect and improve the environment and enhance human health"

- ➤ Monitor environmental quality
- ➤ Offer technical and financial assistance
- ➤ Enforce environmental regulations

MPCA Stormwater Research

- ➤ Research projects
- ➤ Review research and monitoring
- ➤ Support: MN Stormwater Manual, Program, MPCA programs
- ➤ Work with numerous MN entities and purposes

MPCA Stormwater Research: Approaches & Objectives

Approaches & Objectives

➢ **Investigate** essential stormwater research topics

➢ **Collaborate** in smart partnerships

➢ **Share** methods and findings

➢ **Develop** guidance and strategies

Research Project Activities

✓ **Projects:** Design, Partner, Implement, Manage

✓ **Field Work and Data Acquisition:** Varies by project

✓ **Analysis & Interpretation**

✓ **Reporting**
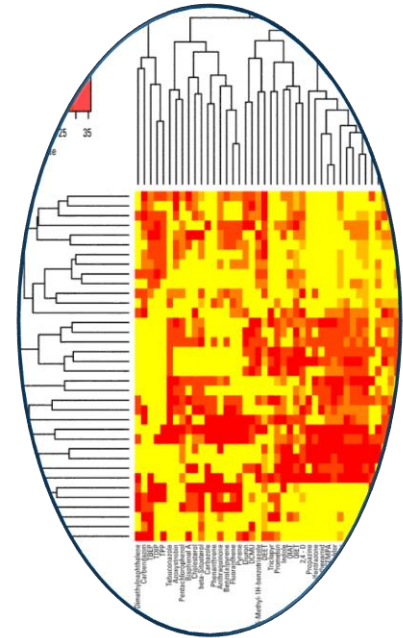
Research Goals - FY14/15 Funding (CWF)

➢ **Many BMPs have WQ benefits**…and **gaps**

   o Contaminant loading, fate/removal, influences

   o BMP performance and variability

   o Optimized management strategies

➢ **Pursued feasible, priority topics**

   o Short timeframe to develop

   o Identified via several routes:

      • Prior MPCA documentation

      • Lit review

      • Outreach: survey and consults

➢ **Funded research** projects & objectives

   o **Underground and surface infiltration**

   o **Iron-enhanced sand filters**
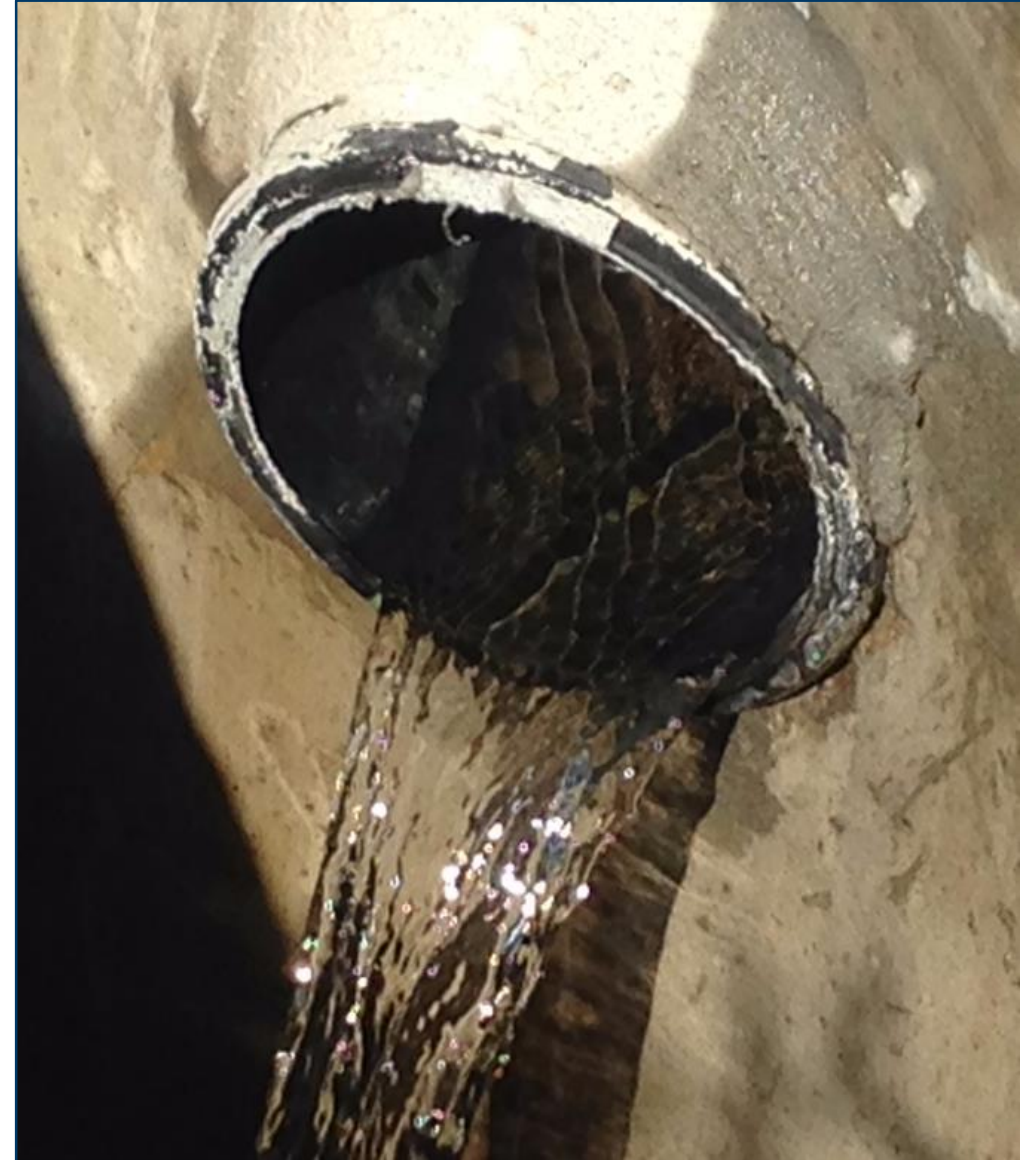
Research Goals - FY16/17 Funding (CWF)

➢ **Extend, expand** FY14/15 research, if prudent

- o Efficient, increased ROI
- o More comprehensive, refined information

➢ **Additional topics**

➢ **Funded research** projects & objectives

- o **Underground infiltration** – extended study, added site
- o **Swales**
  - o 2-year field-based study
  - o Complements recent research and models

➢ **Extended two IESF projects**

Infiltration BMP Research Projects (2015-2018)

➢ **Partners** - multiple projects
- o UMN (Dr. John Nieber, BBE)
- o Capitol Region Watershed District
- o St. Paul Port Authority

➢ **Sites:**
- o 3 Underground
- o 2 Surface

➢ **Basis:** few performance data for underground BMPs

➢ **Goals:** assess contaminant transport in/below BMPs
- o BMP performance
- o Soil treatment zone

Iron-Enhanced Sand Filter Research (2015-2018)

➢ **Partners** – multiple projects**:**
- o Minneapolis/MBPR
- o Prior Lake
- o Ramsey-Washington Metro Watershed District/Barr Engineering
- o CRWD - special study

➢ **Sites:** 6+ iron-enhanced sand filters

➢ **Objectives:**
- o Collect field data to support IESF performance meta-analysis
- o Update MPCA guidance , if indicated
- o Share with practitioners, inform IESF designs and installations
- o Primary focus: phosphorus
- o Also of interest: metals, bacteria, others

Selected Analytes across Sampling Points

Water Quality Parameter
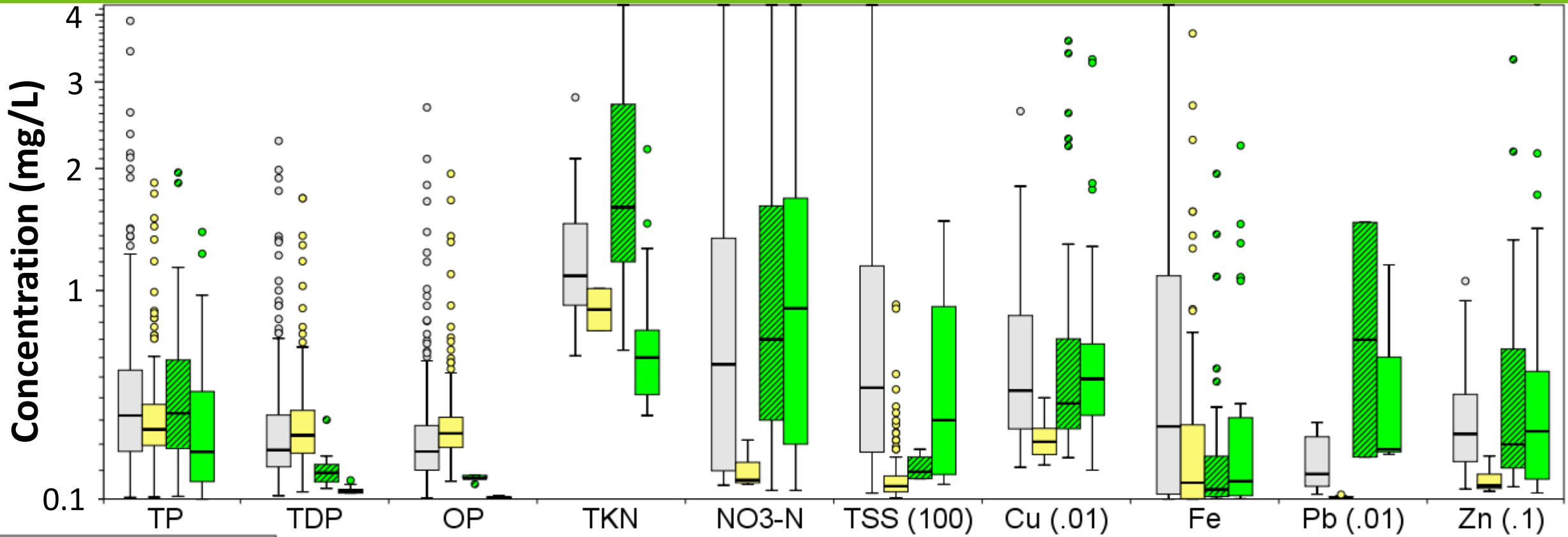
Sampler Location
- Inlet
- Outlet
- <4' Below Grade
- >4' Below Grade

NOTE: This represents currently incomplete datasets, preliminary analysis

Swale Infiltration (Hydrology) Research (2016-2019)

➤ **Fall 2016**: **prototype** site implemented

- o Partner: MnDOT
- o Site: MnROAD research facility

➤ **Summer 2017: full-scale project** implemented

- o 4 new sites: 94, 212, TH8, MnROAD
- o Added partners: Wenck, Barr
- o Enhanced methods

➤ **Design: water balance** at several large swales

➤ **Goals:**

- o **Estimate infiltration performance** of swales
- o **Compare** with existing estimation methods
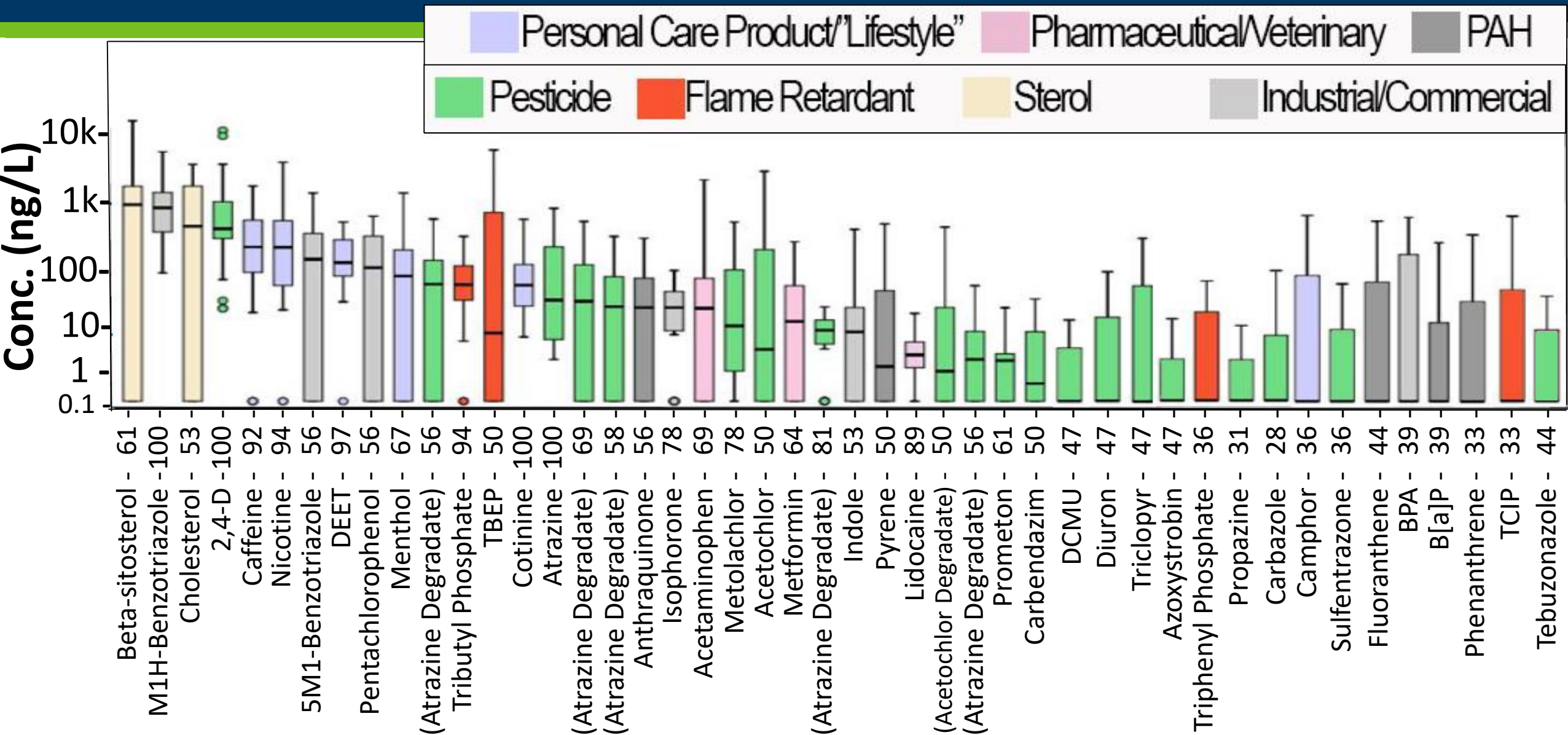- o **Inform** crediting and guidance

➤ **Funding:** EPA 106d; MPCA CEC program (CWF)

➤ **Partners:** USGS, SCSU, UST, UMN, CRWD, Mpls/MBPR

➤ **Sites:** 3 large outfalls, 3 IESFs

➤ **Sampled** 1 snowmelt and 3 seasonal rainfalls

➤ **Data:**

  o **Chemistry:** 400+ CECs, metals, nutrients, chloride

  o **Toxicology:**

    o *Daphnia* and fathead minnow outcomes

    o Differential gene expression (*daphnia*)

    o *In vitro* toxicity

CECs Frequently Detected in 26 Stormwater Samples (ng/L)

Legend: Personal Care Product/"Lifestyle" | Pharmaceutical/Veterinary | PAH | Pesticide | Flame Retardant | Sterol | Industrial/Commercial

Summary of Projects Status

Project	Samples To Date	Parameters*	Status/Plan
Underground Inf. - CRWD	**2016:** 55 Samples **2017:** Samples tbd	Nutrients, metals, TSS, sVOCs, VOCs, flow	**2018**: Continue Sampling
IESF – Prior Lake	**2017:** Samples tbd	Nutrients, metals, TSS, level	**2018:** Continue Sampling
IESF – RWMWD	**2015-16:** 84 Samples **2017:** Samples tbd	Nutrients, metals, TSS, flow D.O., pH, conductivity	**2018:** Continue Sampling
Swales	**2016:** Prototype **July-Oct 2017:** All Sites	Level/flow	**2018**: Continue Monitoring
IESF – Mpls	**2015-16:** 344 Samples	Nutrients, metals, TSS, flow	**2017:** Sampling Completed **2017-18:** Data analysis
Infiltration – UMN	**2015-16:** 330 Samples	Nutrients, metals, TPH, major ions, level	**2017:** Sampling Completed **2017-18:** Data analysis
CECs/Tox	**2016:** 36 Samples	CECs, RNA, *in vitro*, phenotype, metals, ions, flow	**2017-2018:** Reporting

Current Directions

➢ **Complete data** acquisition

➢ **Aggregation** of relevant data
  - o Related studies/data from other sites and organizations
  - o Accessible, collaborative format

➢ **Analysis and reporting** via report(s), Manual, journals, workgroups

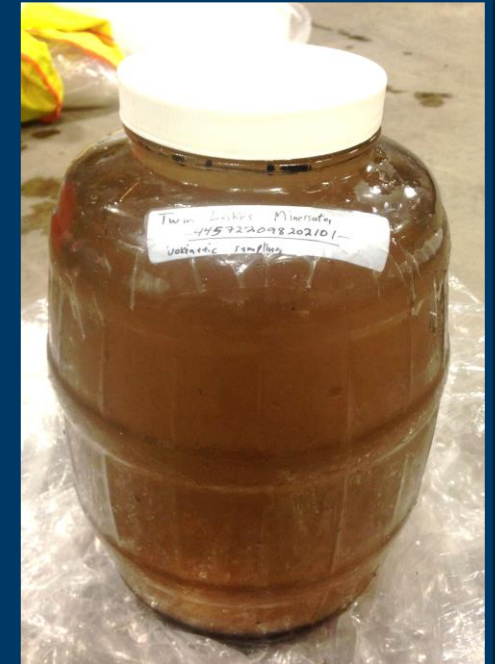➢ **Collaboration:** continue developing and engaging in partnerships

FIN

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MINNESOTA POLLUTION CONTROL AGENCY

PLEASE! DON'T POLLUTE!
DRAINS TO RIVER