NPDES Compliance Summary Report, 2012 and 2013 Clinton Wastewater Treatment Plant

Massachusetts Water Resources Authority

Environmental Quality, Water & Wastewater
Report 2014-05

Citation:
Smolow, M. 2014. NPDES compliance summary report, 2012 and 2013, Clinton Wastewater Treatment Plant. Massachusetts Water Resources Authority. Report 2014-05. 38 p.

NPDES COMPLIANCE SUMMARY REPORT
2012 and 2013
Clinton Wastewater Treatment Plant

Frederick A. Laskey
Executive Director

Michael J. Hornbrook
Chief Operating Officer

Dr. Betsy Reilley
Director, Environmental Quality, Water and Wastewater

By
Maret Smolow

Technical Report No. 2014-05
Environmental Quality, Water and Wastewater Operations Division
Massachusetts Water Resources Authority
Charlestown Navy Yard
100 First Avenue
Boston, MA 02129
(617) 242-6000

Contributors

Grace Bigornia-Vitale
Kelly Coughlin
Michael Derrane
Peter Ralston
Mark Sullivan
David Wu
Yaxin Zhou

Table of Contents

List of Figures

List of Tables

Executive Summary

This report presents and summarizes monitoring and compliance data from January 1, 2012 to December 31, 2013 that were collected and analyzed by the Massachusetts Water Resources Authority's (MWRA) Environmental Quality, Water and Wastewater Department (ENQUAL). This report, though not a regulatory requirement, provides useful documentation of influent and effluent quality trends and of permit compliance at the MWRA's Clinton Wastewater Treatment Plant (CLTP) over the calendar year, as well as of historical trends in water quality.

The CLTP provides secondary treatment of wastewater from the town of Clinton and the Lancaster Sewer District using an activated sludge process in combination with advanced nutrient removal. Effluent is chlorinated and dechlorinated before it is discharged to the South Branch of the Nashua River.

The MWRA's NPDES permit requires the Authority to monitor its wastewater treatment plant at Clinton for specific parameters. The MWRA currently operates under a permit issued on September 27, 2000 that became effective on November 26, 2000. The permit expired in September 2005, but has been administratively continued since that time.

During 2012, there were ten exceedances of the permitted running average flow limit of 3.01 MGD. In 2013, there was one permit limit exceedance, which was a violation of the chronic toxicity limit. The flow violations occurred due to excessive wet weather. However, even with the high influent flows, the plant performed as designed. The toxicity violation was likely caused by a higher concentration of copper in the effluent during a low flow period.

The biochemical oxygen demand (BOD) and total suspended solids (TSS) removal rates during these high flow periods were approximately 98%, well above the 85% theoretical removal rates for secondary treatment. The removal rates in 2012 were comparable to the removal rates in 2013, which had no flow violations.

BOD and TSS Efficiency, 2012 and 2013

Parameter	Influent (mg/L)	Effluent (mg/L)	Efficiency
2012			
BOD	242	3.42	98.59%
TSS	238	3.94	98.34%
2013			
BOD	252	3.69	98.54%
TSS	218	4.65	97.87%

In September 2013, EPA re-issued a draft NPDES permit containing significant changes from the expired permit. The MWRA has commented on several permit issues including co-permittees, phosphorus, flow, copper and aluminum. The most difficult of these changes for CLTP to meet are the more stringent year-round limits on phosphorus discharges in the effluent. The draft permit has not been finalized.

Introduction

This report presents and summarizes the NPDES monitoring and compliance data that were compiled and analyzed by the Massachusetts Water Resources Authority's (MWRA) Environmental Quality, Water and Wastewater Department (ENQUAL) between January 2012 and December 2013. The characteristics examined include flow, conventional parameters (BOD and TSS), nutrients (ammonia nitrogen and total phosphorus), priority pollutants (metals, cyanide, pesticides/PCBs, and organic compounds), fecal coliform bacteria, dissolved oxygen, pH, and whole effluent toxicity. This report is comprised of four major sections. The first section presents and discusses the monitoring results for the Clinton Wastewater Treatment Plant (CLTP). The second section discusses effluent quality and compliance with permit limits. The third section discusses miscellaneous topics introduced in the permit and other applicable environmental regulations. The final section discusses changes in the new permit.

Appendix A provides an overview of the CLTP. Appendix B provides an overview of the NPDES permit requirements. Appendix C describes the types of detection limits encountered in chemical analyses. Appendix D lists toxic pollutants potentially of concern in wastewater discharges. Appendix E provides monthly summary data for CLTP. Appendix F provides historical water quality data for the South Branch of the Nashua River.

Clinton Wastewater Treatment Plant

Overview

This chapter presents and discusses monitoring information for CLTP. Monitoring at CLTP has two main components, influent and effluent monitoring. The characteristics examined include flow, conventional parameters, nutrients, priority pollutants, fecal coliform bacteria, and whole effluent toxicity. An overview of the treatment plant can be found in Appendix A, while a process flow diagram is included as Figure 1. An overview of the NPDES permit requirements is provided in Appendix B. Appendix C provides a detailed discussion of detection and quantitation limits.

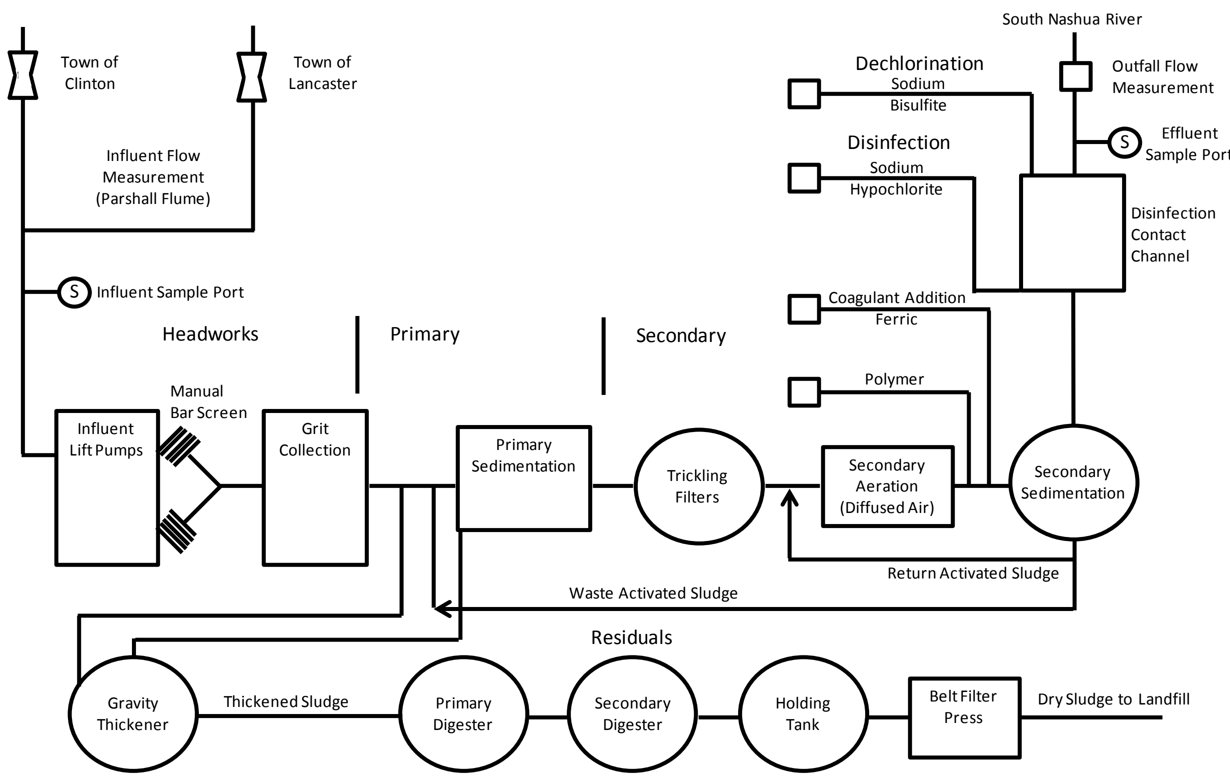

Figure 1. Clinton Wastewater Treatment Plant Process Flow Diagram

Influent Flow

CLTP receives flow from the town of Clinton and the Lancaster Sewer District. Figure 1 shows the average daily flow by month from the town of Clinton while Figure 2 shows comparable flows from the Lancaster Sewer District. In 2012 and 2013, the flow from the town of Clinton averaged about 2.25 MGD. Flow from the Lancaster Sewer District averaged about 0.24 MGD. Lancaster flow is about 10% of the total flow to CLTP.

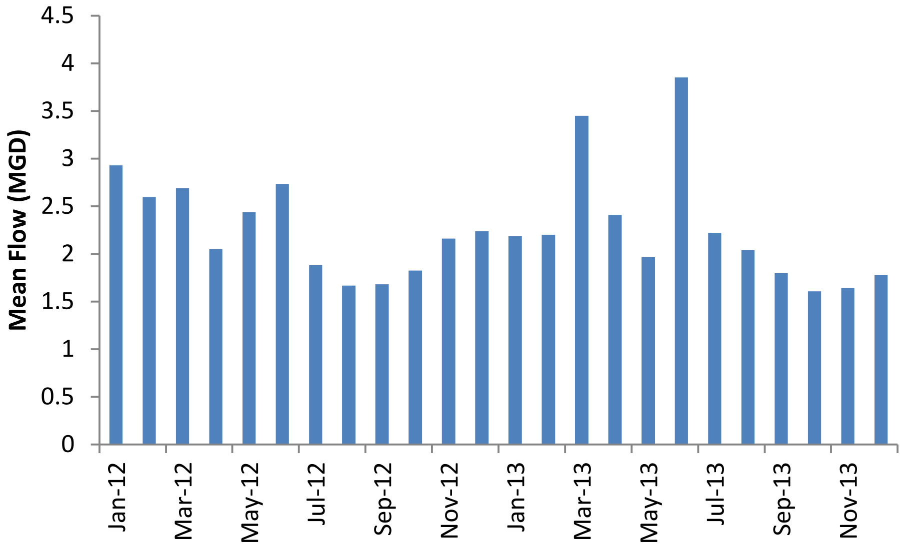

Figure 2. Town of Clinton Average Daily Flow, 2012 and 2013

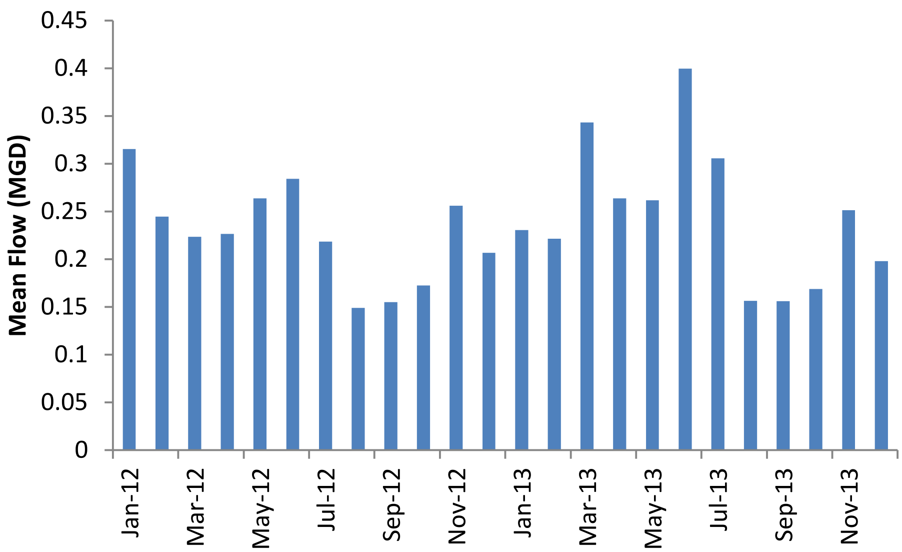

Figure 3. Lancaster Sewer District Average Daily Flow, 2012 and 2013

In June 2013, 10.50 inches of rain fell in the area. Measured flow during this period was very high, with the maximum flow at CLTP reaching 8.48 MGD on June 14, 2013. Figure 3 illustrates the influent flow at CLTP compared to precipitation in 2012 and 2013. The historical influent flow compared to precipitation for the town of Clinton and for the Lancaster Sewer District is shown in Figure 4.

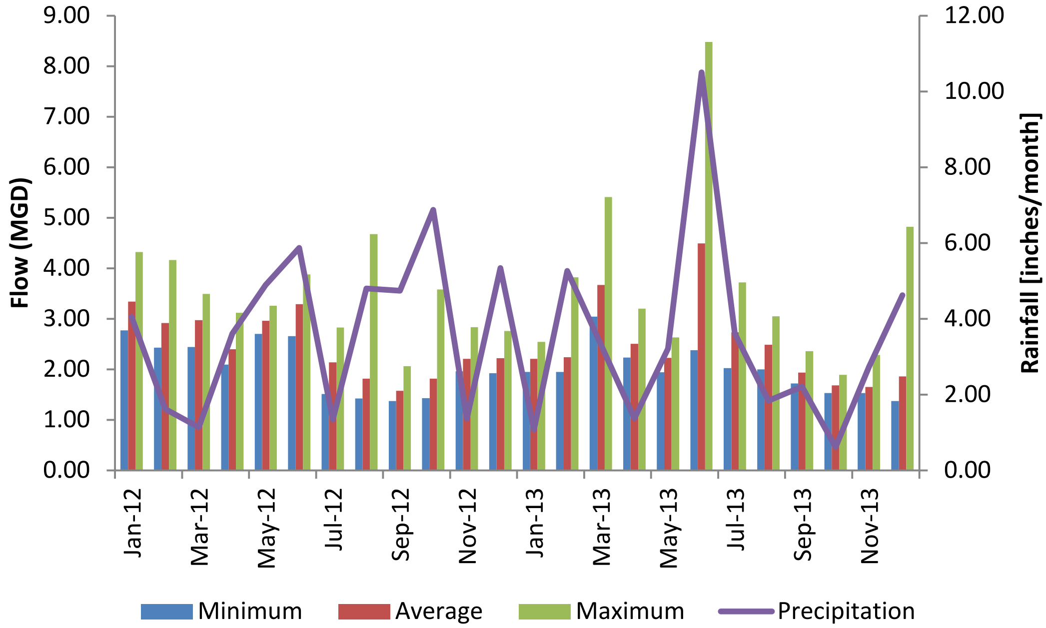

Figure 4. Influent Flow Compared to Precipitation, 2012 and 2013

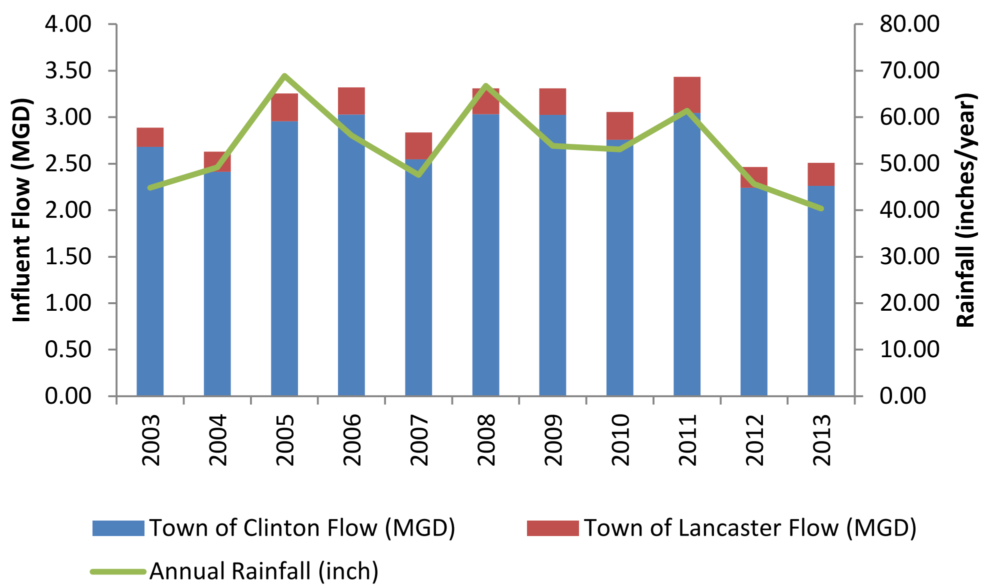

Figure 5. Historical Influent Flow Compared to Precipitation, 2003-2013

Influent Monitoring

Influent monitoring characterizes the influent to the CLTP. Monitoring for some conventional parameters is necessary to meet the NPDES reporting requirements, and monitoring others is critical for process control to ensure optimal plant functioning. Influent monitoring data provides influent loading rates and the basis for determining treatment plant efficiency. Influent monitoring for non-conventional parameters is an important part of MWRA's source reduction and Local Limits program run by the Toxic Reduction and Control (TRAC) department.

Influent Conventional Parameters and Nutrients

Tables 1 and 2 present a monthly summary of the influent characteristics at CLTP for 2012 and 2013 respectively.

Table 1. Average Monthly Influent Summary, 2012

2012												
Parameter	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Clinton Flow (MGD)	2.93	2.60	2.69	2.05	2.44	2.74	1.88	1.67	1.68	1.83	2.16	2.24
Lancaster Flow (MGD)	0.32	0.24	0.22	0.23	0.26	0.28	0.22	0.15	0.15	0.17	0.26	0.21
Total Flow (MGD)	3.25	2.84	2.91	2.28	2.70	3.02	2.10	1.82	1.83	2.00	2.42	2.45
BOD (mg/L)	194	223	209	233	200	191	244	341	300	282	229	253
TSS (mg/L)	173	214	217	258	175	140	254	354	328	277	228	233
TP (mg/L)	~	~	8.45	~	~	4.88	~	~	4.85	~	~	3.68
Ortho-P (mg/L)	~	~	1.79	~	~	1.04	~	~	1.70	~	~	1.67
FOG (mg/L)	~	~	17.5	~	~	0.73	~	~	24.5	~	~	27.5
MBAS (mg/L)	~	~	2.65	~	~	2.34	~	~	2.70	~	~	
TPH (mg/L)	~	~	0.55	~	~	0.25	~	~	0.70	~	~	0.97

Table 2. Average Monthly Influent Summary, 2013

2013												
Parameter	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Clinton Flow (MGD)	2.19	2.20	3.45	2.41	1.96	3.85	2.22	2.04	1.80	1.61	1.64	1.78
Lancaster Flow (MGD)	0.23	0.22	0.34	0.26	0.26	0.40	0.31	0.16	0.16	0.17	0.25	0.20
Total Flow (MGD)	2.42	2.42	3.79	2.67	2.22	4.25	2.53	2.20	1.96	1.78	1.89	1.98
BOD (mg/L)	268	252	170	251	256	118	246	280	286	341	286	278
TSS (mg/L)	273	207	124	194	237	115	225	336	223	242	233	212
TP (mg/L)	~	~	7.52	~	~	3.44	~	~	5.47	~	~	5.65
Ortho-P (mg/L)	~	~	1.58	~	~	1.37	~	~	1.57	~	~	3.17
FOG (mg/L)	~	~	17.1	~	~	11.5	~	~	12.7	~	~	28.4
MBAS (mg/L)	~	~		~	~		~	~		~	~	
TPH (mg/L)	~	~	0.91	~	~	0.08	~	~	0.06	~	~	1.01

As shown in Table 3, the influent flow can be characterized as medium-strength[1].

Table 3. Average Influent Strength, 2012 and 2013

Parameter	Year	Value	Weak	Medium	Strong
BOD (mg/L)	2012	242	100	200	300
	2013	253			
TSS (mg/L)	2012	238	100	200	350
	2013	218			

Monthly average influent biochemical oxygen demand (BOD) and average total suspended solids (TSS) concentrations and loadings in 2012 and 2013 are shown in Figures 5 and 6 respectively.

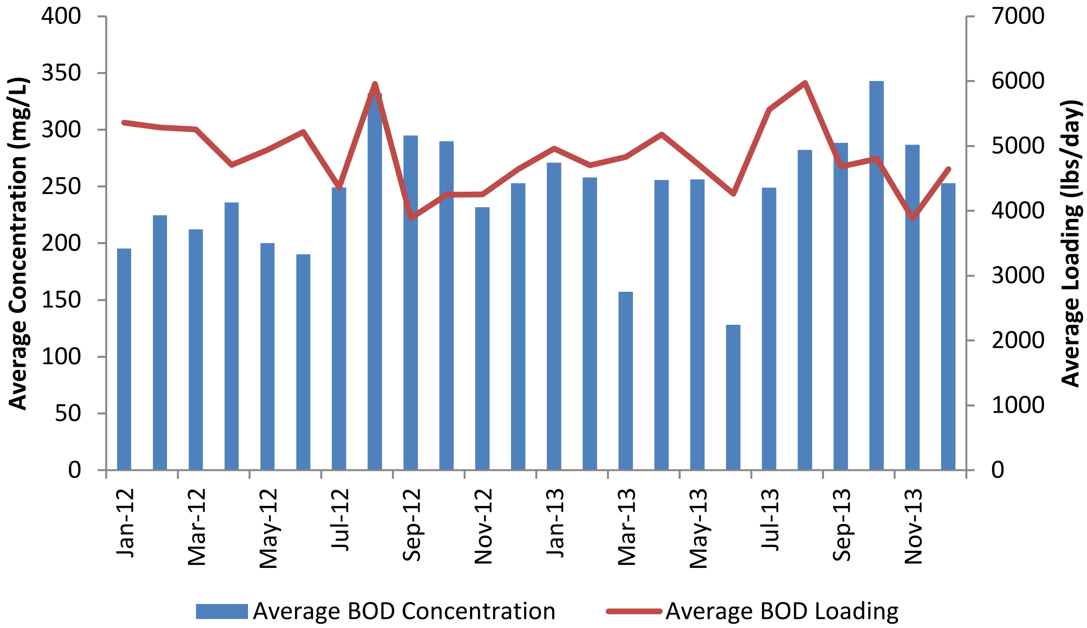

Figure 6. Average Influent BOD Concentration and Loadings, 2012 and 2013

[1] Metcalf & Eddy, Inc, 1972. *Wastewater Engineering: Collection, Treatment, Disposal*, New York, McGraw Hill Book Company, p.109.

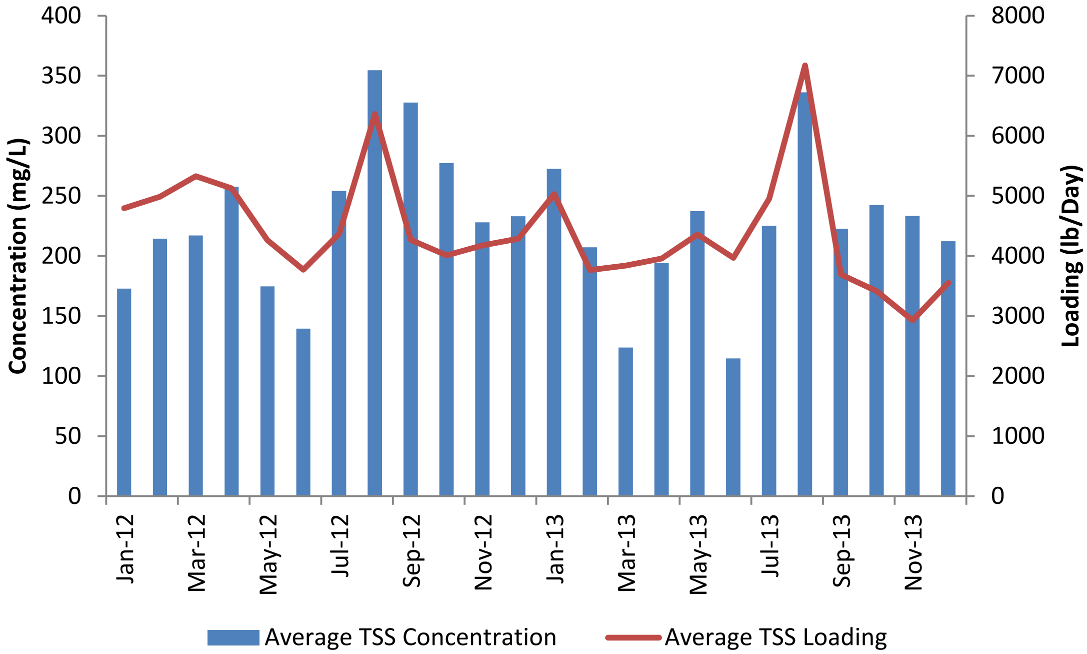

Figure 7. Average Influent TSS Concentration and Loadings, 2012 and 2013

Influent Priority Pollutants

There are 65 compounds and families of compounds that are among the most persistent, prevalent, and toxic of chemicals known to man. These compounds or families of compounds have been translated into 126 individual pollutants which EPA regulates, and for which EPA has published analytical test methods. The current list of 126 Priority Pollutants can be found in Appendix A to 40 CFR Part 423, as well as Appendix D of this report.

The results of a complete priority pollutant scan of CLTP influent can be found in Tables E-3 and E-4 of Appendix E. Most of the samples are collected and analyzed quarterly. Each priority pollutant is included in the scan whether it was detected just once or throughout the course of the year. For levels below detection limits, one half of the method detection limit for inorganic compounds or one tenth of the quantitation limit for organic compounds was substituted to calculate concentration and loading.

Analyses showed very few of the priority pollutants in the influent. In 2012, aluminum, arsenic, copper, iron, lead, mercury, and zinc were detected consistently, while chromium and nickel were detected in two of four samples. In 2013, aluminum, arsenic, copper, iron, lead, mercury, and zinc were detected consistently, while nickel was detected in three of four samples, chromium in two of four samples, and selenium in one of four samples. The influent metals summaries for 2012 and 2013 are included as Tables 4 and 5 respectively, and the influent metal loadings are included as Figure 7. No pesticides were detected in the influent in 2012 or 2013.

Table 4. Influent Metals Summary, 2012

2012					
Metals (ug/L)	**Mar**	**Jun**	**Sep**	**Dec**	**No. of Detects**
Aluminum	1230	482	579	370	4 of 4
Antimony	ND	ND	No Data	No Data	0 of 2
Arsenic	3.72	3.99	4.60	3.04	4 of 4
Beryllium	ND	ND	ND	ND	0 of 4
Boron	ND	ND	ND	ND	0 of 4
Cadmium	ND	ND	ND	ND	0 of 4
Chromium	17.20	6.62	ND	ND	2 of 4
Copper	113	61.40	95.10	46.20	4 of 4
Iron	18700	3830	3710	2350	4 of 4
Lead	17.40	7.05	9.59	4.03	4 of 4
Mercury	0.41	0.09	0.07	0.07	4 of 4
Molybdenum	ND	ND	ND	ND	0 of 4
Nickel	5.94	ND	6.57	ND	2 of 4
Selenium	ND	ND	ND	ND	0 of 4
Silver	ND	ND	ND	ND	0 of 4
Thallium	ND	ND	ND	ND	0 of 4
Zinc	473	181	215	158	4 of 4

ND = Non Detect

Table 5. Influent Metals Summary, 2013

2013					
Metals (ug/L)	**Mar**	**Jun**	**Sep**	**Dec**	**No. of Detects**
Aluminum	1260	228	635	322	4 of 4
Antimony	ND	ND	ND	ND	0 of 4
Arsenic	5.78	3.16	5.08	3.90	4 of 4
Beryllium	ND	ND	ND	ND	0 of 4
Boron	ND	ND	ND	ND	0 of 4
Cadmium	ND	ND	ND	ND	0 of 4
Chromium	10.90	ND	7.86	ND	2 of 4
Copper	196	46.5	125	75.1	4 of 4
Iron	11700	1870	6050	8830	4 of 4
Lead	20.10	3.63	6.30	6.81	4 of 4
Mercury	0.26	0.04	0.11	0.15	4 of 4
Molybdenum	ND	ND	ND	ND	0 of 4
Nickel	7.45	ND	5.39	6.14	3 of 4
Selenium	1.08	ND	ND	ND	1 of 4

Metals (ug/L)	Mar	Jun	Sep	Dec	No. of Detects
Silver	ND	ND	ND	ND	0 of 4
Thallium	ND	ND	ND	ND	0 of 4
Zinc	523	181	245	254	4 of 4

ND = Non Detect

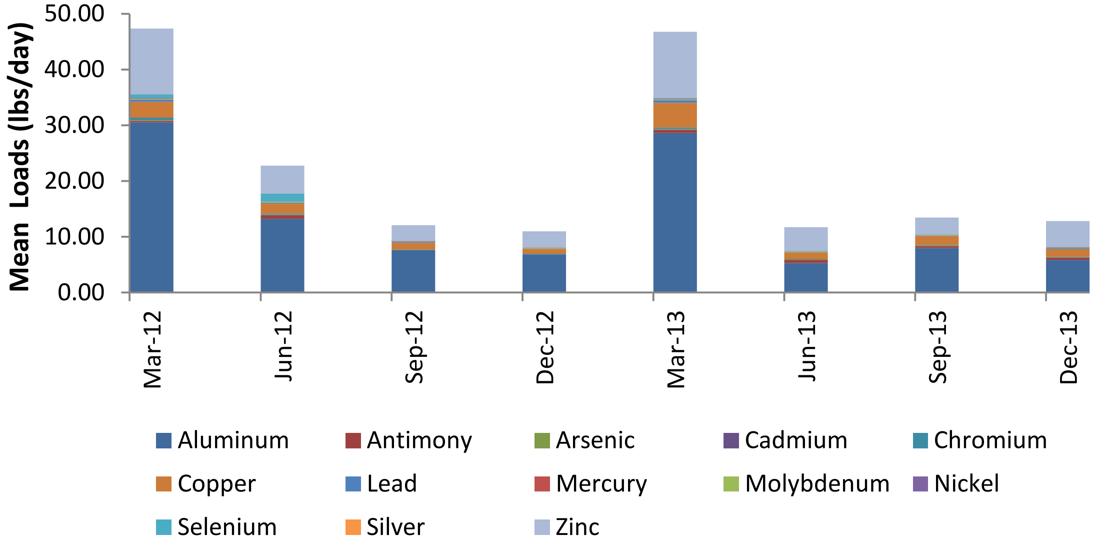

Figure 8. Average Influent Metals Loadings, 2012 and 2013

Effluent Monitoring

Effluent monitoring characterizes the quality of the effluent discharged to the South Branch of the Nashua River. Parameters measured in the effluent are similar to those measured in the influent. Whole effluent toxicity (WET) is also required in the effluent. The NPDES permit requires effluent monitoring and imposes permit limits on both conventional parameters and priority pollutants to ensure the health of the receiving water. Additionally, the permit requires the reporting of non-priority pollutants such as nutrients.

Effluent Conventional Parameters and Nutrients

Monthly measurements of effluent parameters are presented in Tables 6 and 7. Data show very low concentrations of measured parameters when compared to permit limits. Tables 8 and 9 show the treatment efficiency at CLTP in 2012 and 2013. The effluent BOD and TSS concentrations and loadings in 2012 and 2013 are shown in Figures 8 and 9.

Table 6. Effluent Summary, 2012

2012													
Parameter	**Permit Limits**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Flow (MGD)	3.01	3.52	3.56	3.41	3.27	3.23	3.25	3.22	3.16	2.97	2.80	2.65	2.47
Biochemical Oxygen Demand (BOD)													
Concentration (mg/L)	20	5.77	4.88	6.13	4.36	2.18	2.57	2.63	2.20	2.14	2.45	2.56	3.06
Loading (lbs/d)	500	160	117	154	88.2	53.8	71.1	47.0	38.5	28.1	36.8	47.5	56.5
Total Suspended Solids (TSS)													
Concentration (mg/L)	20	5.89	5.60	5.74	4.86	3.71	3.13	2.81	1.97	2.24	2.55	3.22	5.24
Loading (lbs/d)	500	163.6	132.4	142.1	98.0	90.0	86.4	49.5	38.8	29.6	42.5	58.7	96.6
pH													
Minimum	6.5	7.3	7.2	6.9	7.1	6.7	6.7	6.9	6.6	6.9	6.8	7.0	7.0
Maximum	8.3	7.8	7.7	7.7	7.6	7.6	7.5	7.6	7.6	7.7	7.6	7.6	7.6
Dissolved Oxygen (mg/L)	6.0	6.9	7.6	6.2	8.1	8.1	7.5	7.1	6.8	7.4	8.3	9	9.4
Fecal Coliform Bacteria (cfu/100mL)	200	3.8	3.5	3.3	3.2	3.3	3.3	3.6	4.9	3.6	5.8	3.5	3.6
Total Residual Chlorine (ug/L)	50	20	20	20	20	20	20	20	20	20	20	20	20
Copper, Total (ug/L)	20	8.92	7.08	6.95	2.34	5.69	5.55	5.80	5.99	7.70	7.43	7.76	8.41
Ammonia Nitrogen, Total (mg/L)													
April 1 – April 30	10.0	~	~	~	0.03	~	~	~	~	~	~	~	~
May 1 – May 31	5.0	~	~	~	~	0.07	~	~	~	~	~	~	~
June 1 – October 31	2.0	~	~	~	~	~	0.08	0.01	0.00	0.06	0.00	~	~
November 1 – March 31	10.0	0.10	0.00	0.00	~	~	~	~	~	~	~	0.00	0.02
Phosphorus, Total (mg/L)	NA	~	~	1.84	~	~	~	~	~	~	~	~	0.827
May 1 – October 31	1.0	~	~	~	~	0.274	0.168	0.532	0.204	0.209	0.259	~	~

Table 7. Effluent Summary, 2013

2013													
Parameter	**Permit Limits**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Flow (MGD)	3.01	2.38	2.32	2.38	2.39	2.32	2.42	2.47	2.53	2.56	2.55	2.50	2.46
Biochemical Oxygen Demand (BOD)													
Concentration (mg/ L)	20	5.44	4.84	4.48	3.59	3.58	2.59	2.73	2.58	2.21	2.89	4.56	5.23
Loading (lbs/d)	500	101	90.3	138	74.2	66.2	94.8	61.8	55.1	36.3	40.7	61.9	79.2
Total Suspended Solids (TSS)													
Concentration (mg/L)	20	7.69	6.57	4.79	4.23	4.09	3.93	3.17	3.38	2.88	2.88	5.18	6.96
Loading (lbs/d)	500	141.2	122.3	146.3	88.2	75.8	147.1	73.0	79.2	48.6	40.7	70.7	117.9
pH													
Minimum	6.5	7.2	7.2	7.2	7.2	7.3	7.2	7.4	7.3	6.9	7.0	7.0	7.0
Maximum	8.3	7.6	7.5	7.5	7.6	7.7	7.5	7.7	7.6	7.8	7.5	7.5	7.5
Dissolved Oxygen (mg/L)	6.0	9.4	9.7	9.8	8.6	7.1	7.2	6.9	7.1	7.3	6.2	6.1	9.0
Fecal Coliform Bacteria (cfu/100mL)	200	4.7	3.5	3.3	3.3	3.3	3.2	3.8	4.0	3.4	3.2	3.8	3.4
Total Residual Chlorine (ug/L)	50	20	20	20	20	20	20	20	20	20	20	20	20
Copper, Total (ug/L)	20	9.01	9.88	5.63	7.23	6.36	5.84	4.95	6.41	6.66	6.70	5.77	10.0
Ammonia Nitrogen, Total (mg/L)													
April 1 – April 30	10.0	~	~	~	0.00	~	~	~	~	~	~	~	~
May 1 – May 31	5.0	~	~	~	~	0.00	~	~	~	~	~	~	~
June 1 – October 31	2.0	~	~	~	~	~	0.01	0.01	0.03	0.02	0.00	~	~
November 1 – March 31	10.0	0.00	0.00	0.02	~	~	~	~	~	~	~	0.00	0.02
Phosphorus, Total (mg/L)	NA	~	~	0.707	0.692	~	~	~	~	~	~	~	3.30
May 1 – October 31	1.0	~	~	~	~	0.527	0.431	0.386	0.292	0.281	0.246	~	~

Table 8. Treatment Plant Efficiency, 2012

2012			
Parameter	**Influent (mg/L)**	**Effluent (mg/L)**	**Efficiency**
BOD	242	3.42	98.59%
TSS	238	3.94	98.34%

Table 9. Treatment Plant Efficiency, 2013

2013			
Parameter	**Influent (mg/L)**	**Effluent (mg/L)**	**Efficiency**
BOD	252	3.69	98.54%
TSS	218	4.65	97.87%

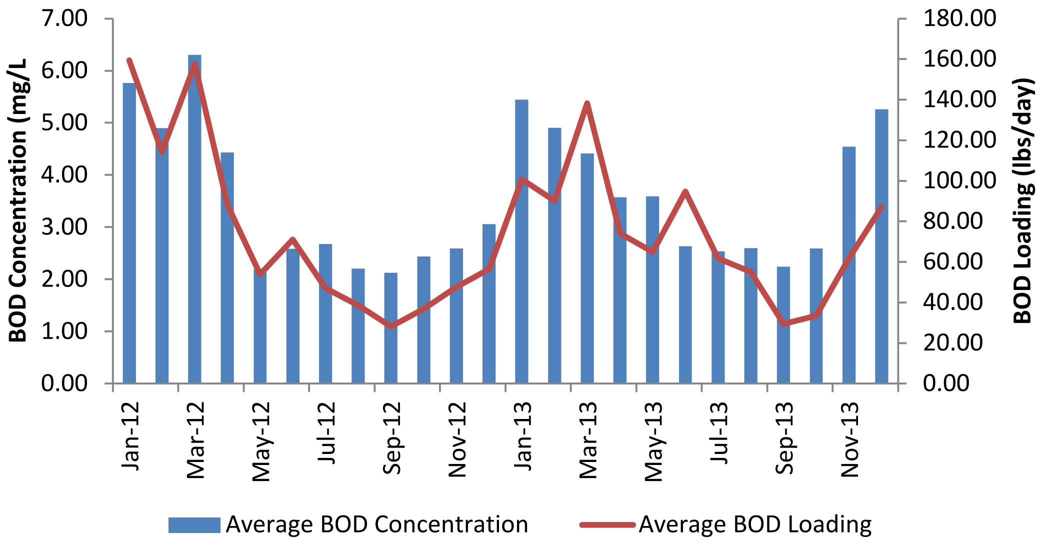

Figure 9. Average Effluent BOD Concentration and Loadings, 2012 and 2013

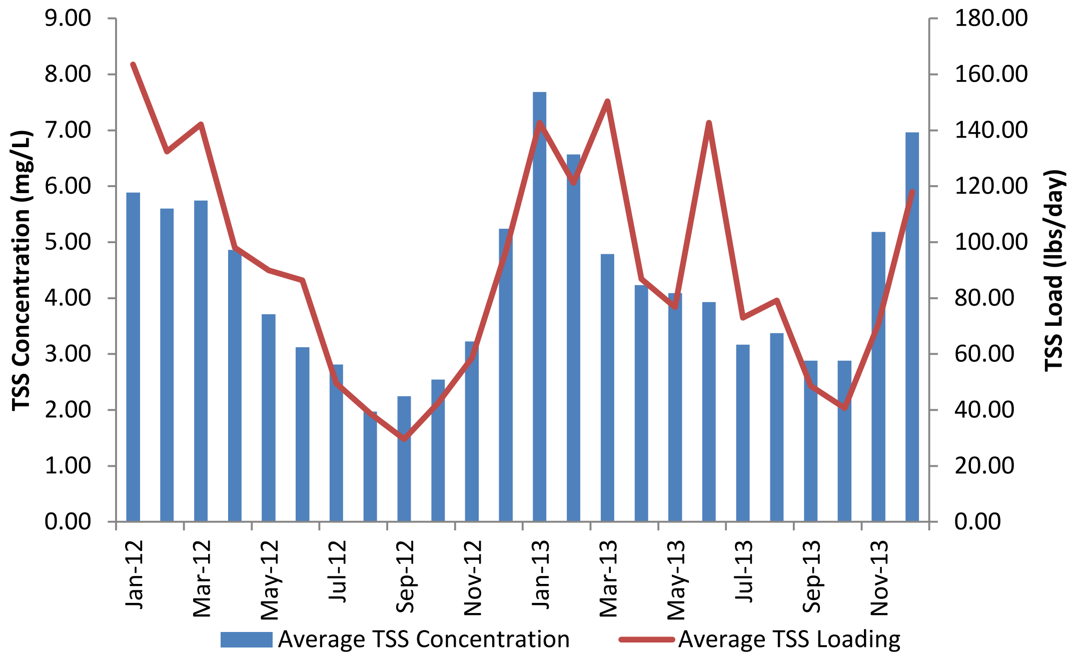

Figure 10. Average Effluent TSS Concentration and Loadings, 2012 and 2013

Effluent Priority Pollutants

While most metals detected in the influent were also detected in the effluent, the removal rates for those metals in 2012 ranged from a high of 98% for aluminum to a low of 56% for nickel. The remaining metals detected in the influent were removed at 97% for lead and mercury, 95% for iron, 93% for zinc, 92% for copper, 81% for chromium, and 67% for arsenic. In 2013, a high of 97% of the aluminum and a low of 48% of the selenium were removed. The remaining metal removal rates varied between 96% for lead, 94% for copper, iron, and zinc, 91% for mercury, 68% for arsenic, 65% for chromium, and 61% for nickel. The 2012 and 2013 effluent metals summaries are given in Tables 10 and 11, and the effluent metals loadings are shown in Figures 10 and 11. The copper loadings are shown on a separate graph because copper is sampled on a different schedule than the rest of the metals. A complete priority pollutant summary can be found in Appendix E.

Table 10. Effluent Metals Summary, 2012

2012													
Metals (ug/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**No. of Detects**
Aluminum	~	~	17	~	~	5.7	~	~	7.8	~	~	20	11 of 12
Antimony	~	~	0.25	~	~	0.25	~	~	10.3	~	~	0.31	0 of 14
Arsenic	~	~	2.63	~	~	0.52	~	~	0.74	~	~	1.21	12 of 12
Beryllium	~	~	0.025	~	~	0.025	~	~	0.031	~	~	0.031	0 of 12
Boron	~	~	125	~	~	125	~	~	125	~	~	125	0 of 12
Cadmium	~	~	0.07	~	~	0.03	~	~	1.5	~	~	0.06	6 of 12
Chromium	~	~	0.82	~	~	0.60	~	~	2.0	~	~	2.0	5 of 12
Copper	8.92	7.08	6.95	2.34	5.69	5.55	5.80	5.99	7.70	7.43	7.76	8.41	25 of 25
Iron	~	~	112	~	~	374	~	~	323	~	~	554	12 of 12
Lead	~	~	0.32	~	~	0.16	~	~	0.24	~	~	0.32	12 of 12
Mercury	~	~	0.005	~	~	0.007	~	~	0.005	~	~	0.005	1 of 12
Molybdenum	~	~	1.29	~	~	1.27	~	~	1.66	~	~	1.18	12 of 12
Nickel	~	~	2.10	~	~	1.94	~	~	2.09	~	~	1.55	11 of 11
Selenium	~	~	0.50	~	~	0.25	~	~	0.31	~	~	0.31	2 of 12
Silver	~	~	0.08	~	~	0.05	~	~	0.16	~	~	0.13	6 of 12
Thallium	~	~	0.03	~	~	0.03	~	~	0.09	~	~	0.03	1 of 12
Zinc	~	~	25.5	~	~	10.6	~	~	14.8	~	~	18.2	12 of 12

Table 11. Effluent Metals Summary, 2013

2013													
Metals (ug/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**No. of Detects**
Aluminum	~	~	16.1	~	~	30.4	~	~	7.77	~	~	17.6	12 of 15
Antimony	~	~	0.313	~	~	12.7	~	~	0.313	~	~	0.531	1 of 15
Arsenic	~	~	1.16	~	~	0.888	~	~	0.564	~	~	3.04	12 of 12
Beryllium	~	~	0.031	~	~	0.141	~	~	0.031	~	~	0.031	0 of 15
Boron	~	~	125	~	~	125	~	~	125	~	~	125	0 of 12
Cadmium	~	~	0.048	~	~	0.887	~	~	0.114	~	~	0.203	6 of 13

Metals (ug/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	No. of Detects
Chromium	~	~	2.0	~	~	2.0	~	~	2.0	~	~	2.0	0 of 12
Copper	9.01	9.88	5.63	7.23	6.36	5.84	4.95	6.41	6.66	6.70	5.77	10.1	26 of 28
Iron	~	~	470	~	~	570	~	~	321	~	~	335	12 of 12
Lead	~	~	0.359	~	~	0.356	~	~	0.184	~	~	0.391	13 of 13
Mercury	~	~	0.013	~	~	0.013	~	~	No Data	~	~	0.013	0 of 9
Molybdenum	~	~	1.29	~	~	4.84	~	~	1.05	~	~	5.80	13 of 16
Nickel	~	~	2.14	~	~	2.38	~	~	1.88	~	~	1.89	12 of 15
Selenium	~	~	0.313	~	~	0.313	~	~	0.313	~	~	0.313	0 of 12
Silver	~	~	0.063	~	~	0.544	~	~	0.063	~	~	0.063	1 of 15
Thallium	~	~	0.042	~	~	.031	~	~	0.031	~	~	0.031	1 of 12
Zinc	~	~	22.0	~	~	16.8	~	~	12.2	~	~	22.3	15 of 15

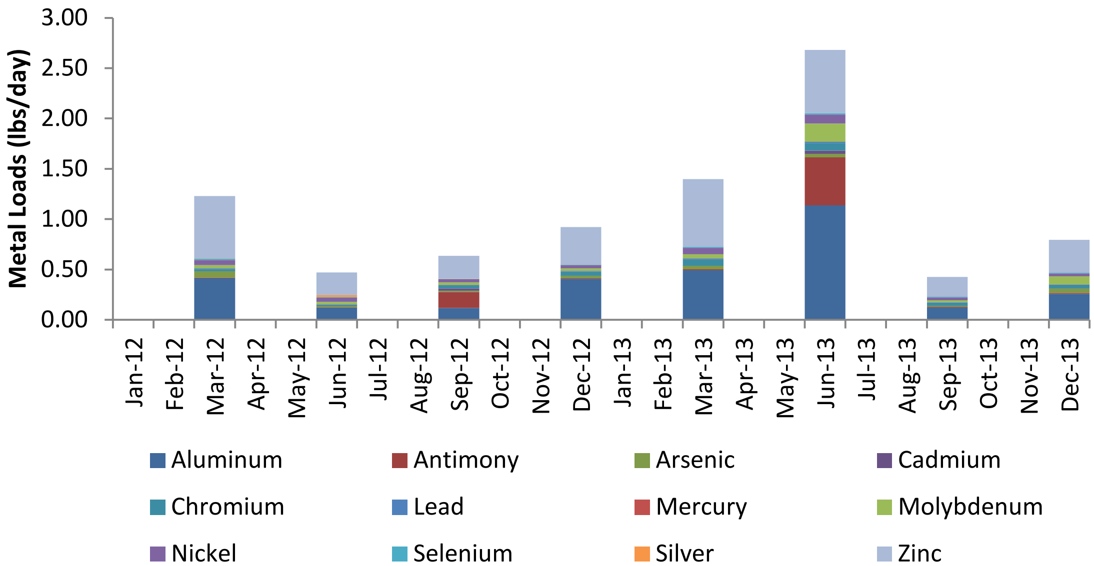

Figure 11. Average Effluent Metals Loadings, 2012 and 2013

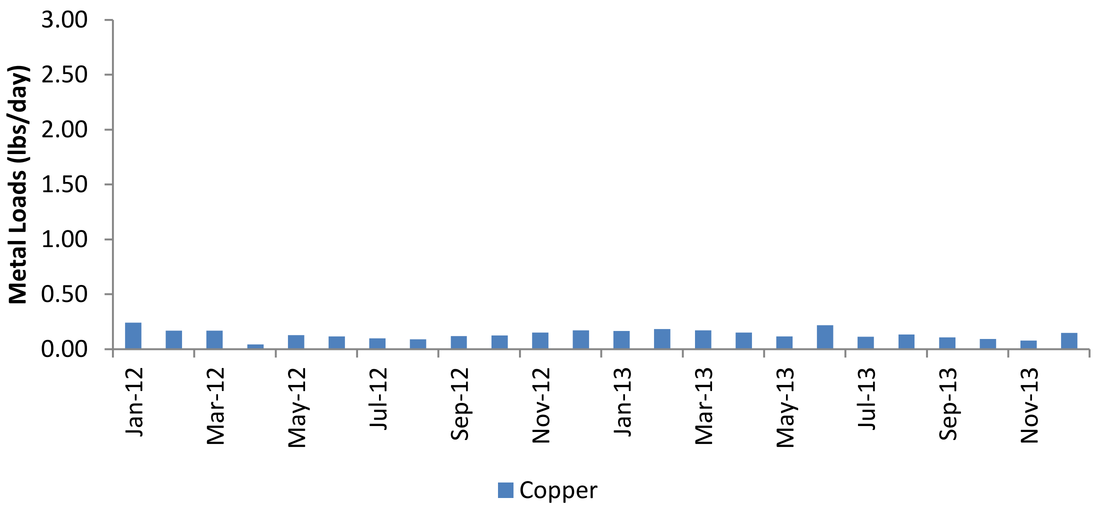

Figure 12. Average Effluent Metals Loadings, Copper, 2012 and 2013

Compliance with Regulatory Limits

Effluent Monitoring

The MWRA submitted monthly effluent sampling records to EPA and the Massachusetts Department of Environmental Protection (MassDEP) in 2012 and 2013 for the following wastewater parameters: biological oxygen demand, 5-day (BOD), total suspended solids (TSS), fecal coliform, total residual chlorine (TRC), total copper, total phosphorus, total ammonia-nitrogen, dissolved oxygen (DO), and pH. Toxicity test results (acute, LC50 and chronic, C-NOEC) were submitted quarterly.

Flow

The flow limit of 3.01 MGD is calculated as a 12-month running average. Although CLTP can treat greater flows and still meet secondary limits, the amount of flow that the plant can discharge is limited to 3.01 MGD because of the very low dilution afforded in the receiving water. The mandated minimum release to the South Branch of the Nashua River from the Wachusett Reservoir is 1.8 MGD, providing for a dilution factor (DF) of 1.6. Figure 12 shows the monthly running averages for flow in 2012 and 2013. As shown, there were eight calculated exceedances of the monthly flow limit in 2012, which were the direct result of wet weather.

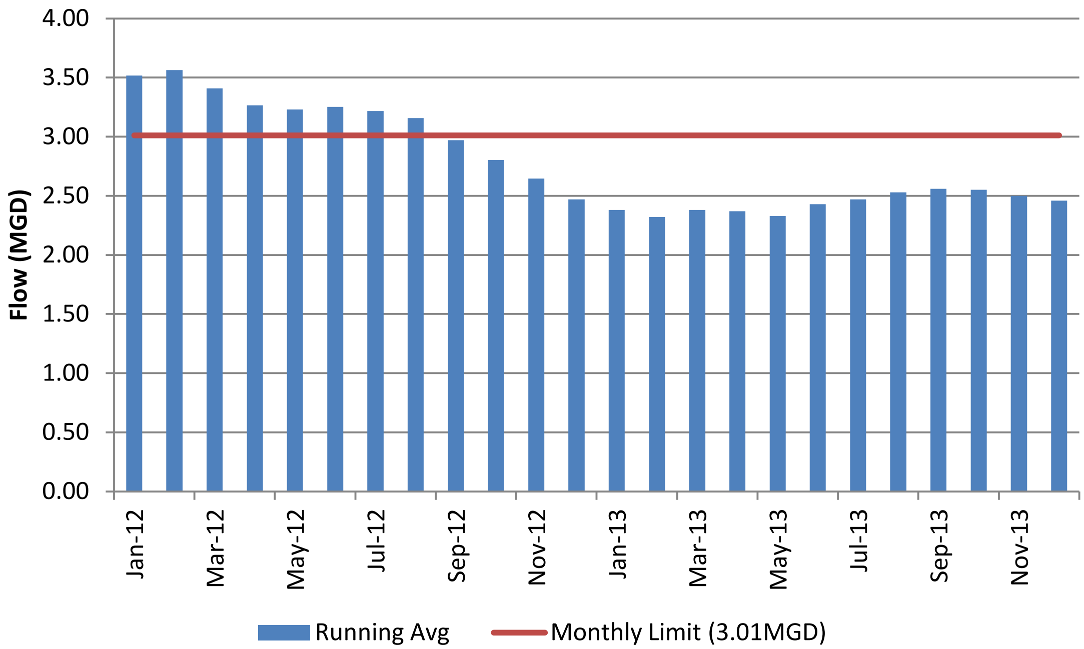

Figure 13. Flow, Running Average, 2012 and 2013

Biochemical Oxygen Demand

The BOD limits were developed by MassDEP in 1987 using a steady-state model and are water quality based. The limits include a monthly average concentration of 20 mg/L, a weekly average concentration of 20 mg/L, and a monthly average loading rate of 500 lbs/day. Figures 13, 14 and 15 depict the average monthly concentration, the weekly concentration, and the monthly loading rates respectively. There were no violations of the BOD limits in 2012 or 2013.

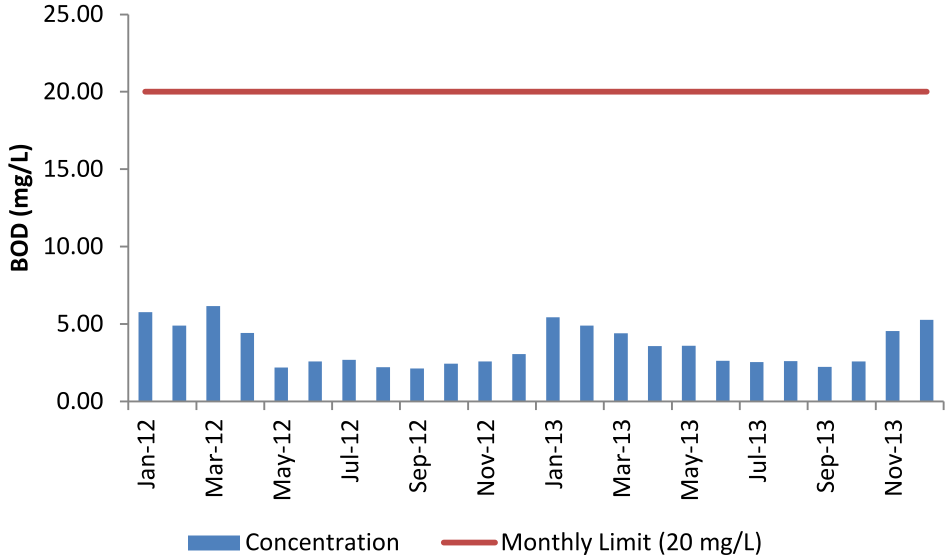

Figure 14. BOD Monthly Average Concentration, 2012 and 2013

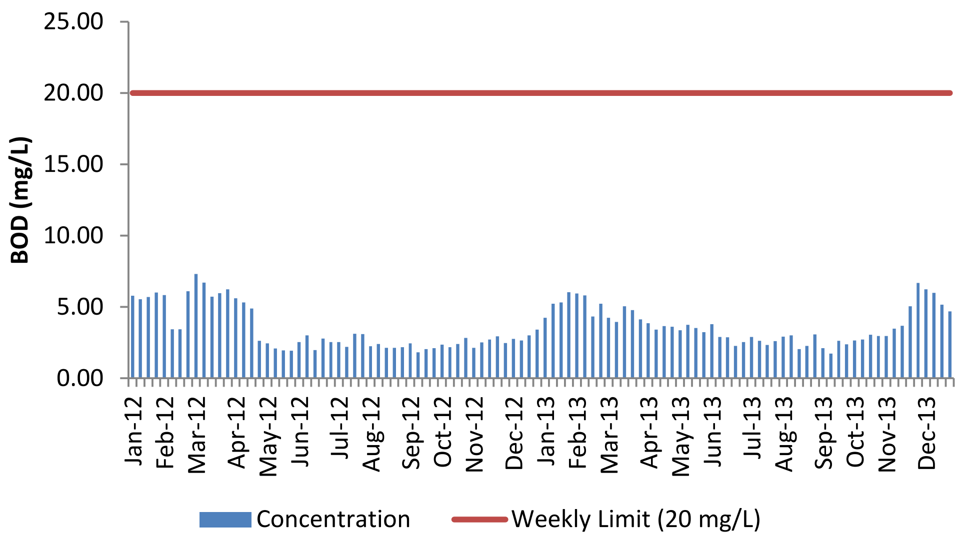

Figure 15. BOD Weekly Average Concentration, 2012 and 2013

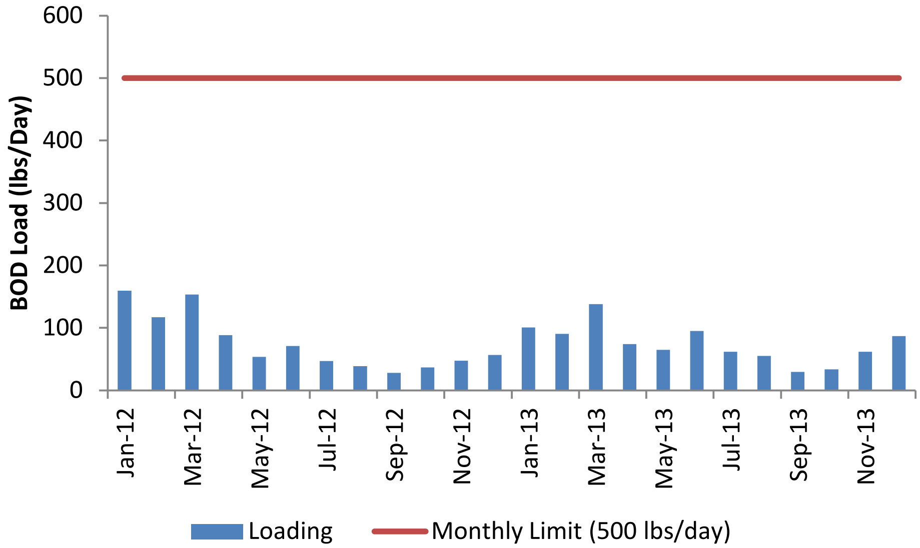

Figure 16. BOD Average Loadings, 2012 and 2013

Total Suspended Solids

In a manner similar to the BOD limits, the TSS limits were developed by MassDEP and are water quality based. The TSS limits include a monthly average of 20 mg/L, a weekly average of 20 mg/L, and a monthly average loading rate of 500 lbs/day. Figures 16, 17, and 18 depict the average monthly concentration, the average weekly concentration, and the average monthly loading rates respectively. There were no violations of the TSS limits in 2012 or 2013.

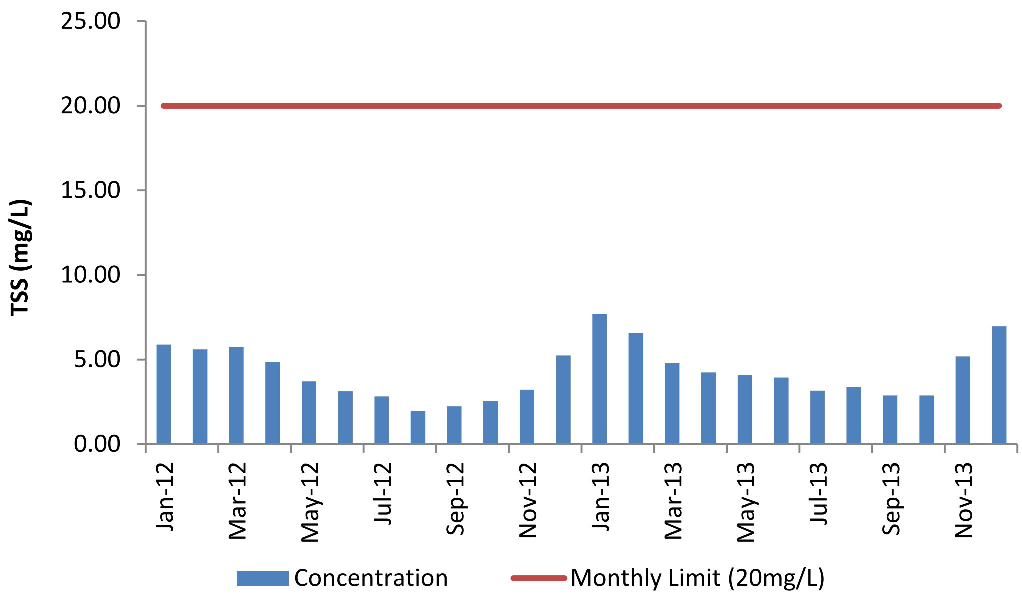

Figure 17. TSS Monthly Average Concentration, 2012 and 2013

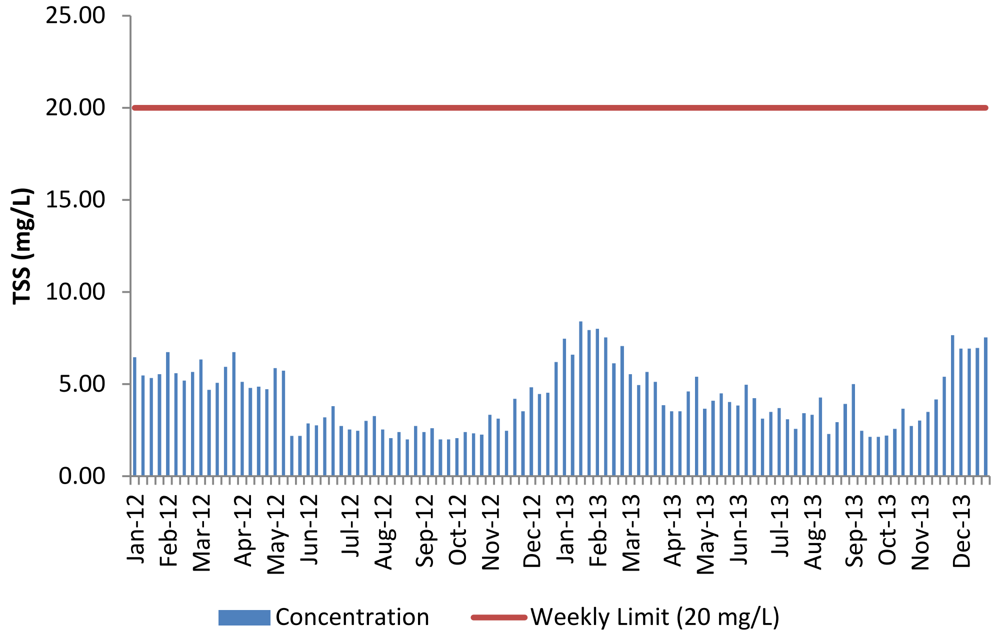

Figure 18. TSS Weekly Average Concentration, 2012 and 2013

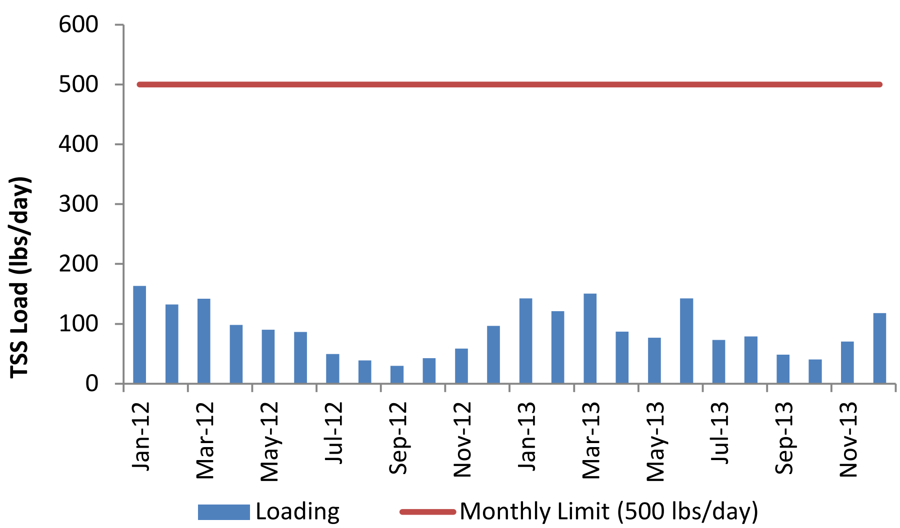

Figure 19. Average Monthly TSS Loadings, 2012 and 2013

Dissolved Oxygen

The monthly permit limit for dissolved oxygen (DO) is a minimum of 6.0 mg/L. The monthly DO readings in 2012 and 2013 are displayed in Figure 19. There were no violations of the DO limit.

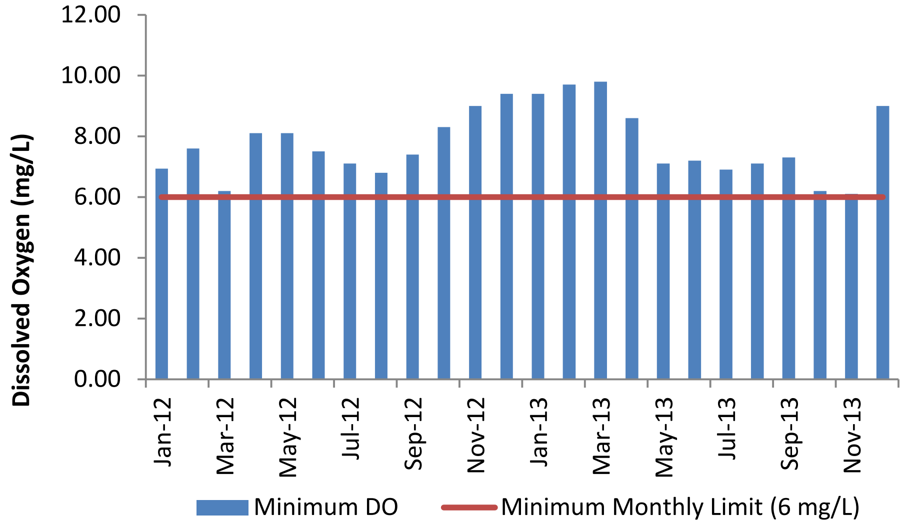

Figure 20. Dissolved Oxygen, 2012 and 2013

pH

The pH limitations required by water quality standards state that the effluent shall not measure less than 6.5 standard units nor greater than 8.3 standard units at any time, unless these limits are exceeded due to natural causes or as a result of the approved treatment processes. There were no violations of the pH limits in 2012 or 2013. pH values are shown in Figure 20.

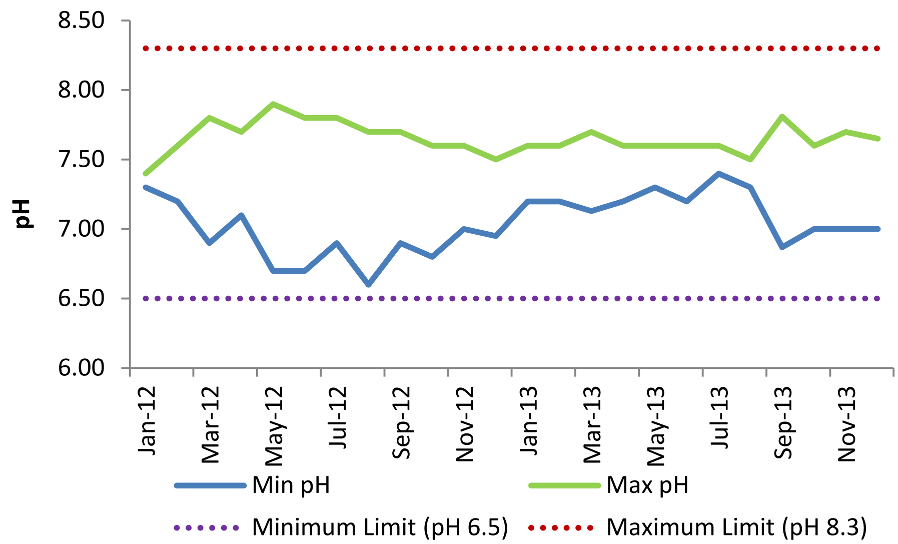

Figure 21. pH, 2012 and 2013

Fecal Coliform

Fecal coliform limits are based on water quality standards. EPA has revised the fecal coliform limits since the NPDES permit was issued in 2000; however, the original permit conditions continue to be enforced. The fecal coliform limits include a monthly average of 200 cfu/100mL and a daily maximum of 400 cfu/100mL. The monthly average and daily maximum results in 2012 and 2013 are displayed in Figures 21 and 22 (Note: The graphs are displayed on a logarithmic scale) respectively. There were no violations of the fecal coliform limits.

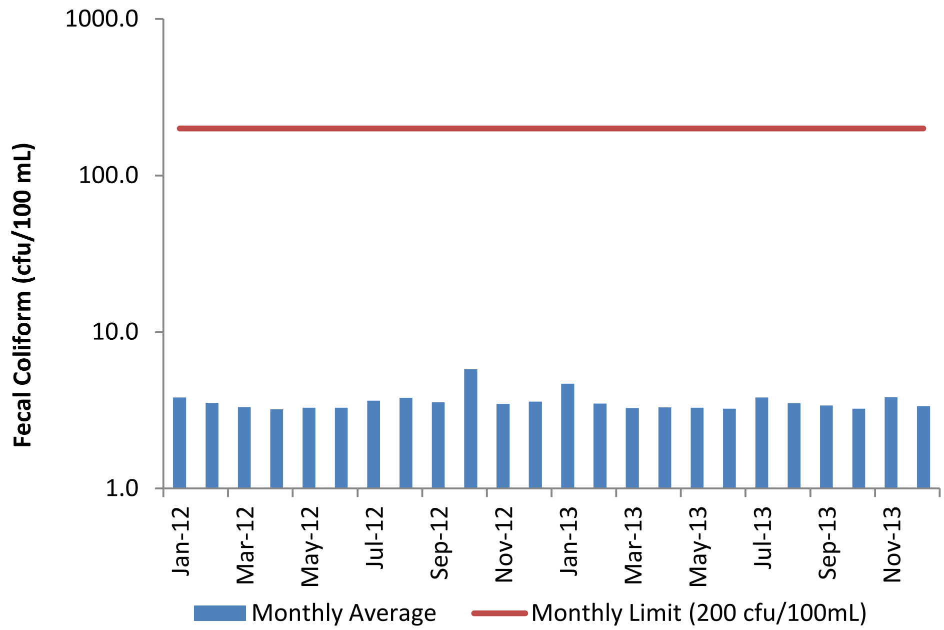

Figure 22. Bacteria, Monthly Average, 2012 and 2013

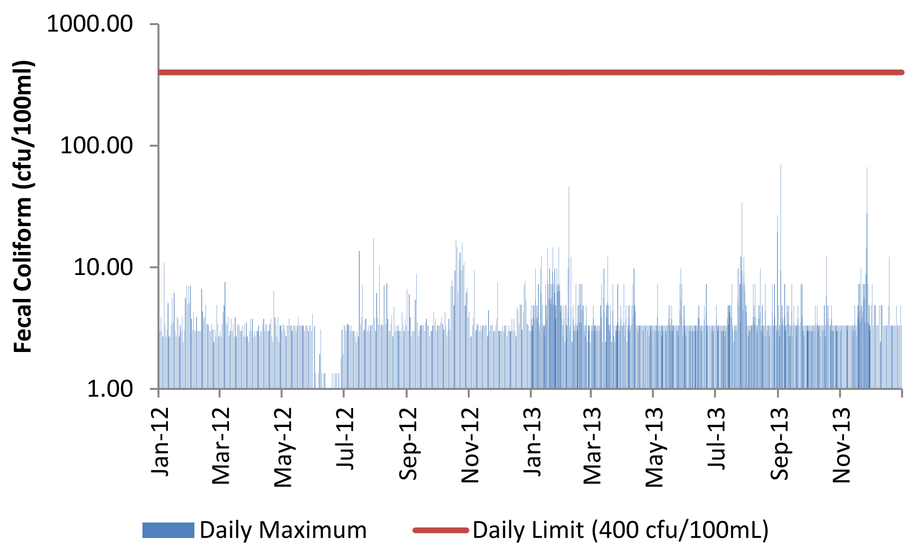

Figure 23. Bacteria, Daily Maximum, 2012 and 2013

Total Chlorine Residual

Limits for total chlorine residual (TCR) are provided in the EPA Gold Book and are water quality based. They are 19 ug/L and 11 ug/L for acute and chronic water quality respectively. Adjusted for the established CLTP DF of 1.6, the true acute and chronic water quality limits are 30.4 ug/L and 17.6 ug/L respectively. However, because the minimum detection level for chlorine residual using EPA-approved Methods 4500 CL-E and 4500 CL-G is 50 ug/L, the TCR permit limit is 50 ug/L by default. There were no violations of the TCR limits in 2012 or 2013. The monthly average and daily maximum TCR values are included in Figures 23 and 24 respectively.

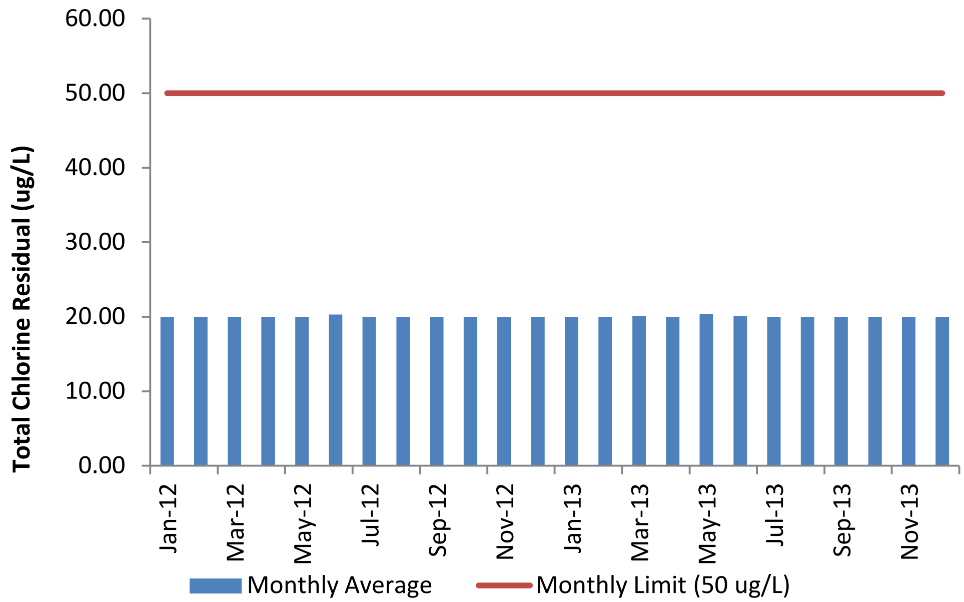

Figure 24. TCR, Monthly Average, 2012 and 2013

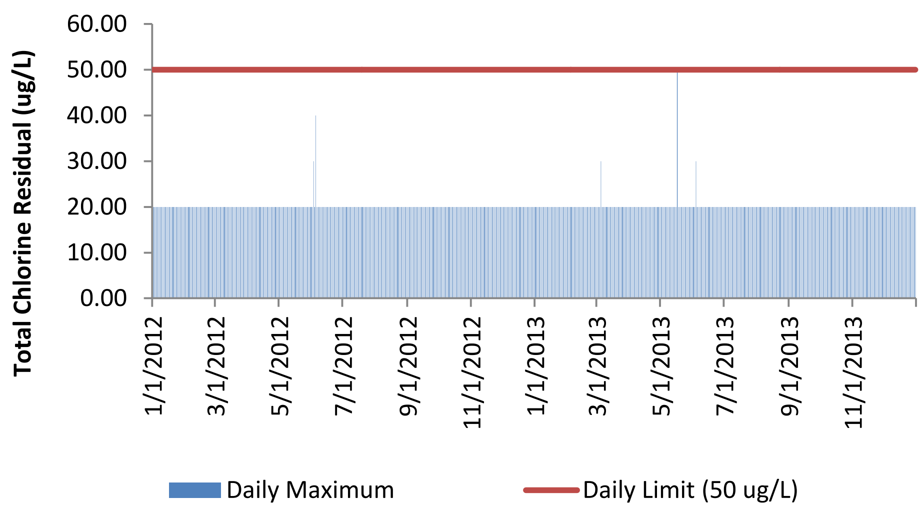

Figure 25. TCR Daily Maximum, 2012 and 2013

Ammonia-Nitrogen

Ammonia-nitrogen limits are water-quality based. To account for the varying impacts on receiving water at different times of the year, the permit includes seasonal ammonia-nitrogen limits. From November 1 to March 31, the monthly average is limited to 10 mg/L and the daily maximum is limited to 35.2 mg/L. In April and May, the monthly average limits are 10 mg/L and 5.0 mg/L respectively. Neither month has a daily maximum limit, but the maximum value in these months must be reported. Between June 1 and October 31, the average monthly limit is 2.0 mg/L and the daily maximum limit is 3.0 mg/L. There were no ammonia-nitrogen violations in 2012 or 2013. The monthly average and daily maximum ammonia-nitrogen values are shown in Figures 25 and 26 respectively.

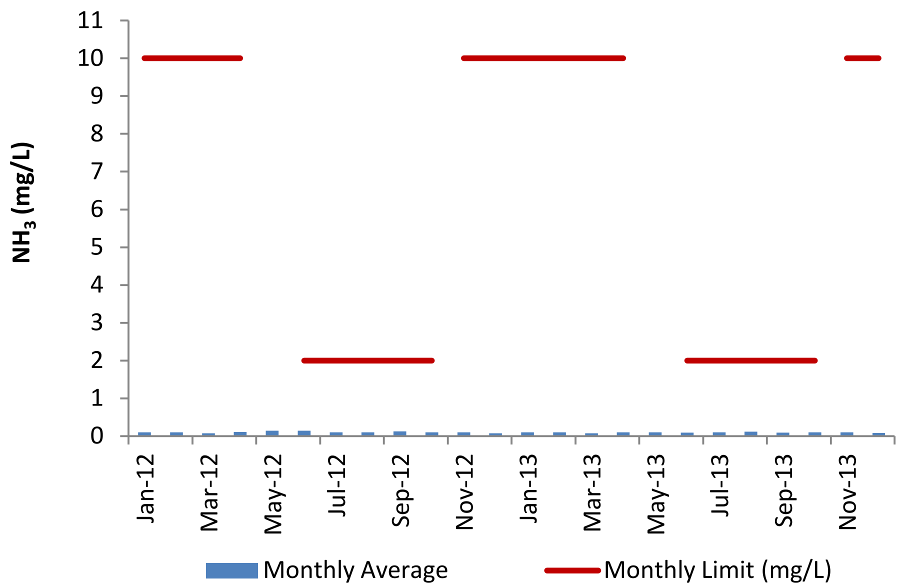

Figure 26. Ammonia-Nitrogen, Monthly Average, 2012 and 2013

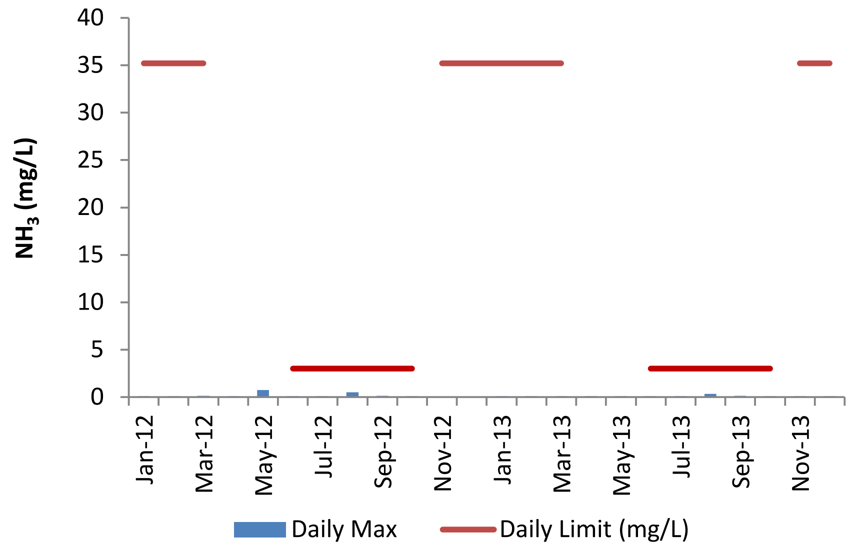

Figure 27. Ammonia-Nitrogen, Daily Maximum, 2012 and 2013

Phosphorus

The phosphorus permit limit is based on EPA's "Ecoregional Nutrient Criteria," which were established in part to reduce problems associated with excess nutrients that could cause eutrophication in water bodies. The phosphorus limit for CLTP, 1.0 mg/L, is applicable only from May through October. The monthly averages in 2012 and 2013 for phosphorus are shown in Figure 27. Samples were collected and analyzed quarterly as part of the Local Limits program. Samples were also collected prior to and throughout the growing season. There were no permit violations.

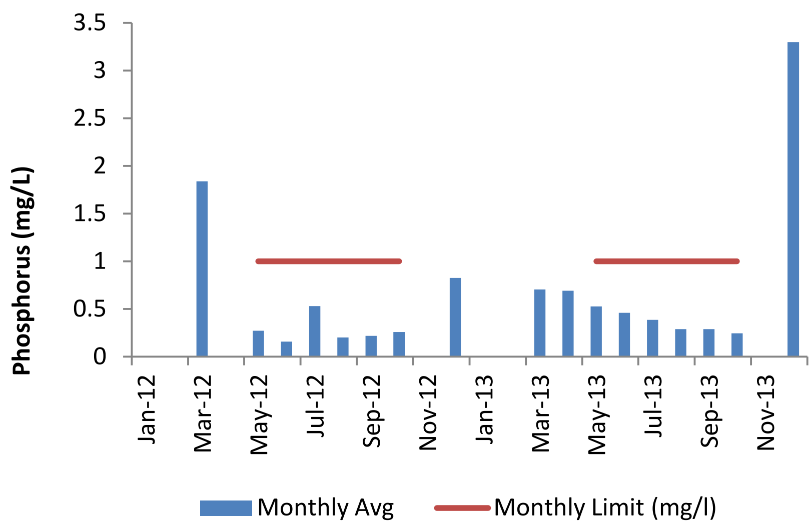

Figure 28. Phosphorus, Monthly Average, 2012 and 2013

Copper

The copper limits include a monthly average of 6.2 ug/L and a daily maximum of 8.3 ug/L. Until 2002, copper in the effluent consistently violated permit limits. On September 30, 2002, EPA issued an administrative order (AO) which specified an interim copper limit of 20 ug/L for both the monthly average and daily maximum limits. The monthly average and daily maximum copper concentrations in the effluent have been well below the interim limit since the AO. In January 2007, MassDEP issued site-specific water quality criteria for copper of 25.7 ug/L (acute) and 18.1 ug/L (chronic). EPA approved the change in 2008 and CLTP met these criteria in 2012 and 2013. The monthly average and daily maximum values for copper are given in Figures 28 and 29 respectively.

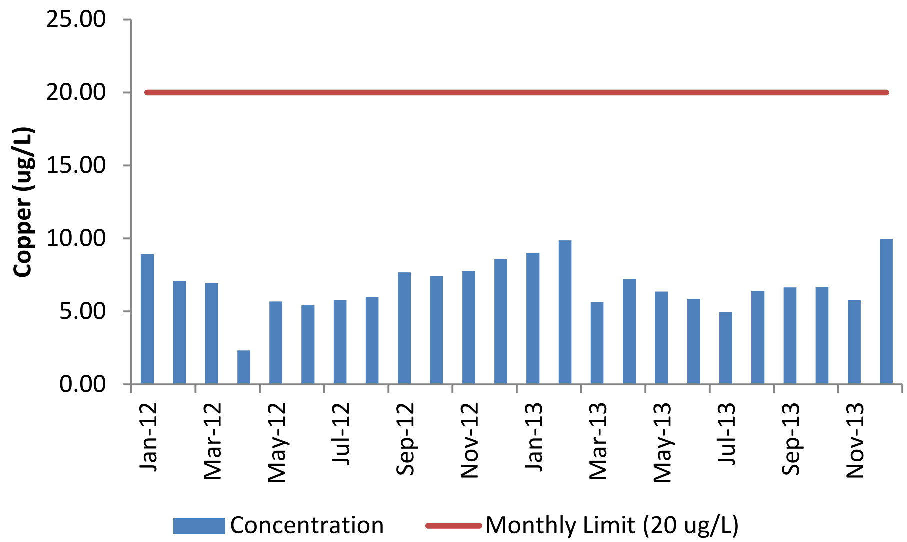

Figure 29. Copper, Monthly Average, 2012 and 2013

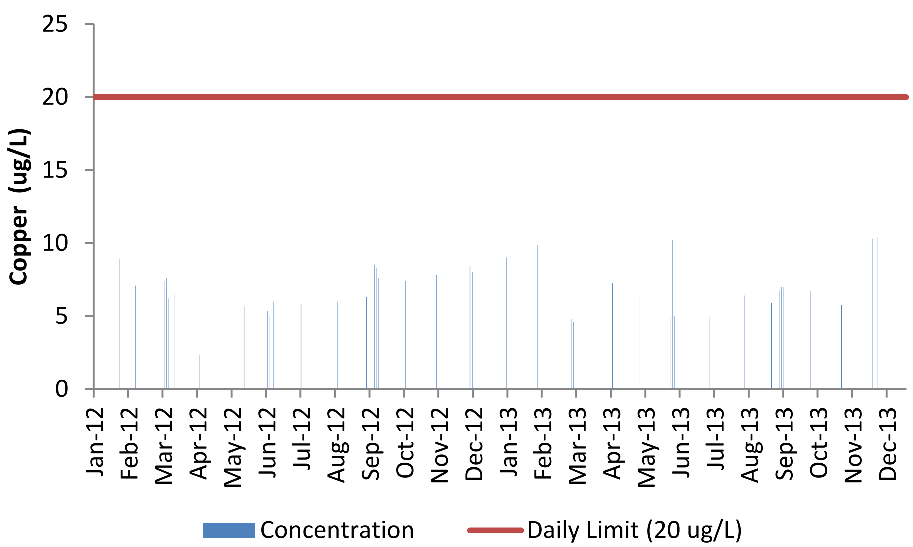

Figure 30. Copper, Daily Maximum, 2012 and 2013

Whole Effluent Toxicity

WET tests measure the effect of wastewater on specific test organisms' ability to survive, grow, and reproduce in receiving waters. WET test methods consist of exposing living aquatic organisms to various concentrations of effluent stream.

The CLTP permit requires two tests for effluent toxicity using freshwater daphnid shrimp (*Ceriodaphnia dubia*). The first, a 48-hour acute toxicity test, measures potential short-term lethal effects. The second is a chronic survival and reproduction test that measures subtle toxic impacts over a longer period of time. The results of the acute test are called the LC_{50} or the concentration of effluent that causes mortality to 50% of the test organisms. The results of the chronic test are called the C-NOEC representing the highest concentration of effluent to which organisms are exposed which causes no adverse effect on growth, survival or reproduction. The results of toxicity testing in 2012 and 2013 are shown in Tables 12 and 13 respectively. As shown, there was one violation of the C-NOEC limit in December 2013, likely caused by lower flows and an increased copper concentration in the effluent.

Table 12. Results of Whole Effluent Toxicity Testing, 2012

	LC_{50}	NOEC
Limit	100% (minimum)	62.50% (minimum)
12-Mar	>100%	100%
12-Jun	>100%	100%
12-Sep	>100%	100%
12-Dec	>100%	100%

Table 13. Results of Whole Effluent Toxicity Testing, 2013

	LC_{50}	NOEC
Limit	100% (minimum)	62.50% (minimum)
13-Mar	>100%	100%
13-Jun	>100%	100%
13-Sep	>100%	100%
13-Dec	>100%	12.5%

Effluent Quality Compared to Water Quality Criteria (Metals)

Tables 14, 15, 16, and 17 compare effluent metal concentrations for both acute and chronic water quality criteria in 2012 and 2013. The established DF of 1.6 was used to determine the true acute and chronic water quality values for each metal. Bold and highlighted numbers indicate samples that exceeded the corresponding water quality criteria; only copper exceeded the acute and chronic water quality criteria on several occasions. However, as previously described, these are not permit violations.

Table 14. Comparison of Treatment Plant Effluent with Acute Water Quality Criteria, 2012

2012													
Parameter	**Acute Criterion (ug/L)**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Aluminum	750	~	~	13.00	~	~	5.18	~	~	5.60	~	~	17.13
Arsenic	340	~	~	1.68	~	~	0.38	~	~	0.51	~	~	0.76
Cadmium	1.38	~	~	0.05	~	~	0.03	~	~	2.63	~	~	0.08
Chromium	763	~	~	0.54	~	~	0.51	~	~	1.25	~	~	1.25
Copper	5.21	**5.58**	4.43	4.76	1.46	3.56	3.42	3.63	3.74	**5.30**	4.64	4.85	**5.50**
Cyanide	22	~	~	3.13	~	~	3.13	~	~	3.13	~	~	3.13
Lead	21.5	~	~	0.24	~	~	0.11	~	~	0.16	~	~	0.23
Mercury	1.6	~	~	0.00	~	~	0.01	~	~	0.00	~	~	0.00
Nickel	193	~	~	1.48	~	~	1.23	~	~	1.34	~	~	1.02
Silver	0.67	~	~	0.09	~	~	0.03	~	~	0.11	~	~	0.11
Zinc	49.2	~	~	17.13	~	~	7.31	~	~	10.13	~	~	11.63

Table 15. Comparison of Treatment Plant Effluent with Acute Water Quality Criteria, 2013

2013													
Parameter	**Acute Criterion (ug/L)**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Aluminum	750	~	~	10.38	~	~	28.13	~	~	5.76	~	~	12.44
Arsenic	340	~	~	0.87	~	~	0.72	~	~	0.40	~	~	2.04
Cadmium	1.38	~	~	0.05	~	~	**1.68**	~	~	0.17	~	~	0.22
Chromium	763	~	~	1.25	~	~	1.25	~	~	1.25	~	~	1.25
Copper	5.21	**5.63**	**6.18**	4.73	4.52	3.98	**6.38**	3.09	4.01	4.37	4.19	3.61	**6.50**
Cyanide	22	~	~	3.13	~	~	3.13	~	~	3.13	~	~	3.13
Lead	21.5	~	~	0.25	~	~	0.28	~	~	0.12	~	~	0.28
Mercury	1.6	~	~	0.01	~	~	0.01	~	~		~	~	0.01

Parameter	Acute Criterion (ug/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Nickel	193	~	~	1.48	~	~	1.62	~	~	1.23	~	~	1.26
Silver	0.67	~	~	0.04	~	~	0.63	~	~	0.04	~	~	0.04
Zinc	49.2	~	~	14.19	~	~	12.38	~	~	8.06	~	~	14.25

Table 16. Comparison of Treatment Plant Effluent with Chronic Water Quality Criteria, 2012

2012													
Parameter	**Chronic Criterion (ug/L)**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Aluminum	87	~	~	10.63	~	~	3.56	~	~	4.88	~	~	12.50
Arsenic	150	~	~	1.64	~	~	0.33	~	~	0.46	~	~	0.76
Cadmium	1.08	~	~	0.04	~	~	0.02	~	~	0.94	~	~	0.04
Chromium	36.5	~	~	0.51	~	~	0.38	~	~	1.25	~	~	1.25
Copper	3.81	**5.58**	**4.43**	**4.34**	1.46	3.56	3.47	3.63	3.74	**4.81**	**4.64**	**4.85**	**5.26**
Cyanide	5.2	~	~	3.13	~	~	3.13	~	~	3.13	~	~	3.13
Lead	0.836	~	~	0.20	~	~	0.10	~	~	0.15	~	~	0.20
Mercury	0.910	~	~	0.00	~	~	0.00	~	~	0.00	~	~	0.00
Nickel	21.5	~	~	1.31	~	~	1.21	~	~	1.31	~	~	0.97
Silver	A	~	~	0.05	~	~	0.03	~	~	0.10	~	~	0.08
Zinc	49.2	~	~	15.94	~	~	6.63	~	~	9.25	~	~	11.38

A – No applicable criteria

Table 17. Comparison of Treatment Plant Effluent with Chronic Water Quality Criteria, 2013

2013													
Parameter	**Chronic Criterion (ug/L)**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Aluminum	87	~	~	10.06	~	~	19.00	~	~	4.86	~	~	11.00

Parameter	Chronic Criterion (ug/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Arsenic	150	~	~	0.73	~	~	0.57	~	~	0.35	~	~	1.90
Cadmium	1.08	~	~	0.03	~	~	0.57	~	~	0.07	~	~	0.13
Chromium	36.5	~	~	1.25	~	~	1.25	~	~	1.25	~	~	1.25
Copper	3.81	**5.63**	**6.18**	3.52	**4.52**	**3.98**	3.66	3.09	**4.01**	**4.16**	**4.19**	3.61	**6.31**
Cyanide	5.2	~	~	3.13	~	~	3.13	~	~	3.13	~	~	3.13
Lead	0.836	~	~	0.22	~	~	0.22	~	~	0.12	~	~	0.24
Mercury	0.910	~	~	0.01	~	~	0.01	~	~		~	~	0.01
Nickel	21.5	~	~	1.34	~	~	1.49	~	~	1.18	~	~	1.18
Silver	A	~	~	0.04	~	~	0.34	~	~	0.04	~	~	0.04
Zinc	49.2	~	~	13.75	~	~	10.50	~	~	7.63	~	~	13.94

A – No applicable criteria

Historical NPDES Violations

Table 18 displays the historical NPDES permit limit violations from 2010 to 2013. The majority of the violations were due to the exceedances of the 12-month running average flow limit of 3.01 MGD. There is no immediate explanation to the DO violation, as the plant performed normally at the time, and there was no process upset. Although staff considered the result suspect, it was reported as a violation on the Discharge Monitoring Report. The NOEC violation is likely the result of lower flows at the plant and a consequently increased copper concentration in the effluent.

Table 18. NPDES Violations at the Clinton Plant, 2010-2013

	2010	2011	2012	2013
Flow	12	3	10	0
BOD_5				
Weekly Average	0	0	0	0
Monthly Average	0	0	0	0
TSS				
Weekly Average	0	0	0	0
Monthly Average	0	0	0	0
pH	0	0	0	0
Dissolved Oxygen	0	1	0	0
Fecal Coliform Bacteria				
Monthly Average	0	0	0	0
Daily Maximum	0	0	0	0
Total Residual Chlorine				
Monthly Average	0	0	0	0
Daily Maximum	0	0	0	0
Total Ammonia Nitrogen, as N	0	0	0	0
Copper				
Monthly Average	0	0	0	0
Daily Maximum	0	0	0	0
Phosphorus	0	0	0	0
LC_{50} (Acute Toxicity)	0	0	0	0
NOEC (Chronic Toxicity)	0	0	0	1
Total Violations	12	4	10	1

Miscellaneous Reporting Requirements

Disinfection Effectiveness

Disinfection at CLTP occurs in two hypochlorite contact tanks, each measuring 100-feet long by 6-feet wide by 14-feet deep. Dechlorination takes place at the overflow cascade of the chlorine contact chamber. Sodium bisulfite is added by injectors into the effluent stream to remove chlorine residual before it mixes with the receiving water. The effluent is discharged through a Parshall flume and a multistep cascade to the South Branch of the Nashua River via a 24-inch outfall.

The permit requires a report documenting the effectiveness of the chlorination and dechlorination system. This report (MWRA, 2001)[2] addresses how flow variability and chlorine demand variability affect compliance with the TCR and fecal coliform limits. The report also includes a description of the system and the method of dosage control.

In addition, the permit requires a summary of violations of the TCR and fecal coliform effluent limits, the estimated or measured fecal coliform and chlorine discharge levels during the violation, and measures taken to fix the problem and to prevent future violations of this kind. This summary is submitted annually by November 30.

Sludge Processing

Primary and secondary sludge is pumped to two 50-foot diameter gravity sludge thickeners. The residuals are then transferred to two 40-foot diameter anaerobic sludge digesters that are operated in series. The primary tank has a fixed cover, while the secondary tank has a floating cover designed to contain gas. Digested sludge is transferred to a 60-foot diameter sludge holding tank before beginning a dewatering process that uses two belt filter presses.

Dewatered sludge is trucked to an MWRA-owned and operated residuals landfill located in the town of Clinton. The sludge landfill is double-lined and includes a leachate collection system that pumps to the town of Clinton sewer system. Soil cover is applied to the sludge following each delivery to meet the vector attraction reduction requirement stipulated in 40 CFR 503.33(b)(11). The permit requires certification that this requirement is being met; the report is due annually by February 19.

Infiltration/Inflow

The MWRA submits an annual wastewater flow report to EPA and MassDEP as required by the permit. The report provides an analysis of infiltration and inflow (I/I) trends. Each permittee (the MWRA, the town of Clinton, and the Lancaster Sewer District) is required to eliminate excessive I/I to the sewer collection system it owns.

---

2 MWRA, 2001. Chlorination System Report: Clinton Treatment Plant, Enquad ms 068, February 22, 2001)

The MWRA owned interceptor, approximately a mile long, is in very good condition. An internal inspection conducted in December 2010 showed minimal infiltration and no significant defects. MWRA field operation staff continue to inspect the interceptor periodically and to perform routine maintenance on the interceptor and associated manholes.

Analysis of CLTP influent wastewater flow (from the annual wastewater flow reports for CY09-13) estimates Clinton and Lancaster Sewer District sanitary flows at approximately 1.6 MGD, with groundwater infiltration ranging from approximately 0.1 MGD in low groundwater to 1.4 MGD in high (spring) groundwater and with stormwater inflow (from a 1.7-inch MassDEP design storm) estimated at approximately 1.4 MGD. Influent wastewater flow to CLTP is significantly affected by I/I entering the local collection systems during high groundwater conditions. MassDEP (via Administrative Consent Orders) currently requires developers proposing to add new sanitary flows in the town of Clinton and the Lancaster Sewer District to offset the proposed new sanitary flows by removing twice the volume of I/I from the local sewer system.

Local Limits and Industrial Pretreatment

These two related programs deal exclusively with non-domestic users, which are primarily industrial. Under the Local Limits program, the MWRA develops and enforces specific limits on discharges from industrial users to the sewer system. The industrial pretreatment program requires the MWRA to inspect and sample industrial users as specified by 40 CFR 403, a source reduction program limiting the amount of pollutants going to the treatment plant.

Both programs result in a cleaner influent, which reduces stress to the plant, improves the efficiency of the treatment processes, and reduces “pass through” of contaminants to the receiving water. An annual report describing the pretreatment activities in the monitoring year is submitted to the regulatory agencies each October.

NPDES Stormwater Multisector General Permit

On January 5, 2009, CLTP submitted a Notice of Intent (NOI) for coverage under the Stormwater Multisector General Permit. CLTP obtained coverage on March 8, 2009. However, subsequent inspections of the facility revealed that there were no processes or material storage facilities exposed to rain. On June 1, 2009, CLTP submitted a Notice of Termination (NOT) of coverage. Although not required, the *Best Management Practices/Stormwater Pollution Prevention Plan* (BMP/SWPPP) was prepared to ensure that the requirements in the General Permit are being met even if there is no discharge of contaminated stormwater runoff to a receiving body of water.

The Clinton Landfill did not require any stormwater coverage in 2012 or 2013 because all of the stormwater collected at the disposal cells was pumped back to the sewer for treatment at CLTP.

Spill Prevention Control and Countermeasure Plan

The amount of oil stored at CLTP is below the regulatory threshold of 1,320 gallons of aboveground storage and/or 42,000 gallons of underground storage that triggers the requirement for a Spill Prevention Control and Countermeasure Plan (SPCC). However, best management practices are employed in handling the delivery, storage, and disposal of oil. SPCC compliance is incorporated in the BMP/SWPPP Plan.

Nashua River Sampling

Flow in the South Branch of the Nashua River depends largely on effluent flow from CLTP and releases from Wachusett Reservoir. Both of these flows are regulated under Massachusetts law. The annual running average flow from the treatment plant may be no more than 3.01 MGD, while flow from the reservoir may be no less than 1.8 MGD. Dilution in the river is sufficient to ensure ambient levels of measured pollutants upstream differ only slightly from levels measured at the plant's outfall. More stringent limits on pollutants in the receiving water in the future would require changes either to the plant's treatment capacity or to the flow from the reservoir.

A sampling program was conducted upstream of the discharge outfall pipe in 2003. Results showed low concentration of metals and three organic compounds present in the water. Limited sampling conducted downstream of the discharge showed a very low concentration of ammonia as well. In 2008 and 2009, metals and some conventional parameters were measured upstream, while copper, ammonia and some conventional parameters were also measured downstream. Since 2010, samples have only been taken upstream for analysis of metals, nutrients, and some conventional parameters. The South Nashua River water quality results are presented in Appendix F.

Draft Permit

Since the current permit expired in September 2005, it has been administratively enforced. The MWRA submitted a permit renewal application in May 2005. A new draft permit was issued for CLTP in September 2010. Following the end of the public comment period, EPA revised portions of the 2010 draft permit and reissued a partially revised draft permit in September 2013. There are several permit issues facing CLTP under the draft permit including:

Co-Permittees. In the revised NPDES permit for CLTP, EPA has included more extensive requirements for the MWRA, the town of Clinton, and Lancaster Sewer District. These requirements could impose a substantial financial burden on both the communities and the MWRA. MWRA previously objected to the inclusion of the Town of Clinton and the Lancaster Sewer District as co-permittees in the 2010 draft Clinton Plant NPDES permit, and has done so again for the 2013 draft permit.

Phosphorus. The draft permit requires more stringent phosphorus limits year-round than the current phosphorus removal treatment cannot meet. The most significant issue for the plant is the construction of a phosphorus treatment facility to meet these new limits. The MWRA has completed the conceptual design for this facility. Under the revised 2013 draft permit, plans and specifications for the facility are to be completed 12 months from the effective date of the permit. Construction is to start 24 months from the effective date and be completed 48 months from the effective date.

Flow. Flow remains a problematic issue at CLTP. Although the plant can treat up to 6 MGD, the plant is limited to a discharge of 3.01 MGD, calculated as a 12-month running average. The flow is limited due to the available dilution of the receiving water. CLTP consistently exceeds this flow limit during wet weather. The MWRA believes EPA should increase the permit effluent limit to 3.65 MGD as a running annual average or calculate a limit (based on historical data) that the MWRA can meet during wet weather which accounts for the higher base flows in the river during those periods.

Copper. The average monthly copper limit in the draft permit is 9.5 ug/L. The MWRA believes that the monthly limitation should be 11.59 ug/L and that there is an error in EPA's calculation. The draft monthly limitation is unduly conservative and would be exceeded almost 20% of the time, even though the chronic water quality criterion of 18.1 ug/L is being met.

Aluminum. In May 2011, the coagulant used in phosphorus removal was changed from aluminum sulfate to ferric chloride. A reevaluation of the need for an aluminum effluent limit by EPA found no reasonable potential for effluent aluminum to cause a violation of water quality standards. Since aluminum sulfate will not be used in the treatment process, the potential to exceed the criterion is no longer an issue. The MWRA believes the monitoring requirement should be removed from the permit, or at a minimum, reduced to once per week, consistent with the monitoring frequency for copper, which also meets water quality standards.

Appendix A. Clinton Wastewater Treatment Plant Overview

Overview

The CLTP provides advanced sewage treatment services to the Town of Clinton and a portion of the Town of Lancaster – the Lancaster Sewer District. Since assuming formal operational responsibility for the plant in 1987, MWRA has designed and constructed new primary and secondary treatment facilities that incorporate rehabilitated portions of the previous plant with new construction. The upgraded treatment plant and sludge landfill was completed in 1992. The plant provides secondary treatment using an activated sludge process in combination with advanced nutrient removal and dechlorination. The plant effluent is discharged into the South Branch of the Nashua River in accordance with the discharge limits of the facility's National Pollutant Discharge Elimination System (NPDES) permit.

MWRA and Local Collection Systems

MWRA owns and maintains approximately one mile of 20-inch, 24-inch and 30-inch interceptor in Clinton that parallels the South Branch of the Nashua River between High and Williams Streets. The interceptor (MWRA Section 402) is constructed of vitrified clay and brick pipe and serves primarily residential areas. During the late 1980s, internal TV inspection of the MWRA-owned interceptor resulted in concern regarding the structural integrity of the pipeline. In 1992, MWRA installed approximately 2500 linear feet (phase 1 lining) of cured-in-place pipe (CIPP) in the interceptor. The remaining 3000 linear feet was lined using CIPP during the fall of 1999 to spring of 2000 (phase 2 lining). The relined interceptor is in very good condition. Post construction internal inspection showed no infiltration/inflow within the interceptor. In addition to the pipeline rehabilitation, the interior of every MWRA-owned manhole was coated with an epoxy lining to eliminate infiltration and extend the useful life of the existing brick.

<u>Clinton Collection System</u>: The Clinton wastewater collection system includes approximately 40 miles of sewers ranging in diameter from 8 to 30 inches. The Clinton collection system has nine public and eleven special connections to the MWRA-owned interceptor. Parts of the Clinton sewer system date back to the mid-1880's when the development of the textile industry and related population increase encouraged sewer construction. Wastewater flows from various sections of Clinton are collected by two circular brick interceptors. A 30-inch interceptor, known as the Counterpane Brook Interceptor, parallels Counterpane Brook and connects to the MWRA interceptor near High and Allen Streets. The second major Town-owned sewer is also a 30-inch pipe that connects to the upstream end of the 20-inch MWRA interceptor. Most of the Clinton collection system is gravity flow; however, there are seven small pump/lift stations. A majority of the lateral sewers in the highly developed downtown section of Clinton are vitrified clay pipe constructed between 1885 and 1910. Very little sewer construction was undertaken between 1910 and 1960. Since that time, substantial additions to the Town's wastewater collection system have been made. The primary focus of the sewer construction has been in three areas: (1) the residential area of Clinton between

Coachlace Pond and Park Street, (2) the northwest section of town in the vicinity of Clinton Hospital, and (3) the northeast section of town between the South Branch of the Nashua River and the towns of Lancaster and Bolton. These more recently constructed sewers are primarily 8-inch diameter clay and asbestos cement pipe with rubber O-ring joints.

Lancaster Collection System: The southern portion of the town of Lancaster (Lancaster Sewer District) is served by a wastewater collection system initially constructed in 1978. The system includes seven small pump stations and approximately 22.6 miles of pipeline, primarily 8, 10, and 15-inch diameter lateral sewers. The town's one main interceptor (15 to 36-inch diameter) collects flow from the lateral sewers and connects to the CLTP on High Street. This is the only connection from the Lancaster Sewer District to the CLTP (known as Public Connection 001).

Treatment Facilities

The CLTP is located on 677 High Street in Clinton, MA. It provides advanced sewage treatment services to the town of Clinton and a portion of the town of Lancaster - the Lancaster Sewer District. The plant provides secondary treatment using an activated sludge process in combination with advanced nutrient removal, chlorination, and dechlorination. The plant effluent is discharged into the South Branch of the Nashua River in accordance with the discharge limits of the facility's National Pollutant Discharge Elimination System (NPDES) permit. Figure A-1 shows the process flow schematic. Sludge from residual processing is transported to an MWRA-owned and operated landfill for disposal.

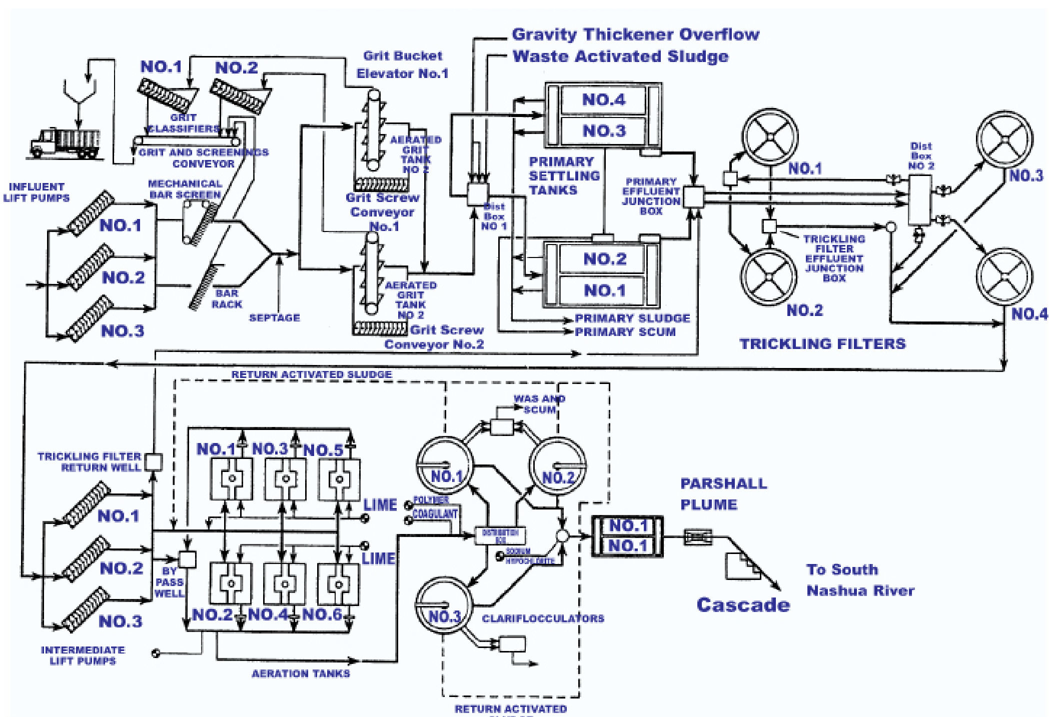

Figure A-1. Clinton Wastewater Treatment Plant Flow Schematic

Unit Operations

Influent Flow Metering: Wastewater enters the plant through two connections: (1) a 24-inch diameter reinforced concrete sewer connected to the MWRA 30-inch diameter interceptor on High Street (Clinton influent), and (2) an 18-inch diameter reinforced concrete sewer connected to the Lancaster interceptor on High Street (Lancaster Sewer District influent). Flow passes through two separate metering stations (one for Clinton and one for Lancaster flows). Two submersible pumps (three old screw pumps are now used as backup) lift flow to a mechanical bar screen.

Grit Removal: A manual bar rack is located in parallel for use when the mechanical bar screen is out of service. Flow is then conveyed to two parallel aerated grit chambers where grit is removed using screw grit collectors.

Primary Treatment: Primary settling is accomplished in two rectangular tanks, each measuring 82-feet long by 24-feet wide by 9-feet deep. Chain and flight collectors are used for scum and primary sludge that is pumped to residuals processing.

Secondary Treatment: From the primary settling tanks, wastewater flows by gravity to four high-rate trickling filters. Two trickling filters are 60-foot diameter (upgraded from original plant) and two are 80-foot diameter (new construction in 1992). Five feet of crushed stone media is used in each tank. Three intermediate pumps lift wastewater from the trickling filters to six 318,000 gallon aeration (activated sludge) tanks; each is 50-feet by 50-feet by 17-feet.

Nitrogen Removal: Nitrification is accomplished also in the aeration tanks. It is accomplished by a biological process, which utilizes nitrogen as an energy source. Proper conditions must be maintained, such as dissolved oxygen supply and pH control, to promote microorganism growth in the aeration tanks. Clinton operates at a sludge retention age of 8 days.

Final Settling: From the aeration tanks, wastewater is conveyed to three 80.25-foot diameter clariflocculators where suspended solids from secondary treatment settle out.

Phosphorus Removal: Ferric chloride is added in the final clarifiers (clariflocculators) to precipitate out phosphorus with the sludge. Ferric chloride also combines with suspended solids and allows for better settling and achieving high effluent quality.

Disinfection/Dechlorination and Discharge: Effluent from the clariflocculators empties into two hypochlorite contact tanks, each measuring 100-feet long by 6-feet wide by 14-feet deep. Dechlorination takes place at the overflow cascade of the chlorine contact chamber. Sodium bisulfite is added by injectors into the effluent stream to remove chlorine residual before going to the receiving water. The effluent is discharged through a Parshall flume, multistep cascade, and 24-inch outfall to the South Branch of the Nashua River.

Residuals Process and Sludge Landfill: Primary and secondary sludge is pumped to two 50-foot diameter gravity sludge thickeners. The residuals are then transferred to two 40-foot diameter anaerobic sludge digesters. The digesters are operated in series. The primary tank has a fixed cover, while the secondary tank has a floating gas holding cover. Digested sludge is transferred to a 60-foot diameter sludge holding tank before the dewatering process that uses two belt filter presses. Dewatered sludge is trucked to an MWRA-owned and operated residuals landfill located in Clinton. The double-lined sludge landfill includes a leachate collection system that pumps to the Clinton sewer system.

Appendix B. NPDES Permit Requirements

NPDES Permit

Under NPDES permit, MA0100404, "in compliance with the provisions of the Clean Water Act, as amended, 33 U.S.C. §§ 1251 et seq., and the Massachusetts Clean Water Act, as amended, Mass. Gen. Laws, ch. 21, §§ 26-53, Massachusetts Water Resources Authority is authorized to discharge from the facility located at 677 High Street, Clinton, MA, to receiving waters named South Branch, Nashua River, in accordance with effluent limitations, monitoring requirements and other conditions set" in the permit.

Monitoring Requirements and Effluent Limitations

The NPDES permit establishes monitoring requirements for the CLTP. The MWRA is authorized to discharge treated effluent from Outfall 001. The discharge is limited and monitored by the MWRA as specified in Table B-1.

Table B-1. Effluent Limitations and Monitoring Requirement

Effluent Characteristic	Units	Discharge Limitation			Monitoring Requirement	
		Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	MGD	3.01		Report	Continuous	Recorder
BOD_5	mg/L (lbs/day)	20 (500)	20	Report	3/Week	24-Hour Composite
TSS	mg/L (lbs/day)	20 (500)	20	Report	3/Week	24-Hour Composite
pH	6.5<pH<8.3				1/Day	Grab
Dissolved Oxygen	mg/L	6 mg/L minimum	~	~	1/Day	Grab
Fecal Coliform Bacteria	cfu/100 mL	200	~	400	1/Day	Grab
Total Residual Chlorine	ug/L	50	~	50	1/Day	Grab
Total Ammonia Nitrogen, as N (April 1 - April 30)	mg/L	10	~	Report	1/Two weeks	24-Hour Composite
Total Ammonia Nitrogen, as N (May 1 - May 31)	mg/L	5	~	Report	1/Week	24-Hour Composite
Total Ammonia Nitrogen, as N (June 1 - October 31)	mg/L	2	~	3	3/Week	24-Hour Composite
Total Ammonia Nitrogen, as N (November 1 - March 31)	mg/L	10	~	35.2	1/Month	24-Hour Composite
Copper, Total[1]	ug/L	20	~	20	1/Month	24-Hour Composite
Phosphorus, Total	mg/L	1	~	Report	1/Week	24-Hour Composite
LC_{50}	%	~	~	100	4/Year	24-Hour Composite
Chronic NOEC	%	~	~	>62.5	4/Year	24-Hour Composite

[1] Limit Set by Administrative Order

Treatment Plant Monitoring

Monitoring at CLTP has two components, influent monitoring and effluent monitoring. Table B-2 lists the treatment plant monitoring program parameters, including sample type, sampling frequency and analytical procedures used.

Table B-2. CLTP Monitoring Program

Parameter	Sample Type[1]	Sampling Frequency Influent	Sampling Frequency Effluent	Analytical Method[2]
Metals				
Aluminum	Composite	Quarterly	3/Quarter	200.7
Antimony	Composite	Quarterly	3/Quarter	200.7
Arsenic	Composite	Quarterly	3/Quarter	200.7, 206.2
Beryllium	Composite	Quarterly	3/Quarter	200.7
Boron	Composite	Quarterly	3/Quarter	200.7
Cadmium	Composite	Quarterly	3/Quarter	200.7, 213.2
Chromium	Composite	Quarterly	3/Quarter	3500-CRD3
Chromium (Hexavalent)	Composite	Quarterly	3/Quarter	200.7, 218.2
Copper	Composite	Quarterly	1/Month	200.7, 200.8, 220.2
Iron	Composite	Quarterly	3/Quarter	200.7
Lead	Composite	Quarterly	3/Quarter	200.7, 239.2
Mercury	Composite	Quarterly	3/Quarter	245.2, 1631
Molybdenum	Composite	Quarterly	3/Quarter	200.7, 246.2
Nickel	Composite	Quarterly	3/Quarter	200.7, 249.2
Selenium	Composite	Quarterly	3/Quarter	200.7, 270.2
Silver	Composite	Quarterly	3/Quarter	200.7, 272.2
Thallium	Composite	Quarterly	3/Quarter	200.7, 279.2
Zinc	Composite	Quarterly	3/Quarter	200.7
Organics and Other Compounds				
Cyanide	Grab	1/Quarter	3/Quarter	335.2
Fats Oils and Grease	Grab	1/Quarter	3/Quarter	1664
MBAS	Composite	1/Quarter	3/Quarter	425.1
PCBs	Composite	1/Quarter	1/Quarter	8080 MOD
Pesticides	Composite	1/Quarter	1/Quarter	608
Petroleum Hydrocarbons	Grab	1/Quarter	1/Quarter	418.1
Phenol	Composite	1/Quarter	3/Quarter	420.2 MO
Semi-volatile Organics	Composite	1/Quarter	3/Quarter	625
Sulfate	Composite	1/Quarter	3/Quarter	300.0
Total Organic Carbon	Composite	1/Quarter	3/Quarter	415.1
Volatile Organics	Grab	1/Quarter	3/Quarter	624
Whole Effluent Toxicity	Composite	1/Quarter	1/Quarter	WET Test Protocols
Conventional				
Biochemical Oxygen Demand	Composite	3/Week	3/Week	5210 B3
Fecal Coliform	Grab	*	3/Day	9222 D3
pH	Grab	Daily	Daily	150.1
Temperature	Grab	Daily	Quarterly	170.1
Total Chlorine Residual	Grab	*	3/Day	330.5
Total Suspended Solids	Composite	3/Week	3/Week	160.2
Nutrients				
Alkalinity	Composite	*	Quarterly	310.1
Ammonia-Nitrogen	Composite	Weekly	Weekly	350.1

Parameter	Sample Type[1]	Sampling Frequency Influent	Effluent	Analytical Method[2]
Ammonia-Nitrate	Composite	*	Quarterly	353.2
Orthophosphorus	Composite	Quarterly	Quarterly and Seasonally	365.1
Total Kjeldahl Nitrogen	Composite	*	Quarterly	351.2
Total Phosphorus	Composite	Quarterly	Quarterly and Seasonally	365.1

* No sampling.
[1] Influent and effluent composite samples are 24-hour time composite samples.
[2] EPA Methods.
[3] Standard Methods.

Reporting Requirements

In addition to the CLTP monitoring requirements, the NPDES permit requires numerous reports including:

- Development of Local Limits,
- Development and implementation of an Industrial Pretreatment Program,
- Annual report on pretreatment activities over the previous year,
- Staffing,
- Annual report on infiltration/inflow,
- One-time chlorination system effectiveness report,
- Annual report on chlorine and bacterial limit exceedances in the previous monitoring year,
- Annual certification that requirements in 40 CFR 503 regarding sludge disposal are met,
- Monthly discharge monitoring reports, and
- Process upsets, sanitary sewer overflows, necessary maintenance, prior notice, regulatory notifications.

Treatment of Results

It can be difficult to interpret laboratory results to ensure that they are representative of the sample, especially when the results are at or below method detection levels. For the conventional parameters measured in these monitoring programs, calculating the average concentration of a particular parameter is straightforward: the arithmetic average is used. However, the concentrations of metals, pesticides and organics are frequently below method detection levels, and more complex calculations are used to report averages. Appendix C gives a brief description of method detection limits and how measurements below detection limits are treated in this report.

Daily loadings (in lbs/day) were calculated using the formula:

$$Loading = Q \times C \times 8.34$$

Q = flow (mgd)

C = concentration (mg/L)
8.34 = unit conversion factor

To calculate monthly average concentrations for priority pollutants (metals, cyanide, pesticides/PCBs and organic compounds), the loadings of the pollutant during each sampling event for that month were added and then divided by the total flow during those events.

Average annual concentrations were calculated using the same method, taking each individual sampling event into account in the calculation. It should be kept in mind that certain parameters (conventional) were analyzed daily while other parameters (priority pollutants) were analyzed only two or three times per month.

Appendix C. Instrument Detection Limits, Method Detection Limits, and Quantitation Limits

Overview

An understanding of the detection limits of analysis is essential to reviewing the data from chemical analyses. There are three different types of detection limits that are most often encountered:

- Instrument Detection Limits
- Method Detection Limits
- Quantitation Limits, also known as Reporting Limits.

Instrument Detection Limits

Instrument detection limits (IDL) reflect the capability of the instrument. This limit will be the lowest of the three detection limits. The IDL will not take into account the losses of the pollutant associated with the matrix (soil or wastewater) and extraction procedure. This discrepancy is known as matrix interference.

Method Detection Limits

Method detection limits (MDL) are the smallest amount of a substance that can be detected above background noise using a particular method. The MDL is statistically determined by running a series of analyses using various low concentrations of a pollutant. Using a Student's "T" test, the smallest concentration that has a 99% probability of being detected above the background is designated the MDL for that pollutant. The EPA, using several private laboratories, has determined the MDLs for most priority pollutants using their approved methods. These are published in 40 CFR.

Quantitation Limits

In general, if a plot is made of pollutant concentration versus instrument response, it will show a linear relationship. As the pollutant concentration approaches zero, the linearity of the relationship is lost. The point where the linearity is lost is called the Quantitation Limit (QL) or sometimes the Reporting Limit. In other words, the smallest concentration where the linear relationship holds is the smallest concentration that can be quantified. Generally, the QL is about five times the MDL. Quantitation limits are relevant to GC/MS analyses, that is, methods 608 (for pesticides), 624 (for volatile organics), and 625 (for semi-volatile organics). Specific limits are highly matrix-dependent.

Detection Limits, Non-Detects, and Reporting

In short, the IDL is the lowest concentration that a particular instrument can detect. The MDL is the lowest concentration that can be detected using a particular method. The QL is the smallest concentration that can be confidently considered to be accurate.

Reported concentrations that are between the MDL and the QL indicate that a pollutant is present, but at a concentration too low to be accurately quantified. For example, using EPA method 624, chloroform has an MDL of 1.6 μg/L and a QL of 10 μg/L. If the concentration from an analysis is reported as 5 μg/L then it can be inferred that although the actual chloroform concentration in the wastewater is uncertain, 5 μg/L is a best guess. The EPA requires that these intermediate values be flagged with a "J" on any reports submitted to them. Therefore, these are sometimes simply called "J-values."

For non-detects in analyses of metals, cyanide, petroleum hydrocarbons, etc., it is customary for "less than the MDL" to be listed as a result. For a non-detect in the 608, 624, and 625 analyses, "less than the QL" is typically listed.

Often it becomes necessary to estimate a concentration far below detection limit values, specifically when calculating the average yearly concentration of a pollutant. A well-established method is to assume the actual concentration of a non-detected pollutant is simply one half of the MDL. While no scientific theory supports this assumption, it is more reasonable than assuming that the concentration is zero, or the MDL itself. The EPA and DEP also accept it as a standard practice that can be applied to any series of tests.

This technique is utilized in this report. For the organic compounds – methods 608, 624, and 625 – one tenth of the QL, or half the MDL, was assumed for all non-detects (i.e. values below QL). For all metals, cyanide, petroleum hydrocarbons, etc., half the MDL was assumed for all non-detects (i.e. values below MDL).

In Table C-1 is a list of the parameters regularly tested for in the effluent. The required EPA method number, and the MDLs and reporting limits attained by the MWRA's Central Laboratory are included.

Table C-1. List of Parameters Tested

Parameter	EPA Method Number	MWRA MDL (μg/L)	MWRA QL (μg/L)
Metals			
Aluminum	200.7	90	<90
Antimony	200.7	0.8	<0.9
Arsenic	206.2	0.8	<0.8
	200.7	43.8	<45
Beryllium	200.7	0.3	<0.5
Boron	200.7	9.5	<250
Cadmium	200.7	1.1	<2
	213.2	0.03	<0.03
Chromium	200.7	4.0	<4

Parameter	EPA Method Number	MWRA MDL (μg/L)	MWRA QL (μg/L)
	218.2	0.7	<0.7
Copper	200.7	10.5	<10
	220.2	0.6	<1
	200.8	1	1
Hexavalent Chromium	SM 3500-CR D[2]	1.8	<5
Iron	200.7	3	<30
Lead	200.7	12.0	<15
	239.2	2.4	<2.4
Mercury	245.2	0.01	<0.01
	1631	1	1
Molybdenum	200.7	3.4	<5
	246.2	1.2	<1
Nickel	200.7	3.0	<3
	249.2	0.7	<0.7
Selenium	200.7	48.2	<50
	270.2	0.9	<0.9
Silver	200.7	1.4	<2
	272.2	0.09	<0.09
Thallium	200.7	58.3	<60
	279.2	1.0	<1
Zinc	200.7	5.7	<6
Other Inorganic Chemicals[4]			
Cyanide	335.2	0.004	<0.01
Fats, Oil, and Grease (mg/L)	1664A	2.0	<7
Petroleum hydrocarbons (mg/L)		1	1
Phenol (mg/L)	420.2 MO	0.003	<0.01
Sulfate (mg/L)	300.0	0.2	<1
Total Organic Carbon (mg/L)	415.1	0.06	<0.3
Surfactants (mg/L)	425.1	0.03	<0.03
Pesticides (ng/L)			
4,4'-DDD	608	6.8	<20
4-4'-DDE	608	8.8	<20
4-4'-DDT	608	15.8	<20
Aldrin	608	3.5	<20
alpha-BHC	608	6.3	<20
alpha-Chlordane	608	3.6	<20
beta-BHC	608	6.3	<20
Chlordane (Technical)	608	1	1
delta-BHC	608	6.7	<20
Dieldrin	608	5.5	<20
Endosulfan I	608	5.3	<20
Endosulfan II	608	4.0	<20
Endosulfan sulfate	608	16.7	<20
Endrin	608	13.7	<20
Endrin aldehyde	608	9.1	<20
Endrin ketone	608	5.4	<20
gamma-BHC (Lindane)	608	4.2	<20
Heptachlor	608	9.7	<20
Heptachlor epoxide	608	8.8	<20
Hexachlorobenzene	612	1	1
Methoxychlor	608	52.0	<200

Parameter	EPA Method Number	MWRA MDL (µg/L)	MWRA QL (µg/L)
Toxaphene	608	1	1
PCBs (all in ng/L)			
Arochlor-1016	608	31.0	<500
Arochlor-1221	608	21.0	<1000
Arochlor-1232	608	14.0	<500
Arochlor-1242	608	1	1
Arochlor-1248	608	1	1
Arochlor-1254	608	10.0	<500
Arochlor-1260	608	32.0	<500
Volatile Organics			
1,1,1-trichloroethane	624	1.0	<5
1,1,2,2-tetrachloroethane	624	1.3	<5
1,1,2-trichloroethane	624	0.6	<5
1,1-dichloroethane	624	0.8	<5
1,1-dichloroethene	624	1.3	<5
1,2-dichlorobenzene	624	0.4	<5
1,2-dichloroethane	624	0.6	<5
1,2-dichloropropane	624	0.4	<5
1,3-dichlorobenzene	624	0.5	<5
1,4-dichlorobenzene	624	0.4	<5
2-butanone	624	1.8	<5
2-chloroethylvinylether	624	0.8	<5
2-hexanone	624	1.5	<5
4-methyl-2-pentanone	624	1.3	<5
Acetone	624	16	<5
Acrolein	624	5.4	<5
Acrylonitrile	624	4.2	<5
Benzene	624	0.5	<5
Bromodichloromethane	624	0.4	<5
Bromoform	624	0.4	<5
Bromomethane	624	1.1	<5
Carbon disulfide	624	1.4	<5
Carbon tetrachloride	624	1.0	<5
Chlorobenzene	624	0.4	<5
Chloroethane	624	1.0	<5
Chloroform	624	0.5	<5
Chloromethane	624	0.7	<5
cis-1,2-dichloroethene	624	0.5	<5
cis-1,3-dichloropropane	624	0.3	<5
Dibromochloromethane	624	0.6	<5
Ethylbenzene	624	0.5	<5
m,p-xylene	624	1.4	<5
Methylene chloride	624	0.6	<5
o-xylene	624	0.5	<5
Styrene	624	0.4	<5
Tetrachloroethene	624	0.8	<5
Toluene	624	0.5	<5
trans-1,2-dichloroethene	624	1.1	<5
trans-1,3-dichloropropene	624	0.3	<5
Trichloroethene	624	1.0	<5
Trichlorofluoromethane	624	0.8	<5

Parameter	EPA Method Number	MWRA MDL (µg/L)	MWRA QL (µg/L)
Vinyl acetate	624	0.8	<5
Vinyl chloride	624	1.0	<5
Semi-Volatiles			
1,2,4-trichlorobenzene	625	6.1	<10
1,2-dichlorobenzene	625	3.7	<10
1,2-diphenylhydrazine	625	8.7	<10
1,3-dichlorobenzene	625	2.9	<10
1,4-dichlorobenzene	625	3.2	<10
2,2'-oxybis(1-chloropropane)	625	3.9	<10
2,4,5-trichlorophenol	625	8.4	<10
2,4,6-trichlorophenol	625	9.6	<10
2,4-dichlorophenol	625	9.0	<10
2,4-dimethylphenol	625	8.1	<10
2,4-dinitrophenol	625	12.4	<20
2,4-dinitrotoluene	625	7.6	<10
2,6-dinitrotoluene	625	10.0	<10
2-chloronaphthalene	625	9.2	<10
2-chlorophenol	625	4.2	<10
2-methyl-4,6-dinitrophenol	625	7.9	<100
2-methylnaphthalene	625	4.5	<10
2-methylphenol	625	7.5	<10
2-nitroaniline	625	6.9	<10
2-nitrophenol	625	6.2	<10
3-3'-dichlorobenzidine	625	8.4	<20
3-nitroaniline	625	8.6	<10
4-bromophenyl phenyl ether	625	7.8	<10
4-chloro-3-methylphenol	625	7.4	<10
4-chloroaniline	625	8.2	<10
4-chlorophenyl phenyl ether	625	9.0	<10
4-methylohenol (includes 3-methylphenol)	625	7.2	<10
4-nitroaniline	625	8.0	<10
4-nitrophenol	625	6.3	<20
Acenaphthene	625	6.8	<10
Acenaphthylene	625	7.2	<10
Aniline	625	6.6	<10
Anthracene	625	5.8	<10
Benzindine	625	0.5	<10
Benzo(a)anthracene	625	5.4	<10
Benzo(a)pyrene	625	5.4	<10
Benzo(b)fluoranthene	625	7.8	<10
Benzo(ghi)perylene	625	5.2	<10
Benzo(k)fluoranthene	625	4.1	<10
Benzoic acid	625	7.2	<20
Benzyl alcohol	625	5.8	<10
bis(2-chloroethoxy) methane	625	6.7	<10
bis(2-chloroethyl) ether	625	4.1	<10
bis(2-ethylhexyl) phthalate	625	4.9	<10
Butyl benzyl phthalate	625	6.6	<10
Chrysene	625	6.2	<10
di-n-butylphthalate	625	5.4	<10

Parameter	EPA Method Number	MWRA MDL (µg/L)	MWRA QL (µg/L)
di-n-octylphthalate	625	4.6	<10
Dibenzo(a,h)anthracene	625	5.2	<10
Dibenzofuran	625	6.8	<10
Diethyl phthalate	625	9.1	<10
Dimethyl phthalate	625	9.9	<10
Fluoranthene	625	5.1	<10
Fluorene	625	8.1	<10
Hexachlorobenzene	625	8.8	<10
Hexachlorobutadiene	625	6.2	<10
Hexachlorocyclopentadiene	625	10.7	<50
Hexachoroethane	625	3.5	<10
Indeno(1,2,3-cd) pyrene	625	6.4	<10
Isophrone	625	7.5	<10
n-nitroso-di-n-propylamine	625	3.1	<10
n-nitrosodimethylamine	625	4.3	<10
n-nitrosodiphenylamine	625	7.9	<10
Naphthalene	625	5.7	<10
Nitrobenzene	625	6.3	<10
Pentachlorophenol	625	6.9	<30
Phenanthrene	625	5.8	<1
Phenol	625	2.2	<20
Pyrene	625	6.0	<10

[1] Data unavailable.
[2] Standard Methods.
[3] Native concentration too high for MDL determination.
[4] Some expressed in mg/L as noted.

Appendix D. Priority Pollutant List and Other Parameters

Table D-1. EPA List of 126 Priority Pollutants

(40 CFR 423, Appendix A)

Chlorinated Benzenes chlorobenzene 1,2-dichlorobenzene 1,3-dichlorobenzene 1,4-dichlorobenzene 1,2,4-trichlorobenzene hexachlorobenzene	**Chlorinated Ethanes** chloroethane 1,1-dichloroethane 1,2-dichloroethane 1,1,1-trichloroethane 1,1,2,2-tetrachloroethane hexachloroethane	**Chlorinated Phenols** 2-chlorophenol 2,4-dichlorophenol 2,4,6-trichlorophenol parametachlorocresol (4-chloro-3-methyl phenol)
DDT and Metabolites 4,4-DDT 4,4-DDE (p,p-DDX) 4,4-DDD (p,p-DDE)	**Haloethers** 4-chlorophenyl phenyl ether 4-bromophenyl phenyl ether bis(2-chloroisopropyl) ether	**Halomethanes** methylene chloride (dichloromethane) methyl chloride (chloromethane) methyl bromide (bromomethane) bromoform (tribromomethane) dichlorobromomethane chlorodibromomethane
Inorganics antimony arsenic asbestos beryllium cadmium chromium (III) chromium (VI) copper cyanide, total lead mercury nickel selenium silver thallium zinc	**Nitroamines** n-nitrosodimethylamine n-nitrosodiphenylamine n-nitrosodi-n-propylamine	**Pesticides and Metabolites** aldrin dieldrin chlordane (technical mixture and metabolites) alpha-endosulfan beta-endosulfan endosulfan sulfate endrin endrin aldehyde heptachlor heptachlor epoxide (BHC-hexachlorocyclohexane) alpha-BHC beta-BHC gamma-BHC (lindane) delta-BHC toxaphene
Phenols (other than chlorinated) 2-nitrophenol 4-nitrophenol 2,4-dinitrophenol 4,6-dinitro-o-cresol (4,6-dinitro-2-methylphenol) pentachlorophenol phenol 2,4-dimethylphenol	**Phthalate Esters** bis(2-ethylhexyl)phthalate butyl benzyl phthalate di-n-butyl phthalate di-n-octyl phthalate diethyl phthalate dimethyl phthalate	**Polychlorinated Biphenyls (PCBs)** PCB-1242 (Aroclor 1242) PCB-1254 (Aroclor 1254) PCB-1221 (Aroclor 1221) PCB-1232 (Aroclor 1232) PCB-1248 (Aroclor 1248) PCB-1260 (Aroclor 1260) PCB-1016 (Aroclor 1016)
Polynuclear Aromatic Hydrocarbons (PAHs) acenaphthene 1,2-benzanthracene (benzo(a)anthracene) benzo(a)pyrene (3,4-benzo-pyrene) 3,4-benzofluoranthene (benzo(b)fluoranthene) 11,12-benzofluoranthene (benzo(k)fluoranthene) chrysene acenaphthylene anthracene 1,12-benzoperylene (benzo(g,h,i)perylene) fluorene fluoranthene phenanthrene 1,2,5,6-dibenzanthracene (dibenzo(a,h)anthracene) indeno (1,2,3-cd) pyrene (2,3-o-phenylene pyrene) pyrene	**Other Chlorinated Organics** chloroform (trichloromethane) carbon tetrachloride (tetrachloromethane) bis(2-chloroethoxy)methane bis(2-chloroethyl)ether 2-chloroethyl vinyl ether (mixed) 2-chloronaphthalene 3,3'-dichlorobenzidine 1,1-dichlorethylene 1,2-trans-dichloroethylene 1,2-dichloropropane 1,2-dichloropropylene (1,3-dichloropropene) tetrachloroethylene trichloroethylene vinyl chloride (chloroethylene) hexachlorobutadiene hexachlorocyclopentadiene 2,3,7,8-tetrachloro-dibenzo-p-dioxin (TCDD)	**Other Organics** acrolein acrylonitrile benzene benzidine 2,4-dinitrotolulene 2,6-dinitrotolulene ethylbenzene isophrone naphthalene nitrobenzene toluene

Appendix E. Clinton Treatment Plant Monthly Summary Data

Table E-1. Clinton Wastewater Treatment Plant Operations Summary, 2012

		Ambient Conditions			Sewage Flows, MGD			Grit	pH, S.U.		Settleable Solids, mL/L/hr				
Date		Rainfall, in. water	Air Temp Max deg F	Inf Temp, deg C	Max	Min	Total Daily	LBS Sent to Landfill	Influent	Final Effluent	Influent	Primary Effluent	Trickling Filter Effluent	Final Effluent	Final Effluent DO, mg/L
January	Total	4.05					103.494								
	Average	0.13	41	11.7			3.339		7.0	7.5	9.3	0.1	2.2	0.1	9.9
	Maximum	0.96	59	14.9	5.8		4.322		7.2	7.8	19.0	0.1	5.0	0.1	12.3
	Minimum	0.00	18	10.8		2.2	2.769		6.7	7.3	7.0	0.1	1.0	0.1	6.9
February	Total	1.62					84.538	6,120							
	Average	0.06	48	11.4			2.915		7.1	7.5	10.4	0.2	1.9	0.1	9.6
	Maximum	0.80	63	12.2	5.7		4.159		7.3	7.7	18.0	1.5	3.0	0.1	12.7
	Minimum	0.00	29	10.6		1.6	2.428		7.0	7.2	6.0	0.1	0.1	0.1	7.6
March	Total	1.14					92.209	6,380							
	Average	0.04	59	12.2			2.974		7.1	7.5	11.8	0.1	3.2	0.1	10.0
	Maximum	0.32	86	14.5	5.1		3.494		7.2	7.7	40.0	0.1	9.5	0.1	12.9
	Minimum	0.00	33	9.7		1.9	2.443		6.9	6.9	6.0	0.1	1.5	0.1	6.2
April	Total	3.61					71.885	7,200							
	Average	0.12	65	14.0			2.396		7.1	7.4	12.5	0.1	5.4	0.1	9.6
	Maximum	2.45	94	15.5	4.8		3.119		7.3	7.6	20.0	0.8	30.0	0.1	13.7
	Minimum	0.00	53	12.6		0.9	2.090		6.9	7.1	8.0	0.1	1.3	0.1	8.1
May	Total	4.89					91.685	7,580							
	Average	0.16	73	15.5			2.958		7.1	7.2	10.6	0.1	3.2	0.1	9.1
	Maximum	1.00	59	17.8	4.9		3.260		7.4	7.6	15.0	0.2	6.5	0.1	11.2
	Minimum	0.00	50	13.6		1.7	2.702		6.8	6.7	5.0	0.1	1.5	0.1	8.1
June	Total	5.87					98.708	10,260							
	Average	0.20	85	17.4			3.290		7.0	7.3	10.3	0.1	4.6	0.1	8.5
	Maximum	2.20	108	19.5	5.8		3.878		7.3	7.5	18.5	0.2	11.0	0.1	9.3
	Minimum	0.00	56	15.5		2.1	2.653		6.8	7.0	6.0	0.1	1.5	0.1	7.5
July	Total	1.34					66.281	2							
	Average	0.04	96	20.3			2.138		7.1	7.3	13.9	0.1	5.6	0.1	8.0
	Maximum	0.54	107	21.6	4.2		2.824		7.4	7.6	20.0	0.2	12.0	0.1	9.6
	Minimum	0.00	74	18.7		0.8	1.511		6.7	6.9	10.0	0.1	2.0	0.1	7.1
August	Total	4.80					56.315	10,220							
	Average	0.15	94	21.5			1.817		7.0	7.2	14.2	0.2	7.3	0.1	7.9
	Maximum	1.50	104	22.9	4.2		4.675		7.4	7.6	20.0	0.9	11.0	0.1	8.6
	Minimum	0.00	81	20.3		0.8	1.420		6.7	6.6	11.0	0.1	4.2	0.1	6.8
September	Total	4.74					47.205	4,820							
	Average	0.16	91	20.5			1.574		7.1	7.2	14.8	0.1	3.9	0.1	8.2
	Maximum	1.30	98	21.5	4.6		2.063		7.4	7.5	24.0	0.4	5.5	0.1	9.2
	Minimum	0.00	55	19.0		0.8	1.369		6.9	6.9	10.0	0.1	1.3	0.1	7.4
October	Total	6.87					56.158	7,020							
	Average	0.22	66	18.4			1.812		7.1	7.3	14.6	0.2	4.7	0.1	9.6
	Maximum	2.75	88	20.2	6.1		3.582		7.4	7.6	22.0	1.2	8.0	0.1	11.6
	Minimum	0.00	54	17.1		0.8	1.428		6.7	6.8	9.0	0.1	3.0	0.1	8.3
November	Total	1.36					66.200	6,260							
	Average	0.05	50	15.5			2.207		7.1	7.3	12.5	0.1	2.3	0.1	10.5
	Maximum	0.40	69	18.8	3.8		2.836		7.4	7.6	17.0	0.2	4.0	0.1	12.9
	Minimum	0.00	35	13.4		1.2	1.960		6.9	7.0	6.5	0.1	1.4	0.1	9.0
December	Total	5.34					68.723								
	Average	0.17	43	12.8			2.217		7.1	7.3	10.8	0.3	4.6	0.1	10.1
	Maximum	1.20	58	14.5	4.1		2.755		7.3	7.6	21.0	2.0	11.0	0.1	11.0
	Minimum	0.00	30	10.8		0.0	1.920		6.9	7.0	7.0	0.1	2.5	0.1	9.4

Table E-1. Clinton Wastewater Treatment Plant Operations Summary, 2012 (cont.)

		Reactor Mixed Liquor					Return Activated Sludge				Waste Activated Sludge			
Date		DO Update, mg/L/hr	Settleometer, mL/L/30 min	ML SS, mg/L	MLVSS, mg/L	Sludge Volume Index, mL/g	Flow, GPD	TSS, mg/L	TSS, tons/day	VSS, mg/L	Flow, GPD	TSS, mg/L	TSS, tons/day	VSS, mg/L
January	**Total**						4,713,120		110.43		1,686,240		202.30	
	Average	7.30	165	1,867	1,445	90	152,036	5,619	3.34	4,491	60,223	28,770	7.43	22,345
	Maximum	9.96	220	2,240	1,670	111	244,800	8,110	4.45	6,180	72,000	49,600	14.89	29,700
	Minimum	4.62	125	1,300	982	79	115,200	3,460	1.90	2,630	0	17,200	0.00	16,100
February	**Total**						4,888,800		93.94		2,812,320		292.09	
	Average	5.96	148	1,657	1,259	90	168,579	4,608	3.24	3,604	96,977	24,907	10.13	17,735
	Maximum	7.80	160	1,810	1,430	101	216,000	6,470	5.08	5,120	109,440	44,400	18.66	23,800
	Minimum	4.80	130	1,510	1,130	83	144,000	3,520	2.44	2,880	72,000	13,500	4.05	11,200
March	**Total**						4,852,800		100.41		3,065,760		297.87	
	Average	7.64	157	1,767	1,421	89	156,542	4,962	3.24	4,050	98,895	23,300	9.58	18,467
	Maximum	13.14	175	2,040	1,820	103	158,400	7,100	4.69	5,680	151,200	29,200	12.62	25,100
	Minimum	5.58	140	1,610	1,280	78	100,800	3,970	1.90	3,220	90,720	18,800	7.45	14,300
April	**Total**						4,415,040		76.64		2,422,080		223.65	
	Average	7.32	158	1,813	1,322	88	147,168	4,163	2.54	3,156	80,736	22,143	7.47	16,750
	Maximum	10.20	200	2,150	1,470	102	158,400	5,560	3.27	3,910	141,120	28,800	13.12	20,900
	Minimum	4.92	130	1,530	1,220	77	141,120	3,050	2.01	2,800	64,800	15,300	5.25	11,700
May	**Total**						4,363,200		98.26		2,718,720		275.75	
	Average	7.14	179	2,079	1,320	86	140,748	5,400	3.16	3,462	87,701	24,343	8.85	15,764
	Maximum	15.48	220	2,860	2,100	100	142,560	6,930	4.12	5,100	106,560	30,300	10.78	19,300
	Minimum	4.80	140	1,840	1,130	71	100,800	4,590	2.72	2,870	72,000	16,400	6.40	11,900
June	**Total**						4,684,320		108.78		3,094,560		239.29	
	Average	6.70	189	2,041	1,345	93	156,144	5,569	3.61	3,739	103,152	18,543	7.97	11,902
	Maximum	15.84	235	2,720	1,980	119	172,800	6,650	4.29	4,850	115,200	26,000	12.49	18,300
	Minimum	4.44	150	1,720	1,090	77	142,560	4,390	2.90	2,970	96,480	13,500	5.84	9,850
July	**Total**						4,910,400		80.46		2,540,160		206.18	
	Average	5.16	145	1,777	1,079	84	158,400	3,929	2.60	2,481	81,941	19,465	6.62	11,970
	Maximum	7.20	170	1,930	1,270	108	158,400	5,070	3.35	3,320	100,800	25,000	8.43	14,500
	Minimum	2.88	130	1,390	888	74	158,400	3,160	2.09	1,900	72,000	10,400	4.37	7,170
August	**Total**						4,910,400		77.43		2,799,360		259.75	
	Average	5.22	150	1,970	1,140	77	158,400	3,781	2.50	2,173	90,302	22,252	8.39	12,577
	Maximum	6.30	165	2,140	1,190	88	158,400	4,590	3.03	2,710	93,600	30,200	11.79	18,200
	Minimum	3.90	125	1,740	1,050	68	158,400	2,930	1.94	1,770	72,000	16,400	5.91	9,980
September	**Total**						4,752,000		70.04		2,115,360		185.33	
	Average	4.82	147	1,828	1,107	81	158,400	3,535	2.33	2,199	70,512	21,010	6.19	11,907
	Maximum	6.18	180	1,950	1,230	103	158,400	4,250	2.81	2,570	89,280	27,500	10.24	14,600
	Minimum	3.12	120	1,640	990	67	158,400	3,110	2.05	1,990	50,400	15,800	3.83	9,530
October	**Total**						4,910,400		80.76		2,291,040		174.34	
	Average	5.34	176	2,012	1,287	89	158,400	3,944	2.61	2,589	73,905	18,248	5.63	11,476
	Maximum	7.92	250	2,370	1,490	117	158,400	6,590	4.35	4,520	79,200	24,200	7.99	13,400
	Minimum	2.58	75	905	594	77	158,400	1,240	0.82	816	72,000	15,200	4.71	9,480
November	Total						4,752,000		93.25		2,249,280		168.24	
	Average	5.47	197	2,131	1,441	93	158,400	4,706	3.11	3,200	74,976	17,937	5.61	11,658
	Maximum	6.96	240	2,320	1,550	110	158,400	5,680	3.75	3,860	82,080	24,100	7.24	13,700
	Minimum	3.00	180	1,910	1,310	83	158,400	3,590	2.37	2,870	72,000	13,600	4.50	9,160
December	**Total**						4,910,400		91.73		2,211,840		175.48	
	Average	8.90	193	1,980	1,399	99	158,400	4,480	2.96	3,213	71,350	19,026	5.66	12,985
	Maximum	14.40	240	2,140	1,510	120	158,400	5,350	3.53	3,760	72,000	25,900	7.78	15,400
	Minimum	1.38	120	1,220	887	79	158,400	3,970	2.62	2,860	69,120	14,600	4.38	11,100

Table E-1. Clinton Wastewater Treatment Plant Operations Summary, 2012 (cont.)

		Ammonia as Nitrogen*, mg/L							Total Phosphorus, mg/L				
Date		**Influent**	**Primary Effluent**	**Primary % Removal**	**Trickling Filter Effluent**	**TF % Removal**	**Final Effluent**	**Overall % Removal**	**Influent**	**Primary Effluent**	**Primary % Removal**	**Final Effluent**	**Overall % Removal**
January	**Average**	12.6	13.8	-9.5%	12.1	4.5%	0.10	99.2%					
	Maximum	18.7	17.7	17.6%	14.8	33.2%	0.10	99.5%					
	Minimum	8.8	11.8	-34.9%	9.7	-33.8%	0.10	98.9%					
February	**Average**	13.5	15.7	-16.3%	13.5	0.0%	0.10	99.3%					
	Maximum	14.7	19.5	6.2%	16.0	8.3%	0.10	99.3%					
	Minimum	10.3	12.8	-32.7%	10.9	-9.6%	0.10	99.0%					
March	**Average**	11.0	16.7	-51.1%	14.8	-33.9%	0.10	99.1%	8.4	2.8	66.9%	1.84	78.7%
	Maximum	13.6	19.8	-32.5%	16.0	-15.8%	0.10	99.3%	8.4	2.8	66.9%	1.93	78.7%
	Minimum	9.0	14.9	-69.7%	13.3	-68.6%	0.10	98.9%	8.5	2.8	66.9%	1.79	78.7%
April	**Average**	18.6	20.3	-9.7%	16.9	8.8%	0.11	99.4%					
	Maximum	25.5	21.2	24.3%	20.0	38.0%	0.12	99.6%					
	Minimum	14.8	19.3	-39.2%	15.5	-35.1%	0.10	99.3%					
May	**Average**	14.5	17.9	-23.6%	17.2	-18.4%	0.14	99.0%				0.27	
	Maximum	20.6	21.4	28.5%	25.1	29.0%	0.34	99.5%				0.60	
	Minimum	11.4	9.4	-64.9%	9.4	-54.4%	0.10	97.1%				0.11	
June	**Average**	12.1	15.9	-31.0%	14.6	-20.8%	0.15	98.7%	4.9	1.8	62.7%	0.17	96.6%
	Maximum	20.6	24.3	25.1%	20.2	16.3%	0.73	99.5%	4.9	1.8	62.7%	0.36	98.0%
	Minimum	8.8	9.2	-92.0%	10.0	-80.2%	0.10	91.8%	4.9	1.8	62.7%	0.10	98.0%
July	**Average**	16.7	19.3	-15.5%	18.1	-8.5%	0.10	99.4%				0.53	
	Maximum	27.5	27.7	6.2%	25.5	8.0%	0.10	99.6%				0.91	
	Minimum	10.4	12.8	-41.1%	11.2	-32.4%	0.10	99.0%				0.23	
August	**Average**	18.1	21.8	-20.6%	20.4	-13.0%	0.10	99.4%				0.20	
	Maximum	25.3	31.2	27.2%	33.0	15.2%	0.10	99.6%				0.24	
	Minimum	14.0	11.5	-59.5%	13.4	-53.5%	0.10	99.3%				0.10	
September	**Average**	19.3	23.5	-21.5%	20.8	-7.5%	0.13	99.3%	4.8	3.5	27.6%	0.21	94.9%
	Maximum	26.6	30.6	6.7%	29.6	34.7%	0.51	99.6%	4.8	3.5	27.6%	0.29	94.9%
	Minimum	15.7	16.8	-61.8%	11.5	-57.3%	0.10	98.0%	4.8	3.5	27.6%	0.12	94.9%
October	**Average**	20.5	21.6	-5.4%	19.2	6.6%	0.10	99.5%				0.26	
	Maximum	24.7	28.1	20.8%	27.8	35.8%	0.10	99.6%				0.35	
	Minimum	9.8	16.8	-108.0%	13.6	-95.7%	0.10	99.0%				0.17	
November	**Average**	18.1	19.8	-9.1%	19.3	-6.1%	0.10	99.4%					
	Maximum	22.1	22.4	-1.4%	21.7	7.2%	0.10	99.5%					
	Minimum	14.2	16.0	-16.1%	15.3	-18.6%	0.10	99.3%					
December	**Average**	16.1	16.8	-4.0%	15.5	3.6%	0.10	99.4%	3.7	3.3	9.8%	0.83	77.5%
	Maximum	16.7	21.5	16.7%	17.9	15.9%	0.10	99.4%	3.7	3.3	9.8%	0.85	76.8%
	Minimum	15.0	12.5	-28.7%	13.2	-9.8%	0.10	99.3%	3.7	3.3	9.8%	0.80	76.8%

* Secondary treatment converts other forms of nitrogren to ammonia, which can result in negative primary and trickling filter removal percentages.

Table E-1. Clinton Wastewater Treatment Plant Operations Summary, 2012 (cont.)

		Biochemical Oxygen Demand (BOD5), mg/L							Total Suspended Solids (TSS), mg/L						
Date		**Influent**	**Primary Effluent**	**Primary % Removal**	**Trickling Filter Effluent**	**TF % Removal**	**Final Effluent**	**Overall % Removal**	**Influent**	**Primary Effluent**	**Primary % Removal**	**Trickling Filter Effluent**	**TF % Removal**	**Final Effluent**	**Overall % Removal**
January	**Average**	195	128.0	34.5%	54.3	72.2%	5.76	97.1%	173	39.3	77.3%				
	Maximum	272	194.0	54.9%	76.8	83.6%	6.31	97.8%	354	62.0	88.7%				
	Minimum	129	80.8	15.5%	29.3	54.3%	4.57	95.2%	98	28.0	59.6%				
February	**Average**	225	104.6	53.5%	48.7	78.3%	4.90	97.8%	214	44.0	79.5%			5.60	97.4%
	Maximum	300	139.0	73.3%	79.6	86.8%	8.18	98.8%	322	62.0	86.1%			6.40	98.4%
	Minimum	168	62.9	29.2%	31.7	56.0%	2.85	96.5%	144	26.0	67.1%			4.80	95.7%
March	**Average**	212	120.6	43.2%	55.3	73.9%	6.16	97.1%	217	61.2	71.8%			5.74	97.4%
	Maximum	254	142.0	57.0%	79.2	82.2%	8.19	98.0%	376	86.0	90.4%			8.20	98.6%
	Minimum	165	69.9	17.6%	40.7	57.2%	4.50	96.4%	146	36.0	51.2%			3.93	95.5%
April	**Average**	236	133.1	43.6%	53.3	77.4%	4.44	98.1%	258	45.7	82.3%			4.86	98.1%
	Maximum	333	198.0	64.0%	81.6	85.0%	6.33	98.9%	400	70.0	88.6%			5.20	98.8%
	Minimum	172	99.3	4.1%	32.6	57.1%	2.32	97.2%	160	38.0	71.2%			4.00	97.2%
May	**Average**	200	133.5	33.3%	47.4	76.3%	2.20	98.9%	175	43.5	75.1%				
	Maximum	373	260.0	46.9%	94.6	88.8%	3.67	99.4%	244	48.7	80.3%				
	Minimum	138	87.6	1.3%	15.5	63.2%	1.41	98.1%	88	32.0	44.7%				
June	**Average**	190	126.9	33.3%	41.1	78.4%	2.58	98.6%	140	43.2	69.1%			<3.12	97.8%
	Maximum	326	286.0	66.8%	121.0	89.5%	4.30	99.3%	230	66.0	80.0%			4.20	98.5%
	Minimum	116	64.5	-37.9%	20.9	52.9%	1.88	96.5%	70	32.0	43.2%			<2.00	96.2%
July	**Average**	249	148.0	40.6%	46.8	81.2%	2.68	98.9%	254	49.0	80.7%			2.81	98.9%
	Maximum	436	329.0	62.4%	114.0	87.3%	3.84	99.4%	420	60.0	87.4%			5.00	99.4%
	Minimum	149	67.6	9.3%	27.0	73.9%	1.77	98.4%	144	32.0	63.9%			2.00	97.8%
August	**Average**	332	225.0	32.3%	59.7	82.0%	2.21	99.3%	354	64.5	81.8%			<2.28	99.4%
	Maximum	520	360.0	59.8%	119.0	90.4%	2.84	99.6%	534	78.0	90.1%			3.60	99.6%
	Minimum	206	156.0	-35.8%	32.2	55.1%	1.83	98.9%	270	48.0	74.4%			<2.00	99.1%
September	**Average**	295	141.6	52.0%	47.7	83.8%	2.12	99.3%	328	53.1	83.8%			<2.23	99.3%
	Maximum	515	236.0	77.3%	70.5	92.2%	2.93	99.5%	550	70.4	89.6%			3.50	99.6%
	Minimum	198	83.9	9.2%	33.0	72.9%	1.62	98.5%	161	42.0	73.7%			<2.00	98.5%
October	**Average**	290	233.6	19.4%	68.9	76.2%	2.44	99.2%	277	59.5	78.6%			<2.55	99.1%
	Maximum	387	496.0	60.3%	192.0	89.0%	3.47	99.3%	764	80.0	92.7%			5.80	99.7%
	Minimum	181	78.4	-65.7%	32.7	44.9%	2.06	98.7%	164	48.0	68.9%			<2.00	96.5%
November	**Average**	232	139.6	39.8%	41.7	82.0%	2.59	98.9%	228	50.5	77.8%			<3.23	98.6%
	Maximum	291	170.0	53.5%	63.5	92.8%	3.71	99.2%	312	58.0	82.9%			4.80	99.0%
	Minimum	161	113.0	16.1%	20.9	71.0%	1.76	98.3%	148	40.0	64.2%			<2.00	97.9%
December	**Average**	253	150.8	40.4%	261.6	-3.5%	3.06	98.8%	233	53.4	77.1%			5.21	97.8%
	Maximum	330	258.0	58.8%	2690.0	84.5%	4.14	99.2%	304	65.8	84.9%			7.60	98.5%
	Minimum	171	92.4	12.2%	47.4	-954.9%	2.30	97.9%	170	40.0	63.0%			3.46	96.9%

Table E-1. Clinton Wastewater Treatment Plant Operations Summary, 2012 (cont.)

Date		Plant Flow, MGD	Disinfection: Sodium Hypochlorite, GPD	Dechlorination: Sodium Bisulfate, GPD	Final Effluent Sampling Results: Time Collected			Total Chlorine Residual, mg/L (MDL <0.02)				Fecal Coliform, col/100 mL (MDL <3)			
					1	2	3	1	2	3	Avg	1	2	3	GeoMean
January	Total	103.494	2,060	1,484											
	Average	3.339	66	48								0.02			4
	Maximum	4.322	70	50								0.02			11
	Minimum	2.769	50	34								0.02			2
February	Total	84.538	1,920	1,363											
	Average	2.915	66	47								0.02			4
	Maximum	4.159	70	50								0.02			7
	Minimum	2.428	50	30								0.02			2
March	Total	92.209	2,215	1,560											
	Average	2.974	71	50								0.02			3
	Maximum	3.494	100	60								0.02			8
	Minimum	2.443	50	50								0.02			2
April	Total	71.885	1,960	1,500											
	Average	2.396	65	50								0.02			3
	Maximum	3.119	70	55								0.02			6
	Minimum	2.090	50	40								0.02			2
May	Total	91.685	2,040	1,534											
	Average	2.958	66	49								0.02			3
	Maximum	3.260	70	50								0.02			4
	Minimum	2.702	50	39								0.02			3
June	Total	98.708	1,950	1,555											
	Average	3.290	65	52								0.02			3
	Maximum	3.878	75	105								0.02			5
	Minimum	2.653	50	50								0.02			3
July	Total	66.281	2,170	1,555											
	Average	2.138	70	50								0.02			4
	Maximum	2.824	75	55								0.02			17
	Minimum	1.511	50	50								0.02			2
August	Total	56.315	2,130	1,565											
	Average	1.817	69	50								0.02			4
	Maximum	4.675	70	65								0.02			10
	Minimum	1.420	50	50								0.02			3
September	Total	47.205	2,140	1,500											
	Average	1.574	71	50								0.02			4
	Maximum	2.063	80	50								0.02			9
	Minimum	1.369	70	50								0.02			3
October	Total	56.158	2,170	1,550											
	Average	1.812	70	50								0.02			6
	Maximum	3.582	70	50								0.02			17
	Minimum	1.428	70	50								0.02			3
November	Total	66.200	2,100	1,500											
	Average	2.207	70	50								0.02			3
	Maximum	2.836	70	50								0.02			9
	Minimum	1.960	70	50								0.02			3
December	Total	68.723	2,170	1,550											
	Average	2.217	70	50								0.02			4
	Maximum	2.755	70	50								0.02			8
	Minimum	1.920	70	50								0.02			3

Table E-2. Clinton Wastewater Treatment Plant Operations Summary, 2013

Date		Ambient Conditions			Sewage Flows, MGD			Grit	pH, S.U.		Settleable Solids, mL/L/hr				
		Rainfall, in. water	Air Temp Max deg F	Inf Temp, deg C	Max	Min	Total Daily	LBS Sent to Landfill	Influent	Final Effluent	Influent	Primary Effluent	Trickling Filter Effluent	Final Effluent	Final Effluent DO, mg/L
January	Total	1.64					68.342								
	Average	0.05	38	11.9			2.205		7.2	7.4	11.1	0.1	2.2	0.1	10.1
	Maximum	0.55	61	14.6	4.0		2.541		7.4	7.6	19.0	0.5	5.0	0.1	11.1
	Minimum	0.00	14	10.2		1.2	1.948		6.9	7.2	3.5	0.1	1.2	0.1	9.4
February	Total	4.23					62.617	5,700							
	Average	0.15	38	11.0			2.236		7.1	7.3	11.3	0.1	3.5	0.1	10.5
	Maximum	1.10	55	12.5	4.8		3.820		7.4	7.5	15.0	0.5	8.0	0.1	13.2
	Minimum	0.00	22	10.2		1.0	1.949		6.9	7.2	5.0	0.1	2.0	0.1	9.7
March	Total	3.77					113.717	9,240							
	Average	0.12	46	10.5			3.668		7.1	7.4	7.5	0.1	1.3	0.1	10.4
	Maximum	0.86	61	11.5	6.2		5.413		7.3	7.5	13.0	0.1	2.0	0.1	11.2
	Minimum	0.00	30	8.6		2.1	3.045		6.8	7.2	3.0	0.1	0.3	0.1	9.8
April	Total	1.51					75.126								
	Average	0.05	64	12.8			2.504		7.2	7.4	12.4	0.1	1.7	0.1	9.5
	Maximum	0.52	83	15.2	4.0		3.196		7.4	7.6	23.0	0.6	3.5	0.1	10.4
	Minimum	0.00	38	10.1		1.4	2.225		7.0	7.2	8.0	0.1	0.5	0.1	8.6
May	Total	5.08					68.938	7,660							
	Average	0.16	81	16.2			2.224		7.1	7.5	15.5	0.1	4.5	0.1	8.4
	Maximum	1.20	111	18.2	4.8		2.627		7.5	7.7	25.0	0.1	7.0	0.1	9.4
	Minimum	0.00	52	14.8		1.0	1.940		6.7	7.3	10.0	0.1	3.0	0.1	7.1
June	Total	9.71					134.799	7,780							
	Average	0.32	86	17.2			4.493		6.9	7.4	7.5	0.1	2.1	0.1	8.3
	Maximum	2.90	112	19.0	10.2		8.476		7.3	7.5	15.0	0.1	6.5	0.1	9.2
	Minimum	0.00	58	15.7		1.6	2.382		6.6	7.2	2.5	0.1	0.2	0.1	7.2
July	Total	2.96					84.604	9,860							
	Average	0.10	91	19.8			2.729		6.9	7.6	13.9	0.1	2.3	0.1	7.9
	Maximum	1.20	106	22.0	5.0		3.717		7.2	7.7	40.0	0.1	5.0	0.1	9.1
	Minimum	0.00	64	18.0		1.3	2.019		6.6	7.4	5.0	0.1	0.5	0.1	6.9
August	Total	2.03					76.972								
	Average	0.07	86	20.4			2.483		7.1	7.4	14.8	0.2	2.7	0.1	7.7
	Maximum	1.00	96	21.8	4.3		3.046		7.3	7.6	25.0	1.5	7.0	0.1	8.3
	Minimum	0.00	69	19.2		1.3	1.999		6.6	7.3	8.0	0.1	0.8	0.1	7.1
September	Total	2.64					58.011	9,660							
	Average	0.09	79	19.9			1.934		7.1	7.5	13.4	0.1	3.0	0.1	7.9
	Maximum	1.35	103	21.1	5.6		2.360		7.3	7.8	26.0	0.2	7.0	0.1	8.8
	Minimum	0.00	68	18.9		0.8	1.715		6.7	7.2	10.0	0.1	1.5	0.1	7.3
October	Total	1.45					52.024	8,580							
	Average	0.05	65	18.4			1.678		7.1	7.3	15.9	0.1	5.0	0.1	7.7
	Maximum	0.40	82	20.5	2.7		1.894		7.4	7.5	29.0	0.1	7.0	0.1	9.0
	Minimum	0.00	51	15.7		0.7	1.534		6.6	7.0	11.0	0.1	1.5	0.1	6.2
November	Total	3.19					49.528	5,340							
	Average	0.11	51	15.9			1.651		7.3	7.3	15.5	0.1	4.2	0.1	9.0
	Maximum	1.20	69	18.7	3.9		2.280		7.5	7.5	20.0	0.2	14.0	0.1	10.8
	Minimum	0.00	28	13.4		0.7	1.527		7.1	7.0	12.0	0.1	1.7	0.1	6.1
December	Total	4.85					54.543	6,080							
	Average	0.16	35	12.7			1.759		7.3	7.2	13.5	0.1	2.4	0.1	10.4
	Maximum	1.25	55	15.1	4.2		2.303		7.6	7.5	19.0	0.3	4.0	0.1	12.5
	Minimum	0.00	-3	10.7		0.8	1.371		7.1	7.0	9.0	0.1	1.5	0.1	9.0

Table E-2. Clinton Wastewater Treatment Plant Operations Summary, 2013 (cont.)

Date		Reactor Mixed Liquor					Return Activated Sludge				Waste Activated Sludge			
		DO Update, mg/L/hr	Settleometer, mL/L/30 min	ML SS, mg/L	MLVSS, mg/L	Sludge Volume Index, mL/g	Flow, GPD	TSS, mg/L	TSS, tons/day	VSS, mg/L	Flow, GPD	TSS, mg/L	TSS, tons/day	VSS, mg/L
January	Total						4,910,400		100.51		2,249,280		190.37	
	Average	8.14	180	2,163	1,577	84	158,400	4,909	3.24	3,709	72,557	20,297	6.16	14,624
	Maximum	16.80	200	2,570	1,790	104	158,400	5,820	3.84	4,480	79,200	27,300	9.02	19,600
	Minimum	1.98	160	1,640	1,180	76	158,400	4,050	2.68	3,180	69,120	15,500	4.56	11,100
February	Total						4,435,200		84.30		1,915,200		146.18	
	Average	8.93	173	2,030	1,532	89	158,400	4,558	3.01	3,527	68,400	18,304	5.23	13,702
	Maximum	13.56	210	2,540	1,800	122	158,400	6,740	4.45	5,330	83,520	23,500	8.18	18,400
	Minimum	3.30	35	288	236	80	158,400	2,670	1.76	2,070	0	12,100	0.00	9,430
March	Total						4,910,400		138.72		2,619,360		230.29	
	Average	10.20	189	2,203	1,723	86	158,400	6,775	4.47	5,370	84,495	21,084	7.50	15,962
	Maximum	14.40	210	2,400	1,900	102	158,400	8,750	5.78	6,760	100,800	29,400	11.94	23,300
	Minimum	6.24	150	1,830	1,410	75	158,400	5,600	3.70	4,660	69,120	15,800	4.74	12,500
April	Total						4,752,000		95.12		2,640,960		222.94	
	Average	11.50	174	1,955	1,538	89	158,400	4,800	3.17	3,769	88,032	20,243	7.43	15,433
	Maximum	19.44	200	2,260	1,670	95	158,400	6,190	4.09	4,510	100,800	33,000	11.89	21,200
	Minimum	5.82	160	1,760	1,460	82	158,400	4,080	2.69	3,180	79,200	15,400	5.55	12,000
May	Total						4,910,400		108.47		3,509,280		246.55	
	Average	16.70	186	2,221	1,544	87	158,400	5,297	3.50	3,819	113,203	16,848	8.01	11,719
	Maximum	27.18	220	2,510	1,820	153	158,400	12,300	8.12	8,620	129,600	25,500	13.78	17,200
	Minimum	8.76	160	1,310	918	76	158,400	4,180	2.76	2,930	100,800	10,900	5.21	8,260
June	Total						6,760,800		157.11		3,445,920		305.73	
	Average	10.75	172	1,940	1,281	90	225,360	5,573	5.25	3,871	114,864	21,277	10.19	14,320
	Maximum	22.20	210	2,330	1,500	102	288,000	9,020	8.14	5,950	122,400	29,600	14.90	19,500
	Minimum	3.82	50	489	320	78	158,400	4,280	2.83	3,190	86,400	13,200	5.94	8,990
July	Total						6,134,400		113.16		3,212,640		303.20	
	Average	7.98	165	1,926	1,273	87	197,884	4,424	3.62	2,971	103,634	22,632	9.61	14,135
	Maximum	11.70	200	2,270	1,590	103	259,200	5,050	5.40	3,440	129,600	33,700	12.97	16,900
	Minimum	4.02	120	1,440	878	69	158,400	3,640	2.54	2,530	72,000	17,200	5.67	11,100
August	Total						4,694,400		86.42		2,102,400		199.75	
	Average	5.44	150	1,905	1,182	78	151,432	4,415	2.79	2,738	67,819	22,784	6.32	13,418
	Maximum	9.00	190	2,570	1,520	86	158,400	5,360	3.54	3,470	97,920	33,100	9.68	20,300
	Minimum	1.50	130	1,650	860	57	144,000	3,680	2.21	2,160	28,800	16,700	2.29	10,200
September	Total						4,320,000		71.32		2,174,400		208.43	
	Average	5.01	170	1,860	1,105	93	144,000	3,959	2.38	2,466	72,480	22,987	6.94	14,120
	Maximum	7.56	200	2,230	1,420	113	144,000	5,120	3.07	3,060	74,880	34,000	10.21	19,800
	Minimum	2.22	65	710	447	76	144,000	1,210	0.73	770	72,000	14,500	4.53	9,190
October	Total						4,492,800		74.98		2,638,080		238.43	
	Average	5.89	172	1,958	1,258	88	144,929	4,002	2.42	2,644	85,099	21,674	7.73	13,655
	Maximum	6.96	190	2,240	1,370	95	158,400	4,820	3.18	3,120	100,800	33,700	14.17	18,100
	Minimum	4.14	160	1,690	1,160	78	144,000	3,020	1.81	2,180	74,880	15,600	5.43	10,100
November	Total						4,320,000		67.46		2,201,760		170.31	
	Average	7.03	152	1,806	1,311	84	144,000	3,745	2.25	2,842	75,923	18,550	5.76	12,901
	Maximum	9.54	170	2,000	1,440	90	144,000	5,430	3.26	4,130	100,800	29,300	12.32	18,000
	Minimum	5.70	140	1,550	1,120	75	144,000	3,030	1.82	2,300	0	14,000	0.00	9,920
December	Total						4,420,800		68.39		2,100,960		179.88	
	Average	6.87	174	1,769	1,378	98	142,606	3,710	2.20	2,986	67,773	20,532	5.76	15,324
	Maximum	8.40	210	1,910	1,480	113	158,400	4,440	2.67	3,490	86,400	27,800	8.23	20,000
	Minimum	5.52	155	1,620	1,300	85	136,800	2,730	1.64	2,630	43,200	14,800	2.85	11,700

Table E-2. Clinton Wastewater Treatment Plant Operations Summary, 2013 (cont.)

Date		Ammonia as Nitrogen*, mg/L							Total Phosphorus, mg/L				
		Influent	Primary Effluent	Primary % Removal	Tricklying Filter Effluent	TF % Removal	Final Effluent	Overall % Removal	Influent	Primary Effluent	Primary % Removal	Final Effluent	Overall % Removal
January	Average	21.8	20.5	5.7%	19.1	12.2%	0.10	99.5%					
	Maximum	29.0	27.0	25.2%	22.0	29.7%	0.10	99.7%					
	Minimum	15.9	15.7	-10.7%	16.8	-5.7%	0.10	99.4%					
February	Average	16.9	23.7	-39.9%	22.1	-30.9%	0.10	99.4%					
	Maximum	20.2	30.2	-14.5%	30.8	-7.4%	0.10	99.5%					
	Minimum	13.8	15.8	-65.8%	15.3	-64.7%	0.10	99.3%					
March	Average	10.7	12.2	-14.3%	12.7	-18.9%	0.10	99.1%	7.5	2.2	70.9%	0.71	89.9%
	Maximum	15.0	16.3	-6.1%	17.1	-14.0%	0.10	99.3%	7.5	2.2	70.9%	0.77	89.9%
	Minimum	7.6	8.0	-25.0%	8.9	-25.0%	0.10	98.7%	7.5	2.2	70.9%	0.59	89.9%
April	Average	17.5	16.8	4.2%	16.1	8.0%	0.10	99.4%				0.69	
	Maximum	19.1	19.0	12.1%	17.8	23.0%	0.10	99.5%				1.66	
	Minimum	14.6	14.3	-7.3%	14.0	-16.4%	0.10	99.3%				0.16	
May	Average	19.3	20.8	-7.5%	21.2	-9.7%	0.10	99.5%				0.53	
	Maximum	24.1	28.2	5.6%	27.3	0.0%	0.10	99.6%				0.59	
	Minimum	15.6	16.7	-17.0%	17.7	-20.5%	0.10	99.4%				0.38	
June	Average	10.3	12.3	-19.3%	11.7	-13.0%	0.10	99.0%	3.4	4.6	-32.8%	0.43	84.5%
	Maximum	26.6	20.6	22.6%	21.4	19.5%	0.10	99.6%	3.4	4.6	-32.8%	0.66	84.5%
	Minimum	6.2	6.9	-72.2%	5.7	-69.0%	0.10	98.4%	3.4	4.6	-32.8%	0.32	84.5%
July	Average	15.8	17.2	-8.9%	14.3	9.5%	0.10	99.4%				0.39	
	Maximum	22.5	27.4	25.2%	23.0	24.3%	0.10	99.6%				0.45	
	Minimum	8.8	8.8	-45.7%	6.6	-22.3%	0.10	98.9%				0.31	
August	Average	18.8	16.9	10.1%	15.0	20.2%	0.12	99.4%				0.29	
	Maximum	31.2	23.5	62.5%	20.5	64.1%	0.33	99.7%				0.37	
	Minimum	13.4	11.7	-11.6%	10.3	-0.5%	0.10	98.1%				0.23	
September	Average	19.7	21.4	-8.8%	18.5	6.0%	0.10	99.5%	5.5	2.9	46.3%	0.28	94.9%
	Maximum	22.9	33.4	21.8%	25.8	28.7%	0.13	99.6%	5.5	2.9	46.3%	0.35	94.6%
	Minimum	15.5	15.0	-62.1%	12.8	-25.2%	0.10	99.2%	5.5	2.9	46.3%	0.20	94.6%
October	Average	22.8	24.1	-5.4%	21.3	6.7%	0.10	99.6%				0.25	
	Maximum	25.7	31.1	21.0%	31.3	33.6%	0.10	99.6%				0.31	
	Minimum	18.8	17.3	-31.2%	15.5	-32.1%	0.10	99.5%				0.17	
November	Average	23.9	32.0	-33.9%	22.5	6.2%	0.10	99.6%					
	Maximum	27.6	35.7	-23.8%	26.6	26.2%	0.10	99.6%					
	Minimum	15.8	27.4	-73.4%	18.6	-49.4%	0.10	99.4%					
December	Average	22.0	21.6	1.6%	21.0	4.4%	0.10	99.5%	5.7	4.1	27.3%	3.30	21.6%
	Maximum	24.1	24.8	30.5%	26.0	18.5%	0.10	99.6%	5.7	4.1	27.3%	4.43	21.6%
	Minimum	19.5	15.5	-18.1%	15.9	-23.8%	0.10	99.6%	5.7	4.1	27.3%	2.70	21.6%

* Secondary treatment converts other forms of nitrogren to ammonia, which can result in negative primary and trickling filter removal percentages.

Table E-2. Clinton Wastewater Treatment Plant Operations Summary, 2013 (cont.)

Date		Biochemical Oxygen Demand (BOD5), mg/L							Total Suspended Solids (TSS), mg/L						
		Influent	**Primary Effluent**	**Primary % Removal**	**Trickling Filter Effluent**	**TF % Removal**	**Final Effluent**	**Overall % Removal**	**Influent**	**Primary Effluent**	**Primary % Removal**	**Trickling Filter Effluent**	**TF % Removal**	**Final Effluent**	**Overall % Removal**
January	**Average**	271	152.9	43.6%	58.8	78.3%	5.44	98.0%	273	58.1	78.7%	48.5	88.7%	7.69	97.2%
	Maximum	420	235.0	63.1%	87.4	87.8%	6.59	99.0%	488	74.0	84.8%	48.5	88.7%	9.20	98.4%
	Minimum	187	82.2	18.5%	36.5	66.7%	4.30	97.0%	138	42.0	60.9%	48.5	88.7%	5.80	94.2%
February	**Average**	258	151.2	41.4%	68.8	73.3%	4.90	98.1%	207	60.5	70.8%			6.57	96.8%
	Maximum	402	208.0	59.0%	99.4	81.4%	7.48	98.9%	340	94.0	79.3%			8.80	98.0%
	Minimum	152	95.6	11.2%	48.9	58.7%	3.32	97.0%	124	42.0	51.1%			5.20	94.5%
March	**Average**	157	89.3	43.2%	51.2	67.4%	4.41	97.2%	124	41.2	66.8%			<4.79	96.1%
	Maximum	232	129.0	67.0%	74.1	80.3%	5.44	98.4%	166	66.0	81.3%			6.00	97.1%
	Minimum	112	56.7	18.8%	32.2	45.1%	3.48	95.4%	84	24.0	56.5%			<3.40	92.9%
April	**Average**	157	89.3	43.2%	51.2	67.4%	4.41	97.2%	124	41.2	66.8%			<4.79	96.1%
	Maximum	232	129.0	67.0%	74.1	80.3%	5.44	98.4%	166	66.0	81.3%			6.00	97.1%
	Minimum	112	56.7	18.8%	32.2	45.1%	3.48	95.4%	84	24.0	56.5%			<3.40	92.9%
May	**Average**	256	172.2	32.8%	95.3	62.8%	3.59	98.6%	237	72.6	69.4%			4.09	98.3%
	Maximum	463	313.0	59.2%	166.0	79.7%	5.63	99.3%	422	98.0	81.9%			4.70	98.9%
	Minimum	175	104.0	-15.1%	53.8	38.8%	2.61	97.5%	120	44.0	52.9%			3.50	97.0%
June	**Average**	128	78.8	38.5%	44.7	65.1%	2.63	97.9%	115	43.0	62.5%			<3.93	96.6%
	Maximum	215	174.5	75.0%	76.2	75.0%	3.79	99.0%	192	83.3	78.1%			5.55	97.5%
	Minimum	71	26.8	7.8%	24.3	34.8%	1.93	96.5%	84	26.0	48.5%			<2.80	95.5%
July	**Average**	249	134.3	46.0%	64.6	74.0%	2.71	98.9%	225	52.2	76.8%			3.17	98.6%
	Maximum	439	239.0	70.4%	143.0	88.9%	3.95	99.4%	368	80.0	82.7%			3.80	99.3%
	Minimum	115	46.4	-2.1%	32.9	37.3%	2.14	97.2%	120	32.0	63.2%			2.20	96.8%
August	**Average**	282	135.4	52.0%	53.5	81.0%	2.60	99.1%	336	47.7	85.8%			3.38	99.0%
	Maximum	459	255.0	82.1%	130.0	93.0%	4.56	99.6%	766	76.0	92.4%			7.00	99.7%
	Minimum	144	58.6	-12.0%	26.8	39.8%	1.83	98.5%	158	32.0	72.3%			1.80	98.3%
September	**Average**	288	162.9	43.5%	51.9	82.0%	2.24	99.2%	223	51.0	77.1%			<2.88	98.7%
	Maximum	481	367.0	73.8%	129.0	90.7%	3.10	99.4%	362	74.0	87.8%			10.00	99.2%
	Minimum	168	60.3	16.3%	21.5	67.3%	1.54	98.6%	176	36.0	62.6%			<1.80	96.6%
October	**Average**	343	206.4	39.8%	82.0	76.1%	2.89	99.2%	242	63.9	73.7%			2.88	98.8%
	Maximum	682	368.0	78.2%	212.0	92.8%	3.67	99.5%	312	82.0	82.3%			4.60	99.2%
	Minimum	180	95.5	-45.5%	27.7	16.2%	2.44	98.6%	138	42.0	59.4%			2.00	97.7%
November	**Average**	287	177.8	38.0%	74.9	73.9%	4.54	98.4%	233	54.5	76.6%			5.18	97.8%
	Maximum	423	375.0	65.7%	159.0	85.4%	7.67	99.3%	328	70.0	86.0%			8.00	98.9%
	Minimum	199	97.2	11.3%	38.8	62.4%	3.00	97.0%	172	38.0	69.4%			3.00	96.0%
December	**Average**	273	153.4	43.7%	59.9	78.0%	5.26	98.1%	212	51.3	75.8%			<6.96	96.7%
	Maximum	433	262.0	60.0%	90.9	86.4%	6.72	98.8%	308	72.0	87.7%			8.89	97.8%
	Minimum	186	92.0	22.5%	39.2	66.1%	3.23	96.4%	148	34.0	60.4%			<5.60	94.0%

Table E-2. Clinton Wastewater Treatment Plant Operations Summary, 2013 (cont.)

Date		Plant Flow, MGD	Disinfection Sodium Hypochlorite,	Dechlorination Sodium Bisulfate, GPD	Final Effluent Sampling Results Time Collected			Total Chlorine Residual, mg/L (MDL <0.02)				Fecal Coliform, col/100 mL (MDL <3)			
					1	2	3	1	2	3	Avg	1	0	3	GeoMean
January	Total	68.342	2,170	1,550											
	Average	2.205	70	50								0.02			5
	Maximum	2.541	70	50								0.02			9
	Minimum	1.948	70	50								0.02			3
February	Total	62.617	1,960	1,400											
	Average	2.236	70	50								0.02			3
	Maximum	3.820	70	50								0.02			12
	Minimum	1.949	70	50								0.02			2
March	Total	113.717	2,170	1,550											
	Average	3.668	70	50								0.02			3
	Maximum	5.413	70	50								0.02			6
	Minimum	3.045	70	50								0.02			2
April	Total	75.126	2,100	1,500											
	Average	2.504	70	50								0.02			3
	Maximum	3.196	70	50								0.02			5
	Minimum	2.225	70	50								0.02			2
May	Total	68.938	2,170	1,550											
	Average	2.224	70	50								0.02			3
	Maximum	2.627	70	50								0.03			5
	Minimum	1.940	70	50								0.02			3
June	Total	134.799	2,830	1,500											
	Average	4.493	94	50								0.02			3
	Maximum	8.476	150	50								0.02			4
	Minimum	2.382	70	50								0.02			3
July	Total	84.604	2,775	1,520											
	Average	2.729	90	49								0.02			4
	Maximum	3.717	100	50								0.02			9
	Minimum	2.019	70	20								0.02			2
August	Total	76.972	2,170	1,550											
	Average	2.483	70	50								0.02			4
	Maximum	3.046	70	50								0.02			19
	Minimum	1.999	70	50								0.02			3
September	Total	58.011	2,100	1,500											
	Average	1.934	70	50								0.02			3
	Maximum	2.360	70	50								0.02			9
	Minimum	1.715	70	50								0.02			3
October	Total	52.024	2,170	1,552											
	Average	1.678	70	50								0.02			3
	Maximum	1.894	70	52								0.02			6
	Minimum	1.534	70	50								0.02			3
November	Total	49.528	2,100	1,500											
	Average	1.651	70	50								0.02			4
	Maximum	2.280	70	50								0.02			28
	Minimum	1.527	70	50								0.02			3
December	Total	54.543	2,170	1,550											
	Average	1.759	70	50								0.02			3
	Maximum	2.303	70	50								0.02			5
	Minimum	1.371	70	50								0.02			2

Table E-3. Clinton Wastewater Treatment Plant 2012 Average Influent Concentrations

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Annual	Max Annual	No of Detects
Metals and Cyanide (ug/L)															
Aluminum			1230			482			579			370	665	1230	4 of 4
Antimony			12.5			25							19	25	0 of 2
Arsenic			3.72			3.99			4.6			3.04	3.84	4.6	4 of 4
Beryllium			0.25			0.25			0.25			0.25	0.25	0.25	0 of 4
Boron			125			125			125			125	125	125	0 of 4
Cadmium			1			1			1			1	1	1	0 of 4
Chromium			17.2			6.62			2			2	7	17.2	2 of 4
Copper			113			61.4			95.1			46.2	78.9	113	4 of 4
Iron			18700			3830			3710			2350	7148	18700	4 of 4
Lead			17.4			7.05			9.59			4.03	9.52	17.4	4 of 4
Mercury			0.412			0.0879			0.0739			0.0691	0.1607	0.412	4 of 4
Molybdenum			7.5			7.5			7.5			7.5	7.5	7.5	0 of 4
Nickel			5.94			2.5			6.57			2.5	4	6.57	2 of 4
Selenium			25			50			0.45			0.45	19	50	0 of 4
Silver			1			1			1			1	1	1	0 of 4
Thallium			30			75			0.5			0.5	27	75	0 of 4
Zinc			473			181			215			158	257	473	4 of 4
Cyanide			5			5			5			5	5	5	0 of 4
FOG, PHC, and Surfactants (mg/L)															
Fats Oil and Grease			17500			729			24500			27500	17557	27500	3 of 4
MBAS			2650			2340			2700				2563	2700	3 of 3
Petroleum Hydrocarbon			554			250			700			970	619	970	4 of 4
Nutrients (mg/L)															
Orthophosphate			1790			1040			1700			1670	1550	1790	4 of 4
Total Phosphorus			8450			4880			4850			3680	5465	8450	4 of 4
Conventional Parameters (mg/L)															
Biochemical Oxygen Demand	194	223	209	233	200	191	244	341	300	282	229	253	242	341	160 of 160
Total Suspended Solids	173	214	217	258	175	140	254	354	328	277	228	233	238	354	
Pesticides (ug/L)															
4,4'-DDD			0.00218			0.00208			0.00218			0.00208	0	0.00218	0 of 4
4,4'-DDE			0.00218			0.00208			0.00218			0.00208	0	0.00218	0 of 4
4,4'-DDT			0.00218			0.00208			0.00218			0.00208	0	0.00218	0 of 4
Aldrin			0.00109			0.00104			0.00109			0.00104	0	0.00109	0 of 4
Alpha-BHC			0.00109			0.00104			0.00109			0.00104	0	0.00109	0 of 4
Alpha-chlordane			0.00109			0.00104			0.00109			0.00104	0	0.00109	0 of 4
Aroclor-1016			0.0545			0.052			0.0545			0.052	0	0.0545	0 of 4
Aroclor-1221			0.109			0.104			0.109			0.104	0	0.109	0 of 4
Aroclor-1232			0.0545			0.052			0.0545			0.052	0	0.0545	0 of 4
Aroclor-1242			0.0545			0.052			0.0545			0.052	0	0.0545	0 of 4
Aroclor-1248			0.0545			0.052			0.0545			0.052	0	0.0545	0 of 4
Aroclor-1254			0.0545			0.052			0.0545			0.052	0	0.0545	0 of 4
Aroclor-1260			0.0545			0.052			0.0545			0.052	0	0.0545	0 of 4
Beta-BHC			0.00109			0.00104			0.00109			0.00104	0	0.00109	0 of 4
Chlordane (technical)			0.109			0.104			0.109			0.104	0	0.109	0 of 4
Delta-BHC			0.00109			0.00104			0.00109			0.00104	0	0.00109	0 of 4
Dieldrin			0.00218			0.00208			0.00218			0.00208	0	0.00218	0 of 4
Endosulfan I			0.00109			0.00104			0.00109			0.00104	0	0.00109	0 of 4
Endosulfan II			0.00218			0.00208			0.00218			0.00208	0	0.00218	0 of 4
Endosulfan Sulfate			0.00218			0.00208			0.00218			0.00208	0	0.00218	0 of 4
Endrin			0.00218			0.00208			0.00218			0.00208	0	0.00218	0 of 4

Table E-3. Clinton Wastewater Treatment Plant 2012 Average Influent Concentrations (cont.)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Annual	Max Annual	No of Detects
Pesticides (ug/L) (cont.)															
Endrin Aldehyde			0.00218			0.00208			0.00218			0.00208	0	0.00218	0 of 4
Endrin Ketone			0.00218			0.00208			0.00218			0.00208	0	0.00218	0 of 4
Gamma-BHC			0.00109			0.00104			0.00109			0.00104	0	0.00109	0 of 4
Gamma-chlordane			0.00109			0.00104			0.00109			0.00104	0	0.00109	0 of 4
Heptachlor			0.00109			0.00104			0.00109			0.00104	0	0.00109	0 of 4
Heptachlor Epoxide			0.00109			0.00104			0.00109			0.00104	0	0.00109	0 of 4
Hexachlorobenzene			0.00106			0.00105			0.00105			0.00104	0	0.00106	0 of 24
Methoxychlor			0.0109			0.0104			0.0109			0.0104	0	0.0109	0 of 4
Toxaphene			0.109			0.104			0.109			0.104	0	0.109	0 of 4
Semivolatile Organics (ug/L)															
1,2,4-Trichlorobenzene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
1,2-Dichlorobenzene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
1,2-Diphenylhydrazine (as Azobenzene)			2.06			2.16			2.18			2.06	2	2.18	0 of 4
1,3-Dichlorobenzene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
1,4-Dichlorobenzene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
2,2'-Oxybis(1-chloropropane)			2.06			2.16			2.18			2.06	2	2.18	0 of 4
2,4,5-Trichlorophenol			2.06			2.16			2.18			2.06	2	2.18	0 of 4
2,4,6-Trichlorophenol			2.06			2.16			2.18			2.06	2	2.18	0 of 4
2,4-Dichlorophenol			2.06			2.16			2.18			2.06	2	2.18	0 of 4
2,4-Dimethylphenol			2.06			2.16			2.18			2.06	2	2.18	0 of 4
2,4-Dinitrophenol			5.15			5.4			5.45			5.15	5	5.45	0 of 4
2,4-Dinitrotoluene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
2,6-Dinitrotoluene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
2-Chloronaphthalene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
2-Chlorophenol			2.06			2.16			2.18			2.06	2	2.18	0 of 4
2-Methyl-4,6-dinitrophenol			5.15			5.4			5.45			5.15	5	5.45	0 of 4
2-Methylnaphthalene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
2-Methylphenol			2.06			2.16			2.18			2.06	2	2.18	0 of 4
2-Nitroaniline			2.06			2.16			2.18			2.06	2	2.18	0 of 4
2-Nitrophenol			2.06			2.16			2.18			2.06	2	2.18	0 of 4
3,3'-Dichlorobenzidine			2.06			2.16			2.18			2.06	2	2.18	0 of 4
3-Nitroaniline			2.06			2.16			2.18			2.06	2	2.18	0 of 4
4-Bromophenyl Phenyl Ether			2.06			2.16			2.18			2.06	2	2.18	0 of 4
4-Chloro-3-methylphenol			2.06			2.16			2.18			2.06	2	2.18	0 of 4
4-Chloroaniline			2.06			2.16			2.18			2.06	2	2.18	0 of 4
4-Chlorophenyl Phenyl Ether			2.06			2.16			2.18			2.06	2	2.18	0 of 4
4-Methylphenol (includes 3-Methylphenol)			2.06			2.16			2.18			20.8	7	20.8	1 of 4
4-Nitroaniline			2.06			2.16			2.18			2.06	2	2.18	0 of 4
4-Nitrophenol			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Acenaphthene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Acenaphthylene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Aniline			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Anthracene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Benzidine			5.15			5.4			5.45			5.15	5	5.45	0 of 4
Benzo(a)anthracene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Benzo(a)pyrene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Benzo(b)fluoranthene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Benzo(g,h,i)perylene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Benzo(k)fluoranthene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Benzoic Acid			5.15			5.4			5.45			5.15	5	5.45	0 of 4
Benzyl Alcohol			2.06			2.16			23.1			2.06	7	23.1	1 of 4
Bis(2-chloroethoxy)methane			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Bis(2-chloroethyl)ether			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Bis(2-ethylhexyl)phthalate			2.06			2.16			2.18			2.06	2	2.18	0 of 4

Table E-3. Clinton Wastewater Treatment Plant 2012 Average Influent Concentrations (cont.)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Annual	Max Annual	No of Detects
Semivolatile Organics (ug/L) (cont.)															
Butylbenzylphthalate			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Carbazole			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Chrysene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Dibenzo(a,h)anthracene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Dibenzofuran			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Diethylphthalate			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Dimethylphthalate			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Di-n-butylphthalate			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Di-n-octylphthalate			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Fluoranthene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Fluorene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Hexachlorobenzene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Hexachlorobutadiene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Hexachlorocyclopentadiene			5.15			5.4			5.45			5.15	5	5.45	0 of 4
Hexachloroethane			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Indeno(1,2,3-cd)pyrene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Isophorone			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Naphthalene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
N-decane			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Nitrobenzene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
N-nitrosodimethylamine (NDMA)			2.06			2.16			2.18			2.06	2	2.18	0 of 4
N-nitrosodi-n-propylamine (NDPA)			2.06			2.16			2.18			2.06	2	2.18	0 of 4
N-nitrosodiphenylamine			2.06			2.16			2.18			2.06	2	2.18	0 of 4
N-octadecane			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Pentachlorophenol			5.15			5.4			5.45			5.15	5	5.45	0 of 4
Phenanthrene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Phenol			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Pyrene			2.06			2.16			2.18			2.06	2	2.18	0 of 4
Volatile Organics (ug/L)															
1,1,1-Trichloroethane			0.5			0.5			0.5			0.5	1	0.5	0 of 4
1,1,2,2-Tetrachloroethane			0.5			0.5			0.5			0.5	1	0.5	0 of 4
1,1,2-Trichloroethane			0.5			0.5			0.5			0.5	1	0.5	0 of 4
1,1-Dichloroethane			0.5			0.5			0.5			0.5	1	0.5	0 of 4
1,1-Dichloroethene			0.5			0.5			0.5			0.5	1	0.5	0 of 4
1,2-Dichlorobenzene			0.5			0.5			0.5			0.5	1	0.5	0 of 4
1,2-Dichloroethane			0.5			0.5			0.5			0.5	1	0.5	0 of 4
1,2-Dichloropropane			0.5			0.5			0.5			0.5	1	0.5	0 of 4
1,3-Dichlorobenzene			0.5			0.5			0.5			0.5	1	0.5	0 of 4
1,4-Dichlorobenzene			0.5			0.5			0.5			0.5	1	0.5	0 of 4
2-Butanone			0.5			0.5			0.5			0.5	1	0.5	0 of 4
2-Chloroethyl Vinyl Ether			0.5			0.5			0.5			0.5	1	0.5	0 of 4
2-Hexanone			0.5			0.5			0.5			0.5	1	0.5	0 of 4
4-Methyl-2-pentanone			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Acetone			138			30.2			66.9			87.5	81	138	4 of 4
Acrolein			1			1			1			1	1	1	0 of 4
Acrylonitrile			1			1			1			1	1	1	0 of 4
Benzene			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Bromodichloromethane			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Bromoform			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Bromomethane			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Carbon Disulfide			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Carbon Tetrachloride			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Chlorobenzene			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Chloroethane			0.5			0.5			0.5			0.5	1	0.5	0 of 4

Table E-3. Clinton Wastewater Treatment Plant 2012 Average Influent Concentrations (cont.)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Annual	Max Annual	No of Detects
Volatile Organics (ug/L) (cont.)															
Chloroform			25.2			0.5			0.5			7.35	8	25.2	2 of 4
Chloromethane			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Cis-1,2-dichloroethene			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Cis-1,3-dichloropropene			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Dibromochloromethane			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Ethylbenzene			0.5			0.5			0.5			0.5	1	0.5	0 of 4
m,p-Xylene			1			1			1			1	1	1	0 of 4
Methylene Chloride			0.5			0.5			0.5			0.5	1	0.5	0 of 4
o-Xylene			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Styrene			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Tetrachloroethene			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Toluene			0.5			0.5			5.51			0.5	2	5.51	1 of 4
Trans-1,2-dichloroethene			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Trans-1,3-dichloropropene			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Trichloroethene			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Trichlorofluoromethane			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Vinyl Acetate			0.5			0.5			0.5			0.5	1	0.5	0 of 4
Vinyl Chloride			0.5			0.5			0.5			0.5	1	0.5	0 of 4

Notes:

1. Where parameters were below detection levels, half the method detection limit was used to calculate the flow-weighted average monthly concentration.
2. The annual average concentration is the flow-weighted average of all data points. The maximum concentration is the highest concentration observed in the monitoring year.

Table E-4. Clinton Wastewater Treatment Plant 2012 Average Effluent Concentrations

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Annual	Max Annual	No of Detects
Metals and Cyanide (ug/L)															
Aluminum			17			5.7			7.83			20	12.63	20	11 of 12
Antimony			0.25			0.25			10.3			0.313	2.78	10.3	0 of 14
Arsenic			2.63			0.52			0.742			1.21	1.28	2.63	12 of 12
Beryllium			0.025			0.025			0.0313			0.0313	0.03	0.0313	0 of 12
Boron			125			125			125			125	125	125	0 of 12
Cadmium			0.0684			0.0338			1.5			0.0632	0.41635	1.5	6 of 12
Chromium			0.816			0.604			2			2	1.355	2	5 of 12
Copper	8.92	7.08	6.95	2.34	5.69	5.55	5.8	5.99	7.7	7.43	7.76	8.41	6.64	8.92	25 of 25
Iron			112			374			323			554	341	554	12 of 12
Lead			0.32			0.155			0.237			0.322	0.259	0.322	12 of 12
Mercury			0.005			0.00746			0.005			0.005	0.006	0.00746	1 of 12
Molybdenum			1.29			1.27			1.66			1.18	1.35	1.66	12 of 12
Nickel			2.1			1.94			2.09			1.55	1.92	2.1	11 of 11
Selenium			0.504			0.25			0.313			0.313	0.345	0.504	2 of 12
Silver			0.0789			0.05			0.157			0.129	0.103725	0.157	6 of 12
Thallium			0.025			0.025			0.0946			0.0313	0.043975	0.0946	1 of 12
Zinc			25.5			10.6			14.8			18.2	17.275	25.5	12 of 12
Cyanide			5			5			5			5	5	5	0 of 12
FOG, PHC, and Surfactants (mg/L)															
Fats Oil and Grease			700			710			727			810	737	810	0 of 12
MBAS			56.8			26.2			66.8				49.9	66.8	8 of 9
Petroleum Hydrocarbon			19.7			21.9			20			20.3	20.5	21.9	0 of 12
Nutrients (mg/L)															
Ammonia	100	100	100	106	137	161	100	100	1060	1040	1080	1010	425	1080	42 of 130
Nitrate			15700			12700			19600			16700	16175	19600	11 of 11
Orthophosphate			1570	371	196	163	454	136	201	233		565	432	1570	294 of 298
Total Phosphorus			1840		266	575	203	211	264		828		598	1840	33 of 38
Conventional Parameters (mg/L)															
Biochemical Oxygen Demand	5770	4880	6130	4360	2180	2570	2630	2200	2140	2450	2560	3060	3411	6130	169 of 169
Total Suspended Solids	5.9	5.6	5.5	4.9	3.7	3.2	2.8	2.3	2.3	2.6	3.2	5.1	3.9	5.9	
Pesticides (ug/L)															
4,4'-DDD			0.00211			0.0021			0.00211			0.00207	0.0020975	0.00211	0 of 12
4,4'-DDE			0.00211			0.0021			0.00211			0.00207	0.0020975	0.00211	0 of 12
4,4'-DDT			0.00211			0.0021			0.00211			0.00207	0.0020975	0.00211	0 of 12
Aldrin			0.00106			0.00105			0.00105			0.00104	0.00105	0.00106	0 of 12
Alpha-BHC			0.00106			0.00105			0.00105			0.00104	0.00105	0.00106	0 of 12
Alpha-chlordane			0.00106			0.00105			0.00105			0.00104	0.00105	0.00106	0 of 12
Aroclor-1016			0.0528			0.0525			0.0526			0.0519	0.05245	0.0528	0 of 12
Aroclor-1221			0.106			0.105			0.105			0.104	0.105	0.106	0 of 12
Aroclor-1232			0.0528			0.0525			0.0526			0.0519	0.05245	0.0528	0 of 12
Aroclor-1242			0.0528			0.0525			0.0526			0.0519	0.05245	0.0528	0 of 12
Aroclor-1248			0.0528			0.0525			0.0526			0.0519	0.05245	0.0528	0 of 12
Aroclor-1254			0.0528			0.0525			0.0526			0.0519	0.05245	0.0528	0 of 12
Aroclor-1260			0.0528			0.0525			0.0526			0.0519	0.05245	0.0528	0 of 12
Beta-BHC			0.00106			0.00105			0.00105			0.00104	0.00105	0.00106	0 of 12
Chlordane (technical)			0.106			0.105			0.105			0.104	0.105	0.106	0 of 12
Delta-BHC			0.00106			0.00105			0.00105			0.00104	0.00105	0.00106	0 of 12
Dieldrin			0.00211			0.0021			0.00211			0.00207	0.0020975	0.00211	0 of 12
Endosulfan I			0.00106			0.00105			0.00105			0.00104	0.00105	0.00106	0 of 12

Table E-4. Clinton Wastewater Treatment Plant 2012 Average Effluent Concentrations (cont.)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Annual	Max Annual	No of Detects
Pesticides (ug/L) (cont.)															
Endosulfan II			0.00211			0.0021			0.00211			0.00207	0.0020975	0.00211	0 of 12
Endosulfan Sulfate			0.00211			0.0021			0.00211			0.00207	0.0020975	0.00211	0 of 12
Endrin			0.00211			0.0021			0.00211			0.00207	0.0020975	0.00211	0 of 12
Endrin Aldehyde			0.00211			0.0021			0.00211			0.00207	0.0020975	0.00211	0 of 12
Endrin Ketone			0.00211			0.0021			0.00211			0.00207	0.0020975	0.00211	0 of 12
Gamma-BHC (Lindane)			0.00106			0.00105			0.00105			0.00104	0.00105	0.00106	0 of 12
Gamma-chlordane			0.00106			0.00105			0.00105			0.00104	0.00105	0.00106	0 of 12
Heptachlor			0.00106			0.00105			0.00105			0.00104	0.00105	0.00106	0 of 12
Heptachlor Epoxide			0.00106			0.00105			0.00105			0.00104	0.00105	0.00106	0 of 12
Hexachlorobenzene															
Methoxychlor			0.0106			0.0105			0.0105			0.0104	0.0105	0.0106	0 of 12
Toxaphene			0.106			0.105			0.105			0.104	0.105	0.106	0 of 12
Semivolatile Organics (ug/L)															
1,2,4-Trichlorobenzene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
1,2-Dichlorobenzene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
1,2-Diphenylhydrazine (as Azobenzene)			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
1,3-Dichlorobenzene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
1,4-Dichlorobenzene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
2,2'-Oxybis(1-chloropropane)			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
2,4,5-Trichlorophenol			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
2,4,6-Trichlorophenol			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
2,4-Dichlorophenol			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
2,4-Dimethylphenol			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
2,4-Dinitrophenol			5.3			5.3			5.17			5.19	5.24	5.3	0 of 12
2,4-Dinitrotoluene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
2,6-Dinitrotoluene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
2-Chloronaphthalene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
2-Chlorophenol			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
2-Methyl-4,6-dinitrophenol			5.3			5.3			5.17			5.19	5.24	5.3	0 of 12
2-Methylnaphthalene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
2-Methylphenol			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
2-Nitroaniline			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
2-Nitrophenol			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
3,3'-Dichlorobenzidine			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
3-Nitroaniline			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
4-Bromophenyl Phenyl Ether			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
4-Chloro-3-methylphenol			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
4-Chloroaniline			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
4-Chlorophenyl Phenyl Ether			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
4-Methylphenol (includes 3-Methylphenol)			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
4-Nitroaniline			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
4-Nitrophenol			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Acenaphthene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Acenaphthylene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Aniline			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Anthracene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Benzidine			5.3			5.3			5.17			5.19	5.24	5.3	0 of 12
Benzo(a)anthracene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Benzo(a)pyrene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Benzo(b)fluoranthene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Benzo(g,h,i)perylene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Benzo(k)fluoranthene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Benzoic Acid			5.3			5.3			5.17			5.19	5.24	5.3	0 of 12
Benzyl Alcohol			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Bis(2-chloroethoxy)methane			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12

Table E-4. Clinton Wastewater Treatment Plant 2012 Average Effluent Concentrations (cont.)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Annual	Max Annual	No of Detects
Semivolatile Organics (ug/L) (cont.)															
Bis(2-chloroethyl)ether			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Bis(2-ethylhexyl)phthalate			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Butyl Benzyl Phthalate			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Carbazole			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Chrysene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Dibenzo(a,h)anthracene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Dibenzofuran			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Diethyl Phthalate			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Dimethyl Phthalate			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Di-n-butylphthalate			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Di-n-octylphthalate			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Fluoranthene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Fluorene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Hexachlorobenzene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Hexachlorobutadiene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Hexachlorocyclopentadiene			5.3			5.3			5.17			5.19	5.24	5.3	0 of 12
Hexachlorothane			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Indeno(1,2,3-cd)pyrene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Isophorone			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Naphthalene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
N-Decane			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Nitrobenzene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
N-nitrosodimethylamine			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
N-nitrosodi-n-propylamine			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
N-nitrosodiphenylamine			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
N-octadecane			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Pentachlorophenol			5.3			5.3			5.17			5.19	5.24	5.3	0 of 12
Phenanthrene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Phenol			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Pyrene			2.12			2.12			2.07			2.07	2.10	2.12	0 of 12
Volatile Organics (ug/L)															
1,1,1-Trichloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,1,2,2-Tetrachloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,1,2-Trichloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,1-Dichloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,1-Dichloroethene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,2-Dichlorobenzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,2-Dichloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,2-Dichloropropane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,3-Dichlorobenzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,4-Dichlorobenzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
2-Butanone			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
2-Chloroethyl Vinyl Ether			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
2-Hexanone			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
4-Methyl-2-pentanone			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Acetone			1			1			8.76			1	2.94	8.76	1 of 12
Acrolein			1			1			1			1	1	1	0 of 12
Acrylonitrile			1			1			1			1	1	1	0 of 12
Benzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Bromodichloromethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Bromoform			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Bromomethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Carbon Disulfide			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Carbon Tetrachloride			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Chlorobenzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12

Table E-4. Clinton Wastewater Treatment Plant 2012 Average Effluent Concentrations (cont.)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Annual	Max Annual	No of Detects
Volatile Organics (ug/L) (cont.)															
Chloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Chloroform			14.8			10.5			19			22.9	16.8	22.9	12 of 12
Chloromethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Cis-1,2-dichloroethene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Cis-1,3-dichloropropene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Dibromochloromethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Ethylbenzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
m,p-Xylene			1			1			1			1	1	1	0 of 12
Methylene Chloride			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
o-Xylene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Styrene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Tetrachloroethene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Toluene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Trans-1,2-dichloroethene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Trans-1,3-dichloropropene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Trichloroethene			0.5			0.5			2.67			0.5	1.0425	2.67	1 of 12
Trichlorofluoromethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Vinyl Acetate			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Vinyl Chloride			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12

Notes:

1. Where parameters were below detection levels, half the method detection limit was used to calculate the flow-weighted average monthly concentration.
2. The annual average concentration is the flow-weighted average of all data points. The maximum concentration is the highest concentration observed in the monitoring year.

Table E-5. Clinton Wastewater Treatment Plant 2013 Average Influent Concentrations

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Annual	Max Annual	No of Detects
Metals and Cyanide (ug/L)															
Aluminum			1260			228			635			322	611	1260	4 of 4
Antimony			25			25			25			25	25	25	0 of 4
Arsenic			5.78			3.16			5.08			3.9	4.5	5.78	4 of 4
Beryllium			0.25			0.25			0.25			0.25	0.25	0.25	0 of 4
Boron			125			125			125			125	125	125	0 of 4
Cadmium			1			1			1			1	1	1	0 of 4
Chromium			10.9			2			7.86			2	5.69	10.9	2 of 4
Copper			196			46.5			125			75.1	111	196	4 of 4
Iron			11700			1870			6050			8830	7113	11700	4 of 4
Lead			20.1			3.63			6.3			6.81	9.21	20.1	4 of 4
Mercury			0.261			0.042			0.107			0.148	0.140	0.261	4 of 4
Molybdenum			7.5			7.5			7.5			7.5	7.5	7.5	0 of 4
Nickel			7.45			2.5			5.39			6.14	5.37	7.45	3 of 4
Selenium			1.08			0.45			0.45			0.45	0.61	1.08	1 of 4
Silver			1			1			1			1	1	1	0 of 4
Thallium			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Zinc			523			181			245			254	301	523	4 of 4
Cyanide			5			5			5			5	5	5	0 of 4
FOG, PHC, and Surfactants (mg/L)															
Fats Oil and Grease			17100			11500			12700			28400	17425.0	28400.0	4 of 4
MBAS															
Petroleum Hydrocarbon			910			76.9			63.8			1010	515.2	1010.0	2 of 4
Nutrients (mg/L)															
Orthophosphate			1580			1370			1570			3170	1923	3170.0	4 of 4
Total Phosphorus			7520			3440			5470			5650	5520	7520.0	4 of 4
Conventional Parameters (mg/L)															
Biochemical Oxygen Demand	268	252	170	251	256	118	246	280	286	341	286	278	253	341	161 of 161
Total Suspended Solids	273	207	124	194	237	115	225	336	223	242	233	212	218	336	
Pesticides (ug/L)															
4,4'-DDD			0.00204			0.00208			0.00218			0.00224	0.002135	0.00224	0 of 4
4,4'-DDE			0.00204			0.00208			0.00218			0.00224	0.002135	0.00224	0 of 4
4,4'-DDT			0.00204			0.00208			0.00218			0.00224	0.002135	0.00224	0 of 4
Aldrin			0.00102			0.00104			0.00109			0.00112	0.0010675	0.00112	0 of 4
Alpha-BHC			0.00102			0.00104			0.00109			0.00112	0.0010675	0.00112	0 of 4
Alpha-Chlordane			0.00102			0.00104			0.00109			0.00112	0.0010675	0.00112	0 of 4
Aroclor-1016			0.051			0.052			0.0545			0.056	0.053375	0.056	0 of 4
Aroclor-1221			0.102			0.104			0.109			0.112	0.10675	0.112	0 of 4
Aroclor-1232			0.051			0.052			0.0545			0.056	0.053375	0.056	0 of 4
Aroclor-1242			0.051			0.052			0.0545			0.056	0.053375	0.056	0 of 4
Aroclor-1248			0.051			0.052			0.0545			0.056	0.053375	0.056	0 of 4
Aroclor-1254			0.051			0.052			0.0545			0.056	0.053375	0.056	0 of 4
Aroclor-1260			0.051			0.052			0.0545			0.056	0.053375	0.056	0 of 4
Beta-BHC			0.00102			0.00104			0.00109			0.00112	0.0010675	0.00112	0 of 4
Chlordane (technical)			0.102			0.104			0.109			0.112	0.10675	0.112	0 of 4
Delta-BHC			0.00102			0.00104			0.00109			0.00112	0.0010675	0.00112	0 of 4
Dieldrin			0.00204			0.00208			0.00218			0.00224	0.002135	0.00224	0 of 4
Endosulfan I			0.00102			0.00104			0.00109			0.00112	0.0010675	0.00112	0 of 4
Endosulfan II			0.00204			0.00208			0.00218			0.00224	0.002135	0.00224	0 of 4
Endosulfan Sulfate			0.00204			0.00208			0.00218			0.00224	0.002135	0.00224	0 of 4
Endrin			0.00204			0.00208			0.00218			0.00224	0.002135	0.00224	0 of 4
Endrin Aldehyde			0.00204			0.00208			0.00218			0.00224	0.002135	0.00224	0 of 4
Endrin Ketone			0.00204			0.00208			0.00218			0.00224	0.002135	0.00224	0 of 4

Table E-5. Clinton Wastewater Treatment Plant 2013 Average Influent Concentrations (cont.)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Annual	Max Annual	No of Detects
Pesticides (ug/L) (cont.)															
Gamma-BHC			0.00102			0.00104			0.00109			0.00112	0.0010675	0.00112	0 of 4
Gamma-Chlordane			0.00102			0.00104			0.00109			0.00112	0.0010675	0.00112	0 of 4
Heptachlor			0.00102			0.00104			0.00109			0.00112	0.0010675	0.00112	0 of 4
Heptachlor Epoxide			0.00102			0.00104			0.00109			0.00112	0.0010675	0.00112	0 of 4
Hexachlorobenzene			0.00102						0.00109				0.001055	0.00109	0 of 2
Methoxychlor			0.0102			0.0104			0.0109			0.0112	0.010675	0.0112	0 of 4
Toxaphene			0.102			0.104			0.109			0.112	0.10675	0.112	0 of 4
Semivolatile Organics (ug/L)															
1,2,4-Trichlorobenzene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
1,2-Dichlorobenzene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
1,2-Diphenylhydrazine (as Azobenzene)			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
1,3-Dichlorobenzene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
1,4-Dichlorobenzene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
2,2'-Oxybis(1-Chloropropane)			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
2,4,5-Trichlorophenol			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
2,4,6-Trichlorophenol			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
2,4-Dichlorophenol			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
2,4-Dimethylphenol			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
2,4-Dinitrophenol			5.45			5.2			5.25			5.32	5.305	5.45	0 of 4
2,4-Dinitrotoluene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
2,6-Dinitrotoluene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
2-Chloronaphthalene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
2-Chlorophenol			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
2-Methyl-4,6-dinitrophenol			5.45			5.2			5.25			5.32	5.305	5.45	0 of 4
2-Methylnaphthalene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
2-Methylphenol			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
2-Nitroaniline			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
2-Nitrophenol			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
3,3'-Dichlorobenzidine			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
3-Nitroaniline			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
4-Bromophenyl Phenyl Ether			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
4-Chloro-3-methylphenol			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
4-Chloroaniline			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
4-Chlorophenyl Phenyl Ether			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
4-Methylphenol (includes 3-Methylphenol)			22.1			22.1			65.4			64.8	43.6	65.4	4 of 4
4-Nitroaniline			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
4-Nitrophenol			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Acenaphthene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Acenaphthylene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Aniline			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Anthracene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Benzidine			5.45			5.2			5.25			5.32	5.305	5.45	0 of 4
Benzo(a)anthracene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Benzo(a)pyrene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Benzo(b)fluoranthene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Benzo(g,h,i)perylene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Benzo(k)fluoranthene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Benzoic Acid			5.45			5.2			5.25			5.32	5.305	5.45	0 of 4
Benzyl Alcohol			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Bis(2-chloroethoxy)methane			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Bis(2-chloroethyl)ether			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Bis(2-ethylhexyl)phthalate			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Butylbenzylphthalate			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Carbazole			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Chrysene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Dibenzo(a,h)anthracene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Dibenzofuran			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4

Table E-5. Clinton Wastewater Treatment Plant 2013 Average Influent Concentrations (cont.)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Annual	Max Annual	No of Detects
Semivolatile Organics (ug/L) (cont.)															
Diethylphthalate			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Dimethylphthalate			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Di-n-butylphthalate			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Di-n-octylphthalate			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Fluoranthene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Fluorene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Hexachlorobenzene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Hexachlorobutadiene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Hexachlorocyclopentadiene			5.45			5.2			5.25			5.32	5.305	5.45	0 of 4
Hexachloroethane			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Indeno(1,2,3-cd)pyrene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Isophorone			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Naphthalene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
N-decane			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Nitrobenzene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
N-nitrosodimethylamine (NDMA)			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
N-nitrosodi-n-propylamine (NDPA)			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
N-nitrosodiphenylamine			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
N-Octadecane			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Pentachlorophenol			5.45			5.2			5.25			5.32	5.305	5.45	0 of 4
Phenanthrene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Phenol			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Pyrene			2.18			2.08			2.1			2.13	2.1225	2.18	0 of 4
Volatile Organics (ug/L)															
1,1,1-Trichloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
1,1,2,2-Tetrachloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
1,1,2-Trichloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
1,1-Dichloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
1,1-Dichloroethene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
1,2-Dichlorobenzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
1,2-Dichloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
1,2-Dichloropropane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
1,3-Dichlorobenzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
1,4-Dichlorobenzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
2-Butanone			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
2-Chloroethyl Vinyl Ether			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
2-Hexanone			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
4-Methyl-2-pentanone			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Acetone			34.3			368			30.8			12.7	111.45	368	4 of 4
Acrolein			1			1			1			1	1	1	0 of 4
Acrylonitrile			1			1			1			1	1	1	0 of 4
Benzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Bromodichloromethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Bromoform			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Bromomethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Carbon Disulfide			0.5			0.5			10			0.5	2.875	10	1 of 4
Carbon Tetrachloride			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Chlorobenzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Chloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Chloroform			0.5			18.1			0.5			0.5	4.9	18.1	1 of 4
Chloromethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Cis-1,2-dichloroethene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Cis-1,3-dichloropropene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Dibromochloromethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Ethylbenzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
m,p-Xylene			1			1			1			1	1	1	0 of 4
Methylene Chloride			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4

Table E-5. Clinton Wastewater Treatment Plant 2013 Average Influent Concentrations (cont.)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Annual	Max Annual	No of Detects
Volatile Organics (ug/L) (cont.)															
o-Xylene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Styrene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Tetrachloroethene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Toluene			7.2			0.5			5.56			0.5	3.44	7.2	2 of 4
Trans-1,2-dichloroethene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Trans-1,3-dichloropropene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Trichloroethene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Trichlorofluoromethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Vinyl Acetate			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4
Vinyl Chloride			0.5			0.5			0.5			0.5	0.5	0.5	0 of 4

Notes:
1. Where parameters were below detection levels, half the method detection limit was used to calculate the flow-weighted average monthly concentration.
2. The annual average concentration is the flow-weighted average of all data points. The maximum concentration is the highest concentration observed in the monitoring year.

Table E-6. Clinton Wastewater Treatment Plant 2013 Average Effluent Concentrations

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Annual	Max Annual	No of Detects
Metals and Cyanide (ug/L)															
Aluminum			16.1			30.4			7.77			17.6	17.97	30.4	12 of 15
Antimony			0.313			12.7			0.313			0.531	3.46	12.7	1 of 15
Arsenic			1.16			0.888			0.564			3.04	1.41	3.04	12 of 12
Beryllium			0.0313			0.141			0.0313			0.0313	0.06	0.141	0 of 15
Boron			125			125			125			125	125.00	125	0 of 12
Cadmium			0.0482			0.887			0.114			0.203	0.31	0.887	6 of 13
Chromium			2			2			2			2	2.00	2	0 of 12
Copper	9.01	9.88	5.63	7.23	6.36	5.84	4.95	6.41	6.66	6.7	5.77	10.1	7.05	10.1	26 of 28
Iron			470			570			321			335	424.00	570	12 of 12
Lead			0.359			0.356			0.184			0.391	0.32	0.391	13 of 13
Mercury			0.0125			0.0125						0.0125	0.01	0.0125	0 of 9
Molybdenum			1.29			4.84			1.05			5.8	3.25	5.8	13 of 16
Nickel			2.14			2.38			1.88			1.89	2.07	2.38	12 of 15
Selenium			0.313			0.313			0.313			0.313	0.31	0.313	0 of 12
Silver			0.0625			0.544			0.0625			0.0625	0.18	0.544	1 of 15
Thallium			0.0417			0.0313			0.0313			0.0313	0.03	0.0417	1 of 12
Zinc			22			16.8			12.2			22.3	18.33	22.3	15 of 15
Cyanide			5			5			5			5	5.00	5	0 of 12
FOG, PHC, and Surfactants (mg/L)															
Fats Oil and Grease			781			696			689			678	711	781	0 of 12
MBAS															
Petroleum Hydrocarbon			21			65.1			63.9			62.5	53.125	65.1	0 of 10
Nutrients (mg/L)															
Ammonia	1070	1050	100	100	100	100	100	117	103	100	100	100	261.66667	1070	12 of 105
Nitrate			12500			19700			21000			26600	19950	26600	10 of 10
Orthophosphate			512	306	372	276	272	224	216	193		2200	507.88889	2200	297 of 297
Total Phosphorus			708	722	528	407	384	286	282	247		3280	760.44444	3280	42 of 42
Conventional Parameters (mg/L)															
Biochemical Oxygen Demand	5.44	4.84	4.48	3.59	3.58	2.59	2.73	2.58	2.21	2.89	4.56	5.23	3.7	5.44	168 of 168
Total Suspended Solids	7.69	6.57	4.82	4.23	4.09	4.13	3.17	3.38	2.81	2.88	5.18	6.96	4.7	7.69	
Pesticides (ug/L)															
4,4'-DDD			0.00211			0.00207			0.00209			0.0023	0.0021425	0.0023	0 of 12
4,4'-DDE			0.00211			0.00207			0.00209			0.0023	0.0021425	0.0023	0 of 12
4,4'-DDT			0.00211			0.00207			0.00209			0.0023	0.0021425	0.0023	0 of 12
Aldrin			0.00105			0.00104			0.00104			0.00115	0.00107	0.00115	0 of 12
Alpha-BHC			0.00105			0.00104			0.00104			0.00115	0.00107	0.00115	0 of 12
Alpha-chlordane			0.00105			0.00104			0.00104			0.00115	0.00107	0.00115	0 of 12
Aroclor-1016			0.0527			0.0519			0.0521			0.0576	0.053575	0.0576	0 of 12
Aroclor-1221			0.105			0.104			0.104			0.115	0.107	0.115	0 of 12
Aroclor-1232			0.0527			0.0519			0.0521			0.0576	0.053575	0.0576	0 of 12
Aroclor-1242			0.0527			0.0519			0.0521			0.0576	0.053575	0.0576	0 of 12
Aroclor-1248			0.0527			0.0519			0.0521			0.0576	0.053575	0.0576	0 of 12
Aroclor-1254			0.0527			0.0519			0.0521			0.0576	0.053575	0.0576	0 of 12
Aroclor-1260			0.0527			0.0519			0.0521			0.0576	0.053575	0.0576	0 of 12
Beta-BHC			0.00105			0.00104			0.00104			0.00115	0.00107	0.00115	0 of 12
Chlordane (technical)			0.105			0.104			0.104			0.115	0.107	0.115	0 of 12
Delta-BHC			0.00105			0.00104			0.00104			0.00115	0.00107	0.00115	0 of 12
Dieldrin			0.00211			0.00207			0.00209			0.0023	0.0021425	0.0023	0 of 12
Endosulfan I			0.00105			0.00104			0.00104			0.00115	0.00107	0.00115	0 of 12

Table E-6. Clinton Wastewater Treatment Plant 2013 Average Effluent Concentrations (cont.)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Annual	Max Annual	No of Detects
Pesticides (ug/L) (cont.)															
Endosulfan II			0.00211			0.00207			0.00209			0.0023	0.0021425	0.0023	0 of 12
Endosulfan Sulfate			0.00211			0.00207			0.00209			0.0023	0.0021425	0.0023	0 of 12
Endrin			0.00211			0.00207			0.00209			0.0023	0.0021425	0.0023	0 of 12
Endrin Aldehyde			0.00211			0.00207			0.00209			0.0023	0.0021425	0.0023	0 of 12
Endrin Ketone			0.00211			0.00207			0.00209			0.0023	0.0021425	0.0023	0 of 12
Gamma-BHC (Lindane)			0.00105			0.00104			0.00104			0.00115	0.00107	0.00115	0 of 12
Gamma-chlordane			0.00105			0.00104			0.00104			0.00115	0.00107	0.00115	0 of 12
Heptachlor			0.00105			0.00104			0.00104			0.00115	0.00107	0.00115	0 of 12
Heptachlor Epoxide			0.00105			0.00104			0.00104			0.00115	0.00107	0.00115	0 of 12
Hexachlorobenzene			0.00105			0.0301			0.00104			0.00115	0.008335	0.0301	1 of 22
Methoxychlor			0.0105			0.0104			0.0104			0.0115	0.0107	0.0115	0 of 12
Toxaphene			0.105			0.104			0.104			0.115	0.107	0.115	0 of 12
Semivolatile Organics (ug/L)															
1,2,4-Trichlorobenzene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
1,2-Dichlorobenzene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
1,2-Diphenylhydrazine (as Azobenzene)			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
1,3-Dichlorobenzene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
1,4-Dichlorobenzene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
2,2'-Oxybis(1-chloropropane)			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
2,4,5-Trichlorophenol			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
2,4,6-Trichlorophenol			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
2,4-Dichlorophenol			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
2,4-Dimethylphenol			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
2,4-Dinitrophenol			5.15			5.05			5.18			5.34	5.18	5.34	0 of 12
2,4-Dinitrotoluene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
2,6-Dinitrotoluene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
2-Chloronaphthalene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
2-Chlorophenol			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
2-Methyl-4,6-dinitrophenol			5.15			5.05			5.18			5.34	5.18	5.34	0 of 12
2-Methylnaphthalene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
2-Methylphenol			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
2-Nitroaniline			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
2-Nitrophenol			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
3,3'-Dichlorobenzidine			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
3-Nitroaniline			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
4-Bromophenyl Phenyl Ether			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
4-Chloro-3-methylphenol			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
4-Chloroaniline			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
4-Chlorophenyl Phenyl Ether			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
4-Methylphenol (includes 3-Methylphenol)			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
4-Nitroaniline			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
4-Nitrophenol			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Acenaphthene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Acenaphthylene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Aniline			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Anthracene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Benzidine			5.15			5.05			5.18			5.34	5.18	5.34	0 of 12
Benzo(a)anthracene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Benzo(a)pyrene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Benzo(b)fluoranthene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Benzo(g,h,i)perylene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Benzo(k)fluoranthene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Benzoic Acid			5.15			5.05			5.18			5.34	5.18	5.34	0 of 12
Benzyl Alcohol			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Bis(2-chloroethoxy)methane			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12

Table E-6. Clinton Wastewater Treatment Plant 2013 Average Effluent Concentrations (cont.)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Annual	Max Annual	No of Detects
Semivolatile Organics (ug/L) (cont.)															
Bis(2-chloroethyl)ether			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Bis(2-ethylhexyl)phthalate			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Butyl Benzyl Phthalate			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Carbazole			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Chrysene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Dibenzo(a,h)anthracene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Dibenzofuran			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Diethyl Phthalate			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Dimethyl Phthalate			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Di-n-butylphthalate			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Di-n-octylphthalate			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Fluoranthene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Fluorene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Hexachlorobenzene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Hexachlorobutadiene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Hexachlorocyclopentadiene			5.15			5.05			5.18			5.34	5.18	5.34	0 of 12
Hexachloroethane			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Indeno(1,2,3-cd)pyrene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Isophorone			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Naphthalene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
N-decane			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Nitrobenzene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
N-nitrosodimethylamine			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
N-nitrosodi-n-propylamine			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
N-nitrosodiphenylamine			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
N-octadecane			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Pentachlorophenol			5.15			5.05			5.18			5.34	5.18	5.34	0 of 12
Phenanthrene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Phenol			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Pyrene			2.06			2.02			2.07			2.14	2.0725	2.14	0 of 12
Volatile Organics (ug/L)															
1,1,1-Trichloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,1,2,2-Tetrachloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,1,2-Trichloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,1-Dichloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,1-Dichloroethene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,2-Dichlorobenzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,2-Dichloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,2-Dichloropropane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,3-Dichlorobenzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
1,4-Dichlorobenzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
2-Butanone			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
2-Chloroethyl Vinyl Ether			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
2-Hexanone			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
4-Methyl-2-pentanone			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Acetone			1			1			1			1	1	1	0 of 12
Acrolein			1			1			1			1	1	1	0 of 12
Acrylonitrile			1			1			1			1	1	1	0 of 12
Benzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Bromodichloromethane			0.5			1.89			0.5			0.5	0.8475	1.89	1 of 12
Bromoform			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Bromomethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Carbon Disulfide			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Carbon Tetrachloride			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Chlorobenzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12

Table E-6. Clinton Wastewater Treatment Plant 2013 Average Effluent Concentrations (cont.)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Annual	Max Annual	No of Detects
Volatile Organics (ug/L) (cont.)															
Chloroethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Chloroform			9.96			25.7			23.3			31	22.49	31	12 of 12
Chloromethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Cis-1,2-dichloroethene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Cis-1,3-dichloropropene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Dibromochloromethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Ethylbenzene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
m,p-Xylene			1			1			1			1	1	1	0 of 12
Methylene Chloride			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
o-Xylene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Styrene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Tetrachloroethene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Toluene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Trans-1,2-dichloroethene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Trans-1,3-dichloropropene			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Trichloroethene			0.5			0.5			0.5			0.5	0.5	0.5	1 of 12
Trichlorofluoromethane			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Vinyl Acetate			0.5			0.5			0.5			0.5	0.5	0.5	0 of 12
Vinyl Chloride			0.5			0.5			0.5			0.399	0.47475	0.5	0 of 12

Notes:

1. Where parameters were below detection levels, half the method detection limit was used to calculate the flow-weighted average monthly concentration.
2. The annual average concentration is the flow-weighted average of all data points. The maximum concentration is the highest concentration observed in the monitoring year.

Appendix F. Historical South Nashua River Water Quality

COMPONENT\YEAR	2003	2008	2009	2010	2011	2012	2013
UP STREAM							
METALS							
ANTIMONY (UG/L)	<15	~	~	~	~	~	~
ALUMINUM (UG/L)	35.82	52.41	44.11	67.23	45.64	21.14	59.45
ARSENIC (UG/L)	1.64	~	~	~	~	~	~
BERYLLIUM (UG/L)	<0.5	~	~	~	~	~	~
BORON (UG/L)	<250	~	~	~	~	~	~
CADMIUM (UG/L)	1	0.1	0.14	0.13	0.09	0.05	0.12
CALCIUM (UG/L)	~	8683.08	8535.6	8339.29	5747.5	8433.64	5736.25
CHROMIUM (UG/L)	<4	~	~	~	~	~	~
COPPER (UG/L)	4.65	2.21	1.82	3.05	4.53	2.30	3.03
HEXAVALENT CHROMIUM (UG/L)	<5	~	~	~	~	~	~
IRON (UG/L)	398	~	~	~	~	~	~
LEAD (UG/L)	3.03	2.36	1.17	2.79	1.14	1.09	2.12
MAGNESIUM (UG/L)	~	1762	1745.33	1688.79	1030.83	1698.82	1102.75
MERCURY (UG/L)	0.01	~	~	~	~	~	~
MOLYBDENUM (UG/L)	<5	~	~	~	~	~	~
NICKEL (UG/L)	3.39	<3	<3	1.45	0.92	0.8	1.00
SELENIUM (UG/L)	<0.9	~	~	~	~	~	~
SILVER (UG/L)	<2	~	~	~	~	~	~
THALLIUM (UG/L)	<1	~	~	~	~	~	~
ZINC (UG/L)	23	7.56	7.79	8.83	9.38	4.75	8.09
FOG, PHC, AND SURFACTANTS							
FATS OIL AND GREASE (AS HEXANE EXTRACTABLE MATERIAL) (MG/L)	<7	~	~	~	~	~	~
PETROLEUM HYDROCARBON (MG/L)	<0.2	~	~	~	~	~	~
NUTRIENTS							
AMMONIA (MG/L)	0.03	0.12	0.02	0.01	0.05	0.01	0.02
ORTHOPHOSPHATE (MG/L)	<0.1	0.01	~	~	~	~	~
TOTAL PHOSPHORUS (MG/L)	<0.1	0.03	0	0.02	0.03	0.01	0.01
CONVENTIONAL							
ALKALINITY (MG/L)	13.92	16.16	14.46	14.15	9.68	15.28	10.42
BIOCHEMICAL OXYGEN DEMAND (MG/L)	<1.54	~	~	~	~	~	~
DO (MG/L)	8	8.78	~	~	~	~	~
HARDNESS (MG/L)	~	28.95	27.52	27.76	18.6	27.07	18.87

COMPONENT\YEAR	2003	2008	2009	2010	2011	2012	2013
PH (S.U.)	~	~	~	6.64	6.45	6.36	7.17
SULFATE (MG/L)	8.66	~	~	~	~	~	~
SULFIDE (MG/L)	<0.1	~	~	~	~	~	~
TEMPERATURE (DEG C)	17.03	13.52	13.33	12.71	14.26	13.07	13.69
TOTAL CHLORINE RESIDUAL (MG/L)	~	<0.01	0.01	0.02	0.01	0.02	0.02
TOTAL ORGANIC CARBON (MG/L)	3.04	2.62	2.35	2.21	3.09	2.37	2.50
TOTAL SUSPENDED SOLIDS (MG/L)	<5	~	~	~	~	~	~
VOLATILE ORGANICS							
1,1,1-TRICHLOROETHANE (UG/L)	<5	~	~	~	~	~	~
1,1,2,2-TETRACHLOROETHANE (UG/L)	<5	~	~	~	~	~	~
1,1,2-TRICHLOROETHANE (UG/L)	<5	~	~	~	~	~	~
1,1-DICHLOROETHANE (UG/L)	<5	~	~	~	~	~	~
1,1-DICHLOROETHENE (UG/L)	<5	~	~	~	~	~	~
1,2-DICHLOROETHANE (UG/L)	<5	~	~	~	~	~	~
1,2-DICHLOROPROPANE (UG/L)	<5	~	~	~	~	~	~
2-BUTANONE (UG/L)	<5	~	~	~	~	~	~
2-CHLOROETHYL VINYL ETHER (UG/L)	<5	~	~	~	~	~	~
2-HEXANONE (UG/L)	<5	~	~	~	~	~	~
4-METHYL-2-PENTANONE (UG/L)	<5	~	~	~	~	~	~
ACETONE (UG/L)	<10	~	~	~	~	~	~
ACROLEIN (UG/L)	<10	~	~	~	~	~	~
ACRYLONITRILE (UG/L)	<10	~	~	~	~	~	~
BENZENE (UG/L)	<5	~	~	~	~	~	~
BROMODICHLOROMETHANE (UG/L)	<5	~	~	~	~	~	~
BROMOFORM (UG/L)	<5	~	~	~	~	~	~
BROMOMETHANE (UG/L)	<5	~	~	~	~	~	~
CARBON DISULFIDE (UG/L)	<5	~	~	~	~	~	~
CARBON TETRACHLORIDE (UG/L)	<5	~	~	~	~	~	~
CHLOROBENZENE (UG/L)	<5	~	~	~	~	~	~
CHLOROETHANE (UG/L)	<5	~	~	~	~	~	~
CHLOROFORM (UG/L)	<5	~	~	~	~	~	~
CHLOROMETHANE (UG/L)	<5	~	~	~	~	~	~
CIS-1,2-DICHLOROETHENE (UG/L)	<5	~	~	~	~	~	~
CIS-1,3-DICHLOROPROPENE (UG/L)	<5	~	~	~	~	~	~
DIBROMOCHLOROMETHANE (UG/L)	<5	~	~	~	~	~	~
ETHYLBENZENE (UG/L)	<5	~	~	~	~	~	~

COMPONENT\YEAR	2003	2008	2009	2010	2011	2012	2013
GAMMA-CHLORDANE (NG/L)	<25.6	~	~	~	~	~	~
M,P-XYLENE (UG/L)	<10	~	~	~	~	~	~
METHYLENE CHLORIDE (UG/L)	<5	~	~	~	~	~	~
METHYLENE CHLORIDE (UG/L)	<5	~	~	~	~	~	~
O-XYLENE (UG/L)	<5	~	~	~	~	~	~
STYRENE (UG/L)	<5	~	~	~	~	~	~
TETRACHLOROETHENE (UG/L)	<5	~	~	~	~	~	~
TOLUENE (UG/L)	<5	~	~	~	~	~	~
TRANS-1,2-DICHLOROETHENE (UG/L)	<5	~	~	~	~	~	~
TRANS-1,3-DICHLOROPROPENE (UG/L)	<5	~	~	~	~	~	~
TRICHLOROETHENE (UG/L)	<5	~	~	~	~	~	~
TRICHLOROFLUOROMETHANE (UG/L)	<5	~	~	~	~	~	~
VINYL ACETATE (UG/L)	<5	~	~	~	~	~	~
VINYL CHLORIDE (UG/L)	<5	~	~	~	~	~	~
PESTICIDES							
4,4'-DDD (NG/L)	<25.6	~	~	~	~	~	~
4,4'-DDE (NG/L)	<25.6	~	~	~	~	~	~
4,4'-DDT (NG/L)	<25.6	~	~	~	~	~	~
ALDRIN (NG/L)	<25.6	~	~	~	~	~	~
ALPHA-BHC (NG/L)	<25.6	~	~	~	~	~	~
ALPHA-CHLORDANE (NG/L)	<25.6	~	~	~	~	~	~
AROCLOR-1016 (NG/L)	<641	~	~	~	~	~	~
AROCLOR-1221 (NG/L)	<1280	~	~	~	~	~	~
AROCLOR-1232 (NG/L)	<641	~	~	~	~	~	~
AROCLOR-1242 (NG/L)	<641	~	~	~	~	~	~
AROCLOR-1248 (NG/L)	<641	~	~	~	~	~	~
AROCLOR-1254 (NG/L)	<641	~	~	~	~	~	~
AROCLOR-1260 (NG/L)	<641	~	~	~	~	~	~
BETA-BHC (NG/L)	<25.6	~	~	~	~	~	~
CHLORDANE (TECHNICAL) (NG/L)	<641	~	~	~	~	~	~
DELTA-BHC (NG/L)	<25.6	~	~	~	~	~	~
DIELDRIN (NG/L)	<25.6	~	~	~	~	~	~
ENDOSULFAN I (NG/L)	<25.6	~	~	~	~	~	~
ENDOSULFAN II (NG/L)	<25.6	~	~	~	~	~	~
ENDOSULFAN SULFATE (NG/L)	<25.6	~	~	~	~	~	~
ENDRIN (NG/L)	<25.6	~	~	~	~	~	~

COMPONENT\YEAR	2003	2008	2009	2010	2011	2012	2013
ENDRIN ALDEHYDE (NG/L)	<25.6	~	~	~	~	~	~
ENDRIN KETONE (NG/L)	<25.6	~	~	~	~	~	~
GAMMA-BHC (LINDANE) (NG/L)	<25.6	~	~	~	~	~	~
HEPTACHLOR (NG/L)	<25.6	~	~	~	~	~	~
HEPTACHLOR EPOXIDE (NG/L)	<25.6	~	~	~	~	~	~
METHOXYCHLOR (NG/L)	<256	~	~	~	~	~	~
TOXAPHENE (NG/L)	<641	~	~	~	~	~	~
SEMIVOLATILE ORGANICS							
1,2,4-TRICHLOROBENZENE (UG/L)	<14.7	~	~	~	~	~	~
1,2-DICHLOROBENZENE (UG/L)	0.985	~	~	~	~	~	~
1,2-DIPHENYLHYDRAZINE (AS AZOBENZENE) (UG/L)	<14.7	~	~	~	~	~	~
1,3-DICHLOROBENZENE (UG/L)	0.985	~	~	~	~	~	~
1,4-DICHLOROBENZENE (UG/L)	0.985	~	~	~	~	~	~
2,2'-OXYBIS(1-CHLOROPROPANE) (UG/L)	<14.7	~	~	~	~	~	~
2,4,5-TRICHLOROPHENOL (UG/L)	<14.7	~	~	~	~	~	~
2,4,6-TRICHLOROPHENOL (UG/L)	<14.7	~	~	~	~	~	~
2,4-DICHLOROPHENOL (UG/L)	<14.7	~	~	~	~	~	~
2,4-DIMETHYLPHENOL (UG/L)	<14.7	~	~	~	~	~	~
2,4-DINITROPHENOL (UG/L)	<29.4	~	~	~	~	~	~
2,4-DINITROTOLUENE (UG/L)	<14.7	~	~	~	~	~	~
2,6-DINITROTOLUENE (UG/L)	<14.7	~	~	~	~	~	~
2-CHLORONAPHTHALENE (UG/L)	<14.7	~	~	~	~	~	~
2-CHLOROPHENOL (UG/L)	<14.7	~	~	~	~	~	~
2-METHYL-4,6-DINITROPHENOL (UG/L)	<147	~	~	~	~	~	~
2-METHYLNAPHTHALENE (UG/L)	<14.7	~	~	~	~	~	~
2-METHYLPHENOL (UG/L)	<14.7	~	~	~	~	~	~
2-NITROANILINE (UG/L)	<14.7	~	~	~	~	~	~
2-NITROPHENOL (UG/L)	<14.7	~	~	~	~	~	~
3,3'-DICHLOROBENZIDINE (UG/L)	<29.4	~	~	~	~	~	~
3-NITROANILINE (UG/L)	<14.7	~	~	~	~	~	~
4-BROMOPHENYL PHENYL ETHER (UG/L)	<14.7	~	~	~	~	~	~
4-CHLORO-3-METHYLPHENOL (UG/L)	<14.7	~	~	~	~	~	~
4-CHLOROANILINE (UG/L)	<14.7	~	~	~	~	~	~
4-CHLOROPHENYL PHENYL ETHER (UG/L)	<14.7	~	~	~	~	~	~
4-METHYLPHENOL (INCLUDES 3-METHYLPHENOL) (UG/L)	<14.7	~	~	~	~	~	~
4-NITROANILINE (UG/L)	<14.7	~	~	~	~	~	~

COMPONENT\YEAR	2003	2008	2009	2010	2011	2012	2013
4-NITROPHENOL (UG/L)	<29.4	~	~	~	~	~	~
ACENAPHTHENE (UG/L)	<14.7	~	~	~	~	~	~
ACENAPHTHYLENE (UG/L)	<14.7	~	~	~	~	~	~
ANILINE (UG/L)	<14.7	~	~	~	~	~	~
ANTHRACENE (UG/L)	<14.7	~	~	~	~	~	~
BENZIDINE (UG/L)	<73.5	~	~	~	~	~	~
BENZO(A)ANTHRACENE (UG/L)	<14.7	~	~	~	~	~	~
BENZO(A)PYRENE (UG/L)	<14.7	~	~	~	~	~	~
BENZO(B)FLUORANTHENE (UG/L)	<14.7	~	~	~	~	~	~
BENZO(GHI)PERYLENE (UG/L)	<14.7	~	~	~	~	~	~
BENZO(K)FLUORANTHENE (UG/L)	<14.7	~	~	~	~	~	~
BENZOIC ACID (UG/L)	<29.4	~	~	~	~	~	~
BENZYL ALCOHOL (UG/L)	<14.7	~	~	~	~	~	~
BIS(2-CHLOROETHOXY)METHANE (UG/L)	<14.7	~	~	~	~	~	~
BIS(2-CHLOROETHYL)ETHER (UG/L)	<14.7	~	~	~	~	~	~
BIS(2-ETHYLHEXYL)PHTHALATE (UG/L)	<14.7	~	~	~	~	~	~
BUTYL BENZYL PHTHALATE (UG/L)	<14.7	~	~	~	~	~	~
CHRYSENE (UG/L)	<14.7	~	~	~	~	~	~
DIBENZO(A,H)ANTHRACENE (UG/L)	<14.7	~	~	~	~	~	~
DIBENZOFURAN (UG/L)	<14.7	~	~	~	~	~	~
DIETHYL PHTHALATE (UG/L)	<14.7	~	~	~	~	~	~
DIMETHYL PHTHALATE (UG/L)	<14.7	~	~	~	~	~	~
DI-N-BUTYLPHTHALATE (UG/L)	<14.7	~	~	~	~	~	~
DI-N-OCTYLPHTHALATE (UG/L)	<14.7	~	~	~	~	~	~
FLUORANTHENE (UG/L)	<14.7	~	~	~	~	~	~
FLUORENE (UG/L)	<14.7	~	~	~	~	~	~
HEXACHLOROBENZENE (UG/L)	<14.7	~	~	~	~	~	~
HEXACHLOROBUTADIENE (UG/L)	<14.7	~	~	~	~	~	~
HEXACHLOROCYCLOPENTADIENE (UG/L)	<73.5	~	~	~	~	~	~
HEXACHLOROETHANE (UG/L)	<14.7	~	~	~	~	~	~
INDENO(1,2,3-CD)PYRENE (UG/L)	<14.7	~	~	~	~	~	~
ISOPHORONE (UG/L)	<14.7	~	~	~	~	~	~
NAPHTHALENE (UG/L)	<14.7	~	~	~	~	~	~
NITROBENZENE (UG/L)	<14.7	~	~	~	~	~	~
N-NITROSODIMETHYLAMINE (UG/L)	<14.7	~	~	~	~	~	~
N-NITROSODI-N-PROPYLAMINE (UG/L)	<14.7	~	~	~	~	~	~

COMPONENT\YEAR	2003	2008	2009	2010	2011	2012	2013
N-NITROSODIPHENYLAMINE (UG/L)	<14.7	~	~	~	~	~	~
PENTACHLOROPHENOL (UG/L)	<44.1	~	~	~	~	~	~
PHENANTHRENE (UG/L)	<1.47	~	~	~	~	~	~
PHENOL (UG/L)	<29.4	~	~	~	~	~	~
PYRENE (UG/L)	<14.7	~	~	~	~	~	~
DOWN STREAM							
METALS							
COPPER (UG/L)	~	4.56	2.09	~	~	~	~
NUTRIENTS							
AMMONIA-NITROGEN BY ELECTRODE (MG/L)	0.03	~	~	~	~	~	~
TOTAL PHOSPHORUS (MG/L)	~	0.46	0.02	~	~	~	~
CONVENTIONAL							
HARDNESS (MG/L)	~	~	17.4	~	~	~	~
PH (S.U.)	7.32	6.9	6.75	~	~	~	~
TEMPERATURE (DEG C)	16.14	10.5	22.93	~	~	~	~

Massachusetts Water Resources Authority
Charlestown Navy Yard
100 First Avenue
Boston, MA 02129
(617) 242-6000