2010 Annual Wastewater Report

Trenton Wastewater Treatment Plant

Public Works & Environmental Services
7 Creswell Drive
Trenton, Ontario K8V 5R6
www.quintewest.ca

A Natural Attraction

Table of Contents

List of Tables and Figures

Executive Summary

The Trenton Wastewater Treatment Plant, MOE Identifier Number: 110000775, is located at 25 Couch Crescent in Trenton, ON. The plant operates under Certificates of Approval (C of A) numbers 3-0732-93-006, No. 8-4116-92-006, and No. 1-0210-69-753236. The facility is owned and operated by the Corporation of the City of Quinte West. The Trenton WWTP is rated as a Class 3 facility. It is described as a conventional activated sludge treatment plant with tertiary filtration treatment. Anaerobic digestion is used at this facility, and effluent disinfection is through UV irradiation treatment. The receiving water body is the Bay of Quinte. The plant has a design capacity of 15,900 m^3/day, and a design peak flow capacity of 51,100 m^3/day. The Trenton Wastewater Treatment plant services a population of approximately 17,000 people along with various industries in the area.
As per C of A number 3-0732-93-006, Condition 17 (a-c), an annual report shall be prepared within 90 days following the end of the calendar year detailing the following:

i. *Executive summary;*

ii. *tabulation and comprehensive interpretation of all monitoring data and analytical results collected in accordance with Conditions Nos. 13, 14 and 15 of the C of A during the reporting period, and a comparison to the effluent quality and quantity criteria described in Conditions Nos. 10, 11, 12 and 13;*

iii. *summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the works;*

iv. *description of all operating problems encountered and corrective actions taken during the reporting period;*

v. *tabulation of the volume of sludge generated in the reporting period and an outline of anticipated volumes to be generated over the next reporting period, and an outline of the sludge handling methods and disposal areas to be utilized over the next reporting period;*

vi. *evaluation of the calibration and maintenance procedures conducted on all monitoring equipment;*

vii. *an evaluation for the need for modifications to the works to improve performance and reliability and to minimize upsets and bypasses.*

This condition, or annual reporting requirement is imposed to ensure that all pertinent information is available for the evaluation of the performance of the sewage works and that disposal of sludge generated at the sewage works is in accordance with the Provincial Sludge Utilisation Guidelines and consistent with requirements of Part V of the Environmental Protection Act

Public Works & Environmental Services
7 Creswell Drive
Trenton, Ontario K8V 5R6
www.quintewest.ca

A Natural Attraction

Tabulation of all monitoring data and analytical results collected throughout the reporting period with comparison to effluent limits and objectives:

Table 1 – Effluent Concentration Compliance Parameters							
Month	Monthly Average BOD Concentration (mg/L) *Objective:15.0 mg/L*	**12-Month Cumulative Average BOD Concentration** (mg/L) *Objective: 15.0 mg/L* **Limit: 25.0 mg/L**	Monthly Average Total Suspended Solids Concentration (mg/L) *Objective: 15.0 mg/L*	**12-Month Cumulative Average TSS Concentration** (mg/L) *Objective: 15.0 mg/L* **Limit: 25.0 mg/L**	**Monthly Average Total Phosphorus Concentration** (mg/L) *Objective: 0.5 mg/L* **Limit: 1.0 mg/L**	**12-Month Cumulative Average TP Concentration** (mg/L) *Objective: 0.5 mg/L* **Limit: 1.0 mg/L**	Geometric Mean Density of E. Coli (cfu/100 mL) *Objective: 200 cfu/100 mL)*
January	6	9.0	12.3	6.9	0.17	0.18	12
February	10.8	9.1	4.3	6.8	0.10	0.18	3
March	10.8	8.5	9.4	6.7	0.14	0.18	22
April	3.3	7.7	4.8	5.9	0.06	0.17	14
May	5.2	7.3	3.6	5.8	0.27	0.17	17
June	10.0	6.8	3.4	5.8	0.14	0.16	33
July	9.4	7.0	2.4	5.6	0.10	0.15	42
August	8.0	7.3	3.7	5.6	0.18	0.14	6
September	4.6	7.4	2.2	5.4	0.08	0.13	2
October	4.3	7.3	3.8	5.5	0.07	0.13	2
November	4.9	7.0	3.0	4.9	0.08	0.12	2
December	7.7	7.1	7.4	5.0	0.15	0.13	22

Table 1 - Effluent Concentration Compliance Parameters

Table 2 – Effluent Waste Loading Compliance Parameters						
Month	Monthly Average BOD Waste Loading (kg/d) *Objective:238.5 mg/L*	**12-Month Cumulative Average BOD Waste Loading** (kg/d) *Objective: 238.5 kg/d* **Limit: 397.5 kg/d**	Monthly Average Total Suspended Solids Concentration (kg/d) *Objective: 238.5 kg/d*	**12-Month Cumulative Average TSS Concentration** (kg/d) *Objective: 238.5 kg/d* **Limit: 397.5 kg/d**	Monthly Average Total Phosphorus Waste Loading (kg/d) *Objective: 8.0 kg/d*	**12-Month Cumulative Average TP Concentration** (kg/d) *Objective: 8.0 kg/d* **Limit: 15.9 kg/d**
January	6	9.0	12.3	6.9	0.17	0.18
February	10.8	9.1	4.3	6.8	0.10	0.18
March	10.8	8.5	9.4	6.7	0.14	0.18
April	3.3	7.7	4.8	5.9	0.06	0.17
May	5.2	7.3	3.6	5.8	0.27	0.17
June	10.0	6.8	3.4	5.8	0.14	0.16
July	9.4	7.0	2.4	5.6	0.10	0.15
August	8.0	7.3	3.7	5.6	0.18	0.14
September	4.6	7.4	2.2	5.4	0.08	0.13
October	4.3	7.3	3.8	5.5	0.07	0.13
November	4.9	7.0	3.0	4.9	0.08	0.12
December	7.7	7.1	7.4	5.0	0.15	0.13

Table 2 - Effluent Waste Loading Compliance Parameters

Public Works & Environmental Services
7 Creswell Drive
Trenton, Ontario K8V 5R6
www.quintewest.ca

A Natural Attraction

Table 3 - Effluent Monitoring Program Analytical Results												
Month	**Dissolved Reactive Phosphorus** (mg/L)	**Total Kjeldahl Nitrogen** (mg/L)	**Ammonia + Ammonium Nitrogen** (mg/L)	**Nitrite + Nitrate Nitrogen** (mg/L)	**Alkalinity** (mg/L)	**Chlorides** (mg/L)	**Conductivity** (microS/cm)	**Total Coliforms** (cfu/100 mL)	**Faecal Streptococcus** (cfu/100 mL)	**pH** MIN	**pH** MAX	**Temp** (deg. C)
January	0.04	6.38	5.76	4.37	191	129	900	242	75	6.95	7.57	8.3
February	0.05	5.93	4.20	6.65	189	140	931	13	4	7.01	7.95	8.4
March	0.03	6.28	5.74	5.20	202	186	1,104	1,209	106	6.82	8.00	9.4
April	0.03	2.93	1.68	6.05	149	140	877	1,041	85	6.80	7.92	12.3
May	0.13	1.58	1.22	11.70	140	138	921	11,531	190	6.58	7.74	16.7
June	0.06	4.78	3.78	4.55	175	120	871	4,961	115	6.73	7.71	22.3
July	0.05	9.88	8.16	3.31	202	124	954	10,713	303	6.67	7.86	25.7
August	0.04	5.05	4.42	6.45	141	122	830	513	28	6.64	8.01	25.3
September	0.04	6.32	5.68	6.50	142	116	815	866	4	6.30	6.90	23.5
October	0.03	3.08	2.43	6.47	136	133	852	6	2	6.51	7.71	20.3
November	0.03	4.07	3.37	5.87	153	94	787	18	18	6.60	7.29	16.8
December	0.08	5.31	4.41	5.35	184	126	918	51,780	13,736	6.94	7.50	12.3
Yearly Average	**0.05**	**5.1**	**4.2**	**6.0**	**166.9**	**130.7**	**896.7**	**6,907.8**	**1,222.2**	**6.71**	**7.68**	**16.8**

Table 3 - Effluent Monitoring Program Results

Public Works & Environmental Services
7 Creswell Drive
Trenton, Ontario K8V 5R6
www.quintewest.ca

A Natural Attraction

Table 4 - Influent Monitoring Program Analytical Results
(mg/L unless otherwise stated)

Month	BOD_5	Total Suspended Solids	Total Phosphorus	Dissolved Reactive Phosphorus	Total Kjeldahl Nitrogen	Ammonia + Ammonium Nitrogen	Nitrite + Nitrate Nitrogen	Alkalinity	Chlorides	Conductivity (microS/cm)	Average pH (no units)
January	174.3	200.0	2.59	1.07	11.88	8.98	0.21	233	138	911	7.26
February	272.5	533.3	3.73	1.05	15.48	9.60	0.06	239	135	914	7.45
March	244.6	3001.4	4.81	0.62	16.34	7.34	0.06	237	182	1,036	7.39
April	193.5	241.5	4.13	1.12	16.23	9.85	0.06	227	135	895	7.35
May	165.3	209.3	3.54	1.63	13.18	10.65	0.07	253	130	929	7.50
June	225.8	566.8	3.65	0.58	15.72	7.58	0.06	240	134	932	7.02
July	129.5	276.3	2.89	0.98	11.28	8.23	0.06	247	123	928	7.22
August	152.2	155.0	3.58	1.96	20.48	16.30	0.06	227	114	867	6.97
September	226.3	282.0	4.45	1.62	21.65	14.88	0.06	227	112	836	6.76
October	204.8	253.8	3.64	1.46	18.03	20.18	0.06	243	138	957	6.83
November	354.4	456.8	5.00	1.67	35.94	18.94	0.07	241	117	888	6.79
Yearly Average	**220.5**	**537.9**	**3.9**	**1.3**	**18.8**	**12.0**	**0.1**	**238.2**	**133.5**	**922.7**	**7.2**

Table 4 - Influent Monitoring Program Results

Public Works & Environmental Services
7 Creswell Drive
Trenton, Ontario K8V 5R6
www.quintewest.ca

A Natural Attraction

Table 5 – Effluent Flow Monitoring Data

**All results reported are Final Effluent Flows; Effluent Flows are used for determining compliance due to inaccuracy of Influent Flow Meter*

Month	2010 Average Daily Flow (m^3/d)	Annual Cumulative Average Daily Flow (m^3/d) ***Limit: 15, 900 m^3/d***	Peak Daily Flow (m^3/d) ***Limit: 51,100 m^3/d***	Total Monthly Flow (m^3/month)	Monthly Tertiary Filter Bypass Volumes (m^3/month)
January	13,514	14,025	26,009	418,944	223,049
February	12,202	13,730	15,083	341,657	28,467
March	13,343	13,526	17,617	413,616	79,873
April	10,259	12,857	11,703	307,780	0
May	10,034	12,520	11,716	311,053	5,588
June	10,988	12,463	13,745	329,653	0
July	10,811	12,382	12,746	335,137	4,550
August	11,467	12,409	14,332	355,478	3,556
September	9,188	12,221	10,509	275,649	3,078
October	9,089	11,820	10,467	281,784	0
November	10,157	11,477	14,019	304,718	2,770
December	14,266	11,277	33,784	442,244	47,974

Total Effluent Flow for 2010 = 4,117,713 m^3

2010 Average Daily Effluent Flow = 11,281 m^3/d

3-year Average Daily Effluent Flow = 13,073 m^3

5-year Average Daily Effluent Flow = 13,827 m^3

Table 5 - Effluent Flow Monitoring Data

Bypass and Spill Summary throughout the reporting period:

Table 6 – 2010 Bypass and Spill Summary

	Date of Bypass occurrence	Duration of Bypass Occurrence (hrs)	Bypass or Spill Volume (m3/occurrence)	Type of Bypass
January	Dec 3, 09 – Jan 15,10	1, 056 hours (44 days)	686, 287	**Tertiary Filter Bypass** -UV disinfection received
	Jan 25 – 27, 2010	48 hours (2 days)	24, 000	**Partial Tertiary Filter Bypass** - UV disinfection received
February	Feb 22 – Mar 11, 2010	422 hours (17 days, 14 hours)	108, 340	**Partial Tertiary Filter Bypass** - UV disinfection received
March				
April	***No Bypasses or Spills experienced throughout the month***			
May	May 8 – May 10, 2010	53 hours	5, 589	**Tertiary Filter Bypass** - No Disinfection for 49 hours, 15 min. of bypass – power out to building
June	***No Bypasses or Spills experienced throughout the month***			
July	July 16, 2010	3 hours	1, 344	**Partial Tertiary Filter Bypass** - UV disinfection received
August	Aug 3, 2010;	7 hours	3, 206	**Partial Tertiary Filter Bypass** - UV disinfection received
	Aug 11, 2010;	7 hours	350	**Partial Tertiary Filter Bypass** - UV disinfection received
September	Sept 1 – Sept 2, 2010	23 hours	3, 078	**Partial Tertiary Filter Bypass** - UV disinfection received
October	***No Bypasses or Spills experienced throughout the month***			
November	Nov 16 – Nov 17, 2010	14.5 hours	2, 770	**Partial Tertiary Filter Bypass -** UV disinfection received
December	Dec 1 – Dec 3, 2010	70 hours	43, 974	**Partial Tertiary Filter Bypass -** UV disinfection received
	Dec 12 – Dec 13, 2010	20.5 hours	4, 000	**Partial Tertiary Filter Bypass -** UV disinfection received

Table 6 – 2010 Bypass and Spill Summary

Comprehensive interpretation of all compliance related monitoring data and analytical results throughout the reporting period:

Biological Oxygen Demand (BOD_5)

The Trenton WWTP accepts waste discharge from various industries in the City resulting in higher than typical raw BOD concentrations. Referring to the following figures 1,2, and 3, it is clearly evident the plant is able to process these high BOD levels, with an average reduction rate of 96.5%, without exceeding compliance limits. Under the C of A non-compliance with regulatory requirements for BOD occurs when '*the annual average concentration and waste loading of BOD exceeds effluent limits during any twelve (12) consecutive calendar months'*. The plant was able to remain within compliance limits and consistently operated within the C of A objective concentrations. The annual cumulative average BOD waste loadings have also remained within compliance limits throughout the reporting period. Due to the increased sludge removal in the plant, the Trenton WWTP has been able to operate more efficiently removing high BOD concentrations (1% better than 2009).

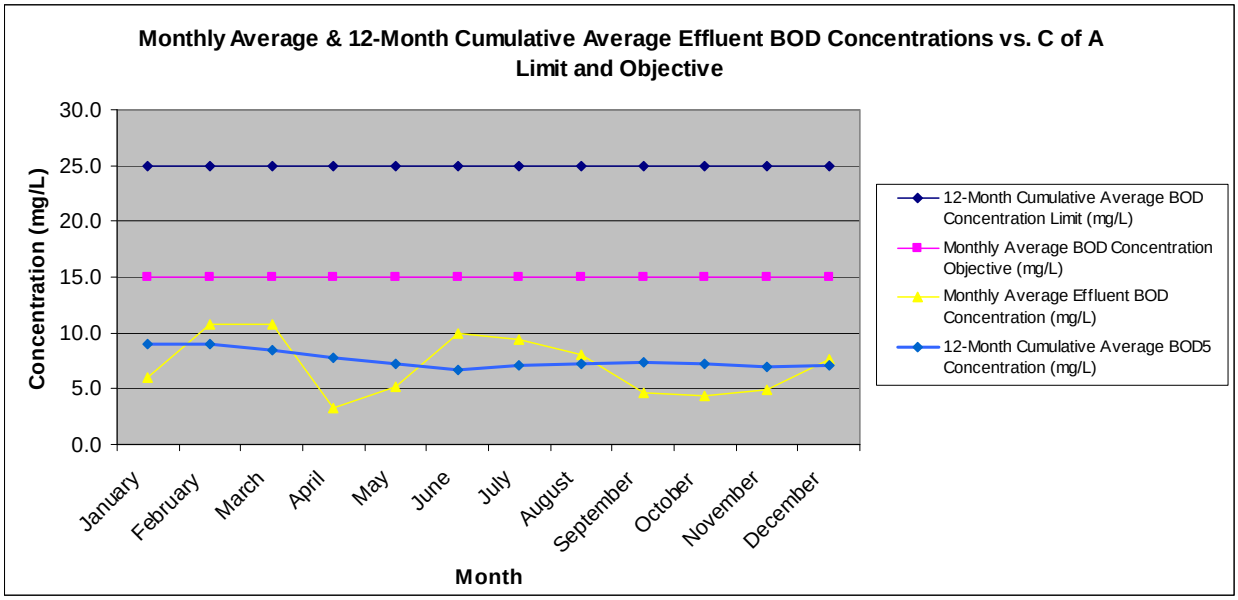

Figure 1 - Effluent BOD Concentrations vs. C of A Limit & Objective

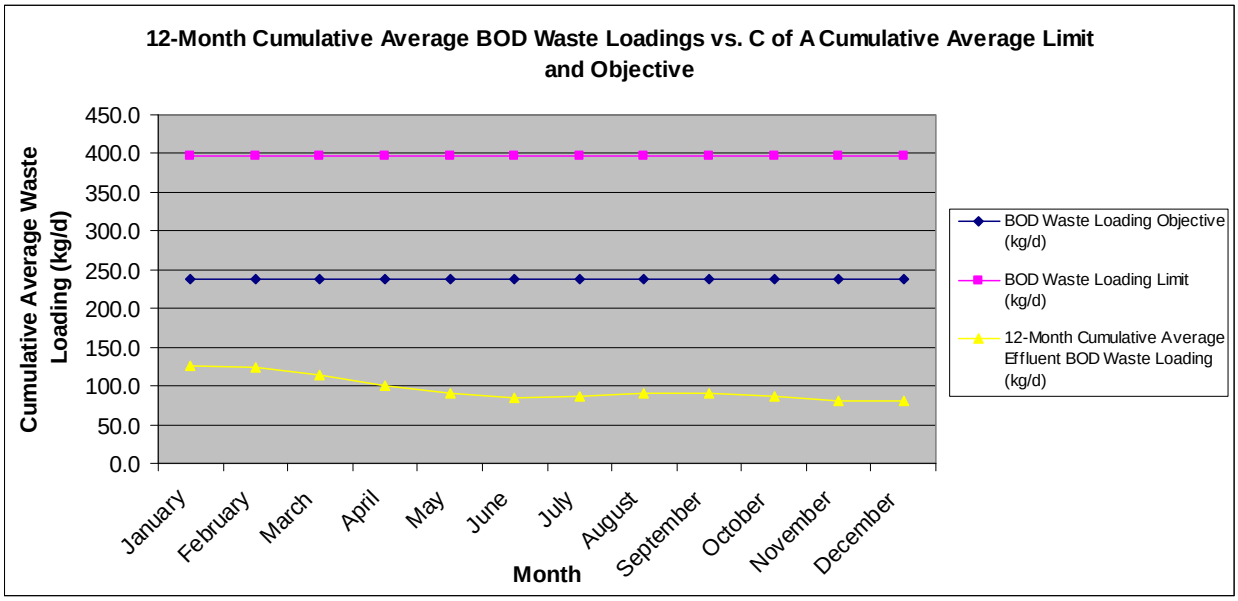

Figure 2 - Effluent BOD Waste Loadings vs. C of A Limit & Objective

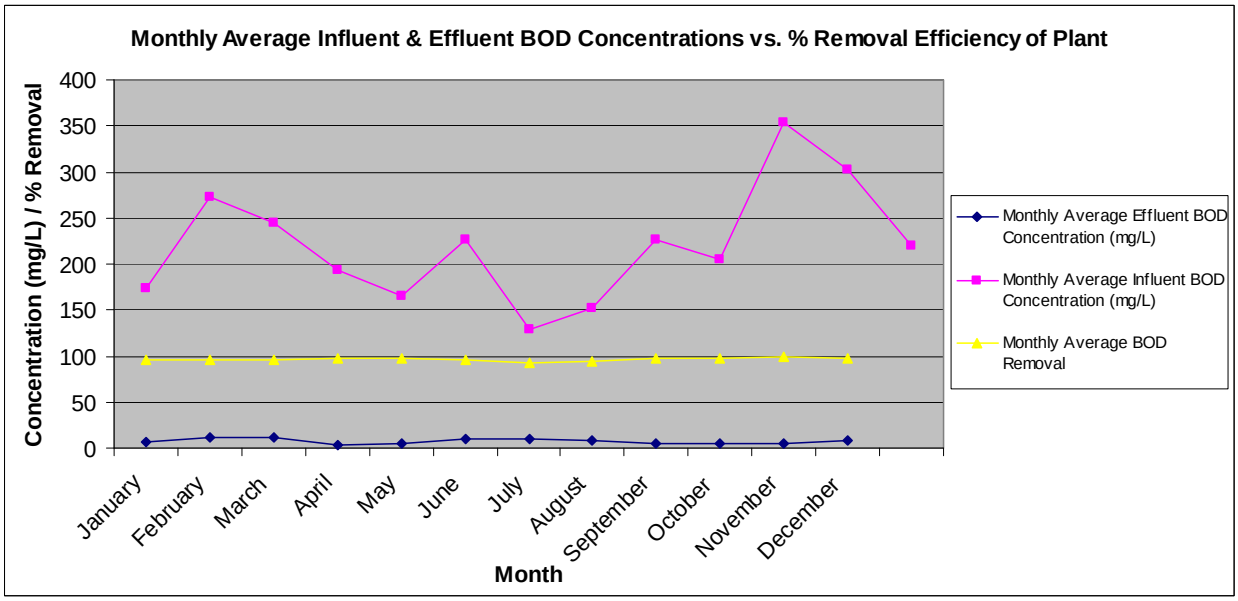

Figure 3 - Influent & Effluent BOD Concentrations vs. % Removal

Total Suspended Solids (TSS)

The Trenton WWTP plant operated with an average 98.3% total suspended solids removal efficiency (0.9% better than 2009 removal efficiency). As shown in Fig. 4, the monthly average Effluent TSS concentrations were higher than normal due to fairly substantial bypass events occurring throughout the month (see Table 6 for details), though still operated within allowable limits and objectives. Figure 5 plots the 12-month cumulative average Effluent Waste Loadings against the C of A allowable limit and objective. Clearly, the plant operated well below allowable limits and objectives for effluent waste loadings throughout 2010, which shows still greater improvement for plant operations since 2008 and 2009. This is due in large part to the increased sludge removal in the plant throughout the end of 2009, continuing in to 2010. As shown in Fig. 6, the monthly removal efficiency of TSS in the plant is reasonably constant, even when influent TSS concentrations are very high.

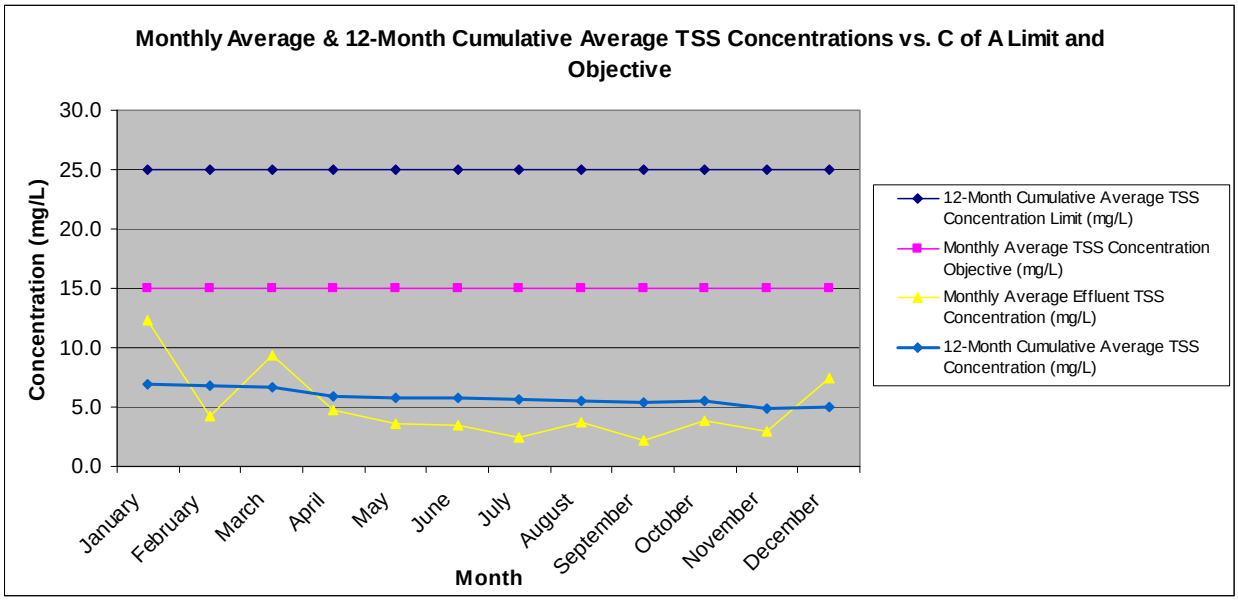

Figure 4 - TSS Concentrations vs. C of A Limit and Objective

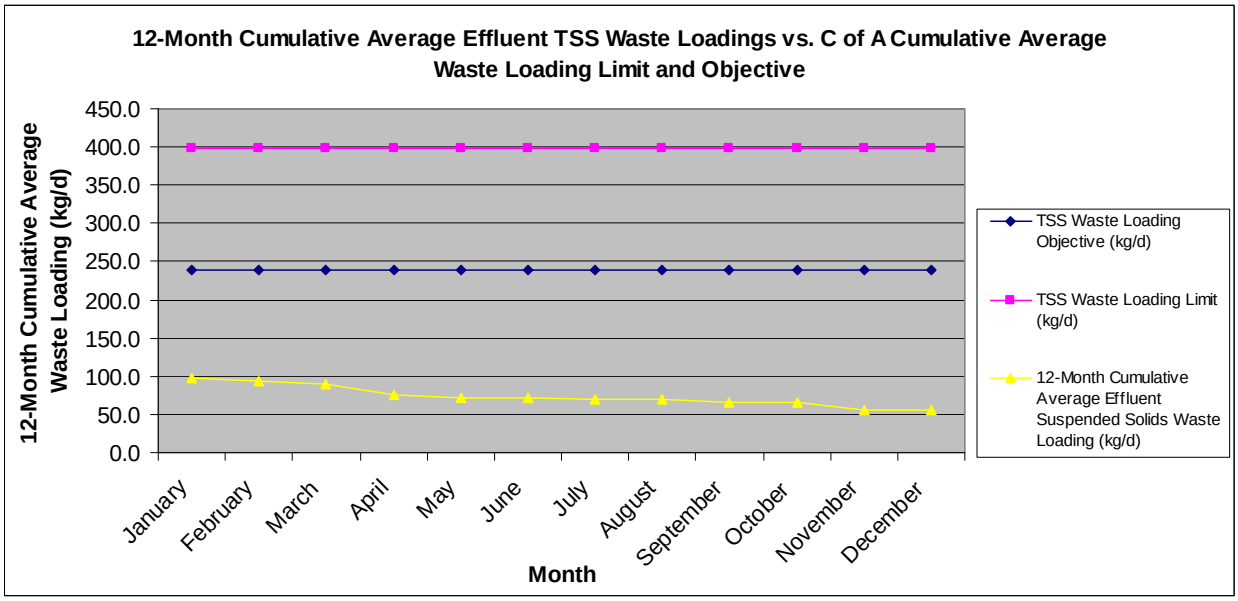

Figure 5 - Effluent Waste Loadings vs. C of A Limit & Objective

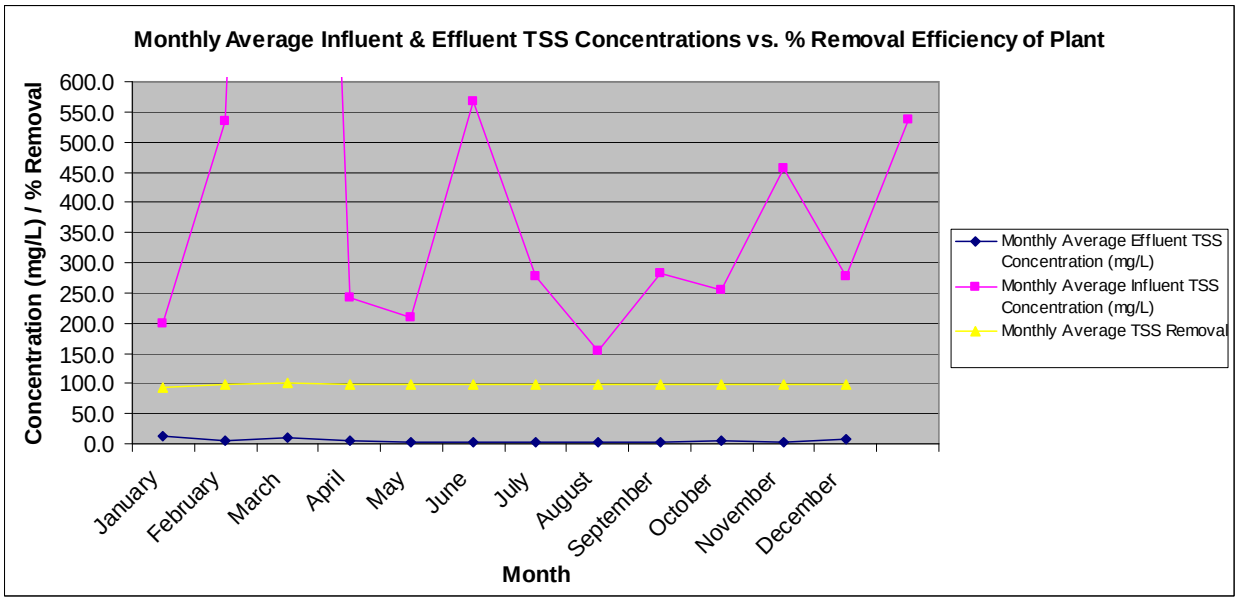

Figure 6 - Influent & Effluent TSS Concentrations vs. % Removal

Total Phosphorus (TP)

The Trenton WWTP operated with an average 96.5% phosphorus removal efficiency throughout the reporting period (2% better removal than in 2009). The annual average and monthly average TP concentrations did not exceed the C of A limit of 1.0 mg/L or the C of A objective of 0.5 mg/L throughout the reporting period. The plant C of A stipulates that both the annual average and monthly average concentration shall be maintained below the allowable limit and this was achieved (please see Fig. 7 for details). Additionally, the Bay of Quinte Remedial Action Plan stipulates that best efforts should be made to maintain concentrations of phosphorus below 0.3 mg/L, and this was also achieved. The annual average waste loading for TP shall be maintained below 397.5 kg/d and best efforts should be made to maintain this loading below 238.5 kg/d; Fig. 8 shows that these C of A requirements were met. The monthly average waste loadings were also maintained below the allowable limit and objective. As per Fig. 9, the plants monthly average phosphorus removal efficiency was always very good, even when TP concentrations in the influent were fairly high. Compared to the 2009 annual report data, it is evident that the annual average TP concentrations, and monthly average TP concentrations have consistently dropped throughout the last two years which is in large part due to the increase in sludge removal from the system.

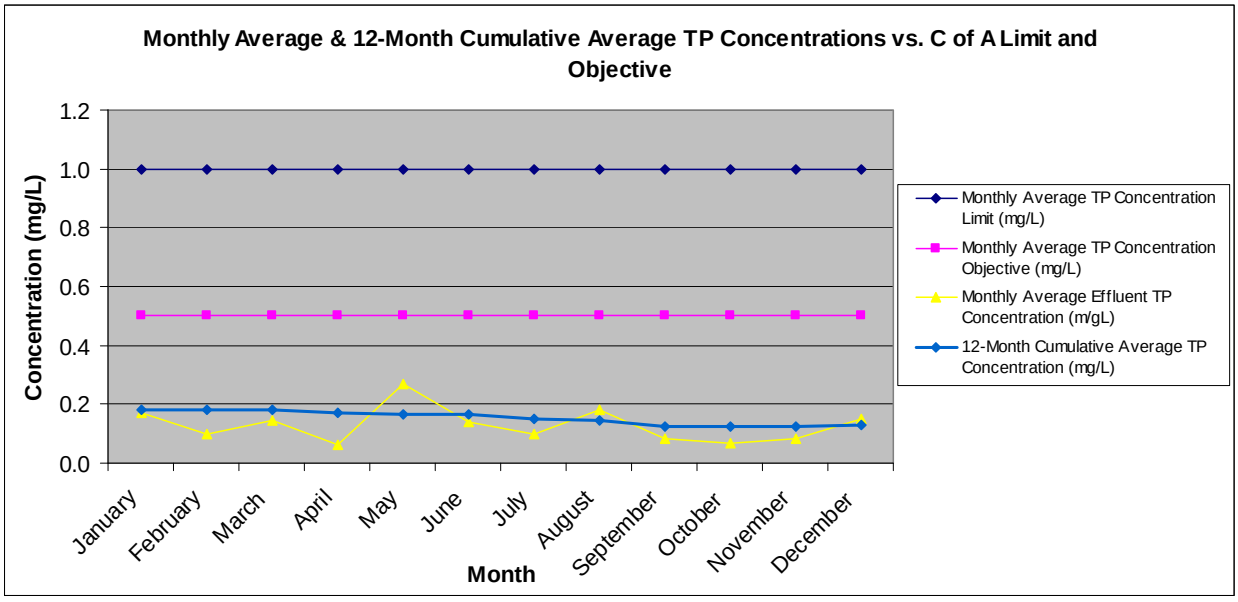

Figure 7 - Effluent TP Concentrations vs. C of A Limit and Objective

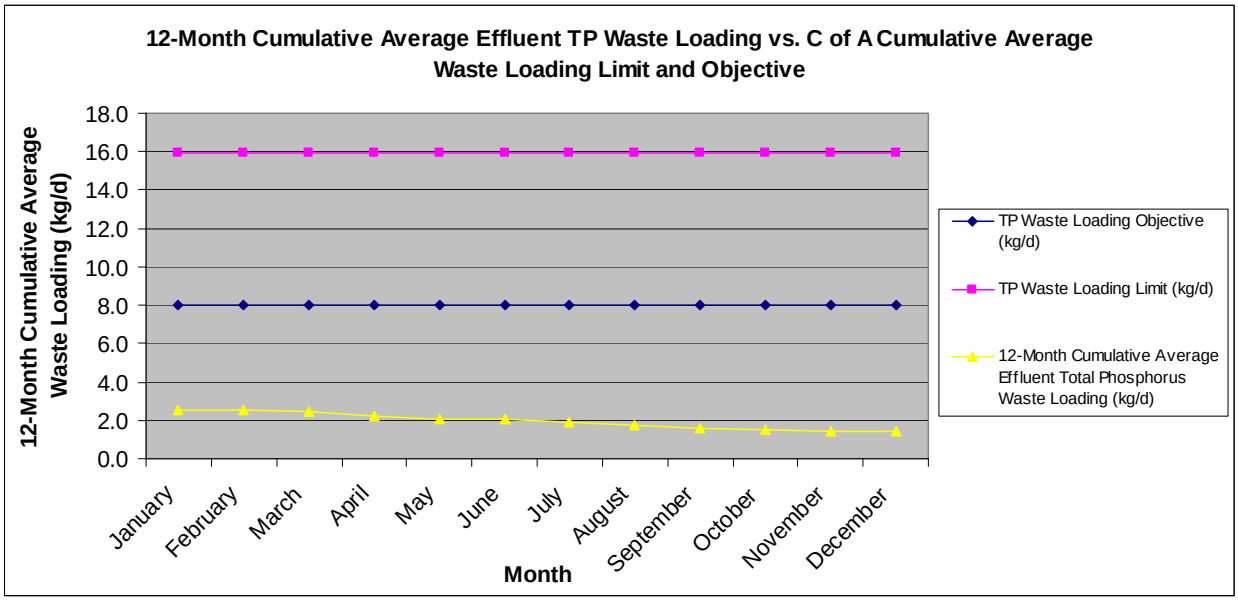

Figure 8 - Effluent TP Waste Loadings vs. C of A Limit and Objective

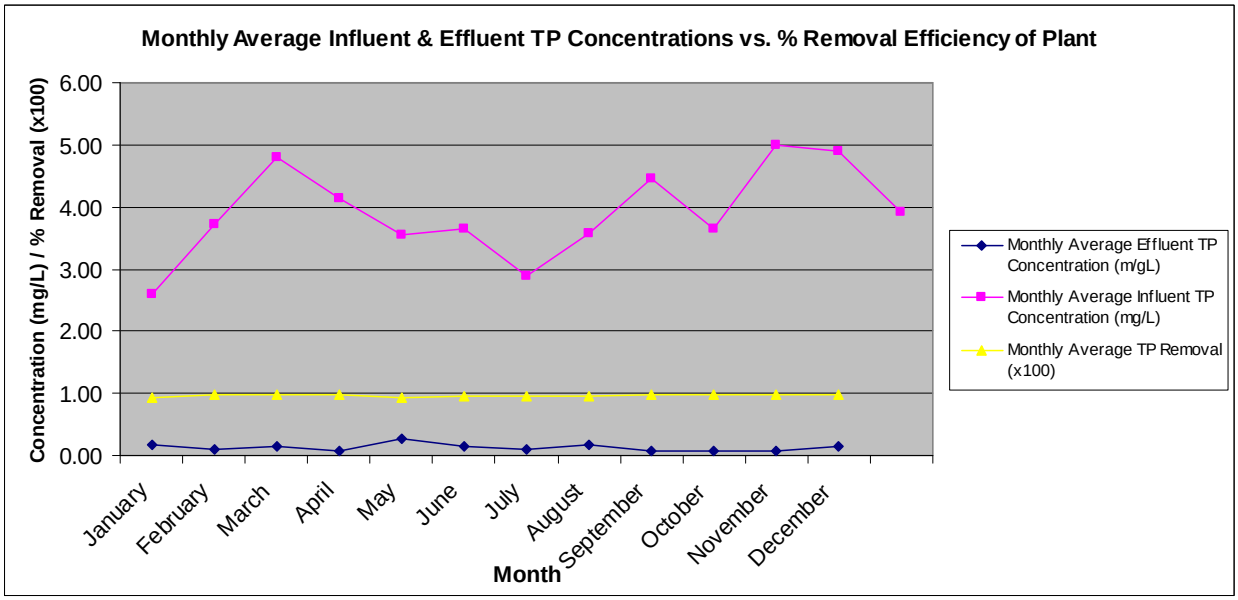

Figure 9 - Influent & Effluent TP Concentrations vs. % Removal Efficiency

Effluent Flows

The Trenton WWTP C of A stipulates the annual average daily flow shall not exceed the design capacity of 15, 900 m^3/d. Throughout the reporting period, the annual average daily effluent flow nor the monthly average effluent flow exceeded the allowable limit as shown in Fig. 10. Additionally, as per C of A requirements, the monthly peak effluent flow never reached the allowable limit of 51, 100 m^3/d as shown in Fig. 11.

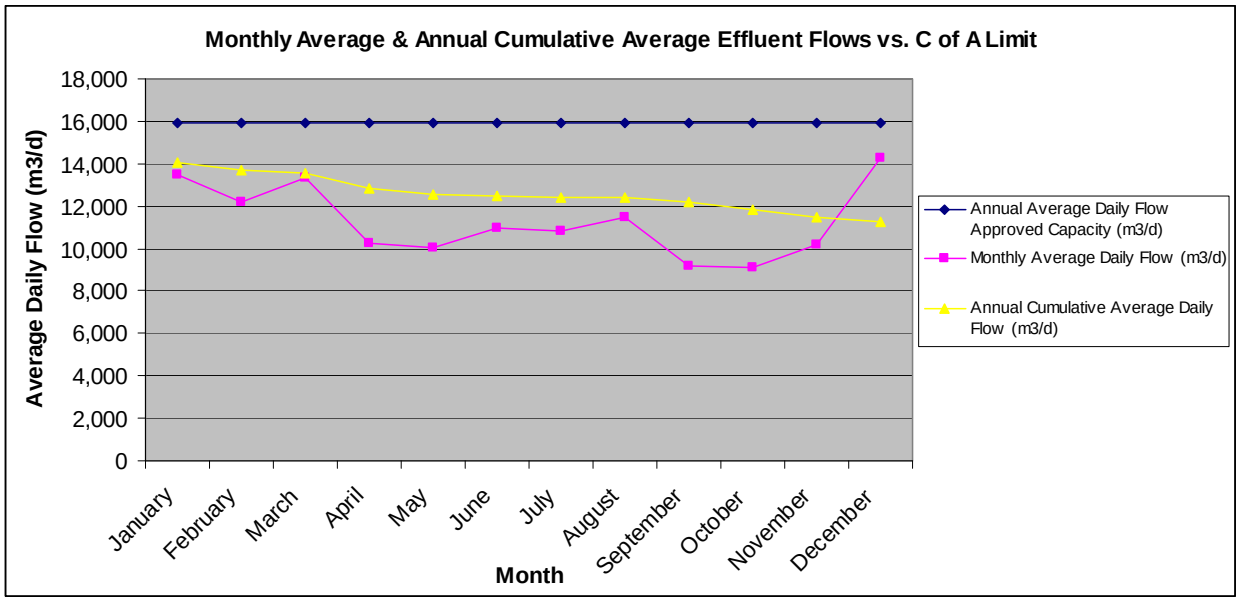

Figure 10 - Monthly Average & Annual Average Effluent Flows vs. C of A Limit

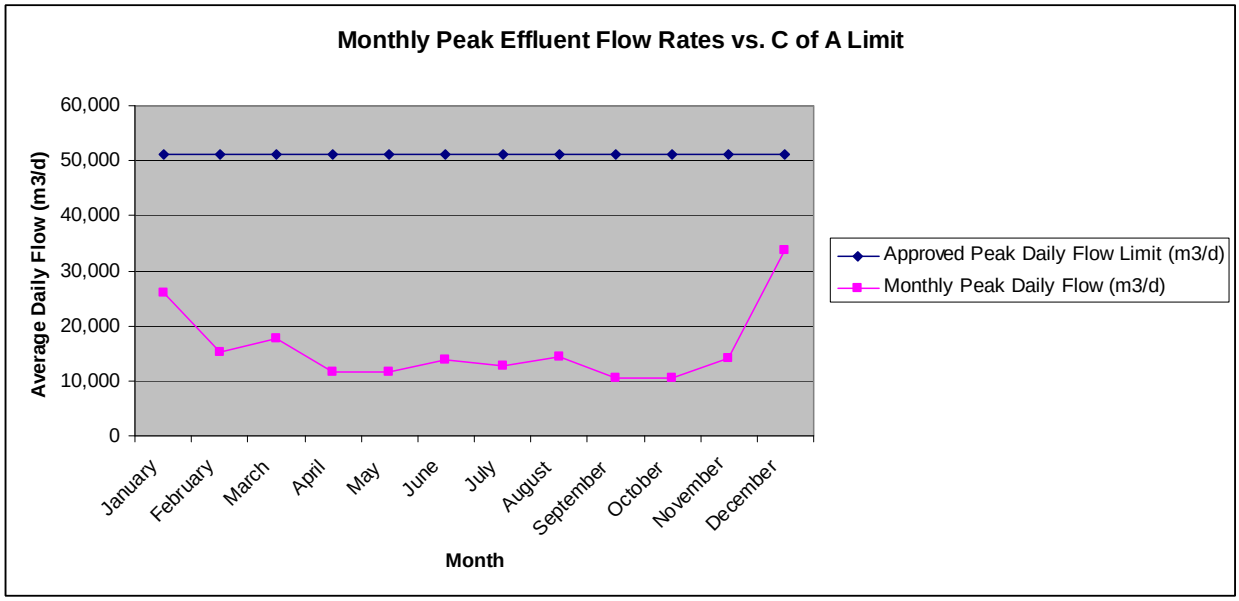

Figure 11 - Monthly Peak Effluent Flow Rates vs. C of A Limit

Interpretation of all additional monitoring program analytical results:

E. Coli

The Trenton WWTP does not have a compliance limit for the Monthly Geometric Mean Density of E. Coli, however does have a performance objective of 200 cfu/100 mL. Throughout the reporting period, including months in which there were substantial bypass volumes, the E. Coli objective was always met as shown in Fig. 12. During the month of May, there was a power failure in the tertiary building which lasted for a period of 53 hours (see Table 6 for details). A sample was collected of the effluent during this time and the E. Coli level was at 1720 cfu/100 mL, this was an isolated incident.

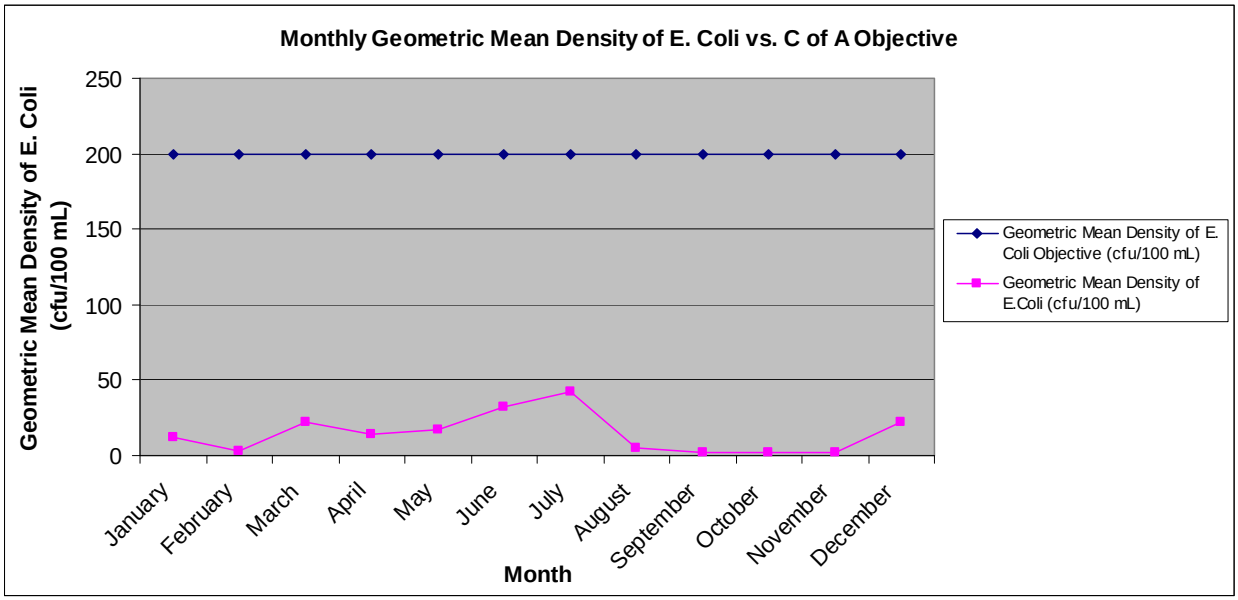

Figure 12 - Monthly Geometric Mean Density of E. Coli vs. C of A Objective

Total Kjeldahl Nitrogen (TKN)

A common Effluent Concentration and Loading objective and limit for most wastewater facilities is TKN. However, the Trenton WWTP C of A came in effect earlier than some Certificates of Approval, and did not include this compliance parameter. Even though this is the case, the City still strives to minimize adverse effects on the receiving waters through excellent effluent quality. The Trenton WWTP operated with an average 68.4% TKN Removal Efficiency throughout the reporting period. As seen in Fig. 13, the Trenton WWTP does not remove TKN concentrations as well as other parameters in the C of A. This lack of nitrogen removal is due to the design capabilities of the plant. As part of the City's goals to improve effluent quality, steps will be taken in the future to try and improve this process by doing in-house process optimization testing. Additionally, future plant upgrades will require denitrification capabilities.

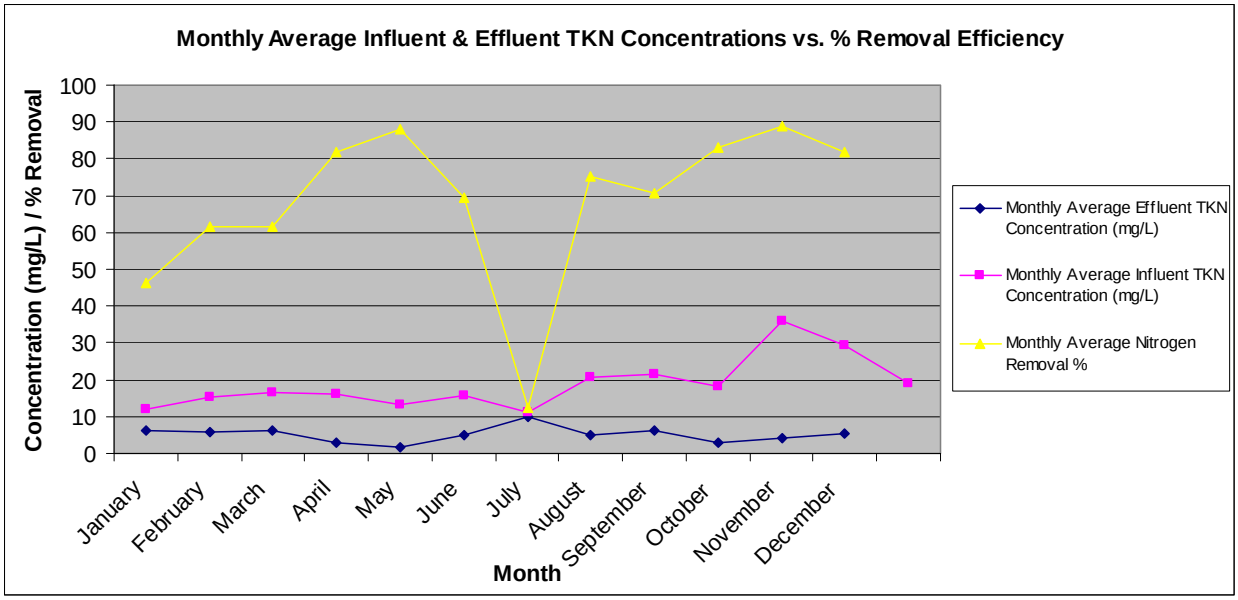

Figure 13 - Influent & Effluent TKN Concentrations vs. % Removal Efficiency

Removal Efficiency of additional monitoring data

The table below details yearly average concentration results of monitoring data which normally are not typical sampling requirements (other than Ammonia + Ammonium, and Nitrites + Nitrates). As seen in the table, the plant is not able to remove Nitrates and Nitrites in the plant effectively. As part of the Nitrogen removal optimization goal, the Nitrates and Nitrites in the effluent should reduce over time.

Removal Efficiency of Additional Monitoring Program Analytical Results			
	Yearly Average Influent Concentration	**Yearly Average Effluent Concentration**	**% Removal Efficiency (if applicable)**
Dissolved Reactive Phosphorus	1.3 mg/L	0.05 mg/L	95.6
Ammonia + Ammonium Nitrogen	12.0 mg/L	4.2 mg/L	58.5
Nitrates + Nitrites Nitrogen	0.08 mg/L	6.04 mg/L	0

In addition to the above monitoring program, In-house testing is done on the effluent for the following parameters on a regular basis: *pH, Temperature*
Please see Table 3 for details on results for the reporting period.

Description of all operating problems encountered throughout the reporting period:

- For all months of the year (except April, June and October) the tertiary filters encountered operating problems.
- The Influent flow meter does not read accurately, replacement is not feasible
- Primary Clarifier out of service to be rebuilt causing lack of solids removal in front of plant

Summary of all maintenance carried out in the Works:

- Tertiary filter backwash pump replaced
- Primary clarifier #2 rebuilt
- UV Bulbs replaced
- Digester Gas system upgraded
- Gravity Belt Thickener refurbished
- Recirculating pump #1 motor replaced
- Alum pump repair

- RAS pumps being rebuilt/repaired
- New progressive cavity pump rebuilt in blower room
- New sump pump in blower room
- Media replaced in tertiary filters
- New Final Effluent Flow meter
- Annual Boiler maintenance completed
- Installed camera in Belt Press room with monitoring screens in control room
- Generator serviced
- MCC panels cleaned and inspected

Tabulation of the volume of sludge generated in the reporting period and an outline of anticipated volumes to be generated in 2011:

Month	Volume	Disposal Method	Land C of A #
January	3, 933	Dewatered –Landfill	A021601
February	1, 718	Dewatered –Landfill	A021601
March	1, 001	Dewatered –Landfill	A021601
April	2, 960	Dewatered –Landfill	A021601
May	2, 248	Dewatered –Landfill	A021601
June	3, 330	Dewatered –Landfill	A021601
July	3, 144	Dewatered –Landfill and Land Application	A021601 and S-3626-118
August	1, 458	Dewatered - Land Application	S-3626-118
September	1, 699	Dewatered - Land Application	S-3626-118
October	1, 878	Dewatered - Land Application	S-3626-118 and S-3626-137
November	1, 412	Dewatered – Land Application and Landfill	S-3626-137 and A021601
December	2, 203	Dewatered - Landfill	A021601
Total Volume of Sludge generated throughout 2010			***26, 984 m^3***
Estimated Volume of Sludge generation for 2011			***30, 000 m^3***

Outline of the proposed Sludge handling methods and disposal areas to be utilized in 2011:

The City intends to continue land application (during approved months) of it's dewatered Biosolids over the next reporting period on one of several certified land sites. During the remainder of the year, the City intends to send all dewatered biosolids to Landfill. The City is currently in the process of designing a biosolids storage facility to be located at the Trenton WWTP site.

Evaluation of the calibration and maintenance procedures conducted on all monitoring equipment:

Date of Calibration: June 7, 2010

Accusonic 7510 Plus Effluent Flow Meter

	Average % Error	Pass/Fail
Display	0.00	Pass
mA Output	-0.08	Pass
Totalizer	-1.91	Pass

Evaluation for the need for modifications to the Works to improve performance and reliability and the minimize upsets and bypasses:

The City is in the process of setting up a preventative maintenance program for all City owned facilities. The Trenton WWTP is part of this program, and will have a monthly Work Order distributed to chemically clean a tertiary filter each month. This should minimize the amount of time in which the filters are not able to operate to their full capability. A Class 'C' Environmental Assessment has been initiated on December 2010. This project will evaluate the options to expand wastewater treatment capacity for the Trenton service area.