Pennsylvania Department of Environmental Protection

Northwest Regional Office
CLEAN WATER PROGRAM

NPDES PERMIT FACT SHEET INDIVIDUAL SEWAGE

Application Type	**Renewal**	Application No.	**PA0029467**
Facility Type	**Municipal**	APS ID	**1088351**
Major / Minor	**Minor**	Authorization ID	**1439469**

Applicant and Facility Information

Applicant Name	**North Warren Municipal Authority Warren County**	Facility Name	**North Warren Municipal STP**
Applicant Address	44 Hospital Drive North Warren, PA 16365-4882	Facility Address	3129 Market Street Ext North Warren, PA 16365
Applicant Contact	D Jacobson	Facility Contact	Nate Blick
Applicant Phone	(814) 688-6069	Facility Phone	(814) 688-2991
Client ID	43613	Site ID	453251
Ch 94 Load Status	Not Overloaded	Municipality	Conewango Township
Connection Status	No Limitations	County	Warren
Date Application Received	May 2, 2023	EPA Waived?	Yes
Date Application Accepted		If No, Reason	

Purpose of Application: NPDES Renewal of a municipal Sewage Treatment Plant (STP).

Summary of Review

Due to the presence of endangered mussels and critical habitat in Conewango Creek, the permitting of this facility will be coordinated through the US Fish & Wildlife Service and Pennsylvania Fish & Boat Commission.

E. Coli monitoring and an effluent limit for Ammonia-Nitrogen have been added.

Sludge use and disposal description and location(s): disposed of in reed beds onsite.

There are currently no open violations for this client (43613) as of 4/3/2025.

Public Participation

DEP will publish notice of the receipt of the NPDES permit application and a tentative decision to issue the individual NPDES permit in the *Pennsylvania Bulletin* in accordance with 25 Pa. Code § 92a.82. Upon publication in the *Pennsylvania Bulletin*, DEP will accept written comments from interested persons for a 30-day period (which may be extended for one additional 15-day period at DEP's discretion), which will be considered in making a final decision on the application. Any person may request or petition for a public hearing with respect to the application. A public hearing may be held if DEP determines that there is significant public interest in holding a hearing. If a hearing is held, notice of the hearing will be published in the *Pennsylvania Bulletin* at least 30 days prior to the hearing and in at least one newspaper of general circulation within the geographical area of the discharge.

Approve	Deny	Signatures	Date
X		Jordan A. Frey, E.I.T. Jordan A. Frey, E.I.T. / Project Manager	April 3, 2025
X		Adam Olesnanik Adam Olesnanik, P.E. / Environmental Engineer Manager	April 21, 2025

Discharge, Receiving Waters and Water Supply Information

Outfall No.	001	Design Flow (MGD)	.75
Latitude	41º 53' 3.40"	Longitude	-79º 8' 30.57"
Quad Name	Russell	Quad Code	41079H2
Wastewater Description:	Sewage Effluent		

Receiving Waters	Conewango Creek (WWF)	Stream Code	56311
NHD Com ID	129446917	RMI	
Drainage Area	868	Yield (cfs/mi^2)	0.075
Q_{7-10} Flow (cfs)	65.1	Q_{7-10} Basis	Streamstats
Elevation (ft)	1194	Slope (ft/ft)	---
Watershed No.	16-B	Chapter 93 Class.	WWF
Existing Use		Existing Use Qualifier	
Exceptions to Use		Exceptions to Criteria	
Assessment Status	Impaired		
Cause(s) of Impairment	MERCURY		
Source(s) of Impairment	SOURCE UNKNOWN		
TMDL Status		Name	

Background/Ambient Data		Data Source
pH (SU)	7.0	Default
Temperature (°F)	20	Default
Hardness (mg/L)	100	Default
Other:		

Nearest Downstream Public Water Supply Intake	Aqua PA - Emlenton		
PWS Waters	Allegheny River	Flow at Intake (cfs)	1370
PWS RMI		Distance from Outfall (mi)	>25

Changes Since Last Permit Issuance: None.

Other Comments: None.

Treatment Facility Summary

Treatment Facility Name: North Warren Municipal STP

WQM Permit No.	Issuance Date
WQM 6298414 A-1	3/9/2017

Waste Type	Degree of Treatment	Process Type	Disinfection	Avg Annual Flow (MGD)
Sewage	Secondary	Trickling Filter With Settling	Gas Chlorine	0.75

Hydraulic Capacity (MGD)	Organic Capacity (lbs/day)	Load Status	Biosolids Treatment	Biosolids Use/Disposal
0.364	1050	Not Overloaded	Anaerobic Digestion	Land Application

Changes Since Last Permit Issuance: (2) Mechanically-Cleaned Fine Screens, Equalization, (2) Primary Settling Tanks, (2) Trickling Filters (operating in series), (1) Final Settling Tank, (1) Chlorine Contact Tank, (2) Aerobic Digesters, (1) Aerated Sludge Holding Tank and (16) Sludge Drying Beds (4 of which are reed drying beds and 6 of the remaining 12 regular beds are covered).

Other Comments: The screening and comminutor units were replaced with two mechanical fine screens (2MGD capacity each). A new 9'x18' sampling/electrical room was constructed. Two new aerobic digesters (87,970-gallons each) were added. A 26'x60' digester control building was added. The existing anaerobic digester was converted to an aerated sludge holding tank. All aforementioned items were permitted under the 3/9/2017 amendment to WQM #6298414 and proposed prior to the previous NPDES permit renewal.

Threatened and Endangered Mussel Species Concerns and Considerations

Conewango Creek has known populations of federally listed endangered/threatened species of the Northern Riffleshell, Clubshell and Rayed Bean mussels. This is based on PA Fish & Boat Commission studies conducted in 2007, 2013 & 2014. Due to this being a direct discharge to Conewango Creek, potential impacts were evaluated.

The USFWS has indicated in comment letters on other NPDES permits that in order to protect threatened and endangered mussel species, wastewater discharges containing ammonia-nitrogen (NH_3-N), chloride (Cl^-), copper, zinc and nickel, where mussels or their habitat exist, can be no more than 1.9 mg/l, 78 mg/l, 10.0 µg/l ,13.18 µg/l and 7.3 µg/l, respectively. The permittee was monitoring for these parameters during the previous permit cycle and the Department reviewed this sampling data to determine potential impacts that the discharge may have to threatened and endangered mussel species

The Department completed an aquatic biological investigation on Conewango Creek in 2012 to determine the impacts, if any, of the North Warren Municipal Sewage Treatment Plant. Results of the study indicate the STP was having little to no impact on Conewango Creek.

The Department utilized its Impact Evaluation spreadsheet to calculate the maximum potential impact area of the STP discharge under the worst-case theoretical scenario. The spreadsheet in included as an attachment to this Fact Sheet. This yielded a maximum potential impact area of approximately 24 square meters (258 square feet) for ammonia-nitrogen. All other parameters resulted in an anticipated impact area of less than 1 square meter. The calculated 24 square meter impact area for ammonia-nitrogen is based on the discharge concentration of ammonia-nitrogen being at the proposed water quality based effluent limitation of 22.6 mg/l. The Department will retain monitoring for Chloride, Copper, Nickel, and Zinc for the next permit term, and the Department intends to conduct an aquatic biological investigation on Conewango Creek near the North Warren Municipal Sewage Treatment plant discharge this year (2025) to ensure that the discharge has no adverse impact to endangered/threatened mussels.

Compliance History

DMR Data for Outfall 001 (from March 1, 2024 to February 28, 2025)

Parameter	FEB-25	JAN-25	DEC-24	NOV-24	OCT-24	SEP-24	AUG-24	JUL-24	JUN-24	MAY-24	APR-24	MAR-24
Flow (MGD) Average Monthly	0.407	0.3454	0.4173	0.3066	0.2603	0.2915	0.2646	0.2921	0.335	0.3204	0.5766	0.383
Flow (MGD) Weekly Average	0.5297	0.4228	0.5181	0.3777	0.268	0.3488	0.2836	0.3393	0.4299	0.3606	0.7221	0.4259
pH (S.U.) Minimum	7.1	6.9	6.9	7.0	7.0	7.1	7.1	6.8	7.0	6.7	6.7	7.2
pH (S.U.) Maximum	7.6	7.6	7.5	7.5	7.6	7.5	7.8	7.6	8.3	7.5	7.5	7.5
DO (mg/L) Minimum	8.8	8.5	7.8	6.7	5.5	5.7	5.4	5.5	6.0	5.9	7.0	7.4
TRC (mg/L) Average Monthly	0.3	0.4	0.4	0.3	0.2	0.3	0.2	0.3	0.2	0.2	0.3	0.3
TRC (mg/L) Instantaneous Maximum	0.4	0.55	0.6	0.42	0.34	0.5	0.3	0.5	0.5	0.34	0.55	0.8
CBOD5 (lbs/day) Average Monthly	42	44	64	24	27	< 28	23	19	31	< 55	40	32
CBOD5 (lbs/day) Weekly Average	51	52	134	29	30	< 63	36	23	40	< 64	87	47
CBOD5 (mg/L) Average Monthly	14	16	15	10	11	< 11	9	7	13	< 22	10	11
CBOD5 (mg/L) Weekly Average	17	21	22	11	13	< 24	12	8	18	27	14	15
BOD5 (lbs/day) Influent Average Monthly	491	585	454	327	483	324	462	485	407	441	470	462
BOD5 (mg/L) Influent Average Monthly	161	219	119	148	199	135	180	171	179	173	123	152
TSS (lbs/day) Average Monthly	30	19	56	22	19	16	< 18	< 21	24	28	< 23	< 18
TSS (lbs/day) Influent Average Monthly	354	347	284	172	253	209	226	248	327	229	357	263
TSS (lbs/day) Weekly Average	49	21	101	30	24	18	28	29	36	54	< 32	25

TSS (mg/L) Average Monthly	12	7	13	9	8	7	< 8	< 7	11	11	< 6	< 6
TSS (mg/L) Influent Average Monthly	112	130	72	75	102	89	89	88	146	90	95	86
TSS (mg/L) Weekly Average	25	8	17	11	9	8	< 10	11	16	21	< 5	9
Fecal Coliform (No./100 ml) Geometric Mean	> 1142	508	89	35	101	27	34	< 1	4	12	8	< 28
Fecal Coliform (No./100 ml) Instantaneous Maximum	> 2420	1414	2420	580	1733	142	184	6	10	37	285	326
Total Nitrogen (mg/L) Average Monthly	25.31	21.2	16.59	19.07	16.47	16.99	15.63	16.08	19	22.97	16.55	18.17
Ammonia (mg/L) Average Monthly	20.2	8.93	4.74	1.79	0.95	0.49	0.47	0.222	E	E	13.4	13.6
Total Phosphorus (mg/L) Average Monthly	3.77	3.77	3.35	5.1	5.3	5.54	5.25	4.95	5.23	5.04	3.91	3.18
Total Copper (mg/L) Average Quarterly			0.0197			0.0315			0.015			0.021
Total Nickel (mg/L) Average Quarterly			< 0.0065			< 0.0065			< 0.0065			< 0.0065
Chloride (mg/L) Average Monthly	211	218	182	258	229	237	230	122	244	201	168	155

Development of Effluent Limitations

Outfall No. 001 **Design Flow (MGD)** .75
Latitude 41º 52' 59.90" **Longitude** -79º 8' 35.58"
Wastewater Description: Sewage Effluent

Technology-Based Limitations

The following technology-based limitations apply, subject to water quality analysis and BPJ where applicable:

Pollutant	Limit (mg/l)	SBC	Federal Regulation	State Regulation
$CBOD_5$	25	Average Monthly	133.102(a)(4)(i)	92a.47(a)(1)
	40	Average Weekly	133.102(a)(4)(ii)	92a.47(a)(2)
Total Suspended Solids	30	Average Monthly	133.102(b)(1)	92a.47(a)(1)
	45	Average Weekly	133.102(b)(2)	92a.47(a)(2)
pH	6.0 – 9.0 S.U.	Min – Max	133.102(c)	95.2(1)
Fecal Coliform (5/1 – 9/30)	200 / 100 ml	Geo Mean	-	92a.47(a)(4)
Fecal Coliform (5/1 – 9/30)	1,000 / 100 ml	IMAX	-	92a.47(a)(4)
Fecal Coliform (10/1 – 4/30)	2,000 / 100 ml	Geo Mean	-	92a.47(a)(5)
Fecal Coliform (10/1 – 4/30)	10,000 / 100 ml	IMAX	-	92a.47(a)(5)
Total Residual Chlorine	0.5	Average Monthly	-	92a.48(b)(2)

Comments: E. Coli monitoring was added in accordance with the Department's SOP on new and reissued permits.

Water Quality-Based Limitations

The following limitations were determined through water quality modeling (output files attached):

Parameter	Limit (mg/l)	SBC	Model
Ammonia-Nitrogen	22.6	Average Monthly	WQM v.1.0b
CBOD5	25	Average Monthly	WQM v1.0b
Dissolved Oxygen	4.0	Daily Minimum	WQM v.1.0b
Total Residual Chlorine	0.5	Average Monthly	TRC Spreadsheet

Comments: An Ammonia-Nitrogen (NH3N) limit of 22.6 mg/l, a CBOD5 limit of 25 mg/l, and a Dissolved Oxygen limit of 4.0 mg/l were determined by WQM modeling to be protective. The Department's TRC Spreadsheet determined a limit of 0.5 mg/l.

Best Professional Judgment (BPJ) Limitations

Comments: Monitoring for Total Copper was determined by the Department's Toxics Management Spreadsheet (TMS).

An aquatic biological investigation on Conewango Creek was completed by the Department in 2012 to determine the impacts, if any, of the North Warren Municipal Sewage Treatment Plant. Results of the study indicate the STP was having little to no impact on Conewango Creek.

Anti-Backsliding

N/A

Proposed Effluent Limitations and Monitoring Requirements

The limitations and monitoring requirements specified below are proposed for the draft permit, and reflect the most stringent limitations amongst technology, water quality and BPJ. Instantaneous Maximum (IMAX) limits are determined using multipliers of 2 (conventional pollutants) or 2.5 (toxic pollutants). Sample frequencies and types are derived from the "NPDES Permit Writer's Manual" (386-0400-001), SOPs and/or BPJ.

Outfall 001, Effective Period: Permit Effective Date through Permit Expiration Date.

Parameter	Effluent Limitations						Monitoring Requirements	
	Mass Units (lbs/day) (1)		Concentrations (mg/L)				Minimum (2) Measurement Frequency	Required Sample Type
	Average Monthly	Weekly Average	Minimum	Average Monthly	Weekly Average	Instant. Maximum		
Flow (MGD)	Report	Report	XXX	XXX	XXX	XXX	Continuous	Measured
pH (S.U.)	XXX	XXX	6.0 Inst Min	XXX	XXX	9.0	1/day	Grab
DO	XXX	XXX	4.0 Inst Min	XXX	XXX	XXX	1/day	Grab
TRC	XXX	XXX	XXX	0.5	XXX	1.6	1/day	Grab
CBOD5	156	250	XXX	25	40	50	1/week	24-Hr Composite
BOD5 Raw Sewage Influent	Report	XXX	XXX	Report	XXX	XXX	1/week	24-Hr Composite
TSS	188	281	XXX	30	45	60	1/week	24-Hr Composite
TSS Raw Sewage Influent	Report	XXX	XXX	Report	XXX	XXX	1/week	24-Hr Composite
Fecal Coliform (No./100 ml) Oct 1 - Apr 30	XXX	XXX	XXX	2000 Geo Mean	XXX	10000	1/week	Grab
Fecal Coliform (No./100 ml) May 1 - Sep 30	XXX	XXX	XXX	200 Geo Mean	XXX	1000	1/week	Grab
Total Nitrogen	XXX	XXX	XXX	Report	XXX	XXX	1/week	24-Hr Composite
Ammonia	XXX	XXX	XXX	22.6	XXX	45.2	1/month	24-Hr Composite
Total Phosphorus	XXX	XXX	XXX	Report	XXX	XXX	1/week	24-Hr Composite

Outfall 001, Continued (from Permit Effective Date through Permit Expiration Date)

Parameter	Effluent Limitations						Monitoring Requirements	
	Mass Units (lbs/day) (1)		Concentrations (mg/L)				Minimum (2)	Required
	Average Monthly	Weekly Average	Minimum	Average Monthly	Weekly Average	Instant. Maximum	Measurement Frequency	Sample Type
Total Copper	XXX	XXX	XXX	Report	XXX	XXX	1/week	24-Hr Composite
Total Nickel	XXX	XXX	XXX	Report Avg Qrtly	XXX	XXX	1/quarter	24-Hr Composite
Chloride	XXX	XXX	XXX	Report	XXX	XXX	1/month	24-Hr Composite
E. Coli (No./100 ml)	XXX	XXX	XXX	XXX	XXX	Report	1/quarter	Grab
Total Zinc (µg/L)	XXX	XXX	XXX	Report Avg Qrtly	XXX	XXX	1/quarter	24-Hr Composite

Compliance Sampling Location: Outfall 001, after disinfection.

Other Comments: Special Conditions – Chlorine Minimization, Solids Handling

WQM 7.0 Wasteload Allocations

SWP Basin	Stream Code	Stream Name
16B	56311	CONEWANGO CREEK

NH3-N Acute Allocations

RMI	Discharge Name	Baseline Criterion (mg/L)	Baseline WLA (mg/L)	Multiple Criterion (mg/L)	Multiple WLA (mg/L)	Critical Reach	Percent Reduction
3.600	Conewango Cree	6.76	45.2	6.76	45.2	0	0

NH3-N Chronic Allocations

RMI	Discharge Name	Baseline Criterion (mg/L)	Baseline WLA (mg/L)	Multiple Criterion (mg/L)	Multiple WLA (mg/L)	Critical Reach	Percent Reduction
3.600	Conewango Cree	1.34	22.6	1.34	22.6	0	0

Dissolved Oxygen Allocations

RMI	Discharge Name	CBOD5		NH3-N		Dissolved Oxygen		Critical Reach	Percent Reduction
		Baseline (mg/L)	Multiple (mg/L)	Baseline (mg/L)	Multiple (mg/L)	Baseline (mg/L)	Multiple (mg/L)		
3.60	Conewango Creek	25	25	22.6	22.6	4	4	0	0

WQM 7.0 D.O.Simulation

SWP Basin	Stream Code	Stream Name
16B	56311	CONEWANGO CREEK

RMI	Total Discharge Flow (mgd)	Analysis Temperature (°C)	Analysis pH
3.600	0.750	25.000	7.000
Reach Width (ft)	**Reach Depth (ft)**	**Reach WDRatio**	**Reach Velocity (fps)**
142.759	1.089	131.085	0.426
Reach CBOD5 (mg/L)	**Reach Kc (1/days)**	**Reach NH3-N (mg/L)**	**Reach Kn (1/days)**
2.40	0.231	0.40	1.029
Reach DO (mg/L)	**Reach Kr (1/days)**	**Kr Equation**	**Reach DO Goal (mg/L)**
8.169	3.369	Tsivoglou	6
Reach Travel Time (days)			
0.217			

Subreach Results

TravTime (days)	CBOD5 (mg/L)	NH3-N (mg/L)	D.O. (mg/L)
0.022	2.39	0.39	7.54
0.043	2.37	0.38	7.54
0.065	2.36	0.37	7.54
0.087	2.34	0.36	7.54
0.108	2.33	0.35	7.54
0.130	2.31	0.35	7.54
0.152	2.30	0.34	7.54
0.173	2.28	0.33	7.54
0.195	2.27	0.32	7.54
0.217	2.26	0.32	7.54

WQM 7.0 Effluent Limits

SWP Basin	Stream Code	Stream Name
16B	56311	CONEWANGO CREEK

RMI	Name	Permit Number	Disc Flow (mgd)	Parameter	Effl. Limit 30-day Ave. (mg/L)	Effl. Limit Maximum (mg/L)	Effl. Limit Minimum (mg/L)
3.600	Conewango Creek	PA0029467	0.340	CBOD5	25		
				NH3-N	22.6	45.2	
				Dissolved Oxygen			4

Input Data WQM 7.0

SWP Basin	Stream Code	Stream Name	RMI	Elevation (ft)	Drainage Area (sq mi)	Slope (ft/ft)	PWS Withdrawal (mgd)	Apply FC
16B	56311	CONEWANGO CREEK	**3.600**	1194.00	868.00	0.00000	0.00	☑

Stream Data

Design Cond.	LFY (cfsm)	Trib Flow (cfs)	Stream Flow (cfs)	Rch Trav Time (days)	Rch Velocity (fps)	WD Ratio	Rch Width (ft)	Rch Depth (ft)	Tributary Temp (°C)	Tributary pH	Stream Temp (°C)	Stream pH
Q7-10	0.075	0.00	0.00	0.000	0.000	0.0	0.00	0.00	25.00	7.00	0.00	0.00
Q1-10		0.00	0.00	0.000	0.000							
Q30-10		0.00	0.00	0.000	0.000							

Discharge Data

Name	Permit Number	Existing Disc Flow (mgd)	Permitted Disc Flow (mgd)	Design Disc Flow (mgd)	Reserve Factor	Disc Temp (°C)	Disc pH
Conewango Creek	PA0029467	0.3400	0.7500	0.7500	0.000	25.00	7.00

Parameter Data

Parameter Name	Disc Conc (mg/L)	Trib Conc (mg/L)	Stream Conc (mg/L)	Fate Coef (1/days)
CBOD5	25.00	2.00	0.00	1.50
Dissolved Oxygen	4.00	8.24	0.00	0.00
NH3-N	22.60	0.00	0.00	0.70

Input Data WQM 7.0

SWP Basin	Stream Code	Stream Name	RMI	Elevation (ft)	Drainage Area (sq mi)	Slope (ft/ft)	PWS Withdrawal (mgd)	Apply FC
16B	56311	CONEWANGO CREEK	**2.090**	1182.00	901.00	0.00000	0.00	☑

Stream Data

Design Cond.	LFY (cfsm)	Trib Flow (cfs)	Stream Flow (cfs)	Rch Trav Time (days)	Rch Velocity (fps)	WD Ratio	Rch Width (ft)	Rch Depth (ft)	Tributary Temp (°C)	Tributary pH	Stream Temp (°C)	Stream pH
Q7-10	0.075	0.00	0.00	0.000	0.000	0.0	0.00	0.00	25.00	7.00	0.00	0.00
Q1-10		0.00	0.00	0.000	0.000							
Q30-10		0.00	0.00	0.000	0.000							

Discharge Data

Name	Permit Number	Existing Disc Flow (mgd)	Permitted Disc Flow (mgd)	Design Disc Flow (mgd)	Reserve Factor	Disc Temp (°C)	Disc pH
Conewango Creek	PA0029467	0.0000	0.0000	0.0000	0.000	25.00	7.00

Parameter Data

Parameter Name	Disc Conc (mg/L)	Trib Conc (mg/L)	Stream Conc (mg/L)	Fate Coef (1/days)
CBOD5	25.00	2.00	0.00	1.50
Dissolved Oxygen	3.00	8.24	0.00	0.00
NH3-N	25.00	0.00	0.00	0.70

WQM 7.0 Hydrodynamic Outputs

SWP Basin	Stream Code	Stream Name
16B	56311	CONEWANGO CREEK

RMI	Stream Flow (cfs)	PWS With (cfs)	Net Stream Flow (cfs)	Disc Analysis Flow (cfs)	Reach Slope (ft/ft)	Depth (ft)	Width (ft)	W/D Ratio	Velocity (fps)	Reach Trav Time (days)	Analysis Temp (°C)	Analysis pH
Q7-10 Flow												
3.600	65.10	0.00	65.10	1.1602	0.00151	1.089	142.76	131.09	0.43	0.217	25.00	7.00
Q1-10 Flow												
3.600	41.66	0.00	41.66	1.1602	0.00151	NA	NA	NA	0.33	0.276	25.00	7.00
Q30-10 Flow												
3.600	88.54	0.00	88.54	1.1602	0.00151	NA	NA	NA	0.50	0.183	25.00	7.00

WQM 7.0 Modeling Specifications

Parameters	Both	Use Inputted Q1-10 and Q30-10 Flows	☑
WLA Method	EMPR	Use Inputted W/D Ratio	☐
Q1-10/Q7-10 Ratio	0.64	Use Inputted Reach Travel Times	☐
Q30-10/Q7-10 Ratio	1.36	Temperature Adjust Kr	☑
D.O. Saturation	90.00%	Use Balanced Technology	☑
D.O. Goal	6		

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Toxics Management Spreadsheet
Version 1.3, March 2021

Discharge Information

Instructions | Discharge | Stream

Facility: North Warren Muni STP NPDES Permit No.: PA0029467 Outfall No.: 001

Evaluation Type: Wastewater Description:

Discharge Characteristics								
Design Flow (MGD)*	Hardness (mg/l)*	pH (SU)*	Partial Mix Factors (PMFs)				Complete Mix Times (min)	
			AFC	CFC	THH	CRL	Q_{7-10}	Q_h
0.75	100	7.27						

					0 if left blank		0.5 if left blank		0 if left blank			1 if left blank	
	Discharge Pollutant	Units	Max Discharge Conc		Trib Conc	Stream Conc	Daily CV	Hourly CV	Stream CV	Fate Coeff	FOS	Criteria Mod	Chem Transl
Group 1	Total Dissolved Solids (PWS)	mg/L		568									
	Chloride (PWS)	mg/L		250									
	Bromide	mg/L		0.309									
	Sulfate (PWS)	mg/L		27.2									
	Fluoride (PWS)	mg/L											
Group 2	Total Aluminum	µg/L											
	Total Antimony	µg/L											
	Total Arsenic	µg/L											
	Total Barium	µg/L											
	Total Beryllium	µg/L											
	Total Boron	µg/L											
	Total Cadmium	µg/L											
	Total Chromium (III)	µg/L											
	Hexavalent Chromium	µg/L											
	Total Cobalt	µg/L											
	Total Copper	mg/L		0.0226									
	Free Cyanide	µg/L											
	Total Cyanide	µg/L											
	Dissolved Iron	µg/L											
	Total Iron	µg/L											
	Total Lead	mg/L	<	0.001									
	Total Manganese	µg/L											
	Total Mercury	µg/L											
	Total Nickel	mg/L		0.00191									
	Total Phenols (Phenolics) (PWS)	µg/L											
	Total Selenium	µg/L											
	Total Silver	µg/L											
	Total Thallium	µg/L											
	Total Zinc	mg/L		0.044									
	Total Molybdenum	µg/L											
	Acrolein	µg/L	<										
	Acrylamide	µg/L	<										
	Acrylonitrile	µg/L	<										
	Benzene	µg/L	<										
	Bromoform	µg/L	<										

Group 3	Carbon Tetrachloride	µg/L	<										
	Chlorobenzene	µg/L											
	Chlorodibromomethane	µg/L	<										
	Chloroethane	µg/L	<										
	2-Chloroethyl Vinyl Ether	µg/L	<										
	Chloroform	µg/L	<										
	Dichlorobromomethane	µg/L	<										
	1,1-Dichloroethane	µg/L	<										
	1,2-Dichloroethane	µg/L	<										
	1,1-Dichloroethylene	µg/L	<										
	1,2-Dichloropropane	µg/L	<										
	1,3-Dichloropropylene	µg/L	<										
	1,4-Dioxane	µg/L	<										
	Ethylbenzene	µg/L	<										
	Methyl Bromide	µg/L	<										
	Methyl Chloride	µg/L	<										
	Methylene Chloride	µg/L	<										
	1,1,2,2-Tetrachloroethane	µg/L	<										
	Tetrachloroethylene	µg/L	<										
	Toluene	µg/L	<										
	1,2-trans-Dichloroethylene	µg/L	<										
	1,1,1-Trichloroethane	µg/L	<										
	1,1,2-Trichloroethane	µg/L	<										
	Trichloroethylene	µg/L	<										
	Vinyl Chloride	µg/L	<										
Group 4	2-Chlorophenol	µg/L	<										
	2,4-Dichlorophenol	µg/L	<										
	2,4-Dimethylphenol	µg/L	<										
	4,6-Dinitro-o-Cresol	µg/L	<										
	2,4-Dinitrophenol	µg/L	<										
	2-Nitrophenol	µg/L	<										
	4-Nitrophenol	µg/L	<										
	p-Chloro-m-Cresol	µg/L	<										
	Pentachlorophenol	µg/L	<										
	Phenol	µg/L	<										
	2,4,6-Trichlorophenol	µg/L	<										
Group 5	Acenaphthene	µg/L	<										
	Acenaphthylene	µg/L	<										
	Anthracene	µg/L	<										
	Benzidine	µg/L	<										
	Benzo(a)Anthracene	µg/L	<										
	Benzo(a)Pyrene	µg/L	<										
	3,4-Benzofluoranthene	µg/L	<										
	Benzo(ghi)Perylene	µg/L	<										
	Benzo(k)Fluoranthene	µg/L	<										
	Bis(2-Chloroethoxy)Methane	µg/L	<										
	Bis(2-Chloroethyl)Ether	µg/L	<										
	Bis(2-Chloroisopropyl)Ether	µg/L	<										
	Bis(2-Ethylhexyl)Phthalate	µg/L	<										
	4-Bromophenyl Phenyl Ether	µg/L	<										
	Butyl Benzyl Phthalate	µg/L	<										
	2-Chloronaphthalene	µg/L	<										
	4-Chlorophenyl Phenyl Ether	µg/L	<										
	Chrysene	µg/L	<										
	Dibenzo(a,h)Anthrancene	µg/L	<										
	1,2-Dichlorobenzene	µg/L	<										
	1,3-Dichlorobenzene	µg/L	<										
	1,4-Dichlorobenzene	µg/L	<										
	3,3-Dichlorobenzidine	µg/L	<										
	Diethyl Phthalate	µg/L	<										
	Dimethyl Phthalate	µg/L	<										
	Di-n-Butyl Phthalate	µg/L	<										
	2,4-Dinitrotoluene	µg/L	<										

	2,6-Dinitrotoluene	µg/L	<										
	Di-n-Octyl Phthalate	µg/L	<										
	1,2-Diphenylhydrazine	µg/L	<										
	Fluoranthene	µg/L	<										
	Fluorene	µg/L	<										
	Hexachlorobenzene	µg/L	<										
	Hexachlorobutadiene	µg/L	<										
	Hexachlorocyclopentadiene	µg/L	<										
	Hexachloroethane	µg/L	<										
	Indeno(1,2,3-cd)Pyrene	µg/L	<										
	Isophorone	µg/L	<										
	Naphthalene	µg/L	<										
	Nitrobenzene	µg/L	<										
	n-Nitrosodimethylamine	µg/L	<										
	n-Nitrosodi-n-Propylamine	µg/L	<										
	n-Nitrosodiphenylamine	µg/L	<										
	Phenanthrene	µg/L	<										
	Pyrene	µg/L	<										
	1,2,4-Trichlorobenzene	µg/L	<										
Group 6	Aldrin	µg/L	<										
	alpha-BHC	µg/L	<										
	beta-BHC	µg/L	<										
	gamma-BHC	µg/L	<										
	delta BHC	µg/L	<										
	Chlordane	µg/L	<										
	4,4-DDT	µg/L	<										
	4,4-DDE	µg/L	<										
	4,4-DDD	µg/L	<										
	Dieldrin	µg/L	<										
	alpha-Endosulfan	µg/L	<										
	beta-Endosulfan	µg/L	<										
	Endosulfan Sulfate	µg/L	<										
	Endrin	µg/L	<										
	Endrin Aldehyde	µg/L	<										
	Heptachlor	µg/L	<										
	Heptachlor Epoxide	µg/L	<										
	PCB-1016	µg/L	<										
	PCB-1221	µg/L	<										
	PCB-1232	µg/L	<										
	PCB-1242	µg/L	<										
	PCB-1248	µg/L	<										
	PCB-1254	µg/L	<										
	PCB-1260	µg/L	<										
	PCBs, Total	µg/L	<										
	Toxaphene	µg/L	<										
	2,3,7,8-TCDD	ng/L	<										
Group 7	Gross Alpha	pCi/L											
	Total Beta	pCi/L	<										
	Radium 226/228	pCi/L	<										
	Total Strontium	µg/L	<										
	Total Uranium	µg/L	<										
	Osmotic Pressure	mOs/kg											

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Toxics Management Spreadsheet
Version 1.3, March 2021

Stream / Surface Water Information

North Warren Muni STP, NPDES Permit No. PA0029467, Outfall 001

Instructions | Discharge | *Stream*

Receiving Surface Water Name: _____ No. Reaches to Model: 1

- (●) Statewide Criteria
- ( ) Great Lakes Criteria
- ( ) ORSANCO Criteria

Location	Stream Code*	RMI*	Elevation (ft)*	DA (mi²)*	Slope (ft/ft)	PWS Withdrawal (MGD)	Apply Fish Criteria*
Point of Discharge	056311	3.6	1194	868			Yes
End of Reach 1	056311	2.09	1182	901			Yes

$Q_{7\text{-}10}$

Location	RMI	LFY (cfs/mi²)*	Flow (cfs)		W/D Ratio	Width (ft)	Depth (ft)	Velocity (fps)	Travel Time (days)	Tributary		Stream		Analysis	
			Stream	Tributary						Hardness	pH	Hardness*	pH*	Hardness	pH
Point of Discharge	3.6	0.075										100	7		
End of Reach 1	2.09	0.075													

Q_h

Location	RMI	LFY (cfs/mi²)	Flow (cfs)		W/D Ratio	Width (ft)	Depth (ft)	Velocity (fps)	Travel Time (days)	Tributary		Stream		Analysis	
			Stream	Tributary						Hardness	pH	Hardness	pH	Hardness	pH
Point of Discharge	3.6														
End of Reach 1	2.09														

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Toxics Management Spreadsheet
Version 1.3, March 2021

Model Results

North Warren Muni STP, NPDES Permit No. PA0029467, Outfall 001

Instructions | Results | RETURN TO INPUTS | SAVE AS PDF | PRINT | ◉ All ○ Inputs ○ Results ○ Limits

☐ ***Hydrodynamics***

☑ ***Wasteload Allocations***

☑ ***AFC*** CCT (min): 15 PMF: 0.157 Analysis Hardness (mg/l): 100 Analysis pH: 7.02

Pollutants	Stream Conc (µg/L)	Stream CV	Trib Conc (µg/L)	Fate Coef	WQC (µg/L)	WQ Obj (µg/L)	WLA (µg/L)	Comments
Total Dissolved Solids (PWS)	0	0		0	N/A	N/A	N/A	
Chloride (PWS)	0	0		0	N/A	N/A	N/A	
Sulfate (PWS)	0	0		0	N/A	N/A	N/A	
Total Copper	0	0		0	13.439	14.0	137	Chem Translator of 0.96 applied
Total Lead	0	0		0	64.581	81.6	799	Chem Translator of 0.791 applied
Total Nickel	0	0		0	468.236	469	4,592	Chem Translator of 0.998 applied
Total Zinc	0	0		0	117.180	120	1,173	Chem Translator of 0.978 applied

☑ ***CFC*** CCT (min): ###### PMF: 1 Analysis Hardness (mg/l): 100 Analysis pH: 7.00

Pollutants	Stream Conc (µg/L)	Stream CV	Trib Conc (µg/L)	Fate Coef	WQC (µg/L)	WQ Obj (µg/L)	WLA (µg/L)	Comments
Total Dissolved Solids (PWS)	0	0		0	N/A	N/A	N/A	
Chloride (PWS)	0	0		0	N/A	N/A	N/A	
Sulfate (PWS)	0	0		0	N/A	N/A	N/A	
Total Copper	0	0		0	8.956	9.33	533	Chem Translator of 0.96 applied
Total Lead	0	0		0	2.517	3.18	182	Chem Translator of 0.791 applied
Total Nickel	0	0		0	52.007	52.2	2,979	Chem Translator of 0.997 applied
Total Zinc	0	0		0	118.139	120	6,843	Chem Translator of 0.986 applied

☑ ***THH*** CCT (min): ###### PMF: 1 Analysis Hardness (mg/l): N/A Analysis pH: N/A

Pollutants	Stream Conc (µg/L)	Stream CV	Trib Conc (µg/L)	Fate Coef	WQC (µg/L)	WQ Obj (µg/L)	WLA (µg/L)	Comments
Total Dissolved Solids (PWS)	0	0		0	500,000	500,000	N/A	

Chloride (PWS)	0	0		0	250,000	250,000	N/A	
Sulfate (PWS)	0	0		0	250,000	250,000	N/A	
Total Copper	0	0		0	N/A	N/A	N/A	
Total Lead	0	0		0	N/A	N/A	N/A	
Total Nickel	0	0		0	610	610	34,836	
Total Zinc	0	0		0	N/A	N/A	N/A	

☑ ***CRL*** CCT (min): ###### PMF: 1 Analysis Hardness (mg/l): N/A Analysis pH: N/A

Pollutants	Stream Conc (µg/L)	Stream CV	Trib Conc (µg/L)	Fate Coef	WQC (µg/L)	WQ Obj (µg/L)	WLA (µg/L)	Comments
Total Dissolved Solids (PWS)	0	0		0	N/A	N/A	N/A	
Chloride (PWS)	0	0		0	N/A	N/A	N/A	
Sulfate (PWS)	0	0		0	N/A	N/A	N/A	
Total Copper	0	0		0	N/A	N/A	N/A	
Total Lead	0	0		0	N/A	N/A	N/A	
Total Nickel	0	0		0	N/A	N/A	N/A	
Total Zinc	0	0		0	N/A	N/A	N/A	

☑ ***Recommended WQBELs & Monitoring Requirements***

No. Samples/Month: 4

	Mass Limits		*Concentration Limits*						
Pollutants	AML (lbs/day)	MDL (lbs/day)	AML	MDL	IMAX	Units	Governing WQBEL	WQBEL Basis	Comments
Total Copper	Report	Report	Report	Report	Report	mg/L	0.088	AFC	Discharge Conc > 10% WQBEL (no RP)

☑ ***Other Pollutants without Limits or Monitoring***

The following pollutants do not require effluent limits or monitoring based on water quality because reasonable potential to exceed water quality criteria was not determined and the discharge concentration was less than thresholds for monitoring, or the pollutant was not detected and a sufficiently sensitive analytical method was used (e.g., <= Target QL).

Pollutants	Governing WQBEL	Units	Comments
Total Dissolved Solids (PWS)	N/A	N/A	PWS Not Applicable
Chloride (PWS)	N/A	N/A	PWS Not Applicable
Bromide	N/A	N/A	No WQS
Sulfate (PWS)	N/A	N/A	PWS Not Applicable
Total Lead	N/A	N/A	Discharge Conc < TQL
Total Nickel	2.94	mg/L	Discharge Conc ≤ 10% WQBEL
Total Zinc	0.75	mg/L	Discharge Conc ≤ 10% WQBEL

TRC - North Warren Muni STP

TRC EVALUATION

Input appropriate values in A3:A9 and D3:D9

65.1	= Q stream (cfs)	0.5	= CV Daily
0.75	= Q discharge (MGD)	0.5	= CV Hourly
30	= no. samples	1	= AFC_Partial Mix Factor
0.3	= Chlorine Demand of Stream	1	= CFC_Partial Mix Factor
0	= Chlorine Demand of Discharge	15	= AFC_Criteria Compliance Time (min)
0.5	= BAT/BPJ Value	720	= CFC_Criteria Compliance Time (min)
0	= % Factor of Safety (FOS)		=Decay Coefficient (K)

Source	Reference	AFC Calculations		Reference	CFC Calculations	
TRC	1.3.2.iii	WLA afc =	17.918	1.3.2.iii	WLA cfc =	17.461
PENTOXSD TRG	5.1a	LTAMULT afc =	0.373	5.1c	LTAMULT cfc =	0.581
PENTOXSD TRG	5.1b	LTA_afc=	6.677	5.1d	LTA_cfc =	10.151

Source		Effluent Limit Calculations		
PENTOXSD TRG	5.1f	AML MULT =	1.231	
PENTOXSD TRG	5.1g	AVG MON LIMIT (mg/l) =	0.500	BAT/BPJ
		INST MAX LIMIT (mg/l) =	1.635	

WLA afc	**(.019/e(-k*AFC_tc)) + [(AFC_Yc*Qs*.019/Qd*e(-k*AFC_tc))...** **...+ Xd + (AFC_Yc*Qs*Xs/Qd)]*(1-FOS/100)**
LTAMULT afc	EXP((0.5*LN(cvh^2+1))-2.326*LN(cvh^2+1)^0.5)
LTA_afc	wla_afc*LTAMULT_afc
WLA_cfc	**(.011/e(-k*CFC_tc) + [(CFC_Yc*Qs*.011/Qd*e(-k*CFC_tc))...** **...+ Xd + (CFC_Yc*Qs*Xs/Qd)]*(1-FOS/100)**
LTAMULT_cfc	EXP((0.5*LN(cvd^2/no_samples+1))-2.326*LN(cvd^2/no_samples+1)^0.5)
LTA_cfc	wla_cfc*LTAMULT_cfc
AML MULT	EXP(2.326*LN((cvd^2/no_samples+1)^0.5)-0.5*LN(cvd^2/no_samples+1))
AVG MON LIMIT	MIN(BAT_BPJ,MIN(LTA_afc,LTA_cfc)*AML_MULT)
INST MAX LIMIT	**1.5*((av_mon_limit/AML_MULT)/LTAMULT_afc)**

4/3/2025

Outfall 001

Facility: North Warren Muni STP			
Permit Number: PA0029467		Effective:	Expiration:
Outfall No:			
Location:			
Discharge to:			
Site Specific Mussel Survey Completed:			

Discharge and Stream Characteristics			Comments
Q_S	Stream Flow	42 MGD / 65.01 cfs	
Q_D	Discharge Flow	0.75 MGD / 1.16059 cfs	
$C_{S(Cl^-)}$	Instream chloride Concentration	mg/L	
$C_{E(Cl^-)}$	Discharge chloride (existing)	250 mg/L	
$C_{P(Cl^-)}$	Discharge chloride (proposed)	250 mg/L	
$C_{S(Ni)}$	Instream nickel Concentration	µg/L	
$C_{E(Ni)}$	Discharge nickel (existing)	1.91 µg/L	
$C_{P(Ni)}$	Discharge nickel (proposed)	1.91 µg/L	
$C_{S(Zn)}$	Instream zinc Concentration	µg/L	
$C_{E(Zn)}$	Discharge zinc (existing)	44 µg/L	
$Zn_{P(Zn)}$	Discharge zinc (proposed)	44 µg/L	
$C_{S(Cu)}$	Instream copper Concentration	µg/L	
$C_{E(Cu)}$	Discharge copper (existing)	22.6 µg/L	
$Zn_{P(Cu)}$	Discharge copper (proposed)	22.6 µg/L	
$C_{S(NH3-N)}$	Instream NH^3-N	mg/L	
$C_{E(NH3-N)}$	Discharge NH^3-N (existing)	25 mg/L	
$C_{P(NH3-N)}$	Discharge NH^3-N (proposed)	22.6 mg/L	
pH_S	Instream pH	7 S.U.	
T_S	Instream Temp.	25 °C	Default value for a WWF
$C_{C(NH3-N)}$	Ammonia criteria	1.367 mg/L	From ammonia criteria comparison spreadsheet -using instream pH and Temp
$C_{C(Cl^-)}$	Chloride criteria	78 mg/L	USFWS criteria
$C_{C(Ni)}$	Nickel criteria	7.3 µg/L	USFWS criteria
$C_{C(Zn)}$	Zinc criteria	13.18 µg/L	USFWS criteria
$C_{C(Cu)}$	Copper criteria	10 µg/L	USFWS criteria
W_S	Stream width	25 meters	Google Earth (Approximate)

Ammonia Criteria Calculations:

	pH_S	7	S.U.	*(Default value is 7.0)*
	T_S	25	°C	*(Default value is 20° for a CWF and 25° for a WWF)*

Acute Criteria

	METHOD and UNITS	CRITERIA	Comments	
	Old CMC (mg TAN/L) =	6.764		
	EPA 2013 CMC (mg TAN/L) =	11.073	Oncorhynchus present	* formula on pg. 41 (plateaus at 15.7 C)
		11.073	Oncorhynchus absent	* formula on pg. 42 (plateaus at 10.2 C)

Chronic Criteria

	METHOD and UNITS	CRITERIA	COMMENTS
	Old CMC (mg TAN/L) =	1.341	
$C_{C(NH3-N)}$	EPA 2013 CMC (mg TAN/L) =	1.367	* formula on pg. 46 (plateaus at 7 C)

Endangered Mussel Species Impact Area Calculations:

Existing Area of Impact

☑ N/A - No Site Specific Mussel Survey Completed for this Discharger

Approximate Area of Impact Determined from Survey =	N/A m^2	(Enter N/A if no site specific survey has been completed)
Existing Mussel Density within Area of Impact =		
Rabbitsfoot *(Quadrula cylindrical)*	per m^2	
Northern Riffleshell *(Epioblasma torulosa rangiana)*	per m^2	
Rayed Bean *(Villosa fabalis)*	per m^2	
Clubshell *(Pleurobema clava)*	per m^2	
Sheepnose *(Plethobasus cyphyus)*	per m^2	
Snuffbox *(Epioblasma triquetra)*	per m^2	
TOTAL	0 per m^2	

Method 1 - Utilizing Site Specific Mussel Survey Information

☑ N/A - No Site Specific Mussel Survey Completed for this Discharger

This method utilizes a simple comparison of the size of the existing area of impact as determined from a site specific mussel survey and the chlorides in the existing discharge compared to the chlorides in the proposed discharge after the facility upgrades treatment technologies. This method is only applicable to where the stream impairment is caused by TDS and/or chlorides as the plume has been delineated through conductivity measurements.

A.	Area of Impact Determined from Survey:	N/A	m^2
B.	Chlorides in Existing Discharge:	250	mg/L
C.	Chlorides in Proposed Discharge after Treatment Facility Upgrades:	174	mg/L
D.	Approximate Area of Impact after Treatment Facility Upgrades:	N/A	m^2

A/B = D/C Therefore, D = (A*C)/B

4/3/2025

Outfall 001

Facility:		
Permit Number:	Effective:	Expiration:
Outfall No:		
Location:		
Discharge to:		
Site Specific Mussel Survey Completed:		

Endangered Mussel Species Impact Area Calculations: (continued…)

Method 2 - Mass Balance Relationship of Loading and Assimilative Capacity of Stream

Chloride (Cl^-)	$L_{S(Cl^-)}$ = Available Chloride Loading in Stream = $C_{C(Cl^-)} - C_{S(Cl^-)} \times Q_S$(MGD) X 8.34 =	27,322 lbs/Day
	$L_{D\text{-}MAX(Cl^-)}$ = Current Maximium Discharge Chloride Loading exceeding criteria = $\{C_{E(CL^-)} - C_{E(CL^-)}\} \times Q_D$(MGD) X 8.34 =	1,076 lbs/Day
	$\%_{E(Cl^-)}$ = Percent of Stream Capacity for Current Loading = $L_{D\text{-}MAX(Cl^-)} / L_{S(Cl^-)}$ =	4% of Stream Capacity
	$L_{D(Cl^-)}$ = Proposed Discharge Cl^- Loading exceeding criteria after Treatment Facility Upgrades = $\{C_{P(Cl^-)} - C_{P(Cl^-)}\} \times Q_D$(MGD) X 8.34 =	1075.86 lbs/Day
	$\%_{P(Cl^-)}$ = Percent of Stream Capacity for Proposed Loading = $L_{D(Cl^-)} / L_{S(Cl^-)}$ =	3.94% of Stream Capacity
	Proposed Area of Impact due to Chloride * = $(\%_{P(Cl^-)} \times W_S)^2 \times 0.5$ = * assuming equal flow across transect and 90° spread at discharge	0.48 m^2
Nickel(Ni)	$L_{S(Ni)}$ = Available Nickel Loading in Stream = $C_{C(Ni)} - C_{S(Ni)} \times Q_S$(MGD) X 8.34 =	2,557 lbs/Day
	$L_{D\text{-}MAX(Ni)}$ = Current Maximium Discharge Nickel Loading exceeding criteria = $\{C_{E(Ni)} - C_{E(Ni)}\} \times Q_D$(MGD) X 8.34 =	-34 lbs/Day
	$\%_{E(Ni)}$ = Percent of Stream Capacity for Current Loading = $L_{D\text{-}MAX(Ni)} / L_{S(Ni)}$ =	0% of Stream Capacity
	$L_{D(Ni)}$ = Proposed Discharge Ni Loading exceeding criteria after Treatment Facility Upgrades = $\{C_{P(Ni)} - C_{P(Ni)}\} \times Q_D$(MGD) X 8.34 =	-33.71445 lbs/Day
	$\%_{P(Ni)}$ = Percent of Stream Capacity for Proposed Loading = $L_{D(Ni)} / L_{S(Ni)}$ =	-1.32% of Stream Capacity
	Proposed Area of Impact due to Nickel * = $(\%_{P(Ni)} \times W_S)^2 \times 0.5$ = * assuming equal flow across transect and 90° spread at discharge	0.05 m^2
Zinc (Zn)	$L_{S(Zn)}$ = Available Zinc Loading in Stream = $C_{C(Zn)} - C_{S(Zn)} \times Q_S$(MGD) X 8.34 =	4,617 lbs/Day
	$L_{D\text{-}MAX(Zn)}$ = Current Maximium Discharge Zinc Loading exceeding criteria = $\{C_{E(Zn)} - C_{E(Zn)}\} \times Q_D$(MGD) X 8.34 =	193 lbs/Day
	$\%_{E(Zn)}$ = Percent of Stream Capacity for Current Loading = $L_{D\text{-}MAX(Zn)} / L_{S(Zn)}$ =	4% of Stream Capacity
	$L_{D(Zn)}$ = Proposed Discharge Zn Loading exceeding criteria after Treatment Facility Upgrades = $\{C_{P(Zn)} - C_{P(Zn)}\} \times Q_D$(MGD) X 8.34 =	192.7791 lbs/Day
	$\%_{P(Zn)}$ = Percent of Stream Capacity for Proposed Loading = $L_{D(Zn)} / L_{S(Zn)}$ =	4.18% of Stream Capacity
	Proposed Area of Impact due to Zinc * = $(\%_{P(Zn)} \times W_S)^2 \times 0.5$ = * assuming equal flow across transect and 90° spread at discharge	0.54 m^2
Copper (Cu)	$L_{S(Cu)}$ = Available Copper Loading in Stream = $C_{C(Cu)} - C_{S(Cu)} \times Q_S$(MGD) X 8.34 =	3,503 lbs/Day
	$L_{D\text{-}MAX(Cu)}$ = Current Maximium Discharge Copper Loading exceeding criteria = $\{C_{E(Cu)} - C_{E(Cu)}\} \times Q_D$(MGD) X 8.34 =	79 lbs/Day
	$\%_{E(Cu)}$ = Percent of Stream Capacity for Current Loading = $L_{D\text{-}MAX(Cu)} / L_{S(Cu)}$ =	2% of Stream Capacity
	$L_{D(Cu)}$ = Proposed Discharge Cu Loading exceeding criteria after Treatment Facility Upgrades = $\{C_{P(Cu)} - C_{P(Cu)}\} \times Q_D$(MGD) X 8.34 =	78.813 lbs/Day
	$\%_{P(Cu)}$ = Percent of Stream Capacity for Proposed Loading = $L_{D(Cu)} / L_{S(Cu)}$ =	2.25% of Stream Capacity
	Proposed Area of Impact due to Copper* = $(\%_{P(Cu)} \times W_S)^2 \times 0.5$ = * assuming equal flow across transect and 90° spread at discharge	0.16 m^2
Ammonia-Nitrogen (NH3-N)	$L_{S(NH3\text{-}N)}$ = Available NH3-N Loading in Stream = $C_{C(NH3\text{-}N)} - C_{S(NH3\text{-}N)} \times Q_S$(MGD) X 8.34 =	479 lbs/Day
	$L_{D\text{-}MAX(NH3\text{-}N)}$ = Current Maximium Discharge NH3-N Loading = $C_{E(NH3\text{-}N)} \times Q_D$(MGD) X 8.34 =	156 lbs/Day
	$\%_{E(NH3\text{-}N)}$ = Percent of Stream Capacity for Current Loading = $L_{D\text{-}MAX(NH3\text{-}N)} / L_{S(NH3\text{-}N)}$ =	33% of Stream Capacity
	$L_{D(NH3\text{-}N)}$ = Proposed Discharge NH3-N Loading after Treatment Facility Upgrades = $C_{P(NH3\text{-}N)} - C_{C(NH3\text{-}N)} \times Q_D$(MGD) X 8.34 =	133 lbs/Day
	$\%_{P(NH3\text{-}N)}$ = Percent of Stream Capacity for Proposed Loading = $L_{D(NH3\text{-}N)} / L_{S(NH3\text{-}N)}$ =	27.77% of Stream Capacity
	Proposed Area of Impact due to NH3-N * = $(\%_{P(NH3\text{-}N)} \times W_S)^2 \times 0.5$ = * assuming equal flow across transect and 90° spread at discharge	24.09 m^2

4/3/2025

Outfall 001

Facility:		
Permit Number:	Effective:	Expiration:
Outfall No:		
Location:		
Discharge to:		
Site Specific Mussel Survey Completed:		

Endangered Mussel Species Impact Area Calculations: (continued…)

Method 3 - Mass Balance Relationship of Stream Flow, Proposed Effluent Quality, and Mussel Protection Criteria

Chloride (Cl^-)	$Q_{A(Cl^-)}C_{S(Cl^-)} + Q_DC_{P(Cl^-)} = Q_TC_{C(Cl^-)}$	
	$Q_{A(Cl^-)}$ = Assimilative Stream Flow Required to Achieve Criteria (cfs)	
	$Q_T = Q_S + Q_D$ (cfs)	
	$Q_{A(Cl^-)}C_{S(Cl^-)} + Q_DC_{P(Cl^-)} = (Q_D+Q_S)C_{C(Cl^-)}$	
	SOLVING FOR $Q_{A(Cl^-)} = [(Q_DC_{P(Cl^-)} / C_{C(Cl^-)}) - Q_D)] / (1 - C_{S(Cl^-)}/C_{C(Cl^-)})$ =	2.55924974 cfs
	$\%_{P(Cl^-)}$ = Percent of Stream Width Required to Assimilate Chlorides to Criteria Concentration = $Q_{A(Cl^-)} / Q_S$ (cfs) =	3.9367%
	$W_{I(Cl^-)}$ = Proposed Width of Stream required to Assimilate Chlorides to Criteria Concentration = W_S X $\%_{P(Cl^-)}$	0.984175 meters
	Proposed Area of Impact due to Chloride * = $(W_{I(Cl^-)})^2$ X 0.5 = * assuming equal flow across transect and 90° spread at discharge	0.48 m^2
Nickel (Ni)	$Q_{A(Ni)}C_{S(Ni)} + Q_DC_{P(Ni)} = Q_TC_{C(Ni)}$	
	$Q_{A(Ni)}$ = Assimilative Stream Flow Required to Achieve Criteria (cfs)	
	$Q_T = Q_S + Q_D$ (cfs)	
	$Q_{A(Ni)}C_{S(Ni)} + Q_DC_{P(Ni)} = (Q_D+Q_S)C_{C(Ni)}$	
	SOLVING FOR $Q_{A(Ni)} = [(Q_DC_{P(Ni)} / C_{C(Ni)}) - Q_D)] / (1 - C_{S(Ni)}/C_{C(Ni)})$ =	-0.85692878 cfs
	$\%_{P(Cl^-)}$ = Percent of Stream Width Required to Assimilate Nickel to Criteria Concentration = $Q_{A(Ni)} / Q_S$ (cfs) =	-1.3181%
	$W_{I(Ni)}$ = Proposed Width of Stream required to Assimilate Nickel to Criteria Concentration = W_S X $\%_{P(Ni)}$	-0.329537 meters
	Proposed Area of Impact due to Nickel * = $(W_{I(Ni)})^2$ X 0.5 = * assuming equal flow across transect and 90° spread at discharge	0.05 m^2
Zinc (Zn)	$Q_{A(Zn)}C_{S(Zn)} + Q_DC_{P(Zn)} = Q_TC_{C(Zn)}$	
	$Q_{A(Zn)}$ = Assimilative Stream Flow Required to Achieve Criteria (cfs)	
	$Q_T = Q_S + Q_D$ (cfs)	
	$Q_{A(Zn)}C_{S(Zn)} + Q_DC_{P(Zn)} = (Q_D+Q_S)C_{C(Zn)}$	
	SOLVING FOR $Q_{A(Zn)} = [(Q_DC_{PZn)} / C_{C(Zn)}) - Q_D)] / (1 - C_{S(Zn)}/C_{C(Zn)})$ =	2.71391379 cfs
	$\%_{P(Cl^-)}$ = Percent of Stream Width Required to Assimilate Zinc to Criteria Concentration = $Q_{A(Zn)} / Q_S$ (cfs) =	4.1746%
	$W_{I(Zn)}$ = Proposed Width of Stream required to Assimilate Zinc to Criteria Concentration = W_S X $\%_{PZn)}$	1.043652 meters
	Proposed Area of Impact due to Zinc * = $(W_{IZn)})^2$ X 0.5 = * assuming equal flow across transect and 90° spread at discharge	0.54 m^2
Copper (Cu)	$Q_{A(Cu)}C_{S(Cu)} + Q_DC_{P(Cu)} = Q_TC_{C(Cu)}$	
	$Q_{A(Cu)}$ = Assimilative Stream Flow Required to Achieve Criteria (cfs)	
	$Q_T = Q_S + Q_D$ (cfs)	
	$Q_{A(Cu)}C_{S(Cu)} + Q_DC_{P(Cu)} = (Q_D+Q_S)C_{C(Cu)}$	
	SOLVING FOR $Q_{A(Cu)} = [(Q_DC_{PCu)} / C_{C(Cu)}) - Q_D)] / (1 - C_{S(Cu)}/C_{C(Cu)})$ =	1.4623434 cfs
	$\%_{P(Cu)}$ = Percent of Stream Width Required to Assimilate Copper to Criteria Concentration = $Q_{A(Cu)} / Q_S$ (cfs) =	2.2494%
	$W_{I(Cu)}$ = Proposed Width of Stream required to Assimilate Copper to Criteria Concentration = W_S X $\%_{PCu)}$	0.562353 meters
	Proposed Area of Impact due to Copper * = $(W_{I(Cu)})^2$ X 0.5 = * assuming equal flow across transect and 90° spread at discharge	0.16 m^2
Ammonia-Nitrogen (NH3-N)	$Q_{A(NH3\text{-}N)}C_{S(NH3\text{-}N)} + Q_DC_{P(NH3\text{-}N)} = Q_TC_{C(NH3\text{-}N)}$	
	$Q_{A(NH3\text{-}N)}$ = Assimilative Stream Flow Required to Achieve Criteria (cfs)	
	$Q_T = Q_S + Q_D$ (cfs)	
	$Q_{A(NH3\text{-}N)}C_{S(NH3\text{-}N)} + Q_DC_{P(NH3\text{-}N)} = (Q_D+Q_S)C_{C(NH3\text{-}N)}$	
	SOLVING FOR $Q_{A(NH3\text{-}N)} = [(Q_DC_{P(NH3\text{-}N)} / C_{C(NH3\text{-}N)}) - Q_D)] / (1 - C_{S(NH3\text{-}N)}/C_{C(NH3\text{-}N)})$ =	18.026926 cfs
	$\%_{P(NH3\text{-}N)}$ = Percent of Stream Width Required to Assimilate NH3-N to Criteria Concentration = $Q_{A(NH3\text{-}N)} / Q_S$ (cfs) =	27.7295%
	$W_{I(NH3\text{-}N)}$ = Proposed Width of Stream required to Assimilate NH3-N to Criteria Concentration = W_S X $\%_{P(NH3\text{-}N)}$	6.932366 meters
	Proposed Area of Impact due to NH3-N * = $(W_{I(NH3\text{-}N)})^2$ X 0.5 = * assuming equal flow across transect and 90° spread at discharge	24.03 m^2

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pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

MEMO

TO: Christina Nagy
Operations Group Manager
Clean Water Management Program

FROM: Jay Gerber
Water Pollution Biologist 2
Clean Water Management Program

THROUGH: Joe Brancato
Water Pollution Biologist 3
Clean Water Management Program

DATE: December 21, 2012

SUBJECT: Aquatic Biology Investigation
North Warren Sewage Treatment Plant
Conewango Creek (Stream Code 56311)
Conewango Township, Warren County

INTRODUCTION

At the request of the Clean Water Management Program, an aquatic biological investigation was completed on Conewango Creek, Conewango Township, Warren County on August 8, 2012. The survey was completed to determine the impacts, if any, the North Warren Sewage Treatment Plant (NWSTP) may be having on water quality and aquatic life in the receiving stream. Conewango Creek was sampled at two stations for benthic macroinvertebrates, basic water quality, and habitat.

Conewango Creek originates north, in New York, approximately 65 miles upstream of the NWSTP. At the discharge, Conewango Creek is a relatively large, low gradient, warmwater stream. Oil Creek travels south another 3.5 miles before flowing into the Allegheny River in Warren. Upstream of the discharge, Conewango Creek drains approximately 867 square miles. The dominant land use is forest (54.5), while urban cover encompasses 5.8% of the basin (Pennsylvania StreamStats). Conewango Creek is in the Conewango Creek Drainage Basin (State Water Plan 16B) and the Conewango Creek Hydrologic Unit (Hydrologic Unit Code 05010002). At the discharge, Conewango Creek is currently supporting its designated

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use as Warm Water Fishes (WWF) for aquatic life and recreation under 25 Pa. Code §93.9q. It is not supporting its designated use for fish consumption, which has a smallmouth bass (*Micropterus dolomieu*) mercury advisory of two meals per month.

The NWSTP has had three violations for exceeding permit limits, including one for total residual chlorine and two for fecal coliform, over the past two years. The NWSTP's National Pollutant Discharge Elimination System (NPDES) permit expires December 31, 2013. Prior to this study, Department biologists had not completed a survey on Conewango Creek within the vicinity of the NWSTP.

METHODS AND MATERIALS

On August 8, 2012, benthic macroinvertebrates, basic water quality, and habitat were examined at two sites on Conewango Creek (Figure 1). A reference station was established approximately 250 meters upstream of the NWSTP. An impact station was surveyed approximately 250 meters downstream of the discharge. These sampling locations were the nearest riffles upstream and downstream of the discharge.

Macroinvertebrates were collected, processed, and identified following the Instream Comprehensive Evaluation Protocol (Pennsylvania DEP 2009). Sampling was standardized to riffles utilizing the best available habitat for each site. Six D-frame (500µm mesh netting) kicks, disturbing an area of one meter, were completed at each station. The six kicks were combined into a single jar and filled with 95% ethyl alcohol to preserve the macroinvertebrates. Upon arrival at the Department's lab, organisms were sub-sampled and identified to the lowest possible taxonomic level using a dissecting microscope. Peckarsky *et al.* (1990), Stewart and Stark (2002), Pfeiffer *et al.* (2006a, 2006b), and Merritt *et al.* (2008) were used as taxonomic references. An Index of Biotic Integrity (IBI) was computed for each site using the sub-sampled macroinvertebrate assemblages.

Basic water quality parameters, including dissolved oxygen, pH, specific conductivity, temperature, and alkalinity were measured *in situ* at both sites prior to the macroinvertebrate surveys. All parameters, except alkalinity, were determined using field meters. Alkalinity was determined using a titration kit.

Physical habitat assessments, modified for the Department from the EPA Rapid Bioassessment Protocols (Barbour *et al.* 1999) were completed at all sites. These assessments consist of twelve criteria, encompassing instream and riparian zone parameters, scored from 0-20. Total scores result in habitat characterizations of poor (0-60), marginal (72-120), sub-optimal (132-180), and optimal (>192). The decision is left to the discretion of the investigator if a score falls between any of these categories.

RESULTS

Macroinvertebrate communities were characterized through an IBI score. This is a method to determine stream health and aquatic life attainment status of a waterbody (Karr 1981). IBI scores vary from 0-100, with a higher score indicating more pristine conditions. IBIs are computed using a suite of metrics measuring characteristics of a macroinvertebrate assemblage. Metrics used for the Department's Freestone IBI are taxa richness, EPT (Ephemeroptera, Plecoptera, and Trichoptera) richness, Beck's Index, Hilsenhoff Biotic Index, percentage of sensitive individuals, and the Shannon Diversity Index. Typically, if a stream scores greater than 63.0, it is considered to be attaining its designated use(s) for aquatic life. For large streams, such as Conewango Creek, there is some flexibility left to the discretion of the investigator for the 63.0 attainment threshold.

Macroinvertebrate assemblages were very similar between sites (Table 1). Dominant taxa at each site included filter-feeding caddisflies (*Cheumatopsyche*, *Ceratopsyche*), a fine organic particulate feeding mayfly (*Serratella*), a detrital scraper (*Stenelmis*), and midges. Comparison of the six metrics used to generate the Department's IBI showed no remarkable differences (Table 2). The reference station scored better than the impact station in a single metric (percentage of sensitive individuals). The impact station had better scores in the remaining five metrics. Most metric scores were within percentage points of each other. None of the differences between sites should be considered significant. The Department's IBI scores were also very similar between the upstream and downstream stations. The reference site scored 56.7, while the impact site scored slightly better at 59.8. Statistically, the scores are not significantly different from each other.

Basic water quality parameters showed some differences between sites, though none of these results should be attributed solely to the NWSTP discharge (Table 3). Dissolved oxygen and specific conductivity were lower at the reference site compared to the impact station. The difference in dissolved oxygen could be an artifact of riffle development at each site. While large, slow moving pools were upstream of both sites, riffles consisted of gravel with some cobble at the reference station, while boulder and cobble were the prevalent substrate at the impact station. The large substrate may have acted as an aerator, providing greater oxygenation at the impact station. Additionally, the river is slow moving with an open canopy upstream of the reference site. Heat from sunlight and stagnation can lower oxygen levels in a waterbody. Specific conductivity could be higher at the impact station due to stormwater runoff. There are several stormwater outlets in the vicinity of the NWSTP discharge.

Habitat was similar between sites (Table 4), with the two sites scoring within seven points of each other. Both scored within the "sub-optimal" category. Most of the twelve criteria were within one or two points between the sites. Variation in habitat between sites did not have an impact on macroinvertebrate IBI scores.

DISCUSSION AND CONCLUSIONS

The NWSTP discharges to Conewango Creek just upstream of the City of Warren. The NWSTP has had several violations for exceeding permit limits for fecal coliform and total residual chlorine over the past two years. Their permit is due for renewal December 31, 2013.

Results gathered through this study suggest the NWSTP is having little to no effect on the macroinvertebrate community or water quality on the receiving stream. IBI scores were very similar between the reference and impact stations. The impact station obtained higher scores in five of the six metrics used to derive the IBI. As observed from the taxa list, no large changes in population, community structure, or feeding niches occurred at the impact station. Both sites supported a diverse, well balanced, warmwater macroinvertebrate assemblage. Additionally, water quality and habitat were not impacted by the NWSTP. Conewango Creek's recreational use was examined in September of 2010, by Central Office-DEP staff, for fecal coliforms near the stream's confluence with the Allegheny River. The survey indicated Conewango Creek's recreational use was not being impaired. Also, occasionally when a discharger exceeds limits for residual chlorine, macroinvertebrates may have obvious burns to their gills. During identification, the Department did not document burns afflicting any macroinvertebrate taxonomic groups.

The objective of this study was to determine the impacts, if any, the NWSTP discharge was having on Conewango Creek. Results seen through this study indicate the NWSTP is having a minimal effect on Conewango Creek.

cc: Stream File – Conewango Creek (SC 56311)
Tony Shaw, DEP – Central Office, Water Quality Standards Monitoring Chief
Don Hanna, DEP – NWRO, Water Quality Specialist

JG:ll

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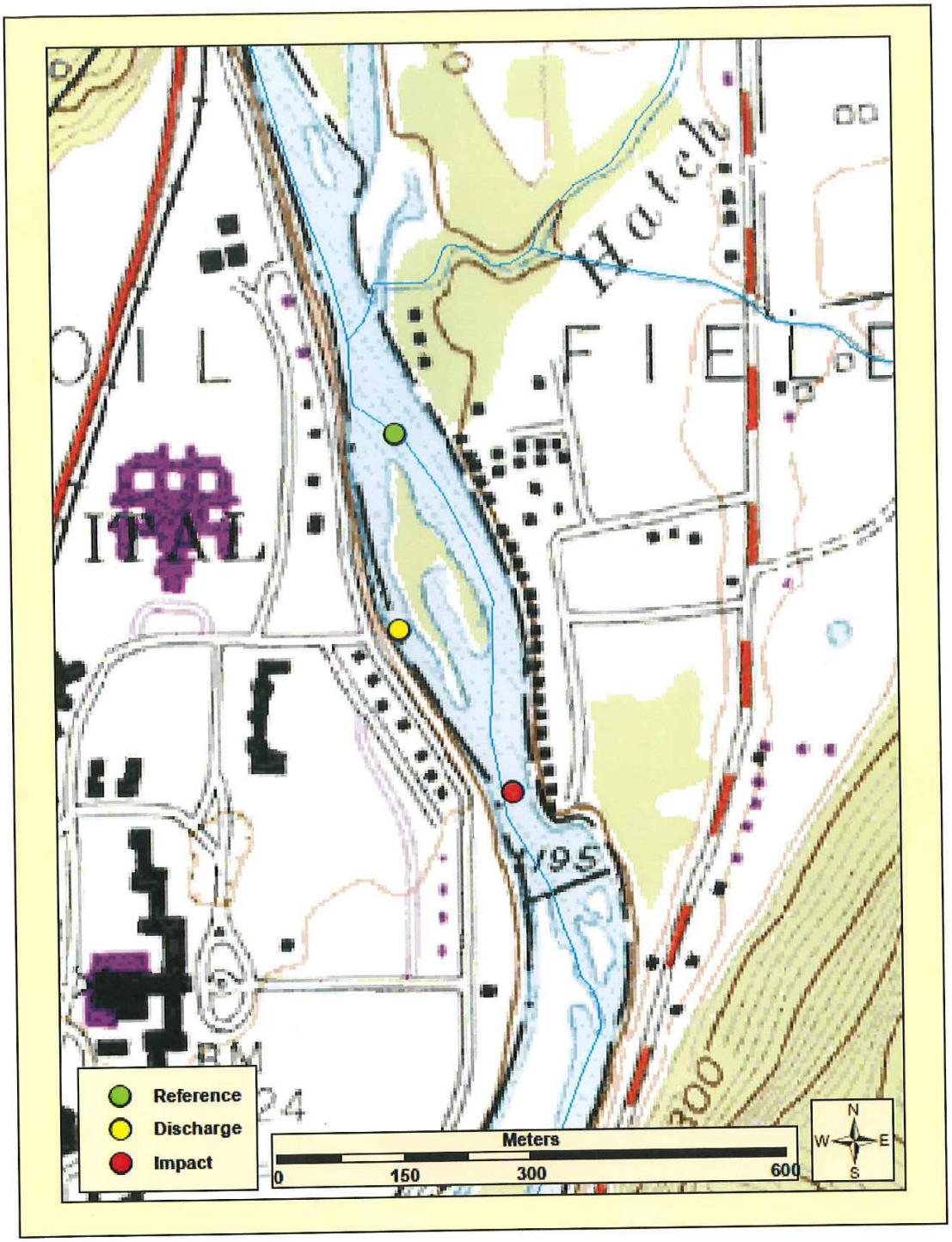

Figure 1. A map from the Russell USGS Quad showing the North Warren Sewage Treatment Plant discharge and the two sampling locations.

Table 1. Macroinvertebrates collected upstream and downstream of the North Warren Sewage Treatment Plant discharge on August 8, 2012.

Taxa		Hilsenhoff Value	Conewago Creek - Reference Station	Conewago Creek - Impact Station
EPHEMEROPTERA (MAYFLIES)				
Baetidae	*Acentrella*	4		2
	Acerpenna	6	1	
	Baetis	6	18	1
	Plauditus	4	2	5
	Heterocloeon	6	5	
Caenidae	*Caenis*	7	4	2
Ephemerellidae	*Serratella*	2	42	31
Heptageniidae	*Maccaffertium*	3	4	8
Isonychiidae	*Isonychia*	3	3	10
PLECOPTERA (STONEFLIES)				
Perlidae	*Acroneuria*	0	2	3
	Agnetina	2		1
	Paragnetina	1		1
TRICHOPTERA (CADDISFLIES)				
Brachycentridae	*Brachycentrus*	1	3	7
Hydropsychidae	*Ceratopsyche*	5	14	24
	Cheumatopsyche	6	18	34
	Hydropsyche	5	1	
	Macrostemum	0	9	
Philopotamidae	*Chimarra*	4	10	3
COLEOPTERA (Beetles)				
Elmidae	*Optioservus*	4	7	10
	Oulimnius	5		3
	Stenelmis	5	16	19
Psephenidae	*Psephenus*	4	4	1
MEGALOPTERA (Alderflies, Dobsonflies and Fishflies)				
Corydalidae	*Corydalus*	4		2
DIPTERA (TRUE FLIES)				
Athericidae	*Atherix*	2		3
Chironomidae		6	33	22
Simuliidae	*Simulium*	6	3	9
NON-INSECT TAXA				
Sphaeriidae (Bivalves)	*Sphaerium*	6	6	8
Gammaridae (Scuds)	*Gammarus*	4	1	1
Crangonyctidae (Scuds)	*Crangonyx*	4	1	
Isopoda (Sowbugs)	*Caecidotea*	6		1
Planaria (Flatworms)		8	5	1
Hirudinea (Leeches)		9	1	1

Table 2. Raw metric scores used to calculate the Index of Biotic Integrity for macroinvertebrate assemblages on Conewango Creek.

Metric	Conewago Creek - Reference Station	Conewago Creek - Impact Station
Taxa Richness	25	27
EPT Richness (PTV<4)	9	10
Beck's Index	7	10
Hilsenhoff Biotic Index	4.54	4.48
% Sensitive Individuals (PTV<3)	31.9	30
Shannon Diversity	2.68	2.71
IBI Score	56.7	59.8

Table 3. Basic water quality parameters measured at macroinvertebrate sites on Conewango Creek upstream and downstream of the North Warren Sewage Treatment Plant discharge.

Field Parameter	Conewago Creek - Reference Station	Conewago Creek - Impact Station
Temperature (°C)	23.4	23.9
Dissolved Oxygen (mg/L)	7.73	9.03
pH (Units)	7.74	8.08
Specific Conductivity (µS/cm)	774	868
Alkalinity (mg/L)	46	50

Table 4. Habitat scores taken from Conewango Creek at macroinvertebrate sampling sites upstream and downstream of the North Warren Sewage Treatment Plant discharge.

Field Parameter	Scoring Range	Conewago Creek - Reference Station	Conewago Creek - Impact Station
1. Instream Cover	0-20	15	15
2. Epifaunal Substrate	0-20	14	14
3. Embeddedness	0-20	13	12
4. Velocity/Depth Regimes	0-20	15	14
5. Channel Alteration	0-20	12	11
6. Sediment Deposition	0-20	12	11
7. Frequency of Riffles	0-20	12	9
8. Channel Flow Status	0-20	15	17
9. Condition of Banks	0-20	17	14
10. Bank Vegetative Protection	0-20	15	17
11. Grazing/Disruptive Pressures	0-20	17	16
12. Riparian Vegetation Zone Width	0-20	7	7
Total Score	**0-240**	**164**	**157**
Rating		**Sub-Optimal**	**Sub-Optimal**