

**WASTELOAD ANALYSIS [WLA]
Addendum: Statement of Basis
SUMMARY**

Discharging Facility: St. George WWTP
 UPDES No: UT-
 Design Flow 17.00 MGD

Receiving Water: Virgin River
 Stream Classification: 2B, 3B, 4
 Stream Flows [cfs]:
 34.30 Summer (July-Sept) 20th Percentile
 73.52 Fall (Oct-Dec) 20th Percentile
 76.06 Winter (Jan-Mar) 20th Percentile
 36.50 Spring (Apr-June) 20th Percentile
 0.0 Average
 Stream TDS Values:
 2105.0 Summer (July-Sept) Average
 1883.0 Fall (Oct-Dec) Average
 2285.0 Winter (Jan-Mar) Average
 2684.0 Spring (Apr-June) Average

Effluent Limits:		WQ Standard:
Flow, MGD:	17.00 MGD	Design Flow
BOD, mg/l:	17.0 Summer	5.0 Indicator
Dissolved Oxygen, mg/l	5.5 Summer	5.5 30 Day Average
TNH3, Chronic, mg/l:	2.8 Summer	Varies Function of pH and Temperature
TDS, mg/l:	2692.6 Summer	2360.0 Site Specific

Modeling Parameters:
 Acute River Width: 50.0%
 Chronic River Width: 100.0%

Level 1 Antidegradation Level Completed: Level II Review NOT required.

Date: 7/16/2018

Utah Division of Water Quality
Salt Lake City, Utah

WASTELOAD ANALYSIS [WLA]
Addendum: Statement of Basis

16-Jul-18
4:00 PM

Facilities: St. George WWTP
Discharging to: Virgin River

UPDES No: UT-

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

Virgin River:	2B, 3B, 4
Antidegradation Review:	Level I review completed. Amended Level II review NOT requ

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)	5.50 mg/l (30 Day Average) 4.00 mg/l (7Day Average) 3.00 mg/l (1 Day Average)	
Maximum Total Dissolved Solids	2360.0 mg/l	3ackground

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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**	12.356 lbs/day	750.00	ug/l	106.520 lbs/day
Arsenic	190.00 ug/l	26.985 lbs/day	340.00	ug/l	48.289 lbs/day
Cadmium	0.76 ug/l	0.107 lbs/day	8.73	ug/l	1.240 lbs/day
Chromium III	268.22 ug/l	38.094 lbs/day	5611.67	ug/l	797.006 lbs/day
ChromiumVI	11.00 ug/l	1.562 lbs/day	16.00	ug/l	2.272 lbs/day
Copper	30.50 ug/l	4.332 lbs/day	51.68	ug/l	7.341 lbs/day
Iron			1000.00	ug/l	142.027 lbs/day
Lead	18.58 ug/l	2.639 lbs/day	476.82	ug/l	67.720 lbs/day
Mercury	0.0120 ug/l	0.002 lbs/day	2.40	ug/l	0.341 lbs/day
Nickel	168.54 ug/l	23.937 lbs/day	1515.91	ug/l	215.300 lbs/day
Selenium	4.60 ug/l	0.653 lbs/day	20.00	ug/l	2.841 lbs/day
Silver	N/A ug/l	N/A lbs/day	41.07	ug/l	5.833 lbs/day
Zinc	387.83 ug/l	55.082 lbs/day	387.83	ug/l	55.082 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 400 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	0.213 lbs/day
Chlordane	0.004 ug/l	1.405 lbs/day	1.200	ug/l	0.170 lbs/day
DDT, DDE	0.001 ug/l	0.327 lbs/day	0.550	ug/l	0.078 lbs/day
Dieldrin	0.002 ug/l	0.621 lbs/day	1.250	ug/l	0.178 lbs/day
Endosulfan	0.056 ug/l	18.291 lbs/day	0.110	ug/l	0.016 lbs/day
Endrin	0.002 ug/l	0.751 lbs/day	0.090	ug/l	0.013 lbs/day
Guthion			0.010	ug/l	0.001 lbs/day
Heptachlor	0.004 ug/l	1.241 lbs/day	0.260	ug/l	0.037 lbs/day
Lindane	0.080 ug/l	26.130 lbs/day	1.000	ug/l	0.142 lbs/day
Methoxychlor			0.030	ug/l	0.004 lbs/day
Mirex			0.010	ug/l	0.001 lbs/day
Parathion			0.040	ug/l	0.006 lbs/day
PCB's	0.014 ug/l	4.573 lbs/day	2.000	ug/l	0.284 lbs/day
Pentachlorophenol	13.00 ug/l	4246.172 lbs/day	20.000	ug/l	2.841 lbs/day
Toxephene	0.0002 ug/l	0.065 lbs/day	0.7300	ug/l	0.104 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	0.71 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			2360.0 mg/l	167.59 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	881.90 lbs/day
Acrolein	ug/l	lbs/day	780.0 ug/l	254.77 lbs/day
Acrylonitrile	ug/l	lbs/day	0.7 ug/l	0.22 lbs/day
Benzene	ug/l	lbs/day	71.0 ug/l	23.19 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	1.44 lbs/day
Chlorobenzene	ug/l	lbs/day	21000.0 ug/l	6859.20 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	32.34 lbs/day

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1,1,1-Trichloroethane				
Hexachloroethane	ug/l	lbs/day	8.9 ug/l	2.91 lbs/day
1,1-Dichloroethane				
1,1,2-Trichloroethane	ug/l	lbs/day	42.0 ug/l	13.72 lbs/day
1,1,2,2-Tetrachloroethane	ug/l	lbs/day	11.0 ug/l	3.59 lbs/day
Chloroethane			0.0 ug/l	0.00 lbs/day
Bis(2-chloroethyl) ether	ug/l	lbs/day	1.4 ug/l	0.46 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	1404.50 lbs/day
2,4,6-Trichlorophenol	ug/l	lbs/day	6.5 ug/l	2.12 lbs/day
p-Chloro-m-cresol			0.0 ug/l	0.00 lbs/day
Chloroform (HM)	ug/l	lbs/day	470.0 ug/l	153.52 lbs/day
2-Chlorophenol	ug/l	lbs/day	400.0 ug/l	130.65 lbs/day
1,2-Dichlorobenzene	ug/l	lbs/day	17000.0 ug/l	5552.69 lbs/day
1,3-Dichlorobenzene	ug/l	lbs/day	2600.0 ug/l	849.23 lbs/day
1,4-Dichlorobenzene	ug/l	lbs/day	2600.0 ug/l	849.23 lbs/day
3,3'-Dichlorobenzidine	ug/l	lbs/day	0.1 ug/l	0.03 lbs/day
1,1-Dichloroethylene	ug/l	lbs/day	3.2 ug/l	1.05 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	258.04 lbs/day
1,2-Dichloropropane	ug/l	lbs/day	39.0 ug/l	12.74 lbs/day
1,3-Dichloropropylene	ug/l	lbs/day	1700.0 ug/l	555.27 lbs/day
2,4-Dimethylphenol	ug/l	lbs/day	2300.0 ug/l	751.25 lbs/day
2,4-Dinitrotoluene	ug/l	lbs/day	9.1 ug/l	2.97 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	0.18 lbs/day
Ethylbenzene	ug/l	lbs/day	29000.0 ug/l	9472.23 lbs/day
Fluoranthene	ug/l	lbs/day	370.0 ug/l	120.85 lbs/day
4-Chlorophenyl phenyl ether				
4-Bromophenyl phenyl ether				
Bis(2-chloroisopropyl) ether	ug/l	lbs/day	170000.0 ug/l	55526.86 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	522.61 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	117.59 lbs/day
Dichlorobromomethane	ug/l	lbs/day	22.0 ug/l	7.19 lbs/day
Chlorodibromomethane	ug/l	lbs/day	34.0 ug/l	11.11 lbs/day
Hexachlorobutadiene(c)	ug/l	lbs/day	50.0 ug/l	16.33 lbs/day
Hexachlorocyclopentadiene	ug/l	lbs/day	17000.0 ug/l	5552.69 lbs/day
Isophorone	ug/l	lbs/day	600.0 ug/l	195.98 lbs/day
Naphthalene				
Nitrobenzene	ug/l	lbs/day	1900.0 ug/l	620.59 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	4572.80 lbs/day
4,6-Dinitro-o-cresol	ug/l	lbs/day	765.0 ug/l	249.87 lbs/day
N-Nitrosodimethylamine	ug/l	lbs/day	8.1 ug/l	2.65 lbs/day
N-Nitrosodiphenylamine	ug/l	lbs/day	16.0 ug/l	5.23 lbs/day
N-Nitrosodi-n-propylamine	ug/l	lbs/day	1.4 ug/l	0.46 lbs/day
Pentachlorophenol	ug/l	lbs/day	8.2 ug/l	2.68 lbs/day

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Phenol	ug/l	lbs/day	4.6E+06 ug/l	1.50E+06 lbs/day
Bis(2-ethylhexyl)phthala	ug/l	lbs/day	5.9 ug/l	1.93 lbs/day
Butyl benzyl phthalate	ug/l	lbs/day	5200.0 ug/l	1698.47 lbs/day
Di-n-butyl phthalate	ug/l	lbs/day	12000.0 ug/l	3919.54 lbs/day
Di-n-octyl phthlate				
Diethyl phthalate	ug/l	lbs/day	120000.0 ug/l	39195.43 lbs/day
Dimethyl phthlate	ug/l	lbs/day	2.9E+06 ug/l	9.47E+05 lbs/day
Benzo(a)anthracene (P/	ug/l	lbs/day	0.0 ug/l	0.01 lbs/day
Benzo(a)pyrene (PAH)	ug/l	lbs/day	0.0 ug/l	0.01 lbs/day
Benzo(b)fluoranthene (F	ug/l	lbs/day	0.0 ug/l	0.01 lbs/day
Benzo(k)fluoranthene (F	ug/l	lbs/day	0.0 ug/l	0.01 lbs/day
Chrysene (PAH)	ug/l	lbs/day	0.0 ug/l	0.01 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	0.01 lbs/day
Indeno(1,2,3-cd)pyrene	ug/l	lbs/day	0.0 ug/l	0.01 lbs/day
Pyrene (PAH)	ug/l	lbs/day	11000.0 ug/l	3592.91 lbs/day
Tetrachloroethylene	ug/l	lbs/day	8.9 ug/l	2.91 lbs/day
Toluene	ug/l	lbs/day	200000 ug/l	65325.72 lbs/day
Trichloroethylene	ug/l	lbs/day	81.0 ug/l	26.46 lbs/day
Vinyl chloride	ug/l	lbs/day	525.0 ug/l	171.48 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	0.65 lbs/day
beta-Endosulfan	ug/l	lbs/day	2.0 ug/l	0.65 lbs/day
Endosulfan sulfat	ug/l	lbs/day	2.0 ug/l	0.65 lbs/day
Endrin	ug/l	lbs/day	0.8 ug/l	0.26 lbs/day
Endrin aldehyde	ug/l	lbs/day	0.8 ug/l	0.26 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 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 101	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	1404.50 lbs/day
Asbestos	ug/l	lbs/day		
Beryllium				
Cadmium				
Chromium (III)				
Chromium (VI)				
Copper				
Cyanide	ug/l	lbs/day	2.2E+05 ug/l	71858.29 lbs/day
Lead	ug/l	lbs/day		
Mercury			0.15 ug/l	0.05 lbs/day
Nickel			4600.00 ug/l	1502.49 lbs/day
Selenium	ug/l	lbs/day		
Silver	ug/l	lbs/day		
Thallium			6.30 ug/l	2.06 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	
Summer (Irrig. Season)	34.30	27.8	8.0	0.10	1.00	6.98	0.00	2105.0	
Fall	73.52	10.6	7.8	0.10	1.00	---	0.00	1883.0	
Winter	76.06	8.0	7.7	0.10	1.00	---	0.00	2285.0	
Spring	36.50	20.5	7.8	0.10	1.00	---	0.00	2684.0	
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	2.385*	10.80	0.05	1.92	3.975*	2.77	16.5	0.24	
Dissolved Metals	Hg	Ni	Se	Ag	Zn	Boron			
	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l			
All Seasons	0.0000	3.19	1.27	0.29	10.84	881.7			

* ~80% MDL

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Projected Discharge Information

Season	Flow, MGD	Temp.
Summer	17.00000	27.4
Fall	17.00000	21.4
Winter	17.00000	17.8
Spring	17.00000	22.2

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	17.000 MGD	26.299 cfs
Fall	17.000 MGD	26.299 cfs
Winter	17.000 MGD	26.299 cfs
Spring	17.000 MGD	26.299 cfs

Flow Requirement or Loading Requirement

The calculations in this wasteload analysis utilize the maximum effluent discharge flow of 17 MGD. If the discharger is allowed to have a flow greater than 17 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 >	43.4% 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	17.0 mg/l as BOD5	2409.8 lbs/day
Fall	17.0 mg/l as BOD5	2409.8 lbs/day
Winter	17.0 mg/l as BOD5	2409.8 lbs/day
Spring	17.0 mg/l as BOD5	2409.8 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	5.50
Fall	5.50
Winter	5.50
Spring	5.50

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	2.77 mg/l as N	392.0 lbs/day
	1 Hour Avg. - Acute	17.2 mg/l as N	2,445.0 lbs/day
Fall	4 Day Avg. - Chronic	5.5 mg/l as N	785.8 lbs/day
	1 Hour Avg. - Acute	16.9 mg/l as N	2,397.2 lbs/day
Winter	4 Day Avg. - Chronic	10.3 mg/l as N	1,461.8 lbs/day
	1 Hour Avg. - Acute	27.8 mg/l as N	3,935.2 lbs/day
Spring	4 Day Avg. - Chronic	8.4 mg/l as N	1,189.4 lbs/day
	1 Hour Avg. - Acute	23.2 mg/l as N	3,290.5 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	0.024 mg/l	3.40 lbs/day
	1 Hour Avg. - Acute	0.042 mg/l	6.01 lbs/day
Fall	4 Day Avg. - Chronic	0.039 mg/l	5.51 lbs/day
	1 Hour Avg. - Acute	0.069 mg/l	9.81 lbs/day
Winter	4 Day Avg. - Chronic	0.040 mg/l	5.65 lbs/day
	1 Hour Avg. - Acute	0.071 mg/l	10.06 lbs/day
Spring	4 Day Avg. - Chronic	0.025 mg/l	3.52 lbs/day
	1 Hour Avg. - Acute	0.044 mg/l	6.23 lbs/day

Effluent Limitations for Total Dissolved Solids based upon Water Quality Standards

Season		Concentration	Load
Summer	Maximum, Acute	2692.6 mg/l	190.84 tons/day
Fall	Maximum, Acute	2982.1 mg/l	211.36 tons/day
Winter	Maximum, Acute	2457.8 mg/l	174.20 tons/day
Spring	4 Day Avg. - Chronic	1937.4 mg/l	137.32 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 400 mg/l):

	4 Day Average		1 Hour Average		Load
	Concentration	Load	Concentration	Load	
Aluminum*	N/A	N/A	1,237.5	ug/l	175.8 lbs/day
Arsenic*	423.72 ug/l	38.8 lbs/day	554.7	ug/l	78.8 lbs/day
Cadmium	1.68 ug/l	0.2 lbs/day	14.4	ug/l	2.0 lbs/day
Chromium III	615.54 ug/l	56.4 lbs/day	9,269.9	ug/l	1316.6 lbs/day
Chromium VI*	20.16 ug/l	1.8 lbs/day	23.8	ug/l	3.4 lbs/day
Copper	66.66 ug/l	6.1 lbs/day	83.6	ug/l	11.9 lbs/day
Iron*	N/A	N/A	43,165.7	ug/l	6130.7 lbs/day
Lead	42.50 ug/l	3.9 lbs/day	787.6	ug/l	111.9 lbs/day
Mercury*	0.03 ug/l	0.0 lbs/day	4.0	ug/l	0.6 lbs/day
Nickel	384.20 ug/l	35.2 lbs/day	2,502.4	ug/l	355.4 lbs/day
Selenium*	8.94 ug/l	0.8 lbs/day	32.2	ug/l	4.6 lbs/day
Silver	N/A ug/l	N/A lbs/day	67.7	ug/l	9.6 lbs/day

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Zinc	879.51 ug/l	80.6 lbs/day	633.7	ug/l	90.0 lbs/day
Cyanide*	11.98 ug/l	1.1 lbs/day	36.3	ug/l	5.2 lbs/day

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

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

Summer	37.0 Deg. C.	98.6 Deg. F
Fall	25.8 Deg. C.	78.4 Deg. F
Winter	23.6 Deg. C.	74.4 Deg. F
Spring	30.1 Deg. C.	86.1 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	3.30E-01 lbs/day
Chlordane	4.30E-03 ug/l	6.10E-01 lbs/day	1.2E+00	ug/l	2.64E-01 lbs/day
DDT, DDE	1.00E-03 ug/l	1.42E-01 lbs/day	5.5E-01	ug/l	1.21E-01 lbs/day
Dieldrin	1.90E-03 ug/l	2.69E-01 lbs/day	1.3E+00	ug/l	2.75E-01 lbs/day
Endosulfan	5.60E-02 ug/l	7.94E+00 lbs/day	1.1E-01	ug/l	2.42E-02 lbs/day
Endrin	2.30E-03 ug/l	3.26E-01 lbs/day	9.0E-02	ug/l	1.98E-02 lbs/day
Guthion	0.00E+00 ug/l	0.00E+00 lbs/day	1.0E-02	ug/l	2.20E-03 lbs/day
Heptachlor	3.80E-03 ug/l	5.39E-01 lbs/day	2.6E-01	ug/l	5.71E-02 lbs/day
Lindane	8.00E-02 ug/l	1.13E+01 lbs/day	1.0E+00	ug/l	2.20E-01 lbs/day
Methoxychlor	0.00E+00 ug/l	0.00E+00 lbs/day	3.0E-02	ug/l	6.59E-03 lbs/day
Mirex	0.00E+00 ug/l	0.00E+00 lbs/day	1.0E-02	ug/l	2.20E-03 lbs/day
Parathion	0.00E+00 ug/l	0.00E+00 lbs/day	4.0E-02	ug/l	8.79E-03 lbs/day
PCB's	1.40E-02 ug/l	1.98E+00 lbs/day	2.0E+00	ug/l	4.39E-01 lbs/day
Pentachlorophenol	1.30E+01 ug/l	1.84E+03 lbs/day	2.0E+01	ug/l	4.39E+00 lbs/day
Toxephene	2.00E-04 ug/l	2.84E-02 lbs/day	7.3E-01	ug/l	1.60E-01 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	710.1 lbs/day
Nitrates as N	4.0 mg/l	568.1 lbs/day
Total Phosphorus as P	0.05 mg/l	7.1 lbs/day
Total Suspended Solids	90.0 mg/l	12782.4 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:

Toxic Organics	Maximum Concentration	
	Concentration	Load
Acenaphthene	6.22E+03 ug/l	8.82E+02 lbs/day
Acrolein	1.80E+03 ug/l	2.55E+02 lbs/day
Acrylonitrile	1.52E+00 ug/l	2.16E-01 lbs/day
Benzene	1.64E+02 ug/l	2.32E+01 lbs/day
Benzidine	ug/l	lbs/day
Carbon tetrachloride	1.01E+01 ug/l	1.44E+00 lbs/day
Chlorobenzene	4.84E+04 ug/l	6.86E+03 lbs/day
1,2,4-Trichlorobenzene		
Hexachlorobenzene	1.77E-03 ug/l	2.52E-04 lbs/day
1,2-Dichloroethane	2.28E+02 ug/l	3.23E+01 lbs/day
1,1,1-Trichloroethane		
Hexachloroethane	2.05E+01 ug/l	2.91E+00 lbs/day
1,1-Dichloroethane		
1,1,2-Trichloroethane	9.68E+01 ug/l	1.37E+01 lbs/day
1,1,2,2-Tetrachloroethane	2.53E+01 ug/l	3.59E+00 lbs/day
Chloroethane		
Bis(2-chloroethyl) ether	3.23E+00 ug/l	4.57E-01 lbs/day
2-Chloroethyl vinyl ether		
2-Chloronaphthalene	9.91E+03 ug/l	1.40E+03 lbs/day
2,4,6-Trichlorophenol	1.50E+01 ug/l	2.12E+00 lbs/day
p-Chloro-m-cresol		
Chloroform (HM)	1.08E+03 ug/l	1.54E+02 lbs/day
2-Chlorophenol	9.22E+02 ug/l	1.31E+02 lbs/day
1,2-Dichlorobenzene	3.92E+04 ug/l	5.55E+03 lbs/day
1,3-Dichlorobenzene	5.99E+03 ug/l	8.49E+02 lbs/day

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1,4-Dichlorobenzene	5.99E+03 ug/l	8.49E+02 lbs/day
3,3'-Dichlorobenzidine	1.77E-01 ug/l	2.52E-02 lbs/day
1,1-Dichloroethylene	7.37E+00 ug/l	1.05E+00 lbs/day
1,2-trans-Dichloroethylene1		
2,4-Dichlorophenol	1.82E+03 ug/l	2.58E+02 lbs/day
1,2-Dichloropropane	8.99E+01 ug/l	1.27E+01 lbs/day
1,3-Dichloropropylene	3.92E+03 ug/l	5.55E+02 lbs/day
2,4-Dimethylphenol	5.30E+03 ug/l	7.51E+02 lbs/day
2,4-Dinitrotoluene	2.10E+01 ug/l	2.97E+00 lbs/day
2,6-Dinitrotoluene		
1,2-Diphenylhydrazine	1.24E+00 ug/l	1.76E-01 lbs/day
Ethylbenzene	6.68E+04 ug/l	9.47E+03 lbs/day
Fluoranthene	8.53E+02 ug/l	1.21E+02 lbs/day
4-Chlorophenyl phenyl ether		
4-Bromophenyl phenyl ether		
Bis(2-chloroisopropyl) ether	3.92E+05 ug/l	5.55E+04 lbs/day
Bis(2-chloroethoxy) methane		
Methylene chloride (HM)	3.69E+03 ug/l	5.23E+02 lbs/day
Methyl chloride (HM)		
Methyl bromide (HM)		
Bromoform (HM)	8.30E+02 ug/l	1.18E+02 lbs/day
Dichlorobromomethane(HM)	5.07E+01 ug/l	7.19E+00 lbs/day
Chlorodibromomethane (HM)	7.83E+01 ug/l	1.11E+01 lbs/day
Hexachlorocyclopentadiene	3.92E+04 ug/l	5.55E+03 lbs/day
Isophorone	1.38E+03 ug/l	1.96E+02 lbs/day
Naphthalene		
Nitrobenzene	4.38E+03 ug/l	6.21E+02 lbs/day
2-Nitrophenol		
4-Nitrophenol		
2,4-Dinitrophenol	3.23E+04 ug/l	4.57E+03 lbs/day
4,6-Dinitro-o-cresol	1.76E+03 ug/l	2.50E+02 lbs/day
N-Nitrosodimethylamine	1.87E+01 ug/l	2.65E+00 lbs/day
N-Nitrosodiphenylamine	3.69E+01 ug/l	5.23E+00 lbs/day
N-Nitrosodi-n-propylamine	3.23E+00 ug/l	4.57E-01 lbs/day
Pentachlorophenol	1.89E+01 ug/l	2.68E+00 lbs/day
Phenol	1.06E+07 ug/l	1.50E+06 lbs/day
Bis(2-ethylhexyl)phthalate	1.36E+01 ug/l	1.93E+00 lbs/day
Butyl benzyl phthalate	1.20E+04 ug/l	1.70E+03 lbs/day
Di-n-butyl phthalate	2.77E+04 ug/l	3.92E+03 lbs/day
Di-n-octyl phthlate		
Diethyl phthalate	2.77E+05 ug/l	3.92E+04 lbs/day
Dimethyl phthlate	6.68E+06 ug/l	9.47E+05 lbs/day
Benzo(a)anthracene (PAH)	7.14E-02 ug/l	1.01E-02 lbs/day
Benzo(a)pyrene (PAH)	7.14E-02 ug/l	1.01E-02 lbs/day
Benzo(b)fluoranthene (PAH)	7.14E-02 ug/l	1.01E-02 lbs/day
Benzo(k)fluoranthene (PAH)	7.14E-02 ug/l	1.01E-02 lbs/day
Chrysene (PAH)	7.14E-02 ug/l	1.01E-02 lbs/day
Acenaphthylene (PAH)		
Anthracene (PAH)		
Dibenzo(a,h)anthracene (PAH)	7.14E-02 ug/l	1.01E-02 lbs/day
Indeno(1,2,3-cd)pyrene (PAH)	7.14E-02 ug/l	1.01E-02 lbs/day

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Pyrene (PAH)	2.53E+04 ug/l	3.59E+03 lbs/day
Tetrachloroethylene	2.05E+01 ug/l	2.91E+00 lbs/day
Toluene	4.61E+05 ug/l	6.53E+04 lbs/day
Trichloroethylene	1.87E+02 ug/l	2.65E+01 lbs/day
Vinyl chloride	1.21E+03 ug/l	1.71E+02 lbs/day

Pesticides

Aldrin	3.23E-04 ug/l	4.57E-05 lbs/day
Dieldrin	3.23E-04 ug/l	4.57E-05 lbs/day
Chlordane	1.36E-03 ug/l	1.93E-04 lbs/day
4,4'-DDT	1.36E-03 ug/l	1.93E-04 lbs/day
4,4'-DDE	1.36E-03 ug/l	1.93E-04 lbs/day
4,4'-DDD	1.94E-03 ug/l	2.74E-04 lbs/day
alpha-Endosulfan	4.61E+00 ug/l	6.53E-01 lbs/day
beta-Endosulfan	4.61E+00 ug/l	6.53E-01 lbs/day
Endosulfan sulfate	4.61E+00 ug/l	6.53E-01 lbs/day
Endrin	1.87E+00 ug/l	2.65E-01 lbs/day
Endrin aldehyde	1.87E+00 ug/l	2.65E-01 lbs/day
Heptachlor	4.84E-04 ug/l	6.86E-05 lbs/day
Heptachlor epoxide		

PCB's

PCB 1242 (Arochlor 1242)	1.04E-04 ug/l	1.47E-05 lbs/day
PCB-1254 (Arochlor 1254)	1.04E-04 ug/l	1.47E-05 lbs/day
PCB-1221 (Arochlor 1221)	1.04E-04 ug/l	1.47E-05 lbs/day
PCB-1232 (Arochlor 1232)	1.04E-04 ug/l	1.47E-05 lbs/day
PCB-1248 (Arochlor 1248)	1.04E-04 ug/l	1.47E-05 lbs/day
PCB-1260 (Arochlor 1260)	1.04E-04 ug/l	1.47E-05 lbs/day
PCB-1016 (Arochlor 1016)	1.04E-04 ug/l	1.47E-05 lbs/day

Pesticide

Toxaphene	1.73E-03 ug/l	2.45E-04 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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Cyanide	36.3	12.0	
Iron	1641.3		
Lead	230.1	42.5	
Mercury	0.346	0.028	
Nickel	2502.4	384	
Selenium	32.2	8.9	
Silver	67.7	N/A	
Thallium	14.5		
Zinc	633.7	879.5	Acute Controls
Boron	578.23		
Sulfate	4608.5		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.

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.