

Application Type Renewal  
Facility Type Municipal  
Major / Minor Minor

## NPDES PERMIT FACT SHEET INDIVIDUAL SEWAGE

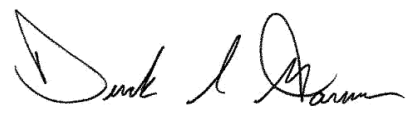

Application No. PA0024759  
APS ID 1075576  
Authorization ID 1417418

### Applicant and Facility Information

Applicant Name <u>Curwensville Municipal Authority</u>	Facility Name <u>Curwensville Municipal Authority Wastewater Treatment Plant</u>
Applicant Address <u>314 South Street</u> <u>Curwensville, PA 16833-1237</u>	Facility Address <u>100 Stadium Drive</u> <u>Curwensville, PA 16833-1313</u>
Applicant Contact <u>Joseph Carfley</u>	Facility Contact <u>David Clark</u>
Applicant Phone <u>(814) 236-2631</u>	Facility Phone <u>(814) 236-0582</u>
Client ID <u>35027</u>	Site ID <u>252525</u>
Ch 94 Load Status <u>Not Overloaded</u>	Municipality <u>Curwensville Borough</u>
Connection Status <u>No Limitations</u>	County <u>Clearfield</u>
Date Application Received <u>November 9, 2022</u>	EPA Waived? <u>No</u>
Date Application Accepted <u>November 16, 2022</u>	If No, Reason <u>Significant CB Discharge</u>
Purpose of Application <u>Renewal of an existing NPDES permit for the discharge of treated sewage.</u>	

### 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		 Derek S. Garner / Project Manager	October 24, 2023
X		 Nicholas W. Hartranft, P.E. / Environmental Engineer Manager	October 25, 2023

Discharge, Receiving Waters and Water Supply Information

Outfall No.	<u>001</u>	Design Flow (MGD)	<u>0.5</u>
Latitude	<u>40° 58' 36.62"</u>	Longitude	<u>-78° 30' 54.28"</u>
Quad Name	<u>Curwensville</u>	Quad Code	<u>1117</u>
Wastewater Description: <u>Sewage Effluent</u>			

Receiving Waters	<u>West Branch Susquehanna River</u>	Stream Code	<u>18668</u>
NHD Com ID	<u>61831329</u>	RMI	<u>181.86</u>
Drainage Area	<u>446</u>	Yield (cfs/mi <sup>2</sup> )	<u>0.125</u>
Q <sub>7-10</sub> Flow (cfs)	<u>55.8</u>	Q <sub>7-10</sub> Basis	<u>Streamgage No. 01541200</u>
Elevation (ft)	<u>1122</u>	Slope (ft/ft)	<u>n/a</u>
Watershed No.	<u>8-B</u>	Chapter 93 Class.	<u>WWF</u>
Existing Use	<u>n/a</u>	Existing Use Qualifier	<u>n/a</u>
Exceptions to Use	<u>n/a</u>	Exceptions to Criteria	<u>n/a</u>

Assessment Status	<u>Attaining Use(s)</u>		
Cause(s) of Impairment	<u>n/a</u>		
Source(s) of Impairment	<u>n/a</u>		
TMDL Status	<u>Final</u>	Name	<u>West Branch Susquehanna</u>

Nearest Downstream Public Water Supply Intake	<u>Shawville Power LLC</u>		
PWS Waters	<u>West Branch Susquehanna River</u>	Flow at Intake (cfs)	<u>117</u>
PWS RMI	<u>125.81</u>	Distance from Outfall (mi)	<u>56.06</u>

### Treatment Facility Summary

The Curwensville Municipal Authority Wastewater Treatment Plant was constructed and operates under coverage from WQM Permit No. 1713401, issued July 19, 2013. The permit was most recently amended on February 14, 2020 to approve installation of a new centrifuge necessitated by the failure of the existing centrifuge. The treatment plant generally consists of:

- One (1) fine screening unit
- Three (3) equalization tanks
- One (1) grit removal unit
- Two (2) ICEAS SBRs
- Two (2) chlorine contact tanks
  - Sodium hypochlorite
- Two (2) aerobic sludge holding tanks
  - Sludge is dewatered using a centrifuge (1) or sludge drying beds (3). Sludge cake is taken to the landfill.

Treated effluent is discharged to the West Branch Susquehanna River via Outfall 001.

Waste Type	Degree of Treatment	Process Type	Disinfection	Avg Annual Flow (MGD)
Sewage	Secondary	Sequencing Batch Reactors (SBRs)	Hypochlorite	0.5
Hydraulic Capacity (MGD)	Organic Capacity (lbs/day)	Load Status	Biosolids Treatment	Biosolids Use/Disposal
0.5	1200	Not Overloaded	Centrifugation	Landfill

### Compliance History

The following effluent violation occurred during the existing permit's term:

Noncompliance Date	Parameter	Sample Value	Violation Condition	Permit Value	Units	SBC
7/20/2022	Fecal Coliform	> 2419.6	>	1000	No./100 ml	IMAX

There are no open violations associated with the client.

The facility was most recently inspected by DEP on March 28, 2023. No violations were noted outside of the abovementioned fecal coliform effluent violation.

Development of Effluent Limitations

Outfall No. 001 Design Flow (MGD) 0.5  
Latitude 40° 58' 35.20" Longitude -78° 30' 52.20"  
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 <sub>5</sub>	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)

**Water Quality-Based Limitations**

DEP models in-stream conditions to determine if WQBELs are appropriate. Models were created using WQM 7.0 v1.1 for CBOD<sub>5</sub>, ammonia-N and dissolved oxygen and the Toxics Management Spreadsheet ("TMS") v1.4 for toxics.

The water quality model WQM 7.0 v1.1 is used to determine WQBELs for dissolved oxygen, CBOD<sub>5</sub> and ammonia-n (NH<sub>3</sub>-N) based on a multiple-discharge analysis, if applicable. The model assumes complete and instantaneous mixing with the receiving surface water. The reach chosen to model the in-stream characteristics is appropriate as a recovery in dissolved oxygen levels is demonstrated. The modeling output is as follows:

Parameter	Effluent Limit (mg/l)		
	Average Monthly	Daily Maximum	Minimum
CBOD <sub>5</sub> <sup>(1)</sup>	25	--	--
Ammonia-nitrogen <sup>(2)</sup>	25	50	--
Dissolved Oxygen <sup>(2)</sup>	--	--	3

<sup>(1)</sup> The input value of 25 mg/l is the existing technology-based CBOD<sub>5</sub> limit.

<sup>(2)</sup> The input values of 25 mg/l ammonia-n and 3 mg/l dissolved oxygen are assumed values of treated sewage.

Based on the model output, no WQBELs are recommended for CBOD<sub>5</sub>, ammonia-n, or dissolved oxygen.

TMS is a single discharge model that does not assume instantaneous mixing with the receiving surface water upon discharge, but instead, assigns a partial mixing factor based upon surface water and discharge characteristics. Based on the sampling data provided with the application, the following requirements are proposed:

Pollutants	Mass Limits		Concentration Limits				Governing WQBEL	WQBEL Basis
	AML (lbs/day)	MDL (lbs/day)	AML	MDL	IMAX	Units		
Total Copper <sup>(1)</sup>	0.4	0.63	0.096	0.15	0.24	mg/l	0.096	AFC
Total Zinc <sup>(1)</sup>	3.44	5.37	0.83	1.29	2.06	mg/l	0.83	AFC

<sup>(1)</sup> Discharge concentration ≥ 50% WQBEL

A total residual chlorine evaluation indicates that the existing technology-based limits are protective of the West Branch Susquehanna River.

### Best Professional Judgment (BPJ) Limitations

DEP recommends the existing influent monitoring requirements for BOD5 and TSS and effluent monitoring requirements for dissolved oxygen and ammonia-n remain in the permit to continue to characterize the wastewater.

A quarterly reporting requirement for E. Coli is proposed per the 2017 Triennial Review of Water Quality Standards, published in the PA Bulletin on July 11, 2020.

### Chesapeake Bay

The Phase III Watershed Implementation Plan ("WIP") Wastewater Supplement (revised July 29, 2022) establishes cap loads for the CMA WWTP of 13,698 lbs/yr total nitrogen and 1,826 lbs/yr total phosphorus, which are currently included in the permit. DEP recommends that the cap loads continue to remain in the permit.

### Anti-Backsliding

No limits are proposed to be made less stringent. Anti-backsliding should not impact the permit's development.

### Whole Effluent Toxicity (WET)

For Outfall 001, ☐ Acute ☒ Chronic WET Testing was completed:

- ☐ For the permit renewal application (4 tests).
- ☐ Quarterly throughout the permit term.
- ☐ Quarterly throughout the permit term and a TIE/TRE was conducted.
- ☒ Other: **Annually throughout the permit term.**

The dilution series used for the tests was: 100%, 60%, 30%, 2%, and 1%. The Target Instream Waste Concentration (TIWC) to be used for analysis of the results is: 2%.

### Summary of Four Most Recent Test Results

#### TST Data Analysis

Test Date	Ceriodaphnia Results (Pass/Fail)		Pimephales Results (Pass/Fail)	
	Survival	Reproduction	Survival	Growth
October 2018	PASS	PASS	PASS	PASS
October 2019	PASS	PASS	PASS	PASS
November 2020	PASS	PASS	PASS	PASS
October 2021	PASS	PASS	PASS	PASS

\* A "passing" result is that in which the replicate data for the TIWC is not statistically significant from the control condition. This is exhibited when the calculated *t* value ("T-Test Result") is greater than the critical *t* value. A "failing" result is exhibited when the calculated *t* value ("T-Test Result") is less than the critical *t* value.

Is there reasonable potential for an excursion above water quality standards based on the results of these tests?

☐ YES ☒ NO

### Evaluation of Test Type, IWC and Dilution Series for Renewed Permit

Acute Partial Mix Factor (PMFa): **0.138**

Chronic Partial Mix Factor (PMFc): **0.956**

#### **1. Determine IWC – Acute (IWC<sub>a</sub>):**

$$(Q_d \times 1.547) / ((Q_{7-10} \times PMFa) + (Q_d \times 1.547))$$

$$[(0.5 \text{ MGD} \times 1.547) / ((55.8 \text{ cfs} \times 0.138) + (0.5 \text{ MGD} \times 1.547))] \times 100 = \mathbf{9\%}$$

Is IWCa < 1%? ☐ YES ☒ NO

Type of Test for Permit Renewal: **Chronic**

**2. Determine Target IWCc (If Chronic Tests Required)**

$$(Q_d \times 1.547) / (Q_{7-10} \times PMFc) + (Q_d \times 1.547)$$

$$[(0.5 \text{ MGD} \times 1.547) / ((55.8 \text{ cfs} \times 0.956) + (0.5 \text{ MGD} \times 1.547))] \times 100 = \mathbf{1\%}$$

**3. Determine Dilution Series**

Dilution Series = 100%, 60%, 30%, 2%, and 1%.

**WET Limits**

Has reasonable potential been determined? ☐ YES ☒ NO

Will WET limits be established in the permit? ☐ YES ☒ NO

**Existing Effluent Limitations and Monitoring Requirements**

The existing effluent limitations and monitoring requirements are as follows:

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

Parameter	Effluent Limitations						Monitoring Requirements	
	Mass Units (lbs/day)		Concentrations (mg/L)				Minimum Measurement Frequency	Required Sample Type
	Average Monthly	Weekly Average	Minimum	Average Monthly	Weekly Average	Instant. Maximum		
Flow (MGD)	Report	Report Daily Max	XXX	XXX	XXX	XXX	Continuous	Measured
pH (S.U.)	XXX	XXX	6.0 Inst Min	XXX	XXX	9.0	1/day	Grab
Dissolved Oxygen	XXX	XXX	Report Inst Min	XXX	XXX	XXX	1/day	Grab
Carbonaceous Biochemical Oxygen Demand (CBOD5)	155	250	XXX	25.0	40.0	50	1/week	8-Hr Composite
Biochemical Oxygen Demand (BOD5) Raw Sewage Influent	Report	Report Daily Max	XXX	Report	XXX	XXX	1/week	8-Hr Composite
Total Suspended Solids Raw Sewage Influent	Report	Report Daily Max	XXX	Report	XXX	XXX	1/week	8-Hr Composite
Total Suspended Solids	185	280	XXX	30.0	45.0	60	1/week	8-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
Ammonia-Nitrogen	Report	XXX	XXX	Report	XXX	XXX	2/week	8-Hr Composite
Zinc, Total	Report Semi Avg	XXX	XXX	Report Semi Avg	XXX	XXX	1/6 months	8-Hr Composite

Compliance Sampling Location: Outfall 001

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

Parameter	Effluent Limitations						Monitoring Requirements	
	Mass Units (lbs)		Concentrations (mg/L)				Minimum Measurement Frequency	Required Sample Type
	Monthly	Annual	Monthly	Monthly Average	Maximum	Instant. Maximum		
Ammonia--N	Report	Report	XXX	Report	XXX	XXX	2/week	8-Hr Composite
Kjeldahl--N	Report	XXX	XXX	Report	XXX	XXX	2/week	8-Hr Composite
Nitrate-Nitrite as N	Report	XXX	XXX	Report	XXX	XXX	2/week	8-Hr Composite
Total Nitrogen	Report	Report	XXX	Report	XXX	XXX	1/month	Calculation
Total Phosphorus	Report	Report	XXX	Report	XXX	XXX	2/week	8-Hr Composite
Net Total Nitrogen	Report	13698	XXX	XXX	XXX	XXX	1/month	Calculation
Net Total Phosphorus	Report	1826	XXX	XXX	XXX	XXX	1/month	Calculation

Compliance Sampling Location: Outfall 001



**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" (362-0400-001), SOPs and/or BPJ.

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

Parameter	Effluent Limitations						Monitoring Requirements	
	Mass Units (lbs/day)		Concentrations (mg/L)				Minimum Measurement Frequency	Required Sample Type
	Average Monthly	Weekly Average	Minimum	Average Monthly	Weekly Average	Instant. Maximum		
Flow (MGD)	Report	Report Daily Max	XXX	XXX	XXX	XXX	Continuous	Measured
pH (S.U.)	XXX	XXX	6.0 Inst Min	XXX	XXX	9.0	1/day	Grab
Dissolved Oxygen	XXX	XXX	Report Inst Min	XXX	XXX	XXX	1/day	Grab
Total Residual Chlorine (TRC)	XXX	XXX	XXX	0.5	XXX	1.6	1/day	Grab
Carbonaceous Biochemical Oxygen Demand (CBOD5)	104	167	XXX	25.0	40.0	50	1/week	8-Hr Composite
Biochemical Oxygen Demand (BOD5) Raw Sewage Influent	Report	Report Daily Max	XXX	Report	XXX	XXX	1/week	8-Hr Composite
Total Suspended Solids	125	188	XXX	30.0	45.0	60	1/week	8-Hr Composite
Total Suspended Solids Raw Sewage Influent	Report	Report Daily Max	XXX	Report	XXX	XXX	1/week	8-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
E. Coli (No./100 ml)	XXX	XXX	XXX	XXX	XXX	Report	1/quarter	Grab
Ammonia-Nitrogen	Report	XXX	XXX	Report	XXX	XXX	2/week	8-Hr Composite
Total Phosphorus	Report	XXX	XXX	Report	XXX	XXX	2/week	8-Hr Composite

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

Parameter	Effluent Limitations						Monitoring Requirements	
	Mass Units (lbs/day)		Concentrations (mg/L)				Minimum Measurement Frequency	Required Sample Type
	Average Monthly	Weekly Average	Minimum	Average Monthly	Weekly Average	Instant. Maximum		
Copper, Total	0.4	0.63 Daily Max	XXX	0.096	0.15 Daily Max	0.24	1/week	8-Hr Composite
Zinc, Total	3.44	5.37 Daily Max	XXX	0.83	1.29 Daily Max	2.06	1/week	8-Hr Composite

Compliance Sampling Location: Outfall 001

The limitations and monitoring requirements specified below are proposed for the draft permit, to comply with Pennsylvania's Chesapeake Bay Tributary Strategy.

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

Parameter	Effluent Limitations						Monitoring Requirements	
	Mass Units (lbs/day)		Concentrations (mg/L)				Minimum Measurement Frequency	Required Sample Type
	Monthly	Annual	Monthly	Monthly Average	Maximum	Instant. Maximum		
Ammonia--N	Report	Report	XXX	Report	XXX	XXX	2/week	8-Hr Composite
Kjeldahl--N	Report	XXX	XXX	Report	XXX	XXX	2/week	8-Hr Composite
Nitrate-Nitrite as N	Report	XXX	XXX	Report	XXX	XXX	2/week	8-Hr Composite
Total Nitrogen	Report	Report	XXX	Report	XXX	XXX	1/month	Calculation
Total Phosphorus	Report	Report	XXX	Report	XXX	XXX	2/week	8-Hr Composite
Net Total Nitrogen	XXX	13698	XXX	XXX	XXX	XXX	1/year	Calculation
Net Total Phosphorus	XXX	1826	XXX	XXX	XXX	XXX	1/year	Calculation

Compliance Sampling Location: Outfall 001

# StreamStats Output Report

State/Region ID	PA	
Workspace ID	PA20231018164135335000	
Latitude		40.97682
Longitude		-78.51489
Time		10/18/2023 12:42:03 PM

## Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLOPD	Mean basin slope measured in degrees	7.8299	degrees
BSLOPDRAW	Unadjusted basin slope, in degrees	8.0512	degrees
BSLPDRPA20	Unadjusted basin slope, in degrees, from PA v1	8.1837	degrees
CARBON	Percentage of area of carbonate rock	0	percent
CENTROXA83	X coordinate of the centroid, in NAD_1983_Albers, meters	-59552.057	meters
CENTROYA83	Basin centroid horizontal (y) location in NAD 1983 Albers	202533.0115	meters
DRN	Drainage quality index from STATSGO	3.6	dimensionless
DRNAREA	Area that drains to a point on a stream	446	square miles
ELEV	Mean Basin Elevation	1727	feet
ELEVMAX	Maximum basin elevation	2388	feet
FOREST	Percentage of area covered by forest	78.8119	percent
GLACIATED	Percentage of basin area that was historically covered by glaciers	0	percent
IMPNLCD01	Percentage of impervious area determined from NLCD 2001 impervious dataset	0.6695	percent
LC01DEV	Percentage of land-use from NLCD 2001 classes 21-24	7.4756	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	7.5492	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	0.6625	percent
LONG_OUT	Longitude of Basin Outlet	-78.514871	degrees
MAXTEMP	Mean annual maximum air temperature over basin area from PRISM 1971-2000 800-m grid	57.2	degrees F
OUTLETXA83	X coordinate of the outlet, in NAD_1983_Albers, meters	-43327.1541	meters
OUTLETYA83	Y coordinate of the outlet, in NAD_1983_Albers, meters	219612.6522	meters
PRECIP	Mean Annual Precipitation	44	inches
ROCKDEP	Depth to rock	4.5	feet
STORAGE	Percentage of area of storage (lakes ponds reservoirs wetlands)	0.65	percent
STRDEN	Stream Density -- total length of streams divided by drainage area	1.9	miles per square mile
STRMTOT	total length of all mapped streams (1:24,000-scale) in the basin	846.7	miles
URBAN	Percentage of basin with urban development	1.7828	percent

Application Version: 4.17.0  
StreamStats Services Version: 1.2.22  
NSS Services Version: 2.2.1

Prepared in cooperation with the Pennsylvania Department of Environmental Protection

## **Selected Streamflow Statistics for Streamgauge Locations in and near Pennsylvania**



Open-File Report 2011-1070

**Table 1.** List of U.S. Geological Survey streamgage locations in and near Pennsylvania with updated streamflow statistics.—Continued[Latitude and Longitude in decimal degrees; mi<sup>2</sup>, square miles]

Streamgage number	Streamgage name	Latitude	Longitude	Drainage area (mi <sup>2</sup> )	Regulated <sup>1</sup>
01508803	West Branch Tioughnioga River at Homer, N.Y.	42.638	-76.176	71.5	N
01509000	Tioughnioga River at Cortland, N.Y.	42.603	-76.159	292	N
01510000	Otselic River at Cincinnatus, N.Y.	42.541	-75.900	147	N
01512500	Chenango River near Chenango Forks, N.Y.	42.218	-75.848	1,483	N
01515000	Susquehanna River near Waverly, N.Y.	41.985	-76.501	4,773	N
01516350	Tioga River near Mansfield, Pa.	41.797	-77.080	153	N
01516500	Corey Creek near Mainesburg, Pa.	41.791	-77.015	12.2	N
01518000	Tioga River at Tioga, Pa.	41.908	-77.129	282	Y
01518700	Tioga River at Tioga Junction, Pa.	41.953	-77.115	446	Y
01518862	Cowanesque River at Westfield, Pa.	41.923	-77.532	90.6	N
01520000	Cowanesque River near Lawrenceville, Pa.	41.997	-77.140	298	Y
01520500	Tioga River at Lindley, N.Y.	42.029	-77.132	771	Y
01521500	Canisteo River at Arkport, N.Y.	42.396	-77.711	30.6	Y
01523500	Canacadea Creek near Hornell, N.Y.	42.335	-77.683	57.9	Y
01524500	Canisteo River below Canacadea Creek at Hornell, N.Y.	42.314	-77.651	158	Y
01526500	Tioga River near Erwins, N.Y.	42.121	-77.129	1,377	Y
01527000	Cohocton River at Cohocton, N.Y.	42.500	-77.500	52.2	N
01527500	Cohocton River at Avoca, N.Y.	42.398	-77.417	152	N
01528000	Fivemile Creek near Kanona, N.Y.	42.388	-77.358	66.8	N
01529000	Mud Creek near Savona, N.Y.	42.308	-77.197	76.6	Y
01529500	Cohocton River near Campbell, N.Y.	42.253	-77.217	470	N
01529950	Chemung River at Corning, N.Y.	42.146	-77.057	2,006	Y
01530332	Chemung River at Elmira, N.Y.	42.086	-76.801	2,162	Y
01530500	Newtown Creek at Elmira, N.Y.	42.105	-76.798	77.5	Y
01531000	Chemung River at Chemung, N.Y.	42.002	-76.635	2,506	Y
01531500	Susquehanna River at Towanda, Pa.	41.765	-76.441	7,797	Y
01532000	Towanda Creek near Monroeton, Pa.	41.707	-76.485	215	N
01532850	MB Wyalusing Creek near Birchardville, Pa.	41.863	-76.007	5.67	N
01533400	Susquehanna River at Meshoppen, Pa.	41.607	-76.050	8,720	Y
01533500	North Branch Mehoopany Creek near Lovelton, Pa.	41.531	-76.156	35.2	N
01533950	SB Tunkhannock Creek near Montdale, Pa.	41.575	-75.642	12.6	N
01534000	Tunkhannock Creek near Tunkhannock, Pa.	41.558	-75.895	383	N
01534300	Lackawanna River near Forest City, Pa.	41.680	-75.472	38.8	Y
01534500	Lackawanna River at Archbald, Pa.	41.505	-75.542	108	Y
01536000	Lackawanna River at Old Forge, Pa.	41.359	-75.744	332	Y
01536500	Susquehanna River at Wilkes-Barre, Pa.	41.251	-75.881	9,960	Y
01537000	Toby Creek at Luzerne, Pa.	41.281	-75.896	32.4	Y
01537500	Solomon Creek at Wilkes-Barre, Pa.	41.228	-75.904	15.7	N
01538000	Wapwallopen Creek near Wapwallopen, Pa.	41.059	-76.094	43.8	N
01539000	Fishing Creek near Bloomsburg, Pa.	41.078	-76.431	274	N
01539500	Little Fishing Creek at Eysers Grove, Pa.	41.080	-76.511	56.5	N
01540200	Trexler Run near Ringtown, Pa.	40.853	-76.280	1.77	N
01540500	Susquehanna River at Danville, Pa.	40.958	-76.619	11,220	Y
01541000	West Branch Susquehanna River at Bower, Pa.	40.897	-78.677	315	N
01541200	West Branch Susquehanna River near Curwensville, Pa.	40.961	-78.519	367	Y

DFLOW Results

All available data from Apr 1, 2001 through Mar 31, 2021 are included in analysis.

Gage	Period	Days in Record	Zero/Missing	1B3	Percentile	Excur per 3 yr	1Q10	Percentile	Excur per 3 yr	1Qy Type	xQy	Percentile	Harmonic	Percentile
01541200 - WB Susquehanna River near Curwensville, PA	2000/04/01 - 2021/04/01	7,670	0/0	40.9	0.17%	1	41.1	0.20%	0.71	1Q11	30.3	0.00%	2.50E+02	31.63%
Gage	Period	Days in Record	Zero/Missing	1B3	Percentile	Excur per 3 yr	7Q10	Percentile	Excur per 3 yr	7Qy Type	xQy	Percentile	Harmonic	Percentile
01541200 - WB Susquehanna River near Curwensville, PA	2000/04/01 - 2021/04/01	7,670	0/0	40.9	0.17%	1	45.9	0.37%	1.43	7Q11	37.6	0.07%	2.50E+02	31.63%
Gage	Period	Days in Record	Zero/Missing	1B3	Percentile	Excur per 3 yr	30Q10	Percentile	Excur per 3 yr	30Qy Type	xQy	Percentile	Harmonic	Percentile
01541200 - WB Susquehanna River near Curwensville, PA	2000/04/01 - 2021/04/01	7,670	0/0	40.9	0.17%	1	59.3	1.66%	5.57	> 21 years	N/A	N/A	2.50E+02	31.63%

### Low-Flow (Q<sub>7-10</sub>) Calculation

Facility: **Curwensville Municipal Authority WWTP**

NPDES Permit No. **PA0024759**

#### Gage Information

Drainage Area: **367** mi<sup>2</sup>

Q<sub>7-10</sub>: **45.9** cfs

LFY: **0.125** cfs/m

#### Outfall Information

Drainage Area: **446** mi<sup>2</sup>

Q<sub>7-10</sub>: **55.8** cfs

#### Downstream Locations

RMI: **180.1**

Drainage Area: **451** mi<sup>2</sup>

Q<sub>7-10</sub>: **56.41** cfs

RMI:

Drainage Area:

Q<sub>7-10</sub>: cfs

RMI:

Drainage Area:

Q<sub>7-10</sub>: cfs

RMI:

Drainage Area:

Q<sub>7-10</sub>: cfs

RMI:

Drainage Area:

Q<sub>7-10</sub>: cfs

RMI:

Drainage Area:

Q<sub>7-10</sub>: cfs

RMI:

Drainage Area:

Q<sub>7-10</sub>: cfs

RMI:

Drainage Area:

Q<sub>7-10</sub>: cfs



## 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
	10D	18668	WEST BRANCH SUSQUEHANNA RI	<b>181.860</b>	1122.00	446.00	0.00000	0.00	<input checked="" type="checkbox"/>

Stream Data												
Design Cond.	LFY	Trib Flow	Stream Flow	Rch Trav Time (days)	Rch Velocity (fps)	WD Ratio	Rch Width (ft)	Rch Depth (ft)	Tributary Temp (°C)	pH	Stream Temp (°C)	pH
	(cfsm)	(cfs)	(cfs)									
<b>Q7-10</b>	0.125	0.00	0.00	0.000	0.000	0.0	0.00	0.00	25.00	7.00	0.00	0.00
<b>Q1-10</b>		0.00	0.00	0.000	0.000							
<b>Q30-10</b>		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
CMA WWTP	PA0024579	0.5000	0.5000	0.5000	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

## 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
	10D	18668	WEST BRANCH SUSQUEHANNA RI	<b>180.100</b>	1116.00	451.00	0.00000	0.00	<input checked="" type="checkbox"/>

Stream Data												
Design Cond.	LFY	Trib Flow	Stream Flow	Rch Trav Time (days)	Rch Velocity (fps)	WD Ratio	Rch Width (ft)	Rch Depth (ft)	Tributary Temp (°C)	pH	Stream Temp (°C)	pH
	(cfsm)	(cfs)	(cfs)									
<b>Q7-10</b>	0.125	0.00	0.00	0.000	0.000	0.0	0.00	0.00	25.00	7.00	0.00	0.00
<b>Q1-10</b>		0.00	0.00	0.000	0.000							
<b>Q30-10</b>		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
		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

<u>SWP Basin</u>		<u>Stream Code</u>				<u>Stream Name</u>						
10D		18668				WEST BRANCH SUSQUEHANNA RIVER						
RMI	Stream Flow	PWS With	Net Stream Flow	Disc Analysis Flow	Reach Slope	Depth	Width	W/D Ratio	Velocity	Reach Trav Time	Analysis Temp	Analysis pH
	(cfs)	(cfs)	(cfs)	(cfs)	(ft/ft)	(ft)	(ft)		(fps)	(days)	(°C)	
<b>Q7-10 Flow</b>												
181.860	55.75	0.00	55.75	.7735	0.00065	1.022	124.62	121.89	0.44	0.242	25.00	7.00
<b>Q1-10 Flow</b>												
181.860	50.17	0.00	50.17	.7735	0.00065	NA	NA	NA	0.42	0.257	25.00	7.00
<b>Q30-10 Flow</b>												
181.860	71.92	0.00	71.92	.7735	0.00065	NA	NA	NA	0.51	0.211	25.00	7.00

## **WQM 7.0 Modeling Specifications**

Parameters	Both	Use Inputted Q1-10 and Q30-10 Flows	<input checked="" type="checkbox"/>
WLA Method	EMPR	Use Inputted W/D Ratio	<input type="checkbox"/>
Q1-10/Q7-10 Ratio	0.9	Use Inputted Reach Travel Times	<input type="checkbox"/>
Q30-10/Q7-10 Ratio	1.29	Temperature Adjust Kr	<input checked="" type="checkbox"/>
D.O. Saturation	90.00%	Use Balanced Technology	<input checked="" type="checkbox"/>
D.O. Goal	5		

## WQM 7.0 Wasteload Allocations

<u>SWP Basin</u>	<u>Stream Code</u>	<u>Stream Name</u>
10D	18668	WEST BRANCH SUSQUEHANNA RIVER

### 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
181.860	CMA WWTP	11.07	50	11.07	50	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
181.860	CMA WWTP	1.37	25	1.37	25	0	0

### Dissolved Oxygen Allocations

RMI	Discharge Name	<u>CBOD5</u>		<u>NH3-N</u>		<u>Dissolved Oxygen</u>		Critical Reach	Percent Reduction
		Baseline (mg/L)	Multiple (mg/L)	Baseline (mg/L)	Multiple (mg/L)	Baseline (mg/L)	Multiple (mg/L)		
181.86	CMA WWTP	25	25	25	25	3	3	0	0

## WQM 7.0 D.O.Simulation

<u>SWP Basin</u>	<u>Stream Code</u>	<u>Stream Name</u>		
10D	18668	WEST BRANCH SUSQUEHANNA RIVER		
<u>RMI</u>	<u>Total Discharge Flow (mgd)</u>	<u>Analysis Temperature (°C)</u>	<u>Analysis pH</u>	
181.860	0.500	25.000	7.000	
<u>Reach Width (ft)</u>	<u>Reach Depth (ft)</u>	<u>Reach WDRatio</u>	<u>Reach Velocity (fps)</u>	
124.620	1.022	121.890	0.444	
<u>Reach CBOD5 (mg/L)</u>	<u>Reach Kc (1/days)</u>	<u>Reach NH3-N (mg/L)</u>	<u>Reach Kn (1/days)</u>	
2.31	0.183	0.34	1.029	
<u>Reach DO (mg/L)</u>	<u>Reach Kr (1/days)</u>	<u>Kr Equation</u>	<u>Reach DO Goal (mg/L)</u>	
8.171	1.504	Tsivoglou	5	
<u>Reach Travel Time (days)</u>	<b>Subreach Results</b>			
0.242	TravTime (days)	CBOD5 (mg/L)	NH3-N (mg/L)	D.O. (mg/L)
	0.024	2.30	0.33	7.54
	0.048	2.29	0.33	7.54
	0.073	2.28	0.32	7.54
	0.097	2.26	0.31	7.54
	0.121	2.25	0.30	7.54
	0.145	2.24	0.29	7.54
	0.170	2.23	0.29	7.54
	0.194	2.21	0.28	7.54
	0.218	2.20	0.27	7.54
	0.242	2.19	0.27	7.54

# WQM 7.0 Effluent Limits

<u>SWP Basin</u>		<u>Stream Code</u>		<u>Stream Name</u>			
10D		18668		WEST BRANCH SUSQUEHANNA RIVER			
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)
181.860	CMA WWTP	PA0024579	0.500	CBOD5	25		
				NH3-N	25	50	
				Dissolved Oxygen			3

## Discharge Information

Instructions

Discharge

Stream

Facility: **Curwensville Municipal Authority WWTP**

NPDES Permit No.: **PA0024759**

Outfall No.: **001**

Evaluation Type: **Custom / Additives**

Wastewater Description: **Sewage**

Discharge Characteristics								
Design Flow (MGD)*	Hardness (mg/l)*	pH (SU)*	Partial Mix Factors (PMFs)				Complete Mix Times (min)	
			AFC	CFC	THH	CRL	Q <sub>7-10</sub>	Q <sub>h</sub>
0.5	77	7						

Discharge Pollutant	Units	Max Discharge Conc	0 if left blank		0.5 if left blank		0 if left blank			1 if left blank	
			Trib Conc	Stream Conc	Daily CV	Hourly CV	Stream CV	Fate Coeff	FOS	Criteria Mod	Chem Transl
Total Dissolved Solids (PWS)	mg/L	310									
Chloride (PWS)	mg/L	210									
Bromide	mg/L	< 0.362									
Sulfate (PWS)	mg/L	27									
Total Copper	µg/L	7.88									
Total Lead	µg/L	< 1.43									
Total Zinc	µg/L	66.4									
Total Aluminum	µg/L	180									
Total Phenols (Phenolics) (PWS)	µg/L	62									



## Stream / Surface Water Information

Curwensville Municipal Authority WWTP, NPDES Permit No. PA0024759, Outfall 001

Instructions Discharge **Stream**

Receiving Surface Water Name: **West Branch Susquehanna River**

No. Reaches to Model: **1**

- ☒ Statewide Criteria  
☐ Great Lakes Criteria  
☐ ORSANCO Criteria

Location	Stream Code*	RMI*	Elevation (ft)*	DA (mi <sup>2</sup> )*	Slope (ft/ft)	PWS Withdrawal (MGD)	Apply Fish Criteria*
Point of Discharge	018668	181.86	1122	446			Yes
End of Reach 1	018668	180.1	1116	451			Yes

**Q<sub>7-10</sub>**

Location	RMI	LFY (cfs/mi <sup>2</sup> )*	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	181.86	0.125										100	7		
End of Reach 1	180.1	0.125													

**Q<sub>h</sub>**

Location	RMI	LFY (cfs/mi <sup>2</sup> )*	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	181.86														
End of Reach 1	180.1														

## Model Results

Curwensville Municipal Authority WWTP, NPDES Permit No. PA0024759, Outfall 001

Instructions

Results

RETURN TO INPUTS

SAVE AS PDF

PRINT

☒ All

☐ Inputs

☐ Results

☐ Limits

☒ **Hydrodynamics**

**Q<sub>7-10</sub>**

RMI	Stream Flow (cfs)	PWS Withdrawal (cfs)	Net Stream Flow (cfs)	Discharge Analysis Flow (cfs)	Slope (ft/ft)	Depth (ft)	Width (ft)	W/D Ratio	Velocity (fps)	Travel Time (days)	Complete Mix Time (min)
181.86	55.75		55.75	0.774	0.00065	1.022	124.62	121.89	0.444	0.242	788.324
180.1	56.38		56.375								

**Q<sub>h</sub>**

RMI	Stream Flow (cfs)	PWS Withdrawal (cfs)	Net Stream Flow (cfs)	Discharge Analysis Flow (cfs)	Slope (ft/ft)	Depth (ft)	Width (ft)	W/D Ratio	Velocity (fps)	Travel Time (days)	Complete Mix Time (min)
181.86	249.58		249.58	0.774	0.00065	1.968	124.62	63.327	1.021	0.105	301.587
180.1	252.022		252.02								

☒ **Wasteload Allocations**

☒ **AFC**

CCT (min): 15

PMF: 0.138

Analysis Hardness (mg/l): 97.898

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	13.173	13.7	150	Chem Translator of 0.96 applied
Total Lead	0	0		0	63.104	79.5	870	Chem Translator of 0.794 applied
Total Zinc	0	0		0	115.090	118	1,288	Chem Translator of 0.978 applied
Total Aluminum	0	0		0	750	750	8,207	
Total Phenols (Phenolics) (PWS)	0	0		0	N/A	N/A	N/A	

☒ **CFC**

CCT (min): 720

PMF: 0.956

Analysis Hardness (mg/l): 99.671

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	8.931	9.3	650	Chem Translator of 0.96 applied
Total Lead	0	0		0	2.508	3.17	221	Chem Translator of 0.791 applied
Total Zinc	0	0		0	117.809	119	8,350	Chem Translator of 0.986 applied
Total Aluminum	0	0		0	N/A	N/A	N/A	
Total Phenols (Phenolics) (PWS)	0	0		0	N/A	N/A	N/A	

☒ **THH**

CCT (min): 720

PMF: 0.956

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 Zinc	0	0		0	N/A	N/A	N/A	
Total Aluminum	0	0		0	N/A	N/A	N/A	
Total Phenols (Phenolics) (PWS)	0	0		0	5	5.0	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 Zinc	0	0		0	N/A	N/A	N/A	
Total Aluminum	0	0		0	N/A	N/A	N/A	
Total Phenols (Phenolics) (PWS)	0	0		0	N/A	N/A	N/A	

☒ **Recommended WQBELs & Monitoring Requirements**

No. Samples/Month: 4

Pollutants	Mass Limits		Concentration Limits				Governing WQBEL	WQBEL Basis	Comments
	AML (lbs/day)	MDL (lbs/day)	AML	MDL	IMAX	Units			
Total Copper	0.4	0.63	0.096	0.15	0.24	mg/L	0.096	AFC	Discharge Conc ≥ 50% WQBEL (RP)
Total Zinc	3.44	5.37	0.83	1.29	2.06	mg/L	0.83	AFC	Discharge Conc ≥ 50% WQBEL (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.,  $\leq$  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	221	$\mu\text{g/L}$	Discharge Conc $\leq$ 10% WQBEL
Total Aluminum	5,260	$\mu\text{g/L}$	Discharge Conc $\leq$ 10% WQBEL
Total Phenols (Phenolics) (PWS)	N/A	N/A	PWS Not Applicable

1A	B	C	D	E	F	G
2	<b>TRC EVALUATION</b>					
3	Input appropriate values in B4:B8 and E4:E7					
4	55.8	= Q stream (cfs)		0.5	= CV Daily	
5	0.5	= Q discharge (MGD)		0.5	= CV Hourly	
6	30	= no. samples		0.138	= AFC_Partial Mix Factor	
7	0.3	= Chlorine Demand of Stream		0.956	= CFC_Partial Mix Factor	
8	0	= Chlorine Demand of Discharge		15	= AFC_Criteria Compliance Time (min)	
9	0.5	= BAT/BPJ Value		720	= CFC_Criteria Compliance Time (min)	
	0	= % Factor of Safety (FOS)		0	=Decay Coefficient (K)	
10	Source	Reference	AFC Calculations	Reference	CFC Calculations	
11	TRC	1.3.2.iii	WLA afc = 3.195	1.3.2.iii	WLA cfc = 21.459	
12	PENTOXSD TRG	5.1a	LTAMULT afc = 0.373	5.1c	LTAMULT cfc = 0.581	
13	PENTOXSD TRG	5.1b	LTA_afc= 1.190	5.1d	LTA_cfc = 12.475	
14						
15	Source	Effluent Limit Calculations				
16	PENTOXSD TRG	5.1f	AML MULT = 1.231			
17	PENTOXSD TRG	5.1g	AVG MON LIMIT (mg/l) = 0.500		BAT/BPJ	
18			INST MAX LIMIT (mg/l) = 1.635			
	<div> <div>WLA afc</div> <div><math>(.019/e(-k \cdot AFC_{tc})) + [(AFC_{Yc} \cdot Qs \cdot .019 / Qd \cdot e(-k \cdot AFC_{tc})) \dots + Xd + (AFC_{Yc} \cdot Qs \cdot Xs / Qd)] \cdot (1 - FOS / 100)</math></div> </div> <div> <div>LTAMULT afc</div> <div><math>EXP((0.5 \cdot LN(cvh^2 + 1)) - 2.326 \cdot LN(cvh^2 + 1)^{0.5})</math></div> </div> <div> <div>LTA_afc</div> <div><math>wla\_afc \cdot LTAMULT\_afc</math></div> </div> <div> <div>WLA_cfc</div> <div><math>(.011/e(-k \cdot CFC_{tc})) + [(CFC_{Yc} \cdot Qs \cdot .011 / Qd \cdot e(-k \cdot CFC_{tc})) \dots + Xd + (CFC_{Yc} \cdot Qs \cdot Xs / Qd)] \cdot (1 - FOS / 100)</math></div> </div> <div> <div>LTAMULT_cfc</div> <div><math>EXP((0.5 \cdot LN(cvd^2 / no\_samples + 1)) - 2.326 \cdot LN(cvd^2 / no\_samples + 1)^{0.5})</math></div> </div> <div> <div>LTA_cfc</div> <div><math>wla\_cfc \cdot LTAMULT\_cfc</math></div> </div> <div> <div>AML MULT</div> <div><math>EXP(2.326 \cdot LN((cvd^2 / no\_samples + 1)^{0.5}) - 0.5 \cdot LN(cvd^2 / no\_samples + 1))</math></div> </div> <div> <div>AVG MON LIMIT</div> <div><math>MIN(BAT\_BPJ, MIN(LTA\_afc, LTA\_cfc) \cdot AML\_MULT)</math></div> </div> <div> <div>INST MAX LIMIT</div> <div><math>1.5 \cdot ((av\_mon\_limit / AML\_MULT) / LTAMULT\_afc)</math></div> </div>					