

Utah Division of Water Quality
Salt Lake City, Utah

WASTELOAD ANALYSIS [WLA]
Addendum: Statement of Basis

10-Apr-20
4:00 PM

Facilities: Canyon Fuel Dugout Mine / Dugout Creek
Discharging to: Dugout Creek

UPDES No: UT-UT0025593

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

Dugout Creek: 2B, 3C, 4
Antidegradation Review: Level I review completed. Level II review not 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	3000.0 mg/l	Background

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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**	0.141 lbs/day	750.00	ug/l	1.213 lbs/day
Arsenic	190.00 ug/l	0.307 lbs/day	340.00	ug/l	0.550 lbs/day
Cadmium	0.61 ug/l	0.001 lbs/day	6.52	ug/l	0.011 lbs/day
Chromium III	211.92 ug/l	0.343 lbs/day	4433.76	ug/l	7.169 lbs/day
ChromiumVI	11.00 ug/l	0.018 lbs/day	16.00	ug/l	0.026 lbs/day
Copper	23.85 ug/l	0.039 lbs/day	39.41	ug/l	0.064 lbs/day
Iron			1000.00	ug/l	1.617 lbs/day
Lead	12.88 ug/l	0.021 lbs/day	330.61	ug/l	0.535 lbs/day
Mercury	0.0120 ug/l	0.000 lbs/day	2.40	ug/l	0.004 lbs/day
Nickel	132.13 ug/l	0.214 lbs/day	1188.45	ug/l	1.922 lbs/day
Selenium	4.60 ug/l	0.007 lbs/day	20.00	ug/l	0.032 lbs/day
Silver	N/A ug/l	N/A lbs/day	25.04	ug/l	0.040 lbs/day
Zinc	303.94 ug/l	0.491 lbs/day	303.94	ug/l	0.491 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 300 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	0.002 lbs/day
Chlordane	0.004 ug/l	0.072 lbs/day	1.200	ug/l	0.002 lbs/day
DDT, DDE	0.001 ug/l	0.017 lbs/day	0.550	ug/l	0.001 lbs/day
Dieldrin	0.002 ug/l	0.032 lbs/day	1.250	ug/l	0.002 lbs/day
Endosulfan	0.056 ug/l	0.934 lbs/day	0.110	ug/l	0.000 lbs/day
Endrin	0.002 ug/l	0.038 lbs/day	0.090	ug/l	0.000 lbs/day
Guthion			0.010	ug/l	0.000 lbs/day
Heptachlor	0.004 ug/l	0.063 lbs/day	0.260	ug/l	0.000 lbs/day
Lindane	0.080 ug/l	1.334 lbs/day	1.000	ug/l	0.002 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	0.233 lbs/day	2.000	ug/l	0.003 lbs/day
Pentachlorophenol	13.00 ug/l	216.804 lbs/day	20.000	ug/l	0.032 lbs/day
Toxephene	0.0002 ug/l	0.003 lbs/day	0.7300	ug/l	0.001 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	0.61 lbs/day
Cadmium			10.0 ug/l	0.01 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			3000.0 mg/l	2.43 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			50.0 ug/l	0.834 lbs/day
Barium			1000.0 ug/l	16.677 lbs/day
Cadmium			10.0 ug/l	0.167 lbs/day
Chromium			50.0 ug/l	0.834 lbs/day
Lead			50.0 ug/l	0.834 lbs/day
Mercury			2.0 ug/l	0.033 lbs/day
Selenium			10.0 ug/l	0.167 lbs/day
Silver			50.0 ug/l	0.834 lbs/day
Fluoride (3)			1.4 ug/l	0.023 lbs/day
to			2.4 ug/l	0.040 lbs/day
Nitrates as N			10.0 ug/l	0.167 lbs/day

Chlorophenoxy Herbicides

2,4-D	100.0 ug/l	1.668 lbs/day
2,4,5-TP	10.0 ug/l	0.167 lbs/day
Endrin	0.2 ug/l	0.003 lbs/day
cyclohexane (Lindane)	4.0 ug/l	0.067 lbs/day
Methoxychlor	100.0 ug/l	1.668 lbs/day
Toxaphene	5.0 ug/l	0.083 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	1200.00 ug/l	20.01 lbs/day	2700.0 ug/l	45.03 lbs/day
Acrolein	320.00 ug/l	5.34 lbs/day	780.0 ug/l	13.01 lbs/day
Acrylonitrile	0.06 ug/l	0.00 lbs/day	0.7 ug/l	0.01 lbs/day
Benzene	1.20 ug/l	0.02 lbs/day	71.0 ug/l	1.18 lbs/day
Benzidine	0.00012 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
Carbon tetrachloride	0.25 ug/l	0.00 lbs/day	4.4 ug/l	0.07 lbs/day
Chlorobenzene	680.00 ug/l	11.34 lbs/day	21000.0 ug/l	350.22 lbs/day
1,2,4-Trichlorobenzene				
Hexachlorobenzene	0.00075 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
1,2-Dichloroethane	0.38 ug/l	0.01 lbs/day	99.0 ug/l	1.65 lbs/day
1,1,1-Trichloroethane				
Hexachloroethane	1.90 ug/l	0.03 lbs/day	8.9 ug/l	0.15 lbs/day
1,1-Dichloroethane				
1,1,2-Trichloroethane	0.61 ug/l	0.01 lbs/day	42.0 ug/l	0.70 lbs/day
1,1,2,2-Tetrachloroethane	0.17 ug/l	0.00 lbs/day	11.0 ug/l	0.18 lbs/day
Chloroethane			0.0 ug/l	0.00 lbs/day
Bis(2-chloroethyl) ether	0.03 ug/l	0.00 lbs/day	1.4 ug/l	0.02 lbs/day
2-Chloroethyl vinyl ether	0.00 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
2-Chloronaphthalene	1700.00 ug/l	28.35 lbs/day	4300.0 ug/l	71.71 lbs/day
2,4,6-Trichlorophenol	2.10 ug/l	0.04 lbs/day	6.5 ug/l	0.11 lbs/day

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p-Chloro-m-cresol			0.0 ug/l	0.00 lbs/day
Chloroform (HM)	5.70 ug/l	0.10 lbs/day	470.0 ug/l	7.84 lbs/day
2-Chlorophenol	120.00 ug/l	2.00 lbs/day	400.0 ug/l	6.67 lbs/day
1,2-Dichlorobenzene	2700.00 ug/l	45.03 lbs/day	17000.0 ug/l	283.51 lbs/day
1,3-Dichlorobenzene	400.00 ug/l	6.67 lbs/day	2600.0 ug/l	43.36 lbs/day
1,4-Dichlorobenzene	400.00 ug/l	6.67 lbs/day	2600.0 ug/l	43.36 lbs/day
3,3'-Dichlorobenzidine	0.04 ug/l	0.00 lbs/day	0.1 ug/l	0.00 lbs/day
1,1-Dichloroethylene	0.06 ug/l	0.00 lbs/day	3.2 ug/l	0.05 lbs/day
1,2-trans-Dichloroethylene	700.00 ug/l	11.67 lbs/day	0.0 ug/l	0.00 lbs/day
2,4-Dichlorophenol	93.00 ug/l	1.55 lbs/day	790.0 ug/l	13.17 lbs/day
1,2-Dichloropropane	0.52 ug/l	0.01 lbs/day	39.0 ug/l	0.65 lbs/day
1,3-Dichloropropylene	10.00 ug/l	0.17 lbs/day	1700.0 ug/l	28.35 lbs/day
2,4-Dimethylphenol	540.00 ug/l	9.01 lbs/day	2300.0 ug/l	38.36 lbs/day
2,4-Dinitrotoluene	0.11 ug/l	0.00 lbs/day	9.1 ug/l	0.15 lbs/day
2,6-Dinitrotoluene	0.00 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
1,2-Diphenylhydrazine	0.04 ug/l	0.00 lbs/day	0.5 ug/l	0.01 lbs/day
Ethylbenzene	3100.00 ug/l	51.70 lbs/day	29000.0 ug/l	483.64 lbs/day
Fluoranthene	300.00 ug/l	5.00 lbs/day	370.0 ug/l	6.17 lbs/day
4-Chlorophenyl phenyl ether				
4-Bromophenyl phenyl ether				
Bis(2-chloroisopropyl) e	1400.00 ug/l	23.35 lbs/day	170000.0 ug/l	2835.12 lbs/day
Bis(2-chloroethoxy) met	0.00 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
Methylene chloride (HM)	4.70 ug/l	0.08 lbs/day	1600.0 ug/l	26.68 lbs/day
Methyl chloride (HM)	0.00 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
Methyl bromide (HM)	0.00 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
Bromoform (HM)	4.30 ug/l	0.07 lbs/day	360.0 ug/l	6.00 lbs/day
Dichlorobromomethane	0.27 ug/l	0.00 lbs/day	22.0 ug/l	0.37 lbs/day
Chlorodibromomethane	0.41 ug/l	0.01 lbs/day	34.0 ug/l	0.57 lbs/day
Hexachlorobutadiene(c)	0.44 ug/l	0.01 lbs/day	50.0 ug/l	0.83 lbs/day
Hexachlorocyclopentadi	240.00 ug/l	4.00 lbs/day	17000.0 ug/l	283.51 lbs/day
Isophorone	8.40 ug/l	0.14 lbs/day	600.0 ug/l	10.01 lbs/day
Naphthalene				
Nitrobenzene	17.00 ug/l	0.28 lbs/day	1900.0 ug/l	31.69 lbs/day
2-Nitrophenol	0.00 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
4-Nitrophenol	0.00 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
2,4-Dinitrophenol	70.00 ug/l	1.17 lbs/day	14000.0 ug/l	233.48 lbs/day
4,6-Dinitro-o-cresol	13.00 ug/l	0.22 lbs/day	765.0 ug/l	12.76 lbs/day
N-Nitrosodimethylamine	0.00069 ug/l	0.00 lbs/day	8.1 ug/l	0.14 lbs/day
N-Nitrosodiphenylamine	5.00 ug/l	0.08 lbs/day	16.0 ug/l	0.27 lbs/day
N-Nitrosodi-n-propylami	0.01 ug/l	0.00 lbs/day	1.4 ug/l	0.02 lbs/day
Pentachlorophenol	0.28 ug/l	0.00 lbs/day	8.2 ug/l	0.14 lbs/day
Phenol	2.10E+04 ug/l	3.50E+02 lbs/day	4.6E+06 ug/l	7.67E+04 lbs/day
Bis(2-ethylhexyl)phthala	1.80 ug/l	0.03 lbs/day	5.9 ug/l	0.10 lbs/day
Butyl benzyl phthalate	3000.00 ug/l	50.03 lbs/day	5200.0 ug/l	86.72 lbs/day
Di-n-butyl phthalate	2700.00 ug/l	45.03 lbs/day	12000.0 ug/l	200.13 lbs/day
Di-n-octyl phthlate				
Diethyl phthalate	23000.00 ug/l	383.58 lbs/day	120000.0 ug/l	2001.26 lbs/day
Dimethyl phthlate	3.13E+05 ug/l	5.22E+03 lbs/day	2.9E+06 ug/l	4.84E+04 lbs/day
Benzo(a)anthracene (P/	0.0028 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
Benzo(a)pyrene (PAH)	0.0028 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
Benzo(b)fluoranthene (F	0.0028 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
Benzo(k)fluoranthene (F	0.0028 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
Chrysene (PAH)	0.0028 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
Acenaphthylene (PAH)				
Anthracene (PAH)	9600.00 ug/l	160.10 lbs/day	0.0 ug/l	0.00 lbs/day
Dibenzo(a,h)anthracene	0.0028 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
Indeno(1,2,3-cd)pyrene	0.0028 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
Pyrene (PAH)	960.00 ug/l	16.01 lbs/day	11000.0 ug/l	183.45 lbs/day
Tetrachloroethylene	0.80 ug/l	0.01 lbs/day	8.9 ug/l	0.15 lbs/day
Toluene	6800.00 ug/l	113.40 lbs/day	200000 ug/l	3335.44 lbs/day
Trichloroethylene	2.70 ug/l	0.05 lbs/day	81.0 ug/l	1.35 lbs/day

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Vinyl chloride	2.00 ug/l	0.03 lbs/day	525.0 ug/l	8.76 lbs/day
			0.0	0.00 lbs/day
Pesticides			0.0	0.00 lbs/day
Aldrin	0.0001 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
Dieldrin	0.0001 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
Chlordane	0.0006 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
4,4'-DDT	0.0006 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
4,4'-DDE	0.0006 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
4,4'-DDD	0.0008 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
alpha-Endosulfan	0.9300 ug/l	0.02 lbs/day	2.0 ug/l	0.03 lbs/day
beta-Endosulfan	0.9300 ug/l	0.02 lbs/day	2.0 ug/l	0.03 lbs/day
Endosulfan sulfate	0.9300 ug/l	0.02 lbs/day	2.0 ug/l	0.03 lbs/day
Endrin	0.7600 ug/l	0.01 lbs/day	0.8 ug/l	0.01 lbs/day
Endrin aldehyde	0.7600 ug/l	0.01 lbs/day	0.8 ug/l	0.01 lbs/day
Heptachlor	0.0002 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
Heptachlor epoxide				
PCB's				
PCB 1242 (Arochlor 1242)	0.000044 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1254 (Arochlor 1254)	0.000044 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1221 (Arochlor 1221)	0.000044 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1232 (Arochlor 1232)	0.000044 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1248 (Arochlor 1248)	0.000044 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1260 (Arochlor 1260)	0.000044 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1016 (Arochlor 1016)	0.000044 ug/l	0.00 lbs/day	0.0 ug/l	0.00 lbs/day
Pesticide				
Toxaphene	0.000750 ug/l	0.00	0.0 ug/l	0.00 lbs/day
Dioxin				
Dioxin (2,3,7,8-TCDD)	1.30E-08 ug/l	0.00 lbs/day	1.40E-08	0.00
Metals				
Antimony	14.0 ug/l	0.23 lbs/day		
Arsenic	50.0 ug/l	0.83 lbs/day	4300.00 ug/l	71.71 lbs/day
Asbestos	7.00E+06 ug/l	1.17E+05 lbs/day		
Beryllium				
Cadmium				
Chromium (III)				
Chromium (VI)				
Copper				
Cyanide	1.30E+03 ug/l	21.68 lbs/day	2.2E+05 ug/l	3668.98 lbs/day
Lead	700.0 ug/l	11.67 lbs/day		
Mercury			0.15 ug/l	0.00 lbs/day
Nickel			4600.00 ug/l	76.72 lbs/day
Selenium	0.1 ug/l	0.00 lbs/day		
Silver	610.0 ug/l	10.17 lbs/day		
Thallium			6.30 ug/l	0.11 lbs/day
Zinc				

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

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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.

(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

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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
Summer (Irrig. Season)	0.0	11.8	8.4	0.00	0.10	10.15	0.00	368.1
Fall	0.0	4.5	8.4	0.00	0.10	---	0.00	498.4
Winter	0.0	4.5	8.4	0.00	0.10	---	0.00	498.4
Spring	0.0	12.8	8.5	0.00	0.10	---	0.00	498.4
Dissolved	Al	As	Cd	CrIII	CrVI	Copper	Fe	Pb
Metals	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	Hg	Ni	Se	Ag	Zn	Boron		
Metals	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.	TDS mg/l	TDS tons/day
Summer	2.00000	17.2	1170.00	9.75585
Fall	2.00000	14.5		
Winter	2.00000	13.1		
Spring	2.00000	15.4		

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	2.000 MGD	3.094 cfs
Fall	2.000 MGD	3.094 cfs
Winter	2.000 MGD	3.094 cfs
Spring	2.000 MGD	3.094 cfs

Flow Requirement or Loading Requirement

The calculations in this wasteload analysis utilize the maximum effluent discharge flow of 2 MGD. If the discharger is allowed to have a flow greater than 2 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.

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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 >	100.0% Effluent	[Chronic]

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	416.9 lbs/day
Fall	25.0 mg/l as BOD5	416.9 lbs/day
Winter	25.0 mg/l as BOD5	416.9 lbs/day
Spring	25.0 mg/l as BOD5	416.9 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	5.00
Fall	5.00
Winter	5.00
Spring	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
Summer	4 Day Avg. - Chronic	1.6 mg/l as N	26.7 lbs/day
	1 Hour Avg. - Acute	6.1 mg/l as N	101.1 lbs/day
Fall	4 Day Avg. - Chronic	2.9 mg/l as N	47.6 lbs/day
	1 Hour Avg. - Acute	9.4 mg/l as N	157.3 lbs/day
Winter	4 Day Avg. - Chronic	2.1 mg/l as N	34.6 lbs/day
	1 Hour Avg. - Acute	7.4 mg/l as N	124.0 lbs/day
Spring	4 Day Avg. - Chronic	2.9 mg/l as N	0.0 lbs/day
	1 Hour Avg. - Acute	9.4 mg/l as N	0.0 lbs/day

Acute limit calculated with an Acute Zone of Initial Dilution (ZID) to be equal to 100.0%.

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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	0.18	lbs/day	
	1 Hour Avg. - Acute	0.019	mg/l	0.32	lbs/day	
Fall	4 Day Avg. - Chronic	0.011	mg/l	0.18	lbs/day	
	1 Hour Avg. - Acute	0.019	mg/l	0.32	lbs/day	
Winter	4 Day Avg. - Chronic	0.011	mg/l	0.18	lbs/day	
	1 Hour Avg. - Acute	0.019	mg/l	0.32	lbs/day	
Spring	4 Day Avg. - Chronic	0.011	mg/l	0.00	lbs/day	
	1 Hour Avg. - Acute	0.019	mg/l	0.00	lbs/day	

Effluent Limitations for Total Dissolved Solids based upon Water Quality Standards

	Season		Concentration		Load	
Summer	Maximum, Acute	3000.1	mg/l	25.02	tons/day	
Fall	Maximum, Acute	3000.1	mg/l	25.02	tons/day	
Winter	Maximum, Acute	3000.1	mg/l	25.02	tons/day	
Spring	4 Day Avg. - Chronic	3000.1	mg/l	25.02	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 300 mg/l):

	4 Day Average		1 Hour Average		Load
	Concentration	Load	Concentration	Load	
Aluminum	N/A	N/A	750.0	ug/l	1.2 lbs/day
Arsenic	190.01 ug/l	2.0 lbs/day	340.0	ug/l	0.5 lbs/day
Cadmium	0.61 ug/l	0.0 lbs/day	6.5	ug/l	0.0 lbs/day
Chromium III	211.93 ug/l	2.3 lbs/day	4,433.9	ug/l	7.2 lbs/day
Chromium VI	11.00 ug/l	0.1 lbs/day	16.0	ug/l	0.0 lbs/day
Copper	23.85 ug/l	0.3 lbs/day	39.4	ug/l	0.1 lbs/day
Iron	N/A	N/A	1,000.0	ug/l	1.6 lbs/day
Lead	12.88 ug/l	0.1 lbs/day	330.6	ug/l	0.5 lbs/day
Mercury	0.01 ug/l	0.0 lbs/day	2.4	ug/l	0.0 lbs/day
Nickel	132.14 ug/l	1.4 lbs/day	1,188.5	ug/l	1.9 lbs/day
Selenium	4.60 ug/l	0.0 lbs/day	20.0	ug/l	0.0 lbs/day
Silver	N/A ug/l	N/A lbs/day	25.0	ug/l	0.0 lbs/day
Zinc	303.95 ug/l	3.3 lbs/day	303.9	ug/l	0.5 lbs/day
Cyanide	5.20 ug/l	0.1 lbs/day	22.0	ug/l	0.0 lbs/day

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

Summer	13.8 Deg. C.	56.8 Deg. F
Fall	6.5 Deg. C.	43.7 Deg. F
Winter	6.5 Deg. C.	43.7 Deg. F
Spring	14.8 Deg. C.	58.6 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 3.75E-03 lbs/day
Chlordane	4.30E-03 ug/l	7.17E-02 lbs/day	1.2E+00	ug/l 3.00E-03 lbs/day
DDT, DDE	1.00E-03 ug/l	1.67E-02 lbs/day	5.5E-01	ug/l 1.38E-03 lbs/day
Dieldrin	1.90E-03 ug/l	3.17E-02 lbs/day	1.3E+00	ug/l 3.13E-03 lbs/day
Endosulfan	5.60E-02 ug/l	9.34E-01 lbs/day	1.1E-01	ug/l 2.75E-04 lbs/day
Endrin	2.30E-03 ug/l	3.84E-02 lbs/day	9.0E-02	ug/l 2.25E-04 lbs/day
Guthion	0.00E+00 ug/l	0.00E+00 lbs/day	1.0E-02	ug/l 2.50E-05 lbs/day
Heptachlor	3.80E-03 ug/l	6.34E-02 lbs/day	2.6E-01	ug/l 6.50E-04 lbs/day
Lindane	8.00E-02 ug/l	1.33E+00 lbs/day	1.0E+00	ug/l 2.50E-03 lbs/day
Methoxychlor	0.00E+00 ug/l	0.00E+00 lbs/day	3.0E-02	ug/l 7.50E-05 lbs/day
Mirex	0.00E+00 ug/l	0.00E+00 lbs/day	1.0E-02	ug/l 2.50E-05 lbs/day
Parathion	0.00E+00 ug/l	0.00E+00 lbs/day	4.0E-02	ug/l 1.00E-04 lbs/day
PCB's	1.40E-02 ug/l	2.33E-01 lbs/day	2.0E+00	ug/l 5.00E-03 lbs/day
Pentachlorophenol	1.30E+01 ug/l	2.17E+02 lbs/day	2.0E+01	ug/l 5.00E-02 lbs/day
Toxephene	2.00E-04 ug/l	3.34E-03 lbs/day	7.3E-01	ug/l 1.83E-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:

	Concentration	1 Hour Average Loading
Gross Beta (pCi/l)	50.0 pCi/L	
BOD (mg/l)	5.0 mg/l	8.1 lbs/day
Nitrates as N	4.0 mg/l	6.5 lbs/day
Total Phosphorus as P	0.05 mg/l	0.1 lbs/day
Total Suspended Solids	90.0 mg/l	145.5 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	Maximum Concentration Load
Toxic Organics		
Acenaphthene	1.20E+03 ug/l	2.00E+01 lbs/day
Acrolein	3.20E+02 ug/l	5.34E+00 lbs/day
Acrylonitrile	5.90E-02 ug/l	9.84E-04 lbs/day
Benzene	1.20E+00 ug/l	2.00E-02 lbs/day
Benzidine	ug/l	lbs/day
Carbon tetrachloride	2.50E-01 ug/l	4.17E-03 lbs/day
Chlorobenzene	6.80E+02 ug/l	1.13E+01 lbs/day
1,2,4-Trichlorobenzene		
Hexachlorobenzene	7.50E-04 ug/l	1.25E-05 lbs/day
1,2-Dichloroethane	3.80E-01 ug/l	6.34E-03 lbs/day
1,1,1-Trichloroethane		
Hexachloroethane	1.90E+00 ug/l	3.17E-02 lbs/day
1,1-Dichloroethane		
1,1,2-Trichloroethane	6.10E-01 ug/l	1.02E-02 lbs/day
1,1,2,2-Tetrachloroethane	1.70E-01 ug/l	2.84E-03 lbs/day
Chloroethane		
Bis(2-chloroethyl) ether	3.10E-02 ug/l	5.17E-04 lbs/day
2-Chloroethyl vinyl ether		
2-Chloronaphthalene	1.70E+03 ug/l	2.84E+01 lbs/day
2,4,6-Trichlorophenol	2.10E+00 ug/l	3.50E-02 lbs/day
p-Chloro-m-cresol		
Chloroform (HM)	5.70E+00 ug/l	9.51E-02 lbs/day
2-Chlorophenol	1.20E+02 ug/l	2.00E+00 lbs/day
1,2-Dichlorobenzene	2.70E+03 ug/l	4.50E+01 lbs/day
1,3-Dichlorobenzene	4.00E+02 ug/l	6.67E+00 lbs/day
1,4-Dichlorobenzene	4.00E+02 ug/l	6.67E+00 lbs/day
3,3'-Dichlorobenzidine	4.00E-02 ug/l	6.67E-04 lbs/day
1,1-Dichloroethylene	5.70E-02 ug/l	9.51E-04 lbs/day
1,2-trans-Dichloroethylene1		
2,4-Dichlorophenol	9.30E+01 ug/l	1.55E+00 lbs/day
1,2-Dichloropropane	5.20E-01 ug/l	8.67E-03 lbs/day
1,3-Dichloropropylene	1.00E+01 ug/l	1.67E-01 lbs/day
2,4-Dimethylphenol	5.40E+02 ug/l	9.01E+00 lbs/day
2,4-Dinitrotoluene	1.10E-01 ug/l	1.83E-03 lbs/day
2,6-Dinitrotoluene		

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1,2-Diphenylhydrazine	4.00E-02 ug/l	6.67E-04 lbs/day
Ethylbenzene	3.10E+03 ug/l	5.17E+01 lbs/day
Fluoranthene	3.00E+02 ug/l	5.00E+00 lbs/day
4-Chlorophenyl phenyl ether		
4-Bromophenyl phenyl ether		
Bis(2-chloroisopropyl) ether	1.40E+03 ug/l	2.33E+01 lbs/day
Bis(2-chloroethoxy) methane		
Methylene chloride (HM)	4.70E+00 ug/l	7.84E-02 lbs/day
Methyl chloride (HM)		
Methyl bromide (HM)		
Bromoform (HM)	4.30E+00 ug/l	7.17E-02 lbs/day
Dichlorobromomethane(HM)	2.70E-01 ug/l	4.50E-03 lbs/day
Chlorodibromomethane (HM)	4.10E-01 ug/l	6.84E-03 lbs/day
Hexachlorocyclopentadiene	2.40E+02 ug/l	4.00E+00 lbs/day
Isophorone	8.40E+00 ug/l	1.40E-01 lbs/day
Naphthalene		
Nitrobenzene	1.70E+01 ug/l	2.84E-01 lbs/day
2-Nitrophenol		
4-Nitrophenol		
2,4-Dinitrophenol	7.00E+01 ug/l	1.17E+00 lbs/day
4,6-Dinitro-o-cresol	1.30E+01 ug/l	2.17E-01 lbs/day
N-Nitrosodimethylamine	6.90E-04 ug/l	1.15E-05 lbs/day
N-Nitrosodiphenylamine	5.00E+00 ug/l	8.34E-02 lbs/day
N-Nitrosodi-n-propylamine	5.00E-03 ug/l	8.34E-05 lbs/day
Pentachlorophenol	2.80E-01 ug/l	4.67E-03 lbs/day
Phenol	2.10E+04 ug/l	3.50E+02 lbs/day
Bis(2-ethylhexyl)phthalate	1.80E+00 ug/l	3.00E-02 lbs/day
Butyl benzyl phthalate	3.00E+03 ug/l	5.00E+01 lbs/day
Di-n-butyl phthalate	2.70E+03 ug/l	4.50E+01 lbs/day
Di-n-octyl phthlate		
Diethyl phthalate	2.30E+04 ug/l	3.84E+02 lbs/day
Dimethyl phthlate	3.13E+05 ug/l	5.22E+03 lbs/day
Benzo(a)anthracene (PAH)	2.80E-03 ug/l	4.67E-05 lbs/day
Benzo(a)pyrene (PAH)	2.80E-03 ug/l	4.67E-05 lbs/day
Benzo(b)fluoranthene (PAH)	2.80E-03 ug/l	4.67E-05 lbs/day
Benzo(k)fluoranthene (PAH)	2.80E-03 ug/l	4.67E-05 lbs/day
Chrysene (PAH)	2.80E-03 ug/l	4.67E-05 lbs/day
Acenaphthylene (PAH)		
Anthracene (PAH)		
Dibenzo(a,h)anthracene (PAH)	2.80E-03 ug/l	4.67E-05 lbs/day
Indeno(1,2,3-cd)pyrene (PAH)	2.80E-03 ug/l	4.67E-05 lbs/day
Pyrene (PAH)	9.60E+02 ug/l	1.60E+01 lbs/day
Tetrachloroethylene	8.00E-01 ug/l	1.33E-02 lbs/day
Toluene	6.80E+03 ug/l	1.13E+02 lbs/day
Trichloroethylene	2.70E+00 ug/l	4.50E-02 lbs/day
Vinyl chloride	2.00E+00 ug/l	3.34E-02 lbs/day
Pesticides		
Aldrin	1.30E-04 ug/l	2.17E-06 lbs/day
Dieldrin	1.40E-04 ug/l	2.33E-06 lbs/day
Chlordane	5.70E-04 ug/l	9.51E-06 lbs/day
4,4'-DDT	5.90E-04 ug/l	9.84E-06 lbs/day
4,4'-DDE	5.90E-04 ug/l	9.84E-06 lbs/day
4,4'-DDD	8.30E-04 ug/l	1.38E-05 lbs/day
alpha-Endosulfan	9.30E-01 ug/l	1.55E-02 lbs/day
beta-Endosulfan	9.30E-01 ug/l	1.55E-02 lbs/day
Endosulfan sulfate	9.30E-01 ug/l	1.55E-02 lbs/day
Endrin	7.60E-01 ug/l	1.27E-02 lbs/day
Endrin aldehyde	7.60E-01 ug/l	1.27E-02 lbs/day
Heptachlor	2.10E-04 ug/l	3.50E-06 lbs/day
Heptachlor epoxide		

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PCB's

PCB 1242 (Arochlor 1242)	4.40E-05 ug/l	7.34E-07 lbs/day
PCB-1254 (Arochlor 1254)	4.40E-05 ug/l	7.34E-07 lbs/day
PCB-1221 (Arochlor 1221)	4.40E-05 ug/l	7.34E-07 lbs/day
PCB-1232 (Arochlor 1232)	4.40E-05 ug/l	7.34E-07 lbs/day
PCB-1248 (Arochlor 1248)	4.40E-05 ug/l	7.34E-07 lbs/day
PCB-1260 (Arochlor 1260)	4.40E-05 ug/l	7.34E-07 lbs/day
PCB-1016 (Arochlor 1016)	4.40E-05 ug/l	7.34E-07 lbs/day

Pesticide

Toxaphene	7.30E-04 ug/l	1.22E-05 lbs/day
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Metals

Antimony	14.00 ug/l	0.23 lbs/day
Arsenic	50.00 ug/l	0.83 lbs/day
Asbestos	7.00E+06 ug/l	1.17E+05 lbs/day
Beryllium		
Cadmium		
Chromium (III)		
Chromium (VI)		
Copper	1300.04 ug/l	21.68 lbs/day
Cyanide	700.02 ug/l	11.67 lbs/day
Lead	0.00	0.00
Mercury	0.14 ug/l	0.00 lbs/day
Nickel	610.02 ug/l	10.17 lbs/day
Selenium	0.00	0.00
Silver	0.00	0.00
Thallium	1.70 ug/l	0.03 lbs/day
Zinc		

Dioxin

Dioxin (2,3,7,8-TCDD)	1.30E-08 ug/l	2.17E-10 lbs/day
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**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		750.0				750.0	N/A
Antimony			14.0	4300.1		14.0	
Arsenic	100.0	340.0	50.0		0.0	50.0	190.0
Barium					1000.0	1000.0	
Beryllium						0.0	
Cadmium	10.0	6.5			0.0	6.5	0.6
Chromium (III)		4433.9			0.0	4433.9	211.9
Chromium (VI)	100.0	16.0			0.0	16.00	11.00
Copper	200.0	39.4	1300.0			39.4	23.9
Cyanide		22.0	220007.1			22.0	5.2
Iron		1000.0				1000.0	
Lead	100.0	330.6			0.0	100.0	12.9
Mercury		2.40	0.1	0.15	0.0	0.14	0.012
Nickel		1188.5	610.0	4600.1		610.0	132.1
Selenium	50.0	20.0			0.0	20.0	4.6
Silver		25.0			0.0	25.0	
Thallium			1.7	6.3		1.7	
Zinc		303.9				303.9	303.9
Boron	750.0					750.0	

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	750.0	N/A	
Antimony	14.00		
Arsenic	50.0	190.0	Acute Controls
Asbestos	7.00E+06		
Barium			
Beryllium			
Cadmium	6.5	0.6	
Chromium (III)	4433.9	212	
Chromium (VI)	16.0	11.0	
Copper	39.4	23.9	
Cyanide	22.0	5.2	
Iron	1000.0		
Lead	100.0	12.9	
Mercury	0.140	0.012	
Nickel	610.0	132	
Selenium	20.0	4.6	
Silver	25.0	N/A	
Thallium	1.7		
Zinc	303.9	303.9	
Boron	750.02		

Other Effluent Limitations are based upon R317-1.

E. coli 126.0 organisms per 100 ml

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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 was not 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.

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 down-stream 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.

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File Name: DugoutCreek_WLA_4-10-2020.xls

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APPENDIX - Coefficients and Other Model Information

CBOD Coeff. (Kd)20 1/day 2.000	CBOD Coeff. FORCED (Kd)/day 0.000	CBOD Coeff. (Ka)T 1/day 0.799	REAER. Coeff. (Ka)20 (Ka)/day 6445.200	REAER. Coeff. FORCED 1/day 0.000	REAER. Coeff. (Ka)T 1/day 4011.980	NBOD Coeff. (Kn)20 1/day 0.250	NBOD Coeff. (Kn)T 1/day 0.054
Open Coeff. (K4)20 1/day 0.000	Open Coeff. (K4)T 1/day 0.000	NH3 LOSS (K5)20 1/day 4.000	NH3 (K5)T 1/day 1.597	NO2+NO3 LOSS (K6)20 1/day 0.000	NO2+NO3 (K6)T 1/day 0.000	TRC Decay K(CI)20 1/day 32.000	TRC K(CI)(T) 1/day 9.985
BENTHIC DEMAND (SOD)20 gm/m2/day 1.000	BENTHIC DEMAND (SOD)T gm/m2/day 0.284						
K1 CBOD {theta} 1.0	K2 Reaer. {theta} 1.0	K3 NH3 {theta} 1.1	K4 Open {theta} 1.0	K5 NH3 Loss {theta} 1.0	K6 NO2+3 {theta} 1.0	K(CI) TRC {theta} 1.1	S Benthic {theta} 1.1

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 any degradation is de minimis in nature and therefore does not require a Level II review.

DWQ-2020-010957