

**Utah Division of Water Quality
Statement of Basis
ADDENDUM
Wasteload Analysis and Antidegradation Level I Review**

Date: September 4, 2021

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Standards and Technical Services

Facility: Manti Lagoons
UPDES No. UT0026026

Receiving water: San Pitch River (2B, 3C, 3D, 4)

This addendum summarizes the wasteload analysis that was performed to determine water quality based effluent limits (WQBEL) for this discharge. Wasteload analyses are performed to determine point source effluent limitations necessary to maintain designated beneficial uses by evaluating projected effects of discharge concentrations on in-stream water quality. The wasteload analysis also takes into account downstream designated uses (UAC R317-2-8). Projected concentrations are compared to numeric water quality standards to determine acceptability. The numeric criteria in this wasteload analysis may be modified by narrative criteria and other conditions determined by staff of the Division of Water Quality.

Discharge

Outfall 001: Unnamed Ditch → San Pitch River

The mean monthly design discharge is 0.97 MGD (1.5 cfs) for the facility.

Receiving Water

The receiving water for Outfall 001 the San Pitch River.

Per UAC R317-2-13.7(a), the designated beneficial uses for San Pitch River and tributaries, is 2B, 3C, 3D, and 4.

- *Class 2B - Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing.*
- *Class 3C - Protected for nongame fish and other aquatic life, including the necessary aquatic organisms in their food chain.*
- *Class 3D - Protected for waterfowl, shore birds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.*

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- *Class 4 - Protected for agricultural uses including irrigation of crops and stock watering.*

Typically, the critical flow for the wasteload analysis is considered the lowest stream flow for seven consecutive days with a ten year return frequency (7Q10). Due to a lack of flow records for the San Pitch River at this location, the 20th percentile of flow measurements was used to represent the critical low flow condition. The source of flow data was from DWQ sampling at station 4946450, San Pitch River west of Manti above Gunnison Reservoir at county road crossing for the period 2010-2020.

Table 1: Seasonal (Oct-Feb) critical low flow (cfs)

Season	San Pitch River at Station 4946450
Oct-Feb	0.53 cfs

San Pitch River water quality was characterized based on samples collected from monitoring station 4946450 - San Pitch River west of Manti above Gunnison Reservoir at county road crossing - for the period 2010-2020 (Oct.-Feb).

TMDL

Based on the 2018/2020 303 (d) list assessment, the receiving water, San Pitch River (San Pitch-3-1, assessment unit UT16030004-005_01), is listed for ammonia, dissolved oxygen, *E. Coli*, pH and total dissolved solids.

A TMDL was completed for the Middle San Pitch River (HUC #16030004) on November 18th 2003 (UDWQ 2003). The TMDL identified a critical season of March 1 - September 30 where the loading capacity was exceeded and load limitations apply. As a result, new discharges with a potential to cause or contribute to the existing impairment are not allowed during the critical season and must meet the TMDL endpoint of <1200 mg/L during the non-critical season – October 1st through the end of February.

Mixing Zone

The maximum allowable mixing zone is 15 minutes of travel time for acute conditions, not to exceed 50% of stream width, and 2,500 feet for chronic conditions, per UAC R317-2-5. Water quality standards must be met at the end of the mixing zone.

Since the receiving water low flow (0.53 cfs) is equal to or less than twice the flow of a point source discharge (1.5 cfs), the combined flows are considered to be totally mixed. Acute limits were calculated using 50% of the seasonal critical low flow.

Parameters of Concern

The potential parameters of concern identified for the discharge/receiving water were BOD₅, total suspended solids, total dissolved solids, total ammonia, and total residual chlorine as determined in consultation with the UPDES Permit Writer.

WET Limits

The percent of effluent in the receiving water in a fully mixed condition, and acute and chronic dilution in a not fully mixed condition are calculated in the WLA in order to generate WET limits. The LC₅₀ (lethal concentration, 50%) percent effluent for acute toxicity and the IC₂₅ (inhibition concentration, 25%) percent effluent for chronic toxicity, as determined by the WET test, needs to be below the WET limits, as determined by the WLA. The WET limit for LC₅₀ is typically 100% effluent and does not need to be determined by the WLA.

Table 2: WET Limits for IC₂₅

Outfall	Percent Effluent
Outfall 001	73.9%

Wasteload Allocation Methods

Effluent limits were determined for conservative constituents using a simple mass balance mixing analysis (UDWQ 2012). The mass balance analysis is summarized in the Wasteload Addendum.

The water quality standard for chronic ammonia toxicity is dependent on temperature and pH, and the water quality standard for acute ammonia toxicity is dependent on pH. The AMMTOX Model developed by University of Colorado and adapted by Utah DWQ and EPA Region VIII was used to determine ammonia effluent limits (Lewis et al. 2002). The analysis is summarized in the Wasteload Addendum.

Models and supporting documentation are available for review upon request.

Antidegradation Level I Review

The objective of the Level I ADR is to ensure the protection of existing uses, defined as the beneficial uses attained in the receiving water on or after November 28, 1975. No evidence is known that the existing uses deviate from the designated beneficial uses for the receiving water. Therefore, the beneficial uses will be protected if the discharge remains below the WQBELs presented in this wasteload.

A Level II Antidegradation Review (ADR) is not required for this facility.

Documents:

WLA Document: *Manti_WLADoc_9-4-21.docx*
Wasteload Analysis and Addendum: *Manti_WLA_9-4-21.xlsm*

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References:

Utah Division of Water Quality. 2012. *Utah Wasteload Analysis Procedures Version 1.0*.

Utah Division of Water Quality. 2003. San Pitch River Watershed Water Quality Management Plan. Millennium Science and Engineering, Inc.

Lewis, B., J. Saunders, and M. Murphy. 2002. *Ammonia Toxicity Model (AMMTOX, Version2): A Tool for Determining Effluent Ammonia Limits*. University of Colorado, Center for Limnology.

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WASTELOAD ANALYSIS [WLA]
Addendum: Statement of Basis

5-Sep-21
4:00 PM

Facilities: Manti City Lagoons
Discharging to: Ditch => San Pitch

UPDES No: UT-0026026

THIS IS A DRAFT DOCUMENT

I. Introduction

Wasteload analyses are performed to determine point source effluent limitations necessary to maintain designated beneficial uses by evaluating projected effects of discharge concentrations on in-stream water quality. The wasteload analysis also takes into account downstream designated uses [R317-2-8, UAC]. Projected concentrations are compared to numeric water quality standards to determine acceptability. The anti-degradation policy and procedures are also considered. The primary in-stream parameters of concern may include metals (as a function of hardness), total dissolved solids (TDS), total residual chlorine (TRC), un-ionized ammonia (as a function of pH and temperature, measured and evaluated in terms of total ammonia), and dissolved oxygen.

Mathematical water quality modeling is employed to determine stream quality response to point source discharges. Models aid in the effort of anticipating stream quality at future effluent flows at critical environmental conditions (e.g., low stream flow, high temperature, high pH, etc).

The numeric criteria in this wasteload analysis may always be modified by narrative criteria and other conditions determined by staff of the Division of Water Quality.

II. Receiving Water and Stream Classification

Ditch => San Pitch:	2B, 3C, 3D, 4
Antidegradation Review:	Level I review completed. Level II review required.

III. Numeric Stream Standards for Protection of Aquatic Wildlife

Total Ammonia (TNH3)	Varies as a function of Temperature and pH Rebound. See Water Quality Standards
Chronic Total Residual Chlorine (TRC)	0.011 mg/l (4 Day Average) 0.019 mg/l (1 Hour Average)
Chronic Dissolved Oxygen (DO)	5.00 mg/l (30 Day Average) N/A mg/l (7Day Average) 3.00 mg/l (1 Day Average)
Maximum Total Dissolved Solids	1200.0 mg/l

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Acute and Chronic Heavy Metals (Dissolved)

Parameter	4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard		
	Concentration	Load*	Concentration		Load*
Aluminum	87.00 ug/l**	0.705 lbs/day	750.00	ug/l	6.078 lbs/day
Arsenic	190.00 ug/l	1.540 lbs/day	340.00	ug/l	2.755 lbs/day
Cadmium	0.82 ug/l	0.007 lbs/day	9.71	ug/l	0.079 lbs/day
Chromium III	292.14 ug/l	2.367 lbs/day	6112.17	ug/l	49.532 lbs/day
ChromiumVI	11.00 ug/l	0.089 lbs/day	16.00	ug/l	0.130 lbs/day
Copper	33.34 ug/l	0.270 lbs/day	57.02	ug/l	0.462 lbs/day
Iron			1000.00	ug/l	8.104 lbs/day
Lead	21.22 ug/l	0.172 lbs/day	544.53	ug/l	4.413 lbs/day
Mercury	0.0120 ug/l	0.000 lbs/day	2.40	ug/l	0.019 lbs/day
Nickel	184.09 ug/l	1.492 lbs/day	1655.77	ug/l	13.418 lbs/day
Selenium	4.60 ug/l	0.037 lbs/day	20.00	ug/l	0.162 lbs/day
Silver	N/A ug/l	N/A lbs/day	49.14	ug/l	0.398 lbs/day
Zinc	423.67 ug/l	3.433 lbs/day	423.67	ug/l	3.433 lbs/day

* Allowed below discharge

**Chronic Aluminum standard applies only to waters with a pH < 7.0 and a Hardness < 50 mg/l as CaCO3

Metals Standards Based upon a Hardness of 443.98 mg/l as CaCO3

Organics [Pesticides]

Parameter	4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard		
	Concentration	Load*	Concentration		Load*
Aldrin			1.500	ug/l	0.012 lbs/day
Chlordane	0.004 ug/l	0.047 lbs/day	1.200	ug/l	0.010 lbs/day
DDT, DDE	0.001 ug/l	0.011 lbs/day	0.550	ug/l	0.004 lbs/day
Dieldrin	0.002 ug/l	0.021 lbs/day	1.250	ug/l	0.010 lbs/day
Endosulfan	0.056 ug/l	0.613 lbs/day	0.110	ug/l	0.001 lbs/day
Endrin	0.002 ug/l	0.025 lbs/day	0.090	ug/l	0.001 lbs/day
Guthion			0.010	ug/l	0.000 lbs/day
Heptachlor	0.004 ug/l	0.042 lbs/day	0.260	ug/l	0.002 lbs/day
Lindane	0.080 ug/l	0.876 lbs/day	1.000	ug/l	0.008 lbs/day
Methoxychlor			0.030	ug/l	0.000 lbs/day
Mirex			0.010	ug/l	0.000 lbs/day
Parathion			0.040	ug/l	0.000 lbs/day
PCB's	0.014 ug/l	0.153 lbs/day	2.000	ug/l	0.016 lbs/day
Pentachlorophenol	13.00 ug/l	142.283 lbs/day	20.000	ug/l	0.162 lbs/day
Toxephene	0.0002 ug/l	0.002 lbs/day	0.7300	ug/l	0.006 lbs/day

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IV. Numeric Stream Standards for Protection of Agriculture

	4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard	
	Concentration	Load*	Concentration	Load*
Arsenic			100.0 ug/l	lbs/day
Boron			750.0 ug/l	lbs/day
Cadmium			10.0 ug/l	0.04 lbs/day
Chromium			100.0 ug/l	lbs/day
Copper			200.0 ug/l	lbs/day
Lead			100.0 ug/l	lbs/day
Selenium			50.0 ug/l	lbs/day
TDS, Summer			1200.0 mg/l	4.86 tons/day

V. Numeric Stream Standards for Protection of Human Health (Class 1C Waters)

Metals	4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard	
	Concentration	Load*	Concentration	Load*
Arsenic			ug/l	lbs/day
Barium			ug/l	lbs/day
Cadmium			ug/l	lbs/day
Chromium			ug/l	lbs/day
Lead			ug/l	lbs/day
Mercury			ug/l	lbs/day
Selenium			ug/l	lbs/day
Silver			ug/l	lbs/day
Fluoride (3)			ug/l	lbs/day
to			ug/l	lbs/day
Nitrates as N			ug/l	lbs/day

Chlorophenoxy Herbicides

2,4-D	ug/l	lbs/day
2,4,5-TP	ug/l	lbs/day
Endrin	ug/l	lbs/day
cyclohexane (Lindane)	ug/l	lbs/day
Methoxychlor	ug/l	lbs/day
Toxaphene	ug/l	lbs/day

VI. Numeric Stream Standards the Protection of Human Health from Water & Fish Consumption [Toxics]

Toxic Organics	Maximum Conc., ug/l - Acute Standards			
	Class 1C [2 Liters/Day for 70 Kg Person over 70 Yr.]		Class 3A, 3B [6.5 g for 70 Kg Person over 70 Yr.]	
Acenaphthene	ug/l	lbs/day	2700.0 ug/l	29.55 lbs/day
Acrolein	ug/l	lbs/day	780.0 ug/l	8.54 lbs/day
Acrylonitrile	ug/l	lbs/day	0.7 ug/l	0.01 lbs/day
Benzene	ug/l	lbs/day	71.0 ug/l	0.78 lbs/day
Benzidine	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Carbon tetrachloride	ug/l	lbs/day	4.4 ug/l	0.05 lbs/day
Chlorobenzene	ug/l	lbs/day	21000.0 ug/l	229.84 lbs/day
1,2,4-Trichlorobenzene				
Hexachlorobenzene	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
1,2-Dichloroethane	ug/l	lbs/day	99.0 ug/l	1.08 lbs/day

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1,1,1-Trichloroethane				
Hexachloroethane	ug/l	lbs/day	8.9 ug/l	0.10 lbs/day
1,1-Dichloroethane				
1,1,2-Trichloroethane	ug/l	lbs/day	42.0 ug/l	0.46 lbs/day
1,1,2,2-Tetrachloroethane	ug/l	lbs/day	11.0 ug/l	0.12 lbs/day
Chloroethane			0.0 ug/l	0.00 lbs/day
Bis(2-chloroethyl) ether	ug/l	lbs/day	1.4 ug/l	0.02 lbs/day
2-Chloroethyl vinyl ether	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
2-Chloronaphthalene	ug/l	lbs/day	4300.0 ug/l	47.06 lbs/day
2,4,6-Trichlorophenol	ug/l	lbs/day	6.5 ug/l	0.07 lbs/day
p-Chloro-m-cresol			0.0 ug/l	0.00 lbs/day
Chloroform (HM)	ug/l	lbs/day	470.0 ug/l	5.14 lbs/day
2-Chlorophenol	ug/l	lbs/day	400.0 ug/l	4.38 lbs/day
1,2-Dichlorobenzene	ug/l	lbs/day	17000.0 ug/l	186.06 lbs/day
1,3-Dichlorobenzene	ug/l	lbs/day	2600.0 ug/l	28.46 lbs/day
1,4-Dichlorobenzene	ug/l	lbs/day	2600.0 ug/l	28.46 lbs/day
3,3'-Dichlorobenzidine	ug/l	lbs/day	0.1 ug/l	0.00 lbs/day
1,1-Dichloroethylene	ug/l	lbs/day	3.2 ug/l	0.04 lbs/day
1,2-trans-Dichloroethylene	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
2,4-Dichlorophenol	ug/l	lbs/day	790.0 ug/l	8.65 lbs/day
1,2-Dichloropropane	ug/l	lbs/day	39.0 ug/l	0.43 lbs/day
1,3-Dichloropropylene	ug/l	lbs/day	1700.0 ug/l	18.61 lbs/day
2,4-Dimethylphenol	ug/l	lbs/day	2300.0 ug/l	25.17 lbs/day
2,4-Dinitrotoluene	ug/l	lbs/day	9.1 ug/l	0.10 lbs/day
2,6-Dinitrotoluene	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
1,2-Diphenylhydrazine	ug/l	lbs/day	0.5 ug/l	0.01 lbs/day
Ethylbenzene	ug/l	lbs/day	29000.0 ug/l	317.40 lbs/day
Fluoranthene	ug/l	lbs/day	370.0 ug/l	4.05 lbs/day
4-Chlorophenyl phenyl ether				
4-Bromophenyl phenyl ether				
Bis(2-chloroisopropyl) ether	ug/l	lbs/day	170000.0 ug/l	1860.63 lbs/day
Bis(2-chloroethoxy) methane	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Methylene chloride (HM)	ug/l	lbs/day	1600.0 ug/l	17.51 lbs/day
Methyl chloride (HM)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Methyl bromide (HM)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Bromoform (HM)	ug/l	lbs/day	360.0 ug/l	3.94 lbs/day
Dichlorobromomethane	ug/l	lbs/day	22.0 ug/l	0.24 lbs/day
Chlorodibromomethane	ug/l	lbs/day	34.0 ug/l	0.37 lbs/day
Hexachlorobutadiene(c)	ug/l	lbs/day	50.0 ug/l	0.55 lbs/day
Hexachlorocyclopentadiene	ug/l	lbs/day	17000.0 ug/l	186.06 lbs/day
Isophorone	ug/l	lbs/day	600.0 ug/l	6.57 lbs/day
Naphthalene				
Nitrobenzene	ug/l	lbs/day	1900.0 ug/l	20.80 lbs/day
2-Nitrophenol	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
4-Nitrophenol	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
2,4-Dinitrophenol	ug/l	lbs/day	14000.0 ug/l	153.23 lbs/day
4,6-Dinitro-o-cresol	ug/l	lbs/day	765.0 ug/l	8.37 lbs/day
N-Nitrosodimethylamine	ug/l	lbs/day	8.1 ug/l	0.09 lbs/day
N-Nitrosodiphenylamine	ug/l	lbs/day	16.0 ug/l	0.18 lbs/day
N-Nitrosodi-n-propylamine	ug/l	lbs/day	1.4 ug/l	0.02 lbs/day
Pentachlorophenol	ug/l	lbs/day	8.2 ug/l	0.09 lbs/day

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Phenol	ug/l	lbs/day	4.6E+06 ug/l	5.03E+04 lbs/day
Bis(2-ethylhexyl)phthala	ug/l	lbs/day	5.9 ug/l	0.06 lbs/day
Butyl benzyl phthalate	ug/l	lbs/day	5200.0 ug/l	56.91 lbs/day
Di-n-butyl phthalate	ug/l	lbs/day	12000.0 ug/l	131.34 lbs/day
Di-n-octyl phthlate				
Diethyl phthalate	ug/l	lbs/day	120000.0 ug/l	1313.39 lbs/day
Dimethyl phthlate	ug/l	lbs/day	2.9E+06 ug/l	3.17E+04 lbs/day
Benzo(a)anthracene (P)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Benzo(a)pyrene (PAH)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Benzo(b)fluoranthene (F	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Benzo(k)fluoranthene (F	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Chrysene (PAH)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Acenaphthylene (PAH)				
Anthracene (PAH)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Dibenzo(a,h)anthracene	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Indeno(1,2,3-cd)pyrene	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Pyrene (PAH)	ug/l	lbs/day	11000.0 ug/l	120.39 lbs/day
Tetrachloroethylene	ug/l	lbs/day	8.9 ug/l	0.10 lbs/day
Toluene	ug/l	lbs/day	200000 ug/l	2188.98 lbs/day
Trichloroethylene	ug/l	lbs/day	81.0 ug/l	0.89 lbs/day
Vinyl chloride	ug/l	lbs/day	525.0 ug/l	5.75 lbs/day
				lbs/day
				lbs/day
Pesticides				
Aldrin	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Dieldrin	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Chlordane	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
4,4'-DDT	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
4,4'-DDE	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
4,4'-DDD	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
alpha-Endosulfan	ug/l	lbs/day	2.0 ug/l	0.02 lbs/day
beta-Endosulfan	ug/l	lbs/day	2.0 ug/l	0.02 lbs/day
Endosulfan sulfate	ug/l	lbs/day	2.0 ug/l	0.02 lbs/day
Endrin	ug/l	lbs/day	0.8 ug/l	0.01 lbs/day
Endrin aldehyde	ug/l	lbs/day	0.8 ug/l	0.01 lbs/day
Heptachlor	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Heptachlor epoxide				
PCB's				
PCB 1242 (Arochlor 124	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1254 (Arochlor 124	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1221 (Arochlor 124	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1232 (Arochlor 124	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1248 (Arochlor 124	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1260 (Arochlor 124	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1016 (Arochlor 10	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Pesticide				
Toxaphene	ug/l		0.0 ug/l	0.00 lbs/day
Dioxin				
Dioxin (2,3,7,8-TCDD)	ug/l	lbs/day		

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Metals

Antimony	ug/l	lbs/day		
Arsenic	ug/l	lbs/day	4300.00 ug/l	47.06 lbs/day
Asbestos	ug/l	lbs/day		
Beryllium				
Cadmium				
Chromium (III)				
Chromium (VI)				
Copper				
Cyanide	ug/l	lbs/day	2.2E+05 ug/l	2407.87 lbs/day
Lead	ug/l	lbs/day		
Mercury			0.15 ug/l	0.00 lbs/day
Nickel			4600.00 ug/l	50.35 lbs/day
Selenium	ug/l	lbs/day		
Silver	ug/l	lbs/day		
Thallium			6.30 ug/l	0.07 lbs/day
Zinc				

There are additional standards that apply to this receiving water, but were not considered in this modeling/waste load allocation analysis.

VII. Mathematical Modeling of Stream Quality

Model configuration was accomplished utilizing standard modeling procedures. Data points were plotted and coefficients adjusted as required to match observed data as closely as possible.

The modeling approach used in this analysis included one or a combination of the following models.

(1) The Utah River Model, Utah Division of Water Quality, 1992. Based upon STREAMDO IV (Region VIII) and Supplemental Ammonia Toxicity Models; EPA Region VIII, Sept. 1990 and QUAL2E (EPA, Athens, GA).

(2) Utah Ammonia/Chlorine Model, Utah Division of Water Quality, 1992.

(3) AMMTOX Model, University of Colorado, Center of Limnology, and EPA Region 8

(4) Principles of Surface Water Quality Modeling and Control. Robert V. Thomann, et.al. Harper Collins Publisher, Inc. 1987, pp. 644.

Coefficients used in the model were based, in part, upon the following references:

(1) Rates, Constants, and Kinetics Formulations in Surface Water Quality Modeling. Environmental Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Athens Georgia. EPA/600/3-85/040 June 1985.

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(2) Principles of Surface Water Quality Modeling and Control. Robert V. Thomann, et.al.
Harper Collins Publisher, Inc. 1987, pp. 644.

VIII. Modeling Information

The required information for the model may include the following information for both the upstream conditions at low flow and the effluent conditions:

Flow, Q, (cfs or MGD)	D.O. mg/l
Temperature, Deg. C.	Total Residual Chlorine (TRC), mg/l
pH	Total NH3-N, mg/l
BOD5, mg/l	Total Dissolved Solids (TDS), mg/l
Metals, ug/l	Toxic Organics of Concern, ug/l

Other Conditions

In addition to the upstream and effluent conditions, the models require a variety of physical and biological coefficients and other technical information. In the process of actually establishing the permit limits for an effluent, values are used based upon the available data, model calibration, literature values, site visits and best professional judgement.

Model Inputs

The following is upstream and discharge information that was utilized as inputs for the analysis. Dry washes are considered to have an upstream flow equal to the flow of the discharge.

Current Upstream Information

	Stream Critical Low								
	Flow	Temp.	pH	T-NH3	BOD5	DO	TRC	TDS	
	cfs	Deg. C		mg/l as N	mg/l	mg/l	mg/l	mg/l	mg/l
Summer	0.53	4.5	8.3	0.07	2.00	9.51	0.00	882.8	
Fall	0.53	4.5	8.3	0.07	2.00	---	0.00	882.8	
Winter	0.53	4.5	8.3	0.07	2.00	---	0.00	882.8	
Spring	0.53	4.5	8.3	0.07	2.00	---	0.00	882.8	
Dissolved Metals	Al	As	Cd	CrIII	CrVI	Copper	Fe	Pb	
	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	
All Seasons	1.59*	0.53*	0.053*	0.53*	2.65*	0.53*	0.83*	0.53*	
Dissolved Metals	Hg	Ni	Se	Ag	Zn	Boron			
	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l			
All Seasons	0.0000	0.53*	1.06*	0.1*	0.053*	10.0			* 1/2 MDL

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Projected Discharge Information

Season	Flow, MGD	Temp.
Winter (Dec-Mar)	0.97000	5.0

All model numerical inputs, intermediate calculations, outputs and graphs are available for discussion, inspection and copy at the Division of Water Quality.

IX. Effluent Limitations

Current State water quality standards are required to be met under a variety of conditions including in-stream flows targeted to the 7-day, 10-year low flow (R317-2-9).

Other conditions used in the modeling effort coincide with the environmental conditions expected at low stream flows.

Effluent Limitation for Flow based upon Water Quality Standards

In-stream criteria of downstream segments will be met with an effluent flow maximum value as follows:

Season	Daily Average	
Winter	0.970 MGD	1.501 cfs

Flow Requirement or Loading Requirement

The calculations in this wasteload analysis utilize the maximum effluent discharge flow of MGD. If the discharger is allowed to have a flow greater than MGD during 7Q10 conditions, and effluent limit concentrations as indicated, then water quality standards will be violated. In order to prevent this from occurring, the permit writers must include the discharge flow limitation as indicated above; or, include loading effluent limits in the permit.

Effluent Limitation for Whole Effluent Toxicity (WET) based upon WET Policy

Effluent Toxicity will not occur in downstream segments if the values below are met.

WET Requirements	LC50 >	EOP Effluent	[Acute]
	IC25 >	73.9% Effluent	[Chronic]

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Effluent Limitation for Biological Oxygen Demand (BOD) based upon Water Quality Standards or Regulations

In-stream criteria of downstream segments for Dissolved Oxygen will be met with an effluent BOD limitation as follows:

Season	Concentration	
Summer	25.0 mg/l as BOD5	0.0 lbs/day
Fall	25.0 mg/l as BOD5	0.0 lbs/day
Winter	25.0 mg/l as BOD5	0.0 lbs/day
Spring	25.0 mg/l as BOD5	0.0 lbs/day

Effluent Limitation for Dissolved Oxygen (DO) based upon Water Quality Standards

In-stream criteria of downstream segments for Dissolved Oxygen will be met with an effluent D.O. limitation as follows:

Season	Concentration
Winter	5.00

Effluent Limitation for Total Ammonia based upon Water Quality Standards

In-stream criteria of downstream segments for Total Ammonia will be met with an effluent limitation (expressed as Total Ammonia as N) as follows:

Season		Concentration	Load
Winter (Oct - Feb)	4 Day Avg. - Chronic	1.2 mg/l as N	9.9 lbs/day
	1 Hour Avg. - Acute	2.9 mg/l as N	23.5 lbs/day

Acute limit calculated with an Acute Zone of Initial Dilution (ZID) to be equal to 100.%.

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Effluent Limitation for Total Residual Chlorine based upon Water Quality Standards

In-stream criteria of downstream segments for Total Residual Chlorine will be met with an effluent limitation as follows:

Season		Concentration	Load
Winter	4 Day Avg. - Chronic	0.015 mg/l	0.12 lbs/day
(Oct - Feb)	1 Hour Avg. - Acute	0.025 mg/l	0.20 lbs/day

Effluent Limitations for Total Dissolved Solids based upon Water Quality Standards

Season		Concentration	Load
Winter	Maximum, Acute	1312.0 mg/l	5.31 tons/day
(Oct - Feb)			
Colorado Salinity Forum Limits		Determined by Permitting Section	

Effluent Limitations for Total Recoverable Metals based upon Water Quality Standards

In-stream criteria of downstream segments for Dissolved Metals will be met with an effluent limitation as follows (based upon a hardness of 443.98 mg/l):

	4 Day Average		1 Hour Average		Load
	Concentration	Load	Concentration	Load	
Aluminum*	N/A	N/A	882.0	ug/l	7.1 lbs/day
Arsenic*	256.83 ug/l	1.3 lbs/day	399.9	ug/l	3.2 lbs/day
Cadmium	1.08 ug/l	0.0 lbs/day	11.4	ug/l	0.1 lbs/day
Chromium III	395.04 ug/l	2.1 lbs/day	7,191.4	ug/l	58.3 lbs/day
Chromium VI*	13.48 ug/l	0.1 lbs/day	18.1	ug/l	0.1 lbs/day
Copper	44.84 ug/l	0.2 lbs/day	67.0	ug/l	0.5 lbs/day
Iron*	N/A	N/A	1,176.4	ug/l	9.5 lbs/day
Lead	28.43 ug/l	0.1 lbs/day	640.6	ug/l	5.2 lbs/day
Mercury*	0.02 ug/l	0.0 lbs/day	2.8	ug/l	0.0 lbs/day
Nickel	248.83 ug/l	1.3 lbs/day	1,948.0	ug/l	15.8 lbs/day
Selenium*	5.66 ug/l	0.0 lbs/day	23.3	ug/l	0.2 lbs/day
Silver	N/A ug/l	N/A lbs/day	57.8	ug/l	0.5 lbs/day
Zinc	573.28 ug/l	3.0 lbs/day	498.5	ug/l	4.0 lbs/day
Cyanide*	7.04 ug/l	0.0 lbs/day	25.9	ug/l	0.2 lbs/day

*Limits for these metals are based on the dissolved standard.

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**Effluent Limitations for Heat/Temperature based upon
Water Quality Standards**

Summer	7.2 Deg. C.	45.0 Deg. F
Fall	7.2 Deg. C.	45.0 Deg. F
Winter	7.2 Deg. C.	45.0 Deg. F
Spring	7.2 Deg. C.	45.0 Deg. F

**Effluent Limitations for Organics [Pesticides]
Based upon Water Quality Standards**

In-stream criteria of downstream segments for Organics [Pesticides] will be met with an effluent limit as follows:

	4 Day Average		1 Hour Average		Load
	Concentration	Load	Concentration	Load	
Aldrin			1.5E+00	ug/l	1.88E-02 lbs/day
Chlordane	4.30E-03 ug/l	3.48E-02 lbs/day	1.2E+00	ug/l	1.50E-02 lbs/day
DDT, DDE	1.00E-03 ug/l	8.09E-03 lbs/day	5.5E-01	ug/l	6.90E-03 lbs/day
Dieldrin	1.90E-03 ug/l	1.54E-02 lbs/day	1.3E+00	ug/l	1.57E-02 lbs/day
Endosulfan	5.60E-02 ug/l	4.53E-01 lbs/day	1.1E-01	ug/l	1.38E-03 lbs/day
Endrin	2.30E-03 ug/l	1.86E-02 lbs/day	9.0E-02	ug/l	1.13E-03 lbs/day
Guthion	0.00E+00 ug/l	0.00E+00 lbs/day	1.0E-02	ug/l	1.25E-04 lbs/day
Heptachlor	3.80E-03 ug/l	3.07E-02 lbs/day	2.6E-01	ug/l	3.26E-03 lbs/day
Lindane	8.00E-02 ug/l	6.47E-01 lbs/day	1.0E+00	ug/l	1.25E-02 lbs/day
Methoxychlor	0.00E+00 ug/l	0.00E+00 lbs/day	3.0E-02	ug/l	3.76E-04 lbs/day
Mirex	0.00E+00 ug/l	0.00E+00 lbs/day	1.0E-02	ug/l	1.25E-04 lbs/day
Parathion	0.00E+00 ug/l	0.00E+00 lbs/day	4.0E-02	ug/l	5.01E-04 lbs/day
PCB's	1.40E-02 ug/l	1.13E-01 lbs/day	2.0E+00	ug/l	2.51E-02 lbs/day
Pentachlorophenol	1.30E+01 ug/l	1.05E+02 lbs/day	2.0E+01	ug/l	2.51E-01 lbs/day
Toxephene	2.00E-04 ug/l	1.62E-03 lbs/day	7.3E-01	ug/l	9.15E-03 lbs/day

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**Effluent Targets for Pollution Indicators
Based upon Water Quality Standards**

In-stream criteria of downstream segments for Pollution Indicators will be met with an effluent limit as follows:

	1 Hour Average	
	Concentration	Loading
Gross Beta (pCi/l)	50.0 pCi/L	
BOD (mg/l)	5.0 mg/l	40.5 lbs/day
Nitrates as N	4.0 mg/l	32.4 lbs/day
Total Phosphorus as P	0.05 mg/l	0.4 lbs/day
Total Suspended Solids	90.0 mg/l	729.3 lbs/day

Note: Pollution indicator targets are for information purposes only.

**Effluent Limitations for Protection of Human Health [Toxics Rule]
Based upon Water Quality Standards (Most stringent of 1C or 3A & 3B as appropriate.)**

In-stream criteria of downstream segments for Protection of Human Health [Toxics] will be met with an effluent limit as follows:

	Maximum Concentration	
	Concentration	Load
Toxic Organics		
Acenaphthene	3.65E+03 ug/l	0.00E+00 lbs/day
Acrolein	1.06E+03 ug/l	0.00E+00 lbs/day
Acrylonitrile	8.93E-01 ug/l	0.00E+00 lbs/day
Benzene	9.61E+01 ug/l	0.00E+00 lbs/day
Benzidine	ug/l	lbs/day
Carbon tetrachloride	5.95E+00 ug/l	0.00E+00 lbs/day
Chlorobenzene	2.84E+04 ug/l	0.00E+00 lbs/day
1,2,4-Trichlorobenzene		
Hexachlorobenzene	1.04E-03 ug/l	0.00E+00 lbs/day
1,2-Dichloroethane	1.34E+02 ug/l	0.00E+00 lbs/day
1,1,1-Trichloroethane		
Hexachloroethane	1.20E+01 ug/l	0.00E+00 lbs/day
1,1-Dichloroethane		
1,1,2-Trichloroethane	5.68E+01 ug/l	0.00E+00 lbs/day
1,1,2,2-Tetrachloroethane	1.49E+01 ug/l	0.00E+00 lbs/day
Chloroethane		
Bis(2-chloroethyl) ether	1.89E+00 ug/l	0.00E+00 lbs/day
2-Chloroethyl vinyl ether		
2-Chloronaphthalene	5.82E+03 ug/l	0.00E+00 lbs/day
2,4,6-Trichlorophenol	8.80E+00 ug/l	0.00E+00 lbs/day
p-Chloro-m-cresol		
Chloroform (HM)	6.36E+02 ug/l	0.00E+00 lbs/day
2-Chlorophenol	5.41E+02 ug/l	0.00E+00 lbs/day
1,2-Dichlorobenzene	2.30E+04 ug/l	0.00E+00 lbs/day
1,3-Dichlorobenzene	3.52E+03 ug/l	0.00E+00 lbs/day

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1,4-Dichlorobenzene	3.52E+03 ug/l	0.00E+00 lbs/day
3,3'-Dichlorobenzidine	1.04E-01 ug/l	0.00E+00 lbs/day
1,1-Dichloroethylene	4.33E+00 ug/l	0.00E+00 lbs/day
1,2-trans-Dichloroethylene1		
2,4-Dichlorophenol	1.07E+03 ug/l	0.00E+00 lbs/day
1,2-Dichloropropane	5.28E+01 ug/l	0.00E+00 lbs/day
1,3-Dichloropropylene	2.30E+03 ug/l	0.00E+00 lbs/day
2,4-Dimethylphenol	3.11E+03 ug/l	0.00E+00 lbs/day
2,4-Dinitrotoluene	1.23E+01 ug/l	0.00E+00 lbs/day
2,6-Dinitrotoluene		
1,2-Diphenylhydrazine	7.31E-01 ug/l	0.00E+00 lbs/day
Ethylbenzene	3.92E+04 ug/l	0.00E+00 lbs/day
Fluoranthene	5.01E+02 ug/l	0.00E+00 lbs/day
4-Chlorophenyl phenyl ether		
4-Bromophenyl phenyl ether		
Bis(2-chloroisopropyl) ether	2.30E+05 ug/l	0.00E+00 lbs/day
Bis(2-chloroethoxy) methane		
Methylene chloride (HM)	2.17E+03 ug/l	0.00E+00 lbs/day
Methyl chloride (HM)		
Methyl bromide (HM)		
Bromoform (HM)	4.87E+02 ug/l	0.00E+00 lbs/day
Dichlorobromomethane(HM)	2.98E+01 ug/l	0.00E+00 lbs/day
Chlorodibromomethane (HM)	4.60E+01 ug/l	0.00E+00 lbs/day
Hexachlorocyclopentadiene	2.30E+04 ug/l	0.00E+00 lbs/day
Isophorone	8.12E+02 ug/l	0.00E+00 lbs/day
Naphthalene		
Nitrobenzene	2.57E+03 ug/l	0.00E+00 lbs/day
2-Nitrophenol		
4-Nitrophenol		
2,4-Dinitrophenol	1.89E+04 ug/l	0.00E+00 lbs/day
4,6-Dinitro-o-cresol	1.04E+03 ug/l	0.00E+00 lbs/day
N-Nitrosodimethylamine	1.10E+01 ug/l	0.00E+00 lbs/day
N-Nitrosodiphenylamine	2.17E+01 ug/l	0.00E+00 lbs/day
N-Nitrosodi-n-propylamine	1.89E+00 ug/l	0.00E+00 lbs/day
Pentachlorophenol	1.11E+01 ug/l	0.00E+00 lbs/day
Phenol	6.22E+06 ug/l	0.00E+00 lbs/day
Bis(2-ethylhexyl)phthalate	7.98E+00 ug/l	0.00E+00 lbs/day
Butyl benzyl phthalate	7.04E+03 ug/l	0.00E+00 lbs/day
Di-n-butyl phthalate	1.62E+04 ug/l	0.00E+00 lbs/day
Di-n-octyl phthlate		
Diethyl phthalate	1.62E+05 ug/l	0.00E+00 lbs/day
Dimethyl phthlate	3.92E+06 ug/l	0.00E+00 lbs/day
Benzo(a)anthracene (PAH)	4.19E-02 ug/l	0.00E+00 lbs/day
Benzo(a)pyrene (PAH)	4.19E-02 ug/l	0.00E+00 lbs/day
Benzo(b)fluoranthene (PAH)	4.19E-02 ug/l	0.00E+00 lbs/day
Benzo(k)fluoranthene (PAH)	4.19E-02 ug/l	0.00E+00 lbs/day
Chrysene (PAH)	4.19E-02 ug/l	0.00E+00 lbs/day
Acenaphthylene (PAH)		
Anthracene (PAH)		
Dibenzo(a,h)anthracene (PAH)	4.19E-02 ug/l	0.00E+00 lbs/day
Indeno(1,2,3-cd)pyrene (PAH)	4.19E-02 ug/l	0.00E+00 lbs/day

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Pyrene (PAH)	1.49E+04 ug/l	0.00E+00 lbs/day
Tetrachloroethylene	1.20E+01 ug/l	0.00E+00 lbs/day
Toluene	2.71E+05 ug/l	0.00E+00 lbs/day
Trichloroethylene	1.10E+02 ug/l	0.00E+00 lbs/day
Vinyl chloride	7.10E+02 ug/l	0.00E+00 lbs/day

Pesticides

Aldrin	1.89E-04 ug/l	0.00E+00 lbs/day
Dieldrin	1.89E-04 ug/l	0.00E+00 lbs/day
Chlordane	7.98E-04 ug/l	0.00E+00 lbs/day
4,4'-DDT	7.98E-04 ug/l	0.00E+00 lbs/day
4,4'-DDE	7.98E-04 ug/l	0.00E+00 lbs/day
4,4'-DDD	1.14E-03 ug/l	0.00E+00 lbs/day
alpha-Endosulfan	2.71E+00 ug/l	0.00E+00 lbs/day
beta-Endosulfan	2.71E+00 ug/l	0.00E+00 lbs/day
Endosulfan sulfate	2.71E+00 ug/l	0.00E+00 lbs/day
Endrin	1.10E+00 ug/l	0.00E+00 lbs/day
Endrin aldehyde	1.10E+00 ug/l	0.00E+00 lbs/day
Heptachlor	2.84E-04 ug/l	0.00E+00 lbs/day
Heptachlor epoxide		

PCB's

PCB 1242 (Arochlor 1242)	6.09E-05 ug/l	0.00E+00 lbs/day
PCB-1254 (Arochlor 1254)	6.09E-05 ug/l	0.00E+00 lbs/day
PCB-1221 (Arochlor 1221)	6.09E-05 ug/l	0.00E+00 lbs/day
PCB-1232 (Arochlor 1232)	6.09E-05 ug/l	0.00E+00 lbs/day
PCB-1248 (Arochlor 1248)	6.09E-05 ug/l	0.00E+00 lbs/day
PCB-1260 (Arochlor 1260)	6.09E-05 ug/l	0.00E+00 lbs/day
PCB-1016 (Arochlor 1016)	6.09E-05 ug/l	0.00E+00 lbs/day

Pesticide

Toxaphene	1.01E-03 ug/l	0.00E+00 lbs/day
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Metals

Antimony	ug/l	lbs/day
Arsenic	ug/l	lbs/day
Asbestos	ug/l	lbs/day
Beryllium		
Cadmium		
Chromium (III)		
Chromium (VI)		
Copper	ug/l	lbs/day
Cyanide	ug/l	lbs/day
Lead		
Mercury	ug/l	lbs/day
Nickel	ug/l	lbs/day
Selenium		
Silver		
Thallium	ug/l	lbs/day
Zinc		

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Dioxin

Dioxin (2,3,7,8-TCDD) 1.89E-08 ug/l 0.00E+00 lbs/day

**Metals Effluent Limitations for Protection of All Beneficial Uses
Based upon Water Quality Standards and Toxics Rule**

	Class 4 Acute Agricultural ug/l	Class 3 Acute Aquatic Wildlife ug/l	Acute Toxics Drinking Water Source ug/l	Acute Toxics Wildlife ug/l	1C Acute Health Criteria ug/l	Acute Most Stringent ug/l	Class 3 Chronic Aquatic Wildlife ug/l
Aluminum		882.0				882.0	N/A
Antimony				5818.7		5818.7	
Arsenic	135.3	399.9			0.0	135.3	256.8
Barium						0.0	
Beryllium						0.0	
Cadmium	13.5	11.4			0.0	11.4	1.1
Chromium (III)		7191.4			0.0	7191.4	395.0
Chromium (VI)	135.0	18.1			0.0	18.12	13.48
Copper	270.4	67.0				67.0	44.8
Cyanide		25.9	297702.8			25.9	7.0
Iron		1176.4				1176.4	
Lead	135.0	640.6			0.0	135.0	28.4
Mercury		2.82		0.20	0.0	0.20	0.016
Nickel		1948.0		6224.7		1948.0	248.8
Selenium	67.1	23.3			0.0	23.3	5.7
Silver		57.8			0.0	57.8	
Thallium				8.5		8.5	
Zinc		498.5				498.5	573.3
Boron	1014.9					1014.9	

Summary Effluent Limitations for Metals [Wasteload Allocation, TMDL]

[If Acute is more stringent than Chronic, then the Chronic takes on the Acute value.]

	WLA Acute ug/l	WLA Chronic ug/l	
Aluminum	882.0	N/A	
Antimony	5818.74		
Arsenic	135.3	256.8	Acute Controls
Asbestos	0.00E+00		
Barium			
Beryllium			
Cadmium	11.4	1.1	
Chromium (III)	7191.4	395	
Chromium (VI)	18.1	13.5	
Copper	67.0	44.8	

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Cyanide	25.9	7.0	
Iron	1176.4		
Lead	135.0	28.4	
Mercury	0.203	0.016	
Nickel	1948.0	249	
Selenium	23.3	5.7	
Silver	57.8	N/A	
Thallium	8.5		
Zinc	498.5	573.3	Acute Controls
Boron	1014.90		

Other Effluent Limitations are based upon R317-1.

E. coli 126.0 organisms per 100 ml

X. Antidegradation Considerations

The Utah Antidegradation Policy allows for degradation of existing quality where it is determined that such lowering of water quality is necessary to accommodate important economic or social development in the area in which the waters are protected [R317-2-3]. It has been determined that certain chemical parameters introduced by this discharge will cause an increase of the concentration of said parameters in the receiving waters. Under no conditions will the increase in concentration be allowed to interfere with existing instream water uses.

The antidegradation rules and procedures allow for modification of effluent limits less than those based strictly upon mass balance equations utilizing 100% of the assimilative capacity of the receiving water. Additional factors include considerations for "Blue-ribbon" fisheries, special recreational areas, threatened and endangered species, and drinking water sources.

An Antidegradation Level I Review was conducted on this discharge and its effect on the receiving water. Based upon that review, it has been determined that an Antidegradation Level II Review is required.

XI. Colorado River Salinity Forum Considerations

Discharges in the Colorado River Basin are required to have their discharge at a TDS loading of less than 1.00 tons/day unless certain exemptions apply. Refer to the Forum's Guidelines for additional information allowing for an exceedence of this value.

This doesn't apply to facilities that do not discharge to the Colorado River Basin.

XII. Summary Comments

The mathematical modeling and best professional judgement indicate that violations of receiving water beneficial uses with their associated water quality standards, including important downstream segments, will not occur for the evaluated parameters of concern as discussed above if the effluent limitations indicated above are met.

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XIII. Notice of UPDES Requirement

This Addendum to the Statement of Basis does not authorize any entity or party to discharge to the waters of the State of Utah. That authority is granted through a UPDES permit issued by the Utah Division of Water Quality. The numbers presented here may be changed as a function of other factors. Dischargers are strongly urged to contact the Permits Section for further information. Permit writers may utilize other information to adjust these limits and/or to determine other limits based upon best available technology and other considerations provided that the values in this wasteload analysis [TMDL] are not compromised. See special provisions in Utah Water Quality Standards for adjustments in the Total Dissolved Solids values based upon background concentration.

Antidegradation Review

An antidegradation review (ADR) was conducted to determine whether the proposed activity complies with the applicable antidegradation requirements for receiving waters that may be affected. The Level I ADR evaluated the criteria of R317-2-3.5(b) and determined that the proposed discharge will require a Level II Antidegradation Review.