DILLON CONSULTING

TAYLOR MCCAFFREY LLP

Cumulative Impact Study

Lagoon Wastewater Discharge

April 2026

April 7, 2026

Taylor McCaffrey
200-201 Portage Avenue
Winnipeg, MB
R3B 3L3

Attention: Kevin T. Williams, K.C.
Partner

Cumulative Impact Study - Lagoon Wastewater Discharge

Dillon Consulting Limited (Dillon) is pleased to provide the attached Lagoon Wastewater Discharge Study for Taylor McCaffrey LLP, on behalf of their client, the Rural Municipality of Gimli.

Sincerely,

DILLON CONSULTING LIMITED

Indra Kalinovich

Indra Kalinovich, Ph.D., C.Chem., P.Eng., FEC
Project Manager

DILLON CONSULTING

300-100 Innovation Dr
Winnipeg, MB
Canada
R3T 6G2
Telephone
204.453.2301

Dillon Consulting Limited

Table of Contents

Figures

Plain Language Summary

The report evaluates the environmental impact of the proposed Harbour Colony (Crystal Springs) two-cell facultative wastewater treatment lagoon (File 6193.00), located near the RM of Gimli. The facility is designed to provide secondary treatment for domestic sewage (design population of 250) and high-strength industrial washwater from an on-site multi-species abattoir, operating under protocols that explicitly exclude solid tissue and blood from the lagoon. Effluent will be managed via a seasonal trickle discharge into Willow Creek, a Class A drain with direct hydraulic connectivity to the sensitive Husavik Wetlands and Lake Winnipeg.

A central focus of the report is the "regulatory paradox" where current provincial guidelines permitting a 1.0 mg/L Total Phosphorus (TP) effluent limit are fundamentally misaligned with the 2024 Nutrient Targets Regulation (M.R. 77/2024). This new regulation establishes a stringent ecological ambient target of 0.05 mg/L TP for Lake Winnipeg's hypereutrophic south basin. The report argues that single-source compliance at the 1.0 mg/L threshold ignores the cumulative, basin-wide nutrient burden. This is particularly concerning because municipal effluent is rich in Soluble Reactive Phosphorus (SRP) and Dissolved Inorganic Nitrogen (DIN), which are highly bioavailable and immediately accelerate stream metabolism and algal proliferation.

The environmental risk is amplified by the hydrological profile of the receiving waterbody. During the late summer and fall discharge windows, natural base flows in Willow Creek decrease significantly, resulting in an "effluent-dominated" condition where the lagoon discharge can comprise 50% to 90% of the total streamflow. Under these conditions, the ambient water quality of the creek is dictated by the effluent concentration. Discharging under standard limits creates a high risk of localized eutrophication, elevated Nitrogenous Biochemical Oxygen Demand (NBOD), and subsequent "oxygen sag," threatening the Class A fish spawning habitat.

To mitigate these impacts, the report proposes several site-specific interventions for the facility's Environment Act License:

- Site-Specific Nutrient Limits: The Environment Act License for File 6193.00 should mandate a site-specific Total Phosphorus and Total Nitrogen limit following a formal assimilative capacity study and the implementation of advanced tertiary treatment to meet the ambient nutrient targets in Lake Winnipeg.
- **Spatial Monitoring Program:** Establishing a mandatory monitoring protocol tracking TP, SRP, TN, Ammonia, and Dissolved Oxygen at three specific points: end-of-pipe, a baseline upstream location, and downstream at the entrance to the Husavik Wetlands.
- **Adaptive Management Clause:** Implementing a regulatory mechanism requiring the Proponent (7317434 Manitoba Ltd./Harbour Colony Holding Co. Ltd.) to reduce discharge volumes or install

further tertiary treatment if downstream monitoring detects significant oxygen depletion or increased algal biomass.

- **Nutrient Mass Balance Reporting:** Requiring operational transparency through annual public reporting that explicitly differentiates the nutrient contributions of the domestic waste stream from the abattoir washwater.
- **Prohibition of Emergency Discharges:** Requiring the facility to utilize alternative emergency measures, such as off-site hauling to a municipal plant, rather than permitting untreated emergency discharges into the hydraulically connected creek
- Zero Emergency Discharge: Given the clear impacts on downgradient receptors, no emergency discharge should be permitted from the facility. The facility should have an emergency plan prepared on how they intend to deal with situations when hydraulic loading exceeds treatment capacity.

Additionally, the lagoon should be relocated to an area of property where the setback distance for wastewater lagoons (300 m) does not encroach on the Rural Municipality of Gimli's land, limiting their decision-making potential for future development. Dillon Consulting Limited has been advised that the Rural Municipality of Gimli was not consulted, nor did they provide approval for this development.

1.0 Introduction

Dillon Consulting Limited (Dillon) was retained by Taylor McCaffrey LLP on behalf of their client, the Rural Municipality of Gimli (RM of Gimli), to prepare a report summarizing the information requests and recommendations regarding the Clean Environment Commission (CEC) hearing for the proposed Crystal Springs Colony Wastewater Treatment Lagoon (Public Registry File Number 6193.00), outlining requests made to the Proponent (7317434 Manitoba Ltd./Harbour Colony Holding Co. Ltd.), the Proponent's procedural responses, and indications from the CEC on the path forward.

This report examines the environmental paradox within the Lake Winnipeg watershed: how the collective impact of multiple, individually compliant wastewater lagoons contributes to the lake's ongoing eutrophication and ecological decline. The analysis reveals a fundamental gap in Manitoba's regulatory framework, which focuses on single-source compliance at the expense of a comprehensive, watershed-wide assessment of cumulative impacts.

2.0 Background

The Manitoba government has committed to the long-term health of the province's aquatic ecosystems and water resources through proactive legislation and nutrient management. Under Sections 4.0.1 (1) through 4.0.2 (5) of *The Water Protection Act*, the Province mandated to develop nutrient targets for Lake Winnipeg and its tributaries and to report on progress every four years.

In 2024, the Province evaluated nutrient levels and reduction initiatives through 2023, with pertinent updates from 2024. On August 23, 2024, the Province established the *Nutrient Targets Regulation*. This regulation formalizes nutrient loading targets for the Red, Winnipeg, Saskatchewan, and Dauphin rivers, alongside concentration targets for total phosphorus and nitrogen in Lake Winnipeg. Developed through years of scientific study and stakeholder collaboration, these targets provide a framework for prioritizing management practices and tracking the efficacy of Manitoba's collective water quality efforts.

Under *The Water Protection Act*, Watershed Districts lead the development of Integrated Watershed Management Plans (IWMP) to maintain water quality and ecosystem integrity. These plans prioritize local issues by combining community input with technical expertise to create targeted recommendations. Because water management is a collective responsibility, implementation is shared across all levels of government, stakeholders, and watershed residents.

Cumulative environmental effects on receiving watercourses result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. For the Willow Creek watershed—which has a drainage area of approximately 1,210 square kilometres and contains

roughly 620 kilometres of ordered drains (per the draft Willow Creek Integrated Watershed Management Plan (IWMP, 2012))—phosphorus contributions from lagoon discharges represent one of many point and non-point sources. While individual discharges may be small, their additive effect contributes to the nutrient loading of the broader Lake Winnipeg drainage basin.

The south basin of Lake Winnipeg is currently phosphorus-enriched and considered hypereutrophic. Long-term mean total phosphorus concentrations in the south basin and narrows (0.106 mg/L) are nearly three times higher than those observed in the north basin (0.040 mg/L) (Manitoba Environment and Climate Change, 2024). Consequently, managing point-source discharges at the watershed level is critical to achieving the provincial targets set for the downstream Lake Winnipeg ecosystem.

Given the sensitivity to nutrient input to the local watershed system, The Willow Creek IWMP (2012) identified the following action to be carried out to protect the watershed against the excessive levels of phosphorus and nitrogen: *conduct environment risk assessments for all wastewater lagoons or sewage treatment plants and establish site-specific effluent discharge objectives.*

While the *Manitoba Water Quality Standards, Objectives and Guidelines* (2011) establish the baseline province-wide thresholds for phosphorus, the introduction of the 2024 Nutrient Targets Regulation creates a more rigorous compliance environment. Because these new regulations focus on the total cumulative load reaching Lake Winnipeg, standard 'one-size-fits-all' discharge limits may be insufficient for projects within sensitive or phosphorus-enriched sub-watersheds like Willow Creek. Consequently, the regulatory framework now supports the implementation of site-specific effluent discharge criteria that are more protective than general provincial standards to ensure alignment with mandated downstream water quality goals.

While community wastewater is a smaller contributor than transboundary agricultural runoff, its point-source nature makes its collective burden a manageable component of the overall problem. This mismatch is compounded by a regulatory process that does not formally require a cumulative impact assessment based on region or proximity to sensitive aquatic receptors. There is no apparent limit to the number of lagoons that could be approved within proximity to Lake Winnipeg. They could all be designed to meet the 1.0 mg/L phosphorus target selected in 2011. However, this regulatory 'target' was not designed to meet the lake's ecological health target later developed in 2024, which was based on cumulative impacts assessment. To meet the provincial goals established in the 2024 Nutrient Targets Regulation, cumulative load reductions are necessary across all tributaries. For context, the province has set specific maximum annual loading targets for major tributaries, such as 2,800 tonnes/year of phosphorus and 19,050 tonnes/year of nitrogen for the Red River. Mitigating point-source discharges in smaller sub-watersheds like Willow Creek is a necessary, high-leverage component of achieving this basin-wide ecological mandate.

2.1 Wastewater Treatment Facility

The proposed wastewater treatment facility is located on SE 28-18-3 EPM in the Rural Municipality of Armstrong, approximately 12 kilometers west of the community of Gimli. The proposed location of the lagoon is shown below on Figure 1 (TREK Geotechnical Inc., 2024). As per the Province of Manitoba's Information Bulletin – Design Objectives for Wastewater Treatment Lagoons (2022),

> A lagoon site should be as far as practicable from habitation or any area which may be built up within a reasonable future period. Lagoons should not be located any closer than 460 metres from any center of population; individual residences should not be any closer than 300 metres. The above distances are to be measured from the outer toe of the nearest dyke.

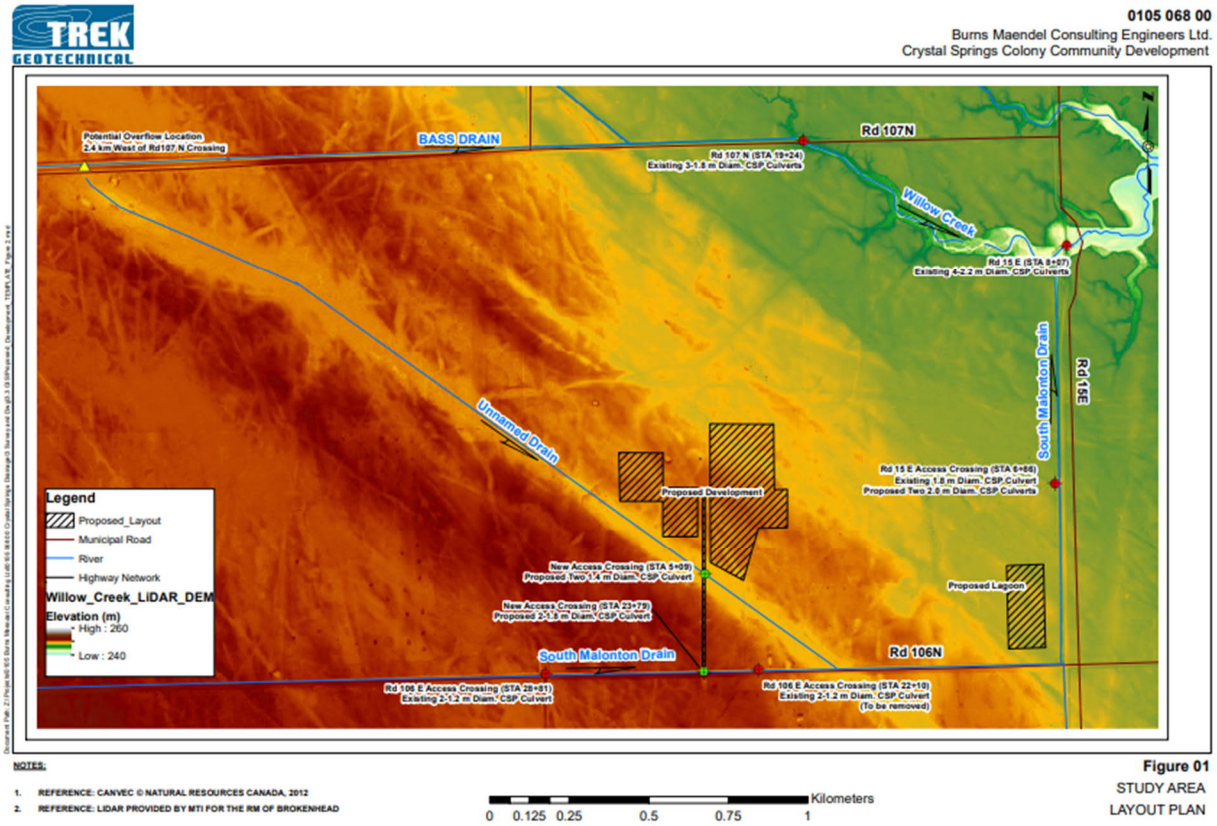

Figure 1: Study Area Layout Plan (TREK Geotechnical Inc., 2024)

The location was evaluated against existing infrastructure and found to be compliant. However, the boundary between the Rural Municipality of Gimli and the Rural Municipality of Armstrong is at Rd 15E. The setback distance (300 m) for the lagoon encroaches onto the Rural Municipality of Gimli's land. These setbacks impose future development constraints on land within the Rural Municipality of Gimli. Under the *Municipal Act* and *The Planning Act*, a rural municipalities' responsibilities include land use planning and zoning. Given Dillon's understanding that that the Rural Municipality of Gimli was not

consulted with respect to this development it is effectively having development restrictions imposed on its lands that the Rural Municipality of Gimli did not agree to cede.

The project involves the construction of a two-cell facultative lagoon (shown below on Figure 2) designed to service the Harbour Colony (Manitoba Environment Act File 6193.00). The facility is situated within the upper reaches of the Willow Creek watershed, a region characterized by low topographic relief and high hydraulic connectivity to the south basin of Lake Winnipeg. The proposed discharge pipe location is at the southeastern corner of the lagoon, and will be discharged into the outfall swale (marked by the blue dashed line shown below on Figure 2) with flow towards the western roadside drain alongside Road 15E.

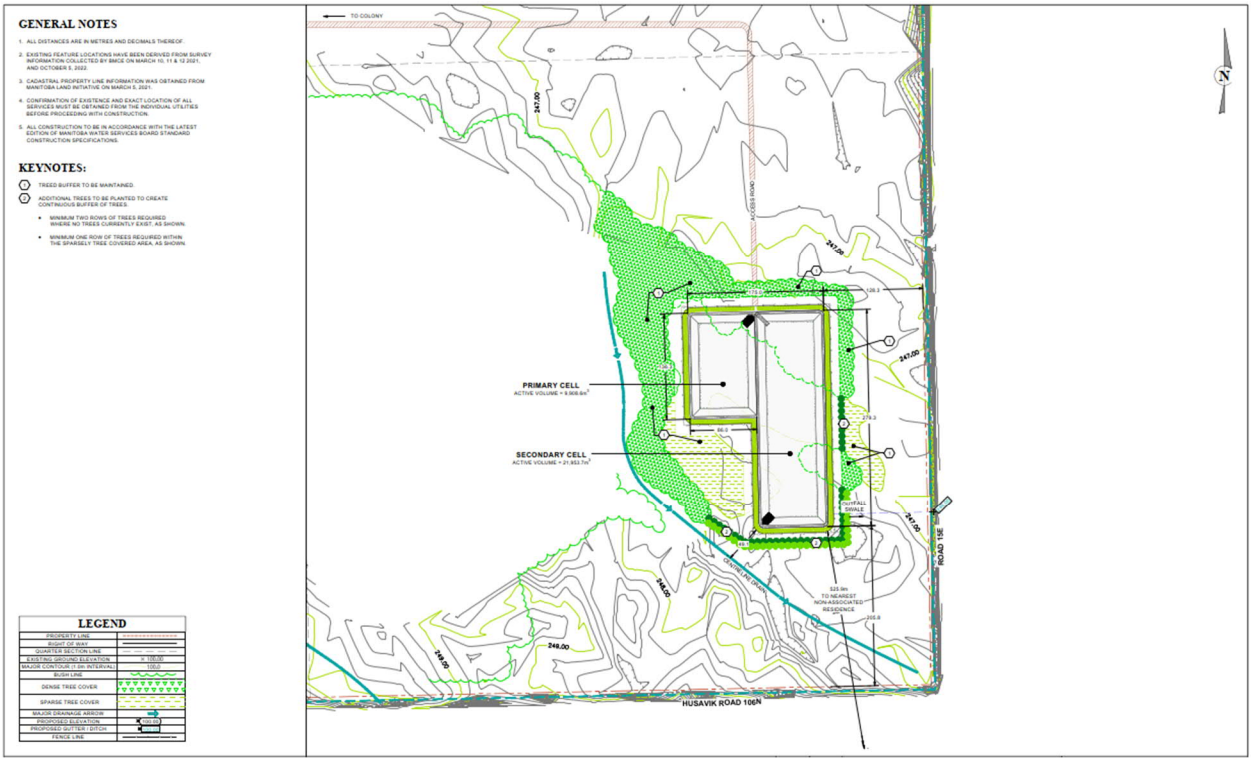

Figure 2: Lagoon Site Plan, Burns Maendel Consulting Engineers Ltd., 2023

The lagoon is designed to provide secondary treatment for a combined waste stream originating from two primary sources:

- Domestic Wastewater: Sized to accommodate a full build-out population of approximately 250 residents, following standard provincial organic and hydraulic loading rates.
- Abattoir Operations: The facility will process high-strength wastewater from an on-site multi-species abattoir. The abattoir is designed with an annual capacity for 6,000 chickens, 2,000 ducks/turkeys, 500 hogs, and 25 cattle. While operational protocols dictate that solid tissue and blood waste will be captured, diverted, and explicitly excluded from the lagoon system, the remaining abattoir

washwater (containing manure, urine, fats, and sanitation chemicals) constitutes a high-strength influent.

Based on the design flow of 27,054 m^3/year, the Proponent has established the following anticipated annual nutrient loads:

- Total Phosphorus (TP): At the current provincial effluent limit of 1.0 mg/L, the lagoon will discharge a mass load of 27.05 kg/year. In the context of the 2024 *Nutrient Targets Regulation*, this load is a point-source contribution to the cumulative phosphorus budget of the Lake Winnipeg south basin.
- Total Nitrogen (TN) and Ammonia: While no annual mass limit for TN is currently mandated for this facility size, typical secondary treatment lagoons produce effluent in the range of 15 to 30 mg/L TN. For this facility, this translates to an estimated loading of 400 to 800 kg/year. Compliance will be governed by the un-ionized ammonia limit of 1.25 mg/L (at 15°C), which is critical for preventing acute toxicity in the immediate receiving watercourse.

The facility will utilize a trickle discharge methodology between June 15 and November 1, releasing treated effluent into a first-order drain that feeds into Willow Creek. The hydrological environment is defined by several critical factors:

- Hydraulic Connectivity: The discharge point is located approximately 9 km upstream of Lake Winnipeg. Due to the drainage-oriented landscape, the 9 km reach acts as a direct conduit, ensuring that nearly 100% of the discharged nutrient load reaches the lake over an annual cycle.
- Class A Fish Habitat: Willow Creek is designated as a Class A drain, providing essential spawning and nursery habitat for indicator species such as Northern Pike and Walleye. This designation requires the maintenance of high dissolved oxygen levels and minimal nutrient enrichment to protect the aquatic ecosystem.
- Effluent Dominance: During late summer and fall, natural base flows in Willow Creek often drop significantly. Under these conditions, the lagoon's trickle discharge can comprise 50% to 90% of the total streamflow, effectively dictating the water quality of the 9 km reach and increasing the risk of localized eutrophication and "oxygen sag."
- Proximity to Sensitive Wetlands: The discharge path passes through the Husavik Wetlands complex. These wetlands are highly sensitive to "nutrient loading" and serve as a critical natural filter (Eastwood, R.A., 2016); however, excessive phosphorus inputs can lead to a shift in vegetation and a reduction in the wetland's long-term assimilative capacity.

2.2 Total Phosphorus Effluent Limits

The current 1.0 milligram per litre (mg/L) total phosphorus effluent limit for wastewater lagoon discharge is misaligned with the lake's ecological health target of 0.05 mg/L total phosphorus under the *Water Protection Act* (Nutrient Targets Regulation, M.R. 77/2024, The Water Protection Act, C.C.S.M. c. W65).

The 1.0 mg/L target was selected (back in 2011) based on several factors:

- Technological Feasibility: At the time, 1.0 mg/L was considered "Best Practicable Technology." It could be achieved through chemical precipitation (using alum or ferric chloride) without requiring the more expensive "biological nutrient removal" (BNR) systems needed for ultra-low limits (like 0.1 mg/L).
- Regional Consistency: At the time, this limit mirrored standards in the Great Lakes basin and Ontario, which had used 1.0 mg/L as a baseline for decades to combat eutrophication.

As of 2026, many jurisdictions managing sensitive or impaired watersheds are moving toward much stricter Ultra-Low Phosphorus (ULP) limits. In 2016, Canada and the United States committed to a 40% total reduction in phosphorus entering Lake Erie to combat toxic algal blooms (Environment and Climate Change Canada, 2016). The decision to drop the limit from 1.0 mg/L to 0.5 mg/L was driven by the 2016 Binational Phosphorus Reduction Targets. Consequently, by 2020, Ontario established a 0.5 mg/L total phosphorus legal effluent limit for wastewater generators in the Lake Erie basin to align with these cumulative loading goals. Lake Erie is a relevant comparable because it shares similar morphological characteristics with Lake Winnipeg; both are shallow, warm, and have a large surface area.

Similar to Manitoba, many municipal lagoon systems in rural Ontario operate on seasonal discharge schedules. While Ontario's *Guideline F-5-1* (1994, reaffirmed 2021) sets a general design objective between 0.5 and 1.0 mg/L (Ministry of the Environment and Energy, 1994), sensitive areas are governed by "Policy 2," which states:

> "Water quality which presently does not meet the Provincial Water Quality Objectives shall not be degraded further and all practical measures shall be taken to upgrade the water quality to the Objectives" (Ministry of Environment and Energy, 1994).

Manitoba has not created a similar policy. The need for site-specific criteria more stringent than the provincial baseline is further supported by the chemical speciation of phosphorus. Effluent from municipal lagoons consists primarily of Soluble Reactive Phosphorus (SRP). Unlike particulate phosphorus bound to soil—which may remain geochemically sequestered in sediments—SRP is highly bioavailable and immediately accessible to primary producers (Schindler et al., 2016). This results in more acute impacts on dissolved oxygen and algal proliferation than equivalent loads from non-point source runoff.

In watersheds like Willow Creek, lagoons often discharge into intermittent streams where effluent can comprise 50% to 90% of the total streamflow during low-flow periods. In these "effluent-dominated" conditions, the discharge concentration effectively dictates the ambient water quality of the reach, necessitating a limit closer to the 0.05 mg/L target to prevent localized degradation and contribute to the 2024 provincial nutrient targets for Lake Winnipeg.

It is noted that between correspondence between the Province and the Engineering representative for the Proponent (Burns Maendel Consulting Engineers Ltd.), that "in order to maintain the average total phosphorus concentration of Willow Creek of 0.06 mg/L, the maximum concentration of the lagoon effluent must also be 0.06 mg/L (or less)." (file listed in Public Registry 6193.00, 2024). While this addresses acute impacts associated with discharge, this does not fully address long-term cumulative impacts associated with excess nutrient discharge to a potentially overloaded receiving system.

In the same correspondence chain, mixing model calculations for total phosphorus were carried out for the June and September lagoon discharges (0.09 mg/L and 0.27 mg/L, respectively). As noted above, the baseline total phosphorus in Willow Creek is 0.06 mg/L. According to the 2004 *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (Canadian Council of Ministers of the Environment), any total phosphorus increase greater than 50% above baseline (which equates to 0.09 mg/L) indicates a high risk of observable effects and warrants further assessment. Both calculated discharge scenarios meet or exceed this 0.09 mg/L threshold.

2.3 Total Nitrogen and Ammonia Effluent Limits

Manitoba's regulatory approach to nitrogen management is dual-purposed: it addresses both the acute toxicity of ammonia (NH_3) to aquatic life and the cumulative loading of Total Nitrogen (TN) contributing to the eutrophication of Lake Winnipeg. Similar to phosphorus, the current provincial standards are increasingly being re-evaluated against the 2024 *Nutrient Targets Regulation* (M.R. 77/2024), which established an ecological health target of 0.75 mg/L Total Nitrogen for Lake Winnipeg (Province of Manitoba, 2024).

Historically, nitrogen regulation in Manitoba lagoons focused primarily on ammonia-nitrogen (NH_3-N) limits to prevent lethal impacts on fish. The 1.25 mg/L un-ionized ammonia limit (at 15°C) was adopted as a standard because of:

- Toxicity Mitigation: Ammonia toxicity is highly dependent on pH and temperature. The historical focus was on ensuring that discharge into small receiving bodies did not cause immediate fish kills.
- Technological Limitations: Traditional facultative lagoons are highly effective at organic removal but have inconsistent performance regarding nitrogen removal, particularly during cold-weather months when nitrifying bacteria are less active (CCME, 2009).

By 2026, the focus has shifted toward Total Nitrogen (TN) as a driver of cumulative impact. While phosphorus is the primary limiting nutrient in many freshwater systems, nitrogen plays a critical role in determining algal community composition—specifically favoring the growth of non-nitrogen-fixing cyanobacteria (blue-green algae) in Lake Winnipeg's south basin (Schindler et al., 2016).

As jurisdictions move toward integrated watershed management, nitrogen limits are becoming more stringent. In the Great Lakes basin, many facilities have moved toward a TN limit of 10 to 15 mg/L to

align with the *Canada-Ontario Agreement on Great Lakes Water Quality*. Similar to the "Policy 2" application for phosphorus, Ontario's approach to nitrogen in sensitive watersheds requires that "effluent requirements shall be based on the more stringent of either the water quality-based effluent limits or the technology-based effluent limits" (Ministry of Environment and Energy, 1994).

In 2020, updated Environmental Compliance Approvals in the Lake Erie basin began mirroring the 40% reduction goals seen in phosphorus management. This trend underscores a move away from simply preventing acute toxicity and toward managing the total nutrient mass entering the basin.

The technical necessity for site-specific nitrogen criteria in the Willow Creek watershed is driven by two factors: speciation and effluent dominance.

- Bioavailable Nitrogen: Lagoon effluent is typically rich in Dissolved Inorganic Nitrogen (DIN), including ammonium and nitrates. Like Soluble Reactive Phosphorus (SRP), DIN is immediately available for uptake by aquatic macrophytes and algae. This "pre-digested" nitrogen accelerates stream metabolism, leading to excessive biomass production in the 9 km reach of Willow Creek.
- Oxygen Demand: The conversion of ammonia to nitrate (nitrification) in the creek consumes significant amounts of dissolved oxygen. In a "trickle discharge" scenario, where effluent may comprise up to 90% of the creek flow during dry periods, this Nitrogenous Biochemical Oxygen Demand (NBOD) can depress oxygen levels to a point that is sub-lethal or lethal for local fish species, regardless of the toxicity of the ammonia itself.

In the context of the 2024 provincial targets, a site-specific limit for Total Nitrogen is required to ensure that the lagoon's contribution does not exceed the assimilative capacity of Willow Creek or undermine the 0.75 mg/L TN objective for Lake Winnipeg. Given the hydraulic connectivity of the system between Willow Creek and Lake Winnipeg, nitrogen discharged at the lagoon is effectively a direct contribution to the nutrient budget of the lake's south basin.

Willow Creek is designated as a Class A drain under the Manitoba Agricultural Drain Classification System, indicating the presence of indicator fish species such as Northern Pike and Walleye and the existence of complex aquatic habitat (DFO & Manitoba Water Stewardship, 2013). Under the Manitoba Water Quality Standards, Objectives and Guidelines (2011), Class A watercourses require stringent protection of dissolved oxygen levels and nutrient controls to prevent the degradation of spawning and nursery grounds, particularly during the low-flow summer months when effluent dominance is highest.

3.0 Interlake Wastewater Lagoon Discharges

In the Interlake region of Manitoba, lagoons have often been discharged into marshes which act like natural filters. Many of these marshes are becoming 'saturated', meaning they can no longer absorb the phosphorus as effectively as they did 50 years ago. In a flood year like 2022, "nutrient reduction

strategies" (like wetlands) fail completely. The water moves too fast for plants to absorb the phosphorus, and the wetland itself can actually "flush out" old phosphorus, making the downstream situation worse.

Willow Creek is a sensitive spawning ground, and Lake Winnipeg is already under duress. Over the period between 2019 to 2024, total phosphorus concentrations measured in Willow Creek (Water Quality Sampling Station MB05SBS279) have been above the 0.05 mg/L target for Lake Winnipeg 55% of the times sampled. Total nitrogen concentrations have been above the 0.75 mg/L target for Lake Winnipeg 87% of the time. The majority of these elevated values have been observed in the months of May and July.

It is noted that this is the same period of time that the Proponent intends to discharge from the lagoon, during the summer months to maximize nutrient utilization by plants and take advantage of high evaporation rate.

If the lagoon discharges into Willow Creek during a low-flow period in late summer (to prepare storage for winter), the stream flow becomes 100% effluent. There is no dilution capacity. Manitoba's climate is defined by extreme hydrological events. Even if some phosphorus is temporarily trapped in the weeds or muck of Willow Creek during a dry August, the Spring Freshet (snowmelt) acts as a massive "flush." The high volume and velocity of spring runoff effectively scours the creek bed, carrying the previous year's accumulated "legacy phosphorus" into the south basin of Lake Winnipeg in a single pulse.

Willow Creek is a direct tributary to Lake Winnipeg. During the typical lagoon discharge windows (spring and fall), water velocities in Manitoba's ordered drains and creeks are generally sufficient to transport dissolved constituents several kilometers per day. At a modest flow rate of 0.1 to 0.5 m/s, water can travel the approximate 9 km in well under 24 hours. Unlike the phosphorus found in soil particles (which is heavy and sinks), SRP is dissolved in the water. It doesn't need a flood to move; it moves as long as the water is moving. Even in a low-gradient system, there is very little to "stop" SRP once it is in the creek. Phosphorus isn't destroyed or degraded. Phosphorus mass can accumulate and migrate towards Lake Winnipeg over time.

The proponent noted under Reply to Information Request No. 4 (The Rural Municipality of Gimli) that "assessment and commentary of effluent discharge on fish habitat in Willow Creek was not completed. License terms within the Province of Manitoba limit the discharge window to be between June 15 and October 31 of any year due to winter storage and fish spawning periods". It is unclear how this continued discharge will affect spawning habitat (e.g., northern pike, walleye) in a Class A Fish Drain in the following spring. The Class A status requires a greater standard of care as the creek is hydraulically linked to sensitive wetlands (i.e., Husavik Wetlands).

The IWMP (East Interlake Watershed District, 2012) recommended that Rural Municipalities and Planning Districts consider the following:

> Adopt policies that restrict future intensive and high-pollution risk developments (developments, activities, land uses and structures that have a high risk of causing pollution and include, but are not limited to chemical and fertilizer storage facilities, septic fields and tanks, fuel tanks, waste disposal grounds and lagoons) in source water protection zones for all public drinking water sources and in areas with less than six meters of overburden. Where restriction is not possible, development should be limited and may be subject to:
>
> - demonstration by the Proponent that no significant negative effect on water quality is likely to occur;
> - the implementation of mitigation measures and alternative approaches that protect, improve or restore these areas;
> - the preparation of a strategy for mitigation in the event that negative impacts do occur.

The surface water quality sampling station is located approximately 7 km downgradient from the point of discharge for the lagoon, indicating that the nutrient burden in the stream prior to reaching Lake Winnipeg is already exceeding the nutrient loading targets set by the Province for the lake.

4.0 Conclusions

Based on the technical evaluation of the Environmental Act Proposal (File 6193.00) and the specific hydrogeological characteristics of the Willow Creek watershed, the following conclusions have been reached:

Insufficiency of Standard Limits: Given the proximity of the lagoon and direct hydraulic connectivity to Lake Winnipeg, the current provincial baseline of 1.0 mg/L Total Phosphorus (TP) is misaligned with the 2024 Nutrient Targets Regulation (M.R. 77/2024). Given that Lake Winnipeg's south basin remains hypereutrophic with a target of 0.05 mg/L TP, a 1.0 mg/L discharge into a direct tributary is statistically incompatible with cumulative loading goals.

Hydraulic Connectivity and Nutrient Transport: The lagoon's location 9 km upstream of Lake Winnipeg ensures high hydraulic connectivity. While the trickle discharge methodology mitigates immediate erosion, it creates a chronic supply of Soluble Reactive Phosphorus (SRP) during the peak growing season, directly feeding algal proliferation in the Husavik Wetlands and residential channels.

Effluent Dominance in Class A Habitat: Willow Creek's status as a Class A drain necessitates a higher standard of protection than a typical agricultural ditch. During low-flow periods, the lagoon effluent may comprise up to 90% of the creek volume. Under these "effluent-dominated" conditions, a 1.0 mg/L TP

limit dictates a water quality that is 20 times higher than the lake's ambient objective, posing a significant potential risk to fish spawning and nursery habitat.

Abattoir Waste Complexity: The inclusion of high-strength industrial waste from abattoir operations introduces a risk of Nitrogenous Biochemical Oxygen Demand (NBOD) and elevated ammonia levels that standard facultative lagoons may struggle to treat effectively during late-fall discharge windows.

To ensure the long-term health of the Willow Creek watershed and alignment with Manitoba's 2026 water quality objectives, the following actions are recommended:

1. Implementation of a Site-Specific Phosphorus and Total Nitrogen Limit:
The Environment Act License for File 6193.00 should mandate a site-specific Total Phosphorus and Total Nitrogen limit following a formal assimilative capacity study for Willow Creek, and the implementation of advanced tertiary treatment to meet the ambient nutrient targets in Lake Winnipeg. This aligns with best practices in comparable jurisdictions (e.g., Lake Erie basin), and is necessary to protect the status of the receiving environment.

2. Comprehensive Downstream Monitoring Program:
A mandatory monitoring program should be established, requiring water quality sampling at three locations:

- The lagoon discharge point (End-of-pipe).
- Willow Creek upstream of the discharge (Baseline).
- Willow Creek at the entrance to the Husavik Wetlands (Cumulative impact).
- Parameters: TP, SRP, TN, Ammonia, and Dissolved Oxygen.

Monitoring events should take place before, during discharge, and after discharge to evaluate potential migration and transport of nutrients associated with the lagoon.

3. Adaptive Management Clause:
The license should include an Adaptive Management Clause stating that if downstream monitoring indicates a significant "Oxygen Sag" or a measurable increase in algal biomass in the 9 km reach of Willow Creek, the Proponent must further reduce discharge volumes or implement tertiary phosphorus removal technologies.

4. Operational Transparency: In accordance with the 2026 CEC hearing recommendations, the colony should provide annual public reporting of their "Nutrient Mass Balance," explicitly showing the phosphorus and nitrogen contributions from the abattoir separate from domestic waste.

5. Zero Emergency Discharge. Given the clear impacts on downgradient receptors, no emergency discharge should be permitted from the facility. The facility should have an emergency plan prepared

on how they intend to deal with situations when hydraulic loading exceeds treatment capacity. One recommendation could be to truck sewage to a nearby wastewater treatment plant, alternately, a tertiary treatment could be applied at the point of discharge to meet effluent discharge limits.

6. Lagoon Relocation. The lagoon should be relocated to an area of property where the setback distance does not encroach on the Rural Municipality of Gimli's potential for future development.

5.0 Disclaimer

This report was prepared exclusively for the purposes, project and site location(s) outlined in the report. The report is based on information provided to, or obtained by, Dillon Consulting Limited ("Dillon") as indicated in the report, and applies solely to site conditions existing at the time of the site investigation(s). Although a reasonable investigation was conducted by Dillon, Dillon's investigation was by no means exhaustive and cannot be construed as a certification of the absence of any contaminants from the site(s). Rather, Dillon's report represents a reasonable review of available information within an agreed work scope, schedule and budget. It is therefore possible that currently unrecognized contamination or potentially hazardous materials may exist at the site(s), and that the levels of contamination or hazardous materials may vary across the site(s). Further review and updating of the report may be required as local and site conditions, and the regulatory and planning frameworks, change over time.

This report was prepared by Dillon for the sole benefit of Taylor McCaffrey LLP and their client, the Rural Municipality of Gimli. The material in it reflects Dillon's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Dillon accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Respectfully Submitted:

DILLON CONSULTING LIMITED

Indra Kalinovich, Ph.D., C.Chem., P.Eng., FEC
Environmental Engineer

6.0 References

Burns Maendel Consulting Engineers Ltd. 2024. Notice of Alteration Report Crystal Springs Colony New Development SE 28-18-03 EPM. Submitted to: Environmental Approvals Branch, Manitoba Environment, Climate and Parks. https://www.gov.mb.ca/sd/eal/registries/6193/prop_res_2.pdf

Canadian Council of Ministers of the Environment (CCME). (2004). *Canadian Water Quality Guidelines for the Protection of Aquatic Life. Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems.*

Canadian Council of Ministers of the Environment (CCME). (2009). *Canada-wide Strategy for the Management of Municipal Wastewater Effluent*.

Eastwood, R. A. (2016). *Section B: Science Report - Shoreline Classification and Sensitivity of Lake Winnipeg's South Basin*. Prepared for the University of Manitoba and the Lake Winnipeg Foundation

East Interlake Conservation District, 2012.The Willow Creek Integrated Watershed Management Plan. Finalized in 2016. https://www.gov.mb.ca/sd/water/watershed/iwmp/willow_creek/documentation/willcreekplan_final_jan31.pdf

Environment and Climate Change Canada. (2016). *Canada-Ontario Lake Erie Action Plan: Partnering in Phosphorus Control and Regaining Health of Lake Erie*. Government of Canada.

Fisheries and Oceans Canada (DFO) & Manitoba Water Stewardship. (2013). *Manitoba Agricultural Drain Classification System.*

Lake Winnipeg Foundation (LWF). (2023). *Lake Winnipeg Community-Based Monitoring Network: Regional Report for the East Interlake Watershed District*.

Manitoba Environment and Climate Change, 2024. Nutrient Targets Regulation: Report on Nutrient Levels Through 2023 And Action Underway. Water Science and Watershed Management Branch. December 2024. https://www.gov.mb.ca/sd/pubs/water/lakes-beaches-rivers/report-on-nutrient-targets-and-action-underway-dec-2024.pdf

Ontario Ministry of the Environment and Energy (MOEE). (1994, Reaffirmed 2021). F-5-1 Determination Of Treatment Requirements For Municipal And Private Sewage Treatment Works. Requirements for treatment of municipal and private sewage discharge in surface waters. Government of Ontario.

Ontario Ministry of the Environment and Energy (MOEE). (1994, Reaffirmed 2021). *Guideline F-8: Effluent Guidelines for Municipal Sewage Treatment Facilities*. Government of Ontario.

Ontario Ministry of the Environment and Energy, 1994. Water management: policies, guidelines, provincial water quality objectives. Updated: August 16, 2021.

https://www.ontario.ca/page/water-management-policies-guidelines-provincial-water-quality-objectives

Province of Manitoba, 1996. *The Municipal Act*, C.C.S.M. c. M225.

Province of Manitoba, 2006. *The Water Protection Act*, C.C.S.M. c. W65.

Province of Manitoba, 2005. *The Planning Act,* C.C.S.M. c. P80.

Province of Manitoba, 2022. Information Bulletin – Design Objectives for Wastewater Lagoons. March 2022.

Province of Manitoba, 2024. Public Registry 6193.0, Additional Information – posted March 10, 2025. https://www.gov.mb.ca/sd/eal/registries/6193/add_info.pdf

Province of Manitoba, 2024. Nutrient Targets Regulation, M.R. 77/2024, *The Water Protection Act*, C.C.S.M. c. W65.

Schindler, D. W., Carpenter, S. R., Chapra, S. C., Hecky, R. E., & Orihel, D. M. (2016). Reducing Phosphorus to Curb Lake Eutrophication is a Success. *Environmental Science & Technology*, 50(17), 8923–8929.

TREK Geotechnical Inc., 2024. Crystal Springs Colony– New Colony Development 200-year Flood Level Assessment. Prepared for Burns Maendel Consulting Engineers Ltd. July 26, 2024.