

## CALCULATIONS OF NEW MEXICO WATER QUALITY-BASED EFFLUENT LIMITATIONS

NMAC 20.6.4. **2005** (Do Not Change This Field)

Calculations Specifications:

Excel **Revised as August, 2008**

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STEP 1: REFERENCE IMPLEMENTATION PROCEDURES  
 INPUT FACILITY AND RECEIVING STREAM DATA  
 LIST SOURCE OF DATA INPUT

**FACT SHEET APPENDIX**

## IMPLEMENTATION PROCEDURES

The State of New Mexico Standards for Interstate and Intrastate Surface Waters are implemented in this spread sheet by using procedures established in the "Implementation Guidance for State of New Mexico Standards for Interstate and Intrastate streams", May 5, 1995.

FACILITY Santa Fe County Judicial

Permittee	Facility Name
NPDES Permit No.	NM0031046
Outfall No.(s)	001
Plant Effluent Flow (MGD)	0.72
Plant Effluent Flow (cfs)	1.116

For industrial and federal facility, use the highest monthly average flow for the past 24 months. For POTWs, use the design flow.

RECEIVING STREAM DATA INPUT

Receiving Stream Name	Santa Fe River
Basin Name	Rio Grande
Waterbody Segment Code No.	20.6.4.98
Is a publicly owned lake or reservoir (enter "1" if it's a lake, "0" if not)	0
Are acute aquatic life criteria considered (1= yes, 0= no) (MUST enter "1" for 2005 Standards)	1
Are chronic aquatic life criteria considered (1= yes, 0=no)	1
Are domestic water supply criteria considered (1= yes, 0=no)	0
Are irrigation water supply criteria considered (1= yes, 0=no)	0
Livestock watering and wildlife habitat criteria applied to all streams	

USGS Flow Station	USGS
WQ Monitoring Station No.	SJR
Receiving Stream TSS (mg/l)	20
Receiving Stream Hardness (mg/l as CaCO <sub>3</sub> )	20
Receiving Stream Critical Low Flow (4Q3) (cfs)	0
Receiving Stream Harmonic Mean Flow (cfs)	0.1
Avg. Water Temperature (C)	12
pH (Avg)	8
Fraction of stream allowed for mixing (F)	1

For intermittent stream, enter effluent TSS

For intermittent stream, enter effluent Hardness (If no data, 20 mg/l is used)

Enter "0" for intermittent stream and lake.

Enter harmonic mean or modified harmonic mean flow data

Enter 1, if stream morphology data is not available or for intermittent streams.

Fraction of Critical Low Flow

0

STEP 2: INPUT AMBIENT AND EFFLUENT DATA  
CALCULATE IN-STREAM WASTE CONCENTRATIONS

## DATA INPUT

Input pollutant geometric mean concentration as micro-gram per liter (ug/l or ppb)  
unless other unit is specified for the parameter.

Effluent value reported as "< detection level" (DL) but the DL is greater than MQL, input "1/2 DL" for calculation.

Effluent value reported as "< detection level" (DL) and the DL is smaller than MQL, input "0" for calculation.

If a less than MQL value is reported, input either the reported value or "0" for calculation.

The following formula is used to calculate the Instream Waste Concentration (Cd)

(Please refer to State Implementation Guidance for details)

$$Cd = [(F \cdot Qa \cdot Ca) + (Qe \cdot 2.13 \cdot Ce)] / (F \cdot Qa + Qe)$$

Where:

Cd = Instream Waste Concentration

F = Fraction of stream allowed for mixing (see NM Implementation Guidance)

Ce = Reported concentration in effluent

Ca = Ambient stream concentration upstream of discharge

Qe = Plant effluent flow

Qa = Critical low flow of stream at discharge point expressed as the 4Q3 or harmonic mean flow for human health criteria

The following formula convert metals reported in total form to dissolved form if criteria are in dissolved form

(Please refer to State Implementation Guidance for details)

$$Kp = Kpo \cdot (TSS)^a$$

Kp = Linear partition coefficient; Kpo and a can be found in table below

$$C/Ct = 1 / (1 + Kp \cdot TSS \cdot 10^{-6})$$

TSS = Total suspended solids concentration found in receiving stream (or in effluent for intermittent stream)

$$\text{Total Metal Criteria (Ct)} = Cr / (C/Ct)$$

C/Ct = Fraction of metal dissolved; and Cr = Dissolved criteria value

Total Metals	Total Value	Stream Linear Partition Coefficient					Lake Linear Partition Coefficient				
		Kpo	alpha (a)	Kp	C/Ct	Dissolved Value in Stream	Kpo	alpha (a)	Kp	C/Ct	Dissolved Value in Lake
Arsenic	20	480000	-0.73	53887.66189	0.481289107	9.62578214	480000	-0.73	53887.66189	0.481289107	9.62578214
Chromium		3360000	-0.93	207196.0069	0.194404262	0	2170000	-0.27	966454.995	0.049190569	0
Copper	6	1040000	-0.74	113310.7574	0.306164767	1.8369886	2850000	-0.9	192272.8058	0.20637892	1.23827352
Lead	100	2800000	-0.8	254878.9884	0.163999495	16.3999495	2040000	-0.53	416950.2799	0.107077781	10.7077781
Nickel	10	490000	-0.57	88840.0885	0.360126535	3.60126535	2210000	-0.76	226782.4678	0.18064728	1.8064728
Zinc	60	1250000	-0.7	153528.5033	0.245665836	14.7399502	3340000	-0.68	435558.075	0.102974294	6.17845764

The following formular is used to calculate hardness dependent criteria

(Please refer to State Water Quality Standards for details)

			Dissolved	
			WQC (ug/l)	
Cadmium (D)	Acute	$e(1.0166[\ln(\text{hardness})]-3.924)*CF1$	0.420098616	$CF1 = 1.136672 - 0.041838*\ln(\text{hardness})$
	Chronic	$e(0.7409[\ln(\text{hardness})]-4.719)*CF2$	0.080185716	$CF2 = 1.101672 - 0.041838*\ln(\text{hardness})$
Chromium (D)	Acute	$0.316 e(0.819[\ln(\text{hardness})]+3.7256)$	152.4888787	
	Chronic	$0.860 e(0.819[\ln(\text{hardness})]+0.6848)$	19.8356702	
Copper (D)	Acute	$0.960 e(0.9422[\ln(\text{hardness})]-1.700)$	2.949857764	
	Chronic	$0.960 e(0.8545[\ln(\text{hardness})]-1.702)$	2.263769249	
Lead (D)	Acute	$e(1.273[\ln(\text{hardness})]-1.46)*CF3$	10.79154489	$CF3 = 1.46203 - 0.145712*\ln(\text{hardness})$
	Chronic	$e(1.273[\ln(\text{hardness})]-4.705)*CF4$	0.420531012	$CF4 = 1.46203 - 0.145712*\ln(\text{hardness})$
Nickel (D)	Acute	$0.998 e(0.846[\ln(\text{hardness})]+2.255)$	119.9874916	
	Chronic	$0.997 e(0.846[\ln(\text{hardness})]+0.0584)$	13.32690594	
Zinc (D)	Acute	$0.978 e(0.8473[\ln(\text{hardness})]+0.884)$	29.96524909	
	Chronic	$0.986 e(0.8473[\ln(\text{hardness})]+0.884)$	30.2103636	
Silver (D)	Acute	$0.85 e(1.72[\ln(\text{hardness})]-6.59)$	0.201924903	

POLLUTANTS	CAS No.	STORET	Instream Waste Concentration							Domestic	Irrigation	Livestock/	Acute Fish	Chronic Fish	Human Health
			MQL	Ambient Conc.	Effluent Conc.	Acute Fshery	Domestic Suq	Chronic Std	Human Health Criteria	Criteria	Wildlife Criteria	Criteria	Criteria	Criteria	
				Ca (ug/l)	Ce (ug/l)	2.13*Ce	Cd,dom (ug/l)	Cd (ug/l)	Cd,hh (ug/l)	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
<b>Radioactivity, Nutrients, and Chlorine</b>															
Aluminum, dissolved	7429-90-5	01106	2.5		20	42.6	42.6	42.6	39.09671053	1E+100	5000	1E+100	750	87	1E+100
Barium, dissolved	7440-39-3	01005	100			0	0	0	0	2000	1E+100	1E+100	1E+100	1E+100	1E+100
Boron, dissolved	7440-42-8	01022	100		78	166.14	166.14	166.14	152.4771711	1E+100	750	5000	1E+100	1E+100	1E+100
Cobalt, dissolved	7440-48-4	01037	50			0	0	0	0	1E+100	50	1000	1E+100	1E+100	1E+100
Molybdenum, dissolved	7439-98-7	01062	10			0	0	0	0	1E+100	1000	1E+100	1E+100	1E+100	1E+100
Uranium, dissolved	7440-61-1	22706	0.1			0	0	0	0	5000	1E+100	1E+100	1E+100	1E+100	1E+100
Vanadium, dissolved	7440-62-2	01087	50			0	0	0	0	1E+100	100	100	1E+100	1E+100	1E+100
Ra-226 and Ra-228 (pCi/l)	11503					0	0	0	0	5	1E+100	30	1E+100	1E+100	1E+100
Strontium (pCi/l)	13501					0	0	0	0	8	1E+100	1E+100	1E+100	1E+100	1E+100
Tritium (pCi/l)	04124					0	0	0	0	20000	1E+100	20000	1E+100	1E+100	1E+100
Gross Alpha (pCi/l)	80029					0	0	0	0	15	1E+100	15	1E+100	1E+100	1E+100
Asbestos (fibers/l)						0	0	0	0	7000000	1E+100	1E+100	1E+100	1E+100	1E+100
Total Residual Chlorine	7782-50-5	50060	33			0	0	0	0	1E+100	1E+100	11	19	11	1E+100
Nitrate as N (mg/l)	00620					0	0	0	0	10	1E+100	1E+100	1E+100	1E+100	1E+100
Nitrite + Nitrate (mg/l)	00630					0	0	0	0	1E+100	1E+100	132	1E+100	1E+100	1E+100

POLLUTANTS	CAS No.	STORET	MQL	Instream Waste Concentration					Domestic	Irrigation	Livestock/	Acute Fish	Chronic Fish	Human Health	
				Ambient Conc.	Effluent Conc.	Acute Fshery	Domestic Sup	Chronic Std	Human Health Criteria	Criteria	Wildlife Criteria	Criteria	Criteria	Criteria	
				Ca (ug/l)	Ce (ug/l)	2.13*Ce	Cd,dom (ug/l)	Cd (ug/l)	Cd,hh (ug/l)	ug/l	ug/l	ug/l	ug/l	ug/l	
<b>METALS AND CYANIDE</b>															
Antimony, dissolved (P)	7440-36-0	01097	60			0	0	0	0	5.6	1E+100	1E+100	1E+100	1E+100	640
Arsenic, dissolved (P)	7440-38-2	01000	0.5	9.625782137		20.502916	20.502916	20.502916	18.81682089	2.3	100	200	340	150	9
Beryllium, dissolved	7440-41-7	01012	0.5			0	0	0	0	4	1E+100	1E+100	1E+100	1E+100	1E+100
Cadmium, dissolved	7440-43-9	01025	1		2	4.26	4.26	4.26	3.909671053	5	10	50	0.42009862	0.08018572	1E+100
Chromium, dissolved	18540-29-9	01034	10		0	0	0	0	0	100	100	1000	152.488879	19.8356702	1E+100
Copper, dissolved	7440-50-8	01042	0.5	1.836988602		3.91278572	3.91278572	3.91278572	3.591010581	1300	200	500	2.94985776	2.26376925	1E+100
Lead, dissolved	7439-92-1	01049	0.5	16.39994945		34.9318923	34.9318923	34.9318923	32.05920382	50	5000	100	10.7915449	0.42053101	1E+100
Mercury, dissolved	7439-97-6	71890	0.005			0	0	0	0	1E+100	1E+100	1E+100	1.4	0.77	1E+100
Mercury, total	7439-97-6	71900	0.005			0	0	0	0	2	1E+100	0.77	1E+100	1E+100	1E+100
Nickel, dissolved (P)	7440-02-0	01065	0.5	3.601265351		7.6706952	7.6706952	7.6706952	7.039881447	100	1E+100	1E+100	119.987492	13.3269059	4600
Selenium, dissolved (P)	7782-49-2	01145	5			0	0	0	0	50	130	50	1E+100	1E+100	4200
Selenium, dis (SO4 >500 mg/l)	01145	01145	5			0	0	0	0	50	250	50	1E+100	1E+100	4200
Selenium, total recoverable	7782-49-2	01147	5		50	106.5	106.5	106.5	97.74177632	1E+100	1E+100	5	20	5	1E+100
Silver, dissolved	7440-22-4	01077	0.5		5	10.65	10.65	10.65	9.774177632	1E+100	1E+100	1E+100	0.2019249	1E+100	1E+100
Thallium, dissolved (P)	7440-28-0	01059	0.5			0	0	0	0	1.7	1E+100	1E+100	1E+100	1E+100	6.3
Zinc, Dis.	7440-66-6	01080	20		14.73995019	31.3960939	31.3960939	31.3960939	28.81417828	7400	2000	25000	29.9652491	30.2103636	26000
Cyanide, dissolved	57-12-5	00720	10			0	0	0	0	200	1E+100	1E+100	1E+100	1E+100	1E+100
Cyanide, weak acid dissociat	57-12-5	00718	10			0	0	0	0	700	1E+100	5.2	22	5.2	220000
<b>DIOXIN</b>															
2,3,7,8-TCDD	1764-01-6	34675	0.00001			0	0	0	0	0.00000005	1E+100	1E+100	1E+100	1E+100	0.000000051
<b>VOLATILE COMPOUNDS</b>															
Acrolein	107-02-8	34210	50			0	0	0	0	190	1E+100	1E+100	1E+100	1E+100	290
Acrylonitrile	107-13-0	34215	20			0	0	0	0	0.51	1E+100	1E+100	1E+100	1E+100	2.5
Benzene	71-43-2	34030	10			0	0	0	0	22	1E+100	1E+100	1E+100	1E+100	510
Bromoform	75-25-2	32104	10			0	0	0	0	43	1E+100	1E+100	1E+100	1E+100	1400
Carbon Tetrachloride	56-23-5	32102	2			0	0	0	0	2.3	1E+100	1E+100	1E+100	1E+100	16
Chlorobenzene	108-90-7	34301	10			0	0	0	0	680	1E+100	1E+100	1E+100	1E+100	21000
Clorodibromomethane	124-48-1	32105	10			0	0	0	0	4	1E+100	1E+100	1E+100	1E+100	130
Chloroform	67-66-3	32106	50			0	0	0	0	57	1E+100	1E+100	1E+100	1E+100	4700
Dichlorobromomethane	75-27-4	32101	10			0	0	0	0	5.5	1E+100	1E+100	1E+100	1E+100	170
1,2-Dichloroethane	107-06-2	34531	10			0	0	0	0	3.8	1E+100	1E+100	1E+100	1E+100	370
1,1-Dichloroethylene	75-35-4	34501	10			0	0	0	0	0.57	1E+100	1E+100	1E+100	1E+100	32
1,2-Dichloropropane	78-87-5	34541	10			0	0	0	0	5	1E+100	1E+100	1E+100	1E+100	150
1,3-Dichloropropylene	542-75-6	34561	10			0	0	0	0	10	1E+100	1E+100	1E+100	1E+100	1700
Ethylbenzene	100-41-4	34371	10			0	0	0	0	3100	1E+100	1E+100	1E+100	1E+100	29000
Methyl Bromide	74-83-9	34413	50			0	0	0	0	47	1E+100	1E+100	1E+100	1E+100	1500
Methylene Chloride	75-09-2	34423	20			0	0	0	0	46	1E+100	1E+100	1E+100	1E+100	5900
1,1,2,2-Tetrachloroethane	79-34-5	34516	10			0	0	0	0	1.7	1E+100	1E+100	1E+100	1E+100	40
Tetrachloroethylene	127-18-4	34475	10			0	0	0	0	6.9	1E+100	1E+100	1E+100	1E+100	33
Toluene	108-88-3	34010	10			0	0	0	0	6800	1E+100	1E+100	1E+100	1E+100	200000
1,2--trans-Dichloroethylene	156-60-5	34546	10			0	0	0	0	700	1E+100	1E+100	1E+100	1E+100	140000
1,1,2-Trichloroethane	79-00-5	34511	10			0	0	0	0	5.9	1E+100	1E+100	1E+100	1E+100	160



POLLUTANTS	CAS No.	STORET	MQL	Instream Waste Concentration						Domestic Irrigation Livestock/ Acute Fish Chronic Fish Human Health						
				Ambient Conc.	Effluent Conc.	Acute Fshery	Domestic Sup	Chronic Std	Human Health Criteria	Criteria	Wildlife Criteria	Criteria	Criteria	Criteria		
				Ca (ug/l)	Ce (ug/l)	2.13*Ce	Cd,dom (ug/l)	Cd (ug/l)	Cd,hh (ug/l)	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	
Nitrobenzene	98-95-3	34447	10				0	0	0	0	17	1E+100	1E+100	1E+100	1E+100	690
n-Nitrosodimethylamine	62-75-9	34438	50				0	0	0	0	0.0069	1E+100	1E+100	1E+100	1E+100	30
PESTICIDES AND PCBs																
Aldrin	309-00-2	39330	0.01				0	0	0	0	0.00049	1E+100	1E+100	3	1E+100	0.0005
Alpha-BHC	319-84-6	39337	0.05				0	0	0	0	0.026	1E+100	1E+100	1E+100	1E+100	0.049
Beta-BHC	319-85-7	39338	0.05				0	0	0	0	0.091	1E+100	1E+100	1E+100	1E+100	0.17
Gamma-BHC	58-89-9	39340	0.05				0	0	0	0	0.19	1E+100	1E+100	0.95	1E+100	0.63
Chlordane	57-74-9	39350	0.2				0	0	0	0	0.008	1E+100	1E+100	2.4	0.0043	0.0081
4,4'-DDT and derivatives	50-29-3	39300	0.02				0	0	0	0	0.0022	1E+100	0.001	1.1	0.001	0.0022
Dieldrin	60-57-1	39380	0.02				0	0	0	0	0.00052	1E+100	1E+100	0.24	0.056	0.00054
Alpha-Endosulfan	959-98-8	34361	0.01				0	0	0	0	62	1E+100	1E+100	0.22	0.056	89
Beta-Endosulfan	33213-65-9	34356	0.02				0	0	0	0	62	1E+100	1E+100	0.22	0.056	89
Endosulfan sulfate	1031-7-8	34351	0.1				0	0	0	0	62	1E+100	1E+100	1E+100	1E+100	89
Endrin	72-20-8	39390	0.02				0	0	0	0	0.76	1E+100	1E+100	0.086	0.036	0.81
Endrin Aldehyde	7421-93-4	34366	0.1				0	0	0	0	0.29	1E+100	1E+100	1E+100	1E+100	0.3
Heptachlor	76-44-8	39410	0.01				0	0	0	0	0.00079	1E+100	1E+100	0.52	0.0038	0.00079
Heptachlor Epoixde	1024-57-3	39420	0.01				0	0	0	0	0.00039	1E+100	1E+100	0.52	0.0038	0.00039
PCBs	1336-36-3	39516	0.2				0	0	0	0	0.00064	1E+100	0.014	1E+100	0.014	0.00064
Toxaphene	8001-35-2	39400	0.3				0	0	0	0	0.0028	1E+100	1E+100	0.73	0.0002	0.0028

Note: SCORET CODE for reference only. Codes for total form are used except for parameters which have criteria in both total and dissolved forms.

STEP 3: SCAN POTENTIAL INSTREAM WASTE CONCENTRATIONS AGAINST WATER QUALITY CRITERIA  
AND ESTABLISH EFFLUENT LIMITATIONS FOR ALL APPLICABLE PARAMETERS

No limits are established if the receiving stream is not designated for the particular uses.

No limits are established if the potential instream waste concentrations are less than the chronic water quality criteria.

The most applicable stringent criteria are used to establish effluent limitations for a given parameter.

Water quality criteria apply at the end-of-pipe for acute aquatic life criteria and discharges to public lakes.

If background concentration exceeds the water quality criteria, water quality criteria apply. And "Need TMDL" shown to the next column of Avg. Mass

Monthly avg concentration = daily max. / 1.5.

APPLICABLE WATER QUALITY-BASED LIMITS

The following formular is used to calculate the allowable daily maximum effluent cencentration

(Please refer to State Implementation Guidance for details)

Daily Max. Conc. =  $C_s + (C_s - C_a)(F \cdot Q_a / Q_e)$

Monthly Avg. Conc. = Daily Max. Conc. / 1.5

Where:  $C_s$  = Applicable water quality standard

$C_a$  = Ambient stream concentration









