

# Understanding the Large Subsurface Sewage Treatment System Groundwater Nitrogen Policy

This document presents the Minnesota Pollution Control Agency's (MPCA) Large Subsurface Sewage Treatment System (LSTS) Groundwater Nitrogen Policy and provides general information on LSTS planning, design, permitting, construction, and operation.

## Background

Subsurface, or soil, systems treat approximately one third of Minnesota's domestic wastewater (sewage). Poorly designed systems pose potential environmental and human health risks due to pathogens and nitrogen compounds in the discharge.

However, when properly designed, installed, and operated, soil treatment technology has proven to be an effective option for domestic-strength wastewater.

Compared to some other types of wastewater treatment, subsurface systems offer flexibility in operation, and design; characteristics that make them a popular treatment alternative. Construction of these systems is on the rise statewide resulting in an increased demand for associated LSTS permits.

The MPCA Groundwater Nitrogen Policy provides a consistent technical basis for permitting decisions, as well as a means to ensure the protection of Minnesota's valuable groundwater resources.

Soil treatment systems are categorized by size with individual sewage treatment systems (ISTS) serving flows of 5,000 gallons per day or less, mid-sized sewage treatment systems (MSTS) serving flows between 5,001 and 10,000 gallons per day, and LSTS serving flows greater than 10,000 gallons per day.

ISTS and MSTS are regulated by the local unit of government (i.e., city, township, or county). However, due to the volume of wastewater treated by LSTS systems and the potential risks to the environment and human health, Minnesota rules require that the MPCA regulate LSTS.

**LSTS:**

*Large Subsurface Sewage Treatment System serving flows 10,000 gallons per day or greater.*

**MSTS:**

*Mid-sized Sewage Treatment System serving flows between 5,001 and 10,000 gallons per day.*

**ISTS:**

*Individual (on site) Sewage Treatment System serving flows of 5,000 gallons per day or less.*

## Frequently asked questions

### What is the LSTS Nitrogen Policy?

The discharge of LSTS facility effluent must result in a 10 milligrams per liter (mg/L) or less nitrite plus nitrate-nitrogen concentration in groundwater at the property boundary or nearest receptor (i.e., drinking water well), whichever is closer. Each site-specific wastewater treatment state disposal system permit will define how nitrogen is regulated.

### How was this policy limit determined?

This policy is consistent with maximum contaminant levels and health risk limits set by federal and state regulations for groundwater (see 40 CFR § 141.51 and Minn. R. 4717.7860).

## How does the policy affect LSTS projects and permits?

The goals of the policy for protecting the environment and human health are straightforward. However, application of the policy through the MPCA's permitting process is designed to be flexible. The permittee has two permitting options:

**Option #1:** Permittees selecting this option build treatment systems with pretreatment units designed to reduce nitrogen compounds in the wastewater. This option requires the LSTS to meet an end-of-pipe (EOP) limit of 10 mg/L total nitrogen (TN) measured as a calendar month average. The limit applies to wastewater **before** discharge to the drainfield or soil treatment portion of the system. This option typically does not require long-term groundwater monitoring.

**Option #2:** Permittees selecting this option construct treatment systems that utilize any combination of nitrogen pretreatment devices, soil and groundwater nitrogen reductions, and groundwater and precipitation dilution to meet the 10 mg/L nitrite plus nitrate-nitrogen limit at the property boundary or nearest receptor, whichever is closer. For this option, a complete hydrogeologic assessment is also required prior to installation of the LSTS. Based on the results of the hydrogeologic assessment, the treatment system must be designed to meet the effluent total nitrogen concentration obtained via pretreatment devices and dilution/dispersion modeling and either:

- an EOP calendar-month average limit will be set above 10 mg/L total nitrogen and a groundwater monitoring well network will likely be required to monitor the effectiveness of the EOP limit, or
- a groundwater calendar month maximum limit will be set at 10 mg/L nitrite plus nitrate-nitrogen at the property boundary or nearest current/potential receptor, whichever is closer.

## How long does it take to get an LSTS permit?

The MPCA attempts to issue permits as quickly as possible. For less complex systems, the goal is to issue the permit within 150 days from the date the permit application is determined to be complete. The evaluation often includes review of submitted soils information, system siting, groundwater mounding analysis, nitrogen removal capabilities, and pathogen treatment capabilities of the proposed system. More complex systems, such as those opting to meet the nitrogen limit at the property boundary, require a more detailed hydrogeologic study and take significantly more review and permitting time.

## What if high nitrate concentrations (>10 mg/L) exist in upgradient groundwater?

*LSTS permittees are required to treat only the wastewater generated by that facility. Permittees are not responsible for cleaning up a previously impacted site.*

Under Option #1, pre-existing groundwater conditions are not a factor since the EOP limit is already established at 10 mg/L TN and will not change.

Under Option #2, the pre-existing groundwater conditions are determined through actual groundwater sampling prior to construction of the LSTS. Based on sampling results, if upgradient nitrite plus nitrate-nitrogen concentrations are greater than 10 mg/L, then the groundwater modeling results must indicate that the predicted nitrite plus nitrate-nitrogen concentrations at the property boundary or nearest receptor will be equal to or less than 10 mg/L if/when the upgradient nitrite plus nitrate-nitrogen concentrations decrease in the future. Up and downgradient groundwater monitoring would be required to demonstrate the effectiveness of the LSTS and one of the following two conditions must be met:

- An EOP total nitrogen calendar month average limit will be established and nitrite plus nitrate-nitrogen concentrations in downgradient monitoring wells must not exceed that of upgradient concentrations (if greater than 10 mg/L). If upgradient concentrations are equal to or less than 10 mg/L nitrite plus nitrate, the EOP total nitrogen calendar month average limit shall be reduced to 10 mg/L.

- If adequate groundwater monitoring is completed, use the three most recent consecutive quarterly samples to calculate the average upgradient nitrite plus nitrate-nitrogen concentration at the upgradient well. This concentration would be considered the calendar month maximum limit for compliance at the property boundary or nearest receptor for the duration of the permit. Due to variability of nitrite plus nitrate-nitrogen concentrations, it is recommended that permits only be valid for five years. The limit would be in effect for the duration of the permit and be recalculated during the reissuance process using the nitrite plus nitrate-nitrogen sample data from the upgradient well.

At a minimum, the MPCA will re-evaluate applicable EOP and groundwater monitoring limits during permit reissuance to verify compliance with permit limits and this policy.

## **When should the MPCA be contacted regarding a proposed new LSTS?**

Contact the MPCA as soon as possible. Most permittees/project consultants do not involve the MPCA soon enough. A number of factors such as siting and soils significantly affect the type and placement of an LSTS. Early involvement by the MPCA can reduce design approval and permitting time.

## **Is a previously permitted LSTS subject to this policy?**

This Nitrogen Policy was first developed in May 2004. Future permitting of LSTS which were in existence prior to this time will be handled on a case-by-case basis. Existing facilities which pursue permitting Option #2 are typically required to complete a hydrogeologic assessment. The goal is to ultimately have all LSTS meet the intent of this Nitrogen Policy. Existing LSTS determined by the MPCA to represent significant potential or actual harm to the environment or human health may be required to modify or upgrade immediately.

## **Additional LSTS guidance**

A number of resources are available to assist with LSTS design, construction, permitting, and operation.

- The MPCA website: <https://www.pca.state.mn.us/business-with-us/wastewater-permits>
- University of Minnesota Extension website: <http://septic.umn.edu/>

## **Applicable rules and regulations**

- Minn. R. chs. 7080 and 7081 – ISTS and MSTs Requirements
- Minn. Stat. § 115.07 and Minn. R. 7001.1030 - MPCA Permitting Authority
- Minn. R. 7060.0400 to 7060.0600 - Use and Protection of Minnesota's Underground Waters
- 40 CFR § 141.51 - Federal Health Risk Standards for Groundwater
- Minn. R. 4717.7860 - Minnesota Department of Health, Health Risk Standards for Groundwater