

Leak Detection Monitoring Parameters

Purpose

Provide guidance on parameters required for leak detection monitoring at liquid manure storage facilities

Ensure appropriate parameters are analyzed

Ensure the performance of manure storage facilities are accurately assessed

Relevant Legislation

[Agricultural Operation Practices Act](#)

- Standards and Administration Regulation

Related Technical Guidelines

Agdex 096-53

[Leak Detection Groundwater Sampling](#)

Technical Guideline Listing

Agdex 096-100

[Technical Guideline Listing](#)

1. Introduction

The Standards and Administration Regulation (S.18) of the *Agricultural Operation Practices Act* (AOPA) gives the Natural Resources Conservation Board (NRCB) discretion to require an operator of a confined feeding operation (CFO) to install and maintain a leak detection system at a manure storage facility. A leak detection system is intended to assess the performance of the storage facility by using groundwater wells or leachate collection systems to identify leakage or seepage that may be occurring. AOPA requires groundwater quality monitoring at regular intervals to detect potential contamination from a facility, as well as monitoring for the presence of liquid in leachate collection systems. The regulations, however, do not specify the physical, chemical, and microbial parameters, or the sampling intervals.

This guideline outlines the parameters that should be assessed if a CFO permit requires a leak detection system. These parameters may be adjusted by the NRCB for site-specific situations and may include additional or alternative requirements. In these cases, the NRCB will outline the requirements and provide reasons in a written decision. To confirm the monitoring

requirements for a specific operation, please contact the NRCB.

For information regarding sampling methodology and procedures, see [Technical Guideline Agdex 096-53 Leak Detection Groundwater Sampling](#).

2. Monitoring

Leakage from liquid manure storages is typically detected by monitoring changes in groundwater levels and chemistry, or the presence and quality of leachate in the collection system of a tank.

Groundwater conditions are affected by geological and hydrogeological factors, as well as human activities. Groundwater levels and chemistry can also vary seasonally. A comprehensive understanding of the groundwater conditions at a site is required to interpret the results of sampling over time, and to assess the likelihood of impact of manure storages on groundwater conditions. Groundwater quality conditions in the vicinity of a manure storage, measured before or soon after the facility is in operation, can provide an effective baseline reference for future comparisons.

Changes to groundwater quality are detected by monitoring indicator parameters that are commonly

present in relatively high concentrations in manure, and in comparatively low concentrations in natural or background groundwater. Elevated or abnormal levels of indicators are determined by comparing to baseline or upgradient conditions. Further monitoring and evaluation may be required to confirm possible leakage, which may be followed by requirements for management action.

The depth to groundwater in monitoring wells allows for calculation of groundwater elevation, which is used for determining flow direction and should be measured at each sampling event. Having consistent and accurate records will help identify upgradient and downgradient monitoring wells and potential changes in groundwater flow direction.

In the case of leachate collection systems, the presence of leachate indicates the possibility of leakage from the manure storage facility. Analysis of the leachate for manure indicator parameters may be required to confirm possible leakage.

3. Parameters

Monitoring parameters include nutrients and other constituents commonly found in manure. These parameters enable an assessment of the representative groundwater conditions at the time they are measured and serve as an indicator of potential manure leakage. The same parameters (except for groundwater elevation, which only applies to monitoring) will be used for monitoring wells and for leachate collection systems when leachate is detected. Refer to Table 1 for monitoring parameters.

4. Sampling

For new construction, initial sampling should be conducted twice in the first year following facility construction. At least one sampling event should be conducted before a new facility becomes operational. Leachate collection systems should be monitored for the presence of leachate; the NRCB is to be notified if leachate is detected.

Sampling for monitoring purposes will typically be completed annually, during the same month each year, preferably in the spring or fall. The frequency and timing of groundwater sampling may be altered at the

discretion and direction of the NRCB. Annual monitoring records for leachate collection systems are to be kept and provided to the NRCB upon request. If leachate is detected, a sample may be required for analysis.

Table 1. Monitoring parameters for leak detection.

Monitoring Parameters	
Electrical conductivity (EC)	Total kjeldahl nitrogen (TKN)
Chloride (Cl ⁻)	Total dissolved phosphorus (TDP)
Nitrate-nitrogen (NO ₃ ⁻ -N)	<i>Escherichia coli</i> (<i>E. coli</i>)
Ammonia-nitrogen (NH ₃ ⁺ -N)	Groundwater elevation*

*Applies only to monitoring wells. Refer to [Agdex 096-53](#) for groundwater elevation calculation.

5. Assessment and analysis

All sample analysis should be performed by an ISO/IEC 17025 accredited laboratory. In addition, a party responsible for reporting the results of a leak detection monitoring program should be qualified in a practice area related to environmental monitoring through a professional regulatory body.

6. Reporting

The following is a checklist of what may be expected for submission:

- Overview of the CFO and the manure storage being monitored
- History of activities and assessments at the site
- Description of the groundwater monitoring or leachate wells and locations (including a site diagram)
- Ground surface and groundwater elevation measurements
- Description of the sampling techniques and protocol
- Laboratory chain of custody form
- Laboratory certificate of analysis containing analytical results and QA/QC information from the laboratory
- Any additional information required by the NRCB

Contact the NRCB for a digital reporting template to be used for reporting submissions.

For more information

Contact your nearest NRCB field office or Alberta government staff

Government of Alberta
alberta.ca/manure-management-guidelines-and-legislation

Phone 310-FARM (3276)
Publications see [Technical Guideline Listing on open.alberta.ca](#)
Email 310FARM@gov.ab.ca

Natural Resources Conservation Board
nrcb.ca

Morinville 780-939-1212
Red Deer/Airdrie 403-340-5241
Lethbridge 403-381-5166
Email info@nrcb.ca

This guideline was developed by the Technical Advisory Group, a partnership among the Government of Alberta, the Natural Resources Conservation Board (NRCB) and the agriculture industry.