CITY OF NORTH BATTLEFORD
2025 ANNUAL WASTEWATER TREATMENT PLANT REPORT

North Battleford
Treaty Six Territory | Heartland of the Métis | Saskatchewan | Canada

April 2026

Executive Summary

The Wastewater Treatment Plant (WWTP) treated approximately 1.9 million cubic meters of domestic wastewater in 2025.

During the reporting period, the WWTP experienced Permit to Operate a Sewage Works (PTO) sewage effluent (treated sewage) sample limit exceedances related to E. coli and Total Ammonia Nitrogen. These exceedances were associated with conditions arising from the commissioning of a newly constructed Sanitary Sewage Lift Station and Force Main in 2023. All other PTO regulated samples met the PTO sample limits.

Since the start of LysteGro fertilizer at the WWTP, 51,708 m^3 of bio-fertilizer has been produced and transferred to the storage lagoon. In 2025, 4,590 m^3 bio-fertilizer was land applied.

In general, the results reported by the accredited lab(s) were comparable with the results reported by the WWTP.

Northland Power Energy Center has continued to take effluent to be used in their power process.

2025 WWTP completed improvements include:

- Upgraded isolation valves in the bioreactors.
- Bioreactor catwalk upgrades
- The purchase of new UV upgrade equipment.
- The implementation of the septage receiving station for septic haulers.
- The replacement of 790m of sanitary sewer pipe in the collection system.

2026 WWTP planned improvements include:

- The installation of new UV upgrade equipment.
- A pilot study for the H_2S generation of the 2023 force main.
- New exhaust fans in the Headworks building for exhausting H2S gas.
- The installation of a new power sliding gate at one of the sewage lagoons.

Operations at the CNB WWTP proceeded smoothly. The WWTP was able to meet most of the guidelines set forth by the WSA.

Table of Contents

Introduction

The City of North Battleford (CNB) owns and operates a Wastewater Treatment Plant (WWTP). The goal of the North Battleford Wastewater Treatment Plant is to treat the City's sewage and produce effluent (treated sewage) that meets or exceeds the Permit to Operate a Sewage Works (PTO) as set by the Water Security Agency (WSA). Data represented within this annual report is taken from operations, sampling, and data collection from the CNB WWTP. The PTO can be found in Appendix A.

Background

The WWTP began operating in 2006 and is a Level 4 plant. The plant is located in the south-east of the City. Effluent (treated sewage) is discharged to the North Saskatchewan River, downstream of the F.E. Holliday Water Treatment Plant. The plant is designed to treat an average flow of 7,320 m^3/day, a maximum flow of 7,617 m^3/day and a peak flow of 11,950 m^3/day. The WWTP complex includes two evaporation lagoons for vacuum trucks hauling heavy grit, primarily carwash grit cleanout, that were constructed in 1968 for the former Saskatchewan Hospital and was later purchased by the City. A septic receiving station for septic waste that was installed in 2021 and commissioned in 2024.

Quality Assurance/Quality Control (QA/QC)

QA/QC involves a duplicate/standard program. WWTP staff conduct daily/weekly *in-house* tests on sewage effluent. The parameters tested include total ammonia, total suspended solids (TSS), biochemical oxygen demand (BOD), carbonaceous biochemical oxygen demand (cBOD), and phosphorous. These *in-house* tests results are compared to the PTO accredited 3rd Party laboratory test results.

Although sewage influent (raw sewage) sampling is not part of the PTO requirements, WWTP staff conduct *in-house* testing of sewage influent. The results of the parameters tested assist with effectively treating the sewage influent to meet the sewage effluent limits in the PTO.

Flows

As part of a requirement in the PTO, the volume of effluent discharged to the environment is monitored and recorded. The WWTP continuously monitors and records all influent entering and all effluent leaving the plant. In 2025, the WWTP treated approximately 1.9 million m^3 of domestic wastewater. The monthly flows ranged from 128,665.7 m^3 (February) to 176,837.4 m^3 (May). The lowest average daily flow was 4,436.7 m^3 (February), and the highest was 5770.3 m^3 (April). Flow data for 2025 can be found in Table 1B.

In 2025, 5,772.4 m^3 of leachate was pumped from the Waste Management Facility landfill pit to the WWTP and 17,326 m^3 of domestic sewage was received from the Septage Receiving Station to be treated at the WWTP.

Tested Parameters

Monthly/Quarterly Data

The following parameters are tested daily or weekly but reported as a monthly or quarterly average since the limits in the PTO are based on a calendar monthly or quarterly arithmetic average. The data is collected and reported from January 1 to December 31 of 2025.

Each of the following parameters are tested for on the basis that each affects the final quality of river water and may be detrimental to aquatic life if higher than the permitted limit.

Ammonia - Total

"Ammonia as Nitrogen" (NH_3-N), is a dissolved form of nitrogen commonly present in wastewater and is a readily available nutrient for algae and aquatic plant growth. The discharge of effluent with elevated ammonia concentrations to receiving waters (e.g., rivers, lakes, or ponds) may contribute to oxygen-depletion conditions.

Total ammonia consists of two chemical species in equilibrium: NH_4^+ (ionized) and NH_3 (unionized). Standard ammonia analytical testing measures total ammonia, which is a combined concentration of both species (ionized and un-ionized ammonia).

Ammonia monitoring is conducted through a combination of in-house and third-party laboratory testing. A composite effluent sample is collected and analyzed in-house daily, with accredited third-party testing a composite effluent sample bi-weekly. Composite influent (raw sewage) samples are collected and analyzed in-house every Wednesday and Thursday to support operational efficiency; while not regulated, these samples are also submitted for accredited third-party testing on a bi-weekly basis. In addition, an in-house grab sample of influent is analyzed daily.

Composite effluent ammonia is a regulated parameter under the Permit to Operate (PTO). The PTO limits for "Ammonia as Nitrogen" are 7 mg/L from October to May and 3 mg/L from June to September.

Un-ionized Ammonia

The toxicity of ammonia is primarily attributed to the un-ionized form (NH_3) as opposed to the ionized form. In general, the un-ionized ammonia is highly toxic to fish and other aquatic life. Toxicity increases as pH and temperature increase. Accredited 3rd Party bi-weekly testing for un-ionized ammonia in the effluent composite sample is a requirement for the PTO. The limit is 1.24 mg/L at 15°C.

Total Phosphate

Like nitrogen, phosphorus is essential for the growth of plants and animals. Influent (composite) and effluent(grab) sampling for total phosphate are conducted twice a week *in-house*. Effluent composite samples are required to be tested by an accredited 3rd Party bi-weekly.

Coliforms

Total Coliform

Coliforms can be found in water, soil, and on vegetation. They are divided into fecal and nonfecal coliforms. Samples are analyzed for the presence of the coliform group of bacteria which serve as indicator organisms for other pathogens. Coliforms are generally not pathogenic but are usually present when pathogens are present. There is no limit for total coliforms. An effluent grab sample is required to be tested by an accredited 3rd Party bi-weekly. For operational efficiency, CNB samples total coliforms weekly.

E. coli/Fecal Coliforms

Escherichia Coli (also known as E.coli) is a fecal coliform. Their presence indicates the potential presence of microorganisms capable of causing gastrointestinal illnesses. Influent is treated to minimize the number of fecal coliforms released into the environment. E. coli/Fecal coliforms are not to exceed a monthly geometric mean density of 200 organisms per 100 mL and not to exceed a single sample maximum of 400 organisms per 100 mL. An effluent grab sample is required to be tested by an accredited 3rd Party bi-weekly. For operational efficiency, CNB samples E.coli weekly.

pH

pH tests are performed to determine if the wastewater effluent is acidic or basic. The pH scale ranges from 0 to 14 with substances less than 7.0 being acidic while pH greater than 7.0 is considered basic or alkaline. A pH of 7.0 is considered neutral. A pH range of 6.5 to 9.0 has been set as the guideline for the Protection of Aquatic Life. Effluent grab samples are tested *in-house* daily. Effluent composite samples are tested bi-weekly by an accredited 3rd Party at 15°C +/- 1°C.

Temperature

Daily temperature samples are collected from the effluent stream. Temperature ranges from 6.7º C in the winter to 18.3º C in the summer.

Turbidity

Turbidity is used to assess the clarity of water. It is a measure of suspended inorganic and organic particles in the water. Effluent turbidity is tested *in-house* once per day using a grab sample. Effluent turbidity stays consistent. The PTO has set no limit for effluent turbidity. An online turbidimeter installed inside the UV channel continuously monitors turbidity.

BOD

Biochemical oxygen demand (BOD) is a chemical process used for determining how fast organisms use up oxygen in a body of water. The PTO does not regulate BOD testing in the influent and effluent. CNB performs weekly *in-house* influent and effluent BOD tests. Bi-weekly influent tests by an accredited 3rd Party are taken for BOD.

cBOD

Carbonaceous biochemical oxygen demand (cBOD) measures the amount of oxygen consumed by organisms in decomposing the organic portion of waste. Weekly effluent composite *in-house* and bi-weekly accredited 3rd Party samples are taken for this test. The PTO requires that cBOD values for effluent do not exceed a quarterly arithmetic mean of 25 mg/L.

Suspended Solids

TSS

Total suspended solids (TSS) are a measure of suspended particles in a fluid. The TSS test measures both the active bacterial mass and the inert material in the sample. Influent and effluent TSS are tested *in-house* twice weekly. Effluent and influent are tested *by an* accredited 3rd Party bi-weekly. Influent TSS values are tested for internal use but are not required by the PTO. The PTO requires that effluent TSS does not exceed a quarterly arithmetic mean of 25 mg/L.

VSS

Volatile suspended solids (VSS) test measures the mass of the organic solids compared to the mass of the combined organic and inorganic solids. Most of the VSS component will be active microorganisms in the effluent. Sampling for VSS is not a permit requirement, however VSS for influent and effluent is sampled twice weekly *in-house* to monitor the efficiency of the WWTP.

River Analysis

River samples are taken monthly from locations upstream and downstream of the WWTP outfall and tested by an accredited 3rd Party. The upstream samples provide background or normal conditions that the downstream or post treatment samples are

compared to. Differences in analytical results may indicate chemical or biological changes from the release of effluent into the river. The upstream sample is taken from the intake at the F.E. Holliday Water Treatment Plant, while the downstream sample is taken at an irrigation site 1.7km southeast of the outfall.

Major Ions Scan plus Total Disolved Solids (TDS) and Conductivity

Increased concentrations of ions, TDS, and conductivity can cause harm to aquatic organisms. A composite effluent sample is taken semi-annually and tested by an accredited 3rd Party.

Trace Metal Sampling

Trace metals in large quantities can be detrimental to aquatic life. Trace metals such as lead, mercury, and cadmium are considered toxic and exposure over time to these metals can cause serious illness. One composite sewage effluent sample is taken annually and tested by an accredited 3rd Party.

Acute Lethality

Acute lethality refers to the ability of a substance to cause harm to an organism during a relatively short period of time. A grab effluent sample is collected quarterly and sent for testing by an accredited 3rd Party using rainbow trout to determine if it is lethal. The sampling frequency is reduced from quarterly to annually when four consecutive quarterly tests are passed.

Groundwater Well Monitoring

The groundwater underlying the WWTP is sampled annually between September and October at 12 piezometer locations and is tested by an accredited 3rd Party. The condition of each monitoring well is noted and groundwater samples are collected. The groundwater samples are sampled for total coliforms, E.coli., specific conductivity, and chloride. Field monitoring of the piezometer provides the depth to water, pH, and temperature.

Biosolids Monitoring

All sample results, the product label, and the Product Management Yearly Report for biosolids can be found in Appendix E

Biosolids, also known as sewage sludge, is a semi-solid or liquid residue generated during treatment of domestic sewage in treatment works. It consists mainly of water (90 to 99%) and settleable solids. The solids, that are mostly organics, are removed during primary, secondary, or advanced wastewater treatment processes. The biosolids generated by the WWTP are converted to a registered bio-fertilizer product.

Biosolids Volume Produced

In 2025, all biosolids were converted into bio-fertilizer product. Since the start of LysteGro fertilizer at the WWTP, 51,708 m^3 of bio-fertilizer has been produced and transferred to the storage lagoon. In 2025, 4,590 m^3 bio-fertilizer was land applied.

Biosolids Analysis

WSA does not regulate biosolids in the PTO. One biosolid sample is submitted for sampling monthly for metals, mercury, Total-P, Total-N, moisture, fecal coliforms + Salmonella, and total organic carbon (TOC) by an accredited 3rd Party. The biosolid is tested to ensure all the regulatory requirements set out by the Canadian Food Inspection Agency (CFIA) for a registered fertilizer product are met.

PTO Regulated Sample Results

The required test parameters and limits can be found in Appendix A.

Treated Wastewater Effluent Discharge to Environment

All sample results for effluent discharge to environment can be found in Appendix B.

Bi-Weekly Effluent Composite and Grab Samples

As shown in Table 2B, 28 composite Group 4 Panel effluent samples were taken in 2025. Total Ammonia Nitrogen exceeded PTO monthly arithmetic mean of 7mg/L for the months of May and June, and monthly arithmetic mean of 3mg/L for the month of July. Results for all other tested parameters were below PTO limits.

As shown in Table 3B, 56 grab total coliform and E.coli effluent samples were taken in 2025. 12 PTO exceedances for E.coli single sample of over 400 organisms/100 mL occurred for the months of January, April, May, June, July, and August, and three PTO exceedances for E.coli monthly arithmetic mean of above 200 organisms/100mL occurred for the months of May, June, and July.

These exceedances were associated with conditions arising from the commissioning of a newly constructed sanitary sewage lift station and force main (Riverview Lift Station and Force Main) in 2023 located west of Riverview Subdivision. The Riverview Lift Station and Force Main conveys approximately 30% of the City's sewage to the WWTP. The introduction of the Riverview Lift Station and Force Main resulted in aerobic wastewater becoming anaerobic prior to reaching the WWTP. This shift in wastewater characteristics is believed to have contributed to exceedances of E.Coli and Total Ammonia Nitrogen in the sewage effluent. Additionally, operation of the force main generated elevated concentrations of hydrogen sulfide (H_2S) within the WWTP and along the force main alignment. With the elevated concentrations of H_2S gas, the force mains operating status was changed from regular to intermittent operation with regular

flushing while a permanent solution can be found. WSA was notified each time a permit exceedance occurred.

Quarterly Acute Lethality Effluent Grab Samples

The results show that the effluent had no impact on the test organism’s mortality rate at all effluent concentrations, including 100% effluent. Only one sample was needed for 2025, the PTO states: "Following the collection of 4 consecutive quarterly samples that have been collected and analyzed and found not to be acutely lethal, the acute lethality sampling and testing requirements may be reduced to yearly." The results can be found in Table 4B.

Semi-Annual Effluent Composite Samples

The test parameters do not have regulated limits. Results can be found in Table 5B.

Annual Effluent Composite Sample

The test parameters do not have regulated limits. Results can be found in Table 6B.

Receiving Environment (River) Upstream and Downstream locations

All sample results for receiving environment upstream and downstream can be found in Appendix C.

Monthly River Samples

The downstream sample location is not accessible during winter months. No downstream samples were taken in the months of January, February, March, and April. The required test parameters can be found in Appendix A. Downstream nitrogen compounds are the only parameters that are consistently elevated in comparison to upstream results. Downstream nitrogen concentrations are not significantly elevated and may be elevated from runoff/stormwater from North Battleford and Battleford, agricultural runoff, and wastewater effluent. Results can be found in Table 1C.

Groundwater Monitoring Wells (GWMW)

All sample results for GWMW can be found in Appendix D.

Annual GWMW Samples

There are 12 groundwater wells within proximity of the WWTP and evaporation lagoons (Figure 1). Out of the twelve piezometers at the WWTP, ten were field tested and sampled. GRWW MW14_05 was damaged and GWMW MW14_06 was dry. The results from the groundwater well monitoring describes the state of each well and the condition

of the groundwater. The results were consistent with historical data and did not demonstrate any anomalous results. The 2025 results were compared to the Saskatchewan Environmental Quality Guidelines (SEQG) for agricultural land-use and the following exceedances were noted:

Chloride concentrations ranged from 6 (MW14-02) to 2,810 mg/L (MW14-11). Monitoring wells MW14-03, and MW14-09 through MW14-12 exceeded the SEQG tier 1 guideline for chloride of 100 mg/L.

Nitrate concentrations ranged from 1 (MW14-08) to 1200 mg/L (MW14-11). Monitoring wells MW14-02 through MW-04, MW14-07, and MW14-09 through MW14-12 exceeded the SEQG tier 1 guideline of 3 mg/L.

TDS concentrations ranged from 539 (MW14-07) to 7,140 mg/L (MW14-11). All groundwater wells exceeded the SEQG tier 1 guideline of 500 mg/L.

Sodium concentrations ranged from 34 (MW14-02) to 1950 mg/L (MW14-11). Monitoring wells MW14-01, MW14-03, and MW14-09 through MW14-12 exceeded the SEQG tier 1 guideline for sodium of 200 mg/L.

Sulphate concentrations ranged from 43 (MW14-07) to 2990 mg/L (MW14-03). Monitoring wells MW14-01, MW14-03, MW14-04 MW14-08, MW-10 and MW14-11 exceeded the SEQG tier 1 guideline for sulphate of 500 mg/L.

The SEQG tier 1 exceedances are likely related to a large former lagoon that was utilized at some point between the Saskatchewan Hospital's opening date of 1914 and the construction of the1968 wastewater lagoons (still in place used today as City evaporation lagoons), and the decommissioned 1988 lagoon that was later converted into the current WWTP surge pond. The former historical (pre 1968) lagoon is referenced in the 1968 lagoon drawings and is present in a 1962 aerial photo. Nitrate and sulphate exceedances in monitoring wells MW14-03, MW14-07, and MW14-08 may be impacted through agricultural fertilizer application. Results can be found in Table 1D.

Conclusion

The Wastewater Treatment Plant treated approximately 1.9 million cubic meters of domestic wastewater in 2025.

During the reporting period, the WWTP experienced PTO sewage effluent sample limit exceedances related to E. coli and Total Ammonia Nitrogen. These exceedances were associated with conditions arising from the commissioning of a newly constructed sanitary sewage lift station and force main. All other PTO regulated samples met the PTO sample limits.

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- The installation of a new power sliding gate at one of the sewage lagoons.

In conclusion, operations at the CNB WWTP proceeded smoothly. The WWTP was able to meet most of the guidelines set forth by the WSA.

ACKNOWLEDGEMENTS

The Department of Utility Services of the City of North Battleford prepared this report. The dedication and commitment of civic staff in providing regulated wastewater during 2025 is acknowledged.

Also acknowledged is the ongoing assistance of the WSA.

For more information, please contact:

City of North Battleford

Department of Utility Services
Box 460
North Battleford, SK
S9A 2Y6
Phone: (306) 445-1700

City of North Battleford
Wastewater Treatment Plant
2025 Report
Appendix A: Permit to Operate a Sewage Works – North Battleford

Water Security Agency

April 24, 2024

City of North Battleford
1291-101st St
Box 460
North Battleford, SK S9A 2Y6

Dear Sewage Works Owner/Operator:

Permit to Operate a Sewage Works

Please be advised that the Water Security Agency has hereby issued the City of North Battleford's Permit to Operate a Sewage Works, pursuant to the authority of Section 28(1)(h) of *The Environmental Management and Protection Act, 2010*. This permit (No. 00050936-08-00) is attached for your information.

This permit expires on May 1, 2027. Please ensure that a copy of this permit is provided to the operators and posted in a conspicuous place at the sewage works or administration office.

If you have any questions regarding the Permit to Operate a Sewage Works or any other related matters, please contact the undersigned at 306-230-3184 or bruce.dahl@wsask.ca.

Sincerely,

Bruce Dahl, B. Sc.
Environment Officer
Water Security Agency

Water Security Agency

Science and Licensing Division

Permit to Operate a Sewage Works

Altered pursuant to section 28(1)(h) of *The Environmental Management and Protection Act, 2010*

Permit No.: 00050936-08-00
File: 21050-50/WWW/OP/North Battleford

ISSUED TO **The City of North Battleford (the permittee)** the person/entity responsible for the sewage works consisting of a **Class 4** wastewater treatment facility and a **Class 2** wastewater collection facility, located in City of North Battleford and at the sewage treatment works located at Northeast ¼ of Section 22, in Township 43, in Range 16, West of the 3rd Meridian; the Northwest ¼ of Section 22, in Township 43, in Range 16 West of the 3rd Meridian, which provides sewage collection and treatment to the City of North Battleford in the Province of Saskatchewan.

PURSUANT to section 28(1)(h) of *The Environmental Management and Protection Act, 2010*, the Permit to Operate a Sewage Works No. 00050936-07-01 issued to the permittee on 23rd day of January, 2023, whose sewage works is located at Northeast ¼ of Section 22, in Township 43, in Range 16, West of the 3rd Meridian; the Northwest ¼ of Section 22, in Township 43, in Range 16 West of the 3rd Meridian, in the Province of Saskatchewan, and which operation involves the discharge of effluent into the North Saskatchewan River at LSD 2 Section 22 in Township 43, in Range 16, West of the 3rd Meridian in the Province of Saskatchewan, is hereby altered and amended, subject to the terms and conditions attached to this permit.

This permit takes effect on the **1st day of May, 2024**.

This permit expires on the **1st day of May, 2027**, unless cancelled or suspended before that date.

Issued

Bruce Dahl, B. Sc.*
Environment Officer
Water Security Agency

*☑ This digital signature affixed to the permit is legally binding and is considered a sufficient electronic signature as required under *The Electronic Information and Documents Act*, 2000. The original copy is retained by the Water Security Agency and shall be considered the official record.

Terms and Conditions

Section One: Definitions

1.1 All words and phrases have the same definitions as set out in *The Environmental Management and Protection Act, 2010*, or *The Waterworks and Sewage Works Regulations*, as the case may be.

1.2 In this permit:

(a) "*Act*" means *The Environmental Management and Protection Act, 2010;*

(b) "Accredited laboratory" means a laboratory that is accredited under the International Organization for Standardization standard ISO/IEC 17025:2005 entitled *General requirements for the competence of testing and calibration laboratories*, as amended from time to time, by an accrediting body that is a signatory to the *International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement* or a laboratory that is accredited under the *Environment Quality Act,* R.S.Q., c. Q-2, as amended from time to time, by an accredited body that is recognized in accordance with the *Environment Quality Act*;

(c) "Adverse effect" has the same meaning as defined in the *Act*;

(d) "*Regulations*" means *The Waterworks and Sewage Works Regulations;*

(e) "Science and Licensing Division" means the Science and Licensing Division of the Water Security Agency;

(f) "Environment" has the same meaning as defined in the *Act*; and

(g) "Environment officer" has the same meaning as defined in the *Act*.

Section Two: Operation

2.1 The permittee shall comply with the *Act* and the *Regulations*, and the terms and conditions of this permit.

2.2 In the event of an inconsistency between the *Act* and this permit, or the *Regulations* and this permit, the more stringent requirement shall apply.

2.3 The permittee shall not extend or alter the sewage works without approval from the Science and Licensing Division.

2.4 The permittee shall ensure that the operation, repair and maintenance of the sewage works is under the direction of an operator who holds at least the corresponding certificate for the classification of the sewage works as set out in the Saskatchewan Water and Wastewater Works Operator Certification Standards, December 2016.

2.5 The permittee shall continuously disinfect the treated effluent prior to discharge to the receiving environment.

2.6 The permittee shall dispose of all biosolids generated by the sewage works at a Saskatchewan Ministry of Environment approved waste disposal grounds or other location that is permitted to accept biosolids.

2.7 In the event of an upset or bypass condition, the permittee shall ensure all downstream water users that may be adversely impacted by the sewage works discharge are notified.

2.8 Pursuant to section 8 of the *Act*, no person shall discharge or allow the discharge of a substance into the environment in an amount, concentration or level or at a rate of release that may cause or is causing an adverse effect unless otherwise expressly authorized pursuant to this permit.

2.9 The permittee shall maintain an emergency response plan that is satisfactory to the minister and shall update the plan from time to time to incorporate changes to the sewage works equipment, operational procedures, chemical use, upset/bypass conditions, or any other matter or thing that could affect the quality of the effluent produced by the sewage treatment works and may adversely affect the environment. The permittee shall:

(a) provide a copy of the plan to any employee, agent or contractor performing work or service in relation to the sewage works; and,

(b) inform the certified operator(s), mentioned in 2.4, of the contents of the emergency response plan.

Section Three: Sampling, Monitoring and Effluent Quality

3.1 The permittee shall cause samples to be taken from the sewage works and receiving environment and tested for the parameters listed in Appendix A, at the locations, times and frequency set out in Appendix A.

3.2 The permittee shall ensure that the effluent quality results for those samples required by 3.1 do not exceed the limits set out in Appendix B for the chemical parameters listed in Appendix B.

3.3 The permittee shall take samples in accordance with the instructions provided by the institution or laboratory that provides the sampling bottles or containers

3.4 Subject to 3.5, the permittee shall have all effluent and receiving environment samples analyzed by an accredited laboratory.

3.5 The permittee may perform on-site effluent and receiving environment sample analyses for parameters indicated in the monitoring schedule as "field test" or "on-site test".

Section Four: Recordkeeping

4.1 The permittee shall cause operational records or logs to be maintained, including information respecting:
- (a) tests conducted and the information to be collected as required by this permit;
- (b) site inspections, maintenance work and any failure of treatment components;
- (c) types, dosages and total amount of chemicals or other substances added to sewage;
- (d) dates and volumes of sewage effluent discharges;
- (e) locations from which samples for any tests are taken;
- (f) the results of any tests conducted on the samples taken pursuant to 3.1;
- (g) records of public complaints including complaints over impacts from suspected seepage from the facility and/or complaints over impacts resulting from discharge practices.

4.2 The permittee shall cause the operational records or logs mentioned in 4.1 to be recorded and maintained in the following manner:
- (a) operational records or logs must be made in chronological order, with the dates, times and testing locations clearly indicated;
- (b) entries in an operational record or log must only be made by the permittee, which includes, by definition, any principal or agent of a permittee;
- (c) any person making an entry in an operational record or log must do so in a manner that allows the person to be unambiguously identified as the maker of the entry;
- (d) operational records or logs must be maintained on a daily basis and retained for at least five years;
- (e) any anomalies or instances of missing entries in an operational record or log must be accompanied by explanatory notes;
- (f) operational records or logs must only contain data or information that is actually observed or produced;
- (g) operational records or logs must not contain default values generated manually or by automated means; and
- (h) operational records or logs maintained pursuant to clause (d) must be made available promptly on request of the Water Security Agency.

4.3 The permittee shall review the records and logs mentioned in 4.1 on a monthly basis to ensure that the operating parameters are being achieved and that the limits set out in Appendix B are not exceeded.

4.4 The permittee shall report the findings to the minister as soon as is reasonably practicable after each review required by 4.3, should the review of the records and logs indicate that the operating parameters have not been achieved and effluent quality limits have been exceeded.

Section Five: Reporting

5.1 The permittee shall submit the results of water sampling analyses performed in accordance with this permit to the Science and Licensing Division, within 7 days following completion of the sampling analyses.

5.2 The permittee shall direct the laboratory performing its water sampling analyses to submit the results within the timeframes mentioned in 5.1. The results must be provided directly to the Science and Licensing Division, in a format compatible with the EPB 383 Water Security Agency and Ministry of Environment - Environmental Management System (SEEMS) Lab-Operator (LAB-OPR) Data File Format, in addition to submitting the written results to the permittee.

5.3 The permittee shall report to the minister any known or anticipated upset condition, bypass condition or events at or affecting the sewage works that could adversely affect the quality of effluent produced by the sewage works.

5.4 The permittee shall immediately report to the minister any instance where:
- (a) effluent disinfection equipment fails;
- (b) the level of effluent disinfection identified in Appendix B is not achieved or is not anticipated to be achieved;
- (c) any other parameter level identified in Appendix B is not achieved or is not anticipated to be achieved; and
- (d) there is a retirement, suspension, resignation, scheduled absence or termination of employment of any certified sewage works collection or sewage works treatment operator, or any anticipated retirement, suspension, resignation or termination that results in the sewage works not being under the direction of a certified operator.

5.5 The permittee shall instruct its employees, agents and contractors performing work or service in relation to the sewage works of their obligation, under section 13(2) of the *Regulations,* to report to the minister any instance described in 5.4 and any known or anticipated upset condition, bypass condition or events at or affecting a sewage works that could adversely affect the quality of effluent discharged into the environment.

5.6 The permittee shall, as soon as reasonably practical, report any of the events mentioned in 5.3 or 5.4 to the minister.

5.7 The permittee shall submit an annual operating report to the Water Security Agency by March 31st of the following year of operation, which shall include all monitoring data as required by condition 3.1 and all record keeping information as required by condition 4.1 of this permit.

Section Six: Inspection

6.1 An environment officer may enter the sewage works at any time to conduct an inspection to ensure that the permittee is complying with this permit, the *Act* or the *Regulations*.

6.2 Upon the request of an environment officer, the permittee shall immediately provide any books, records, logs, graphs, papers, documents, or data, including any computer, digital or electronic records, logs, graphs, files or data maintained with respect to the sewage works.

Section Seven: General

7.1 A copy of this permit shall be posted in a conspicuous place at the sewage works or administration office.

7.2 The permittee shall provide each operator of the sewage works with a copy of this permit and the *Regulations*.

7.3 The minister may cancel, alter or suspend this permit for the reasons and in the manner set out in the *Act*.

7.4 The permittee shall apply for renewal/alteration of this permit at least 60 days prior to its expiry.

7.5 In the event of any inconsistency between a previously issued Permit to Operate a Sewage Works, and the terms and conditions of this Permit to Operate a Sewage Works, the terms and conditions of this permit prevail.

7.6 This permit does not replace or supersede any approvals, licenses or authorizations that may be required due to municipal, provincial or federal legislation. The permittee shall maintain in force any and all such approvals, licenses or authorizations that may be required.

7.7 Where any notice or reporting is required to be given by the permittee, it shall be provided to:

Water Security Agency
Bruce Dahl B. Sc.
10-3904 Millar Ave
Telephone: 306-230-3184
Fax: 306-933-6820
Email: bruce.dahl@wsask.ca

After hours, weekends and holidays, the Water Security Agency can be contacted by calling the Upset Report Line at 1.844.536.9494.

Appendix A

Permit to Operate a Sewage Works
Monitoring Schedule
Permit No.: 00050936-07-01

Location	Station Number	Frequency	Type of Sample	Parameter(s)
1. Treated Wastewater Effluent Discharge to Environment	SK05EG0281	Daily	Volume of influent or effluent discharged at final discharge point[1]	
		Bi-weekly (at least seven days after any other sample)	24-hour Composite	**Group 4 Panel** 5-day Carbonaceous Biochemical Oxygen Demand Chloride pH at 15ºC ± 1ºC Total Suspended Solids Total Phosphorous Total Nitrogen Total Ammonia Nitrogen Total Kjeldahl Nitrogen Calculated Un-ionized Ammonia[2]
			Grab	Total Coliform Bacteria *Escherichia coli* Temperature *(field test)* pH *(field test)*
		Quarterly[3,4] (at least 60 days after any other sample)	Grab	Acute Lethality[5]

		Semi-annually (at least four months after any other sample)	24-hour Composite	**Major Ions Scan plus TDS and Conductivity** Alkalinity, Total Bicarbonate Calcium Carbonate Conductivity at 25ºC Magnesium Nitrate – N Potassium Sodium Sulphate Total Dissolved Solids Total Hardness
		Annually (at least six months after any other sample)	24-hour composite	**Trace Metals** Aluminum Arsenic Antimony Barium Beryllium Boron Cadmium Chromium Cobalt Copper Iron Lead Manganese Mercury Molybdenum Nickel Selenium Silver Strontium Thallium Tin Titanium Uranium Vanadium Zinc

2. Receiving Environment Upstream and Downstream locations	SK05EG0089 and SK05GD0093	Monthly (at least 21 days after any other sample)	Grab	**<u>Group 4 Panel plus TDS and Conductivity</u>** 5-day Carbonaceous Biochemical Oxygen Demand Chloride Conductivity at 25ºC pH at 15ºC ± 1ºC Total Suspended Solids Total Phosphorous Total Nitrogen Total Ammonia Nitrogen Total Dissolved Solids Total Kjeldahl Nitrogen Calculated Un-ionized Ammonia[6] Total Coliform Bacteria *Escherichia coli* Temperature *(field test)* pH *(field test)*
			Grab	**<u>Major Ions Scan</u>** Alkalinity, Total Bicarbonate Calcium Carbonate Magnesium Nitrate – N Potassium Sodium Sulphate Total Hardness

3. Monitoring Wells	SK050EG0176 MW 14-01 SK050EG0278 MW 14-02 SK050EG0347 MW 14-03 SK050EG0351 MW 14-04 SK050EG0352 MW 14-05 SK050EG0353 MW 14-06 SK050EG0354 MW 14-07 SK050EG0355 MW 14-08 SK050EG0356 MW 14-09 SK050EG0357 MW 14-10 SK050EG0358 MW 14-11 SK050EG0359 MW 14-12	Once per year (October)	Grab (Following the purging of at least two volumes of water from the well if possible or the stabilization of pH and conductivity)	**Group 1 Panel** Conductivity at 25ºC Chloride Nitrate – N Total Coliform Bacteria *Escherichia Coli*

[1] The permittee shall calibrate or conduct calibration verification of the flow monitoring equipment at least once in every calendar year and at least five months after a previous calibration. The monitoring equipment must be able to determine the volume or rate of flow with a margin of error of ±15%.

[2] The un-ionized portion of total ammonia (NH_3) in the treated effluent shall be calculated using the formula:

Total Ammonia Nitrogen x 1 ÷ (1+ $10^{9.56-pH}$)

- where pH is the pH of the effluent adjusted to 15ºC ± 1ºC

[3] If a treated wastewater effluent sample is determined to be acutely lethal, the permittee must collect a grab sample of treated wastewater effluent twice per month but at least seven days after any previous sample and conduct the acute lethality test on each of the samples. The permittee shall continue to sample twice per month until such time as three consecutive samples are found not to be acutely lethal. Once three consecutive samples are found not to be acutely lethal, the permittee shall revert back to quarterly acute lethality testing.

[4] Following the collection of 4 consecutive quarterly samples, that have been collected and analyzed and found not to be acutely lethal, the acute lethality sampling and testing requirement may be reduced to yearly (one per calendar year but at least 6 months after any other sample). Should an acute lethality test fail, the permittee shall revert to sampling as per the frequency in footnote 3.

[5] The accredited laboratory must adhere to the following biological test methods:

Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout (Reference Method EPS 1/RM/13 Second Edition)

Procedure for pH Stabilization During the Testing of Acute Lethality of Wastewater Effluent to Rainbow Trout (Reference Method EPS 1/RM/50)

[6] The un-ionized portion of total ammonia (NH_3) in the receiving waters shall be calculated using the formula:

Total Ammonia Nitrogen x 1 ÷ (1+ 10^{pKa-pH})

- where pKa is 0.09018 + 2729.92/T
- where T is the ambient receiving water temperature in degrees Kelvin
- where pH is the pH of the receiving water

Appendix B

Permit to Operate a Sewage Works
Permit Limits
Permit No.: 00050936-07-01

Location	Parameter	Limit
Final Treated Wastewater Effluent	5-day Carbonaceous Biochemical Oxygen Demand	Shall not exceed a quarterly arithmetic mean of 25 milligrams per litre.
	Total Suspended Solids	Shall not exceed a quarterly arithmetic mean of 25 milligrams per litre.
	Un-ionized Ammonia - N	Shall not exceed 1.24 milligrams per litre at 15°C ± 1°C.
	Total Chlorine Residual	Shall not exceed 0.02 milligrams per litre.
	Acute Lethality (pH-stabilized)	Shall be non-lethal to 50% or more of test organisms at 100% effluent concentration.
	Escherichia coli	Shall not exceed a monthly geometric mean of 200 organisms per 100 millilitres and shall not exceed a single sample maximum of 400 organisms per 100 millilitres.
	Total Ammonia Nitrogen *(October 1st to May 31st)*	Shall not exceed a monthly arithmetic mean of 7 milligrams per litre
	Total Ammonia Nitrogen *(June 1st to September30th)*	Shall not exceed a monthly arithmetic mean of 3 milligrams per litre

City of North Battleford
Wastewater Treatment Plant
2025 Report
Appendix B: Regulated Results Tables – Effluent Discharge to Environment

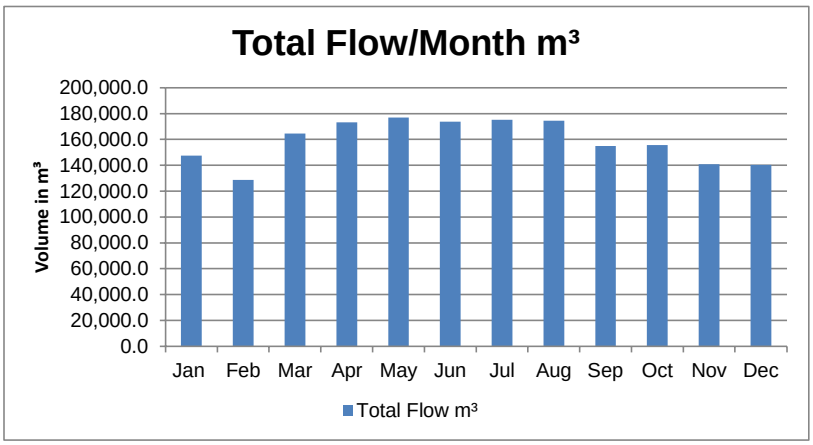
Total Flows

Month	Total Flow m³
Jan	147,403.8
Feb	128,665.7
Mar	164,522.3
Apr	173,107.7
May	176,837.4
Jun	173,606.7
Jul	175,199.1
Aug	174,421.3
Sep	154,905.5
Oct	155,703.4
Nov	140,665.0
Dec	140,222.9
Total	**1,905,260.8**

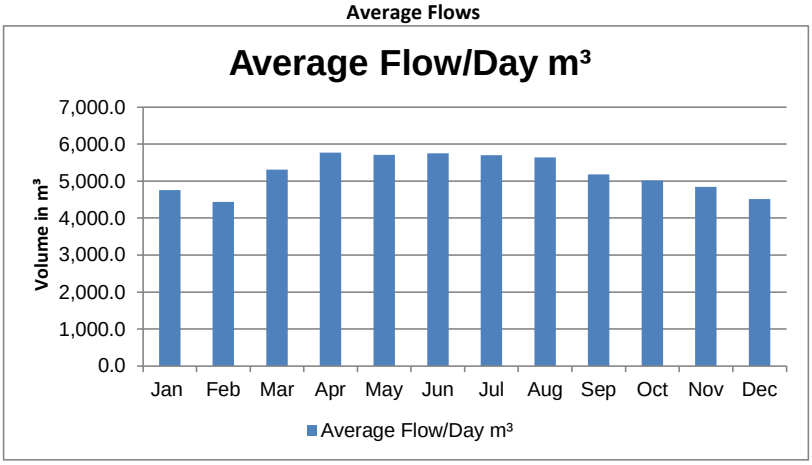
Average Flows

Month	Average Flow/Day m³
Jan	4,755.0
Feb	4,436.7
Mar	5,307.2
Apr	5,770.3
May	5,704.4
Jun	5,748.4
Jul	5,697.0
Aug	5,635.8
Sep	5,178.0
Oct	5,018.2
Nov	4,847.6
Dec	4,517.4
Average	**5,219.9**

Total Flows



Average Flows



Date	cBOD	Chloride	ph	TSS	Total Phosphorous	Total Nitrogen	Total Ammonia Nitrogen	Total Kjeldahl Nitrogen	Calculated Un-ionized Ammonia
	mg/L	mg/L	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2-Jan	3.00	254	7.76	7	0.30	26	0.11	2.4	<0.01
8-Jan	4.00	226	7.63	7	0.32	25	0.08	2.8	<0.01
22-Jan	4.00	212	7.87	7	0.28	25	0.09	2.1	<0.01
5-Feb	<3	212	7.82	6	0.25	24	0.05	2.0	<0.01
19-Feb	4.00	188	7.80	10	0.36	24	0.08	2.1	<0.01
5-Mar	5.00	274	7.60	6	0.69	23	0.10	2.4	<0.01
19-Mar	3.00	262	7.83	5	0.71	21	0.10	2.3	0.01
2-Apr	5.00	240	7.99	10	0.69	25	0.92	3.4	0.02
16-Apr	6.00	202	7.77	8	0.63	24	0.70	3.4	<0.01
30-Apr	5.00	250	8.03	8	0.71	22	3.70	6.3	<0.01
14-May	5.00	210	7.88	10	1.00	24	7.60	10.0	0.15
29-May	8.00	207	7.78	11	1.30	10	7.00	10.0	0.11
10-Jun	6.00	201	7.84	8	0.86	26	10.00	15.0	<0.01
26-Jun	8.00	196	7.90	6	2.00	25	12.00	15.0	<0.01
9-Jul	---	194	7.66	12	3.60	21	4.60	7.2	<0.01
16-Jul	8.00	202	7.66	16	3.70	23	6.00	9.4	<0.01
23-Jul	7.00	189	7.79	11	2.20	20	1.60	4.2	<0.01
6-Aug	3.00	200	8.00	8	0.56	22	0.08	2.5	<0.01
20-Aug	<3	182	7.87	5	0.63	21	0.10	2.6	<0.01
3-Sep	<3	176	8.02	6	0.63	19	0.12	1.9	<0.01
17-Sep	<3	188	7.97	8	0.49	22	0.14	2.4	<0.01
1-Oct	<3	198	8.08	8	0.69	24	0.10	2.2	<0.01
15-Oct	<3	187	7.77	6	2.40	25	0.11	2.6	<0.01
29-Oct	5.00	198	7.90	22	2.90	27	0.11	3.0	<0.01
12-Nov	3.00	228	7.86	11	1.60	28	0.12	2.5	<0.01
25-Nov	<3	217	7.83	6	1.10	25	0.06	23.0	<0.01
10-Dec	<3	230	7.93	6	0.23	26	0.06	2.2	<0.01
22-Dec	<2	224	7.96	4.5	0.17	25	0.04	1.8	<0.01

Permit Exceedances

Total Ammonia - Ocober 1st to May 31st - Shall not exceed a monthly arithmetic mean of **7mg/L**
Total Ammonia - June 1st to September 30th - Shall not exceed a monthly arithmetic mean of **3mg/L**

Total Ammonia Monthly Arithmetic Mean Excedances

May	7.30
June	11.00
July	4.07

Date	Total Coliform	E.Coli	E. Coli Limit - Monthly Geometric <200/100mL Single Sample <400/100mL	
			E.Coli Monthly Geometric Mean	E.Coli Single Sample
January				
2-Jan	1000	1000		<400
8-Jan	1000	89		<400
16-Jan	150	29		<400
22-Jan	460	15		<400
29-Jan	170	24		<400
Geo-Mean	**411.02**	**62.18**	<200	
February				
5-Feb	170	25		<400
12-Feb	220	22		<400
19-Feb	550	25		<400
26-Feb	280	15		<400
Geo-Mean	**275.49**	**21.31**	<200	
March				
13-Mar	150	51		<400
19-Mar	440	55		<400
26-Mar	1000	390		<400
Geo-Mean	**404.12**	**103.04**	<200	
April				
2-Apr	690	66		<400
9-Apr	2400	550		<400
16-Apr	610	48		
23-Apr	690	88		
23-Apr	610	35		<400
30-Apr	8200	650		<400
Geo-Mean	**1231.39**	**123.15**	<200	
May				
7-May	1000	2000		<400
7-May	20000	5500		<400
14-May	2000	340		<400
21-May	1100	650		<400
21-May	6300	3100		<400
29-May	650	33		<400
Geo-Mean	**2376.57**	**793.01**	<200	
June				
4-Jun	3700	440		<400
4-Jun	2600	170		<400

Date	Total Coliform	E.Coli	E. Coli Limit - Monthly Geometric <200/100mL Single Sample <400/100mL	
			E.Coli Monthly Geometric Mean	E.Coli Single Sample
10-Jun	520	86		<400
10-Jun	770	76		<400
18-Jun	2400	770		<400
18-Jun	2400	610		<400
26-Jun	2800	550		<400
Geo-Mean	**1803.76**	**277.37**	<200	
July				
2-Jul	980	120		<400
9-Jul	200	200		<400
23-Jul	2400	2400		
30-Jul	2400	24000		<400
Geo-Mean	**1030.79**	**1084.32**	<200	
August				
6-Aug	24000	1600		<400
13-Aug	210	21		<400
13-Aug	326	27	Note: ALS Lab Sample	<400
20-Aug	12000	770		
27-Aug	1400	130		
Geo-Mean	**1941.74**	**155.46**	<200	
September				
3-Sep	1000	90		<400
11-Sep	52	5		<400
17-Sep	290	21		<400
24-Sep	240	22		<400
Geo-Mean	**245.27**	**21.35**	<200	
October				
1-Oct	1200	83		<400
8-Oct	4400	130		<400
15-Oct	2400	62		<400
22-Oct	33	9		<400
29-Oct	150	16		<400
Geo-Mean	**804.16**	**49.54**	<200	
November				
5-Nov	93	17		<400
12-Nov	190	17		<400
18-Nov	100	13		
25-Nov	185	10		<400
Geo-Mean	**134.46**	**13.92**	<200	

Date	Total Coliform	E.Coli	E. Coli Limit - Monthly Geometric <200/100mL Single Sample <400/100mL	
			E.Coli Monthly Geometric Mean	E.Coli Single Sample
December				
3-Dec	29	4		<400
10-Dec	980	60		<400
22-Dec	86	12		<400
				<400
Geo-Mean	**134.70**	**14.23**	<200	

Permit Exceedances

E.Coli - Shall not exceed a monthly geometric mean of 200 organisms per 100 millilitres and shall not exceed a single samle maximum of 400 organisms per 100 millilitres.

Monthly E. Coli Sample Exceedances

May/June/July

Single Sample E.Coli Sample Exceedances

January 2/April 9/April 30/May 7/May 21/June 4/June 18/June 26/July 23/July 30/August 6/August 20

Acute Lethality							
Parameter	Species	Unit	Results				Limit
			4-Mar-25	N/A	N/A	N/A	
Acute Lethality (96 hr LC_{50} - survival)	Trout	%	>100	N/A	N/A	N/A	>50

Note:
Only one sample needed for Acute Lethality for 2025. The Permit to Operate a Sewage Works states: "Following the collection of 4 consecutive quarterly samples that have been collected and analyzed and found not to be acutely lethal, the acute lethality sampling and testing requirements may be reduced to yearly."

CITY OF NORTH BATTLEFORD **TABLE 5B** **WASTEWATER TREATMENT PLANT**

Semi-Annual Lab Results - Major Ions Scan Plus TDS and Conductivity **2025 REPORT**

Sewage Effluent Discharge to Environment (Composite)

Parameter	Units	Date	
		16-Apr	29-Oct
Total Alkalinity	mg/L	198	169
Bicarbonate	ug/L	242	206
Calcium	mg/L	118	105
Carbonate	mg/L	<1	<1
Conductivity (at 25°C)	uS/cm	1900	1700
Magnesium	mg/L	60	49
Nitrate	mg/L	18	24
Potassium	mg/L	17	16
Sodium	mg/L	193	166
Sulphate	mg/L	400	310
Total Dissolved Solids	mg/L	1240	1060
Total Hardness	mg/L	541	463

CITY OF NORTH BATTLEFORD | TABLE 6B | WASTEWATER TREATMENT PLANT

Annual Lab Results - Trace Metals | **2025 REPORT**

Sewage Effluent Discharge to Environment (Composite)

Parameter	Units	Date
		28-Oct
Aluminum	mg/L	0.081
Antimony	ug/L	0.0006
Arsenic	mg/L	0.7
Barium	mg/L	0.047
Beryllium	mg/L	<0.0001
Boron	mg/L	0.19
Cadmium	mg/L	0.00006
Chromium	mg/L	0.0009
Cobalt	mg/L	0.0004
Copper	mg/L	0.029
Iron	mg/L	0.22
Lead	mg/L	0.0007
Manganese	mg/L	0.044
Mercury	ng/L	2
Molybdenum	ng/L	0.0021
Nickel	mg/L	0.0029
Selenium	mg/L	0.001
Silver	mg/L	<0.000005
Strontium	ug/L	0.074
Thallium	mg/L	<0.0002
Tin	mg/L	0.0007
Titanium	mg/L	0.0027
Uranium	ug/L	3.7
Vanadium	mg/L	0.0003
Zinc	mg/L	0.058

City of North Battleford
Wastewater Treatment Plant
2025 Report
Appendix C: Regulated Results Tables – Receiving Environment Upstream and Downstream locations

Month		13-Jan-25		13-Feb-25		11-Mar-25		24-Apr-25	
Parameter	**Units**	**Upstream**	**Downstream**	**Upstream**	**Downstream**	**Upstream**	**Downstream**	**Upstream**	**Downstream**
cBOD	mg/L	>3	Not Accessible	<3	Not Accessible	<3	Not Accessible	<3	Not Accessible
Chloride	mg/L	6.00	Not Accessible	12	Not Accessible	22	Not Accessible	8	Not Accessible
Specific Conductivity	uS/cm	402.00	Not Accessible	433	Not Accessible	482	Not Accessible	390	Not Accessible
pH at 15°C	pH Units	8.02	Not Accessible	7.99	Not Accessible	8.06	Not Accessible	8.37	Not Accessible
TSS	mg/L	4.00	Not Accessible	8	Not Accessible	4	Not Accessible	74	Not Accessible
Total-P	mg/L	<0.01	Not Accessible	<0.01	Not Accessible	0.02	Not Accessible	0.07	Not Accessible
Total-N	mg/L	0.98	Not Accessible	1	Not Accessible	1	Not Accessible	1.2	Not Accessible
Ammonia as N	mg/L	0.11	Not Accessible	0.11	Not Accessible	0.18	Not Accessible	0.04	Not Accessible
TDS	mg/L	248.00	Not Accessible	273	Not Accessible	298	Not Accessible	145	Not Accessible
TKN	mg/L	0.24	Not Accessible	0.22	Not Accessible	0.36	Not Accessible	0.8	Not Accessible
Un-ionized Ammonia	mg/L	<0.01	Not Accessible	<0.01	Not Accessible	<0.01	Not Accessible	<0.01	Not Accessible
Total Coliforms	ct/100mL	160.00	Not Accessible	130	Not Accessible	280	Not Accessible	38	Not Accessible
E.coli	ct/100mL	59.00	Not Accessible	39	Not Accessible	13	Not Accessible	1	Not Accessible
Temp (field test)	C°	2.00	Not Accessible	1.6	Not Accessible	1.6	Not Accessible	9.4	Not Accessible
ph (field test)	pH Units	7.76	Not Accessible	7.67	Not Accessible	7.71	Not Accessible	7.79	Not Accessible
Total Alkalinity	mg/L	138.00	Not Accessible	132	Not Accessible	137	Not Accessible	128	Not Accessible
Bicarbonate	mg/L	168.00	Not Accessible	161	Not Accessible	167	Not Accessible	156	Not Accessible
Calcium	mg/L	49.00	Not Accessible	51	Not Accessible	53	Not Accessible	43	Not Accessible
Carbonate	mg/L	<1	Not Accessible	<1	Not Accessible	<1	Not Accessible	<1	Not Accessible
Magnesium	mg/L	15.00	Not Accessible	16	Not Accessible	16	Not Accessible	14	Not Accessible
Nitrate-N	mg/L	0.74	Not Accessible	0.81	Not Accessible	0.65	Not Accessible	0.4	Not Accessible
Potassium	mg/L	1.30	Not Accessible	1.3	Not Accessible	1.7	Not Accessible	3.7	Not Accessible
Sodium	mg/L	9.20	Not Accessible	12	Not Accessible	19	Not Accessible	15	Not Accessible
Sulphate	mg/L	61.00	Not Accessible	63	Not Accessible	69	Not Accessible	56	Not Accessible
Total Hardness	mg/L	184.00	Not Accessible	193	Not Accessible	198	Not Accessible	165	Not Accessible

Notes:

E.coli is not reported (NR) when Total Coliform is not detected.

Downstream river samples site is not accessible during winter months.

Month		26-May-25		17-Jun-25		15-Jul-25		19-Aug-25	
Parameter	**Units**	**Upstream**	**Downstream**	**Upstream**	**Downstream**	**Upstream**	**Downstream**	**Upstream**	**Downstream**
cBOD	mg/L	<3	<3	<3	<3	<3	<3	<3	<3
Chloride	mg/L	4	4	4	6	7	7	3	3
Specific Conductivity	uS/cm	341	349	384	405	368	380	358	363
pH at 15°C	pH Units	8.43	8.45	8.59	8.53	8.64	8.63	8.43	8.48
TSS	mg/L	77	71	22	15	31	20	58	50
Total-P	mg/L	0.06	0.04	<0.02	<0.02	0.04	0.04	0.04	0.05
Total-N	mg/L	0.5	0.68	0.38	0.6	0.4	0.47	0.54	0.68
Ammonia as N	mg/L	0.02	0.03	0.02	0.16	0.02	0.03	0.01	0.02
TDS	mg/L	225	228	233	236	248	250	211	227
TKN	mg/L	0.5	0.49	0.38	0.54	0.4	0.47	0.33	0.37
Un-ionized Ammonia	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Coliforms	ct/100mL	98	250	210	650	1200	>2400	1700	>2400
E.coli	ct/100mL	7	10	4	15	5	10	11	12
Temp (field test)	C°	16.3	17.5	19.3	19.2	19.7	18.5	19.2	18.4
ph (field test)	pH Units	8.24	8.13	8.54	8.35	8.64	8.36	8.15	8.14
Total Alkalinity	mg/L	130	130	138	139	120	123	130	131
Bicarbonate	mg/L	159	159	166	170	142	145	154	155
Calcium	mg/L	44	45	50	52	43	43	46	47
Carbonate	mg/L	<1	<1	1	<1	2	2	2	2
Magnesium	mg/L	13	13	15	16	14	14	14	14
Nitrate-N	mg/L	<0.01	0.19	<0.01	0.06	<0.01	0.06	0.21	0.31
Potassium	mg/L	1.6	1.6	1.4	1.6	1.4	1.4	1	1.1
Sodium	mg/L	8.6	9.3	8.8	11	10	10	6.4	7.1
Sulphate	mg/L	44	46	61	65	59	58	50	52
Total Hardness	mg/L	163	166	186	195	165	165	172	175

Notes:

E.coli is not reported (NR) when Total Coliform is not detected.

Downstream river samples site is not accessible during winter months.

TABLE 1C
Monthly Lab Results - Group 4 Panel + TDS Conductivity/Major Ions Scan
Receiving Environment Upstream and Downstream locations

Month		11-Sep-25		16-Oct-25		Nov 18 (Up)/13-Nov (Down)		*December 2025	
Parameter	**Units**	**Upstream**	**Downstream**	**Upstream**	**Downstream**	**Upstream**	**Downstream**	**Upstream**	**Downstream**
cBOD	mg/L	<3	<3	<3	<3	<3	<3	Not Accessible	Not Accessible
Chloride	mg/L	2	3	4	7	5	6	Not Accessible	Not Accessible
Specific Conductivity	uS/cm	342	350	389	408	391	404	Not Accessible	Not Accessible
pH at 15°C	pH Units	8.57	8.58	8.28	8.31	8.27	8.24	Not Accessible	Not Accessible
TSS	mg/L	38	28	8	3	9	9	Not Accessible	Not Accessible
Total-P	mg/L	<0.02	<0.02	<0.01	0.03	<0.01	0.02	Not Accessible	Not Accessible
Total-N	mg/L	0.3	0.38	0.47	0.72	0.57	0.82	Not Accessible	Not Accessible
Ammonia as N	mg/L	0.02	0.03	0.04	0.03	0.05	0.06	Not Accessible	Not Accessible
TDS	mg/L	240	232	235	254	249	232	Not Accessible	Not Accessible
TKN	mg/L	0.3	0.3	0.18	0.14	0.18	0.27	Not Accessible	Not Accessible
Un-ionized Ammonia	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	Not Accessible	Not Accessible
Total Coliforms	ct/100mL	2000	1600	91	200	82	330	Not Accessible	Not Accessible
E.coli	ct/100mL	26	23	23	38	5	23	Not Accessible	Not Accessible
Temp (field test)	C°	18.6	18.3	6.1	6.2	4	4	Not Accessible	Not Accessible
ph (field test)	pH Units	8.32	8.37	8.18	8.23	8.46	8.77	Not Accessible	Not Accessible
Total Alkalinity	mg/L	122	122	139	140	135	138	Not Accessible	Not Accessible
Bicarbonate	mg/L	149	149	170	171	165	168	Not Accessible	Not Accessible
Calcium	mg/L	45	44	48	49	48	49	Not Accessible	Not Accessible
Carbonate	mg/L	<1	<1	<1	<1	<1	<1	Not Accessible	Not Accessible
Magnesium	mg/L	14	14	15	16	15	15	Not Accessible	Not Accessible
Nitrate-N	mg/L	<0.01	0.08	0.29	0.58	0.39	0.55	Not Accessible	Not Accessible
Potassium	mg/L	0.9	1	1.3	1.4	1.1	1.1	Not Accessible	Not Accessible
Sodium	mg/L	5.5	6.2	8.5	10	8.5	9.2	Not Accessible	Not Accessible
Sulphate	mg/L	50	50	59	62	56	58	Not Accessible	Not Accessible
Total Hardness	mg/L	170	167	181	188	181	184	Not Accessible	Not Accessible

Notes:

E.coli is not reported (NR) when Total Coliform is not detected.

Downstream river samples site is not accessible during winter months.

*No samples taken in December, Upstream samples taken from the raw water intake at FEH WTP - plant was down for maintenance for the month of December.

City of North Battleford
Wastewater Treatment Plant
2025 Report
Appendix D: Regulated Results Tables – Ground Water Monitoring Wells

TABLE 5C - Annual Groundwater Well Monitoring at WWTP - October 7-9, 2025

Lab Parameter	Units	Piezometer					
		MW14_01	MW14_02	MW14_03	MW14_04	MW14_05	MW14_06
Total Coliforms	MPN/100mL	<1	<1	<1	<1	n/a	n/a
E.coli	MPN/100mL	Not Reported	Not Reported	Not Reported	Not Reported	n/a	n/a
Specific Conductivity	uS/cm	4960	974	5110	1780	n/a	n/a
Chloride	mg/L	66	6	108	21	n/a	n/a
Nitrate - N	mg/L	2.8	27	5	78	n/a	n/a
TDS	mg/L	4930	682	5230	1350	n/a	n/a
Sodium	mg/L	391	34	347	92	n/a	n/a
Sulphate	mg/L	2850	140	2990	530	n/a	n/a
Field Parameter	**Units**	**Piezometer**					
		MW14_01	MW14_02	MW14_03	MW14_04	MW14_05	MW14_06
Specific Conductivity	uS/cm	4732	950	4849	1699	n/a	n/a
pH	pH units	7.30	7.55	7.15	7.07	n/a	n/a
Temperature	°C	11.0	12.1	10.2	9.5	n/a	n/a
Depth to Water	m	5.26	5.23	6.00	6.51	n/a	n/a
Depth to Well Bottom	m	7.24	6.95	6.94	8.29	n/a	n/a
Volume of Water in Well	L	3.89	3.38	1.85	3.50	n/a	n/a
Volume Purged	L	8.0 Dry	6.5 Dry	3.5 Dry	6.5 Dry	n/a	n/a
Condition of Well	n/a	Good	Good	Good	Good	Damaged	Good
Notes	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Lab Parameter	Units	Piezometer					
		MW14_07	MW14_08	MW14_09	MW14_10	MW14_11	MW14_12
Total Coliforms	MPN/100mL	<1	<1	8	<1	<1	<1
E.coli	MPN/100mL	Not Reported	Not Reported	Not Reported	Not Reported	Not Reported	Not Reported
Specific Conductivity	uS/cm	896	2840	8310	9180	11600	8280
Chloride	mg/L	16	21	2100	2300	2810	2260
Nitrate - N	mg/L	120	1	65	190	1200	27
TDS	mg/L	539	2520	4860	5540	7140	4940
Sodium	mg/L	18	87	1010	1180	1950	872
Sulphate	mg/L	43	1380	270	780	530	240
Field Parameter	**Units**	**Piezometer**					
		MW14_07	MW14_08	MW14_09	MW14_10	MW14_11	MW14_12
Specific Conductivity	uS/cm	868	2659	8103	8912	11103	8035
pH	pH units	7.63	7.15	6.74	6.87	7.4	7.05
Temperature	°C	10.6	10.5	8.9	10.0	9.5	11.9
Depth to Water	m	5.11	5.04	8.49	6.07	6.51	6.6
Depth to Well Bottom	m	6.58	8.00	9.59	8.28	6.93	7
Volume of Water in Well	L	2.89	5.81	2.16	4.26	1.96	0.79
Volume Purged	L	9.0	9 Dry	3.5 Dry	13.0	2 Dry	1.5 Dry
Condition of Well	n/a	Good	Good	Good	Good	Good	Good
Notes	n/a	n/a	n/a	n/a	n/a	n/a	n/a

n/a - Not Applicable

Notes:

E. coli is not reported when Total Coliform is not detected.

October 7, 2025 - Water was purged from from all wells.

October 8 & 9, 2025 - Water samples were collected from all wells.

Monitor Wells 5 and 6 were not sampled. Monitor well 5 was damaged and monitor well 6 was dry.

City of North Battleford
Wastewater Treatment Plant
2025 Report
Appendix E: Biosolids Results Table/Yearly Report

City of North Battleford 2025 LysteGro Application Summary

Marketing and Management of LysteGro Produced at the North Battleford Wastewater Treatment Plant

February, 2026

Lystek
Nothing wasted.
Everything to gain.

City of North Battleford

2025 LysteGro Application Summary

Prepared For:

Stewart Schafer, P.Eng.

Director of City Operations, City of North Battleford

1291-101st St. P.O. Box 460

North Battleford, SK S9A 2Y6

T: 306-445-1700 E: sschafer@cityofnb.ca

Prepared By:

Lystek International Inc.

125 McGovern Drive Unit #1

Cambridge, ON N3H 4R7

Contact Person:

Simon Meulendyk, P.Ag

Product Manager

T: 519-503-2189

E: smeulendyk@lystek.com

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES:

1 INTRODUCTION

In 2019, Lystek International Corp, entered into a three-year agreement for the marketing and management of LysteGro fertilizer produced at the North Battleford Wastewater Treatment Plant (WWTP) located at 1 Canola Ave, North Battleford, SK S0M 0E0. As per the agreement and subsequent amendments extending the agreement, Lystek is responsible for all aspects of the marketing and application of LysteGro fertilizer produced at the facility from 2024-2027.

In 2025, the City of North Battleford recycled 4,590 m^3 of biosolids to agricultural land.

LysteGro is a valuable fertilizer for crop production and is valued by farmers in the region. LysteGro has a good concentration of nitrogen (N), phosphorus (P) and potassium (K), micronutrients such as sulfur (S) and calcium (Ca), as well as organic matter. There is an increasing recognition by the agricultural community of the value of organic amendments, such as LysteGro, in building soil health and long-term improvements in yield. Third party trials in Ontario have shown that farmers can completely replace their commercial fertilizer with LysteGro and achieve comparable or higher corn yields.

In 2025, 4,590 cubic metres (m^3) of LysteGro was hauled from the North Battleford WWTP and directly injected into approximately 250 acres (ac). All hauling and land application activities proceeded as normal.

This report is a summary of the City of North Battleford's 2025 LysteGro application program. It will provide more information about the product, volumes hauled and applied and details of the application.

2 PRODUCT CHARACTERIZATION AND VALUE SUMMARY

2.1 LYSTEGRO FERTILIZER LABEL

The material produced at the North Battleford WWTP with the Lystek-patented technology is a regulated fertilizer product through the Canadian Food Inspection Agency (CFIA), as shown in Appendix A. As such, the material is applied as a fertilizer, where the rate of application is based on soil characteristics and crop requirements. The requirements of the product characteristics under the Federal *Fertilizers Act* include:

- Reduced pathogen content (Fecal Coliforms <1,000 MPN/gram, Salmonella Absence/25 grams)
- Dioxin & furan analysis and meeting regulatory limits
- Guaranteed minimum nutrient analysis (NPK)
- Analysis of 11 Regulated Metals and application rate maximums based on concentrations

According to the product label, the fertilizer has a minimum guaranteed analysis of 3-3-3 % on a dry weight basis for Total N, Total Available Phosphoric Acid (P_2O_5), and Soluble Potash (K_2O), respectively. However, based on the mean of 12 samples collected monthly during the

2025 production period, the actual analysis of the material is 6-4-5. A product analysis is available in Appendix B. The actual product analysis is always used by Lystek's Certified Crop Advisors when making application rate recommendations, while both the actual analysis and the fertilizer label is provided to the farmer.

2.2 VALUE OF LYSTEGRO FERTILIZER

The ***Ontario Farm Monitoring Project*** is an effort by the University of Guelph to gather information about the cost of farm inputs (fertilizer, pesticides, fuel) in Ontario. As no such publication could be found for Saskatchewan, the pricing for Ontario will be used to evaluate the equivalent fertilizer value of LysteGro compared to commercial fertilizer: Urea (primary source of N), mono-ammonium phosphate (MAP) (primary source of P) and Muriate of Potash (primary source of K). Based on their most current 2025 surveys average fertilizer prices, the equivalent value of LysteGro product produced at the North Battleford WWTP is $110.31 /1,000 imperial gallons (imp gal) based on total N, P_2O_5 and K_2O and $58.72 /1,000 imp gal based on predicted availability of nutrients in the first growing season.

Recycling nutrients from the WWTP back to farm fields provides local farmers with benefits in the form of reduced costs for fertilizer and improving their overall soil fertility. The price charged to customers in 2025 was $17.50/1,000 imp gal. It is expected that the sale price will remain or potentially increase from $17.50/1000 imp gal for 2026, due to modest increases seen in the granular fertilizer market.

3 VOLUMES REMOVED AND APPLICATION SITES

3.1 FERTILIZER VOLUMES

Table 3-1 and outlines the LysteGro hauling and land application volumes from the North Battleford WWTP for 2025. In total, 4,590 m^3 of LysteGro was hauled and applied. Further details of each application are described below.

Table 3-1 Land Application Events from North Battleford WWTP in 2025

Hauling Date (from plant)	Farmer	Interim Storage	Volume (m^3)	Land App dates	Acres	App Rate (imp gal./ac)
September 22 – October 3, 2025	Ryan Charabin	NO	4,590	Same as hauling	250	4,039

3.2 HAULING SUMMARIES & APPLICATION SITES

There was one hauling event from the North Battleford WWTP in 2025. Maps showing the location of the application sites are available in Appendix C. Bills of sale for LysteGro fertilizer sold to the end customer are in Appendix D.

Between September 22 – October 3, 2025, approximately 4,590 m^3 was hauled from the North Battleford WWTP to land farmed by Ryan Charabin, east of the WWTP at the NE corner of Brada and Hill Rd.

3.3 DISTANCE FROM WWTP TO SITES

Lystek's focus is on fertilizer program efficiency and delivering fertilizer to the farm customer when it is most beneficial for their program. Reducing hauling distance increases efficiency of the program and reduces greenhouse gas emissions. In 2025, the application site was 5 km away from the WWTP, keeping the need for hauling to a minimum.

4 THE LYSTEK PRODUCT MANAGEMENT APPROACH

4.1 APPLICATION METHOD

All material was sub-surface injected using a tanker-mounted injection system. The benefits of subsurface injection are summarized in Figure 4-1. The injection equipment is designed to ensure all material is applied below the soil surface, causing minimal disturbance, reducing odours, improving optics and maximizing the nutrient value of the product.

Ammonia-nitrogen (NH_4-N) will be lost to the atmosphere if it is top-spread, therefore subsurface injection allows for higher retention of nitrogen, and greater value for the farmer. The application equipment is also able to apply the material evenly throughout the application area through a combination of hydraulics, pumping rate control and vehicle speed.

4.2 BEST MANAGEMENT PRACTICES

The Product Management staff at Lystek are all professionals with experience in nutrient management principles and a commitment to environmental stewardship. As such, in addition to ensuring that all LysteGro is subsurface injected rather than top spread, Lystek also employs additional voluntary best management practices (BMPs). These BMPs include setback guidelines from waterways and dwellings, minimum groundwater depth requirements, and refraining from applying any material to frozen or snow-covered soil. These BMPs are clearly communicated to all land application contractors that Lystek works with and monitored by Lystek staff oversight.

Lystek's full voluntary best management practices are included in Appendix F.

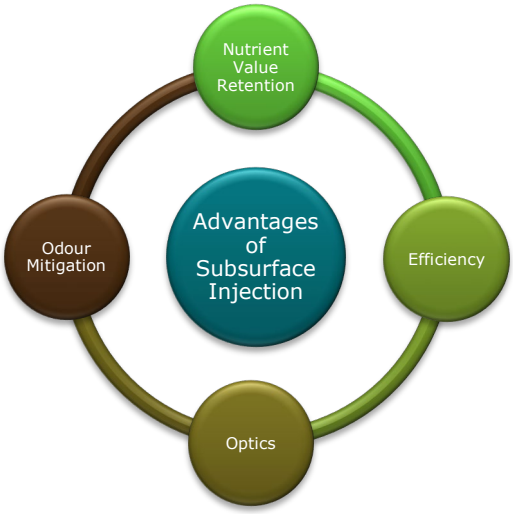


Figure 4-1. Advantages of Subsurface Injection.

4.3 PROFESSIONAL SERVICES

Lystek product management staff are certified crop advisors and/or professional agronomists committed to serving the needs of our agricultural customers, while practising environmental

stewardship. Along with ensuring regulatory compliance for the use of LysteGro and overseeing all hauling/land application activities, we are active in the Canadian agricultural and biosolids industries. We attended various tradeshows and presented a major research project in 2025, including:

- Presenting the LysteMize Livestock Waste Characterization Study supported by the Canadian Department of Natural Resources.

5 APPLICATION RATE DETERMINATION

Application rates for LysteGro fertilizer are based on several factors, including but not limited to soil characteristics and crop plans. LysteGro is used as a fertilizer, with the additional benefit of providing organic matter to the soil, so application is based primarily on nutrient concentration, while also accounting for metal additions to soils.

The City of North Battleford recycled:

- **24 tonnes of Nitrogen**
- **17 tonnes of P_2O_5**

to local farmland as a result of their LysteGro program in 2025.

5.1 NUTRIENT MANAGEMENT

Application rates of LysteGro fertilizer are primarily dependant upon crop nutrient requirements and pre-existing soil nutrient concentrations. The average application rate in 2025 was 4,000 imp gal/ac.

Land used for cash cropping with limited addition of organic amendments (manure, compost, biosolids, etc) will often see a depletion in P, K and organic matter. In addition, depending on parent material and soil characteristics, secondary and micronutrients can also be deficient in soils that are intensively cropped. Farmers often apply large amounts of P and K fertilizers to overcome deficiencies in the current crop year as well as build up the supply of P and K in the soil for future years. LysteGro applied at the appropriate rates to fields will provide adequate nutrition for the next crop, while also increasing concentrations of organic matter, macro and micronutrients, providing multi-year value to the customer.

5.2 HEAVY METALS

Heavy metals generally refer to the 11 regulated metals which are monitored for their inputs to agricultural soils. The addition of heavy metals to the soil through fertilizers and amendments is regulated under the federal ***Fertilizers Act***. LysteGro is a fertilizer regulated by the CFIA, and therefore falls under the *Fertilizers Act*. The federal *Fertilizers Act* limits metal addition to soils by assigning maximum annual application rates based on metal concentrations of the fertilizer. Therefore, the metal concentrations also play a role in determining the application rate for LysteGro. Maximum annual application rate for North Battleford LysteGro for CFIA based on 2025 analysis was 4,264 imp gal/ac. This application rate is based on the nutrient which is closest to its 45-year maximum addition to soils based on annual applications (Copper). A table describing the maximum annual application rates is available in Appendix G.

The maximum application rate of North Battleford LysteGro applied to land in 2025 was 4,039.20 imp gal/ac. In addition, LysteGro application is rotated each year to ensure that the same piece of land does not receive LysteGro in subsequent years meaning the 2025 application rate is far below the 45-year addition referenced application rate. Field rotation is not a regulatory requirement but is in line with best practises for the industry.

6 SUMMARY

The 2025 application season was successful, as the North Battleford LysteGro was applied responsibly as a fertilizer. The Lystek application program managed 4,590 m^3 of product and was completed as a fertilizer program, based on agronomics and best management practices.

To date, the City of North Battleford has produced 51,708 m^3 of LysteGro fertilizer from its biosolids. We look forward to continuing to work in partnership with the City to divert valuable nutrients from landfill and return them back to the soil in an environmentally responsible manner as part of a circular economy.

APPENDICES

APPENDIX A

CFIA Fertilizer Label

LYSTEGRO 3-3-3

Guaranteed minimum analysis (dry weight basis)		**Analyse minimale garantie**	
Total nitrogen (N)	3%	Azote total (N)	3%
Available phosphoric acid (P_2O_5)	3%	Acide phosphorique assimilable (P_2O_5)	3%
Total phosphoric acid 3%		Acide phosphorique total 3%	
Soluble potash (K_2O)	3%	Potasse soluble (K_2O)	3%
Organic Matter	45%	Matière organique	45%
Maximum Moisture	92%	Humidité maximale	92%

Active ingredient derived from municipal biosolids.

Lot #:1-2025
Net Weight: 40,000 kg

Manufactured By:
The City of North Battleford Wastewater Treatment Plant
1 Canola Avenue
North Battleford, SK, S0M 0E0

Directions for use: Maximum annual application rates for LysteGro fertilizer should not exceed 4 dry tonnes per hectare.

User should seek the advice of a county agricultural representative or professional agricultural consultant. This product should be used based on soil and/or tissue analysis and incorporated following application.

Not to be applied to land during the production of ready-to-eat crops that may come in contact with the soil. When applied to pastureland, do not allow animals to graze for at least one month from the date of application. When applied to land on which forage crops are grown, do not harvest crop for at least one month from the date of application.

Keep out of reach of children
Read label before use.

Protective eyewear and gloves recommended.
If on skin: wash with water and soap.
If in eyes: flush with water thoroughly. If irritation persists, seek medical advice.

Matières actives dérivées des biosolides municipaux.

No. de lot: 1-2025
Poids net: 40,000 kg

Fabriqué par:
The City of North Battleford Wastewater Treatment Plant
1, Canola Avenure
North Battleford (Saskatchewan), S0M 0E0

Mode d'emploi: La dose maximale annuelle d'application d'engrais de LysteGro ne devrait pas dépasser 4 tonnes sèches par hectare.

L'utilisateur devrait demander conseil à un représentant agricole du compté ou un consultant agricole professionnel. Ce produit devrait être utilisé basé sur une analyse de sol et/ou de tissus et incorporé suivant l'application.

Ne pas appliquer à la terre pendant la production de cultures prêtes à manger qui peuvent entrer en contact avec le sol. Lorsque appliqué sur les pâturages, ne pas laisser les animaux paître pendant au moins un mois à partir de la date d'application. Lorsque appliqué sur les terres fourragères, ne pas récolter de cultures pendant au moins un mois à partir de la date d'application.

Tenir hors de la portée des enfants.
Lire l'étiquette avant d'utiliser.

Il est conseillé de porter des lunettes et des gants de protection.
En cas de contact avec la peau : Laver avec de l'eau et du savon.
En cas de contact avec les yeux : Rincer à fond avec de l'eau. Si l'irritation persiste, consultez un médecin.

APPENDIX B

Fertilizer Composition

North Battleford Wastewater Treatment Facility
1 Canola Ave, North Battleford, SK S0M 0E0

LysteGro Biofertilizer

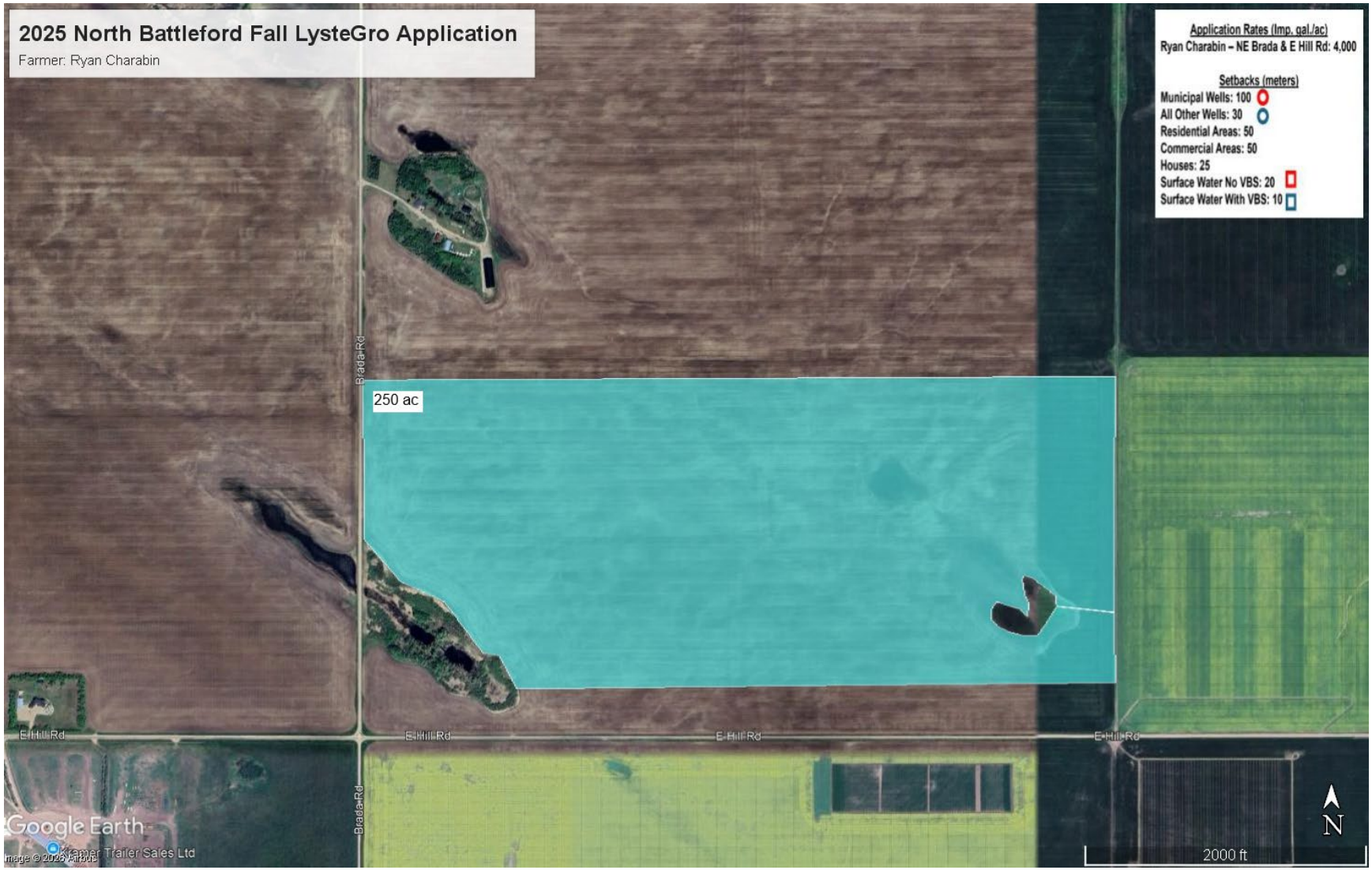
LysteGro Fertilizer Composition

	LysteGro Average[a]	Units
Organic Matter Content	5.33	% on a wet weight basis
Total Organic Carbon	3.10	% on a wet weight basis
Total Nutrient Content		
Total Nitrogen (TKN)	6.01	% on a dry weight basis
Total Available Nitrogen (Ammonium + Nitrate)	0.14	% on a dry weight basis
Total Phosphorus (P_2O_5)	4.31	% on a dry weight basis
Total Potassium (K_2O)	5.82	% on a dry weight basis
Metals Regulated by Fertilizers Act		
Arsenic	2.43	mg/kg
Cadmium	0.49	mg/kg
Cobalt	2.37	mg/kg
Chromium	12.34	mg/kg
Copper	782	mg/kg
Mercury	0.29	mg/kg
Molybdenum	7.03	mg/kg
Nickel	12.00	mg/kg
Lead	9.48	mg/kg
Selenium	4.48	mg/kg
Zinc	278	mg/kg
Relevant Micronutrients		
Calcium	13.4	lbs/1,000 gallons
Copper	0.70	lbs/1,000 gallons
Iron	5.39	lbs/1,000 gallons
Magnesium	6.53	lbs/1,000 gallons
Manganese	0.23	lbs/1,000 gallons
Sulphur	6.74	lbs/1,000 gallons
Zinc	0.25	lbs/1,000 gallons
Total and Available Nutrients (during 1st growing season) - Imperial		
Total Nitrogen	53.56	lbs/1,000 gallons
Total Available Nitrogen[b]	22.18	lbs/1,000 gallons
Total Phosphorus (P_2O_5)[c]	38.42	lbs/1,000 gallons
Total Potassium (K_2O)	51.91	lbs/1,000 gallons
Total Available Potassium (K_2O)[d]	46.72	lbs/1,000 gallons
Pathogens		
Fecal Coliform	<2.0[e]	MPN/g(ml)
Salmonella spp	Absent[e]	P-A/25g(ml)

[a] Values represent the mean of 12 samples collected monthly from January - December 2025
[c] Ammonium + Nitrate + assume 40% mineralization of Organic N during first growing season
[d] Assume 40 % availability of Phosphorus during first growing season
[e] Assume 90% availability of Potassium during first growing season
[f] Results were consistent for all sampling events
BDL - Below Detectable Limit

APPENDIX C

Maps of Land Application Sites


2025 North Battleford Fall LysteGro Application
Farmer: Ryan Charabin
Application Rates (Imp. gal./ac)
Ryan Charabin – NE Brada & E Hill Rd: 4,000
Setbacks (meters)
Municipal Wells: 100
All Other Wells: 30
Residential Areas: 50
Commercial Areas: 50
Houses: 25
Surface Water No VBS: 20
Surface Water With VBS: 10
250 ac
Brada Rd
E Hill Rd
E Hill Rd
E Hill Rd
E Hill Rd
Brada Rd
Google Earth
Kramer Trailer Sales Ltd
2000 ft
N

APPENDIX D

Bills of Sale for Fertilizer sold to Farmers

INVOICE

Invoice #: 155-38

Reference No.: D-70
ID Number: 1290
Invoice Date: October 31, 2024
Billing Period: October 2025

SOLD TO:

Ryan Charabin
Box 216
North Battleford, Sask
S9A 2Y1

DELIVERED TO:

02_1290_002 (NE Brada & E Hill Rd)

This invoice is for product (LysteGro 3-3-3) that was delivered in the month of September and October 2025.

PROJECT NO.	PROJECT NAME	PAYMENT TERMS	DUE DATE
LYS13155	North Battleford LysteGro	30-days	December 11, 2025

TOTAL QTY	DESCRIPTION	RATE	TOTAL
(Imp. gal)		(Per 1,000 Imp. gal.)	CDN ($)
1,009,659	LysteGro Fertilizer	$ 17.50	$ 17,669.03
1,009,659	Additional Mileage	0	0

HST Reference # 78093 6670 RT0001

SUB-TOTAL: $ 17,669.03

All invoices are payable within 30 days of receipt. A monthly service charge of 1.5% per month (18% per annum, nominal) is payable on all overdue balances.

Tax: NA

Total Amount Due: $ 17,669.03

PAYMENT INFORMATION - CHEQUE AND WIRE TRANSFER ACCEPTED

E-Transfer Information - Use **PAYMENTS@LYSTEK.COM**. Please indicate the invoice number in the memo of the transfer.

Wire Transfer Information - Please email the payment receipt to Jim Robbins at jrobbins@lystek.com

Name of Beneficiary: Lystek International Corporation	**Bank Code:** 002
Address of Beneficiary: 125 McGovern Dr., Unit 1, Cambridge, ON N3H 4R7	**Transit Number:** 64832
Name of Bank: The Bank Of Nova Scotia	**Account Number:** 0052213
Bank Address: 544 Hespeler Rd., Cambridge, ON N1R 6J8	

We appreciate and thank you for your business.

CHEQUE REMITTANCE ADDRESS:

Lystek International Corp. - 125 McGovern Dr., Unit 1, Cambridge, ON N3H 4R7

Tel: 226-444-0186 Toll Free: 888-501-6508 Fax: 888-501-7429

APPENDIX E

Photos of Land Application

APPENDIX F

Lystek Best Management Practices

LysteGro – Application and Setback Guidelines

Application Method

LysteGro must be **sub-surface injected.**

> Sub-surface injection is defined as the placement of nutrients to 10 – 30 cm below the soil surface in the crop root zone using equipment specifically designed for that purpose, when the applied material is retained by the soil.
>
> Surface application is to be only used as an application method by the approval of a Lystek staff agronomist and must be incorporated within 12 hours.

Application – Ground Condition

LysteGro cannot be applied to Frozen or Snow-covered soil.

> "Frozen", when used in reference to soil, means that a layer of soil with an average minimum depth of five centimetres, located within the top 15 centimetres of the soil, is consolidated by the presence of frozen moisture;
>
> "snow-covered", when used in reference to soil, means that there is a layer of snow with an average minimum depth of five centimetres.

Depth to Groundwater

There must be at least 30 cm of unsaturated soil at the surface of the land at the time of application.

Depth to Bedrock

There must be at least 1 m separation distance from ground surface to bedrock.

Set-backs

- **100 m** from municipal wells for all applied nutrients
  - 30 m from any other well
- No application is permitted within **25 m** of a dwelling

Last Updated: May 2025
Updated By: Simon Meulendyk

- No application is permitted within **50 m** of a residential area or commercial, community or institutional use.
- **3 to 20 m** from the bank of surface water (as defined by the Nutrient Management Act, 2002). This setback depends on a number of factors such as the slope near the watercourse and whether there is a presence of a vegetated buffer strip along water body. i.e. If no buffer strip, a setback on the higher end (**20 m**) will be the course of action.

For LysteGro application, the following setbacks are to be adhered to:

- **100 m** distance buffer from municipal wells
- **30 m** distance buffer for all other wells
- **50 m** distance buffer from residential, commercial, community or institutional areas
- **25 m** distance buffer from house dwellings
- For surface water without a vegetated buffer strip, a **20 m** distance buffer from top of bank will be used
- For surface water with a vegetated buffer strip a **10 m** distance buffer from top of bank will be used

Note: This document is a summary of Guidelines which all companies applying LysteGro originating from the Southgate Organic Materials Recovery Centre or other Lystek managed programs as an agricultural fertilizer must adhere to, unless otherwise approved by a qualified Lystek representative. The above noted criteria are Guidelines voluntarily enforced by Lystek International Corp. and Lystek International Corp. as Best Management Practices.

Last Updated: May 2025
Updated By: Simon Meulendyk

APPENDIX G

Heavy Metal Application to Soils

North Battleford LysteGro Fertilizer Heavy Metal Analysis and Maximum Application Rates

Heavy Metals	LysteGro Average (mg/kg)a	Maximum Acceptable Product Metal Concentration based on Annual Application rates (mg metal/kg product) 500 kg/ha/yr[b]	Maximum Acceptable Application Rate Based on Average Metal Concentrations (dry kg/ha/year)
Arsenic	2.43	666	136,849
Cadmium	0.49	177	180,000
Cobalt	2.37	9,333	1,971,761
Chromium	12.34	1,333	54,004
Copper	781.67	6,666	4,264
Mercury	0.29	44	76,081
Molybdenum	7.03	177	12,583
Nickel	12.00	1,600	66,667
Lead	9.48	4,444	234,512
Selenium	4.48	124	13,855
Zinc	277.50	16,444	29,629

[a] Values represent the mean of 12 samples collected from January - December, 2025

[b] As per T-4-93 of the *Fertilizers Act* under the *CFIA*

City of North Battleford
Wastewater Treatment Plant
2025 Report
Appendix F: Glossary

Glossary

Ammonia – Ammonia as N (NH_3-N) – Ammonia as N is an inorganic, dissolved form of nitrogen that can be found in water and is the preferred form for algae and plant growth. The term ammonia refers to two chemical species which are in equilibrium in water. They are NH_4^+ (ionized) and NH_3 (un-ionized). Tests for ammonia usually measure total ammonia.

Biosolids – also knows as sewage sludge, is a solid, semi-solid, or liquid residue generated during treatment of domestic sewage in a treatment works. It consists mainly of water (90 to 99%) and settleable solids. The solids are mostly organics that are removed during primary, secondary or advanced wastewater treatment processes.

BOD – Biochemical Oxygen Demand is the amount of dissolved oxygen needed by aerobic organisms in water to break down organic material present.

BTEX – Benzene, Toluene, Ethylbenzene, and Xylene are volatile organic compounds typically found in petroleum products such as gasoline and diesel.

CBOD – Carbonaceous Biochemical Demand measures the amount of oxygen consumed by living organisms (bacteria) in decomposing the organic waste.

EC – is a measure of water's ability to conduct electricity, the higher the concentration of dissolved ions, the higher the conductivity. It is most often measured in µS/cm – microSiemens per centimetre.

E. coli – is the only member of the total coliform group of bacteria that is found only in the intestines of mammals. The presence of E. coli in water indicates recent fecal contamination and may indicate the possible presence of disease-causing pathogens

MAC - Maximum Acceptable Limit and is health based

mg/l – milligrams per litre

NTU – Nephelometric Turbidity Unit is based on the amount of light that is scattered by particles

Pathogen – is a disease causing microorganism such as a virus or bacterium.

pH – is a measure of how acidic or basic a solution is. It ranges from 0 to 14. A pH of 7 is neutral. A pH less than 7 is acidic while a pH greater than 7 is basic.

S.E. – Saskatchewan Ministry of the Environment is the department that oversees solid waste disposal

SWSA – The Saskatchewan Water Security Agency was created on October 1, 2012. The former Saskatchewan Watershed Authority is now part of this new provincial water organization. This agency regulates and monitors waterworks and wastewater works.

THMs – Trihalomethanes are disinfection by-products that form when chlorine is added to water that contains natural organic matter.

TKN – Total Kjedahl nitrogen is the sum of organic nitrogen, ammonia, and ammonium.

Total Coliforms – are a group of bacteria commonly found in the environment. They are not likely to cause illness, but their presence indicates the water supply may be vulnerable to contamination by more harmful microorganisms.

Total P – Total Phosphorus is a measure of all the forms of phosphorus in a sample

TSS – Total Suspended Solids includes all particles suspended in water which will not pass through a filter.

Turbidity – is a measure of relative clarity of a liquid. Guidelines for turbidity are a safeguard against pathogens in drinking water.

Un-ionized Ammonia – NH_3 is the un-ionized form of ammonia. It is the toxic form of ammonia. In general, the un-ionized ammonia is highly toxic to fish and other aquatic life. Toxicity increases as pH and temperature increase.

VSS – Volatile Suspended Solids is the portion of Total Suspended Solids that can be ignited and is made up of organic material.

WMF – Waste Management Facility

WSA – The Water Security Agency was created on October 1, 2012. The former Saskatchewan Watershed Authority is now part of this new provincial water organization.

WWTP – Wastewater Treatment Plant