Water Treatment Plant Year-end Report for 2022

For Information Only

Water demand

The total influent volume of water drawn from the Assiniboine River for treatment was approximately 6.8% higher in 2022 than in 2021, and 23% higher than 2020. 2022 had an influent volume of 9,902,712 m3 compared to 9,331,668 m3 in 2021.

The total treated volume of water pumped to the distribution system from the water treatment plant was approximately 8,593,430 m3 in 2022, compared to 8,519,485 m3 in 2021.

The volume of water used internally for the treatment process in 2022 was 214,224 m3. This water is used in the process production for mixing chemicals, dilution of chemicals for pumping purposes, and flushing pipes after sludge removal from process systems.

Raw Water Quality

The raw water quality for 2022 had higher turbidity spikes than the previous year. From early April to nearly the end of June the water treatment plant (WTP) experienced several turbidity spikes up to 1100 NTU. The turbidity spikes were caused by the spring thaw, and the frequent rainstorms in early 2022. The Actiflow clarifier was able to reduce the high levels of turbidity to minimize the impact on the downstream treatment process. The plant effluent turbidity rose slightly in the spring as usual. This is due to organics, and water chemistry changes as the near freezing water warms up.

The average raw water hardness for the winter months; January, February, March, October, November, and December 2022, was 433 ppm. The raw water hardness average for the other six months was 316 ppm. The treated water average hardness was 205 ppm and 179 ppm for the respective periods. The 2021 yearly average hardness for Raw Water was 375 ppm and Treated Water was 192 ppm.

Minimal operator overtime and shift changes were required during the spring runoff to service equipment to ensure water production continued. Plant operation during fall freeze up was difficult, however it was short lived as the river froze relatively quickly.

Distribution System Water Quality

Distribution testing for 2022 was done on a weekly basis for Total Coliforms and Escherichia Coli. All Drinking Water Regulation treatment parameters were met.

Metals sampling and testing was conducted on a quarterly basis for the assessment of metals including lead concentrations found in some household service lines. The samples were sent to an independent lab and all results were forwarded, by the lab, to the Manitoba Conservation and Climate, Office of Drinking Water Officer for our area. The practice of running cold water for 2 to 5 minutes, following extended periods of non-use, and before consuming, is recommended for all homes with lead services.

On March 8, 2019, Health Canada set new regulatory guidelines for lead in potable water. The new Canadian Drinking Water Quality Guideline maximum acceptable concentration (MAC) for total lead was lowered from 0.010 mg/L, set in 1992, to 0.005 mg/L. This is based on a sample of water taken at the consumer's tap.

Starting in 2022 the provincial Office of Drinking Water, partnered with Manitoba Health has mandated the City to do lead testing in forty residences per year. 42 sets of samples were obtained from participants homes and tested for total lead. One sample was taken straight out of the tap without flushing and another sample was taken after flushing the tap for 5 minutes. Many of the homes tested in 2022 had confirmed lead service lines.

More information may be obtained from the City's web page.

Water Quality Monitoring and Analyses

Each year, an annual water system report is to be completed by the City and submitted to Manitoba Conservation & Climate, Office of Drinking Water by March 31st. The Office of Drinking Water and the City of Portage la Prairie will continue implementing testing improvements at the Water Treatment Plant to enhance the water quality and will continue to work jointly with the local Drinking Water Officer.

The attached graphs for Hardness show the Raw Water followed a typical annual pattern for the most part, being softer after spring runoff and harder near year end. In November and December however, there were extreme jumps in the raw hardness that were harder to deal with. Overall, in 2022 the plant operators did a good job dealing with the hardness, the average finished total hardness was 192 ppm, versus 199 ppm in 2021.

As shown in the turbidity graph below and as previously mentioned, the WTP experienced more than usual turbidity spikes in 2022. This is likely due to the heavy rains we had in the spring. The high spikes in the raw water turbidities did not make a severe impact on the effluent turbidities however, as we see just small rises on the graph and no results were over the standard of 0.3 NTU for more than 12 hours.

Sodium hydroxide is added to help increase the pH of the finished water. However, final pH is difficult to control due to the consistent fluctuations in the raw water pH. The raw water pH tends to follow seasonal trends for highs and lows, but often as in 2022 there are substantial variance within each season or sometimes even day to day. Sodium Hydroxide is added to help prevent metal corrosion, and the leaching of metals into the water from too low of a pH. Despite this, for the most part of the year, the effluent pH was over 7.5.

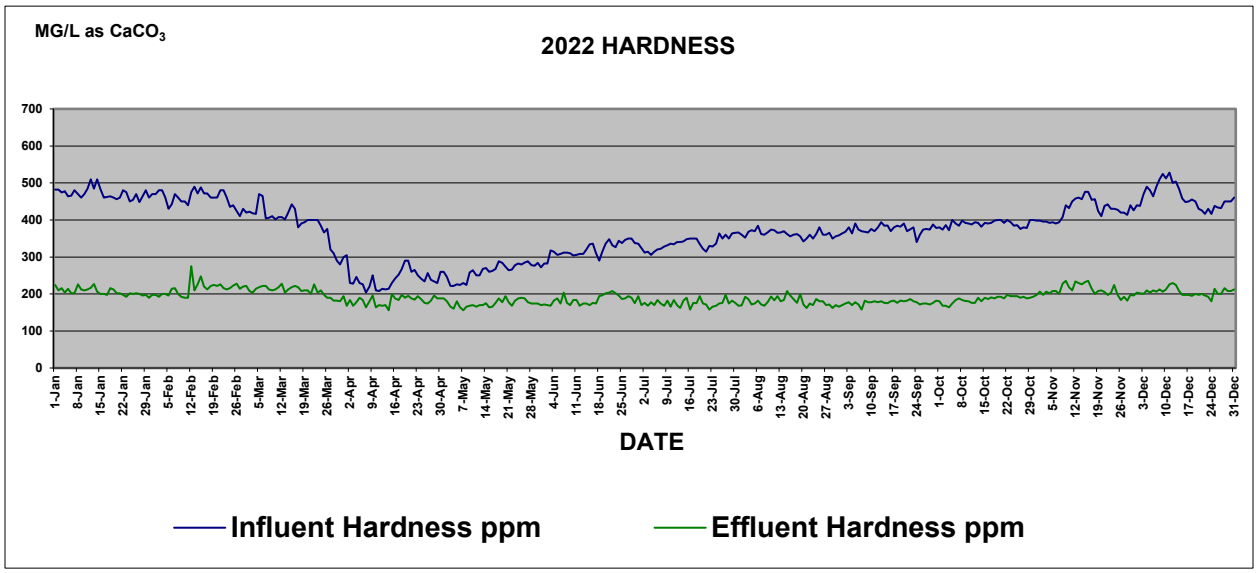
Fluoride graphs shows some variation in Fluoride levels in 2022. Fluctuation is common on feeding fluoride due to the very low level injected and the fact that the method used for in-house testing of Fluoride is finicky. The fluoride test results are from the morning sample and represent the reading in the effluent water at that time, and not as a daily average. A concentration of 0.70 mg/l has been deemed optimum by Health Canada.

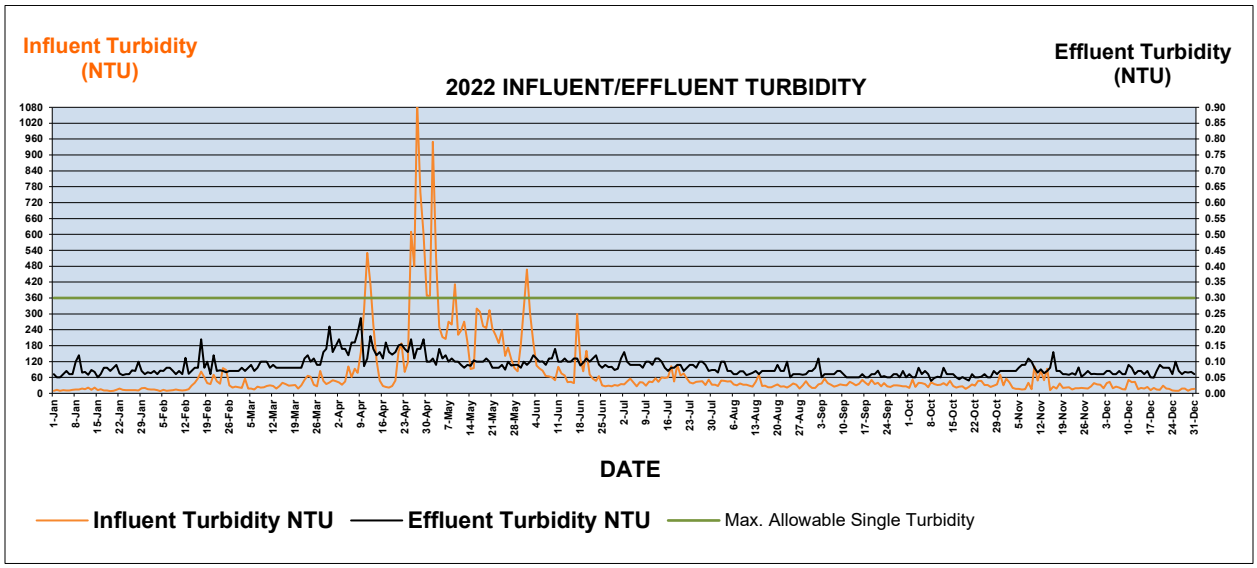
As a whole, chlorine feed was more consistent in 2022 than 2021 and there was less day to day variation in residuals. The plant is also working towards more redundancy in the chlorine feed systems. The effluent chlorine levels are higher as it enters the distribution system. Weekly sampling of the distribution areas for chlorine residual was done and samples sent to an independent lab for analyses and reporting to the Drinking Water Officer and Water Plant Management. All samples were shown to be free of Total Coliform and Escherichia Coli.

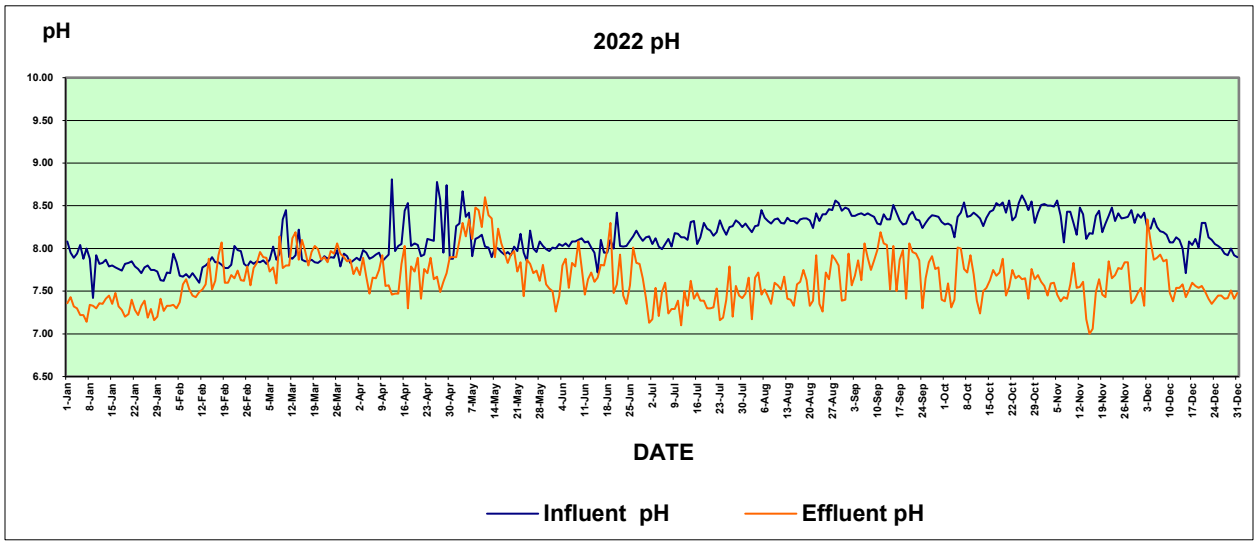
In 2022, the Tri-halomethane (THM) regulation requirements were met in the city limits. In the regional water systems where the water age increases, THM results are higher. THM's and other disinfection byproducts develop when chlorine reacts with organics in the water, organics can also cause taste and odour issues. Taste and odours are removed in part by the granular activated carbon filters. While these filters still seem to be reducing tastes and odour, they are showing higher levels of embedded total organic carbon (TOC) that could react with chlorine to form THM'S. The effective removal of THM-forming compounds is limited. The expected life rating of the GAC media life is well below the original anticipated three years, but the replacement of the GAC media annually, or more frequently, would be cost prohibitive. Monitoring of the raw and treated water will continue to detect problems within the raw water that would cause this. Further studies with chemical treatment alternatives have continued in 2022 to help find ways to reduce THM's.

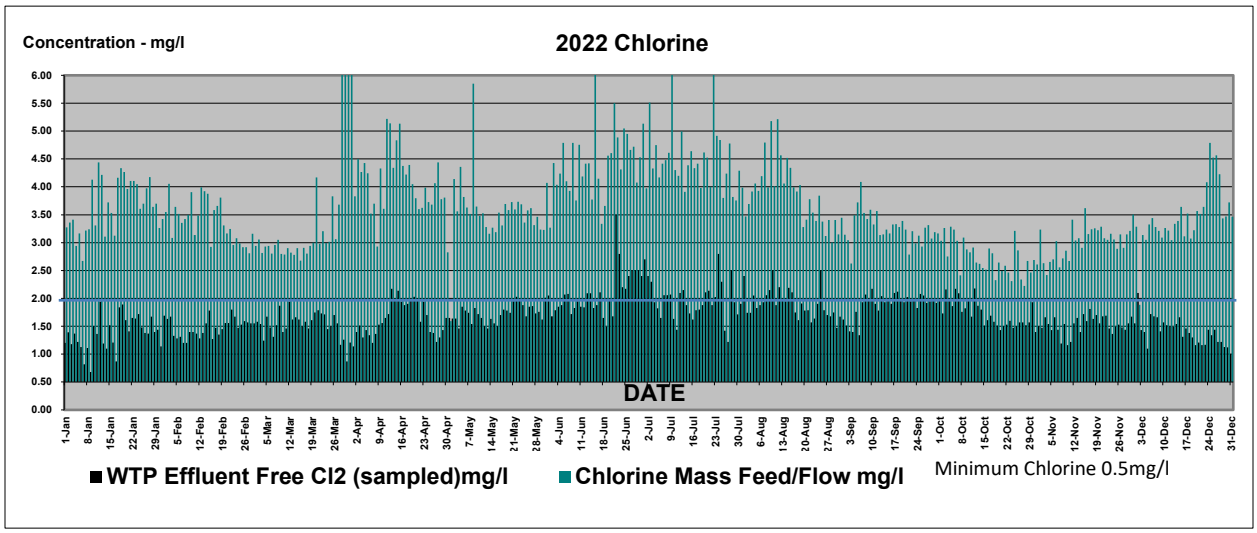
City of Portage la Prairie Water Treatment Plant - 2022 Annual Data Summary

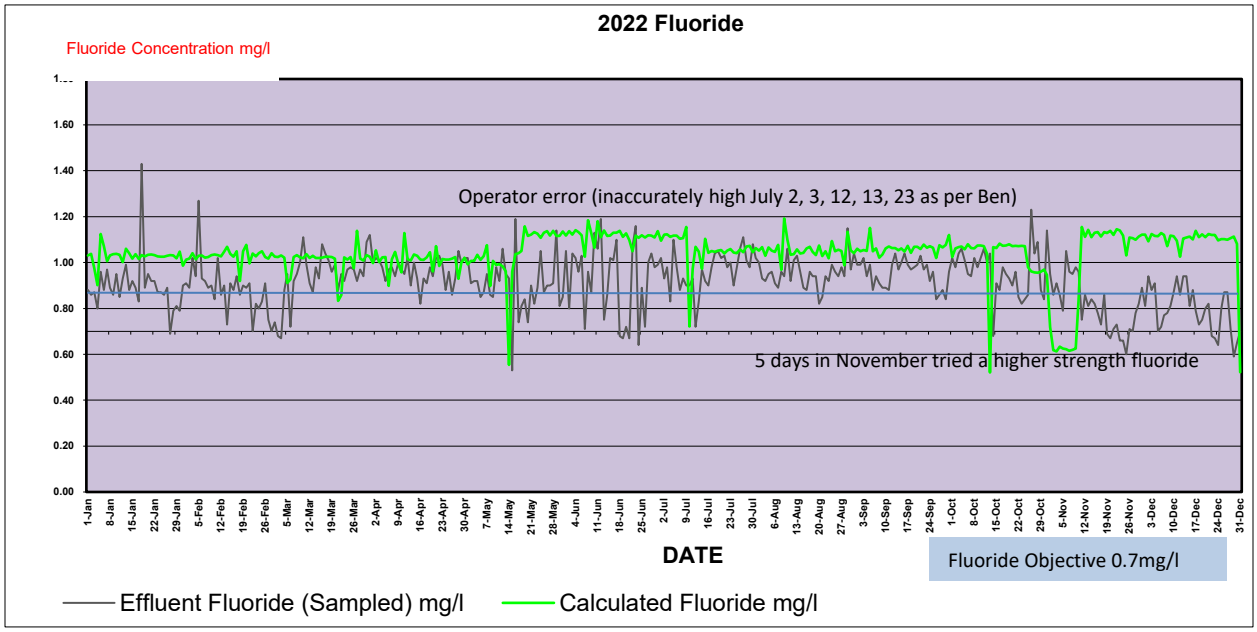
	Influent Hardness ppm	Effluent Hardness ppm	Influent Turbidity NTU	Effluent Turbidity NTU	Influent pH	Effluent pH	WTP Effluent Free Cl_2 (sampled)mg/l	W.T.P. Effluent Fluoride (Sampled) mg/l	WTP Reservoir Influent Flow m3	Reservoir Effluent less process water m3
TOTAL ANNUAL									9,146,105	8,580,430
AVERAGE	**375**	**192**	**72.80**	**0.08**	**8.13**	**7.64**	**1.68**	**0.91**	**25,058**	**23,508**
PEAK DAY	528	275	1100.00	0.24	8.81	8.60	3.50	1.43	32,200	28,116
90th PERCENTILE	470	217	189.20	0.12	8.44	7.98	2.09	1.04		
MEDIAN	380	190	33.00	0.08	8.11	7.61	1.66	0.92		
WINTER AVG	433	205								
SUMMER AVG	316	179								

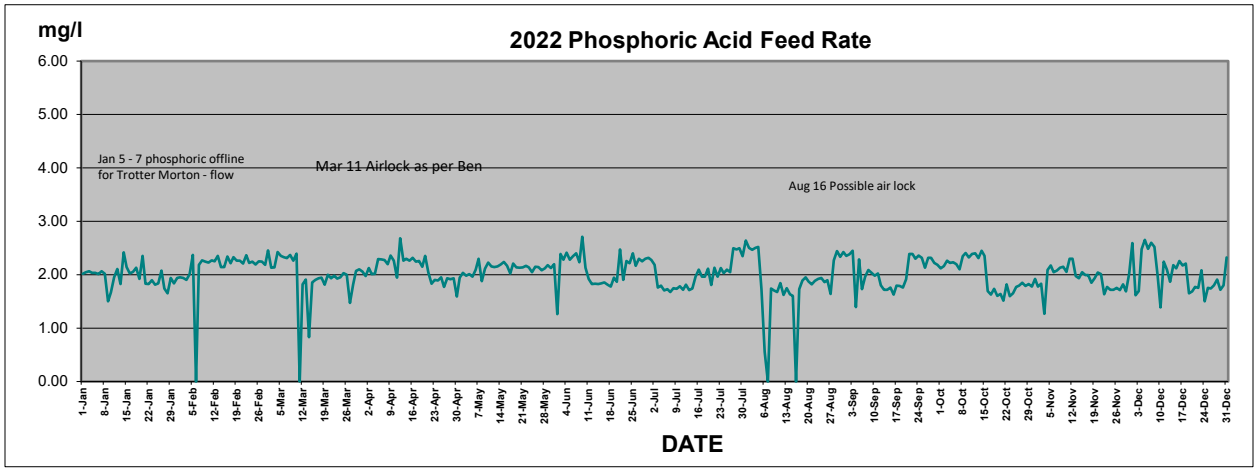

MG/L as CaCO3
2022 HARDNESS
700
600
500
400
300
200
100
0
1-Jan 8-Jan 15-Jan 22-Jan 29-Jan 5-Feb 12-Feb 19-Feb 26-Feb 5-Mar 12-Mar 19-Mar 26-Mar 2-Apr 9-Apr 16-Apr 23-Apr 30-Apr 7-May 14-May 21-May 28-May 4-Jun 11-Jun 18-Jun 25-Jun 2-Jul 9-Jul 16-Jul 23-Jul 30-Jul 6-Aug 13-Aug 20-Aug 27-Aug 3-Sep 10-Sep 17-Sep 24-Sep 1-Oct 8-Oct 15-Oct 22-Oct 29-Oct 5-Nov 12-Nov 19-Nov 26-Nov 3-Dec 10-Dec 17-Dec 24-Dec 31-Dec
DATE
Influent Hardness ppm
Effluent Hardness ppm

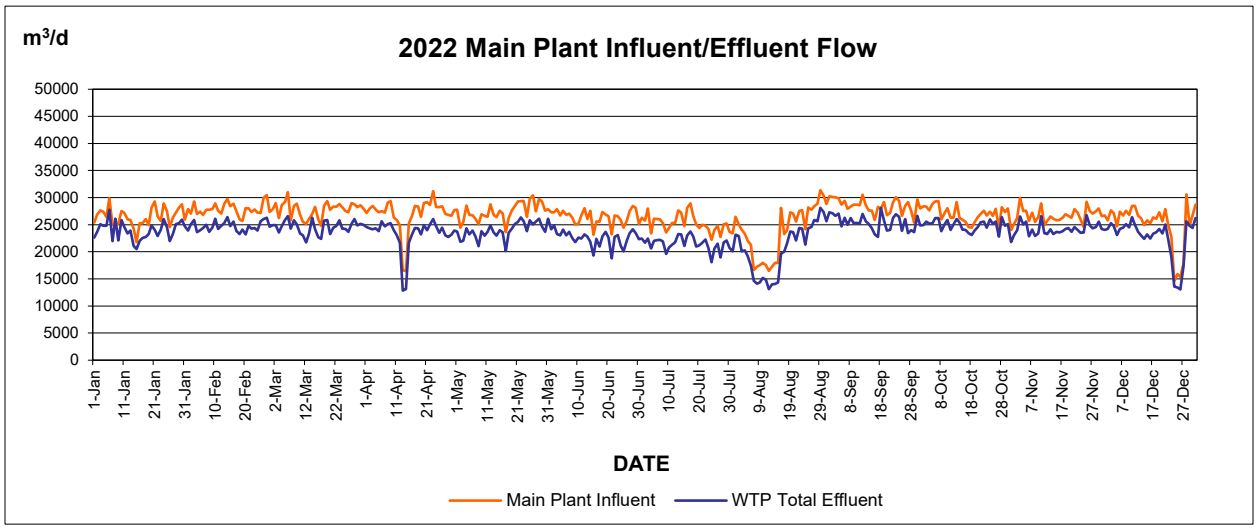

Influent Turbidity (NTU)
Effluent Turbidity (NTU)
2022 INFLUENT/EFFLUENT TURBIDITY
1080
1020
960
900
840
780
720
660
600
540
480
420
360
300
240
180
120
60
0
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1-Jan 8-Jan 15-Jan 22-Jan 29-Jan 5-Feb 12-Feb 19-Feb 26-Feb 5-Mar 12-Mar 19-Mar 26-Mar 2-Apr 9-Apr 16-Apr 23-Apr 30-Apr 7-May 14-May 21-May 28-May 4-Jun 11-Jun 18-Jun 25-Jun 2-Jul 9-Jul 16-Jul 23-Jul 30-Jul 6-Aug 13-Aug 20-Aug 27-Aug 3-Sep 10-Sep 17-Sep 24-Sep 1-Oct 8-Oct 15-Oct 22-Oct 29-Oct 5-Nov 12-Nov 19-Nov 26-Nov 3-Dec 10-Dec 17-Dec 24-Dec 31-Dec
DATE
Influent Turbidity NTU
Effluent Turbidity NTU
Max. Allowable Single Turbidity

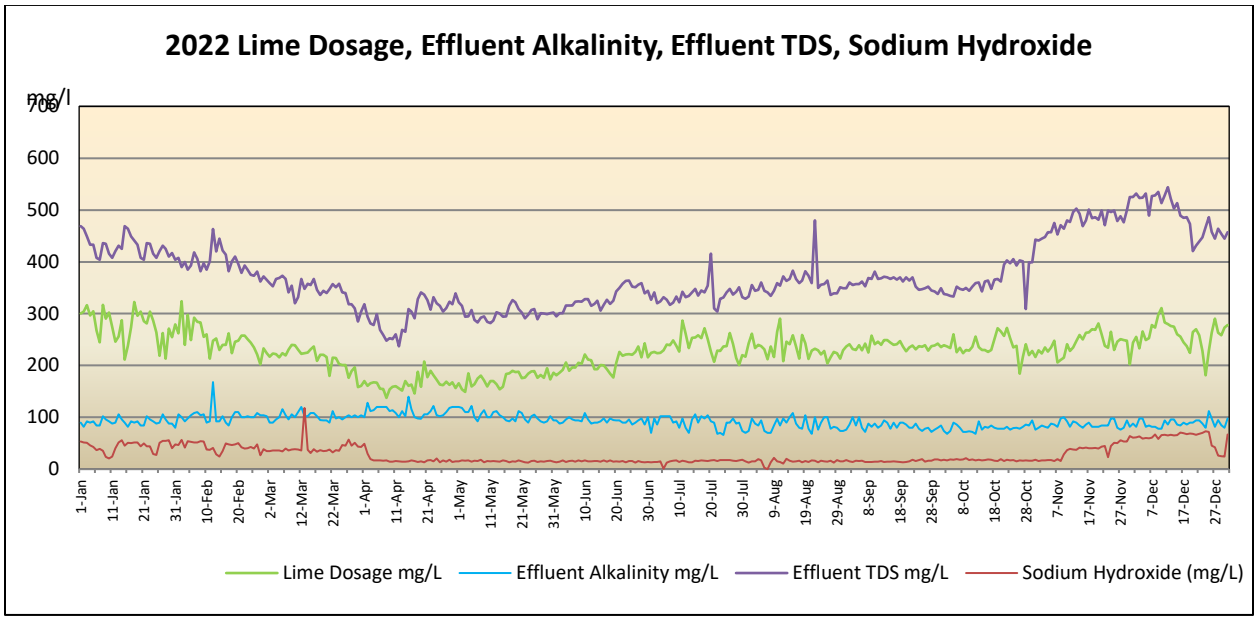

pH
2022 pH
10.00
9.50
9.00
8.50
8.00
7.50
7.00
6.50
1-Jan 8-Jan 15-Jan 22-Jan 29-Jan 5-Feb 12-Feb 19-Feb 26-Feb 5-Mar 12-Mar 19-Mar 26-Mar 2-Apr 9-Apr 16-Apr 23-Apr 30-Apr 7-May 14-May 21-May 28-May 4-Jun 11-Jun 18-Jun 25-Jun 2-Jul 9-Jul 16-Jul 23-Jul 30-Jul 6-Aug 13-Aug 20-Aug 27-Aug 3-Sep 10-Sep 17-Sep 24-Sep 1-Oct 8-Oct 15-Oct 22-Oct 29-Oct 5-Nov 12-Nov 19-Nov 26-Nov 3-Dec 10-Dec 17-Dec 24-Dec 31-Dec
DATE
Influent pH
Effluent pH

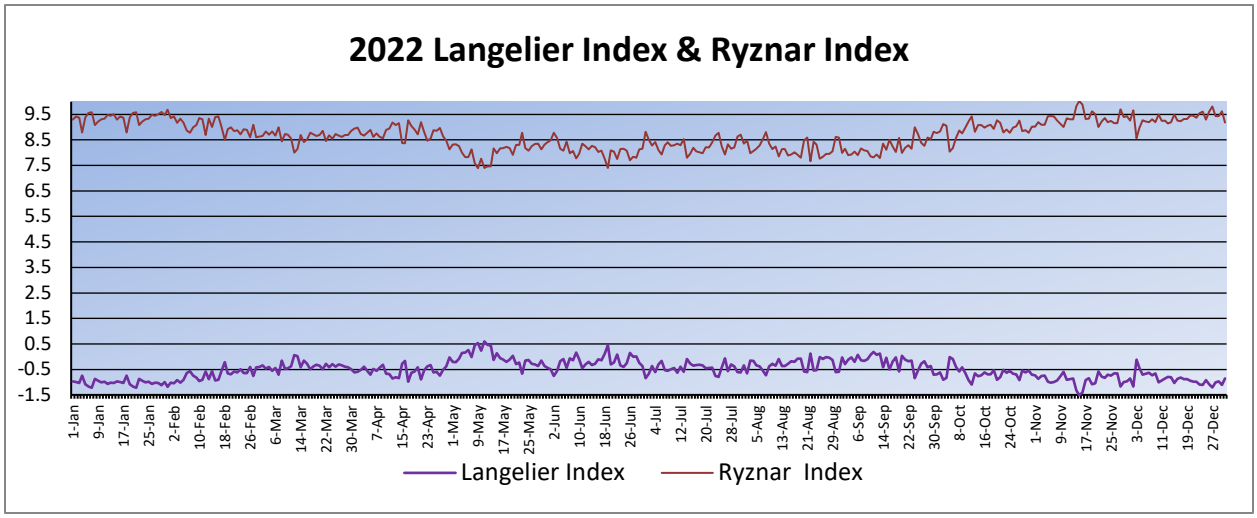

Concentration - mg/l
2022 Chlorine
DATE
WTP Effluent Free Cl2 (sampled)mg/l
Chlorine Mass Feed/Flow mg/l
Minimum Chlorine 0.5mg/l


2022 Fluoride
Fluoride Concentration mg/l
Operator error (inaccurately high July 2, 3, 12, 13, 23 as per Ben)
5 days in November tried a higher strength fluoride
DATE
Fluoride Objective 0.7mg/l
Effluent Fluoride (Sampled) mg/l
Calculated Fluoride mg/l


mg/l
2022 Phosphoric Acid Feed Rate
Jan 5 - 7 phosphoric offline for Trotter Morton - flow
Mar 11 Airlock as per Ben
Aug 16 Possible air lock
DATE


m³/d
2022 Main Plant Influent/Effluent Flow
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
1-Jan
11-Jan
21-Jan
31-Jan
10-Feb
20-Feb
2-Mar
12-Mar
22-Mar
1-Apr
11-Apr
21-Apr
1-May
11-May
21-May
31-May
10-Jun
20-Jun
30-Jun
10-Jul
20-Jul
30-Jul
9-Aug
19-Aug
29-Aug
8-Sep
18-Sep
28-Sep
8-Oct
18-Oct
28-Oct
7-Nov
17-Nov
27-Nov
7-Dec
17-Dec
27-Dec
DATE
Main Plant Influent
WTP Total Effluent


2022 Lime Dosage, Effluent Alkalinity, Effluent TDS, Sodium Hydroxide
mg/l
700
600
500
400
300
200
100
0
1-Jan
11-Jan
21-Jan
31-Jan
10-Feb
20-Feb
2-Mar
12-Mar
22-Mar
1-Apr
11-Apr
21-Apr
1-May
11-May
21-May
31-May
10-Jun
20-Jun
30-Jun
10-Jul
20-Jul
30-Jul
9-Aug
19-Aug
29-Aug
8-Sep
18-Sep
28-Sep
8-Oct
18-Oct
28-Oct
7-Nov
17-Nov
27-Nov
7-Dec
17-Dec
27-Dec
Lime Dosage mg/L
Effluent Alkalinity mg/L
Effluent TDS mg/L
Sodium Hydroxide (mg/L)


2022 Langelier Index & Ryznar Index
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
-1.5
1-Jan
9-Jan
17-Jan
25-Jan
2-Feb
10-Feb
18-Feb
26-Feb
6-Mar
14-Mar
22-Mar
30-Mar
7-Apr
15-Apr
23-Apr
1-May
9-May
17-May
25-May
2-Jun
10-Jun
18-Jun
26-Jun
4-Jul
12-Jul
20-Jul
28-Jul
5-Aug
13-Aug
21-Aug
29-Aug
6-Sep
14-Sep
22-Sep
30-Sep
8-Oct
16-Oct
24-Oct
1-Nov
9-Nov
17-Nov
25-Nov
3-Dec
11-Dec
19-Dec
27-Dec
Langelier Index
Ryznar Index

Major Maintenance in 2022

Early in 2022 McKay Reservoir received the installation a new 24" isolation valve on the main effluent line. Also new flow control valves and new motor control centre buckets were installed in the pump house. Three new pump motors arrived in late 2022 and early 2023 and are ready to be installed. A major capital roof membrane replacement will be conducted at McKay reservoir in 2023.

Phase 2 A plant upgrades were now complete. Phase 2 B plant upgrades are very close to completion.

Phase Three of the water plant upgrades includes a water treatment plant expansion. The expansion would consist of a membrane plant to run along with the existing conventional treatment plant. The Functional Design for Phase 3 has now been updated for increased projected water demands by Stantec Engineering, and it now calls for a combined plant output of 55 MLD for the design year of 2050.

Ozone air compressor ventilation system install.

Poplar Bluff distribution pump VFD replacement.

Various valve replacements.

Ozone room air conditioner install.

Blowdown sludge pump repair

Gas chlorine system upgrades

Ozone vacuum/pressure relief valve install and venting.

McKay reservoir MCC bucket replacements.

McKay reservoir roof condition study.

Heat loop circulation pump replacement.

Loop heat exchanger replacement.

Summary

Ongoing Water Quality Studies will result in optimizing the treatment process to treat the raw water to continue to have a safe, reliable product for our consumers.

The plant was kept in operation during maintenance work and plant shutdowns were done in a manner to that kept the consumers supplied with water.

Operating staff will continue to abide by all Government operational requirements and work with the local Drinking Water Officer to ensure the best quality of water for all persons.