



# CITY CORPORATION

Russellville Water and Sewer System

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January 19, 2010

Mr. Rufus Torrence  
Arkansas Department of Environmental Quality  
5301 Northshore Drive  
North Little Rock, AR 72118

Re: Russellville City Corporation TBLL  
AFIN 58-00105; NPDES Permit No. AR0021768

Dear Mr. Torrence:

Please find attached a copy of the calculations prepared to document the Technically Based Local Limits (TBLL) for the Russellville wastewater treatment plant. These limits were developed by employing the calculation methodology used by the ADEQ and the guidance provided by EPA guidance documents. Please review the information submitted and respond with any comments.

We appreciate the Department's cooperation in this matter. If you have any questions or need additional information please feel free to contact me or Sam Gates of Garver at (501) 376-3633.

Sincerely,

RUSSELLVILLE CITY CORPORATION

Randy Bradley  
Pretreatment Coordinator

Attachment: TBLL Calculations

Cc: Mr. Aaron Stallmann, PE – Garver  
Mr. Sam Gates – Garver

Outfall 001

**Russellville Maximum Allowable Headworks Loading**

Pollutant	% Rem***	Water Quality	Water Quality*	Sludge	Sludge+	Inhibition**	Inhibition++	MAHL	MAHC	Domestic Allocation for %SF	MAIL	Max Inf Exceeded	Max Effluent	
		mg/l	lbs/day	mg/kg	lbs/day	mg/l	lbs/day	lbs/day	mg/l	lbs/day	lbs/day^	lbs/day	MAHC	vs WQS(mg/l)
Cadmium Total	67	0.0018	0.253	85	13.942	1.00	60.88	0.253	0.00415	0.07	0.19	0.119	No	No
Copper Total	86	0.0092	2.988	4300	549.494	1.00	60.88	2.988	0.04907	1.55	2.24	0.688	0.5300	0.0920
Lead Total	61	0.0027	0.315	840	105.238	1.00	60.88	0.315	0.00517	0.01	0.24	0.224	0.0400	0.0090
Mercury Total	60	0.00001	0.002	57	7.054	0.10	6.09	0.002	0.00002	0.00	0.0011	0.000	0.0038	0.0083
Nickel Total	42	0.0970	7.571	420	61.869	1.00	60.88	7.571	0.12435	0.03	5.68	5.644	No	No
Selenium Total	50	0.0056	0.505	100	11.001	0.20	12.18	0.505	0.00830	1.23	0.38	0.000	No	No
Silver Total	75	0.0009	0.169	0	0.000	0.25	15.221	0.169	0.00278	0.02	0.13	0.107	0.0230	0.0190
Zinc Total	79	0.0855	18.444	7500	1043.343	0.800	48.71	18.444	0.30295	10.80	13.83	3.037	0.8000	0.3250
Chromium Total	82	0.2954	74.328	3000	330.026	1.00	60.882	60.882	1.00000	0.29	45.66	45.374	No	No
Cyanide Total	69	0.0058	0.848	0	0.000	0.10	6.088	0.848	0.01392	0.18	0.64	0.481	0.0170	0.0140
Arsenic	45	0.3490	28.733	75	18.316	0.10	6.088	6.088	0.10000	0.88	4.57	3.690	No	No
Molybdenum	50	NA	NA	75	16.485	0.20	12.176	12.176	0.20000	0.14	9.13	8.992	No	No
Beryllium	50	11160	1010787.984	0	0.000	0.10	6.0882	6.088	0.10000	0.01	4.57	4.557	No	No

Dry tons/day of sludge\*\*\*\* 1.21 Safety Factor 0.25  
 Sludge Percent Solids 1.36 %  
 Sludge Rate to Disposal 0.58 MGD  
 Sludge Specific Gravity 0.97

\* lbs/day = mg/l \* 8.34 \* average flow / (1-%Rem)

\*\* Page 3-44 of EPA 833B87202 Be est @ 0.10 mg/l and Zinc Level from 04-19-2005 Inf analysis

+ lbs/day = (dry tons/day \* 0.002 \* critria(mg/kg)) / % Rem; Dry Tons/Day taken from Audit report dated 12-16-03, page 3

++ lbs/day = mg/l \* Flow \* 8.34

^ lbs/day = (1 - SF) \* MAHL

MAIL = Maximum allowable industrial loading = Allocation for % SF - Domestic

\*\*\* Page 3-58 EPA 833B87202, Be & Mo est @ 50

\*\*\*\*Dry tons/day of sludge from R Bradley email dated 5-13-2008 with 441.3 dry tons/year or 441.3/365 = 1.21 Dry tons/day

**Russellville City Corporation, Russellville Arkansas**  
**Maximum Allowable Headworks Loading Development**  
**Wastewater Treatment Plant (PCW), NPDES Permit Number AR0021768 Outfall 001**  
**September-09**

**Facility Information**

Parameter	Value	Units	Symbol	Comment
Influent Flow Rate	7.3	MGD	Qpotw	Design Rate
POTW Average Flow Rate	5.43	MGD	Qpotw	From 2007 Annual Report
Sludge Rate to Digester	0.0277	MGD		From Utility
Sludge Rate to Disposal	0.0189	MGD	Qsludg	From Utility
Total Solids to Disposal	1.36	%	TS	From Utility
Effluent Total Solids	17.96	mg/L		From Utility
Hardness	40	mg/L		estimate
Sludge Application Area	NA	Acres	SA	
Disposal Site Useful Life	NA	Years	DSUL	
Industrial Flow Rate	1.193	MGD	Qind	From Utility
Safety Factor (Capacity Reserve)	0.25	none	SF	Assumption
Sludge Specific Gravity	0.9689	kg/L	SG	From Utility

Qpotw = Flow through Publicly Owned Treatment Works  
 Qsludg = Flow through Sludge Processing  
 Qind = Flow from industrial users

**Receiving Stream Information Note Arkansas River**

Parameter	Units	Concentration Factor	Value	Symbol	Comments
Flow Rate	MGD		0.0	7Q10	NPDES Permit Fact Sheet
@25%	MGD	Chronic (CCC)	0.00		NPDES Permit Fact Sheet
@06%	MGD	Acute (CMC)	0.00		NPDES Permit Fact Sheet
Hardness	mg/L		25.00		Ecoregion Value
Arsenic	mg/L		1		No Data
Cadmium	mg/L		1		No Data
Chromium	mg/L		1		No Data
Copper	mg/L		1		No Data
Lead	mg/L		1		No Data
Mercury	mg/L		1		No Data
Nickel	mg/L		1		No Data
Silver	mg/L		1		No Data
Zinc	mg/L		1		No Data
Cyanide	mg/L		1		No Data
Ammonia	mg/L		1		No Data
Selenium	mg/L		1		No Data
Molybdenum	mg/L		1		No Data

**Pollutant Removal Efficiencies**

Pollutant	PCW		EPA Median Removal			Use for MAHL Development		
	Rprim	Rpri+sec	Rpri	Rpri+sec	Rpotw	Rpri	Rpri+sec	Rpotw
Arsenic		0.00		45%		0%	45%	45%
Antimony								
Beryllium		#VALUE!						
Cadmium		0%	15%	67%	50%	15%	67%	67%
Chromium		100%	27%	82%	72%	27%	82%	82%
Copper		84.0%	22%	86%	85%	50%	85%	86%
Lead		88%	57%	61%	52%	57%	61%	61%
Mercury		89%	10%	60%	67%	10%	60%	60%
Nickel		74.6%	14%	42%	17%	14%	42%	17%
Silver		89.5%	20%	75%	62%	20%	75%	75%
Zinc		75.3%	27%	79%	78%	55%	67.4%	67.4%
Cyanide		99.9%	27%	69%	66%	27%	69%	69%
Ammonia	85%	95%					85%	95%
Selenium					50%			50%
Molybdenum					50%			50%
Nitrate		61%						61%
TSS		99%						99%
CBOD	96%	99%					96%	99%
BOD5	96%	99%						99%

Rprim = Removal through Primary Treatment  
 Rpri+sec = Removal through Primary and Secondary Treatment  
 Rpotw = Removal through POTW  
 Note: Typical values from EPA Guideline for TBLL Development

**Nitrate - NO3N**

	NO3-N		NO3-N	NH3-N	NH3-N	NH3-N	NH3-N	Additional Samples			
	Ffinal Eff	mg/L	Rpotw	Influent	Ffinal Eff	% remain	Rpotw	NO3-N	NO3-N	NO3-N	
Monthly Average				mg/L	mg/L			Dig Inf	Dig Eff	R digester	
								mg/L	mg/L	%	
Jan-08		9.5		16.43	1.14	6.9%	93.1%				
Feb-08		5.1		10.08	1.63	16.2%	83.8%				
Mar-08		3.5		6.81	1.80	26.4%	73.6%				
Apr-08		7.5		12.28	0.71	5.8%	94.2%				
May-08		9.1		10.72	0.19	1.8%	98.2%				
Jun-08		8.4		9.00	0.17	1.9%	98.1%	Jun-09	17.00	6.60	61.1%
Jul-08		10.4		11.25	0.09	0.8%	99.2%				
Aug-08		11.3		13.42	0.08	0.6%	99.4%				
Sep-08		9.9		9.44	0.06	0.6%	99.4%				
Oct-08		12.8		13.07	0.07	0.5%	99.5%				
Nov-08		16.7		14.36	0.07	0.5%	99.5%				
Dec-08		15.2		13.88	0.10	0.7%	99.3%				
Jan-09		12.6		14.45	0.21	1.5%	98.5%				
Feb-09		11.5		12.78	0.35	2.7%	97.3%				
Mar-09		8.7		10.14	1.00	9.9%	90.1%				
<u>Apr-09</u>		<u>7.8</u>		<u>9.63</u>	<u>0.61</u>	<u>6.3%</u>	<u>93.7%</u>				
Average		10.0		11.73	0.52	5.2%	94.8%	17.00	6.60	61.1%	

**Domestic Sampling Average**

Pollutant	mg/L
Arsenic	0
Antimony	
Beryllium	0
Cadmium	0
Chromium	0.00821
Copper	0.04433
Lead	0.00033
Mercury	0.00006
Nickel	0.00097
Silver	0.00056
Zinc	0.30822
Cyanide	0
Ammonia	18.5
Selenium	0
Molybdenum	0
Nitrate	
TSS	129
BOD 5-day	171

**Russellville - City Corporation  
 Maximum Allowable Headworks Loading Development  
 Wastewater Treatment Plant - PCW Outfall 001  
 September-09**

Process of Calculating Maximum Allowable Headworks Loading (MAHL)

1. Calculate Removal Efficiencies
2. Calculate Allowable Headworks Loading (AHL)
  - a. AHL Based on NPDES Permit
  - b. AHL Based on Water Quality
    1. EPA Water Quality
      - a. Using MRE
      - b. Using Sludge Data
    2. ADEQ Water Quality
      - a. Using MRE
      - b. Using Sludge Data
  - c. Inhibition - Based on AHL
  - d. AHL Based on Sludge Land Application and Surface Disposal Criteria
3. Determination of the Maximum Allowable Headworks Loading

**1. Calculate Removal Efficiencies using Mean Removal Efficiencies (MRE)**

Rpotw = Plant removal efficiency from headworks to plant effluent, as decimal  
 Rprim = Removal efficiency from headworks to primary treatment effluent, as decimal  
 Rsec = Removal efficiency from headworks to secondary treatment effluent, as decimal  
 Ir = POTW influent pollutant concentration at headworks, mg/L  
 Epotw,t = POTW effluent pollutant concentration, mg/L  
 Eprim, x = Primary treatment effluent pollutant concentration, mg/L  
 Esec, y = Secondary treatment effluent pollutant concentration, mg/L  
 t = Plant effluent samples, numbered 1to T  
 r = Plant influent samples, numbered 1to R  
 x = Primary treatment effluent samples, numbered 1to X  
 y = Secondary treatment effluent samples, numbered 1to Y  
 <DL = Less than Detection Level  
 Note: See Russellville PPS data sheets for Influent, Effluent, and Sludge Data

$$R_{potw} = (I_r - E_{potw,t}) / I_r$$

Pollutant	Rpotw	Ir mg/L	Epotw, t mg/l	t #	r #	y
Arsenic	0.450	0.00016	0.00012		2	4
Antimony						
Beryllium	<DL	<DL	<DL			
Cadmium	0.670	0.00007	0.00009		1	2
Chromium	0.820	0.02727	0.00106		1	23
Copper	0.860	0.08193	0.01181		44	25
Lead	0.610	0.00302	0.00060		3	18
Mercury	0.600	0.00072	0.00068		17	17
Nickel	0.746	0.00831	0.00229		5	14
Silver	0.750	0.00484	0.00138		4	13
Zinc	0.753	0.23244	0.05658		64	26
Cyanide	0.690	0.00200	0.00281		6	5
Selenium	0.500	0.00016	0.00000			1
Molybdenum	0.500	0.01453	0.00812		9	17
Ammonia	0.948	11.73	0.52			
Nitrates	0.850					
TSS	0.978	327	7.1		31	20
CBOD	0.994	298.6	1.86		21	21
BOD5	0.994					

**Russellville - City Corporation**  
**Maximum Allowable Headworks Loading Development**  
**Wastewater Treatment Plant - PCW Outfall 001**  
**September-09**

**Plant Removal Efficiencies Calculating using MRE and Sludge Data**

Note: Due to small data set (20-21 Data Points) equation 5.4 from EPA Guidance was used

$$R_{potw} = (S_u \times 8.34 \times PS/100 \times Q_{slud} \times G_{slud}) / (I_r \times 8.34 \times Q_{potw})$$

$R_{potw}$	=	Plant removal efficiency from headworks to plant effluent, as decimal		
$I_n, I_r$	=	POTW influent pollutant concentration at headworks, mg/L		
PS	=	Percent Solids of sludge to disposal,	=	1.36 %
$Q_{slud}$	=	Total sludge flow rate to disposal, MGD	=	0.0189 MGD
$Q_{potw}$	=	POTW average flow rate, MGD	=	5.43 MGD
$G_{slud}$	=	Specific gravity of sludge, kg/L	=	0.96892 kg/L
8.34	=	Unit conversion factor		
$S_n, S_u$	=	Sludge pollutant concentration, mg/kg		
n	=	Paired observations, numbered 1 to N		
u	=	Sludge samples, numbered 1 to U		
r	=	Influent samples numbered 1 to R		
<DL	=	Less than Detection Level		

**SLUDGE DATA**

Pollutant	$R_{potw}$	$I_n, I_r$ mg/L	$S_n, S_u$ mg/Kg	u #	r #
Arsenic	0.99	0.00016	<DL	21	4
Antimony	0.99	0.00000	<DL	21	
Beryllium	<DL	<DL	<DL	21	
Cadmium	1.0182204	0.00007	1.48	20	2
Chromium	0.3282	0.02727	195.15	20	23
Copper	0.1876	0.08193	335.14	21	25
Lead	0.7179	0.00302	47.22	21	18
Mercury	0.1033	0.00072	1.63	21	17
Nickel	0.2426	0.00831	43.96	21	14
Silver	0.9900	0.00484	<DL	21	13
Zinc	0.2102	0.23244	1065.14	21	26
Cyanide	0.99	0.00200	<DL	21	5
Selenium	0.5166322	0.00016	1.76	21	1
Molybdenum	0.067899	0.01453	21.51	21	17

**Russellville - City Corporation**  
**Maximum Allowable Headworks Loading Development**  
**Wastewater Treatment Plant - PCW Outfall 001**  
**September-09**

**2. Calculation of AHL**

**a. AHL Based on NPDES Permit Limit**

$$AHL_{NPDES} = (8.34 \times C_{NPDES} \times Q_{POTW}) / (1 - R_{POTW})$$

- AHL<sub>NPDES</sub> = AHL based on NPDES permit limit, lb/day (Mass on Monthly Average)
- C<sub>NPDES</sub> = NPDES permit limit, mg/L
- L<sub>NPDES</sub> = NPDES permit limit, lb/day
- Q<sub>POTW</sub> = POTW average flow rate, MGD 5.43 MGD
- R<sub>POTW</sub> = Plant removal efficiency from headworks to plant effluent, as decimal
- 8.34 = Unit conversion factor

Note! CBOD, TSS, NH3-N, and DO uses a design Flow =  
 There are currently the following AHL based on NPDES Permit Limits for the Russellville PCW.

Pollutant	L <sub>NPDES</sub>	C <sub>NPDES</sub>	C <sub>NPDES</sub>	NPDES	Calculated AHL <sub>NPDES</sub> lb/day
	lb/day	mg/L	mg/L	R <sub>POTW</sub>	
	Monthly Avg.	Monthly Avg.	7-Day Avg.		
Ammonia	243	4	6	0.948	0.00
Nitrates	609	10	15	0.85 Assumption	0.00
Copper	0.56	0.00924	0.01857	0.860	2.99
Zinc	5.2	0.086	0.172	0.753	15.80
TSS	1826	30	45	0.978	0.00
BOD5	1826	30	45	0.9937709	0.00

Note! Copper & Zinc Concentrations are Total Recoverable.

Ammonia = Ammonia Nitrogen (NH3-N)

Nitrates = NO3-N

Note! NPDES permit AR0021768 list Discharge Limitations in lbs/day 7.3 MGD

**b. AHL Based on Water Quality**

$$AHL_{WQ} = (8.34[C_{WQ}(Q_{STR} + Q_{POTW}) - (C_{STR} \times Q_{STR})]) / (1 - R_{POTW})$$

- AHL<sub>wq</sub> = AHL based on water quality criteria, lb/day
- C<sub>strs</sub> = Receiving Stream background concentration, mg/L = 0
- C<sub>wq</sub> = State WQS or EPA WQS, mg/L
- Q<sub>str</sub> = Receiving stream (upstream) flow rate, MGD
  - Acute Criteria (CMC) = 0.00 MGD
  - Chronic Criteria (CCC) = 0.00 MGD
- Q<sub>potw</sub> = POTW average flow rate, MGD = 5.43 MGD
- R<sub>potw</sub> = Plant removal efficiency from headworks to plant effluent, as decimal
- 8.34 = Unit conversion factor

AHL Using MRE Rpotw and EPA Cwq

Pollutant	CMC	CCC	Cstrs mg/L	CMC	CCC	MRE Rpotw
	AHLwq lb/day	AHLwq lb/day		Cwq mg/L	Cwq mg/L	
Arsenic	28.00	12.35	0	0.34	0.15	0.45
Antimony	0.00	0.00	0			
Beryllium	0.00	0.00	0			0
Cadmium	0.59	0.30	0	0.0043	0.0022	0.67
Chromium	4.03	2.77	0	0.016	0.011	0.82
Copper	4.21	2.91	0	0.013	0.009	0.86
Lead	7.55	0.29	0	0.065	0.0025	0.61
Mercury	0.16	0.09	0	0.0014	0.00077	0.6
Nickel	83.81	9.27	0	0.47	0.052	0.7460492
Silver	0.62	0.00	0	0.0034		0.75
Zinc	22.04	22.04	0	0.12	0.12	0.7534844
Cyanide	3.21	0.76	0	0.022	0.0052	0.69
Selenium	26.27	6.43	0	0.29	0.071	0.5
Molybdenum	0.00	0.00	0			0.5

Note! CBOD, TSS, NH3-N, and DO uses a design Flow = 7.3 MGD

**Russellville - City Corporation**  
**Maximum Allowable Headworks Loading Development**  
**Wastewater Treatment Plant - PCW Outfall 001**  
**September-09**

AHL Using Sludge Rpotw and EPA Cwq

Pollutant	CMC AHLwq lb/day	CCC AHLwq lb/day	Cstrs mg/L	CMC Cwq mg/L	CCC Cwq mg/L	Sludge Rpotw
Arsenic	1539.73	679.29	0	0.34	0.15	0.99
Antimony	0.00	0.00	0			0.99
Beryllium	0.00	0.00	0			0
Cadmium	19.47	9.96	0	0.0043	0.0022	0.99
Chromium	1.08	0.74	0	0.016	0.011	0.3281987
Copper	0.72	0.50	0	0.013	0.009	0.1876093
Lead	10.44	0.40	0	0.065	0.0025	0.7179389
Mercury	0.07	0.04	0	0.0014	0.00077	0.1033285
Nickel	28.10	3.11	0	0.47	0.052	0.2425981
Silver	15.40	0.00	0	0.0034		0.99
Zinc	6.88	6.88	0	0.12	0.12	0.2101727
Cyanide	99.63	23.55	0	0.022	0.0052	0.99
Selenium	27.17	6.65	0	0.29	0.071	0.5166322
Molybdenum	0.00	0.00	0			0.067899

AHL Using MRE Rpotw and ADEQwq (Reg 2)

Pollutant	CMC AHLwq lb/day	CCC AHLwq lb/day	Cstrs mg/L	CMC Cwq mg/L	CCC Cwq mg/L	MRE Rpotw
Arsenic	0.00	0.00	0			0.45
Antimony	0.00	0.00	0			
Beryllium	0.18	0.18	0	0.004	0.004	0
Cadmium	0.69	0.16	0	0.005	0.0012	0.67
Chromium	4.03	2.67	0	0.016	0.0106	0.82
Copper	6.79	4.53	0	0.021	0.014	0.86
Lead	9.52	0.35	0	0.082	0.003	0.61
Mercury	0.23	0.00	0	0.002	0.00001	0.6
Nickel	304.76	33.88	0	1.709	0.19	0.7460492
Silver	0.91	0.00	0	0.005		0.75
Zinc	25.35	23.15	0	0.138	0.126	0.7534844
Cyanide	3.21	0.76	0	0.022	0.0052	0.69
Selenium	1.81	0.45	0	0.02	0.005	0.5
Molybdenum	0.00	0.00	0			0.5



**Russellville - City Corporation**  
**Maximum Allowable Headworks Loading Development**  
**Wastewater Treatment Plant - PCW Outfall 001**  
**September-09**

AHL Using Sludge Rpotw and ADEQwq (Reg 2)

Pollutant	CMC	CCC	Cstrs mg/L	CMC	CCC	MRE Rpotw
	AHLwq lb/day	AHLwq lb/day		Cwq mg/L	Cwq mg/L	
Arsenic	0.00	0.00	0			0.45
Antimony	0.00	0.00	0			
Beryllium	0.18	0.18	0	0.004	0.004	0
Cadmium	0.69	0.16	0	0.005	0.0012	0.67
Chromium	4.03	2.67	0	0.016	0.0106	0.82
Copper	6.79	4.53	0	0.021	0.014	0.86
Lead	9.52	0.35	0	0.082	0.003	0.61
Mercury	0.226	0.001	0	0.002	0.00001	0.6
Nickel	304.76	33.88	0	1.709	0.19	0.7460492
Silver	0.91	0.00	0	0.005		0.75
Zinc	7.16	6.49	0	0.039	0.03534	0.7534844
Cyanide	3.21	0.76	0	0.022	0.0052	0.69
Selenium	1.81	0.45	0	0.02	0.005	0.5
Molybdenum	0.00	0.00	0			0.5

**c. Inhibition Based AHL**

Activated Sludge

$$AHL_{sec} = (8.34 \times C_{inhib2} \times Q_{potw}) / (1 - R_{prim})$$

Nitrification

$$AHL_{ter} = (8.34 \times C_{inhib3} \times Q_{potw}) / (1 - R_{sec})$$

Aerobic Digestion

$$AHL_{dgstr} = (8.34 \times C_{dgstinhib} \times Q_{dgstr}) / R_{potw}$$

$AHL_{sec}$	=	AHL based on secondary treatment inhibition, lb/day	
$AHL_{ter}$	=	AHL based on tertiary treatment inhibition, lb/day	
$C_{sinhib2}$	=	Inhibition criterion for secondary treatment, mg/L	
$C_{sinhib3}$	=	Inhibition criterion for tertiary treatment, mg/L	
$Q_{potw}$	=	POTW average flow rate, MGD	= 5.43 MGD
$R_{prim}$	=	Removal efficiency from headworks to primary effluent, as decimal	
$R_{sec}$	=	Removal efficiency from headworks to secondary effluent, as decimal	
8.34	=	Unit conversion factor	
$AHL_{dgstr}$	=	AHL based on sludge digestion inhibition, lb/day	
$L_{infl}$	=	POTW influent loading, lb/day	
$C_{dgstinhib}$	=	Sludge digester inhibition criterion, mg/L	
$C_{dgstr}$	=	Existing pollution level in sludge, mg/L	
$Q_{dgstr}$	=	Sludge flow rate to digester, MGD	= 0.0277 MGD
$R_{potw}$	=	Removal efficiency from headworks to primary effluent, as decimal	

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**d. AHL Based on Sludge Land Application and Surface Disposal Criteria**

Sludge Disposal

$$AHL_{slgd} = (C_{slgstd} \times 8.34 \times PS/100 \times Q_{slgd} \times G_{slgd}) / R_{potw}$$

$AHL_{slgd}$	=	AHL based on sludge, lb/day	
$C_{slgstd}$	=	Sludge Standard, mg/kg dry sludge	
PS	=	Percent Solids of sludge to disposal,	1.36 %
$Q_{slgd}$	=	Total sludge flow rate to disposal, MGD	0.0189 MGD
$R_{potw}$	=	Plant removal efficiency from headworks to plant effluent, as decimal	
$G_{slgd}$	=	Specific gravity of sludge, kg/L	= 0.96892 kg/L
8.34	=	Unit conversion factor	

Pollutant	PROCESS INHIBITION				SLUDGE DISPOSAL				
	Activated Sludge		Nitrification		Aerobic Digestion		SD3/NPDE: SD3	Headworks	
	Cinhib	AHL	Cinhib	AHL	Cinhib	AHL	Cum Lin	Table 3	AHL
	mg/L	lb/day	mg/L	lb/day	mg/L	lb/day	lb/ac	mg/kg	lb/day
Arsenic		0.1 4.52862		1.5 123.50782		1.6 0.8213973	NA		41 0.1892457
Antimony							NA		-
Beryllium							NA		-
Cadmium	1	53.277882	5.2	713.60073	20	6.8960597	NA		39 0.1209051
Chromium	1	62.03589	0.25	62.8975	130	36.624805	NA		1200 3.0396395
Copper	1	90.5724	0.2	60.3816	40	10.745023	NA		1500 3.6228261
Lead	1	105.31674	0.5	58.059231	340	128.76413	NA		300 1.0215182
Mercury	0.1	5.0318		0		0	NA		17 0.0588508
Nickel	1	52.658372	0.25	19.519914	10	13.589294	NA		420 1.1693284
Silver		0		0	13	4.004312	NA		100 0.2769449
Zinc	0.3	30.1908	0.3	41.674417	400	137.10267	NA		2800 7.7185981
Cyanide	0.1	6.203589	0.34	49.668735	4	1.3392348	NA		-
Selenium							NA		100 0.4154174
Molybdenum							NA		-

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**9/9/2009**

**Data Summary**

Pollutant	NPDES	WATER QUALITY STANDARDS								PROCESS INHIBITION			SLUDGE DISPOSAL	MAHL	CRITERIA	MAHL w/SF	0.25	Domestic Residential		Net MAIL		
		EPA+M RE CMC	EPA+MR E CCC	EPA + Sludge CMC	EPA + Sludge CCC	ADEQ+M RE CMC	ADEQ+M RE CCC	ADEQ +Sludge CMC	ADEQ +Sludge CCC	ACTIV. SLDG	NITRIF	AER DIG						lb/day	lb/day	mg/L	lbs/day	mg/L
AHL	lb/day																					
Arsenic	NONE	28.00	12.35	1539.73	679.29	--	--	--	--	4.53	123.51	0.82	0.189248	0.189	SLUDGE DISPOSAL	0.142	0.0000	0.000	0.014	0.142		
Antimony	NONE	--	--	--	--	--	--	--	--	--	--	--	--	0.000	--		0.000	0.0000	0.000	0.000	0.000	
Beryllium	NONE	--	--	--	--	0.18	0.18	0.18	0.18	--	--	--	--	0.181	ADEQ+MRE	0.136	0.0000	0.000	0.014	0.138		
Cadmium	NONE	0.59	0.30	19.47	9.96	0.69	0.16	0.69	0.16	53.28	713.60	6.90	0.120905	0.121	SLUDGE DISPOSAL	0.091	0.0000	0.000	0.009	0.091		
Chromium	NONE	4.03	2.77	1.08	0.74	4.03	2.67	4.03	2.67	62.04	62.90	36.62	3.039639	0.742	EPA + Sludge	0.558	0.0082	0.418	0.014	0.138		
Copper	2.99	4.21	2.91	0.72	0.50	6.79	4.53	6.79	4.53	90.57	60.38	10.75	3.622826	0.502	EPA + Sludge	0.376	0.0443	2.258	-0.189	-1.882		
Lead	NONE	7.55	0.29	10.44	0.40	9.52	0.35	9.52	0.35	105.32	58.06	128.76	1.021518	0.290	EPA+MRE	0.218	0.0003	0.017	0.020	0.201		
Mercury	NONE	0.16	0.09	0.07	0.04	0.23	0.00	0.23	0.00	5.03	--	--	0.058851	0.001	ADEQ+MRE	0.001	0.0001	0.003	0.000	-0.002		
Nickel	NONE	83.81	9.27	28.10	3.11	304.76	33.88	304.76	33.88	52.66	19.52	13.59	1.169328	1.169	SLUDGE DISPOSAL	0.877	0.0010	0.049	0.083	0.828		
Silver	NONE	0.62	--	15.40	--	0.91	--	0.91	--	--	--	4.00	0.276945	0.277	SLUDGE DISPOSAL	0.208	0.0006	0.028	0.018	0.179		
Zinc	15.80	22.04	22.04	6.88	6.88	25.35	23.15	7.16	6.49	30.19	41.67	137.10	7.718598	6.492	ADEQ+Sludge	4.869	0.3082	15.698	-1.088	-10.829		
Cyanide	NONE	3.21	0.76	99.63	23.55	3.21	0.76	3.21	0.76	6.20	49.67	1.34	--	0.760	EPA+MRE	0.570	0.0000	0.000	0.057	0.570		
Selenium	NONE	26.27	6.43	27.17	6.65	1.81	0.45	1.81	0.45	--	--	--	0.415417	0.415	SLUDGE DISPOSAL	0.312	0.0000	0.000	0.031	0.312		
Molybdenum	NONE	0.00	--	--	--	--	--	--	--	--	--	--	--	0.000	--		0.0	0.0000	0.000	0.000	0.000	
Ammonia	0.00													0.000	--		0.0	18.5	942.249	-94.7	-942.2	
Nitrates	0.00													0.000	--		0.0	18.5	942.249	-94.7	-942.2	
TSS	0.00													0.000	--		0.0	129.0	6570.277	-660	-6570	
BOD5	0.00													0.000	--		0.0	171.0	8709.437	-875	-8709	

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