

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

Date: July 2, 2019

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Standards and Technical Services

Facility: Anfield Resources Holding Corp; Velvet Mine
UPDES No. UT- 0025810

Receiving water: Unnamed dry wash -> Big Indian Wash -> Hatch Wash -> Kane Creek -> Kane Springs Creek (2B, 3C, 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 dry wash → Big Indian Wash → Hatch Wash → Kane Springs Creek.

The mean monthly design discharge is 0.5 MGD for the facility.

Receiving Water

The receiving water for Outfall 001 is an unnamed ephemeral wash which is tributary of Big Indian Wash, tributary of Hatch Wash, tributary of Kane Springs Creek, tributary of the Colorado River. Per R317-2-13.1, Kane Canyon Creek and tributaries, from confluence with Colorado River to headwaters is classified 2B, 3C, 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 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). Because the receiving water is an ephemeral wash at the point of discharge, the 7Q10 is assumed to be zero.

Ambient water quality was characterized using data from DWQ monitoring station # 4956060, Hatch Wash above Three Mile Creek for the period 2004-2005 (all available data).

TMDL

DWQ's 2016 Integrated Report lists Kane Spring Wash from confluence with Colorado River to headwaters (Assessment Unit UT14030005-001_00) as impaired (TMDL required) for total dissolved solids (Class 4) and temperature (Class 3C).

Effluents limits for TDS and temperature equal to the water quality criteria will ensure that in-stream criteria will not be exceeded at the point of discharge as well as not causing or contributing to the existing impairment downstream in Kane Springs Wash.

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 is considered zero, no mixing zone analysis was considered. Effluent limits revert to end of pipe standards.

Parameters of Concern

The potential parameters of concern identified for the discharge/receiving water were total dissolved solids and temperature as a result of the downstream receiving water having been impaired for these pollutants.

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 1: WET Limits for IC₂₅

Outfall	Percent Effluent
Outfall 001	100%

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.

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 as the UPDES permit is being renewed and there is no increase in load or concentration over that which was approved in the previous permit.

Documents:

WLA Document: *VelvetMine_WLADoc_7-2-19.docx*

Wasteload Analysis and Addendum: *VelvetMine_WLA_7-2-19.xls*

References:

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

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**

2-Jul-19

Facilities:	Anfield Resources Holding Corp; Velvet Mine	UPDES No: UT-0025810
Discharging to:	Unnamed dry wash:Big Indian Wash:Hatch Wash:Kane Creek: Colorado River	
Design Flow:	0.5	MGD

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

Unnamed dry wash:Big Indian Wash:Hatch Wash:Kane Creek: Colorado River	Level I review completed. Level II review not required.
Antidegradation Review:	

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**	0.363 lbs/day	750.00	ug/l	3.133 lbs/day
Arsenic	190.00 ug/l	0.794 lbs/day	340.00	ug/l	1.420 lbs/day
Cadmium	0.62 ug/l	0.003 lbs/day	1.29	ug/l	0.005 lbs/day
Chromium III	64.21 ug/l	0.268 lbs/day	1343.45	ug/l	5.612 lbs/day
Chromium VI	11.00 ug/l	0.046 lbs/day	16.00	ug/l	0.067 lbs/day
Copper	6.86 ug/l	0.029 lbs/day	9.98	ug/l	0.042 lbs/day
Iron			1000.00	ug/l	4.177 lbs/day
Lead	2.01 ug/l	0.008 lbs/day	51.68	ug/l	0.216 lbs/day
Mercury	0.0120 ug/l	0.000 lbs/day	2.40	ug/l	0.010 lbs/day
Nickel	38.49 ug/l	0.161 lbs/day	346.21	ug/l	1.446 lbs/day
Selenium	4.60 ug/l	0.019 lbs/day	20.00	ug/l	0.084 lbs/day
Silver	N/A ug/l	N/A lbs/day	2.04	ug/l	0.009 lbs/day
Zinc	88.37 ug/l	0.369 lbs/day	88.37	ug/l	0.369 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 69.82 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	0.006 lbs/day
Chlordane	0.004 ug/l	0.018 lbs/day	1.200	ug/l	0.005 lbs/day
DDT, DDE	0.001 ug/l	0.004 lbs/day	0.550	ug/l	0.002 lbs/day
Dieldrin	0.002 ug/l	0.008 lbs/day	1.250	ug/l	0.005 lbs/day
Endosulfan	0.056 ug/l	0.234 lbs/day	0.110	ug/l	0.000 lbs/day
Endrin	0.002 ug/l	0.010 lbs/day	0.090	ug/l	0.000 lbs/day
Guthion			0.010	ug/l	0.000 lbs/day
Heptachlor	0.004 ug/l	0.016 lbs/day	0.260	ug/l	0.001 lbs/day
Lindane	0.080 ug/l	0.334 lbs/day	1.000	ug/l	0.004 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	0.058 lbs/day	2.000	ug/l	0.008 lbs/day
Pentachlorophenol	13.00 ug/l	54.269 lbs/day	20.000	ug/l	0.084 lbs/day
Toxephene	0.0002 ug/l	0.001 lbs/day	0.7300	ug/l	0.003 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	Concentration	Load*
Arsenic		100.0 ug/l	lbs/day
Boron		750.0 ug/l	lbs/day
Cadmium		10.0 ug/l	0.02 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	2.51 tons/day

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

4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard	
Metals	Concentration	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
ocyclohexane (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]

Maximum Conc., ug/l - Acute Standards			
Class 1C		Class 3A, 3B	
Toxic Organics			
	[2 Liters/Day for 70 Kg Person over 70 Yr.]		[6.5 g for 70 Kg Person over 70 Yr.]
Acenaphthene	ug/l lbs/day	2700.0 ug/l	11.27 lbs/day
Acrolein	ug/l lbs/day	780.0 ug/l	3.26 lbs/day
Acrylonitrile	ug/l lbs/day	0.7 ug/l	0.00 lbs/day
Benzene	ug/l lbs/day	71.0 ug/l	0.30 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	0.02 lbs/day
Chlorobenzene	ug/l lbs/day	21000.0 ug/l	87.67 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	0.41 lbs/day

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1,1,1-Trichloroethane				
Hexachloroethane	ug/l	lbs/day	8.9 ug/l	0.04 lbs/day
1,1-Dichloroethane				
1,1,2-Trichloroethane	ug/l	lbs/day	42.0 ug/l	0.18 lbs/day
1,1,2,2-Tetrachloroethane	ug/l	lbs/day	11.0 ug/l	0.05 lbs/day
Chloroethane			0.0 ug/l	0.00 lbs/day
Bis(2-chloroethyl) ether	ug/l	lbs/day	1.4 ug/l	0.01 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	17.95 lbs/day
2,4,6-Trichlorophenol	ug/l	lbs/day	6.5 ug/l	0.03 lbs/day
p-Chloro-m-cresol			0.0 ug/l	0.00 lbs/day
Chloroform (HM)	ug/l	lbs/day	470.0 ug/l	1.96 lbs/day
2-Chlorophenol	ug/l	lbs/day	400.0 ug/l	1.67 lbs/day
1,2-Dichlorobenzene	ug/l	lbs/day	17000.0 ug/l	70.97 lbs/day
1,3-Dichlorobenzene	ug/l	lbs/day	2600.0 ug/l	10.85 lbs/day
1,4-Dichlorobenzene	ug/l	lbs/day	2600.0 ug/l	10.85 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	0.01 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	3.30 lbs/day
1,2-Dichloropropane	ug/l	lbs/day	39.0 ug/l	0.16 lbs/day
1,3-Dichloropropylene	ug/l	lbs/day	1700.0 ug/l	7.10 lbs/day
2,4-Dimethylphenol	ug/l	lbs/day	2300.0 ug/l	9.60 lbs/day
2,4-Dinitrotoluene	ug/l	lbs/day	9.1 ug/l	0.04 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	0.00 lbs/day
Ethylbenzene	ug/l	lbs/day	29000.0 ug/l	121.06 lbs/day
Fluoranthene	ug/l	lbs/day	370.0 ug/l	1.54 lbs/day
4-Chlorophenyl phenyl ether				
4-Bromophenyl phenyl ether				
Bis(2-chloroisopropyl) ether	ug/l	lbs/day	170000.0 ug/l	709.67 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	6.68 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	1.50 lbs/day
Dichlorobromomethane	ug/l	lbs/day	22.0 ug/l	0.09 lbs/day
Chlorodibromomethane	ug/l	lbs/day	34.0 ug/l	0.14 lbs/day
Hexachlorobutadiene(c)	ug/l	lbs/day	50.0 ug/l	0.21 lbs/day
Hexachlorocyclopentadiene	ug/l	lbs/day	17000.0 ug/l	70.97 lbs/day
Isophorone	ug/l	lbs/day	600.0 ug/l	2.50 lbs/day
Naphthalene				
Nitrobenzene	ug/l	lbs/day	1900.0 ug/l	7.93 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	58.44 lbs/day
4,6-Dinitro-o-cresol	ug/l	lbs/day	765.0 ug/l	3.19 lbs/day
N-Nitrosodimethylamine	ug/l	lbs/day	8.1 ug/l	0.03 lbs/day
N-Nitrosodiphenylamine	ug/l	lbs/day	16.0 ug/l	0.07 lbs/day
N-Nitrosodi-n-propylamine	ug/l	lbs/day	1.4 ug/l	0.01 lbs/day
Pentachlorophenol	ug/l	lbs/day	8.2 ug/l	0.03 lbs/day

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Phenol	ug/l	lbs/day	4.6E+06 ug/l	1.92E+04 lbs/day
Bis(2-ethylhexyl)phthala	ug/l	lbs/day	5.9 ug/l	0.02 lbs/day
Butyl benzyl phthalate	ug/l	lbs/day	5200.0 ug/l	21.71 lbs/day
Di-n-butyl phthalate	ug/l	lbs/day	12000.0 ug/l	50.09 lbs/day
Di-n-octyl phthlate				
Diethyl phthalate	ug/l	lbs/day	120000.0 ug/l	500.95 lbs/day
Dimethyl phthlate	ug/l	lbs/day	2.9E+06 ug/l	1.21E+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	45.92 lbs/day
Tetrachloroethylene	ug/l	lbs/day	8.9 ug/l	0.04 lbs/day
Toluene	ug/l	lbs/day	200000 ug/l	834.91 lbs/day
Trichloroethylene	ug/l	lbs/day	81.0 ug/l	0.34 lbs/day
Vinyl chloride	ug/l	lbs/day	525.0 ug/l	2.19 lbs/day
				lbs/day
Pesticides				lbs/day
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	0.01 lbs/day
beta-Endosulfan	ug/l	lbs/day	2.0 ug/l	0.01 lbs/day
Endosulfan sulfate	ug/l	lbs/day	2.0 ug/l	0.01 lbs/day
Endrin	ug/l	lbs/day	0.8 ug/l	0.00 lbs/day
Endrin aldehyde	ug/l	lbs/day	0.8 ug/l	0.00 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 125	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1221 (Arochlor 122	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1232 (Arochlor 123	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 126	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	17.95 lbs/day
Asbestos	ug/l	lbs/day		
Beryllium				
Cadmium				
Chromium (III)				
Chromium (VI)				
Copper				
Cyanide	ug/l	lbs/day	2.2E+05 ug/l	918.40 lbs/day
Lead	ug/l	lbs/day		
Mercury			0.15 ug/l	0.00 lbs/day
Nickel			4600.00 ug/l	19.20 lbs/day
Selenium	ug/l	lbs/day		
Silver	ug/l	lbs/day		
Thallium			6.30 ug/l	0.03 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		pH	T-NH3 mg/l as N	BOD5 mg/l	DO mg/l	TRC mg/l	TDS mg/l
	Flow cfs	Temp. Deg. C						
Summer (Irrig. Season)	0.00	16.7	7.7	0.10	1.00	10.25	0.00	327.0
Fall	0.00	7.9	8.0	0.10	1.00	---	0.00	386.0
Winter	0.00	4.4	8.2	0.10	1.00	---	0.00	503.0
Spring	0.00	12.8	8.3	0.10	1.00	---	0.00	485.0
Dissolved Metals	Al ug/l	As ug/l	Cd ug/l	CrIII ug/l	CrVI ug/l	Copper ug/l	Fe ug/l	Pb ug/l
All Seasons	2.385*	0.795*	0.0795*	0.795*	3.975*	0.8*	1.25*	0.795*
Dissolved Metals	Hg ug/l	Ni ug/l	Se ug/l	Ag ug/l	Zn ug/l	Boron ug/l	* ~80% MDL	
All Seasons	0.0000	0.795*	1.59*	0.15*	0.0795*	1.59*		

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Projected Discharge Information

Season	Flow, MGD	Temp.
Summer	0.50000	23.5
Fall	0.50000	8.5
Winter	0.50000	3.1
Spring	0.50000	15.1

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	
Summer	0.500 MGD	0.774 cfs
Fall	0.500 MGD	0.774 cfs
Winter	0.500 MGD	0.774 cfs
Spring	0.500 MGD	0.774 cfs

Flow Requirement or Loading Requirement

The calculations in this wasteload analysis utilize the maximum effluent discharge flow of 0.5 MGD. If the discharger is allowed to have a flow greater than 0.5 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 >	100.0% Effluent	[Acute]
	IC25 >	99.9% 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	104.2 lbs/day
Fall	25.0 mg/l as BOD5	104.2 lbs/day
Winter	25.0 mg/l as BOD5	104.2 lbs/day
Spring	25.0 mg/l as BOD5	104.2 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
Summer	4.00
Fall	4.00
Winter	4.00
Spring	4.00

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	
Summer	4 Day Avg. - Chronic	0.53 mg/l as N	2.2	lbs/day
	1 Hour Avg. - Acute	2.1 mg/l as N	9.0	lbs/day
Fall	4 Day Avg. - Chronic	1.2 mg/l as N	5.0	lbs/day
	1 Hour Avg. - Acute	3.5 mg/l as N	14.5	lbs/day
Winter	4 Day Avg. - Chronic	1.4 mg/l as N	5.9	lbs/day
	1 Hour Avg. - Acute	4.2 mg/l as N	17.4	lbs/day
Spring	4 Day Avg. - Chronic	1.2 mg/l as N	5.0	lbs/day
	1 Hour Avg. - Acute	3.5 mg/l as N	14.5	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	
Summer	4 Day Avg. - Chronic	0.011	mg/l	0.05	lbs/day
	1 Hour Avg. - Acute	0.019	mg/l	0.08	lbs/day
Fall	4 Day Avg. - Chronic	0.011	mg/l	0.05	lbs/day
	1 Hour Avg. - Acute	0.019	mg/l	0.08	lbs/day
Winter	4 Day Avg. - Chronic	0.011	mg/l	0.05	lbs/day
	1 Hour Avg. - Acute	0.019	mg/l	0.08	lbs/day
Spring	4 Day Avg. - Chronic	0.011	mg/l	0.05	lbs/day
	1 Hour Avg. - Acute	0.019	mg/l	0.08	lbs/day

Effluent Limitations for Total Dissolved Solids based upon Water Quality Standards

Season		Concentration		Load	
Summer	Maximum, Acute	1201.1	mg/l	2.50	tons/day
Fall	Maximum, Acute	1201.1	mg/l	2.50	tons/day
Winter	Maximum, Acute	1200.9	mg/l	2.50	tons/day
Spring	Maximum, Acute	1200.9	mg/l	2.50	tons/day

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 69.82 mg/l):

	4 Day Average		Load	1 Hour Average		Load
	Concentration			Concentration		
Aluminum*	N/A		N/A	751.0	ug/l	3.1 lbs/day
Arsenic*	190.24	ug/l	0.5 lbs/day	340.4	ug/l	1.4 lbs/day
Cadmium	0.62	ug/l	0.0 lbs/day	1.3	ug/l	0.0 lbs/day
Chromium III	64.29	ug/l	0.2 lbs/day	1,345.2	ug/l	5.6 lbs/day
Chromium VI*	11.01	ug/l	0.0 lbs/day	16.0	ug/l	0.1 lbs/day
Copper	6.87	ug/l	0.0 lbs/day	10.0	ug/l	0.0 lbs/day
Iron*	N/A		N/A	1,001.3	ug/l	4.2 lbs/day
Lead	2.02	ug/l	0.0 lbs/day	51.7	ug/l	0.2 lbs/day
Mercury*	0.01	ug/l	0.0 lbs/day	2.4	ug/l	0.0 lbs/day
Nickel	38.54	ug/l	0.1 lbs/day	346.7	ug/l	1.4 lbs/day
Selenium*	4.60	ug/l	0.0 lbs/day	20.0	ug/l	0.1 lbs/day
Silver	N/A	ug/l	N/A lbs/day	2.0	ug/l	0.0 lbs/day

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Zinc	88.49 ug/l	0.2 lbs/day	88.5	ug/l	0.4 lbs/day
Cyanide*	5.21 ug/l	0.0 lbs/day	22.0	ug/l	0.1 lbs/day

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

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

Summer	20.7 Deg. C.	69.3 Deg. F
Fall	11.9 Deg. C.	53.4 Deg. F
Winter	8.4 Deg. C.	47.1 Deg. F
Spring	16.8 Deg. C.	62.2 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	
	Concentration	Load	Concentration	Load
Aldrin			1.5E+00 ug/l	9.69E-03 lbs/day
Chlordane	4.30E-03 ug/l	1.79E-02 lbs/day	1.2E+00 ug/l	7.75E-03 lbs/day
DDT, DDE	1.00E-03 ug/l	4.17E-03 lbs/day	5.5E-01 ug/l	3.55E-03 lbs/day
Dieldrin	1.90E-03 ug/l	7.92E-03 lbs/day	1.3E+00 ug/l	8.08E-03 lbs/day
Endosulfan	5.60E-02 ug/l	2.33E-01 lbs/day	1.1E-01 ug/l	7.11E-04 lbs/day
Endrin	2.30E-03 ug/l	9.59E-03 lbs/day	9.0E-02 ug/l	5.82E-04 lbs/day
Guthion	0.00E+00 ug/l	0.00E+00 lbs/day	1.0E-02 ug/l	6.46E-05 lbs/day
Heptachlor	3.80E-03 ug/l	1.58E-02 lbs/day	2.6E-01 ug/l	1.68E-03 lbs/day
Lindane	8.00E-02 ug/l	3.34E-01 lbs/day	1.0E+00 ug/l	6.46E-03 lbs/day
Methoxychlor	0.00E+00 ug/l	0.00E+00 lbs/day	3.0E-02 ug/l	1.94E-04 lbs/day
Mirex	0.00E+00 ug/l	0.00E+00 lbs/day	1.0E-02 ug/l	6.46E-05 lbs/day
Parathion	0.00E+00 ug/l	0.00E+00 lbs/day	4.0E-02 ug/l	2.58E-04 lbs/day
PCB's	1.40E-02 ug/l	5.84E-02 lbs/day	2.0E+00 ug/l	1.29E-02 lbs/day
Pentachlorophenol	1.30E+01 ug/l	5.42E+01 lbs/day	2.0E+01 ug/l	1.29E-01 lbs/day
Toxephene	2.00E-04 ug/l	8.34E-04 lbs/day	7.3E-01 ug/l	4.72E-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	20.9 lbs/day
Nitrates as N	4.0 mg/l	16.7 lbs/day
Total Phosphorus as P	0.05 mg/l	0.2 lbs/day
Total Suspended Solids	90.0 mg/l	376.0 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	2.70E+03 ug/l	1.13E+01 lbs/day
Acrolein	7.81E+02 ug/l	3.26E+00 lbs/day
Acrylonitrile	6.61E-01 ug/l	2.76E-03 lbs/day
Benzene	7.11E+01 ug/l	2.96E-01 lbs/day
Benzidine	ug/l	lbs/day
Carbon tetrachloride	4.41E+00 ug/l	1.84E-02 lbs/day
Chlorobenzene	2.10E+04 ug/l	8.77E+01 lbs/day
1,2,4-Trichlorobenzene		
Hexachlorobenzene	7.71E-04 ug/l	3.21E-06 lbs/day
1,2-Dichloroethane	9.91E+01 ug/l	4.13E-01 lbs/day
1,1,1-Trichloroethane		
Hexachloroethane	8.91E+00 ug/l	3.72E-02 lbs/day
1,1-Dichloroethane		
1,1,2-Trichloroethane	4.21E+01 ug/l	1.75E-01 lbs/day
1,1,2,2-Tetrachloroethane	1.10E+01 ug/l	4.59E-02 lbs/day
Chloroethane		
Bis(2-chloroethyl) ether	1.40E+00 ug/l	5.84E-03 lbs/day
2-Chloroethyl vinyl ether		
2-Chloronaphthalene	4.31E+03 ug/l	1.80E+01 lbs/day
2,4,6-Trichlorophenol	6.51E+00 ug/l	2.71E-02 lbs/day
p-Chloro-m-cresol		
Chloroform (HM)	4.71E+02 ug/l	1.96E+00 lbs/day
2-Chlorophenol	4.01E+02 ug/l	1.67E+00 lbs/day
1,2-Dichlorobenzene	1.70E+04 ug/l	7.10E+01 lbs/day
1,3-Dichlorobenzene	2.60E+03 ug/l	1.09E+01 lbs/day

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1,4-Dichlorobenzene	2.60E+03 ug/l	1.09E+01 lbs/day
3,3'-Dichlorobenzidine	7.71E-02 ug/l	3.21E-04 lbs/day
1,1-Dichloroethylene	3.20E+00 ug/l	1.34E-02 lbs/day
1,2-trans-Dichloroethylene1		
2,4-Dichlorophenol	7.91E+02 ug/l	3.30E+00 lbs/day
1,2-Dichloropropane	3.91E+01 ug/l	1.63E-01 lbs/day
1,3-Dichloropropylene	1.70E+03 ug/l	7.10E+00 lbs/day
2,4-Dimethylphenol	2.30E+03 ug/l	9.60E+00 lbs/day
2,4-Dinitrotoluene	9.11E+00 ug/l	3.80E-02 lbs/day
2,6-Dinitrotoluene		
1,2-Diphenylhydrazine	5.41E-01 ug/l	2.25E-03 lbs/day
Ethylbenzene	2.90E+04 ug/l	1.21E+02 lbs/day
Fluoranthene	3.70E+02 ug/l	1.54E+00 lbs/day
4-Chlorophenyl phenyl ether		
4-Bromophenyl phenyl ether		
Bis(2-chloroisopropyl) ether	1.70E+05 ug/l	7.10E+02 lbs/day
Bis(2-chloroethoxy) methane		
Methylene chloride (HM)	1.60E+03 ug/l	6.68E+00 lbs/day
Methyl chloride (HM)		
Methyl bromide (HM)		
Bromoform (HM)	3.60E+02 ug/l	1.50E+00 lbs/day
Dichlorobromomethane(HM)	2.20E+01 ug/l	9.18E-02 lbs/day
Chlorodibromomethane (HM)	3.40E+01 ug/l	1.42E-01 lbs/day
Hexachlorocyclopentadiene	1.70E+04 ug/l	7.10E+01 lbs/day
Isophorone	6.01E+02 ug/l	2.50E+00 lbs/day
Naphthalene		
Nitrobenzene	1.90E+03 ug/l	7.93E+00 lbs/day
2-Nitrophenol		
4-Nitrophenol		
2,4-Dinitrophenol	1.40E+04 ug/l	5.84E+01 lbs/day
4,6-Dinitro-o-cresol	7.66E+02 ug/l	3.19E+00 lbs/day
N-Nitrosodimethylamine	8.11E+00 ug/l	3.38E-02 lbs/day
N-Nitrosodiphenylamine	1.60E+01 ug/l	6.68E-02 lbs/day
N-Nitrosodi-n-propylamine	1.40E+00 ug/l	5.84E-03 lbs/day
Pentachlorophenol	8.21E+00 ug/l	3.42E-02 lbs/day
Phenol	4.61E+06 ug/l	1.92E+04 lbs/day
Bis(2-ethylhexyl)phthalate	5.91E+00 ug/l	2.46E-02 lbs/day
Butyl benzyl phthalate	5.21E+03 ug/l	2.17E+01 lbs/day
Di-n-butyl phthalate	1.20E+04 ug/l	5.01E+01 lbs/day
Di-n-octyl phthlate		
Diethyl phthalate	1.20E+05 ug/l	5.01E+02 lbs/day
Dimethyl phthlate	2.90E+06 ug/l	1.21E+04 lbs/day
Benzo(a)anthracene (PAH)	3.10E-02 ug/l	1.29E-04 lbs/day
Benzo(a)pyrene (PAH)	3.10E-02 ug/l	1.29E-04 lbs/day
Benzo(b)fluoranthene (PAH)	3.10E-02 ug/l	1.29E-04 lbs/day
Benzo(k)fluoranthene (PAH)	3.10E-02 ug/l	1.29E-04 lbs/day
Chrysene (PAH)	3.10E-02 ug/l	1.29E-04 lbs/day
Acenaphthylene (PAH)		
Anthracene (PAH)		
Dibenzo(a,h)anthracene (PAH)	3.10E-02 ug/l	1.29E-04 lbs/day
Indeno(1,2,3-cd)pyrene (PAH)	3.10E-02 ug/l	1.29E-04 lbs/day

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Pyrene (PAH)	1.10E+04 ug/l	4.59E+01 lbs/day
Tetrachloroethylene	8.91E+00 ug/l	3.72E-02 lbs/day
Toluene	2.00E+05 ug/l	8.35E+02 lbs/day
Trichloroethylene	8.11E+01 ug/l	3.38E-01 lbs/day
Vinyl chloride	5.26E+02 ug/l	2.19E+00 lbs/day

Pesticides

Aldrin	1.40E-04 ug/l	5.84E-07 lbs/day
Dieldrin	1.40E-04 ug/l	5.84E-07 lbs/day
Chlordane	5.91E-04 ug/l	2.46E-06 lbs/day
4,4'-DDT	5.91E-04 ug/l	2.46E-06 lbs/day
4,4'-DDE	5.91E-04 ug/l	2.46E-06 lbs/day
4,4'-DDD	8.41E-04 ug/l	3.51E-06 lbs/day
alpha-Endosulfan	2.00E+00 ug/l	8.35E-03 lbs/day
beta-Endosulfan	2.00E+00 ug/l	8.35E-03 lbs/day
Endosulfan sulfate	2.00E+00 ug/l	8.35E-03 lbs/day
Endrin	8.11E-01 ug/l	3.38E-03 lbs/day
Endrin aldehyde	8.11E-01 ug/l	3.38E-03 lbs/day
Heptachlor	2.10E-04 ug/l	8.77E-07 lbs/day
Heptachlor epoxide		

PCB's

PCB 1242 (Arochlor 1242)	4.51E-05 ug/l	1.88E-07 lbs/day
PCB-1254 (Arochlor 1254)	4.51E-05 ug/l	1.88E-07 lbs/day
PCB-1221 (Arochlor 1221)	4.51E-05 ug/l	1.88E-07 lbs/day
PCB-1232 (Arochlor 1232)	4.51E-05 ug/l	1.88E-07 lbs/day
PCB-1248 (Arochlor 1248)	4.51E-05 ug/l	1.88E-07 lbs/day
PCB-1260 (Arochlor 1260)	4.51E-05 ug/l	1.88E-07 lbs/day
PCB-1016 (Arochlor 1016)	4.51E-05 ug/l	1.88E-07 lbs/day

Pesticide

Toxaphene	7.51E-04 ug/l	3.13E-06 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)

1.40E-08 ug/l

5.84E-11 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		751.0				751.0	N/A
Antimony				4305.6		4305.6	
Arsenic	100.1	340.4				100.1	190.2
Barium							
Beryllium							
Cadmium	10.0	1.3				1.3	0.6
Chromium (III)		1345.2				1345.2	64.3
Chromium (VI)	100.1	16.0				16.02	11.01
Copper	200.3	10.0				10.0	6.9
Cyanide		22.0	220284.4			22.0	5.2
Iron		1001.3				1001.3	
Lead	100.1	51.7				51.7	2.0
Mercury		2.40		0.15		0.15	0.012
Nickel		346.7		4605.9		346.7	38.5
Selenium	50.1	20.0				20.0	4.6
Silver		2.0				2.0	
Thallium				6.3		6.3	
Zinc		88.5				88.5	88.5
Boron	751.0					751.0	
Sulfate	2002.6					2002.6	

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	751.0	N/A	
Antimony	4305.56		
Arsenic	100.1	190.2	Acute Controls
Asbestos			
Barium			
Beryllium			
Cadmium	1.3	0.6	
Chromium (III)	1345.2	64	
Chromium (VI)	16.0	11.0	
Copper	10.0	6.9	

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Cyanide	22.0	5.2	
Iron	1001.3		
Lead	51.7	2.0	
Mercury	0.150	0.012	
Nickel	346.7	39	
Selenium	20.0	4.6	
Silver	2.0	N/A	
Thallium	6.3		
Zinc	88.5	88.5	
Boron	750.97		
Sulfate	2002.6		N/A at this Waterbody

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.

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 not required. The proposed permit is a simple renewal, with no increase in flow or concentration over that which was approved in the existing permit.

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.

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.