City of Wooster

Water Resource and Recovery Facility

Technical Justification For Revising Local Industrial User Limits

September 29, 2020

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City of Wooster
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CITY OF WOOSTER
1123 Old Columbus Road
Wooster, Ohio 44691-4618

September 29, 2020

Phoebe Low
Ohio EPA - Division of Surface Water
Pretreatment Program
P.O. Box 1049
Columbus, Ohio 43216-1049

Subject: City of Wooster WRRF Pretreatment Program Modification Request
Ohio EPA Permit No. 3PD00013*RD

Dear Phoebe Low,

On behalf of the City of Wooster and the Water Resource Recovery Facility (WRRF), please find enclosed two copies of the Technical Justification for Revised Local Industrial User Limits required in Part I, C - Schedule of Compliance, Municipal Pretreatment Schedule.

The Domestic/Commercial background sampling which was performed at two representative locations in the collection system for seven consecutive days for the period of October 28, 2019 to November 3, 2019 is shown in Section 1 of the technical justification. In many cases the background sampling and analyses showed concentrations for certain parameters which were below detection limits. A value of one half of the detectable limit was therefore assigned when these instances occurred. When averaging the background sampling results, the 11/1/19 North site sample for Cr6+ (260 ug/L) was not included in the calculations as it was clearly an outlier. There were no industrial contributions at either sampling

location. We suspect lab error for the outlier. On the same day the Miller Rd. sampling had a higher result as well compared to the other days.

Section 5 includes a spreadsheet showing quarterly raw and final WRRF plant sampling and effluent flow data for 2018 and 2019 which was used in this evaluation as a check of overall plant pollutant removal efficiencies. In some cases the raw and/or final plant sampling data showed concentrations below detection limits that prevented the calculation of meaningful specific removal efficiencies. Textbook treatment removal efficiency data, which is commonly used for technical justifications when actual efficiency data is not available, was therefore used and is shown in Section 5 of the technical justification.

The spreadsheet calculations of local limits required to meet water quality standards, to prevent inhibition of activated sludge, nitrification, and anaerobic digestion, and to meet 503 sludge regulations are shown in Section 3. A tabular comparison of these results with the most stringent limit being selected as the recommended local limit is also shown in this section alongside the city's current limits for purposes of comparison.

The Industrial User flows in gallons per day was used to determine the IU total plant discharge (Qind) which is used in the various spreadsheet calculations, these are shown in Section 2. If an industry had no detectable discharge of a parameter during the period of 2017-2019, their flow was not included in the total daily flow for that parameter.

Additional supporting data used in the technical justification may be found in Section 5.

If you have any questions or require any additional information, please contact Adam Wilford at 330-201-1212 or Steve Carathers at 330-464-6387.

Sincerely,

Adam Wilford
City of Wooster
Industrial Pretreatment Coordinator

OhioEPA

Pretreatment Program
Modification Request

Approved Program Information		
Date of Request: September 29, 2020		
Sewer Authority Name: City of Wooster - Water Resource Recovery Facility		
Contact Name and Title Name: Adam Wilford		Title: Industrial Pretreatment Coordinator
Mailing Address: 1123 Old Columbus Rd.		
City: Wooster	State: Ohio	Zip: 44691
Phone: (330) 201 - 1212	Fax: (330) 263 - 5291	E-mail: awilford@woosteroh.com

Brief Description of Modification Request:

Local Limits Revisions for Industrial discharges (Technical Justification)

Briefly Describe Reason(s) Why Modification Is Necessary:

NPDES permit requirement – 3PD00013*RD (Page 16)
Part I, C – Schedule of Compliance
A. Municipal Pretreatment Schedule

Signature: Adam Wilford

Title: Industrial Pretreatment Coordinator Date: 9/29/20

Attach to this cover sheet in duplicate an official copy of the proposed modification request describing the request in detail with appropriate justification. Include any technical and supporting documents that might be necessary for Ohio EPA review.

Mail completed requests to:
Ohio EPA, DSW
Pretreatment Unit
PO Box 1049
Columbus, OH 43216-1049

For office use only	S	N

City of Wooster WRRF

Background Sampling			Location			North (Certified Angus Beef manhole)						=	1/2 Detection Limit		
	Date	As (ug/L)	Ag (ug/L)	Cd (ug/L)	Cr (ug/L)	Cr6+ (ug/L)	Cu (ug/L)	Ni (ug/L)	Pb (ug/L)	Se (ug/L)	Zn (ug/L)	CN (ug/L)	LLHg (ug/L)	TSS (mg/L)	COD (mg/L)
Oct 2019	28	3.70	2.50	0.25	5.00	6.50	26.00	5.00	2.10	2.50	100.00	2.50	0.486	266	1150
	29	1.50	2.50	0.25	5.00	2.00	23.00	5.00	1.00	2.50	130.00	2.50	0.019	200	1004
	30	1.50	2.50	0.25	5.00	2.00	24.00	5.00	1.00	2.50	270.00	2.50	0.018	388	1512
	31	1.50	2.50	0.25	5.00	2.00	25.00	5.00	1.00	2.50	110.00	2.50	0.053	200	799
Nov 2019	1	1.50	2.50	0.25	5.00	260.00	26.00	5.00	1.00	2.50	110.00	2.50	0.193	266	1011
	2	1.50	2.50	0.25	5.00	7.80	100.00	5.00	4.00	2.50	130.00	2.50	0.018	660	1589
	3	1.50	2.50	0.25	5.00	5.30	26.00	5.00	1.00	2.50	91.00	2.50	0.029	248	1402
AVG		**1.81**	**2.50**	**0.25**	**5.00**	**40.80**	**35.71**	**5.00**	**1.59**	**2.50**	**134.43**	**2.50**	**0.117**	**318**	**1210**

Background Sampling			Location			Miller Rd (manhole before Christmas Run)						=	1/2 Detection Limit		
	Date	As (ug/L)	Ag (ug/L)	Cd (ug/L)	Cr (ug/L)	Cr6+ (ug/L)	Cu (ug/L)	Ni (ug/L)	Pb (ug/L)	Se (ug/L)	Zn (ug/L)	CN (ug/L)	LLHg (ug/L)	TSS (mg/L)	COD (mg/L)
Oct 2019	28	3.00	2.50	0.25	5.00	8.00	67.00	5.00	3.20	2.50	140.00	2.50	0.032	396	691
	29	1.50	2.50	0.25	5.00	2.00	92.00	5.00	4.20	2.50	290.00	2.50	0.014	412	837
	30	3.30	2.50	0.25	5.00	2.00	78.00	5.00	5.40	2.50	210.00	2.50	0.032	368	472
	31	3.20	2.50	0.25	5.00	2.00	54.00	5.00	3.90	2.50	97.00	2.50	0.033	148	279
Nov 2019	1	1.50	2.50	0.25	5.00	18.00	33.00	5.00	1.00	2.50	70.00	2.50	0.011	126	302
	2	3.30	2.50	0.25	5.00	5.30	46.00	5.00	2.40	2.50	71.00	2.50	0.018	142	320
	3	1.50	2.50	0.25	5.00	2.00	53.00	19.00	1.00	2.50	100.00	2.50	0.019	204	400
AVG		**2.47**	**2.50**	**0.25**	**5.00**	**5.61**	**60.43**	**7.00**	**3.01**	**2.50**	**139.71**	**2.50**	**0.02**	**257**	**472**
14 SAMPLE AVERAGE		**2.14**	**2.50**	**0.25**	**5.00**	**23.21**	**48.07**	**6.00**	**2.30**	**2.50**	**137.07**	**2.500**	**0.07**	**287**	**841**

Industrial Flows (2017-19)			*Metals Contributions (2017-19)*											
Industry	Flow gpd	Flow MGD	As	Cd	CN	Cr6+	Cr	Cu	Pb	Hg	Ni	Se	Zn	Ag
Akron Brass	1,785	0.002						1,785	1,785				1,785	
Arti Flex	13,905	0.014	13,905	13,905	13,905	13,905	13,905	13,905	13,905	13,905	13,905	13,905	13,905	13,905
Buckeye Container	2,368	0.002	2,368	2,368	2,368	2368	2,368	2,368	2,368	2,368		2,368	2,368	
CNC	3,000	0.003		3,000	3,000		3,000	3,000	3,000		3,000		3,000	
Daisy	154,566	0.155									154,566		154,566	
Enviro Clean	10,537	0.011	10,537	10,537	10,537	10,537	10,537	10,537	10,537	10,537	10,537	10,537	10,537	10,537
G&S Bar & Wire	1,500	0.002	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Luk Inc.	39,022	0.039						39,022		39,022			39,022	
Frito	399,190	0.399	399,190											
GOJO	8,080	0.008	8,080					8,080	8,080	8,080			8,080	
International Paper	6,143	0.006	6,143		6,143			6,143		6,143			6,143	
OARDC	36,000	0.036	36,000					36,000	36,000	36,000			36,000	
Tekfor	8,511	0.009					8,511			8,511			8,511	
Rayco	830	0.001		830	830		830	830	830		830		830	830
Seaman Corp.	6,400	0.006								6400			6,400	
Speed USA	1,300	0.001											1,300	
United Titanium	2,400	0.002					2,400	2,400	2,400	2,400	2,400		2,400	
Wooster Brush	3,638	0.004						3,638		3,638			3,638	
Wooster Products	3,223	0.003	3,223	3,223		3223	3,223	3,223	3,223	3,223	3,223		3,223	3,223
Wooster Septage	19,861	0.020	19,861	19,861	19,861	19,861	19,861	19,861	19,861	19,861	19,861	19,861	19,861	19,861
Flow per Parameter	**722,259**	**0.722**	**500,807**	**55,224**	**58,144**	**51,394**	**66,135**	**152,292**	**103,489**	**161,588**	**209,822**	**48,171**	**323,069**	**49,856**

TABLE 1

Local Limits Determination Based on Water Quality (NPDES Permit)

Pollutant	ENVIRONMENTAL CRITERIA AND PROCESS DATA BASE						MAXIMUM LOADING		INDUSTRIAL		
	IU Pollut. Flow (MGD) (Qind)	POTW Flow (MGD) (Qpotw)	Removal Efficiency (%) (Rpotw)	NPDES Limits (mg/l) (Ccrit)	Domestic and Commercial Conc. (mg/l) (Cdom)	Domestic and Commercial Flow (MGD) (Qdom)	Allowable Headworks (lbs/day) (Lhw)	Domestic/ Commercial (lbs/day) (Ldom)	Allowable Loading (lbs/day) (Lind)	Local Limit (mg/l) (Cind)	Safety Factor (%) (SF)
Arsenic	0.500807	5.6	45	0.188	0.00214	5.099193	15.96427636	0.091008357	13.47862655	3.2270760	15
Cadmium	0.055224	5.6	67	0.0059	0.00025	5.544776	0.835010909	0.011560858	0.698198415	1.5159502	15
Chromium (total)	0.066135	5.6	82	0.208	0.005	5.533865	53.96906667	0.230762171	45.6429445	82.7515706	15
Chromium (hex)	0.051394	5.6	36	0.014	0.00478	5.548606	1.02165	0.221196288	0.647206212	1.5099557	15
Copper	0.152292	5.6	86	0.021	0.04807	5.447708	7.0056	2.184006838	3.770753162	2.9688275	15
Cyanide	0.058144	5.6	69	0.015	0.0025	5.541856	2.259870968	0.115547698	1.805342625	3.7229627	15
Lead	0.103489	5.6	61	0.022	0.0023	5.496511	2.634584615	0.105434074	2.133962849	2.4724449	15
Mercury	0.161588	5.6	60	0.012	0.00007	5.438412	1.40112	0.003174945	1.187777055	0.8813731	15
Molybdenum						0	-	0	-	-	15
Nickel	0.209822	5.6	42	0.125	0.006	5.390178	10.06551724	0.269724507	8.285965148	4.7350659	15
Selenium	0.048171	5.6	50	0.0063	0.0025	5.551829	0.5884704	0.115755635	0.384444205	0.9569332	15
Silver	0.049856	5.6	75		0.0025	5.550144	-	0.115720502	-	-	15
Zinc	0.323069	5.6	79	0.299	0.13707	5.276931	66.4976	6.032396494	50.49056351	18.7391065	15

(Qind) Industrial User total plant discharge flow in Million Gallons per Day (MGD) that contains a particular pollutant.

(Qpotw) POTW's average influent flow in MGD.

(Rpotw) Removal efficiency across POTW as percent.

(Ccrit) NPDES daily maximum permit limit for a particular pollutant in mg/l.

(Qdom) Domestic/commercial background flow in MGD.

(Cdom) Domestic/commercial background concentration for a particular pollutant in mg/l.

(Lhw) Maximum allowable headworks pollutant loading to the POTW in pounds per day (lbs/day).

(Ldom) Domestic/commercial background loading to the POTW for a particular pollutant in pounds per day (lbs/day).

(Lind) Maximum allowable industrial loading to the POTW in pounds per day.

(Cind) Industrial allowable local limit for a given pollutant in mg/l.

(SF) Safety factor as a percent.

8.34 Unit conversion factor

$$Lhw = \frac{8.34 * Ccrit * Qpotw}{1 - Rpotw}$$

TABLE 2

Local Limits Determination Based on Activated Sludge Inhibition Level

Pollutant	ENVIRONMENTAL CRITERIA AND PROCESS DATA BASE				Domestic and Commercial		MAXIMUM LOADING		INDUSTRIAL		
	IU Pollut. Flow (MGD) (Qind)	POTW Flow (MGD) (Qpotw)	Removal Efficiency (%) (Rprim)	Activated Sludge Inhibition Level (mg/l) (Ccrit)	Conc. (mg/l) (Cdom)	Flow (MGD) (Qdom)	Allowable Headworks (lbs/day) (Lhw)	Domestic/ Commercial (lbs/day) (Ldom)	Allowable Loading (lbs/day) (Lind)	Local Limit (mg/l) (Cind)	Safety Factor (%) (SF)
Arsenic	0.500807	5.6	0	0.1	0.00214	5.099193	4.6704	0.091008357	3.878831643	0.92867657	15
Cadmium	0.055224	5.6	15	1	0.00025	5.544776	54.94588235	0.011560858	46.69243914	101.3800849	15
Chromium (total)	0.066135	5.6	27	1	0.005	5.533865	63.97808219	0.230762171	54.15060769	98.17613397	15
Chromium (hex)	0.051394	5.6	27	1	0.00478	5.548606	63.97808219	0.221196288	54.16017358	126.3576606	15
Copper	0.152292	5.6	22	1	0.04807	5.447708	59.87692308	2.184006838	48.71137778	38.3519343	15
Cyanide	0.058144	5.6	27	0.1	0.0025	5.541856	6.397808219	0.115547698	5.322589289	10.97619969	15
Lead	0.103489	5.6	57	1	0.0023	5.496511	108.6139535	0.105434074	92.21642639	106.8434855	15
Mercury	0.161588	5.6	10	0.1	0.00007	5.438412	5.189333333	0.003174945	4.407758388	3.27071441	15
Molybdenum	0	0	0		0	0	-	0	-	-	15
Nickel	0.209822	5.6	14	1	0.006	5.390178	54.30697674	0.269724507	45.89120573	26.22481271	15
Selenium	0.048171	5.6	0		0.0025	5.551829	-	0.115755635	-	-	15
Silver	0.049856	5.6	20		0.0025	5.550144	-	0.115720502	-	-	15
Zinc	0.323069	5.6	27	0.3	0.13707	5.276931	19.19342466	6.032396494	10.28201446	3.816074744	15

(Qind) Industrial User total plant discharge flow in Million Gallons per Day (MGD) that contains a particular pollutant.

(Qpotw) POTW's average influent flow in MGD.

(Rprim) Removal efficiency across primary treatment as percent.

(Ccrit) Activated sludge threshold inhibition level, mg/l.

(Qdom) Domestic/commercial background flow in MGD.

(Cdom) Domestic/commercial background concentration for a particular pollutant in mg/l.

(Lhw) Maximum allowable headworks pollutant loading to the POTW in pounds per day (lbs/day).

(Ldom) Domestic/commercial background loading to the POTW for a particular pollutant in pounds per day (lbs/day).

(Lind) Maximum allowable industrial loading to the POTW in pounds per day.

(Cind) Industrial allowable local limit for a given pollutant in mg/l.

(SF) Safety factor as a percent.

8.34 Unit conversion factor

$$Lhw = \frac{8.34 * Ccrit * Qpotw}{1 - Rprim}$$

TABLE 3

Local Limits Determination Based on Nitrification Inhibition Level

Pollutant	ENVIRONMENTAL CRITERIA AND PROCESS DATA BASE						MAXIMUM LOADING		INDUSTRIAL		
	IU Pollut. Flow (MGD) (Qind)	POTW Flow (MGD) (Qpotw)	Removal Efficiency (%) (Rsec)	Nitrification Inhibition Level (mg/l) (Ccrit)	Domestic and Commercial Conc. (mg/l) (Cdom)	Domestic and Commercial Flow (MGD) (Qdom)	Allowable Headworks (lbs/day) (Lhw)	Domestic/ Commercial (lbs/day) (Ldom)	Allowable Loading (lbs/day) (Lind)	Local Limit (mg/l) (Cind)	Safety Factor (%) (SF)
Arsenic	0.500807	5.6	45	1.5	0.00214	5.099193	127.3745455	0.091008357	108.1773553	25.9000092	15
Cadmium	0.055224	5.6	67	5.2	0.00025	5.544776	735.9418182	0.011560858	625.5389846	1358.189816	15
Chromium (total)	0.066135	5.6	82	0.25	0.005	5.533865	64.86666667	0.230762171	54.9059045	99.54550217	15
Chromium (hex)	0.051394	5.6	36	1	0.00478	5.548606	72.975	0.221196288	61.80755371	144.1992774	15
Copper	0.152292	5.6	86	0.05	0.04807	5.447708	16.68	2.184006838	11.99399316	9.443231926	15
Cyanide	0.058144	5.6	69	0.34	0.0025	5.541856	51.22374194	0.115547698	43.42463295	89.54991953	15
Lead	0.103489	5.6	61	0.5	0.0023	5.496511	59.87692308	0.105434074	50.78995054	58.84608149	15
Mercury	0.161588	5.6	60		0.00007	5.438412	-	0.003174945	-	-	15
Molybdenum	0	0	0		0	0	-	0	-	-	15
Nickel	0.209822	5.6	42	0.25	0.006	5.390178	20.13103448	0.269724507	16.8416548	9.624267569	15
Selenium	0.048171	5.6	50		0.0025	5.551829	-	0.115755635	-	-	15
Silver	0.049856	5.6	75		0.0025	5.550144	-	0.115720502	-	-	15
Zinc	0.323069	5.6	79	0.08	0.13707	5.276931	17.792	6.032396494	9.090803506	3.373967794	15

(Qind) Industrial User total plant discharge flow in Million Gallons per Day (MGD) that contains a particular pollutant.

(Qpotw) POTW's average influent flow in MGD.

(Rsec) Removal efficiency across primary treatment and secodary treatment as percent.

(Ccrit) Nitrification threshold inhibition level, mg/l.

(Qdom) Domestic/commercial background flow in MGD.

(Cdom) Domestic/commercial background concentration for a particular pollutant in mg/l.

(Lhw) Maximum allowable headworks pollutant loading to the POTW in pounds per day (lbs/day).

(Ldom) Domestic/commercial background loading to the POTW for a particular pollutant in pounds per day (lbs/day).

(Lind) Maximum allowable industrial loading to the POTW in pounds per day.

(Cind) Industrial allowable local limit for a given pollutant in mg/l.

(SF) Safety factor as a percent.

8.34 Unit conversion factor

$$Lhw = \frac{8.34 * Ccrit * Qpotw}{1 - Rsec}$$

TABLE 4

Local Limits Determination Based on Sludge Regulations

Pollutant	ENVIRONMENTAL CRITERIA AND PROCESS DATA BASE								MAXIMUM LOADING		INDUSTRIAL		
	IU Pollut. Flow (MGD) (Qind)	POTW Flow (MGD) (Qpotw)	Sludge Flow (MGD) (Qsldg)	Percent Solids (%) (PS)	Removal Efficiency (%) (Rpotw)	503 Sludge Criteria (mg/kg) (Cslcrit)	Domestic and Commercial Conc. (mg/l) (Cdom)	Domestic and Commercial Flow (MGD) (Qdom)	Allowable Headworks (lbs/day) (Lhw)	Domestic/ Commercial (lbs/day) (Ldom)	Allowable Loading (lbs/day) (Lind)	Local Limit (mg/l) (Cind)	Safety Factor (%) (SF)
Arsenic	0.500807	5.6	0.0377	3.7	45	41	0.00214	5.099193	1.059938013	0.091008357	0.809938954	0.193916983	15
Cadmium	0.055224	5.6	0.0377	3.7	67	39	0.00025	5.544776	0.677171901	0.011560858	0.564035258	1.224651001	15
Chromium (total)	0.066135	5.6	0.0377	3.7	82		0.005	5.533865	-	0.230762171	-	-	15
Chromium (hex)	0.051394	5.6	0.0377	3.7	36		0.00478	5.548606	-	0.221196288	-	-	15
Copper	0.152292	5.6	0.0377	3.7	86	1500	0.04807	5.447708	20.29092907	2.184006838	15.06328287	11.85977612	15
Cyanide	0.058144	5.6	0.0377	3.7	69		0.0025	5.541856	-	0.115547698	-	-	15
Lead	0.103489	5.6	0.0377	3.7	61	300	0.0023	5.496511	5.721376721	0.105434074	4.757736139	5.512392226	15
Mercury	0.161588	5.6	0.0377	3.7	60	17	0.00007	5.438412	0.32961487	0.003174945	0.276997695	0.205542199	15
Molybdenum	0	0			0	75	0	0	#DIV/0!	0	#DIV/0!	#DIV/0!	15
Nickel	0.209822	5.6	0.0377	3.7	42	420	0.006	5.390178	11.633466	0.269724507	9.618721593	5.496677813	15
Selenium	0.048171	5.6	0.0377	3.7	50	100	0.0025	5.551829	2.3266932	0.115755635	1.861933585	4.634602302	15
Silver	0.049856	5.6	0.0377	3.7	75		0.0025	5.550144	-	0.115720502	-	-	15
Zinc	0.323069	5.6	0.0377	3.7	79	2800	0.13707	5.276931	41.23253772	6.032396494	29.01526057	10.76874609	15

(Qind) Industrial User total plant discharge flow in Million Gallons per Day (MGD) that contains a particular pollutant.

(Qpotw) POTW's average influent flow in MGD.

(Qsldg) Sludge flow to disposal in MGD.

(PS) Percent solids of sludge to disposal.

(Rpotw) Removal efficiency across POTW as a percent.

(Cslcrit) 503 sludge criteria in mg/kg dry sludge.

(Qdom) Domestic/commercial background flow in MGD.

(Cdom) Domestic/commercial background concentration for a particular pollutant in mg/l.

(Lhw) Maximum allowable headworks pollutant loading to the POTW in pounds per day (lbs/day).

(Ldom) Domestic/commercial background loading to the POTW for a particular pollutant in pounds per day (lbs/day).

(Lind) Maximum allowable industrial loading to the POTW in pounds per day.

(Cind) Industrial allowable local limit for a given pollutant in mg/l.

(SF) Safety factor as a percent.

8.34 Unit conversion factor

$$Lhw = \frac{8.34 * Cslcrit * (PS/100) * Qsldg}{Rpotw}$$

TABLE 5

Local Limits Determination Based on Anaerobic Digester Inhibition Level

Pollutant	ENVIRONMENTAL CRITERIA AND PROCESS DATA BASE							MAXIMUM LOADING		INDUSTRIAL		
	IU Pollut. Flow (MGD) (Qind)	POTW Flow (MGD) (Qpotw)	Sludge Flow to Digester (MGD) (Qdig)	Removal Efficiency (%) (Rpotw)	Anaerobic Digeste Inhibition Level (mg/l) (Ccrit)	Domestic and Conc. (mg/l) (Cdom)	Commercial Flow (MGD) (Qdom)	Allowable Headworks (lbs/day) (Lhw)	Domestic/ Commercial (lbs/day) (Ldom)	Allowable Loading (lbs/day) (Lind)	Local Limit (mg/l) (Cind)	Safety Factor (%) (SF)
Arsenic	0.500807	5.6	0.0318	45	1.6	0.00214	5.099193	0.942976	0.091008357	0.710521243	0.170114223	15
Cadmium	0.055224	5.6	0.0318	67	20	0.00025	5.544776	7.916776119	0.011560858	6.717698844	14.58567792	15
Chromium	0.066135	5.6	0.0318	82	130	0.005	5.533865	42.04580488	0.230762171	35.50817198	64.37702544	15
Chromium, Hex	0.051394	5.6	0.0318	36	110	0.00478	5.548606	81.037	0.221196288	68.66025371	160.1868765	15
Copper	0.152292	5.6	0.0318	86	40	0.04807	5.447708	12.33544186	2.184006838	8.301118743	6.535720713	15
Cyanide	0.058144	5.6	0.0318	69	1	0.0025	5.541856	0.384365217	0.115547698	0.211162737	0.435458053	15
Lead	0.103489	5.6	0.0318	61	340	0.0023	5.496511	147.823082	0.105434074	125.5441856	145.4575816	15
Mercury	0.161588	5.6	0.0318	60		0.00007	5.438412	-	0.003174945	-	-	15
Molybdenum	0	0		0		0	0	-	0	-	-	15
Nickel	0.209822	5.6	0.0318	42	10	0.006	5.390178	6.314571429	0.269724507	5.097661207	2.913089955	15
Selenium	0.048171	5.6	0.0318	50		0.0025	5.551829	-	0.115755635	-	-	15
Silver	0.049856	5.6	0.0318	75	13	0.0025	5.550144	4.597008	0.115720502	3.791736298	9.119155969	15
Zinc	0.323069	5.6	0.0318	79	400	0.13707	5.276931	134.284557	6.032396494	108.1094769	40.12383428	15

(Qind) Industrial User total plant discharge flow in Million Gallons per Day (MGD) that contains a particular pollutant.

(Qpotw) POTW's average influent flow in MGD.

(Qdig) Sludge flow to digester in MGD.

(Rpotw) Removal efficiency across POTW as percent.

(Ccrit) Anaerobic digester threshold inhibition level in mg/l.

(Qdom) Domestic/commercial background flow in MGD.

(Cdom) Domestic/commercial background concentration for a particular pollutant in mg/l.

(Lhw) Maximum allowable headworks pollutant loading to the POTW in pounds per day (lbs/day).

(Ldom) Domestic/commercial background loading to the POTW for a particular pollutant in pounds per day (lbs/day).

(Lind) Maximum allowable industrial loading to the POTW in pounds per day.

(Cind) Industrial allowable local limit for a given pollutant in mg/l.

(SF) Safety factor as a percent.

8.34 Unit conversion factor

$$Lhw = \frac{8.34 * Ccrit * Qdig}{Rpotw}$$

TABLE 6

Local Limits Comparison

Pollutant	ENVIRONMENTAL CRITERIA AND PROCESS DATA BASE						Concentration Based Limits						
	Table 1 Pass-Thru	Table 2 Act. Sludge Inhibition	Table 3 Nitrification Inhibition	Table 4 503 Sludge	Table 5 Anaerobic Digestion Inhibition	MINIMUM	Table 1 Pass-Thru	Table 2 Act. Sludge Inhibition	Table 3 Nitrification Inhibition	Table 4 503 Sludge	Table 5 Anaerobic Digestion Inhibition	MINIMUM	Proposed Limits mg/L
Arsenic	13.4786266	3.87883164	108.1773553	0.809938954	0.710521243	0.710521243	3.2270760	0.92867657	25.9000092	0.193916983	0.170114223	0.1701	
Cadmium	0.69819841	46.6924391	625.5389846	0.564035258	6.717698844	0.564035258	1.5159502	101.3800849	1358.189816	1.224651001	14.58567792	1.2247	
Chromium	45.6429445	54.1506077	54.9059045	-	35.50817198	35.50817198	82.7515706	98.17613397	99.54550217	-	64.37702544	64.3770	
Chromium, Hex	0.64720621	54.1601736	61.80755371	-	68.66025371	0.647206212	1.5099557	126.3576606	144.1992774	-	160.1868765	1.5100	
Copper	3.77075316	48.7113778	11.99399316	15.06328287	8.301118743	3.770753162	2.9688275	38.3519343	9.443231926	11.85977612	6.535720713	2.9688	
Cyanide	1.80534262	5.32258929	43.42463295	-	0.211162737	0.211162737	3.7229627	10.97619969	89.54991953	-	0.435458053	0.4355	
Lead	2.13396285	92.2164264	50.78995054	4.757736139	125.5441856	2.133962849	2.4724449	106.8434855	58.84608149	5.512392226	145.4575816	2.4724	
Mercury	1.18777706	4.40775839	-	0.276997695	-	0.276997695	0.8813731	3.27071441	-	0.205542199	-	0.2055	
Molybdenum	-	-	-	#DIV/0!	-	#DIV/0!	-	-	-	#DIV/0!	-	#DIV/0!	
Nickel	8.28596515	45.8912057	16.8416548	9.618721593	5.097661207	5.097661207	4.7350659	26.22481271	9.624267569	5.496677813	2.913089955	2.9131	
Selenium	0.38444421	-	-	1.861933585	-	0.384444205	0.9569332	-	-	4.634602302	-	0.9569	
Silver	-	-	-	-	3.791736298	3.791736298	-	-	-	-	9.119155969	9.1192	
Zinc	50.4905635	10.2820145	9.090803506	29.01526057	108.1094769	9.090803506	18.7391065	3.816074744	3.373967794	10.76874609	40.12383428	3.3740	

Wooster WRRF Final Local Limits		
Pollutant	Current Limit mg/L	Proposed Limit mg/L
Arsenic	0.09	0.17
Cadmium	0.06	1.22
Chromium, Total	9.31	64.38
Chromium, Hexavalent	0.65	1.51
Copper	1.02	2.97
Cyanide	0.41	0.44
Lead	0.45	2.47
Mercury (LL Hg)	0.000293	0.206
Nickel	1.07	2.91
Selenium	0.10	0.96
Silver	1.73	9.12
Zinc	2.41	3.37

Plant Flow (1)	
2019	Total
Jan	176.775
Feb	239.968
Mar	171.810
Apr	183.990
May	187.098
Jun	234.961
Jul	205.780
Aug	150.188
Sep	123.425
Oct	128.543
Nov	114.036
Dec	133.313
MGD	**5.616**

Land Applied (4)		
2019	total	% Solids
Jan		
Feb	0.4441	4.1
Mar	1.6814	3.8
Apr	1.3416	3.0
May	0.2877	2.9
Jun	2.4321	3.5
Jul	1.0219	2.3
Aug	1.4870	4.0
Sep	0.4556	5.0
Oct	2.2978	5.0
Nov	1.5811	4.9
Dec	0.7150	2.6
MGD	**0.0377**	**3.7**

To Digesters (5)	
2019	total
Jan	0.9473
Feb	0.9113
Mar	0.8594
Apr	1.2395
May	0.7541
Jun	0.8389
Jul	0.9701
Aug	0.9629
Sep	1.2852
Oct	1.0889
Nov	0.7819
Dec	0.9701
MGD	**0.0318**

Plant Flow	
2017	4.7
2018	5.6
2019	5.6

City Of Wooster WRRF

Metals Removal (2018-2019)

Shaded cells are 1/2 Detection Limit

		2019										2018								
		Cd	Cr	Cr6+	Cu	CN	Pb	Hg	Ni	Zn		Cd	Cr	Cr6+	Cu	CN	Pb	Hg	Ni	Zn
		ug/L	ug/L	ug/L	ug/L	mg/L	ug/L	ng/L	ug/L	ug/L		ug/L	ug/L	ug/L	ug/L	mg/L	ug/L	ng/L	ug/L	ug/L
Jan	Raw				24										33					
	Final				5										5					
Feb	Raw				46										27					
	Final				5										5					
Mar	Raw	0.6	5	2	120	0.003	9.3	41.6	16	350		0.25	5	2	12	0.003	1	30.5	5	63
	Final	0.25	5	2	5	0.002	1	1.2	5	21		0.25	5	2	5	0.002	1	1.58	5	30
Apr	Raw				25										19					
	Final				5										5					
May	Raw				180										16					
	Final				5										5					
Jun	Raw	0.25	5	2	84	0.003	6.3	11.2	5	240		0.25	5	2	27	0.003	3.9	42.3	5	120
	Final	0.25	5	2	5	0.002	1	0.64	5	36		0.25	5	2	5	0.002	2.0	0.99	5	31
Jul	Raw				26										31					
	Final				5										5					
Aug	Raw	0.25	5	2	51	0.003	4.1	8.36	5	140		0.25	5	2	48	0.003	6.1	217	5	170
	Final	0.25	5	2	5	0.002	1	0.03	5	25		0.25	5	2	5	0.002	4.3	0.97	5	44
Sep	Raw				56										44					
	Final				5										5					
Oct	Raw				79										310					
	Final				5										5					
Nov	Raw				57										25					
	Final				5										5					
Dec	Raw	0.25	5	13	76	0.003	6.3	9.86	12	210		0.25	5	2	46	0.003	4.5	30.6	5	190
	Final	0.25	5	2	5	0.002	1	1.56	10	44		0.25	5	2	21	0.002	1	0.58	5	39
Average Raw		0.34	5	2	68.7	0.003	6.5	17.8	9.5	235		0.25	5	2	53.2	0.003	3.88	80.1	5	136
Average Final		0.25	5	2	5	0.002	1	0.86	6.25	31.5		0.25	5	2	6.33	0.002	2.08	1.03	5	36
% Removal		26%	0%	0%	93%	33%	85%	95%	34%	87%		0%	0%	0%	88%	33%	46%	99%	0%	73%

City of Wooster WRRF

Background Sampling			Location			Septage Receiving						=	1/2 Detection Limit	
	Date	As (ug/L)	Ag (ug/L)	Cd (ug/L)	Cr (ug/L)	Cr6+ (ug/L)	Cu (ug/L)	Ni (ug/L)	Pb (ug/L)	Se (ug/L)	Zn (ug/L)	CN (mg/L)	LLHg (ng/L)	Gallons
Oct 2019	29	15	25	5.2	50	2	50	50	23	25	1,000	0.090	27,300	24,500
	30	68	13	24	480	2	5,100	540	290	13	20,000	0.048	2,590	44,250
	31	100	13	21	170	2	5,500	240	210	26	16,000	0.006	4,290	15,350
Nov 2019	1	180	25	14	130	80	11,000	140	270	25	14,000	0.003	13,500	18,500
	2	15	25	12	150	9.1	6,200	170	190	25	12,000	0.020	2,720	18,950
AVG		**75.6**	**20**	**15.2**	**196**	**19.0**	**5,570**	**228**	**196.6**	**22.8**	**12,600**	**0.0333**	**10,080**	**24,310**

Biosolids Land Application Limitations

Pollutant	Ceiling Concentration* (Table 1, 40 CFR 503.13)		Monthly Average Pollutant Concentration* (Table 3, 40 CFR 503.13)		Cumulative Pollutant Loading Rates* (Table 2, 40 CFR 503.13)		Annual Pollutant Loading Rate* (Table 4, 40 CFR 503.13)	
	mg/kg	lbs/1000 lbs	mg/kg	lbs/1000 lbs	kg/hectare	lbs/acre**	kg/hectare/ 365-day period	lbs/acre/ 365-day period**
Arsenic	75	75	41	41	41	37	2	1.8
Cadmium	85	85	39	39	39	35	1.9	1.7
Copper	4,300	4,300	1,500	1,500	1,500	1,338	75	67
Lead	840	840	300	300	300	268	15	13
Mercury	57	57	17	17	17	15	0.85	0.76
Molybdenum	75	75	-	-	-	-	-	-
Nickel	420	420	420	420	420	375	21	19
Selenium	100	100	100	100	100	89	5	4.5
Zinc	7,500	7,500	2,800	2,800	2,800	2,498	140	125

* Dry weight.

** Calculated using metric standards specified in 40 CFR 503.13 multiplied by the conversion factor of 0.8922.

Source: 40 CFR §503.13, Tables 1-4, October 25, 1995

APPENDIX G -
LITERATURE INHIBITION VALUES

Pollutant	Reported Range of Activated Sludge Inhibition Threshold Levels, mg/L	References*
METALS/NONMETAL INORGANICS		
Ammonia	480	(4)
Arsenic	0.1	(1), (2), (3)
Cadmium	1 - 10	(2), (3)
Chromium (VI)	1	(2), (3)
Chromium (III)	10 - 50	(2), (3)
Chromium (Total)	1 - 100	(1)
Copper	1	(2), (1), (3)
Cyanide	0.1 - 5 5	(1), (2), (3) (1)
Iodine	10	(4)
Lead	1.0 - 5.0 10 - 100	(3) (1)
Mercury	0.1 - 1 2.5 as Hg (II)	(2), (3) (1)
Nickel	1.0 - 2.5 5	(2), (3) (1)
Sulfide	25 -30	(4)
Zinc	0.3 - 5 5 - 10	(3) (1)
ORGANICS		
Anthracene	500	(1)
Benzene	100 - 500 125 - 500	(3) (1)
2-Chlorophenol	5 20 - 200	(2) (3)
1,2 Dichlorobenzene	5	(2)
1,3 Dichlorobenzene	5	(2)
1,4 Dichlorobenzene	5	(2)
2,4-Dichlorophenol	64	(3)
2,4 Dimethylphenol	40 - 200	(3)
2,4 Dinitrotoluene	5	(2)
1,2-Diphenylhydrazine	5	(2)
Ethylbenzene	200	(3)
Hexachlorobenzene	5	(2)
Naphthalene	500 500 500	(1) (2) (3)
Nitrobenzene	30 - 500 500 500	(3) (1) (2)

Pollutant	Reported Range of Activated Sludge Inhibition Threshold Levels, mg/L	References*
Pentachlorophenol	0.95 50 75 - 150	(2) (3) (1)
Phenanthrene	500 500	(1) (2)
Phenol	50 - 200 200 200	(3) (2) (1)
Toluene	200	(3)
2,4,6 Trichlorophenol	50 - 100	(1)
Surfactants	100 - 500	(4)

Pollutant	Reported Range of Trickling Filter Inhibition Threshold Levels, mg/L	References*
Chromium (III)	3.5 - 67.6	(1)
Cyanide	30	(1)

Pollutant	Reported Range of Nitrification Inhibition Threshold Levels, mg/L	References*
METALS/NONMETAL INORGANICS		
Arsenic	1.5	(2)
Cadmium	5.2	(1), (2)
Chloride	180	(4)
Chromium (VI)	1 - 10 [as $(CrO_4)^{2-}$]	(1)
Chromium (T)	0.25 - 1.9 1 - 100 (trickling filter)	(1), (2), (3) (1)
Copper	0.05 - 0.48	(2), (3)
Cyanide	0.34 - 0.5	(2), (3)
Lead	0.5	(2), (3)
Nickel	0.25 - 0.5 5	(2), (3) (1)
Zinc	0.08 - 0.5	(2), (3)
ORGANICS		
Chloroform	10	(2)
2,4-Dichlorophenol	64	(3)
2,4-Dinitrophenol	150	(2)
Phenol	4 4 - 10	(2) (3)

Pollutant	Reported Range of Anaerobic Digestion Inhibition Threshold Levels, mg/L	References*
METALS/NONMETAL INORGANICS		
Ammonia	1500 - 8000	(4)
Arsenic	1.6	(1)
Cadmium	20	(3)
Chromium (III)	130	(3)
Chromium (VI)	110	(3)
Copper	40	(3)
Cyanide	4 - 100 1 - 4	(1) (2), (3)
Lead	340	(3)
Nickel	10 136	(2), (3) (1)
Silver	13 - 65**	(3)
Sulfate	500 - 1000	(4)
Sulfide	50 - 100	(4)
Zinc	400	(3)
ORGANICS		
Acrylonitrile	5 5	(3) (2)
Carbon Tetrachloride	2.9 - 159.4 10 - 20 2.0	(1) (3) (2)
Chlorobenzene	0.96 - 3 0.96	(1) (2)
Chloroform	1 5 - 16 10 - 16	(2) (1) (3)
1,2-Dichlorobenzene	0.23 - 3.8 0.23	(1) (2)
1,4-Dichlorobenzene	1.4 - 5.3 1.4	(1) (2)
Methyl chloride	3.3 - 536.4 100	(1) (2)
Pentachlorophenol	0.2 0.2 - 1.8	(2) (1)
Tetrachloroethylene	20	(2)
Trichloroethylene	1 - 20 20 20	(1) (2) (3)
Trichlorofluoromethane	-	(2)

* Total pollutant inhibition levels, unless otherwise indicated.

** Dissolved metal inhibition levels.

(1) Jenkins, D.I., and Associates. 1984. *Impact of Toxics on Treatment Literature Review.*

APPENDIX L -
HAULED WASTE LOADINGS

Septage Hauler Monitoring Data

Pollutant	Number of Detections	Number of Samples	Minimum Concentration (mg/L)	Maximum Concentration (mg/L)	Average Concentration (mg/L)
INORGANICS					
Arsenic	144	145	0	3.5	0.141
Barium	128	128	0.002	202	5.758
Cadmium	825	1097	0.005	8.1	0.097
Chromium (T)	931	1019	0.01	34	0.49
Cobalt	16	32	< 0.003	3.45	0.406
Copper	963	971	0.01	260.9	4.835
Cyanide	575	577	0.001	1.53	0.469
Iron	464	464	0.2	2740	39.287
Lead	962	1067	< 0.025	118	1.21
Manganese	5	5	0.55	17.05	6.088
Mercury	582	703	0.0001	0.742	0.005
Nickel	813	1030	0.01	37	0.526
Silver	237	272	< 0.003	5	0.099
Tin	11	25	< 015	1	0.076
Zinc	959	967	< 0.001	444	9.971
NONCONVENTIONALS					
COD	183	183	510	117500	21247.951
ORGANICS					
Acetone	118	118	0	210	10.588
Benzene	112	112	0.005	3.1	0.062
Ethylbenzene	115	115	0.005	1.7	0.067
Isopropyl Alcohol	117	117	1	391	14.055
Methyl Alcohol	117	117	1	396	15.84
Methyl Ethyl Ketone	115	115	1	240	3.65
Methylene Chloride	115	115	0.005	2.2	0.101
Toluene	113	113	0.005	1.95	0.17
Xylene	87	87	0.005	0.72	0.051

Source: U.S. EPA's *Supplemental Manual on the Development and Implementation of Local Discharge Limitations Under the Pretreatment Programs*, 21W-4002, May 1991, pp. 1-27 and 1-28. "Pollutant levels reported below specified detection limit were considered in the data analysis and, for the purpose of statistical analysis, were considered equal to the detection limit."

APPENDIX R -
PRIORITY POLLUTANT REMOVAL EFFICIENCIES

Priority Pollutant Removal Efficiencies (%) Through Primary Treatment*

Priority Pollutant	Median	Number of POTWs with Removal Data**
METAL/NONMETAL INORGANICS		
Cadmium	15	6 of 40
Chromium	27	12 of 40
Copper	22	12 of 40
Cyanide	27	12 of 40
Lead	57	1 of 40
Mercury	10	8 of 40
Nickel	14	9 of 40
Silver	20	4 of 40
Zinc	27	12 of 40
ORGANICS		
Benzene	25	8 of 40
Chloroform	14	11 of 40
1,2-trans-Dichloroethylene	36	9 of 40
Ethylbenzene	13	12 of 40
Naphthalene	44	4 of 40
Phenol	8	11 of 40
Butyl benzyl phthalate	62	4 of 40
Di-n-butyl phthalate	36	3 of 40
Diethyl phthalate	56	1 of 40
Tetrachloroethylene	4	12 of 40
1,1,1-Trichloroethane	40	10 of 40
Trichloroethylene	20	12 of 40

* Pollutant removals between POTW influent and primary effluent. From *Fate of Priority Pollutants in Publicly Owned Treatment Works, Volume I* (EPA 440/1-82/303), U.S. Environmental Protection Agency, Washington, D.C., September 1982, p. 61.

** Median removal efficiencies from a data base of removal efficiencies for 40 POTWs. Only POTWs with average influent concentrations exceeding three times each pollutant's detection limit were considered.

Source: U.S. EPA's *Guidance Manual on the Development and Implementation of Local Discharger Limitations Under the Pretreatment Program*, December 1987, p. 3-55.

Priority Pollutant Percent Removal Efficiencies (%) Through Activated Sludge Treatment*

Priority Pollutant	Range	Second Decile	Median	Eight Decile	Number of POTWs with Removal Data
METALS/NONMETAL INORGANICS**					
Arsenic	11-78	31	45	53	5 of 26
Cadmium	25-99	33	67	91	19 of 26
Chromium	25-97	68	82	91	25 of 26
Copper	2-99	67	86	95	26 of 26
Cyanide	3-99	41	69	84	25 of 26
Lead	1-92	39	61	76	23 of 26
Mercury	1-95	50	60	79	20 of 26
Nickel	2-99	25	42	62	23 of 26
Selenium	25-89	33	50	67	4 of 26
Silver	17-95	50	75	88	24 of 26
Zinc	23-99	64	79	88	26 of 26
ORGANICS**					
Anthracene	29-99	44	67	91	5 of 26
Benzene	25-99	50	80	96	18 of 26
Chloroform	17-99	50	67	83	24 of 26
1,2-trans-Dichloroethylene	17-99	50	67	91	17 of 26
Ethylbenzene	25-99	67	86	97	25 of 26
Methylene chloride	2-99	36	62	77	26 of 26
Naphthalene	25-98	40	78	90	16 of 26
Phenanthrene	29-99	37	68	86	6 of 26
Phenol	3-99	75	90	98	19 of 26
Bis (2-ethylhexyl) phthalate	17-99	47	72	87	25 of 26
Butyl benzyl phthalate	25-99	50	67	92	16 of 26
Di-n-butyl phthalate	11-97	39	64	87	19 of 26
Diethyl phthalate	17-98	39	62	90	15 of 26
Pyrene	73-95	76	86	95	2 of 26
Tetrachloroethylene	15-99	50	80	93	26 of 26
Toluene	25-99	80	93	98	26 of 26
1,1,1-Trichloroethane	18-99	75	85	94	23 of 26
Trichloroethylene	20-99	75	89	98	25 of 26

* Pollutant removals between POTW influent and secondary effluent (including secondary clarification). Based on a computer analysis of POTW removal efficiency data (derived from actual POTW influent and effluent sampling data) provided in U.S. EPA's *Fate of Priority Pollutants in Publicly Owned Treatment Works, Volume II* (EPA 440/1-82/303), September 1982.

** For the purpose of deriving removal efficiencies, effluent levels reported as below detection were set equal to the reported detection limits. All secondary activated sludge treatment plants sampled as part of the study were considered.

Source: U.S. EPA's *Guidance Manual on the Development and Implementation of Local Discharger Limitations Under the Pretreatment Program*, December 1987, p. 3-56.