INNOJECTION

InnoJection — Municipal Wastewater Lagoon Phosphorus Treatment

Case Study | Stuartburn Lagoon, Manitoba

0.34 mg/L	>57%	Solar	4 → 0.34
TP Achieved (Limit: 1 mg/L)	Alum Reduction vs Surface Dosing	Powered — No Grid Required	mg/L TP Reduction

Project Background and Challenge

Excess phosphorus from municipal wastewater in Manitoba contributes to eutrophication and harmful algal blooms in receiving waters, including Lake Winnipeg. Many small municipalities and First Nation communities rely on lagoon-based treatment systems, which often struggle to meet the regulatory discharge limit of 1 mg/L total phosphorus.

At the Stuartburn wastewater lagoon site, alum had been applied through surface dosing over multiple seasons to enable lagoon discharge. While partially effective, this approach did not consistently achieve the required phosphorus limit — with some cells remaining above compliance and requiring repeated treatments. Surface dosing also demands significant labour and equipment during a busy operational period, and typically requires two to three times the chemical volume compared to inline dosing methods.

The Innovantage Solution

Innovantage installed a solar-powered InnoJection system to enhance phosphorus removal between lagoon cells. The system applies controlled, inline chemical dosing combined with static mixing to improve coagulation and settling within the lagoon.

During the trial, alum was injected directly into the intercell connection between Cell 2 and Cell 3. Using the existing gravity-driven flow between cells, the system ensured effective mixing prior to discharge into the receiving cell, enabling improved phosphorus coagulation and precipitation.

The Process — Four Key Steps

1. Coagulant Dosing: Alum is injected into the intercell connection between Cell 2 and Cell 3.
2. Inline Mixing: A static mixer ensures thorough contact between the coagulant and wastewater.
3. Precipitation: Phosphorus binds with the coagulant to form settleable particles.
4. Sedimentation: The precipitates settle in the downstream cell for subsequent management.

This approach eliminates the need for surface application, boats, or mechanical mixing equipment, providing a more efficient, controlled, and labour-saving method for lagoon phosphorus treatment. The solar-powered design enables reliable operation at remote or off-grid sites without dependence on grid electricity.

Project Information	
Location	Stuartburn, Manitoba, Canada
Project Type	Wastewater Lagoon Phosphorus Treatment
Completion Date	August 2025
Power Source	Solar — off-grid capable
Regulatory Limit	1 mg/L Total Phosphorus

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Results

The InnoJection system effectively reduced phosphorus levels, enabling the Stuartburn lagoon to meet its discharge requirements. By injecting alum directly between Cell 2 and Cell 3, the system achieved improved mixing and sufficient contact time for coagulation and precipitation in the receiving cell.

Using approximately 1,700 kg of alum, phosphorus concentrations were reduced from 4 mg/L to 0.34 mg/L — well below the 1 mg/L regulatory limit. Compared to conventional surface application, which required approximately 4,000 kg of alum to marginally achieve compliance for the same volume of wastewater, the InnoJection approach reduced chemical usage by more than 57% while significantly improving treatment performance and reducing labour.

Parameter	Before Treatment	After InnoJection	Regulatory Limit
Total Phosphorus (TP)	4.0 mg/L	0.34 mg/L	1.0 mg/L
Alum Required	~4,000 kg (surface dosing)	~1,700 kg	**>57% reduction**

Key Takeaways

- Regulatory compliance achieved: TP reduced from 4 mg/L to 0.34 mg/L — well below the 1 mg/L provincial limit.
- Chemical savings: Alum usage reduced by more than 57% compared to conventional surface dosing for equivalent treatment volumes.
- Labour reduction: Inline automated dosing eliminates the need for boats, sprinklers, and manual surface application during the busy treatment season.
- Remote-site ready: Solar-powered design enables reliable operation at off-grid lagoon sites without grid connection.
- Scalable and retrofit-friendly: Uses existing intercell piping infrastructure — no major civil works required for installation.