What is phosphorus and how does it affect my wastewater treatment facility (WWTF)?

This fact sheet is intended to inform operators and owners of WWTFs about phosphorus, what it is and why it is regulated under the Clean Water Act.

What is phosphorus and why do I have a total phosphorus limit?

Phosphorus is a nutrient. It is essential for plants, animals, and human life. It is a common compound in nature and is the eleventh most abundant element on earth. But, in water, phosphorus is generally scarce; except where human activity has caused it to increase.

The Minnesota Pollution Control Agency (MPCA) regulates the discharge of phosphorus because it has the capacity to impair water quality. Approximately 30% of elevated phosphorus levels in lakes and streams can be traced back to regulated activities such as point-source discharge of wastewater. The remaining 70% can be traced back to nonregulated activities such as agricultural activities and erosion of soil into water bodies.

Is phosphorus bad?

Under normal environmental circumstances, phosphorus is beneficial. Where phosphorus concentrations increase in lakes and streams the water experiences an over-enrichment of nutrients. The response to over-enrichment is algae blooms which can turn otherwise clean water into a green mess.

When this occurs, algae consume the excess phosphorus expediting their life cycles: they grow fast, multiply, and die. As they die and decompose, dissolved oxygen in the water is depleted, and other aquatic life cannot be sustained and recreational use of the water for fishing, boating, and swimming is diminished.

How will the total phosphorus limit effect my WWTF's operation?

If a wastewater permit is issued with requirements to meet a lower total phosphorus concentration, additional treatment may be needed. There are many methods wastewater engineers employ to manage and reduce phosphorus. This can be accomplished through additional use of chemicals to the effluent. But, it may also involve biological phosphorus removal or other advanced treatment. Each system is different. If your existing facility is unable to reduce phosphorus discharge into a receiving water, working with your engineer or consultant to determine the right phosphorus removal approach for your WWTF will help you find the most economical means to meet your National Pollutant Discharge Elimination System (NPDES) permit goal.

What will be my total phosphorus limit?

Effluent limits are reviewed every five years during renewal, including existing permit conditions for phosphorus. Limits will be added or changed if it is necessary to protect downstream waters.

Limits set for lake eutrophication standards (LES) or river eutrophication standards (RES) have no clear answer without understanding the conditions of the receiving water body your facility discharges into, and the broader

watershed. The MPCA wants to make sure any phosphorus limit given will be protective of the waters downstream of an outfall without being overly stringent.

Is everyone going to need RES – based limits?

One of the charges the MPCA is tasked with under the federal Clean Water Act is to develop water quality standards. Water quality standards are used to: evaluate water monitoring data used to assess the quality of Minnesota's water resources; identify waters that are polluted; set limits in NPDES permits to determine what can be discharged into a receiving water body; and protect water resources for uses that include fishing, swimming, and healthy aquatic life. Other beneficial uses the MPCA is charged with protecting water for include drinking water, wildlife, agriculture, navigation, and aesthetic enjoyment of water resources.

Total phosphorus limits based on RES are determined using a watershed approach. This approach evaluates all water bodies within each of Minnesota's 80 watersheds to assess the capacity of each to receive phosphorus without becoming impaired. This is a tailored approach for every watershed and WWTF. As a result, not every WWTF will receive a RES – based limit upon permit reissuance; however, more restrictive limits are possible as more water quality data is collected.

I already have a total phosphorus limit, so why do I need another one?

Formerly, phosphorus limits were established only for new and expanding WWTFs that discharged greater than 1,800 pounds per year total phosphorus or directly to or just upstream of a lake. More recently, those that discharge in a watershed of an impaired lake were issued limits. In many situations, those limits are also protective of rivers and streams, but not all situations. RES enable protection of a river or stream where existing limits are not sufficiently protective using a site-specific evaluation. We now better understand the individual WWTF contributions of total phosphorus loading to an overall watershed. Multiple facilities may discharge upstream of an individual river reach or lake exceeding the standard. This approach assigns a percentage of the phosphorus loading to each facility.

The RES will result in better water quality within the whole watershed. As NPDES permits come up for review every five years, state minimum treatment requirements and downstream water quality will determine a facilities' total phosphorus limit(s).

When will RES – based limits go into effect?

RES were adopted into rule in 2015. Wastewater permits are being reviewed during renewal. If new limits are needed, the MPCA will work with the permittee to determine if a compliance schedule is needed. Compliance schedule length will be determined on a case-by-case basis.

Will it work?

RES applied on a watershed scale provide an opportunity to address impairments through a coordinated process. It will provide for a more efficient approach to addressing those impairments, improve collaboration and innovation, and an overall reduction in the cost of improving the water quality. It will work. In some situations, limits to meet downstream lake goals may even be sufficient for local rivers; the determination will be made during the review process.

Who to contact?

For more information on phosphorus in wastewater discharge, visit http://www.pca.state.mn.us/water/phosphorus-wastewater or call 800-657-3864 or 651-296-6300.