

Addressing Turbidity Impairments in Stormwater Pollution Prevention Programs

This fact sheet provides information to assist Municipal Separate Storm Sewer Systems (MS4s) addressing a Turbidity Total Maximum Daily Load (TMDL) requirement. TMDLs are required under Section 303(d) of the federal Clean Water Act when a water body is impaired and not meeting its designated use.

What is turbidity and what are sources in stormwater?

Turbidity is a measure of the amount of suspended particles in water. Algae, suspended sediment, and organic matter in the water increase turbidity. Some sources of sediment in urban stormwater include new construction, sand from de-icing, runoff from lawns, and atmospheric deposition. Sediment can interfere with organisms ability to breathe and can destroy habitat. Suspended particles in water diffuse sunlight and absorb heat, increasing temperature and reducing light available for plants. Phosphorus attached to suspended sediment promotes algal growth which results in additional turbidity.

How do we know if water is too turbid?

To determine turbidity, the MPCA places water samples into a tool that measure light penetration. Suspended particles scatter light and reduce light penetration, indicating more turbid water. The unit for measuring turbidity is the nephelometric turbidity unit (NTU). If the turbidity of a stream exceeds 25 NTU, it is considered impaired and is placed on the U.S. Environmental Protection Agency 303(d) List of Impaired Waters.

Once on the Impaired Waters List, a TMDL must be completed for the impaired water.

How do TMDLs address turbidity caused by runoff of urban stormwater?

The first challenge with a turbidity TMDL is drawing a connection between turbidity and pollutants that cause turbidity. This is done by monitoring for both turbidity and suspended materials that cause turbidity, then determining the relationship between the two. Typically, total suspended sediment will be the surrogate for turbidity.

Models and data are used to estimate average total suspended sediment loads that can be discharged to a river or stream without exceeding the water quality criteria for turbidity. This load is the TMDL and it is expressed as a mass per unit time (e.g. kg/day).

A TMDL may be estimated from several sources, such as agriculture, stormwater, and wastewater treatment plants. The portion of the TMDL assigned to regulated MS4s, those MS4s covered under a National Pollutant Discharge Elimination System (NPDES) permit, is part of the TMDL wasteload allocation (WLA). NPDES permits must be consistent with the WLA. MS4s regulated under an NPDES permit must therefore comply with any TMDL requirements in the permit.

Which best management practices (BMPs) are most effective for reducing turbidity?

Since the TMDL WLA is typically written for suspended sediment, BMPs that reduce sediment load will reduce turbidity in the receiving water. The two most effective strategies to reduce sediment load are decreasing impervious surface and disconnecting impervious surface. Within each of these two broad strategies there are potentially many BMPs that can be implemented.

To decrease impervious surface:

- Use porous materials for roadways, parking lots and alleys.
- Reduce soil compaction during development.
- Increase green space in new developments.
- Apply horticultural concepts that improve infiltration, such as planting perennial plants.
- Design narrower roads, sidewalks and alleys.

To “disconnect” impervious surfaces:

- Establish grassy buffers along waterways.
- Use structural BMPs, such as detention basins, rain gardens, infiltration trenches, vegetated media strips, constructed wetlands, and vegetated swales.
- Employ properly-maintained proprietary devices to remove sediment under low-flow conditions.

In addition to the above broad BMP strategies, implementation of a phosphorus strategy will reduce turbidity associated with biological growth. The concept of a phosphorus strategy is discussed in another MPCA fact sheet titled Addressing Phosphorus Impairments in a Storm Water Pollution Prevention Program (SWPPP).

For more information, see the Minnesota Stormwater Manual (www.pca.state.mn.us/water/stormwater/stormwater-manual.html), particularly Chapter 12, which includes summary BMP factsheets.

How do I comply with the permit requirement?

The Phase 2 MS4 General Permit will be re-issued in 2011. There will be significant changes from the 2006 permit. Specific guidance has not been developed yet as the permit language for the 2011 permit is not finalized. Following is a list of items MS4s can consider addressing until the permit is re-issued.

- Develop a list of TMDL WLAs that apply to the MS4, including baselines. The MPCA can provide this information.
- Develop a list of BMPs that apply toward the WLA(s).
- Develop a list of BMPs to be implemented and applied toward the WLA(s) and schedules for those BMPs.

Where can I learn more?

There are several excellent sources of information in the literature. MPCA recommends consulting the Minnesota Stormwater Manual (<http://www.pca.state.mn.us/water/stormwater/stormwater-manual.html>) or MPCA staff for additional information.