

Annual Report

For the 2020 Operating Year

Ripley Wastewater Treatment Facility 2020 Operation and Maintenance Annual Report

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Ripley Wastewater Treatment Facility Annual Report

For the 2020 Operating Year

EXECUTIVE SUMMARY:

This report is a summary of the Ripley Wastewater Treatment Facility's performance in accordance with the Ministry of the Environment, Conservation and Parks (MECP) Amended Certificate of Approval (C. of A) No. 3-0724-88-006, Issued: September 18, 2009, and the Federal Wastewater Systems Effluent Regulations (WSER) for the 2020 operating year.

DESCRIPTION OF FACILITIES:

Works Number: 110002773

Component

Location

Sewage Pumping Station	59 Park St (Lot 56, Plan 100)
Stabilization Ponds (Lagoons)	76 Park St (Lot 14, Concession 7)
Outfall to South Pine River	Lot 14, Concession 6
Streamflow Monitoring Station	Sideroad No. 10, at South Pine River Crossing
Collection System	Village of Ripley

SEWAGE PUMPING STATION

- Wet well structure (2.4 m diameter x 10.4 m deep)
- Two (2) raw sewage pumps (11hp each)
- Milltronics level sensor and volume totalizer
- Standby generator (30hp), diesel fuel tank and containment
- Aluminum sulphate storage tank (27,000 L) and containment
- Two (2) chemical feed pumps (30L/h each, max)
- Force Main: 467 m x 150 mm diameter

STABILIZATION PONDS (LAGOONS)

- Cell No. 1: 38,080 m³
- Cell No. 2: 45,500 m³
- Cell No. 3: 45,500 m³
- Aeration Cell 4: 10,400 m³
- Blower: Hick Hargreaves HH4063: 540 - 1,080 m³/h (at 57 kPa)
- Electrically operated knife gate valve (Rotorx)
- Discharge control structure: 90° V-Notch weir and Milltronics level sensor
- Outfall pipe: 550 m x 375 mm diameter

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Ripley Sewage Map

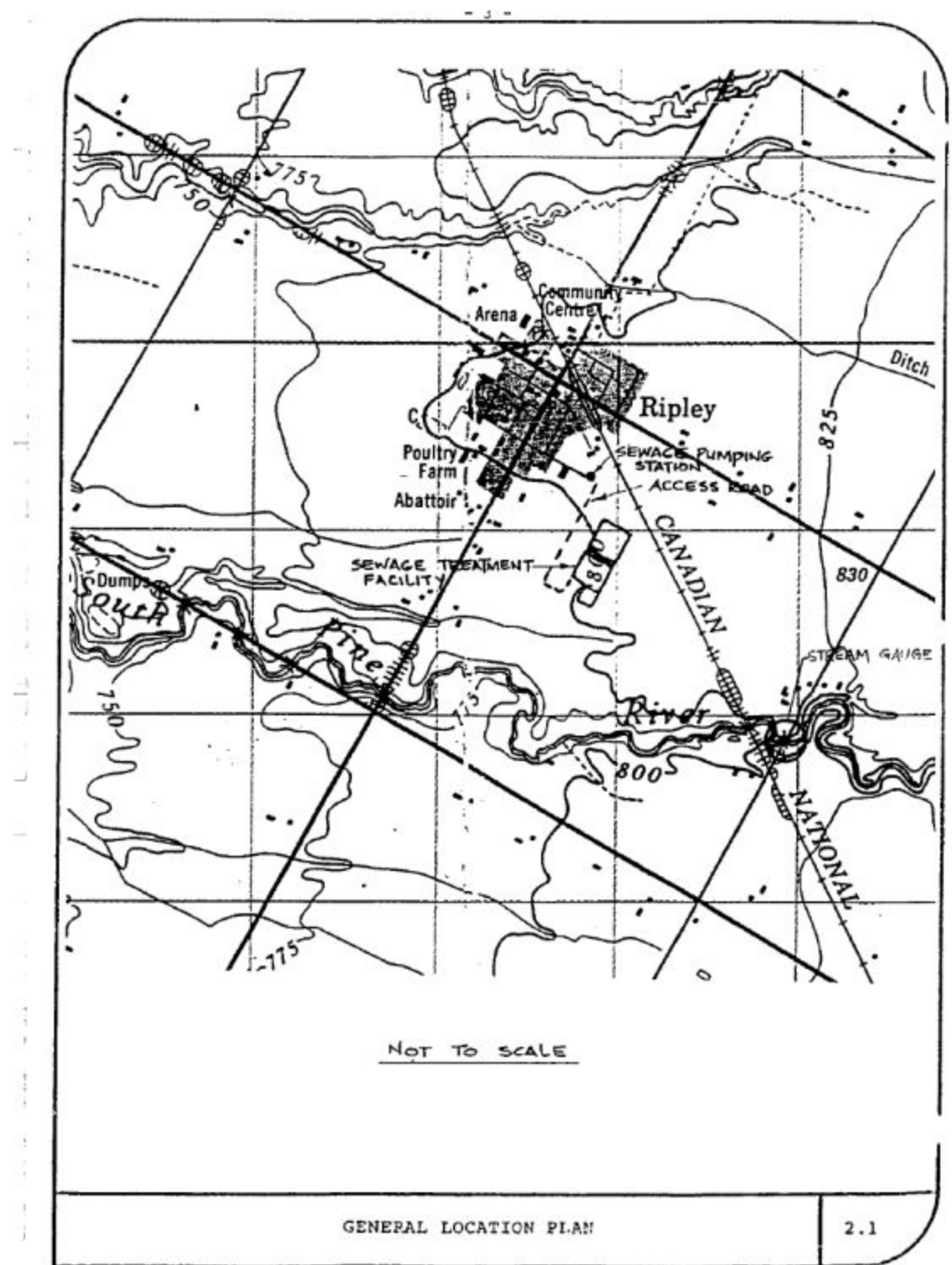


Figure 1

Ripley Sewage Pumping Station Schematic

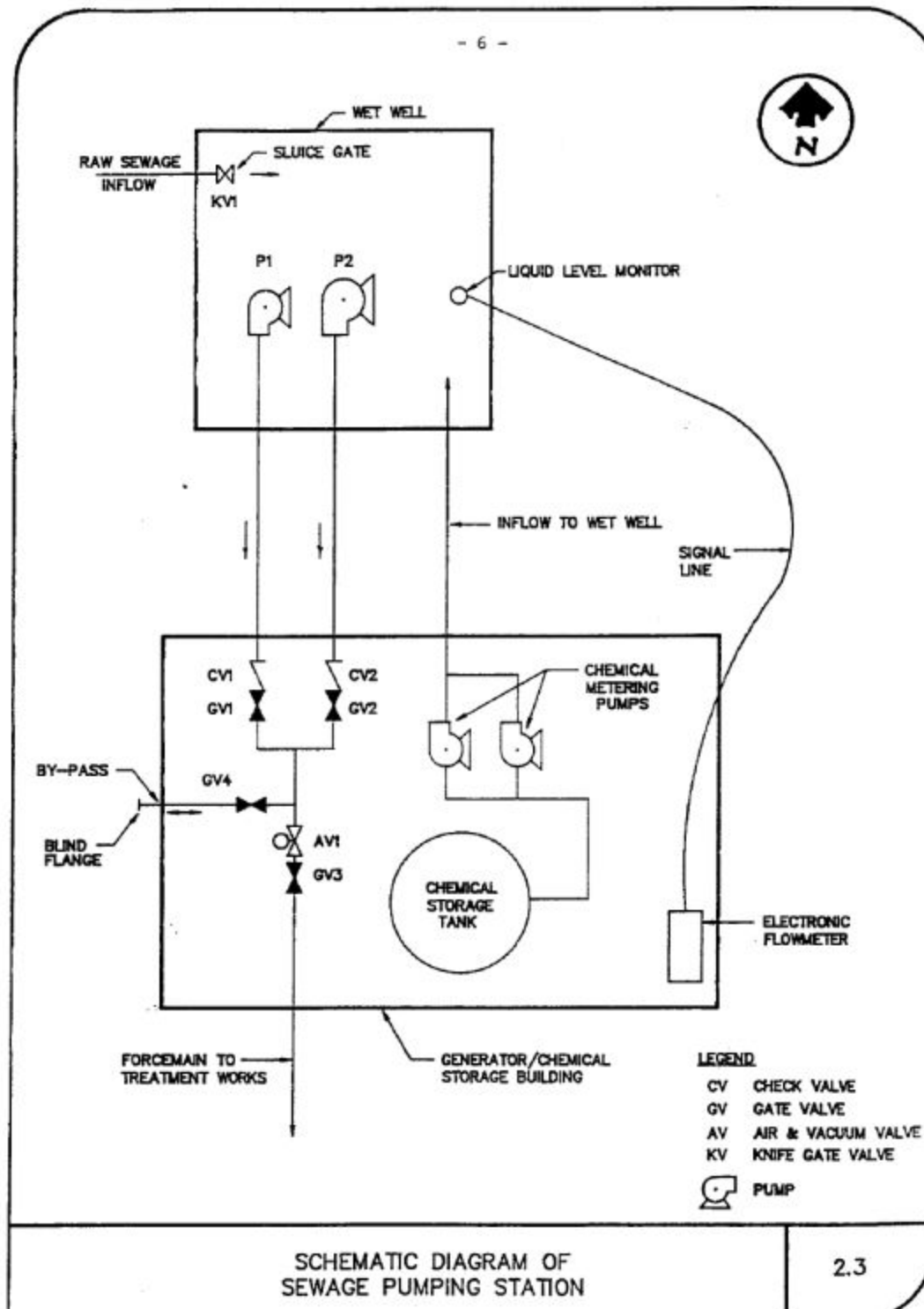


Figure 2

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Ripley Sewage Lagoon Schematic

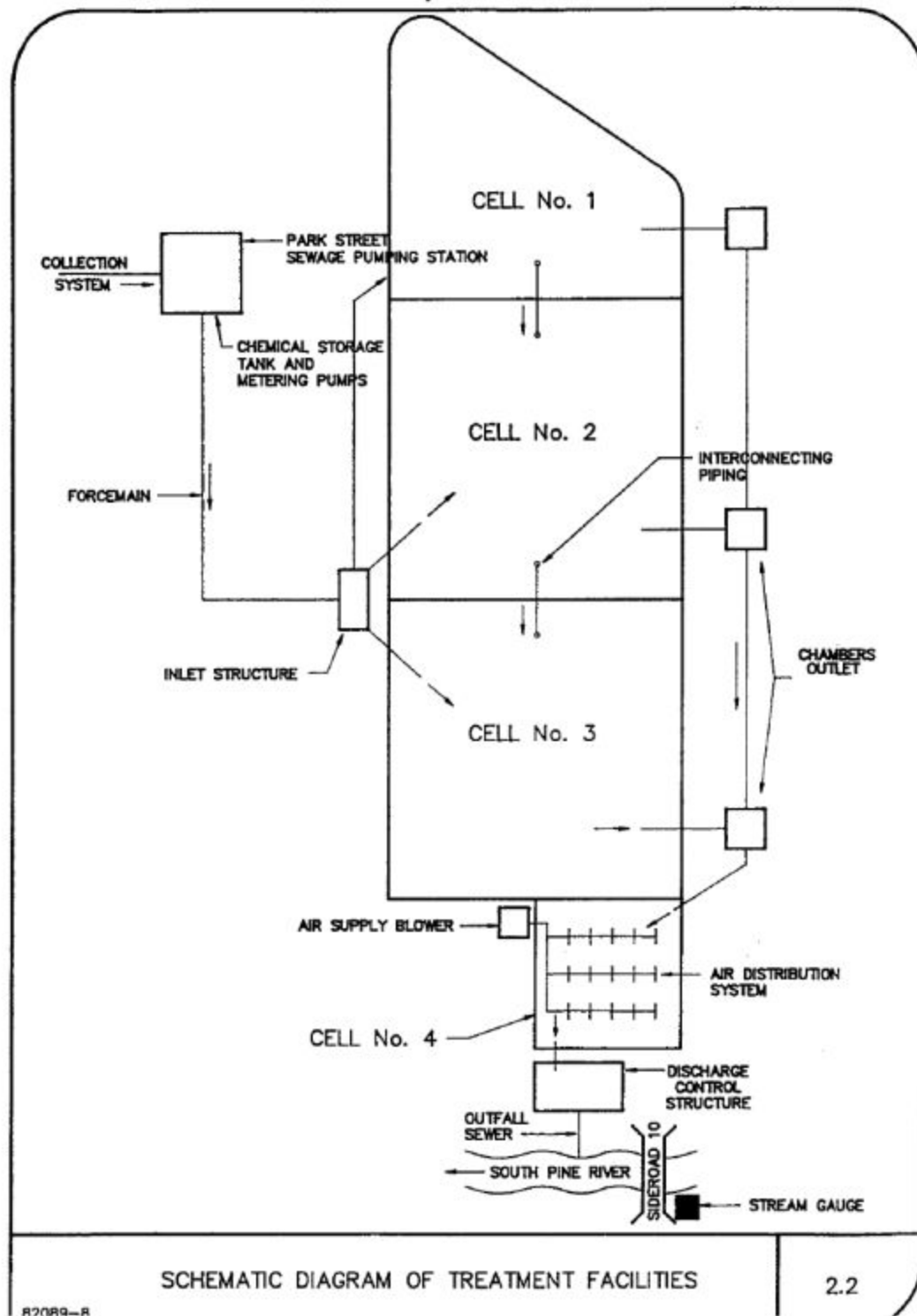


Figure 3

Ripley Sewage Lagoon Aeration Cell Schematic

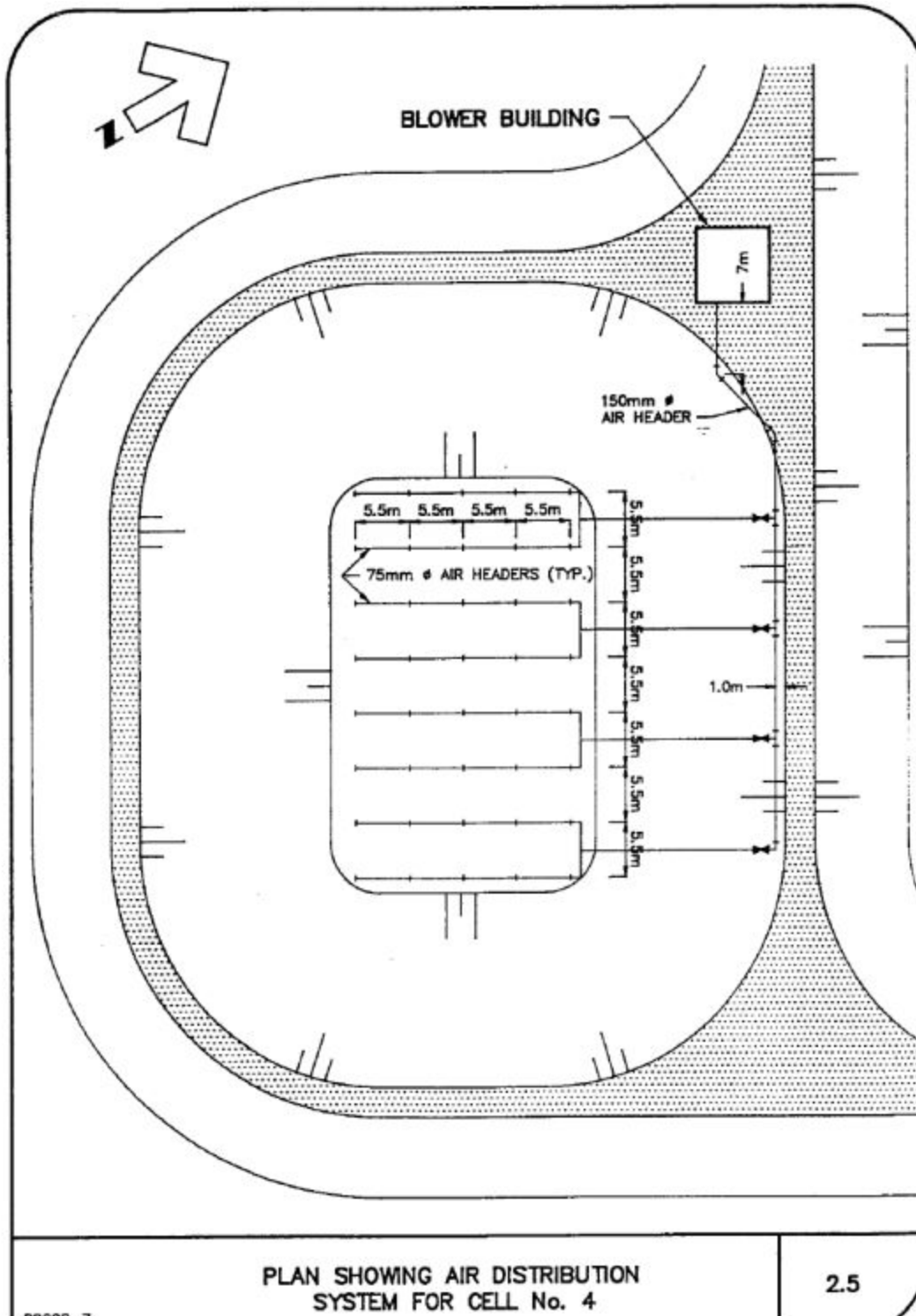


Figure 4

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UNIT PROCESS:

In 2020, the Ripley Wastewater Treatment System was operated as follows:

Raw sewage from the collection system flowed to the wet well structure at the Sewage Pumping Station. Aluminum sulphate (alum) was added to promote phosphorus removal before it was pumped to Lagoon Cell No. 1 via the forcemain. The Lagoon Cells worked in series (i.e. Cell 1 --> Cell 2 --> Cell 3).

The Ministry Certificate of Approval allows the treated effluent to be discharged between October 15th to May 1st. When discharge is permitted, the effluent was directed from Cell 3 to Aeration Cell 4, where a blower was used to supply air through a submersible diffuser system. The treated effluent was then directed to the discharge control structure, where the flow was measured prior to entering the outfall pipe to the South Pine River.

CERTIFICATE OF APPROVAL # 3-0724-88-006 REQUIREMENTS - EFFLUENT:

Condition 3. (1) Subject to Subsection (2), the sewage treatment facilities should be designed, constructed and operated such that the concentrations of the materials named below as Effluent Parameters shall not be exceeded in the effluent from the facilities, calculated in accordance with Subsection (3) as shown in Table 1.

Table 1

Effluent Parameters	Design Objectives	Non-Compliance (Average Over Discharge Period)
BOD-5	15.0 mg/L	25.0 mg/L
Suspended Solids	15.0 mg/L	30.0 mg/L
Total Phosphorus	0.5 mg/L	0.8 mg/L
Free Ammonia	Fall: 3.0 mg/L Spring: 6.0 mg/L	Fall: 6.0 mg/L Spring: 10.0 mg/L
Hydrogen Sulphide	Absent	--

Wastewater Systems Effluent Regulations (WSER)

Table 2

Prescribed Deleterious Substances	Authorization to Deposit - Conditions (Average Concentration per Section 6 (3))
CBOD	25 mg/L
Suspended Solids	25 mg/L
Total Chlorine Residual	0.02 mg/L max
Un-ionized Ammonia	1.25 mg/L

Note: Free ammonia is the same as the Provincial Unionized Ammonia calculated from field pH and temperature provided on the Chain of Custody form. The Federal Unionized Ammonia (WSER) is calculated using laboratory pH measured at 15°C.

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Effluent (Grab) Sample Results (mg/L) - Weekly during discharge

Table 3

Date	BOD-5	CBOD	Total Suspended Solids	Total Phosphorus	Free Ammonia	Calculated Unionized Ammonia (WSER)
March 10	<4	<4	5	0.05	0.0170	0.0089
March 16	4.8	<4	9	0.05	0.0610	0.0426
March 24	4.5	<4	12	0.08	0.0778	0.0567
April 21	5.2	<4	6	0.05	0.0164	0.0197
Dec 1	4.0	4	29	<0.03	0.0050	0.0493
Dec 7	<4	4	17	0.03	0.0020	0.0545
Dec 14	8.0	4	20	<0.03	0.0030	0.0409
Min	<4	<4	5	<0.03	0.0020	0.0089
Max	8.0	4.0	29	0.08	0.0778	0.0567
Avg	4.9	4.0	14.0	0.05	0.0274	0.0389
# Samples	7	7	7	7	7	7
Objectives	15	--	15	0.5	Fall: 3 Spring: 6	--
Non-Compliance ¹	25	--	30	0.8	Fall: 6 Spring: 10	--
WSER ²	--	25	25	--	--	1.25
Compliant	YES	YES	YES	YES	YES	YES

- Notes:
- ¹ For compliance to the Certificate of Approval:
Exceedance of the concentration for BOD-5 and Suspended Solids is deemed to have occurred when the arithmetic mean of analytical results of at least four (4) consecutive grab samples or a single sample is greater than the corresponding concentrations set out in Table 1.
 - ² For compliance to WSER:
The average concentration of CBOD, and Suspended Solids did not exceed the corresponding concentrations set out in Table 2, and the maximum concentration of un-ionized ammonia in the effluent was less than 1.25 mg/L, expressed as Nitrogen (N), at 15°C ± 1°C.

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CERTIFICATE OF APPROVAL # 3-0724-88-006 REQUIREMENTS - RAW FLOWS:

Condition 3. (2) The sewage treatment works has been approved to treat sewage at an average flow of 600 cubic meters per day. Average flows for the year not to exceed 600 m³ per day, based on the arithmetic mean of 366 consecutive days flow (leap year), and have no negative impact on the receiving stream.

Flows: Raw Sewage Collected at Sewage Pumping Station

Table 4

Date	Volume, m ³	Daily Max, m ³	Daily Min, m ³	Average, m ³
January	15,012	1770	243	484.3
February	10,700	554	207	369.0
March	15,399	1476	240	496.7
April	10,339	479	217	344.6
May	11,583	707	187	373.6
June	10,185	600	190	339.5
July	7,486	409	130	241.5
August	7,932	595	167	255.9
September	8,912	551	144	297.1
October	9,460	510	176	305.2
November	9,823	602	141	327.4
December	13,032	874	220	420.4
Total	129,863			
Maximum	15,399	1770		
Minimum	7,486		130	
Average Month	10,822			
Arithmetic Mean*				354.8
Compliant	---	---	---	YES

Note: * Arithmetic mean of 366 days flow (leap year).

Rated Capacity (average): 600 m³/day

Performance (average): 59.1%

Condition 3. (9)(ii): The *Owner* shall, when annual average flows reach 500 m³/day (83.3% capacity), further examine the lagoon performance and receiving stream and confirm, in writing to the *District Manager* and the *Director*, that the rated capacity of 600 m³/day will have no negative impact on the receiver.

In 2020, the annual average flows were below 500 m³/day, therefore, further examination of lagoon performance and receiving stream is not required at this time.

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CERTIFICATE OF APPROVAL # 3-0724-88-006 REQUIREMENTS - EFFLUENT FLOWS:

Condition 3. (3) The effluent volume from the Treatment Works shall be adjusted according to the stream flow available in the South Pine River.

Flows: Effluent Discharged to South Pine River

Table 5

Date	Volume, m ³	Daily Max, m ³	Daily Min, m ³	*Average, m ³
January	--	--	--	--
February	--	--	--	--
March	89,501	4,920	0	3,891
April	15,573	3,199	0	1,416
May	--	--	--	--
June	--	--	--	--
July	--	--	--	--
August	--	--	--	--
September	--	--	--	--
October	--	--	--	--
November	--	--	--	--
December	59,922	5,350	0	3,525
Total	164,996	--	--	--
Maximum	---	5,350	--	--
Minimum	---	--	0	--
Monthly Average	---	--	--	3,511 *
Annual Average	---			451 **
Total # days discharged	47			

Notes:

* The monthly average is calculated using the total monthly volume (m³) divided by the number of days discharged in that same month.

** The annual average is calculated using the annual total volume (m³) divided by 366 (leap year) consecutive days flow as per WSER reporting.

Flows: South Pine River Streamflow (m³), during discharge periods

(Data taken from Sideroad 10 Streamflow Monitoring Station - Saugeen Valley Conservation Authority)

Table 6

2020	March	April	December
Max	535,680	17,280	108,000
Min	19,008	11,750	21,600
Avg	81,817	14,170	42,998

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CERTIFICATE OF APPROVAL # 3-0724-88-006 REQUIREMENTS - UNIONIZED AMMONIA:

Condition 3. (4) The unionized ammonia concentration in the South Pine River after mixing with the discharge should not exceed 0.02 mg/L in accordance with the Ministry's Water Management Goals, Policies and Objectives. In order to comply with this criterion, the effluent discharge rate shall be controlled by the Operating Authority by varying the discharge rate in relation to stream flow in the South Pine River, considering such factors as pH and temperature of the receiving stream.

Table 7

Parameter	Design Objectives	Non-Compliance
Downstream Ammonia (unionized)	---	> 0.02 mg/L

The discharge samples are sent to the laboratory where they are analyzed for Total Ammonia and Free Ammonia. The Free Ammonia is the same as the Provincial Unionized Ammonia, which is calculated from the Total Ammonia, field temperature and field pH.

Spring Discharge (Grab) Sample Results (mg/L): Weekly sampling

Table 8

Date	Upstream Result Unionized Ammonia	Effluent Result Unionized Ammonia	Downstream Result Unionized Ammonia
March 10	0.0008	0.0170	0.0012
March 16	0.0007	0.0610	0.0025
March 24	0.0008	0.0778	0.0027
April 21	0.0013	0.0261	0.0017
Maximum	0.0013	0.0778	0.0027
Compliant	--	--	YES

Discharging began on March 9, 2020 to March 31, 2020. It was resumed on April 22, 2020 until April 30, 2020.

The Spring discharge total volume was **105,074 m³** in 32 days.

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Fall Discharge (Grab) Sample Results (mg/L): Weekly sampling

Table 9

Date	Upstream Result Unionized Ammonia	Effluent Result Unionized Ammonia	Downstream Result Unionized Ammonia
December 1	<0.0010	0.0050	<0.0010
December 7	<0.0010	0.0020	<0.0010
December 14	<0.0010	0.0030	<0.0010
Maximum	<0.0010	0.0050	<0.0010
Compliant	--	--	YES

Discharge began on November 30, 2020 and continued until December 17, 2020.

The Fall discharge total volume was **52,922 m³** in 15 days.

GRAND TOTAL DISCHARGE VOLUME: **164,996 m³** in 47 days

CERTIFICATE OF APPROVAL # 3-0724-88-006 REQUIREMENTS - EFFLUENT SAMPLING:

Condition 4. Grab samples of the final effluent (discharge) shall be collected at least once weekly during the discharge periods. In addition, 24-hour composite samples of the final effluent must also be collected during each discharge period. All final effluent samples must be analyzed for at least the following parameter:

BOD-5
Suspended Solids
Total Kjeldhal Nitrogen (TKN)
Nitrite
Nitrate
Total Phosphorus
Temperature
pH
Hydrogen Sulphide (when odour is present)

Exceedance of the concentration of the parameter is deemed to have occurred when the arithmetic mean of analytical results of at least four (4) consecutive grab samples OR a single sample is greater than the corresponding concentrations set out in Subsection (1).

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Effluent (Grab) Sample Results (mg/L):

Weekly sampling during discharge

Table 10

Date	BOD-5	CBOD	TSS	TKN	Nitrite	Nitrate	TP	Temp. (°C)	pH
March 10	<4	<4	5	1.7	0.007	0.23	0.05	6.1	8.52
March 16	4.8	<4	9	3.2	0.007	0.20	0.05	7.3	8.29
March 24	4.5	<4	12	3.4	0.012	0.64	0.08	7.6	8.34
April 21	5.2	<4	6	2.2	0.023	1.25	0.05	8.1	8.41
December 1	4.0	4.0	29	3.0	<0.030	0.45	<0.03	5.6	7.64
December 7	<4	4.0	17	3.1	<0.030	0.81	0.03	3.6	7.28
December 14	8	4.0	20	2.7	<0.030	1.02	<0.03	6.4	7.33
Minimum	4.0	<4	5	1.7	0.007	0.20	0.03	3.6	7.28
Maximum	8.0	4.0	29	3.4	0.030	1.25	0.08	8.1	8.52
Average	4.9	4.0	14.0	2.8	0.020	0.66	0.05	6.4	7.97
# Samples	7	7	7	7	7	7	7	7	7
Compliant	YES	YES	YES	--	--	--	YES	--	--

Effluent (Composite) Sample Results (mg/L):

Once per discharge period

Table 11

Date	BOD-5	CBOD	TSS	TKN	Nitrite	Nitrate	TP	Temp. (°C)	pH
March 16	6.3	<4	10	3.1	0.06	0.19	0.06	3.9	8.42
December 7	6.0	4.0	15	3.6	<0.03	0.78	0.05	2.2	7.24
Minimum	6.0	<4	10	3.1	<0.03	0.19	0.05	2.2	7.24
Maximum	6.3	4.0	15	3.6	0.06	0.78	0.06	3.9	8.42
Average	6.2	4.0	13	3.4	0.02	0.49	0.06	3.1	7.83
# Samples	2	2	2	2	2	2	2	2	2
Compliant	YES	YES	YES	--	--	--	YES	--	--

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CERTIFICATE OF APPROVAL # 3-0724-88-006 REQUIREMENTS - RAW SEWAGE SAMPLING:

Condition 5. Grab samples of the raw sewage shall be collected at least every two weeks. In addition, 24-hour composite samples of the raw sewage must also be collected every two months. All raw sewage samples must be analyzed for at least the following parameters:

BOD-5
Suspended Solids
Total Kjeldhal Nitrogen (TKN)
Total Phosphorus

Raw Sewage (Grab) Sample Results (mg/L): Bi-weekly sampling

Table 12

Date	BOD-5	CBOD	TKN	TP	TSS
Jan 13	69.2	50.8	19.2	1.89	70
Jan 27	148.0	81.2	22.1	2.49	112
Feb 10	81.0	44.8	22.1	2.58	65
Feb 24	120.0	58.4	27.0	3.19	182
Mar 10	66.8	47.8	10.0	2.20	81
Mar 24	143.0	114.0	35.8	5.21	118
Apr 7	161.0	111.0	30.9	4.50	132
Apr 21	106.0	77.7	48.7	5.14	126
May 4	224.0	135.0	46.7	5.71	134
May 19	82.5	62.8	21.4	2.24	97
Jun 1	183.0	112.0	28.9	3.48	196
Jun 15	116.0	93.8	26.8	3.78	143
Jun 29	772.0	454.0	87.1	15.70	1,080
Jul 14	141.0	124.0	68.2	7.00	190
Jul 27	133.0	113.0	51.0	6.34	154
Aug 11	162.0	135.0	32.2	4.44	190
Aug 24	126.0	82.0	24.4	3.47	120
Sep 8	167.0	109.0	31.2	3.63	131
Sep 21	115.0	30.0	27.4	3.17	99
Oct 5	91.8	--	28.2	3.20	84
Oct 20	138.0	124.0	32.5	3.69	582
Nov 2	101.0	90.2	17.8	2.07	72
Nov 17	257.0	231.0	36.5	7.40	471
Nov 30	91.0	68.0	17.6	1.60	88
Dec 14	74.0	64.0	15.5	0.10	158
Dec 29	145.0	134.0	25.3	2.36	167
Minimum	66.8	30.0	10.0	0.10	65
Maximum	772.0	454.0	87.1	15.70	1,080
Average	177.3	123.1	34.1	4.53	227
# Samples	26	25	26	26	26

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Raw Sewage (Composite) Sample Results (mg/L):

Bi-monthly sampling

Table 13

Date	CBOD	TSS	TP	TKN
Jan 7	61.5	185	4.49	28.9
Mar 3	43.0	110	2.57	20.9
May 12	81.3	185	4.44	42.2
Jul 14	172.0	484	6.42	45.3
Sep 15	58.0	118	2.98	24.9
Nov 10	106.0	173	3.84	30.2
Minimum	43.0	110	2.57	20.9
Maximum	172.0	484	6.42	45.3
Average	87.0	209	4.12	32.1
# Samples	6	6	6	6

Aluminum Sulphate Liquid (48.5%) Usage and Dosage

Aluminum Sulphate (alum) acts as a coagulant and flocculant that adsorbs and precipitates soluble phosphorus and other compounds such as organic matter, forming clumps that settle to the bottom of the lagoon. Typical alum dosages for wastewater treatment are between 50 - 200 mg/L.

Table 14

Month	Total Alum Usage, L	Total Alum Usage, kg	Average Alum Dosage, mg/L
January	1,978	1281	86.3
February	1,871	1211	115.6
March	1,733	1122	79.1
April	1,440	932	91.4
May	1,373	889	80.8
June	1,418	918	99.5
July	1,080	699	93.3
August	1,035	670	85.4
September	1,530	991	128.5
October	1,170	758	82.0
November	1,304	844	90.6
December	2,003	1297	104.3
Total	17,933	11611	---
Average	1,494	968	94.7

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CERTIFICATE OF APPROVAL # 3-0724-88-006 REQUIREMENTS - Operational

Condition 9. (3) (e) Documentation of plant upsets, by-passes, equipment failures, process failures, and the corrective actions taken along with an explanation of why the event occurred.

Operational Problems, Corrective Actions, and Maintenance:

Table 15

Date	Comments
Jan 2	False autodialer alarms - corrected
Jan 11	High level alarm - heavy rain
Feb 13	Alum line plugged - cleaned
Feb 28	Roads closed
Mar 10	High level alarm - heavy rain
Apr 28	Alum delivery
Jun 10	Outfall maintenance - removal of calcium buildup
Jun 16	Sommers generator service
Jun 23	Replace wet well pump rails
Jun 25	Replace Raw Sewage Pump # 1 with a new pump
Jun 28	Raw Sewage Pump # 1 failed - reset
Jun 30	Flowmeter calibration
Jul 2	Check Raw Sewage Pump # 1 controls
Jul 7	Repair Raw Sewage Pump # 1 overload
Jul 10	Permission granted for temporary disposal of Landfill Leachate
Jul 11	Brief power interruption
Jul 15	Leachate hauled
Jul 16	Leachate hauled
Jul 17	Leachate hauled
Aug 2	Raw Sewage Pump # 2 failed - overload; high level alarm - heavy rain
Aug 10	Leachate hauled
Aug 15	Brief power interruption
Aug 17	Leachate hauled
Aug 28	High level alarm - heavy rain
Sep 29	Ferguson on-site for backflow preventer testing
Oct 10	Brief power interruption
Oct 24	Brief power interruption
Nov 15	Wind storm - power outage

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2020 Performance Summary

Table 16 is a summary of the overall effectiveness of the treatment of raw sewage from its entry to the Works through the effluent chamber.

Overall Sewage Renovation Based on Annual Averages

Table 16

Parameter	Raw Sewage	Effluent	Non-Compliance	% Removal
BOD5	177.3	4.9	25.0	97.2%
CBOD	123.1	4.0	---	96.8%
TKN	34.1	2.8	---	91.8%
TP	4.53	0.05	0.8	98.9%
TSS	227	14.0	30.0	93.8%

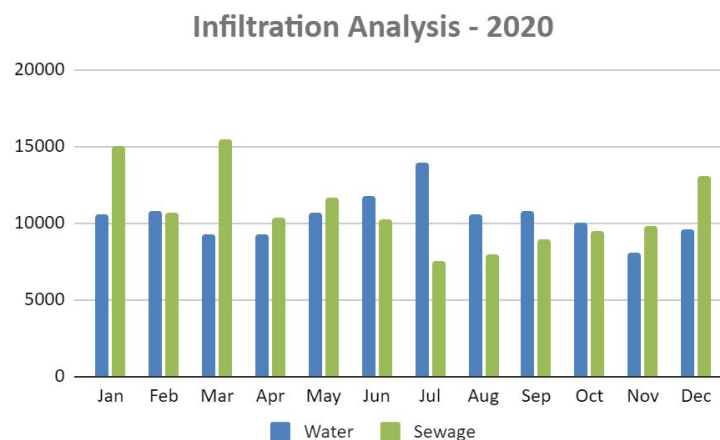
Other Observations:

- No complaints were reported for the period under review
- No sewage bypasses were reported for the period under review
- No modifications to the treatment system were carried out during the period under review

Infiltration Analysis:

Wastewater flows were compared to the drinking water flows in an effort to estimate the amount of infiltration observed within the sewage collection system. Higher summer drinking water flows are likely related to lawn watering endeavours. Higher sewage flows in January were related to a heavy rain event, and in a spring thaw occurred in March.

Historical maximum day flows for each month provide some indication that direct inflow from storm water is occurring at times. Action should be considered to identify and remove any illegal sanitary connections that exist.

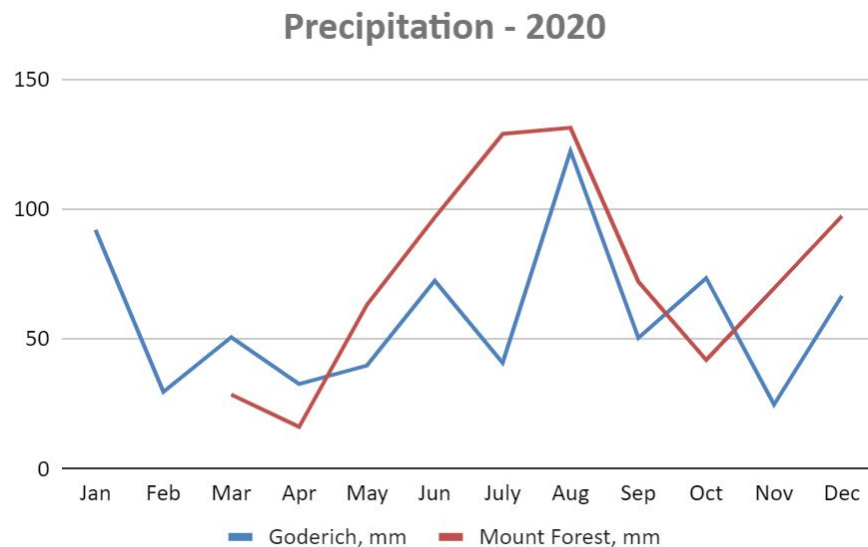


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Weather and Precipitation: (source: Environment Canada)

Month	Goderich			Mount Forest		
	Temp, °C Min	Max	Precip Total, mm	Temp, °C Min	Max	Precip Total, mm
Jan	-18.9	10.9	92.0	-17.6	9.4	m
Feb	-14.9	8.0	29.7	-25.5	5.4	m
Mar	-9.3	15.5	50.7	-17.9	14.8	28.6
Apr	-7.4	17.3	32.7	-7.2	15.0	16.2
May	-6.0	29.3	39.8	-6.2	30.4	63.2
Jun	4.3	32.3	72.4	3.8	30.7	96.8
Jul	11.2	31.7	40.8	11.7	31.8	128.9
Aug	9.7	29.3	122.3	7.7	29.6	131.2
Sep	-1.5	27.1	50.4	-0.8	26.3	72.1
Oct	-0.2	21.9	73.4	-5.5	18.5	41.9
Nov	-5.0	23.1	24.8	-6.6	22.0	69.5
Dec	-7.9	10.2	66.6	-10.1	8.8	97.3
TOTAL			695.6			745.7



NOTE: There was no data collected from the Environment Canada Mount Forest location between January and March.

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Additional Information:

- **Landfill Leachate Disposal**

In June 2020, the Township requested temporary approval from the Ministry of the Environment, Conservation and Parks to dispose of Landfill Leachate in the Ripley Wastewater Treatment Facility lagoons. Permission was granted by the Approvals Branch and a total of 488.38 m³ of leachate was hauled between July and August. The Township has retained the services of BM Ross and Associates to submit a formal application for an ECA amendment with regards to future Landfill Leachate disposal.

- **Municipal Utility Monitoring Program Reports (MUMPs)**

The monthly compilation forms of discharge data are submitted annually to the Ministry. The Ministry uses these forms to publicly report Municipal monitoring data. Please note that the Ministry has revised the format in which this data is uploaded to their website. The Ministry is no longer accepting locally generated reports to be submitted by email. Instead, Operators are required to use the Ministry-provided on-line forms available in the MECP form repository. These forms are populated with appropriate data for submission directly to the Ministry's database.

- **Wastewater Systems Effluent Regulations (WSER) - On-line Reporting**

Since the Ripley Wastewater Treatment Facility discharges to the South Pine River, which is frequented by fish, we are required by WSER to submit a monitoring report through the Effluent Regulatory Reporting Information System (ERRIS) portal on an annual basis. This was submitted and approved in January 2020.

- **Biological Monitoring Report for the South Pine River in the Vicinity of the Ripley Sewage Treatment Facility: Benthic Macroinvertebrate Sampling and Assessment**

Natural Resource Solutions Inc. (NRSI) was retained by B.M. Ross and Associates Limited and the Township of Huron Kinloss to complete benthic macroinvertebrate community monitoring and comparative analysis in support of ongoing monitoring of the Ripley Sewage Treatment Facility within the Town of Ripley, Ontario. This monitoring report is a condition of the Effluent Discharge Extension dated May 1, 2019 by the Owen Sound District of the Ontario Ministry of the Environment, Conservation and Parks.

Findings

The results of the 2020 benthic macroinvertebrate community monitoring suggest a relatively consistent benthic macroinvertebrate community within the South Pine River across all monitoring stations. Calculated environmental water quality metrics fall primarily within the "Potentially Unimpaired" with a healthy, if limited in terms of species richness, benthic diversity.

The consistent environmental water quality both upstream and downstream of the Ripley Sewage Treatment Facility outflow during both 2008 and 2020 suggest that there is limited impact of the Ripley Sewage Treatment Facility outflow on the environmental water quality within the South Pine River. The differences observed between monitoring years would suggest that any potential changes with water quality within the Pine River are related to other environmental factors.

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CONCLUSIONS AND RECOMMENDATIONS

The following are the conclusions and recommendations resulting from the analysis of operating and monitoring data for the Ripley Wastewater Treatment Facility during 2020:

1. The annual average sewage influent flow was 354.82 m³/day in 2020, as determined by the flow measuring instrumentation in the Ripley Sewage Pumping Station. Given that the approved flow to the works is 600 m³/day, the works operated at 59.1% of the design capacity. The 2020 average daily flow is 6.35% higher than the average flow during the previous four years (333.63 m³/day).

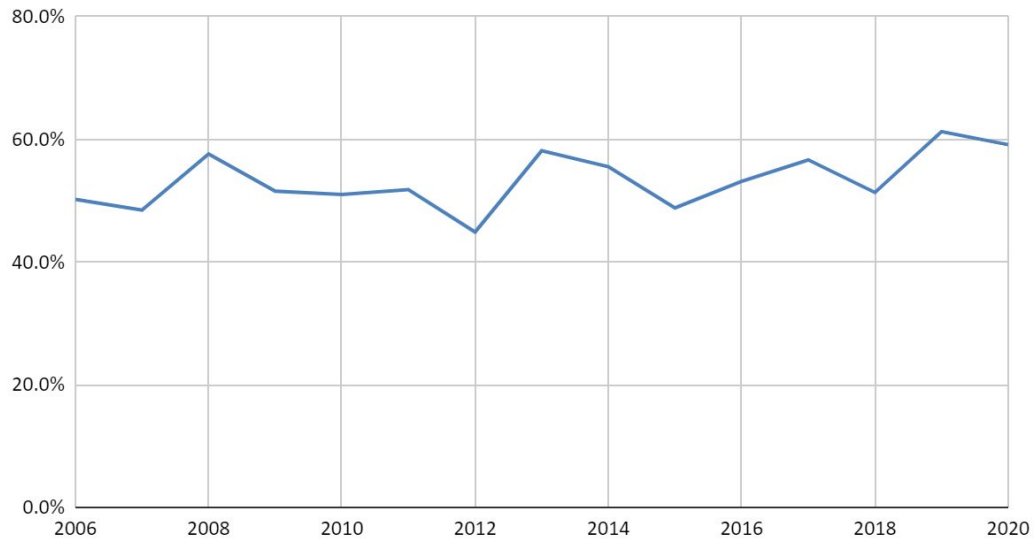
Historically, maximum day flows will typically be greatest during spring months and be lowest during the summer months. During 2020, the maximum day trend was characteristic, with the maximum day flow of 1,770 m³/day occurring in January. Historical maximum day flows for each month provide some indication that direct inflow from storm water is occurring at times, such as rain events and spring thaw. Action should continue to be taken to identify and remove any illegal connections that exist.

Year	Max Volume	Avg Volume	Capacity	Total Volume	Mount Forest	Goderich
	m3	m3	%	m3	Total Precip, mm	Total Precip, mm
2008	1,289	345.68	57.6%	126,518	1,251.8	1,269.6
2009	1,434	309.32	51.6%	112,902	990.7	767.7
2010	1,075	306.04	51.0%	111,703	926.9	736.1
2011	1,079	310.78	51.8%	113,435	1,102.2	1,018.0
2012	599	269.28	44.9%	98,555	693.4	600.3
2013	1,701	348.79	58.1%	127,310	1,174.5	944.5
2014	1,323	333.26	55.5%	121,640	908.6	812.2
2015	766	292.92	48.8%	106,917	773.5	663.5
2016	1,217	318.98	53.2%	116,745	933.5	895.0
2017	849	339.95	56.7%	124,081	1,044.3	981.2
2018	1,221	308.04	51.3%	112,436	912.7	915.6
2019	1,414	367.55	61.3%	134,154	332.5	777.8
2020	1,770	354.82	59.1%	129,863	745.7	675.2
4-Year Average	1,175	333.63	55.6%	121,854	963.5	892.4

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Historical % Capacity



2. Raw sewage concentrations and loadings for BOD₅, TSS, TKN and TP have remained relatively consistent since 2017, however, in 2020, loadings were slightly higher than typical domestic sewage loadings on a per capita basis, with the exception of Total Phosphorus:

Parameter	Typical Loadings (mg/L)	2020 Loadings (mg/L)	% Difference
BOD ₅	170	177.3	4.3% higher
TKN	35	34.1	2.6% lower
TP	7	4.53	35.3% lower
TSS	200	227	13.5% higher

3. Effluent quality, as measured at the effluent structure, generally remained excellent throughout the discharge periods in 2020. There were no exceedances of the C. of A. average monthly concentration limits.
4. Based on the calculated removal rates of 91.7% to 98.4%, it is concluded that the Ripley Wastewater Treatment Facility provided excellent treatment of sewage in 2020.