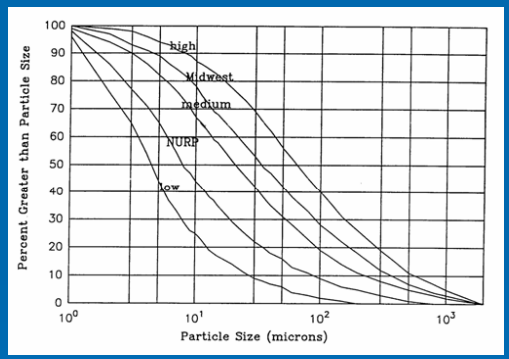
FLOODING

GROSS POLLUTANTS



REGULATORY POLLUTANTS

MAINTENANCE

Gross Pollutants

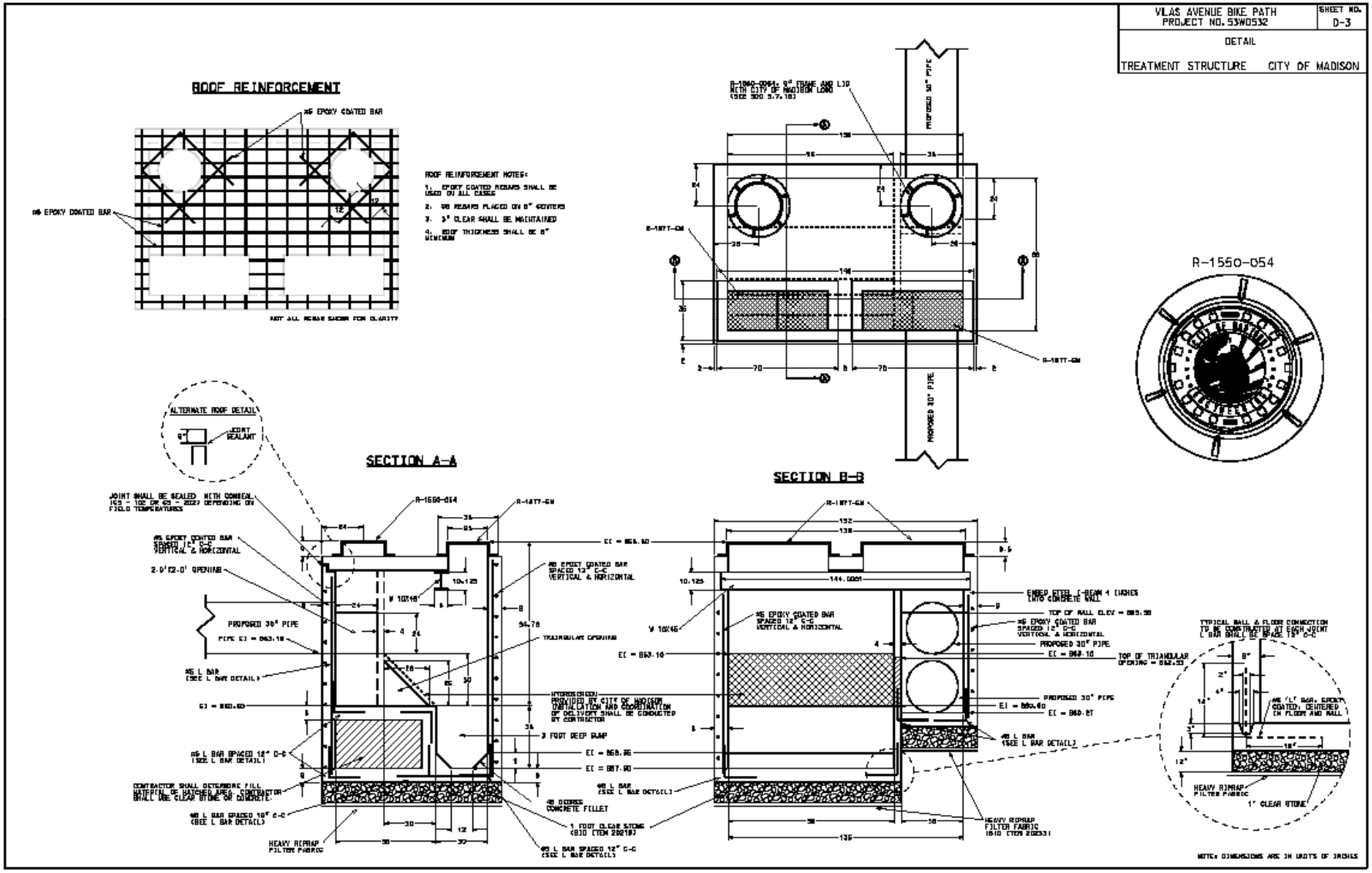
Generally speaking this is what most people think of when they refer to water pollution.

They are not however regulated by NR-151 or the Rock River TMLD

Gross Pollutants

Gross Pollutants

Gross Pollutants



Gross Pollutants

Gross Pollutants

Regulations and Regulatory Pollutant Reductions

All regulations for urban pollutants control primarily:

Total Suspended Solids (TSS)

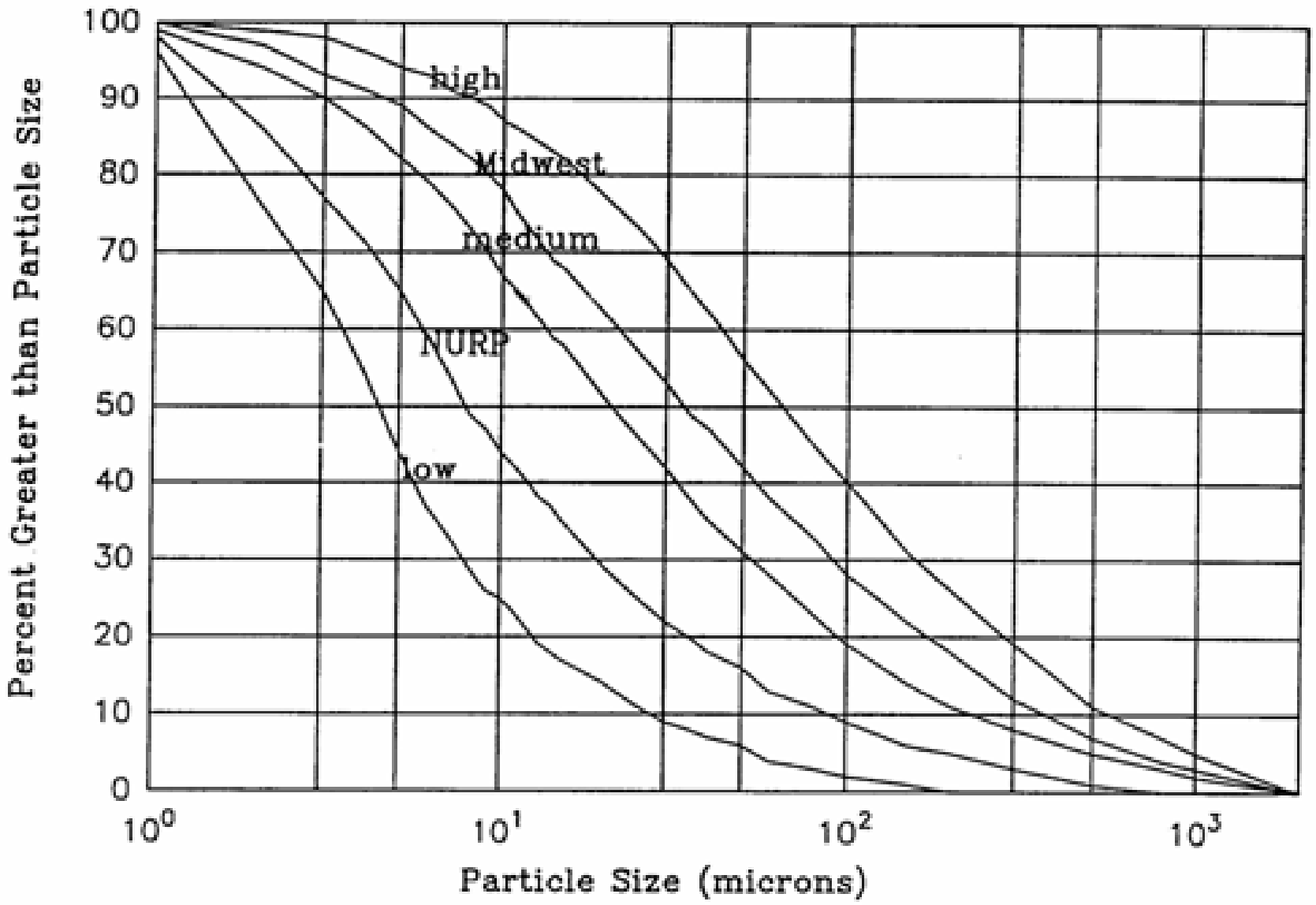
What exactly is TSS?

TSS is defined by the WDNR according to a specific soil distribution curve (how much of a particle passes a certain sieve size).

This distribution was determined based on the NURP (National Urban Runoff Program) research in the 70's and 80's.

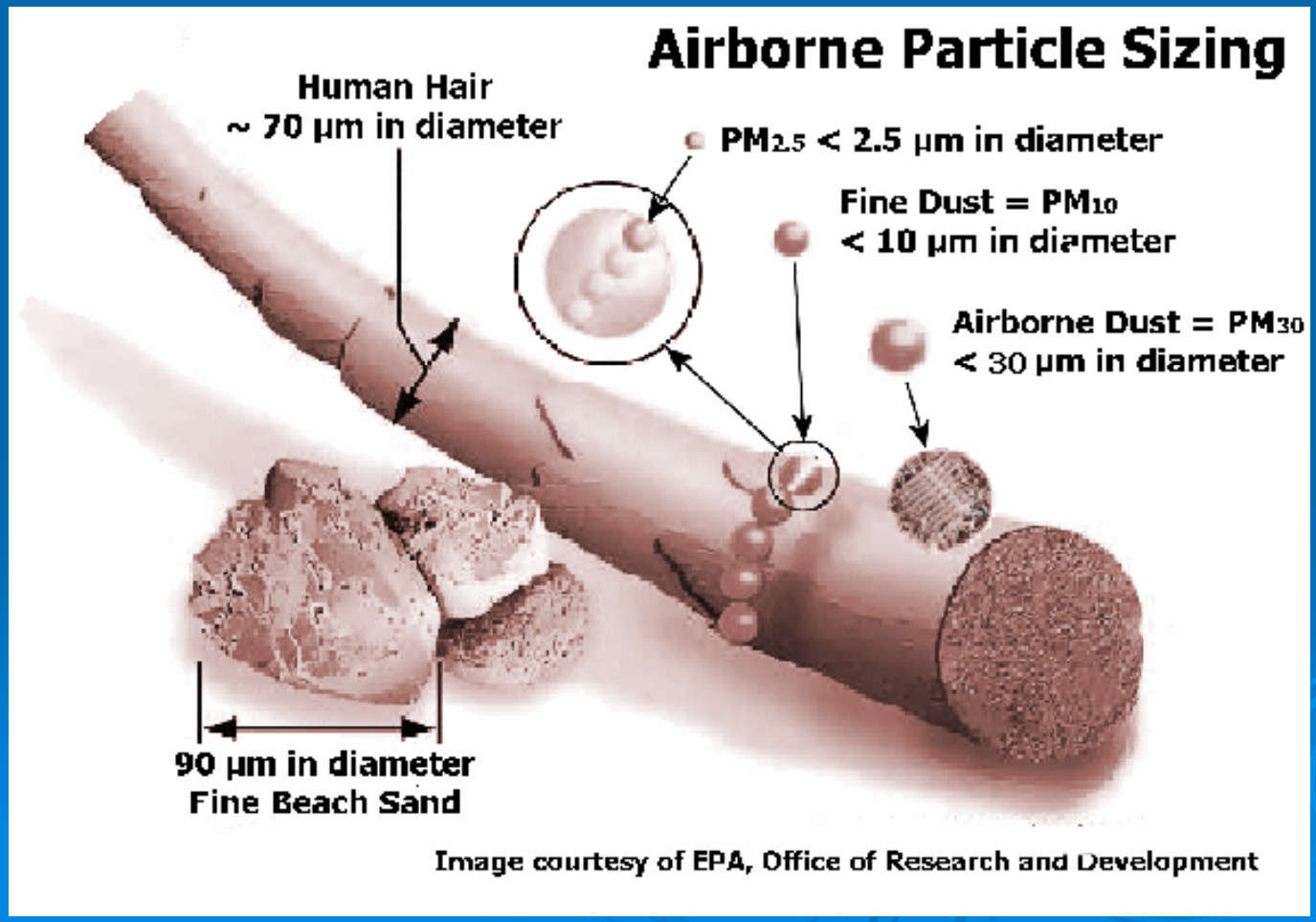
This distribution is skewed heavily towards the small particulate sizes.

What exactly is TSS?

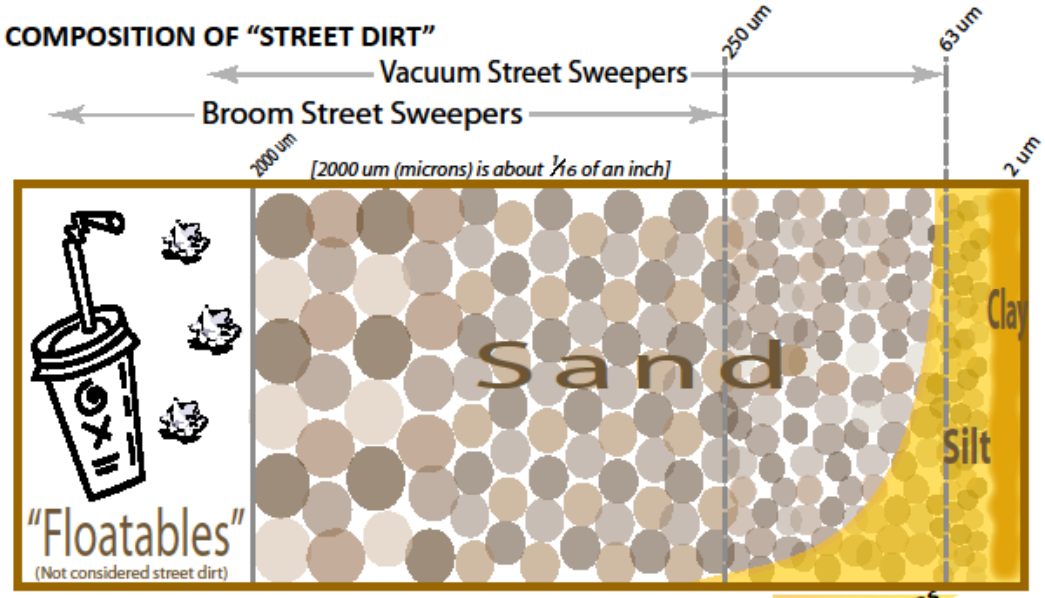


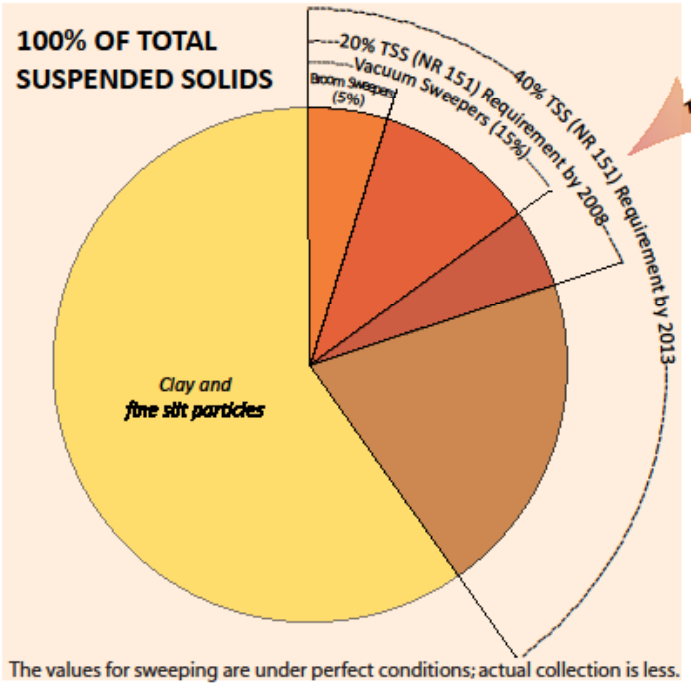
What exactly is TSS?

The **micrometre** (International spelling as used by the International Bureau of Weights and Measures; SI symbol: **µm**) or **micrometer** (American spelling) is an SI derived unit of length equaling 1×10^{-6} of a metre (SI standard prefix "micro-" = 10^{-6}); that is, one millionth of a metre (or one thousandth of a millimetre, 0.001 mm, or about 0.000039 inch). The symbol µm is sometimes rendered as **um** if the symbol µ cannot be used, or if the writer is not aware of the distinction.



Street Sweeping and DNR Regulations





The values for sweeping are under perfect conditions; actual collection is less.

TOTAL SUSPENDED SOLIDS

The Story...

About 95% of dirt on the street is SAND. Broom Sweepers can pick up about 65% of street dirt; Vacuum Sweepers can get up to 95%.

However...
DNR Regulations state that we have to control Total Suspended Solids (TSS). Sand makes up a very small portion of TSS; silt and clay (much smaller particles) make up most of TSS.

Sweepers aren't able to pick up much of the smaller particles (Broom Sweepers get about 5%; Vacuum Sweepers up to 15%).

Other practices like Detention Ponds can control up to 80% TSS, but they are generally only located in areas developed after 1980. State Regulations indicate that CITYWIDE we have to control 20% TSS by 2008 and 40% by 2013.

Regulations
NR-151 / NR-216

This legislation enables WDNR to administer our Phase I – EPA MS4 permit.

The WDNR permit is known as a WPDES (Wi Pollution Discharge Elimination System) permit.

The WPDES permit requires various admin & maintenance actions, and limits the discharge of total suspended solids (TSS) to waters of the state.

How do we meet these regulations??

We have meet the 40% TSS reduction associated with NR-151 already using traditional methods:

1) ponds
2) catchbasins/screens
3) sweeping
4) infiltration/raingardens

Regulations
Rock River TMDL

TMDL - stands for Total Maximum Daily Load and limits the discharge of certain pollutants based on the waterbody's ability to assimilate them.

The Rock River TMDL limits the discharge of TSS and Total Phosphorous (TP).

TMDLs were originally intended for industrial and wastewater dischargers where a discharge was known and was part of a industrial process, their application to non-point sources (stormwater runoff) is a relatively recent application (base on law suits).

MS4 discharges are by law/court decision considered a point source discharger even though our discharges do not occur other than with storm events, are not at one point and are generated only by runoff this is referred to as a "LEGAL FICTION".

TSS regulated under the Rock River TMDL?

The TMDL is much more specific in its target – it is focused completely on Total Suspended Solids and Total Phosphorus.

TSS and TP do come from urban areas, however they are present at much lower levels in urban runoff then they are in Agricultural areas.

TSS is typically used as a surrogate for TP at least in urban areas due to the difficulty of measuring and estimating TP runoff (varies with season dramatically)

What is the Rock River TMDL?

The amount of a pollutant a waterbody can receive and still meet water quality standards

Total **M**aximum **D**aily **L**oad =

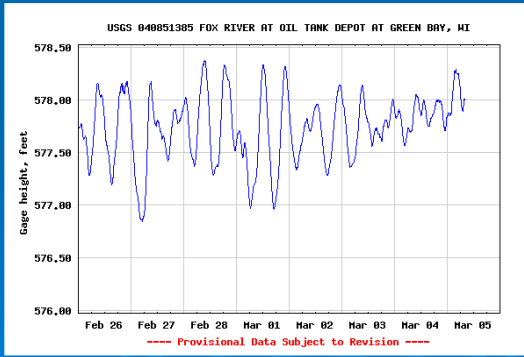
Load Allocation

+

Waste Load Allocation

+

Margin of Safety



How do we meet these regulations??

Meeting the requirements of NR-151 is the beginning of the reductions required by the TMDL. As measured from a baseline of 0% the TMDL requires a 82% TSS control for the entire regulated part of the City of Madison.

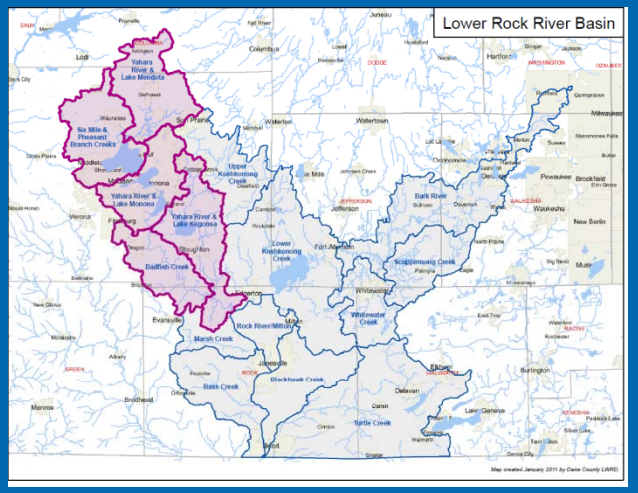
1) ponds can remove 80%
2) catchbasins/screens can remove15%
3) sweeping can remove 5-12%
4) infiltration/raingardens can remove100%

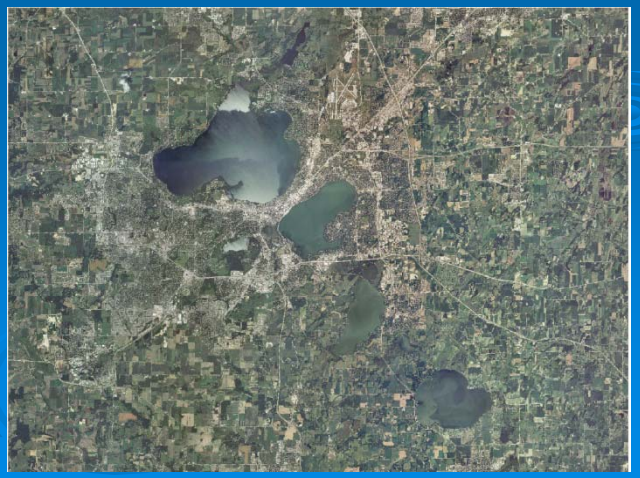
HOW: Traditional Compliance Approaches

- Independent actions
- Discharge focused solutions
- Expensive

New Compliance Approach
Watershed Adaptive Management – As Led by Madison Metropolitan Sewerage District

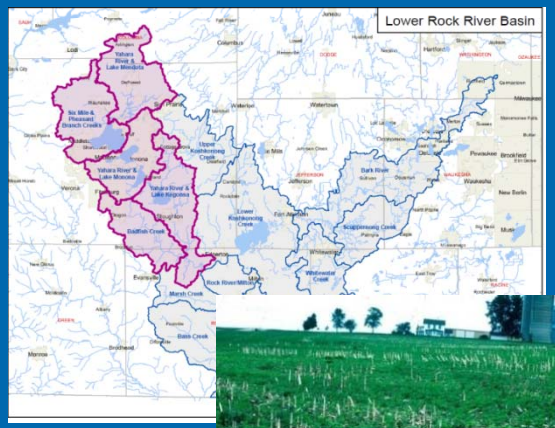
- **Watershed based focus**
- **Lower cost**
- **Lot's of flexibility**
- **Collaboration**
- **NON-TRADITIONAL**
- **LOTS OF NONCONTROLABLE VARIABLES**

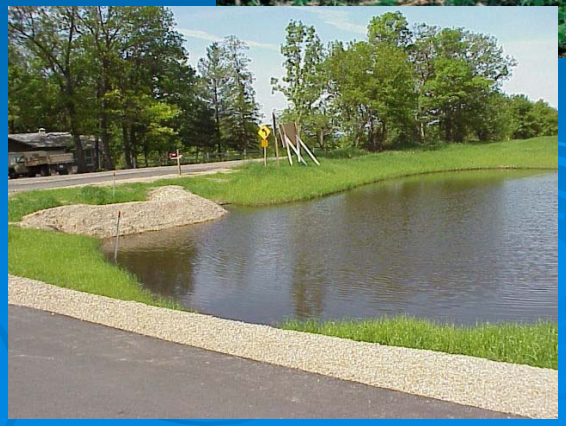




Adaptive Management Basics

- TMDL used to calculate total watershed load reduction
- Costs calculated with input from Dane County Land and Water Resources
- Proportional assignment of costs
- Practices can occur throughout watershed
- TMDL obligations met





Results?

1) Adaptive Management or Trading COULD result in improvements to the lake as most of the efforts will go into ag lands in the North watershed of Mendota.

2) Traditional methods will be more expensive and will certainly have NO affect on the Yahara Chain of Lakes.

Other Programs

Terrace Rain Gardens

- City Engineering administers a program that looks at every reconstruction and resurfacing project in the coming year to identify projects that can have terrace rain gardens installed.
- They become the responsibility of the property owner
- Average costs including planting is about 2000
- The property owner is required to pay a maximum of 400 or ¼ of the cost whichever is less.

Rain Gardens on Public Lands

- City Engineering works other city agencies to construct at least one public rain garden every year on lands owned by the City of Madison.
- Often these are constructed by our operations crews.

Pervious Pavement

- City Engineering has constructed on pervious pavement pilot and will be constructing approximately 500 feet of pervious sidewalk as part of “CENTRAL PARK in 14”

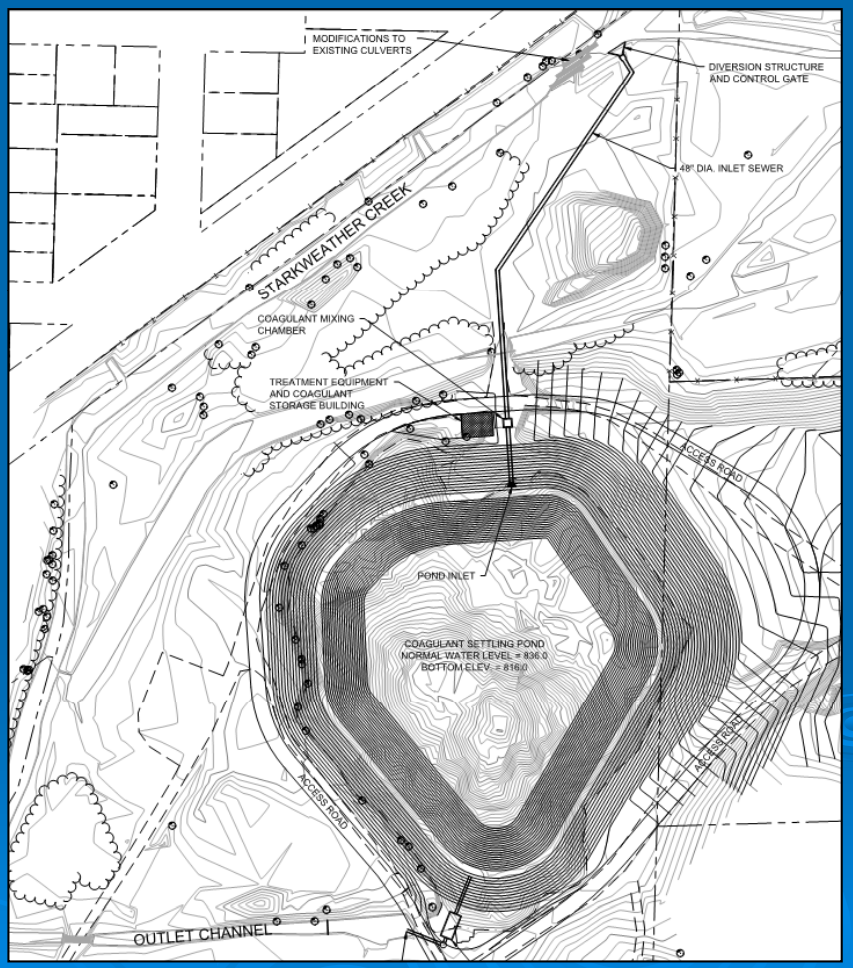
- We are providing the test site for a pervious pavement test site being monitored by the USGS and the WDNR.

Pervious Pavement

- In 2016 City Engineering will be installing approximately 100’ of precast pervious concrete sidewalk this summer as a test.
- Precast pervious concrete has the advantage of taking out the variables of site conditions experienced during the pour, to which pervious concrete is extremely sensitive to.

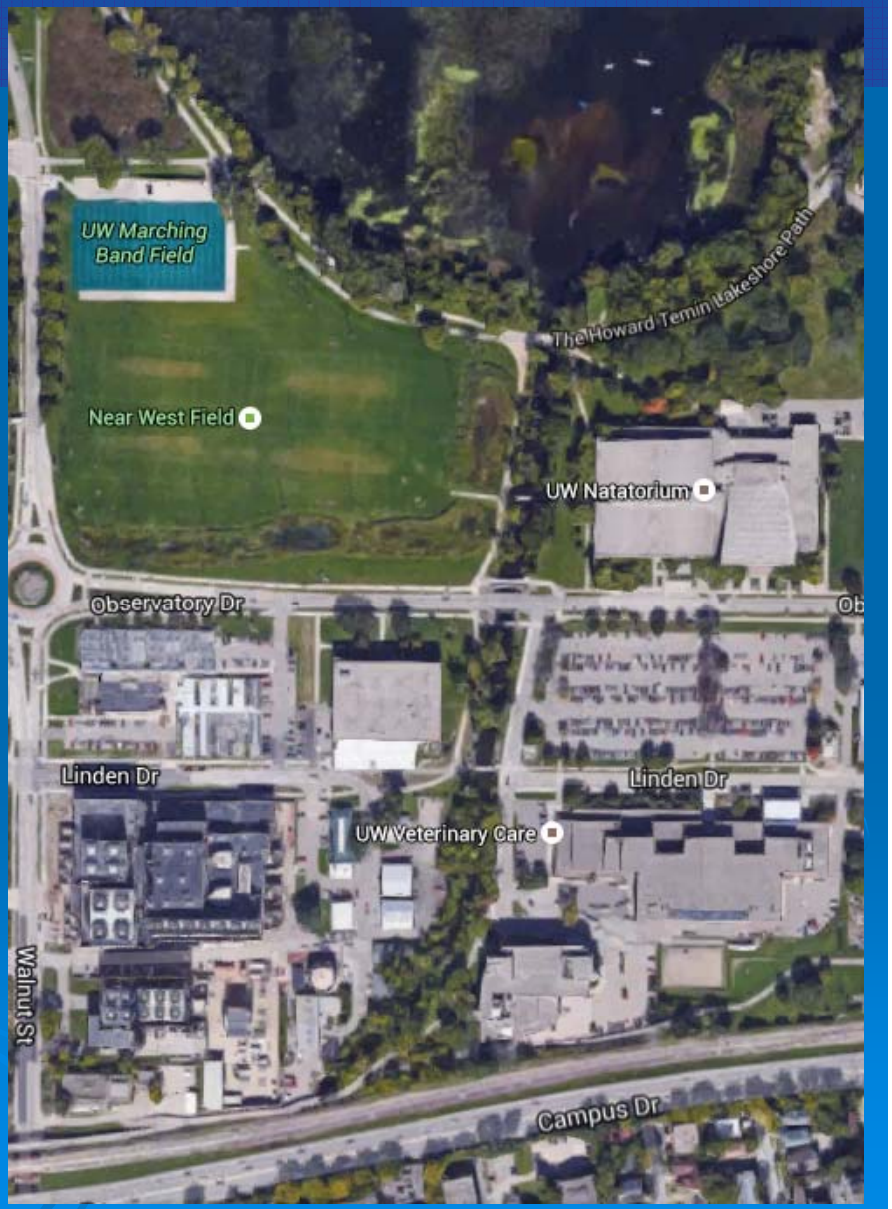
Chemical Treatment

- **In 2016 City Engineering will further investigating the possibility of chemical treatment of stormwater runoff for additional removal of TP and TSS.**



Treatment Devices

- In 2016 City Engineering will bid out a project to construct a 200’ long sediment trap at the discharge to Willow Creek.
- Subsequent projects by the UW will restore the creek from this point to the lake including dredging of the island that has accumulated at the mouth of the creek.



LAND MANAGEMENT
Operations

Engineering Department maintains approximately 1,100 acres of greenways and ponds.

Approximately 10% of these 1,100 acres were managed in the Selective Prairie Management program for the past 3 years.

We have created a draft Land Management Policy – The purpose of which is to…

Define the different types of land cover present in City storm water drainage and environmental corridors.

Create a framework of management practices and goals for each land cover type.

Ensure these systems perform their primary function as storm water drainage and conveyance.

Promote wildlife habitat- especially bee pollinator, reduce mowing, create sense of place, improve soil and water quality, prevent invasive plants from spreading.

2016 Plan of Action

Volunteers will continue to be an integral part of monitoring sites, removing, and treating invasive plants.

Operation Fresh Start will work with Engineering staff to remove invasive trees and plants , and treat with herbicide as needed.

2016 is a year of both inventory and transition to appropriate land management based on what category the vegetation falls in.

By winter, we will know the acreage of each type of land category to be maintained.

We will plan the 2017 maintenance strategy to reflect what we find.

Maintenance Operations

Maintenance operations include primarily:

- Leaf collection
- Street Sweeping
- Catchbasin cleaning

Changes ?

Pilot Study – Leaf Collection Management

- Leaf collection identified by Yahara CLEAN as reasonable measure to reduce Total P delivered to Madison lakes
- Model simulations estimate 23% of annual P load occurs in fall
- What % reduction (credit) can Madison and other MS4s in Rock River basin expect by collecting leaves?

USGS

Measurement of Phosphorus in Water and Leaves

Photos by USGS

USGS

Visual Evidence of Phosphorus in Water

USGS

Summary

- Early results indicate very high P concentrations and yields in fall when leaves are not collected; spring can also be high
- Majority of P is in the dissolved phase as orthophosphate in fall, particulate in spring
- Leaves transported off street may not be a significant part of P load based on published values – need further evaluation

- Leaf collection/sweeper timing could be crucial. Need more basin-specific information to measure response
- Fall contribution to annual load could be much higher than originally thought. Spring also important

USGS

Questions and Discussion