Report to Council

To:	Waterworks Committee
From:	Administration
File #:	DOP-CC-15
Date:	January 31, 2019
Re:	Wastewater Treatment Division 2018 Annual Report

For Information Only

Wastewater Treatment Division 2018 Annual Report

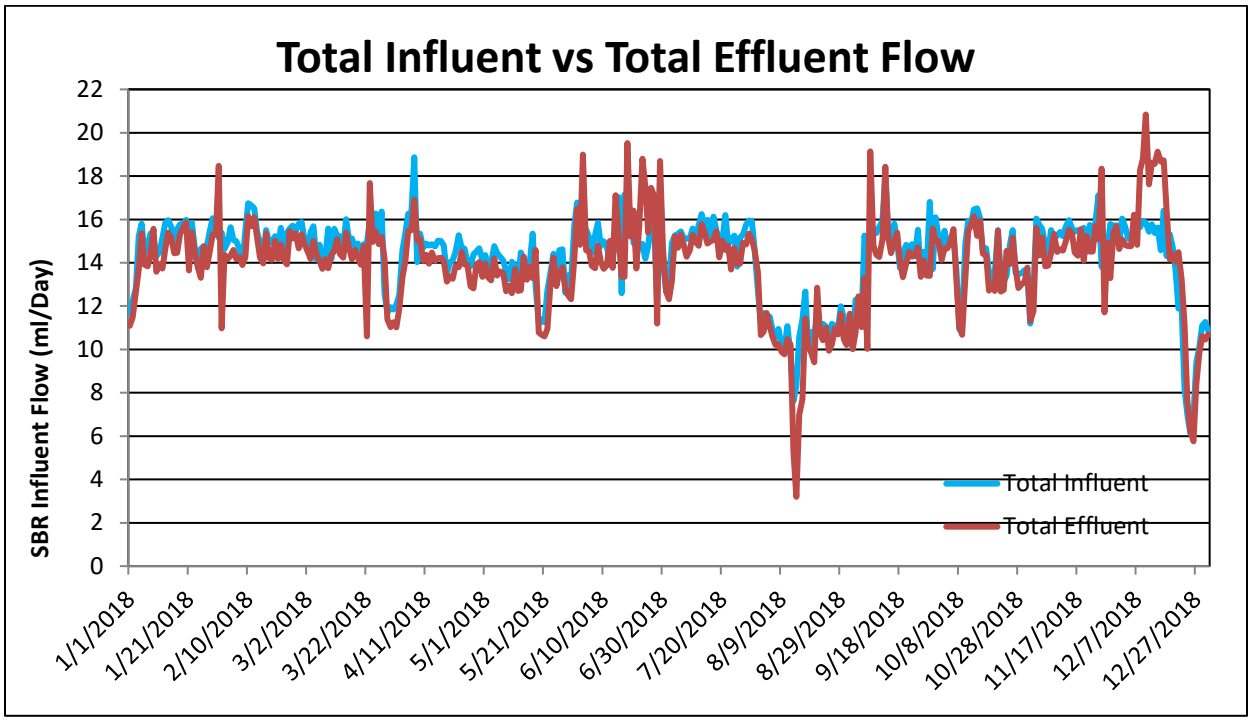
The City of Portage la Prairie Water Pollution Control Facility is a Class 4 wastewater treatment plant. It receives wastewater from three main sources- the domestic wastewater from the City of Portage la Prairie and Southport, the pre-treated wastewater from Poplar Bluff Industrial Park and the full- strength wastewater from McMillan Industrial Park. This water is transferred to the WPCF via eleven lift stations located around the municipality as well as one at each industrial park.

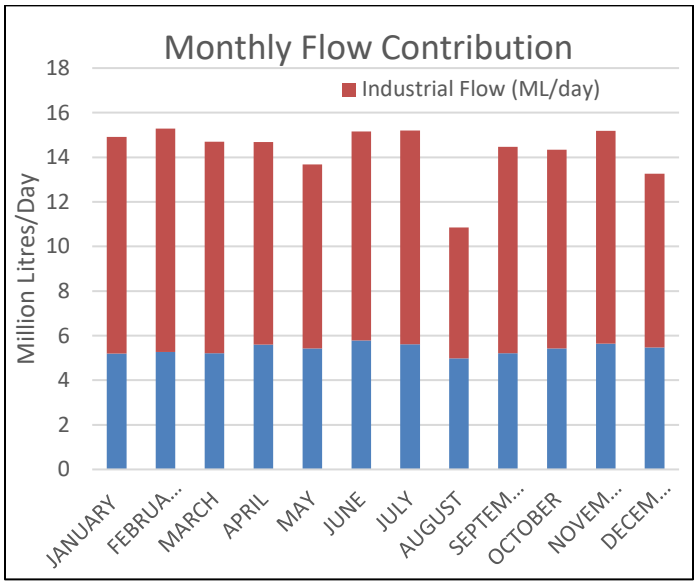
The industrial wastewater from McCain Foods and Nutri-Pea Foods is first treated in a Bulk Volume Fermenter (BVF) located on the WPCF site. Wastewater from Simplot Foods Ltd receives similar pre-treatment in a BVF located at Simplot's facility. Once pretreated, the industrial water is combined with the domestic (residential/commercial wastewater) a common lift station and is pumped into one of the four Sequencing Batch Reactors (SBRs). Through cycles of aeration, mix and settle, the wastewater is treated through the activity of specialized bacteria that remove the organic waste in the water. The treated water is then disinfected via Ultra Violet exposure and then discharged to the Assiniboine River.

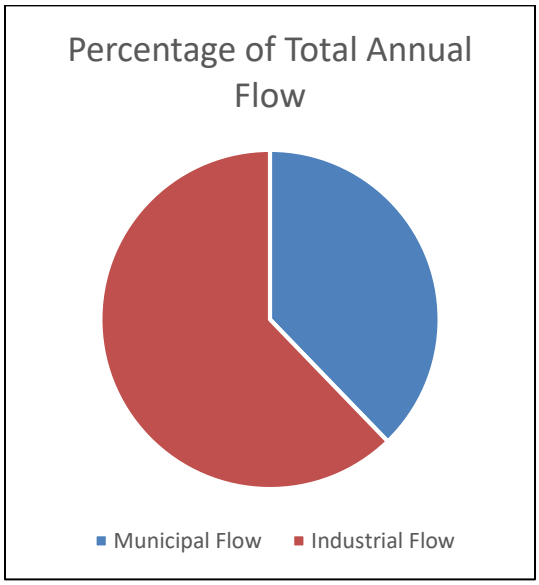
The biological activity required for treatment produces residual solids that accumulate in the SBRs. A calculated volume of these solids must be removed each day. These solids are thickened, then anaerobically digested for stabilization. Stabilized solids are referred to as Biosolids. Biosolids are stored and then land applied each spring and fall to farm land as a soil supplement.

Facility Performance and License compliance

In 2018, the WPCF received an average of 14,295,000 L of wastewater each day, for a total volume of 5,217,528,000 L or 5.2 billion liters. This is a slight decrease from the 6.0 BL received in 2017. The incoming flow is 39% domestic and commercial wastewater and 61% from industrial sources. The peak flow treated occurred on April 7 when 18,867,000 L of wastewater was received. The minimum flow of 6,125,000 L was observed on December 25. This is attributable to industrial shut down to accommodate the holiday season.



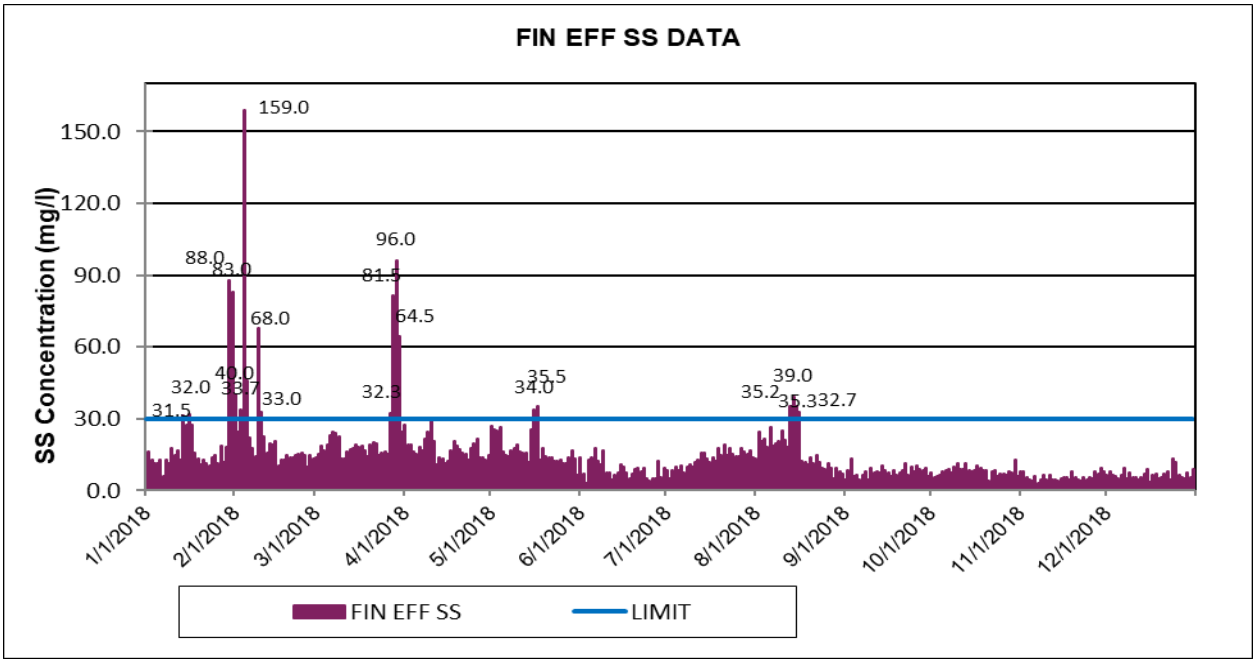




The WCPF operates under Environment Act License #2543 R, which is issued by the Province of Manitoba Department of Sustainable Development. In addition to outlining requirements for treatment processes, sampling and reporting, it also provides maximum limits on the total amount of Suspended Solids, Biological Oxygen Demand, and Ammonia the facility can discharge in the treated wastewater each day and a monthly geometric mean for fecal bacteria. The facility is also required to test for toxicity on a monthly and quarterly basis. Any exceedance is reported to Manitoba Sustainable Development within 24 hours of the limit being surpassed.

Total Suspended Solids

Total Suspended Solids (TSS) is the amount of particulate matter that is suspended in the water that is released from the WPCF. This is to not exceed 30 mg/L per day. The average daily TSS discharged in 2018 was 14.5 mg/L and there were 20 occurrences where this limit was exceeded for a 95% compliance rating. As demonstrated by the chart, on remaining days, the discharged solids were well below the allowable limit.



January 14, 16, 30, 31 & February 1, 3,4,5,9,10- Due to process changes and excess solids in the SBRs, the sludge in the SBR basins was not settling as quickly or completely, leaving fine materials suspended in the effluent. This combined with several high wind events that caused the solids to continue to be stirred up resulting in higher solids in the effluent. After each event, it would take several days for solids that were washed into the Equalization (EQ) Basin to slowly wash out.

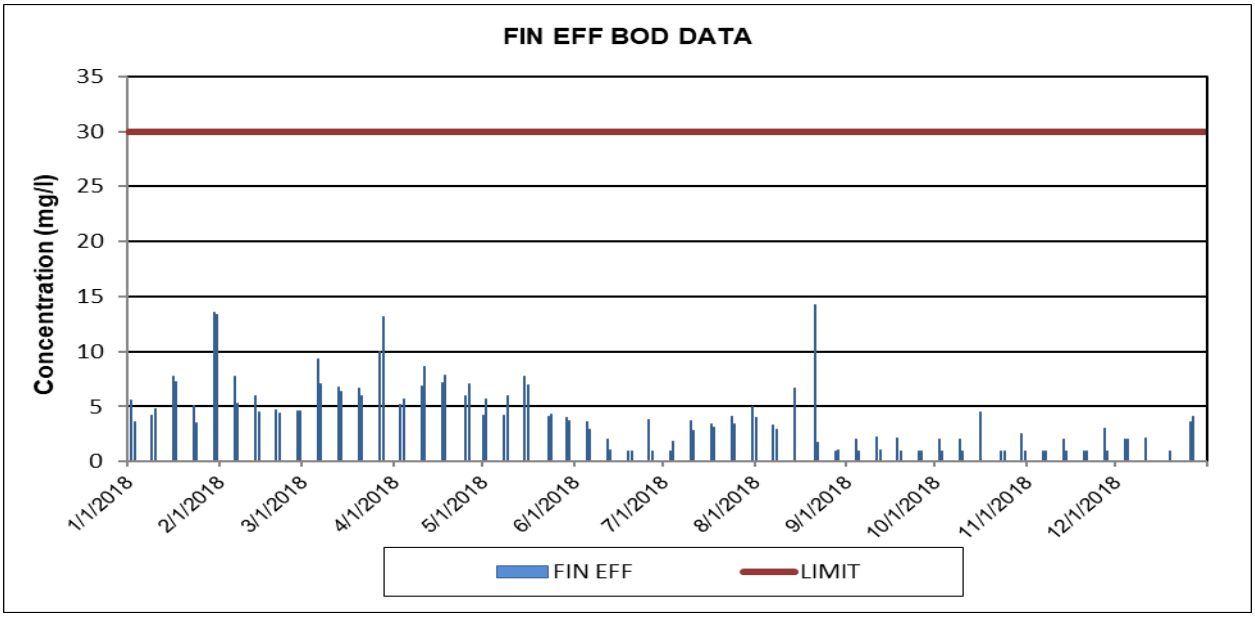
March 27-30- Solids in SBRs continued to settle more slowly than expected. A high wind event again stirred up the sludge blanket causing a high solids excursion and requiring several days for material to be washed out of EQ Basin.

May 16 & 17- Staff performed maintenance on a decant header in SBR Basin #1. Solids material was trapped inside the header that washed out. The second day of high solids was due to material captured in the EQ basin from the header work as well as the EQ basin being cleaned.

August 13- 16- Operational adjustments were made to accommodate a tie-in of new piping into existing infrastructure, however the aeration was not reduced enough compared to the reduced food source. In addition, operators cleaned the EQ basin and the UV lights which resulted in a large number of trapped solids and algae to be flushed through the channel. During this week, the decant header in basin 2 has developed a small leak which also accounted for some of the solids increase.

Biological Oxygen Demand

Biological Oxygen Demand (BOD) is an indicator of the amount of dissolved oxygen need by the remaining biological organisms in the effluent to break down organic matter once it reaches the river. The Environmental License permits a maximum daily discharge of 30 mg/L. There was no exceedance of this parameter for 100 % compliance and the average daily discharge amount was 4.1 mg/L.



Ammonia

Ammonia is a pollutant that may be toxic to aquatic life depending on the concentration. The allowable daily load of ammonia that can be discharged to the Assiniboine River changes each month. There were no incidents of ammonia exceedance and the daily average is significantly less than the allowable limits, regardless of the monthly limit. The chart below indicates the discharge limit for each month compared to average daily amount that was recorded.

Month	Limit (kg/day)	Daily average by month (kg/day)
January	673	7.3
February	560.1	4.3
March	589.3	4.4
April	1068.2	4.3
May	691.8	3.9
June	264.6	21.6
July	213.2	21.6
August	19.6	4
September	134.4	7.6
October	286.4	5.3
November	448	4.4
December	646.4	2.2
Daily Average		7.48

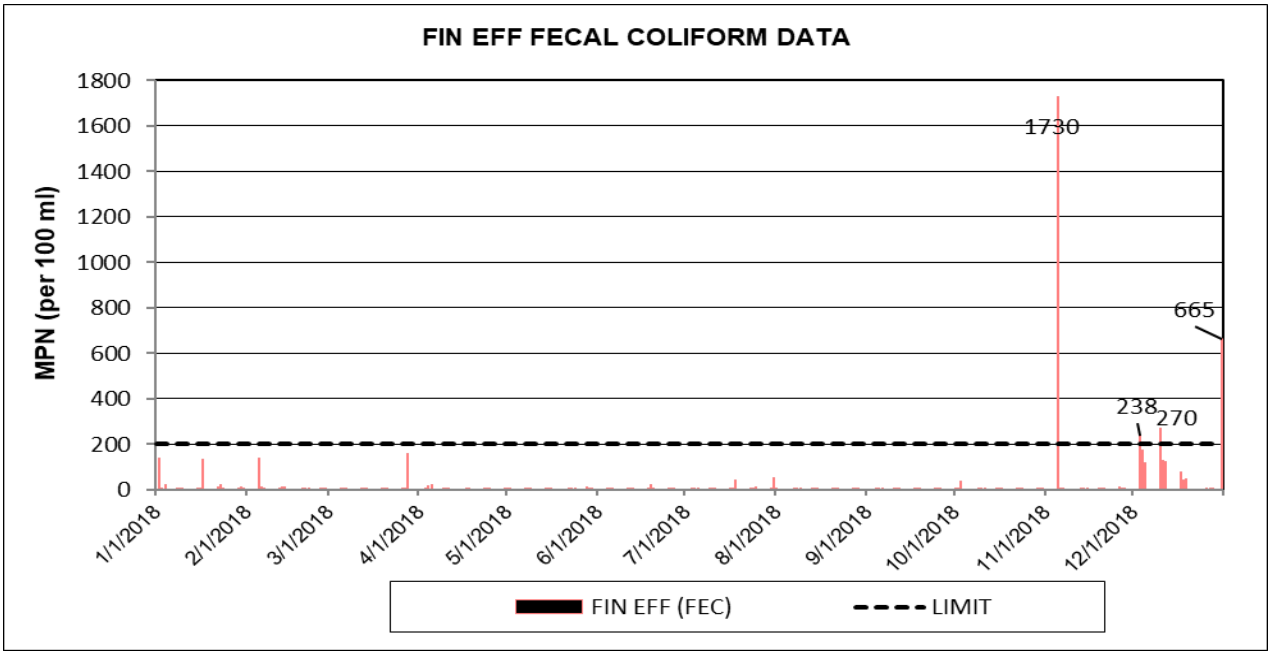
Toxicity

In addition to ammonia testing for toxicity, samples are submitted for toxicity verification through lethality testing. Daphnia toxicity occurs monthly and trout is quarterly. These tests are reported as pass fail. WPCF had no failures of toxicity in 2018.

Month	Toxicity Test	Pass/Fail
January	Trout	Pass
February	Daphnia	Pass
March	Daphnia	Pass
April	Trout	Pass
May	Daphnia	Pass
June	Daphnia	Pass
July	Trout	Pass
August	Daphnia	Pass
September	Daphnia	Pass
October	Trout	Pass
November	Daphnia	Pass
December	Daphnia	Pass

Coliforms

Fecal Coliform is a measurement of the amount of fecal coliform organisms within 100 mL of effluent. There is not a daily discharge limit but rather limit on the monthly geometric mean that must not exceed 200 CFU/100mL. Samples must be submitted three times per week and must be sampled on consecutive days. There were individual days were the results were reported above the limit, but the monthly geometric mean limit was not exceeded. These daily events do not need to be reported.



The employees at the WPCF strive to ensure wastewater is treated and returned to the environment at the highest quality possible. This is evident through the 95% compliance that was achieved in 2018. Despite 20 recorded total suspended solids exceedances, the remaining days the facility operated well below the allowable discharge limits.

Biosolids

The land application of biosolids is a beneficial reuse of nutrients and metals contained in the residual solids material generated as part of the wastewater treatment process as fertilizer for local farm land. Excess Waste Activated Sludge (WAS) is removed from the SBR basins almost daily to maintain a proper amount of WAS within each basin. WAS is thickened and anaerobically digested, then stored in the Biosolids Storage Tanks (BSTs) or in the Bulk Volume Fermenter (BVF) until it can be applied to agricultural land. Land application occurs in the spring and fall, once fields are available. The application of biosolids is a highly regulated process with restrictions on the field types, location to nearby housing and waterways, and background metals concentrations all being part of the verification process prior to application.

The application of biosolids is permitted under a separate Environment Act License, #1907. This license requires that all solids material be stabilized through anaerobic digestion for 30 days at 20°C prior to land application. The mixing system in the anaerobic digester has not been functioning for a few years. Material continues to build up in the tank, reducing the overall capacity and reducing the retention time in the digester, meaning the 30 days cannot be obtained.

The long-term solution is to construct a second anaerobic digester and then retrofit the existing system with mixing. This is part of the nutrient reduction upgrade. In the interim, once the old BVF is no longer being used as a pre-treatment system, the digester will be emptied into the BVF to allow for clean out of the hardened material. The digester will be put back into service, without mixing, however, this will increase the retention time within it.

A suspension of the clause in the license that requires the time and temperature was requested, and approved, for land application of biosolids for the 2018 Spring and Fall application programs. The basis for this approval was supported as we were able to demonstrate that pathogenic kill and material stabilization has still been obtained within the system due to long storage times. In the spring, 215.4 dry tonnes of material were applied and, in the fall, 440.7 dry tonnes was applied for a total of 656.1 dry tonnes. This material was applied to farm land within the RM of Portage la Prairie to land owned by four different farmers.

Odour

Odour is another parameter within the license that WPCF is required to control. Although there is no specific measurable, the license indicates that three written complaints, from three different sources, would constitute a license exceedance. To ensure odour is kept to a minimum, a technician from the supplier of the main odour control system was brought in to optimize the process. From this, it was determined that a significant increase of chemical was required to neutralize the odour producing gases. These adjustments were made, however, without significant upgrades to the automation system, there may be times that the facility is over-dosing. Operators take grab samples of the gases and make adjustments as best as possible.

Another source of odour is from the BVF. The gas collection system does not operate properly and causes gas to become trapped under the cover and vents out of sample ports, instead of travelling to the sides to be flared off. Once the new LRAR is operational, it is believed this source of odour will be significantly less.

Pumping Stations

The City of Portage la Prairie operates and maintains twelve pumping stations throughout the city. These stations collect and pump wastewater to the treatment facility. All pump stations functioned as expected throughout the year with minor mechanical repairs and regular maintenance required. In 2019, three additional pumping stations will be included as City of Portage assets including the new station at Poplar Bluff, the return of operational control of the station at McMillan Industrial Park, and the addition of the station in the new South East subdivision. By the end of 2019 or early 2020, the existing Poplar Bluff lift station will be turned over to Simplot Foods for ownership and operational responsibility.

Industrial Compliance

Each industry has daily peak amounts of flow, total suspended solids, chemical oxygen demand (COD), and total Kjeldahl nitrogen (TKN) that it can discharge to the WPCF after pre-treatment, as well as monthly average limits.

Throughout 2018, the McCain/ NP BVF did not exceed the peak limit for flow or TKN, however exceedances of the peak daily limit occurred on 12 occasions for COD and 11 for TSS. The BVF also exceeded the monthly average limit for TSS in February, March, April, July, September and November. February, March and April also reported monthly exceedance for COD.

The Simplot BVF had recorded exceedance of peak limit 26 times for TSS and 9 occurrences for COD. There were no reported occurrences of flow or TKN peak limits being exceeded. In addition to the peak days, the Simplot BVF sent TSS loads that exceeded the monthly allowable average for each month in 2018 except for March and November.

Despite the ongoing high loadings received from the various industrial partners, the secondary system at WPCF was able to accept and sufficiently treat this additional load with little impact to the final effluent quality. By maintaining a high level of treatment, and operating well below the Environment Act License limits, the facility can accept the higher loads and still produce high quality effluent. Should the facility be running closer to limit values, these higher incoming loads would put the facility out of compliance and in return, could affect the production abilities of the industrial partners.

Reporting

Reporting is a major component of the WPCF. There are several reports that are required by various partners throughout the year. All reports were submitted on-time, as required. This year also required quarterly construction updates to be sent to the Province of Manitoba. These are as follows;

Monthly- final effluent report to Manitoba Sustainable Development; summary reports and exceedance letters, as required, to industrial partners; groundwater sample results to McCain Foods and Manitoba Sustainable Development

Quarterly- Wastewater Systems Effluent Report to the Government of Canada, Nutrient Reduction updates to Manitoba Sustainable Development; Construction and finance reports to Manitoba Strategic Infrastructure Secretariat

Annual- Annual WPCF Summary Report to Portage la Prairie City Council; National Pollutant Control report to Environment Canada; Biosolids Report to Manitoba Sustainable Development.

Staff Compliment

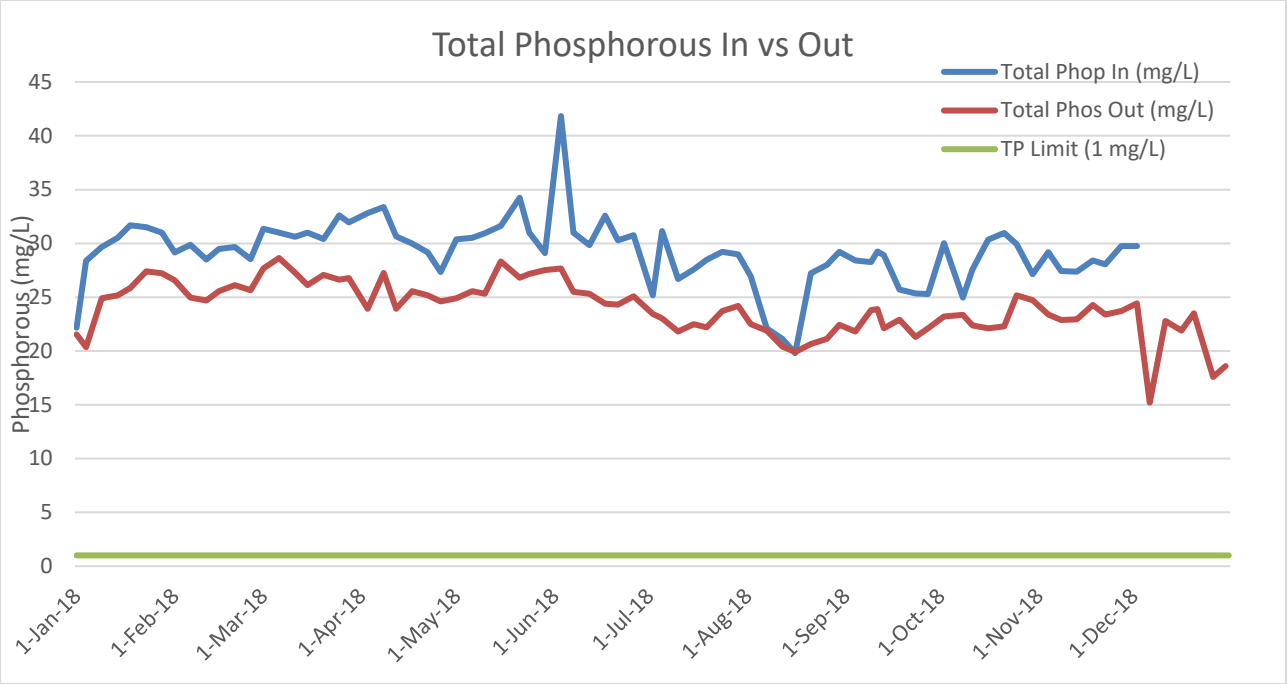
The Province of Manitoba requires operators and pumping station maintenance staff to be certified according to the classification of the facility. The Water Pollution Control Facility is deemed as Class 4 and the collection system is classified as Class 2. All operators must continue to work toward obtaining the same level of certification as the facilities they operate, through ongoing education and examination as well as on the job experience. Staff must also continually participate in ongoing education to maintain their certification levels.

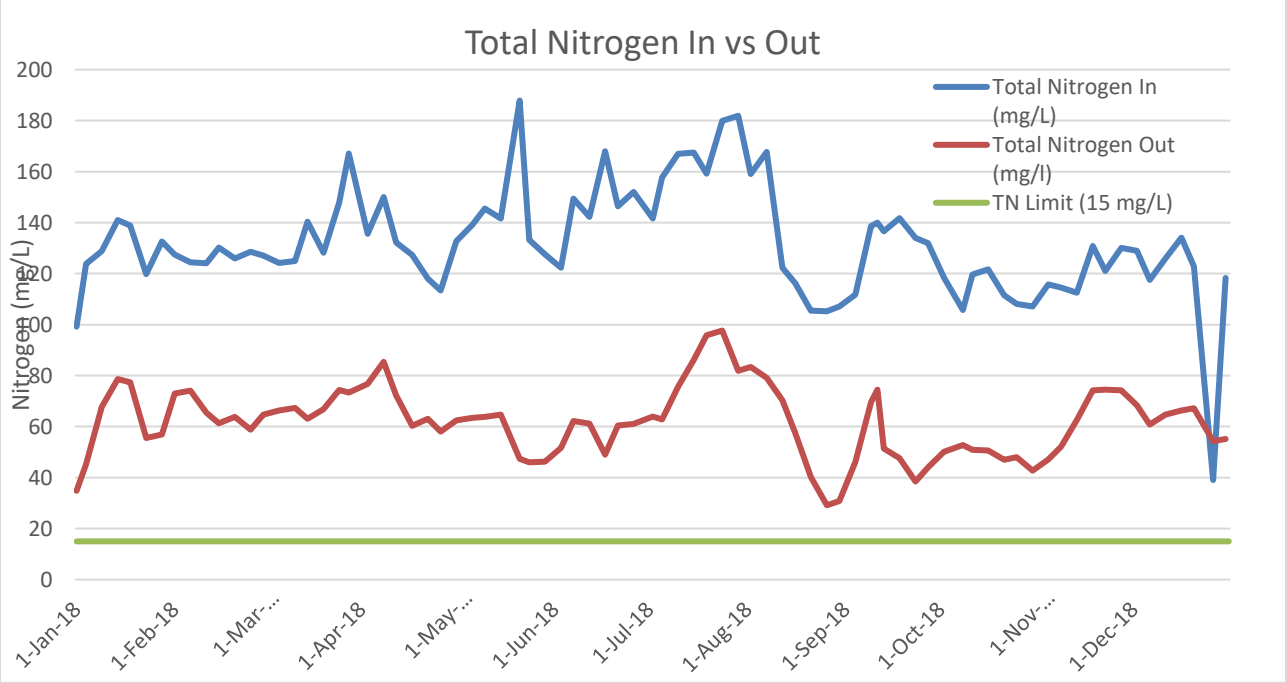
For the majority of 2018, WPCF was staffed by a Manager (level 4), an operations supervisor (level 3), three operators (1 at level 4 and 2 staff at level 1), and a lab technician. The Collection System was staffed by one lift station maintenance person that has obtained level 2 and the second pumping station maintenance staff has obtained level 1. They are supervised by a foreman having level 2 certification.

Two new operators were added to the staff compliment in the fall of 2017 and after 6 months of training, they were able to be added to the rotational schedule of WPCF and work stand-by and weekends. This was a relief to the existing operators that had been on a 3-week rotation for several months. This was short-lived as in spring 2018, a long-standing operator retired leaving a noticeable vacancy on the team. The staff quickly adapted once again to a 4-week rotation. To date, this position has not been filled. A new maintenance person was also hired in the fall to fill a vacancy in the maintenance department. Staff continued to work diligently to balance the workload and ensure the facility was fully operational despite shortages throughout the year.

Nutrient Reduction Regulation Compliance

The Water Quality Standards, Objectives and Guidelines regulation requires any wastewater facility that discharges into Lake Winnipeg to reduce nutrients from the effluent by January 1, 2016. The limits imposed were l mg/L of Phosphorous and 15 mg/L of Nitrogen. Although the existing facility does remove some amounts of these nutrients, it was not designed to meet the regulatory limits. As demonstrated in the graphs, the amount removed does not bring discharged amounts near the regulatory requirements. To meet these limits, the facility will require a new treatment processes to be added as well as supplemental systems to be incorporated with the existing treatment stream. There are also several areas of the facility that are deteriorating, some lack efficiency and other components have been identified that lack redundancy and therefore the ability to properly maintain.





In 2015, a functional design was completed by AECOM to detail the type of processes that would be required to meet the Phosphorous limit of 1 mg/L and the Nitrogen limit of 15 mg/L. The total capital cost was estimated at $106 M. A business case analysis was conducted in 2016 to determine if a Private-Public Partnership would be most economical to help fund this project. Ernst & Young were hired to conduct the review and the result indicated that a complete Design, Build, Finance, Operate & Maintain model through Private-Public Partnership would result in the highest Value for Money. City Council approved this recommendation. It was necessary for

the City of Portage la Prairie to apply for an extension to the phosphorous compliance deadline until January 1, 2018, to allow for the PPP model to be implemented once funding was secured. This extension was granted.

Early in 2017, Roquette announced it would be building a processing facility in the RM of Portage la Prairie. This development had a significant impact on the future incoming loads to the WPCF. A second major impact to the design was the announcement by Simplot Foods Canada that they were going to expand their production facility and construct their own wastewater treatment facility, meaning none of their industrial wastewater would be sent to WPCF. They would continue to send domestic flow which is significantly lower in both flow and loading. These two significant changes to the incoming wastewater were updated on the functional design which also affected the capital and future operating costs. A refresh of the business case was conducted and resubmitted for grant funding consideration early in 2019.

Once funding secured, a Request for Qualifications will be issued to the private sector to begin the selection process of a PPP proponent. Submissions will be evaluated, and the most qualified bidders will be requested to submit proposals for the overall project. This process can take up to 18 months to select a final contractor. The contractor will then require two years to build and a further six months to completely commission the facility. As the funding has not been confirmed and the bidding process not started, the facility will not meet the nutrient removal deadlines. A letter of request for an extension to the Phosphorous compliance deadline was submitted to Manitoba Sustainable Development on July 10, 2017 asking for a new compliance date of January 1, 2021 and there has been no response received regarding this request. Administration continues to submit quarterly reports to keep the provincial department aware of the ongoing changes and progress.

Construction of Low Rate Anaerobic Reactor and Lift Station

To properly accept and treat the wastewater that Roquette will be producing once online, a new Low Rate Anaerobic Reactor (LRAR) and pumping station were required as well as the underground pipework to connect the new systems to the existing treatment plant. A new LRAR was originally planned with the nutrient reduction upgrade however, due to delays in funding for that project, this construction was advanced ahead of the overall project and was referred to as Phase 1. Funding for Phase 1 was provided in full by the Province of Manitoba and the Government of Canada for a total contribution of $28,750,000.

Low Rate Anaerobic Reactor

The tender for the design and construction of the new Low Rate Anaerobic Reactor was awarded to ADI Systems and construction began in April 2018. Substantial completion date was December 14, 2018 but due to delays from weather, electrical tie-in complexities, and the addition of a burn-out basin, the new substantial completion is end of February 2019. As of the end of 2018, the LRAR system is constructed and the ancillary building is erected. Work remains on the pipe work within the building, install of the boiler, and the reactor needs to be seeded and then commissioned. The cover still needs to be installed on the burn out basin. The system will be fully operational by end of May 2019.

Base of LRAR

Wall construction of LRAR

Interior Liner

Installation of cover

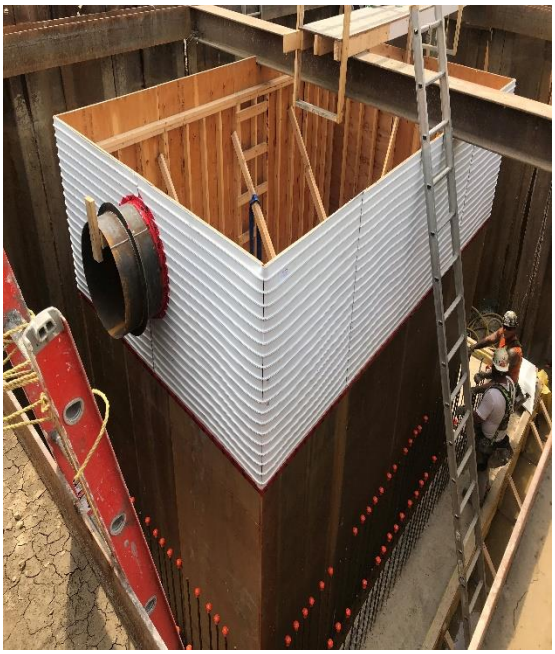
Pre-treatment Building

Interior Pipework and grinders

Poplar Bluff Pumping Station

The tender documents for the new pumping station was released in February and was awarded to Winkler Building Systems. As of the end of 2018, the new pump station has been constructed and the pumps commissioned. To date, outstanding work includes hatches and regrading of lines in the air release chambers along the force main as well as commissioning and training of the HVAC and automation systems as well as the back up generator.

Rebar and frame work



Install of PVC liner

Pumps in dry well of Lift Station

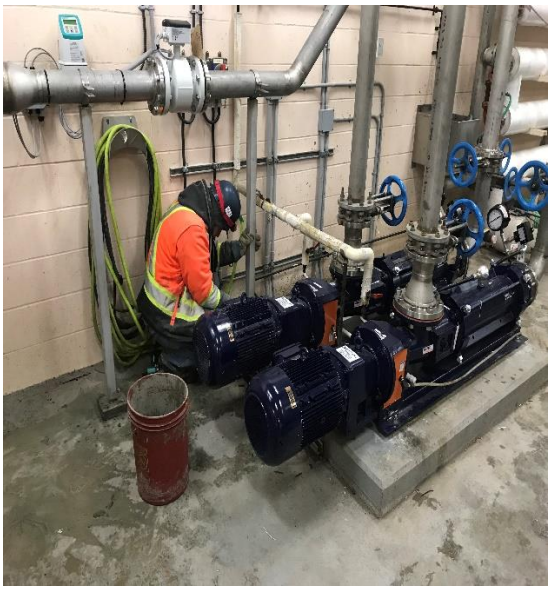
Completed building and station

Civil Works

The piping to connect the new systems to the existing infrastructure as well as install of new pumps and instrumentation at WPCF was tendered separately in February. This successfully bidder was ER Moon Construction. Work will begin in the spring and continued through out 2018. This work involved several major tie-ins of pipe. To accomplish this, municipal wastewater was diverted up to the McMillan Industrial Park Lift Station and around to the pre-treatment system. Staff from WPCF, the City Waterworks department, and the industrial partners were involved in this work and due to their diligence, these tie-ins went smoothly.

Road work to new pre-treatment building

Install of chamber containing metering equipment



New pumps installed

New pipes and valves connected to system

WPCF & Waterworks staff turn valves to divert flow

Staff work under air to insert plug into pipe to prevent gas from reaching workers

Industrial Services Agreements

Once the new LRAR is commissioned, the intent is for the City of Portage la Prairie to resume operational control of the existing BVF and the McMillan Industrial Park Lift Station. These are currently operated by McCain Foods and governed by an operating agreement. Transfer of the operation will occur once the Industrial Services Agreement is updated and completed, and a letter of understanding for the operation of the existing systems, and a list of items identified for repair have all been completed.

Administration continues to work on the Industrial Services Agreements. Extensive alterations to the cost participation formula, including capital and operating costs have been included to ensure equitable distribution of costs is being achieved. With the addition of the new LRAR ahead of the nutrient reduction, an interim ISA is being developed for McCain, Nutri-Pea and Roquette that will not require capital contribution. As well, a transitional ISA has been developed that will govern the operation and cost distribution of the new LRAR without Roquette as a participant as they will not be using the facility for the first year or two of operation.

Several meetings have been held with the industrial partners with ongoing discussions and revisions being made to the documents. The intent is to have the transitional ISA and the interim ISA finalized and signed by mid-2019.

Summary

2018 proved to be another successful year for the WPCF. Despite ongoing construction, elevated loadings, and staffing constraints, the facility operated well below license requirements throughout most of the year, reporting a compliance rating of 95%. Staff- both in Operations and Maintenance- should be commended for their ongoing efforts to ensure WPCF is producing high quality effluent year-round.