HAZEN AND SAWYER
Environmental Engineers & Scientists

Hazen and Sawyer, P.C.
444 Lewis Hargett Circle, Suite 260
Lexington, KY 40503
859 219-1126
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March 12, 2009

RECEIVED
MAR 16 2009
By

Jennifer Spradlin
Pretreatment Coordinator
Surface Waters Permit Branch
Kentucky Division of Water
200 Fair Oaks Lane, 4th floor
Frankfort, KY 40601

Re: Local Discharge Limits
Eastern Regional Water Reclamation Facility
H&S Job No. 30005-003 028

Dear Ms. Spradlin:

We are submitting for Sanitation District No.1 the proposed local limits for the Eastern Regional Water Reclamation Facility, which is located in Alexandria and owned and operated by Sanitation District No.1. We have also enclosed the EPA model calculations and the input data that was used in the model. The proposed limits are the same as were previously discussed with you and have been reviewed and agreed to by SD1.

The ERWRF is a new facility and has been in operation approximately 1.5 years. The agreement with the Kentucky Division of Water (KDOW) was to use the local limits developed for the Campbell County Industrial Park WWTP until the ERWRF had been in operation for a minimum of 1 year when treatment data would be better known. Following KDOW's request we gathered information relevant to the ERWRF and have calculated the proposed limits for your review and approval.

SD1 also has developed a new surcharge rate structure for the ERWRF and we have enclosed a technical memorandum related to that for your information.

If there are any questions on the material enclosed, please contact me at your convenience.

Very truly yours,

HAZEN AND SAWYER, P.C.

Jerry McClary

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Environmental Engineers & Scientists

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Associate

Enclosure

cc:

John Clark, SD1 encl.
Sarah Griffith, SD1 encl.

HAZEN AND SAWYER
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RECEIVED
MAR 1 9 2009
By

Technical Memorandum

To: Jennifer Spradlin, KDOW

From: Jerry McClary, Hazen and Sawyer

Copies: John Clark, SD1
Sarah Griffith, SD1

Date: March 12, 2009

Subject: ERWRF local discharge limits - H&S project # 30005-003 task 028

Introduction / Purpose

The Sanitation District #1 of Northern Kentucky constructed and placed into operation the Eastern Regional Water Reclamation Facility (ERWRF) in September of 2007. In discussions with the Kentucky Division of Water (KDOW), related to the initiation of new local discharge limits, KDOW issued a proclamation that the ERWRF could operate under the existing local limits that were authorized for the Campbell County Industrial WTTP for a minimum period of one year with the understanding that new, respective local limits would be calculated for the ERWRF, based on its actual treatment capabilities. The major difference related to the local limit's calculations is the receiving streams for the two WWTP's. The Campbell County WTTP utilized the Licking River with its higher volume of flow for a receiving stream while the ERWRF discharges in the much smaller body of water, Brush Creek. Brush Creek is on KDOW's 303 (D) list as an impaired stream. The differences in the volume of water to serve as dilution, has an impact on the final local limits. Normally the smaller the stream flow, the potential for more stringent local limits.

Local Limits Criteria

Calculation of the proposed local limits used the existing water quality data (year 2006) as provided by KDOW, the EPA's "Guidance Manual on the Development and Implementation of Local Discharge Limitations under the Pretreatment Program", and data analyzed for influent, effluent and non-industrial pollutant concentrations. The accumulated data was inserted in the EPA's calculation model and evaluated for the more stringent category. Six categories were relevant in this model calculation; NPDES daily limit, NPDES monthly limit, Activated Sludge Inhibition, Nitrification Inhibition, Chronic and Acute factors. The ERWRF disposes of its waste sludge by landfilling and the waste sludge categories are not relevant for this application. Based on the EPA model, the recommended limit for two pollutants, cadmium and selenium were before capable detection limits and a discussion with KDOW allowed the use of the detection capability as the local limit. The recommended limit for chromium was actually less stringent than the "old" limit for the Campbell County WWTP and KDOW issued authorization to use the more stringent limits as provided by the model.

The limit for chlorides is a concern as the water quality limit for Brush Creek is 600 mg/l and the ERWRF does not have the capability for chloride treatment. This is standard for activated sludge WWTP's as the treatment of chlorides is not a normal practice and it is considered a "pass – through" pollutant. A mass balance approach was utilized for calculating the chloride limit as the non-industrial wastewater was tested for chloride concentrations and compared to the allowable industrial concentration. The non-industrial contribution is considered not to be controllable and so the mass loading from this source is considered a "given". The total allowable mass loading was calculated with the non-industrial contribution subtracted from the total. The remaining is assigned to the industrial contribution, which in this case there is only one permitted industry, Sara Lee. On a conservative approach, the calculation of the mass loadings from the two sources, industrial and non-industrial looked at a period when the ERWRF influent flow was low (June 2008 – 1.151 mgd) and the discharged flow from Sara Lee (June 2008 - .283 mgd) was a larger contributor. A review of past ERWRF operating data indicates that the influent chloride concentration averages 608 mg/l with the effluent concentration averaging 583 mg/l. This can lead to the thought that some reduction is taking place in the treatment facility but this would be contrary to recognized practice.

As was reviewed in the one year operating data, the effluent chloride concentration averages very close to the water quality limit of 600 mg/l with very little margin for error. The EPA normally recognizes, (and even requests) the use of safety factors. In this case a safety factor of 20% was used in the calculation of the monthly average limit for chlorides with the daily maximum limit not using a safety factor.

Local Limits Calculation

The attachments provide a summary of the input data which includes:

- Water Quality Data
- Non-industrial Wastewater Pollutant Concentrations
- ERWRF Influent Pollutant Concentrations
- ERWRF Effluent Pollutant Concentrations
- ERWRF Pollutant Removal Efficiencies
- Activated Sludge Inhibition Threshold Levels

Also included are the EPA model calculations with the category levels and proposed local limits.

Conclusion

The local limits for the ERWRF were calculated based on EPA recommended and accepted procedures utilizing actual and documented EPA data. Procedures and practices were discussed with KDOW and it is felt that based on past ERWRF operating information that the proposed limits shall meet their intended purpose. It is realized that major changes in wastewater type or operating

conditions may impact the established limits, which allows a reopening clause to be in effect during their authorization. The following are the recommended local limits for the ERWRF:

Pollutant	Limit
Arsenic	.395 mg/l
Cadmium	.015 mg/l
Chromium	1.258 mg/l
Copper	.204 mg/l
Lead	.044 mg/l
Mercury	.0005 mg/l
Nickel	.454 mg/l
Selenium	.04 mg/l
Silver	.096 mg/l
Zinc	.317 mg/l
Cyanide, A	.178 mg/l
pH	5.0 – 10.0 su
Water Temperature	104 degrees F
Grease and Oil, T	100 mg/l
Chlorides, daily maximum	2,000 mg/l
Chlorides, monthly average	1,522 mg/l

HAZEN AND SAWYER
Environmental Engineers & Scientists

Technical Memorandum

To: Jennifer Spradlin, KDOW

From: Jerry McClary, Hazen and Sawyer

Copies: John Clark, SD1
Sarah Griffith, SD1

Date: March 12, 2009

Subject: ERWRF pollutant surcharge rates - H&S project # 30005-003 task 028

Introduction / Purpose

The Sanitation District #1 of Northern Kentucky requested assistance from Hazen and Sawyer to prepare surcharge rates for compatible pollutants of CBOD, TSS, NH3-N and P as calculated for the ERWRF. The ERWRF was designed to treat the listed pollutants at standard normal domestic concentrations and any variance from the standard pollutant strength can increase the cost of operating the facility. It is commonly recognized that the treatment of pollutants incurs a cost for operations and maintenance (O&M) and this cost is usually looked at as the cost per pound for all expenses that can be traced directly to the actual treatment process and the maintenance required keeping the treatment system effectively functioning. Miscellaneous costs, such as administration, grounds maintenance, office supplies, etc. are not considered directly connected to O&M costs. Each discharger to the ERWRF is expected to pay their fair share of the O&M costs and surcharge rates are utilized to balance out the fair share policy.

Surcharge Criteria

The USEPA recommends that SD1 place into effect maximum pollutant concentrations for raw sewage and consider all concentrations above that level to be greater than normal domestic sewage. These set levels will be conservatively established where a standard residence can comply. Normally a discharger that exceeds these levels is either a commercial or industrial business. It is felt that any discharge containing higher pollutant concentrations than standard domestic wastewater is resulting in higher treatment costs and without a surcharge would not be paying their fair share of the costs. This procedure is highly recommended by the USEPA with it being recognized as a standard practice. The following are the recommended maximum pollutant concentrations before a surcharge rate would be implemented:

- BOD 240 mg/l
- TSS 300 mg/l
- TKN 30 mg/l
- P 10 mg/l

Surcharges would be calculated on the respective individual discharge based on a mass loading where the dischargers flow is used in conjunction with the degree of the concentration exceeding the established limit to calculate the total surcharge. The pounds of the pollutant exceeding the accepted amount will be billed at a calculated cost per pound as derived in this evaluation.

Surcharge Rate Calculation

There are four basic steps in calculating a surcharge rate for the given pollutants. The following provides a summary of those steps, to be followed by a description of how they were utilized in this evaluation:

- Step 1 – Calculate the average influent pollutant concentrations and convert them to total pounds of pollutant per year.
- Step 2 – Review the annual budget to operate the ERWRF and establish the designation of what costs are directly related to operation and maintenance for treatment of the compatible pollutants.
- Step 3 – Establish the portion of the applicable operations and maintenance costs that are directly associated with each process unit.
- Step 4 – Calculate the cost per pound to provide treatment and maintenance for each respective pollutant.

Step 1 – Pollutant Concentrations – SD1 provided to Hazen and Sawyer the ERWRF monthly average raw sewage influent concentrations for Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), Total Kjeldahl Nitrogen (TKN), Phosphorus (P), and the average daily flow. Hazen and Sawyer used this data to arrive at a daily average concentration and then to arrive at the pounds per day of each pollutant. The average pounds per day of pollutant was multiplied by 365 days to estimate the total pounds treated per year. The data included the period form November 2007 through August 2008.(see exhibit 1–A). The estimated treated pollutant pounds per year is:

BOD	1,089,194 lbs
TSS	1,092,115 lbs
TKN	75,346 lbs
P	33,216 lbs

Step 2 – O&M Budget Review - Hazen and Sawyer reviewed the ERWRF's annual operations and maintenance expenses and separated the expenses that are directly related to the treatment and subsequent maintenance required to sustain the effective treatment. A number of costs are incurred with owning and operating a WWTP, but some costs such as general administration, office supplies, grounds maintenance and vehicles are not considered directly related to O&M. Exhibit 1-B provides a

summary of the expenses considered directly related to the treatment on the four listed pollutants. The budget period evaluated encompassed the same periods as the pollutant concentration data with the exceptions of sludge/grit disposal and chemicals. These two items utilized more recent accounting data from July 2008 - October 2008 because the ERWRF's respective phosphorus and sludge treatment facilities were not fully in effect at the time of the earlier accounting as they take longer to initiate full operation. It is felt that the expenses utilized provide a fair accounting of the actual O&M costs.

Step 3 – Assigned Treatment Costs – A WWTP is designed with a grouping of different treatment facilities, each with a respective purpose. Each facility is related to a different form of treatment and a different effect on the pollutant. Exhibit 1-C provides a breakdown of the assigned O&M costs for each treatment facility. As can be seen in the exhibit, the following annual pollutant treatment costs are estimated:

BOD	$303,865
TSS	$268,514
TKN	$68,386
P	$21,251

Step 4 – Surcharge Calculation – The final step is to utilize the data evaluated and calculate a fair and justified surcharge rate. The calculation involves determining the actual direct O&M cost to treat the pollutant based on cost per pound. The following provides the recommended surcharge rates:

Pollutant	lbs/year treated	Cost to Treat	Surcharge Rate/lb
BOD	1,089,194	$303,865	**$.28**
TSS	1,092,115	$268,514	**$.25**
TKN	75,346	$68,386	**$.91**
P	33,216	$21,251	**$.64**

Conclusion

The surcharge rates for the ERWRF were calculated based on EPA recommended and accepted procedures utilizing actual costs and pollutant loadings. The reasoning behind surcharge rates is that everyone pay their fair share for treatment costs and it is felt that concentrations in excess of standard domestic concentrations are beyond the normal cost and the extra cost should be bore by the respective wastewater discharger.

ERWRF
Proposed Local Limits, mg/l

Pollutant	Temporary	EPA Model Calculated	Proposed	
Arsenic	0.124	0.395	0.395	
Cadmium	0.07	0.005	0.015	detection level
Chromium	1.258	4.182	1.258	
Copper	0.246	0.204	0.204	
Lead	0.124	0.044	0.044	
Mercury	0.0005	0.0005	0.0005	
Nickel	1.258	0.454	0.454	
Selinium	0.124	0.017	0.04	detection level
Silver	0.032	0.096	0.096	
Zinc	0.474	0.317	0.317	
Cyanide, A	0.11	0.178	0.178	
pH	5.0 - 10.0		5.0 - 10.0	
Temperature	104 F		104 F	
Grease and Oil, T	100		100	
Chlorides	2,298		2,000	daily max
			1,522	monthly average

ERWRF
Water Quality Data, mg/l

Pollutant	Average	Justification	Maximum	Justification
Arsenic	0.15	chronic	0.34	acute
Cadmium	0.000329	chronic	0.002785	acute
Chromium	171.29	HH DWS	na	na
Copper	0.011673	chronic	0.017925	acute
Cyanide, A	0.0052	chronic	0.022	acute
Cyanide, T				
Lead	0.004443	chronic	0.11402	acute
Mercury	0.000051	HH DWS	0.0017	acute
Nickel	0.065127	chronic	0.585774	acute
O&G, hydrocarbon				
O&G, total				
Selinium	0.005	chronic	0.02	acute
Silver	na	na	0.005943	acute
Zinc	0.149644	chronic	0.149644	acute
chlorides	600	chronic	1,200	acute

ERWRF
Non-industrial Wastewater Data
Sample Location: Mackie

Pollutant	8/29/2008	9/2/2008	9/3/2008	9/9/2008	9/10/2008	Average
Arsenic	0.005		0.005		0.01	0.007
Cadmium	0.001		0.001		0.001	0.001
Chromium	0.005		0.005		0.01	0.007
Copper	0.0469		0.041		0.032	0.040
Cyanide, A		0.005	0.089	0.005		0.0329
Cyanide, T		0.005		0.005		0.005
Lead	0.001		0.001		0.001	0.001
Mercury	0.000012		0.000		0.000001	0.00001
Nickel	0.006		0.005		0.005	0.005
O&G, hydrocarbon	5	5		5		5
O&G, total	28.1	19.7		21		22.9333
Selinium	0.01			0.01	0.01	0.0067
Silver	0.0005		0.001		0.0005	0.001
Zinc	0.894		0.083		0.072	0.350
chlorides	165		146		85.6	132

Pollutant. mg/l	ERWRF Influent 8/28/2008	8/29/2008	9/2/2008	9/3/2008	9/9/2008	9/10/2008	Average
Arsenic		0.005		0.005		0.01	0.0067
Cadmium		0.001		0.001		0.001	0.0010
Copper		0.0563		0.0626		0.0818	0.0669
Cyanide	0.005		0.005		0.005		0.0050
Cyanide, A	0.005		0.005		0.005		0.0050
Lead		0.00318		0.00279		0.00305	0.0030
Mercury		0.000035		0.000026		0.00012	0.000060
Silver		0.00069		0.0005		0.000737	0.0006
Chromium		0.00992		0.00693		0.01	0.0090
Zinc		0.00155		0.162		0.189	0.1175
Selenium		0.01		0.01		0.01	0.0100
pH							
Chlorides		630		622		608	620.0000
O&G, Hydrocarbon	6.04		5.05		5		5.3633
O&G, Total	30.6		26.6		19.6		25.6000

Pollutant, mg/l	ERWRF Effluent 8/28/2008	8/29/2008	9/2/2008	9/3/2008	9/9/2008	9/10/2008	Average
Arsenic		0.005		0.005		0.01	0.0067
Cadmium		0.001		0.001		0.001	0.0010
Copper		0.005		0.007		0.005	0.0057
Cyanide	0.005		0.0644		0.005		0.0248
Cyanide, A	0.005		0.0656		0.005		0.0252
Lead		0.001		0.001		0.001	0.0010
Mercury		0.0000005		0.0000016		0.0000005	0.000001
Silver		0.0005				0.0005	0.0003
Chromium		0.005		0.005		0.01	0.0067
Zinc		0.051		0.0622		0.0637	0.0590
Selenium		0.01		0.01		0.01	0.0100
pH							
Chlorides		491		385		583	486.3333
O&G, Hydrocarbon	5		5		5		5.0000
O&G, Total	5		5		5		5.0000

ERWRF Pollutant Removal Efficiencies

Pollutant	EPA Activated Sludge	Dry Creek Tested
Pollutant		
Arsenic	45%	0%
Cadmium	67%	0%
Chromium	82%	26%
Copper	86%	91%
Cyanide, A	69%	
Cyanide, T	69%	
Lead	61%	67%
Mercury	60%	98%
Selinium	50%	0%
Silver	75%	50%
Zinc	79%	50%

ERWRF
EPA Activated Sludge Inhibition Threshold Levels

Pollutant	Activated Sludge	Nitrification
Arsenic	0.1	
Cadmium	1.0	5.20
Chromium	1.0	0.25
Copper	1.0	0.05
Cyanide, A	0.1	0.34
Cyanide, T	0.1	
Lead	0.1	0.50
Mercury	0.1	
Nickel	1.0	0.25
Selinium		
Silver	0.25	
Zinc	0.3	0.08

Local Limits Evaluation Criteria

	NPDES Daily	NPDES Monthly	Activated Sludge Inhibition	Nitrification Inhibition	Chronic	Acute
Arsenic	2.576	1.122	0.395		1.122	2.576
Cadmium	0.032	0.0005	4.205	66.307	0.0005	0.032
Chromium		4004	4.182	5.819		
Copper	0.392	0.204	4.061	1.356	0.204	0.392
Cyanide, A	0.178		0.299	4.494		0.178
Cyanide, T						
Lead	1.277	0.044	0.417	5.391	0.044	1.227
Mercury	0.018	0.00049	0.421			0.018
Nickel	4.232	0.454	4.189	1.795	0.454	4.232
O&G, hydrocarbon						
O&G, total						
Selinium	0.144	0.017			0.017	0.144
Silver	0.096		1.048			0.096
Zinc	1.712	1.712		0.317	1.712	1.712

TABLE 1

Local Limits Determination Based on NPDES Daily Effluent Limits

Pollutant	ENVIRONMENTAL CRITERIA AND PROCESS DATA BASE						MAXIMUM LOADING		INDUSTRIAL		
	IU Pollut. Flow (MGD) (Qind)	POTW Flow (MGD) (Qpotw)	Removal Efficiency (%) (Rpotw)	NPDES Daily Limit (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	0.293	1.37	45	0.34	0.007	1.077	7.063221818	0.06287526	6.294024376	2.57569687	10
Cadmium	0.293	1.37	67	0.002785	0.001	1.077	0.096426827	0.00898218	0.077801965	0.03183881	10
Chromium (T)	0.293	1.37	82		0.007	1.077	-	0.06287526	-	-	10
Copper	0.293	1.37	86	0.017925	0.04	1.077	1.462910464	0.3592872	0.957332218	0.39176804	10
Cyanide,A	0.293	1.37	69	0.022	0.0329	1.077	0.810863226	0.295513722	0.434263181	0.17771306	10
Lead	0.293	1.37	61	0.11402	0.001	1.077	3.340435169	0.00898218	2.997409472	1.22662667	10
Mercury	0.293	1.37	60	0.0017	0.00001	1.077	0.04855965	8.98218E-05	0.043613863	0.01784805	10
Nickel	0.293	1.37	42	0.585774	0.005	1.077	11.53954581	0.0449109	10.34068033	4.23170555	10
Selenium	0.293	1.37	50	0.02	0.0067	1.077	0.457032	0.060180606	0.351148194	0.1437	10
Silver	0.293	1.37	75	0.005943	0.001	1.077	0.271614118	0.00898218	0.235470526	0.09636135	10
Zinc	0.293	1.37	79	0.149644	0.35	1.077	8.141916263	3.143763	4.183961637	1.71219815	10

(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 NPDES Monthly Effluent Limits

Pollutant	ENVIRONMENTAL CRITERIA AND PROCESS DATA BASE						MAXIMUM LOADING		INDUSTRIAL		
	IU Pollut. Flow (MGD) (Qind)	POTW Flow (MGD) (Qpotw)	Removal Efficiency (%) (Rpotw)	NPDES Monthly Limit (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	0.293	1.37	45	✓ 0.15	0.007	1.077	3.116127273	0.06287526	2.741639285	1.12195811	10
Cadmium	0.293	1.37	67	✓ 0.000329	0.001	1.077	0.011391176	0.00898218	0.001269879	0.00051967	10
Chromium (T)	0.293	1.37	82	✓ 171.29	0.007	1.077	10872.91823	0.06287526	9785.563535	4004.5357	10
Copper	0.293	1.37	86	✓ 0.011673	0.04	1.077	0.952666881	0.3592872	0.498112993	0.20384225	10
Cyanide,A	0.293	1.37	69	✓ 0.0052	0.0329	1.077	0.191658581	0.295513722	-0.123020999	-0.0503438	10
Lead	0.293	1.37	61	✓ 0.004443	0.001	1.077	0.130166229	0.00898218	0.108167426	0.04426524	10
Mercury	0.293	1.37	60	✓ 0.000051	0.00001	1.077	0.00145679	8.98218E-05	0.001221289	0.00049979	10
Nickel	0.293	1.37	42	✓ 0.065127	0.005	1.077	1.282979442	0.0449109	1.109770598	0.45415024	10
Selenium	0.293	1.37	50	✓ 0.005	0.0067	1.077	0.114258	0.060180606	0.042651594	0.01745427	10
Silver	0.293	1.37	75		0.001	1.077	-	0.00898218	-	-	10
Zinc	0.293	1.37	79	✓ 0.149644	0.35	1.077	8.141916263	3.143763	4.183961637	1.71219815	10
TTO											

(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 monthly 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 = 8.34 * Ccrit * Qpotw

TABLE 3

Local Limits Determination Based on Activated Sludge Inhibition Level

Pollutant	ENVIRONMENTAL CRITERIA AND PROCESS DATA BASE						MAXIMUM LOADING		INDUSTRIAL		
	IU Pollut. Flow (MGD) (Qind)	POTW Flow (MGD) (Qpotw)	Removal Efficiency (%) (Rprim)	Activated Sludge 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	0.293	1.37	0	0.1	0.007	1.077	1.14258	0.06287526	0.96544674	0.39508874	10
Cadmium	0.293	1.37	0	1	0.001	1.077	11.4258	0.00898218	10.27423782	4.20451536	10
Chromium (T)	0.293	1.37	0	1	0.007	1.077	11.4258	0.06287526	10.22034474	4.18246075	10
Copper	0.293	1.37	0	1	0.04	1.077	11.4258	0.3592872	9.9239328	4.06116041	10
Cyanide,A	0.293	1.37	0	0.1	0.0329	1.077	1.14258	0.295513722	0.732808278	0.29988635	10
Lead	0.293	1.37	0	0.1	0.001	1.077	1.14258	0.00898218	1.01933982	0.41714334	10
Mercury	0.293	1.37	0	0.1	0.00001	1.077	1.14258	8.98218E-05	1.028232178	0.42078235	10
Nickel	0.293	1.37	0	1	0.005	1.077	11.4258	0.0449109	10.2383091	4.18981229	10
Selenium	0.293	1.37	0		0.0067	1.077	-	0.060180606	-	-	10
Silver	0.293	1.37	0	0.25	0.001	1.077	2.85645	0.00898218	2.56182282	1.04837201	10
Zinc	0.293	1.37	0	0.3	0.35	1.077	3.42774	3.143763	-0.058797	-0.0240614	10

(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 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 4

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	0.293	1.37	45		0.007	1.077	-	0.06287526	-	-	10
Cadmium	0.293	1.37	67	✓ 5.2	0.001	1.077	180.0429091	0.00898218	162.029636	66.3072147	10
Chromium (T)	0.293	1.37	82	✓ 0.25	0.007	1.077	15.86916667	0.06287526	14.21937474	5.81897952	10
Copper	0.293	1.37	86	✓ 0.05	0.04	1.077	4.080642857	0.3592872	3.313291371	1.35589469	10
Cyanide,A	0.293	1.37	69	✓ 0.34	0.0329	1.077	12.53152258	0.295513722	10.9828566	4.49450266	10
Lead	0.293	1.37	61	✓ 0.5	0.001	1.077	14.64846154	0.00898218	13.1746332	5.39144106	10
Mercury	0.293	1.37	60		0.00001	1.077	-	8.98218E-05	-	-	10
Nickel	0.293	1.37	42	✓ 0.25	0.005	1.077	4.924913793	0.0449109	4.387511514	1.79549665	10
Selenium	0.293	1.37	50		0.0067	1.077	-	0.060180606	-	-	10
Silver	0.293	1.37	75		0.001	1.077	-	0.00898218	-	-	10
Zinc	0.293	1.37	79	✓ 0.08	0.35	1.077	4.352685714	3.143763	0.773654143	0.31660166	10

(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 = 8.34 * Ccrit * Qpotw

TABLE 7

Local Limits Determination Based on Chronic Water Quality Standards

Pollutant	ENVIRONMENTAL CRITERIA AND PROCESS DATA BASE								MAXIMUM LOADING		INDUSTRIAL		
	IU Pollut. Flow (MGD) (Qind)	POTW Flow (MGD) (Qpotw)	Upstream Flow (MGD) (Qstr)	Upstream Conc. (mg/l) (Cstr)	Removal Efficiency (%) (Rpotw)	Chronic WQS (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	0.293	1.37	0		45	0.15	0.007	1.077	3.116127273	0.06287526	2.741639285	1.121958114	10
Cadmium	0.293	1.37	0		67	0.000329	0.001	1.077	0.011391176	0.00898218	0.001269879	0.000519671	10
Chromium (T)	0.293	1.37	0		82		0.007	1.077	-	0.06287526	-	-	10
Copper	0.293	1.37	0		86	0.011673	0.04	1.077	0.952666881	0.3592872	0.498112993	0.203842248	10
Cyanide,A	0.293	1.37	0		69	0.0052	0.0329	1.077	0.191658581	0.29551372	-0.123020999	-0.050343752	10
Lead	0.293	1.37	0		61	0.004443	0.001	1.077	0.130166229	0.00898218	0.108167426	0.04426524	10
Mercury	0.293	1.37	0		60		0.00001	1.077	-	8.9822E-05	-	-	10
Nickel	0.293	1.37	0		42	0.065127	0.005	1.077	1.282979442	0.0449109	1.109770598	0.454150235	10
Selenium	0.293	1.37	0		50	0.005	0.0067	1.077	0.114258	0.06018061	0.042651594	0.017454266	10
Silver	0.293	1.37	0		75		0.001	1.077	-	0.00898218	-	-	10
Zinc	0.293	1.37	0		79	0.149644	0.35	1.077	8.141916263	3.143763	4.183961637	1.712198147	10

(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.
(Qstr) Receiving stream (upstream) 7Q10 flow in MGD.
(Cstr) Receiving stream background level in mg/l.
(Rpotw) Removal efficiency across POTW as percent.
(Ccrit) State chronic water quality standard 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

$$Lhw = \frac{8.34 * (Ccrit * (Qstr + Qpotw) - (Cstr * Qstr))}{1 - Rpotw}$$

TABLE 8

Local Limits Determination Based on Acute Water Quality Standards

Pollutant	ENVIRONMENTAL CRITERIA AND PROCESS DATA BASE								MAXIMUM LOADING		INDUSTRIAL		
	IU Pollut. Flow (MGD) (Qind)	POTW Flow (MGD) (Qpotw)	Upstream Flow (MGD) (Qstr)	Upstream Conc. (mg/l) (Cstr)	Removal Efficiency (%) (Rpotw)	Acute WQS (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	0.293	1.37	0	0	45	0.34	0.007	1.077	7.063221818	0.06287526	6.294024376	2.575696866	10
Cadmium	0.293	1.37	0	0	67	0.002785	0.001	1.077	0.096426827	0.00898218	0.077801965	0.031838815	10
Chromium (T)	0.293	1.37	0	0	82		0.007	1.077	-	0.06287526	-	-	10
Copper	0.293	1.37	0	0	86	0.017925	0.04	1.077	1.462910464	0.3592872	0.957332218	0.39176804	10
Cyanide,A	0.293	1.37	0	0	69	0.022	0.0329	1.077	0.810863226	0.29551372	0.434263181	0.177713057	10
Lead	0.293	1.37	0	0	61	0.11402	0.001	1.077	3.340435169	0.00898218	2.997409472	1.226626674	10
Mercury	0.293	1.37	0	0	60	0.0017	0.00001	1.077	0.04855965	8.9822E-05	0.043613863	0.017848055	10
Nickel	0.293	1.37	0	0	42	0.585774	0.005	1.077	11.53954581	0.0449109	10.34068033	4.231705555	10
Selenium	0.293	1.37	0	0	50	0.02	0.0067	1.077	0.457032	0.06018061	0.351148194	0.1437	10
Silver	0.293	1.37	0	0	75	0.005943	0.001	1.077	0.271614118	0.00898218	0.235470526	0.096361352	10
Zinc	0.293	1.37	0	0	79	0.149644	0.35	1.077	8.141916263	3.143763	4.183961637	1.712198147	10

(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.
(Qstr) Receiving stream (upstream) 1Q10 flow in MGD.
(Cstr) Receiving stream background level in mg/l.
(Rpotw) Removal efficiency across POTW as percent.
(Ccrit) State acute water quality standard 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 = 8.34 * (Ccrit * (Qstr + Qpotw) - (Cstr * Qstr))