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

Date: **June 23, 2020**

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Facility: **St. George Regional Water Reclamation Facility (SGRWRF)**
UPDES No. UT-0024686

Receiving water: **Virgin River (2B, 3B, 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 discharges via a 66 inch pipe located on the southeast side of the treatment plant about 400 feet from the north bank of the Virgin River.

The design flow rate of the upgraded facility is 25.2 MGD maximum monthly average and 33.6 maximum daily.

Receiving Water
The receiving water for Outfall 001 is the Virgin River. Per UAC R317-2-13.2(a), the designated beneficial uses of the Virgin River and tributaries from the state line to Quail Creek diversion are 2B, 3B, and 4.

- *Class 2B - Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing.*
- *Class 3B - Protected for warm water species of game fish and other warm water 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). The seasonal 7Q10 was calculated based on daily average flow measurements from USGS monitoring station #09413200, Virgin River Near Bloomington for (2010-2019). The calculated critical low flow values are listed in Table 1.

Table 1.Critical Low Flow

Season	Critical Low Flow (cfs)
Summer (July-Sept)	18.9
Fall (Oct-Dec)	46.6
Winter (Jan-Mar)	46.0
Spring (Apr-June)	20.8

Virgin River water quality was characterized based on samples collected from DWQ monitoring site 4950120, Virgin River at Bloomington Crossing Above St George WWTP (2010-2019).

Impaired Waters and TMDL

According to *Utah's 2016 Integrated Report*, the Virgin River from state line to Santa Clara River confluence (Assessment Unit UT15010010-001_00) was listed as impaired for temperature, boron and total dissolved solids (TDS).

The *TMDL Water Quality Study of the Virgin River Watershed* (Tetra Tech Inc. 2004) was approved for TDS on the Virgin River on September 20, 2004. As a result of the approved TMDL, a site specific standard of 2,360 mg/L TDS for the Virgin River from the Utah/Arizona border to Pah Tempe Springs was included in the Utah Water Quality Standards at R317-2-14. Refer to the attached memorandum for interpretation of the TMDL and associated TDS limits.

Mixing Zone

Per UAC R317-2-5, 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. Water quality standards must be met at the end of the mixing zone. Acute limits were calculated using 50% of the seasonal critical low flow.

Parameters of Concern

The potential parameters of concern identified for the discharge were total suspended solids (TSS), dissolved oxygen (DO), BOD5, total phosphorus (TP), total nitrogen (TN), total ammonia (TAN), dissolved metals, and pH, as determined in consultation with the UPDES Permit Writer.

Wasteload Allocation Methods

Effluent limits were determined for conservative constituents using a mass balance mixing analysis (UDWQ 2012).

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

The effluent limits for DO and BOD_5 in order to meet minimum DO criteria in the receiving water was evaluated using the Utah River Model.

Models and supporting documentation are available for review upon request.

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 LC_{50} (lethal concentration, 50%) percent effluent for acute toxicity and the IC_{25} (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 LC_{50} is typically 100% effluent and does not need to be determined by the WLA.

Table 2: WET Limits for IC_{25}

Season	Percent Effluent	Dilution Ratio
Summer	67.3%	0.5
Fall	45.6%	1.2
Winter	45.9%	1.2
Spring	65.2%	0.5

Ammonia Limits

The water quality criteria for ammonia toxicity are dependent on the temperature and pH of the effluent and the receiving water. The temperature and pH of the effluent after the proposed plant upgrade were assumed similar to current conditions. If the pH of the effluent is different under the plant upgrade than assumed, the ammonia limits calculated in this WLA will be modified in the future. The chronic ammonia criterion is also dependent on the presence or absence of fish early life stages (ELS). Presence of fish ELS was assumed for all seasons.

In 2013, EPA adopted new criteria for ammonia that are lower than current criteria based on the presence of unionid mussels and nonpulmonate snails. States are required to adopt the criteria or establish alternative, scientifically defensible criteria. For planning purposes, ammonia limits were determined to meet both the current criteria and the most stringent potential future criteria with mussels present (Table 3). The proposed future criteria with mussels absent are higher than the current criteria with fish ELS present. Therefore, the limits to meet the current criteria are sufficient to meet the potential future criteria with mussels absent and are not repeated in the tables.

Table 3: Ammonia Limits (mg/L) to Meet Ammonia Toxicity Criteria (1 hour average)

Season	Acute (1 hr ave)		Chronic (30 day ave)	
	Current 1999 Criteria	2013 EPA Mussels Present	Current 1999 Criteria	2013 EPA Mussels Present
Summer (July-September)	14.7	4.4	1.8	0.7
Fall (October-December)	14.2	9.2	3.0	2.1
Winter (January-March)	13.5	12.0	3.5	2.8
Spring (April-June)	12.3	7.5	2.6	1.3

Effluent Limits

Select WQBELs are summarized in Table 4. The complete list of WQBELs is attached in the Wasteload Addendum. Ammonia limits were set in order to meet instream DO criteria.

Table 4: Water Quality Based Effluent Limits Summary

Effluent Constituent	Acute			Chronic		
	Standard	Limit	Averaging Period	Standard	Limit	Averaging Period
Flow (MGD)		33.6	1 day		25.2	30 days
Ammonia (mg/L)						
Summer (Jul-Sep)		14.7			1.0	
Fall (Oct-Dec)	Varies	14.2	1 hour	Varies	3.0	30 days
Winter (Jan-Mar)		13.5			3.0	
Spring (Apr-Jun)		12.3			2.0	
Dissolved Oxygen (mg/L)	4.0	6.0	Minimum	5.5	6.0	30 days
BOD_5 (mg/L)						
Summer (Jul-Sep)					9.0	
Fall (Oct-Dec)				N/A	15.0	30 days
Winter (Jan-Mar)					15.0	
Spring (Apr-Jun)					15.0	

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 required for this facility upgrade, as an increase in flow or concentration of pollutants over those authorized in the current permit is being requested.

Documents:

WLA Document*: StGeorgeWLAUpgrade_2020-06-23.docx*
Wasteload Analysis and Addendum: *StGeorgeWLAUpgrade_2020.xlsm*

References:

- Tetra Tech Inc. 2004. *TMDL Water Quality Study of the Virgin River Watershed.* Utah Division of Water Quality.
- Utah Division of Water Quality. 2012. *Utah Wasteload Analysis Procedures Version 1.0*.
- Utah Division of Water Quality. 2016. *Utah's 2016 Integrated Report*.

WASTELOAD ANALYSIS [WLA] **6/4/2020**
Addendum: Statement of Basis

Facilities: **St. George Regional Water Reclamation Facility (SGRWRF)**
UPDES No: **UT-0024686**
Discharging to: **Virgin River**

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 interms 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. Level II review required.

III. Numeric Stream Standards for Protection of Aquatic Wildlife

Total Ammonia (TNH3)	Varies as a function of Temperature and pH Rebound. See Water Quality Standards		
Chronic Total Residual Chlorine (TRC)	0.011	mg/l	(4 Day Average)
	0.019	mg/l	(1 Hour Average)
Chronic Dissolved Oxygen (DO)	5.50	mg/l	(30 Day Average)
	6.00	mg/l	(7Day Average)
	5.00	mg/l	(1 Day Average
Maximum Total Dissolved Solids	2360.0	mg/l	Site Specific Standard

Acute and Chronic Heavy Metals (Dissolved)

Parameter	4 Day Average (Chronic) Standard Concentration		Load*		1 Hour Average (Acute) Standard Concentration		Load*	
Aluminum	87.00	ug/l**	18.281	lbs/day	750.00	ug/l	157.594	lbs/day
Arsenic	190.00	ug/l	39.924	lbs/day	340.00	ug/l	71.443	lbs/day
Cadmium	0.76	ug/l	0.159	lbs/day	8.73	ug/l	1.835	lbs/day
Chromium III	268.22	ug/l	56.360	lbs/day	5611.67	ug/l	1,179.157	lbs/day
ChromiumVI	11.00	ug/l	2.311	lbs/day	16.00	ug/l	3.362	lbs/day
Copper	30.50	ug/l	6.409	lbs/day	51.68	ug/l	10.860	lbs/day
Iron					1000.00	ug/l	210.126	lbs/day
Lead	18.58	ug/l	3.904	lbs/day	476.82	ug/l	100.191	lbs/day
Mercury	0.0120	ug/l	0.003	lbs/day	2.40	ug/l	0.504	lbs/day
Nickel	168.54	ug/l	35.415	lbs/day	1515.91	ug/l	318.533	lbs/day
Selenium	4.60	ug/l	0.967	lbs/day	20.00	ug/l	4.203	lbs/day
Silver	N/A	ug/l	N/A	lbs/day	41.07	ug/l	8.630	lbs/day
Zinc	387.83	ug/l	81.493	lbs/day	387.83	ug/l	81.493	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 Concentration		Load*		1 Hour Average (Acute) Standard Concentration		Load*	
Aldrin					1.500	ug/l	0.315	lbs/day
Chlordane	0.004	ug/l	1.342	lbs/day	1.200	ug/l	0.252	lbs/day
DDT, DDE	0.001	ug/l	0.312	lbs/day	0.550	ug/l	0.116	lbs/day
Dieldrin	0.002	ug/l	0.593	lbs/day	1.250	ug/l	0.263	lbs/day
Endosulfan	0.056	ug/l	17.472	lbs/day	0.110	ug/l	0.023	lbs/day
Endrin	0.002	ug/l	0.718	lbs/day	0.090	ug/l	0.019	lbs/day
Guthion					0.010	ug/l	0.002	lbs/day
Heptachlor	0.004	ug/l	1.186	lbs/day	0.260	ug/l	0.055	lbs/day
Lindane	0.080	ug/l	24.960	lbs/day	1.000	ug/l	0.210	lbs/day
Methoxychlor					0.030	ug/l	0.006	lbs/day
Mirex					0.010	ug/l	0.002	lbs/day
Parathion					0.040	ug/l	0.008	lbs/day
PCB's	0.014	ug/l	4.368	lbs/day	2.000	ug/l	0.420	lbs/day
Pentachlorophenol	13.00	ug/l	4055.960	lbs/day	20.000	ug/l	4.203	lbs/day
Toxephene	0.0002	ug/l	0.062	lbs/day	0.7300	ug/l	0.153	lbs/day

IV. Numeric Stream Standards for Protection of Agriculture

	4 Day Average (Chronic) Standard Concentration	Load*	1 Hour Average (Acute) Standard Concentration		Load*	
Arsenic			100.0	ug/l		lbs/day
Boron			750.0	ug/l		lbs/day
Cadmium			10.0	ug/l	1.05	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	247.95	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**	**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
ɔcyclohexane (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	842.39	lbs/day
Acrolein	ug/l	lbs/day	780.0	ug/l	243.36	lbs/day
Acrylonitrile	ug/l	lbs/day	0.7	ug/l	0.21	lbs/day
Benzene	ug/l	lbs/day	71.0	ug/l	22.15	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	1.37	lbs/day
Chlorobenzene	ug/l	lbs/day	21000.0	ug/l	6551.94	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	30.89	lbs/day
1,1,1-Trichloroethane						
Hexachloroethane	ug/l	lbs/day	8.9	ug/l	2.78	lbs/day
1,1-Dichloroethane						
1,1,2-Trichloroethane	ug/l	lbs/day	42.0	ug/l	13.10	lbs/day
1,1,2,2-Tetrachloroetha	ug/l	lbs/day	11.0	ug/l	3.43	lbs/day
Chloroethane			0.0	ug/l	0.00	lbs/day
Bis(2-chloroethyl) ether	ug/l	lbs/day	1.4	ug/l	0.44	lbs/day
2-Chloroethyl vinyl ethe	ug/l	lbs/day	0.0	ug/l	0.00	lbs/day
2-Chloronaphthalene	ug/l	lbs/day	4300.0	ug/l	1341.59	lbs/day
2,4,6-Trichlorophenol	ug/l	lbs/day	6.5	ug/l	2.03	lbs/day
p-Chloro-m-cresol			0.0	ug/l	0.00	lbs/day
Chloroform (HM)	ug/l	lbs/day	470.0	ug/l	146.64	lbs/day
2-Chlorophenol	ug/l	lbs/day	400.0	ug/l	124.80	lbs/day
1,2-Dichlorobenzene	ug/l	lbs/day	17000.0	ug/l	5303.95	lbs/day
1,3-Dichlorobenzene	ug/l	lbs/day	2600.0	ug/l	811.19	lbs/day
1,4-Dichlorobenzene	ug/l	lbs/day	2600.0	ug/l	811.19	lbs/day
3,3'-Dichlorobenzidine	ug/l	lbs/day	0.1	ug/l	0.02	lbs/day
1,1-Dichloroethylene	ug/l	lbs/day	3.2	ug/l	1.00	lbs/day
1,2-trans-Dichloroethyle	ug/l	lbs/day	0.0	ug/l	0.00	lbs/day
2,4-Dichlorophenol	ug/l	lbs/day	790.0	ug/l	246.48	lbs/day
1,2-Dichloropropane	ug/l	lbs/day	39.0	ug/l	12.17	lbs/day
1,3-Dichloropropylene	ug/l	lbs/day	1700.0	ug/l	530.39	lbs/day
2,4-Dimethylphenol	ug/l	lbs/day	2300.0	ug/l	717.59	lbs/day
2,4-Dinitrotoluene	ug/l	lbs/day	9.1	ug/l	2.84	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	0.17	lbs/day
Ethylbenzene	ug/l	lbs/day	29000.0	ug/l	9047.91	lbs/day
Fluoranthene	ug/l	lbs/day	370.0	ug/l	115.44	lbs/day

4-Chlorophenyl phenyl ether						
4-Bromophenyl phenyl ether						
Bis(2-chloroisopropyl) e	ug/l	lbs/day	170000.0	ug/l	53039.48	lbs/day
Bis(2-chloroethoxy) met	ug/l	lbs/day	0.0	ug/l	0.00	lbs/day
Methylene chloride (HM	ug/l	lbs/day	1600.0	ug/l	499.20	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	112.32	lbs/day
Dichlorobromomethane	ug/l	lbs/day	22.0	ug/l	6.86	lbs/day
Chlorodibromomethane	ug/l	lbs/day	34.0	ug/l	10.61	lbs/day
Hexachlorobutadiene(c)	ug/l	lbs/day	50.0	ug/l	15.60	lbs/day
Hexachlorocyclopentadi	ug/l	lbs/day	17000.0	ug/l	5303.95	lbs/day
Isophorone	ug/l	lbs/day	600.0	ug/l	187.20	lbs/day
Naphthalene						
Nitrobenzene	ug/l	lbs/day	1900.0	ug/l	592.79	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	4367.96	lbs/day
4,6-Dinitro-o-cresol	ug/l	lbs/day	765.0	ug/l	238.68	lbs/day
N-Nitrosodimethylamine	ug/l	lbs/day	8.1	ug/l	2.53	lbs/day
N-Nitrosodiphenylamine	ug/l	lbs/day	16.0	ug/l	4.99	lbs/day
N-Nitrosodi-n-propylami	ug/l	lbs/day	1.4	ug/l	0.44	lbs/day
Pentachlorophenol	ug/l	lbs/day	8.2	ug/l	2.56	lbs/day
Phenol	ug/l	lbs/day	4.6E+06	ug/l	1.44E+06	lbs/day
Bis(2-ethylhexyl)phthala	ug/l	lbs/day	5.9	ug/l	1.84	lbs/day
Butyl benzyl phthalate	ug/l	lbs/day	5200.0	ug/l	1622.38	lbs/day
Di-n-butyl phthalate	ug/l	lbs/day	12000.0	ug/l	3743.96	lbs/day
Di-n-octyl phthlate						
Diethyl phthalate	ug/l	lbs/day	120000.0	ug/l	37439.63	lbs/day
Dimethyl phthlate	ug/l	lbs/day	2.9E+06	ug/l	9.05E+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	3431.97	lbs/day
Tetrachloroethylene	ug/l	lbs/day	8.9	ug/l	2.78	lbs/day
Toluene	ug/l	lbs/day	200000	ug/l	62399.38	lbs/day
Trichloroethylene	ug/l	lbs/day	81.0	ug/l	25.27	lbs/day
Vinyl chloride	ug/l	lbs/day	525.0	ug/l	163.80	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	0.62	lbs/day
beta-Endosulfan	ug/l	lbs/day	2.0	ug/l	0.62	lbs/day
Endosulfan sulfate	ug/l	lbs/day	2.0	ug/l	0.62	lbs/day
Endrin	ug/l	lbs/day	0.8	ug/l	0.25	lbs/day
Endrin aldehyde	ug/l	lbs/day	0.8	ug/l	0.25	lbs/day
Heptachlor	ug/l	lbs/day	0.0	ug/l	0.00	lbs/day
Heptachlor epoxide						
PCB's						
PCB 1242 (Arochlor 12	ug/l	lbs/day	0.0	ug/l	0.00	lbs/day
PCB-1254 (Arochlor 12	ug/l	lbs/day	0.0	ug/l	0.00	lbs/day
PCB-1221 (Arochlor 12	ug/l	lbs/day	0.0	ug/l	0.00	lbs/day
PCB-1232 (Arochlor 12	ug/l	lbs/day	0.0	ug/l	0.00	lbs/day
PCB-1248 (Arochlor 12	ug/l	lbs/day	0.0	ug/l	0.00	lbs/day
PCB-1260 (Arochlor 12	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			
Metals					
Antimony	ug/l	lbs/day			
Arsenic	ug/l	lbs/day	4300.00	ug/l	1341.59 lbs/day
Asbestos	ug/l	lbs/day			
Beryllium					
Cadmium					
Chromium (III)					
Chromium (VI)					
Copper					
Cyanide	ug/l	lbs/day	2.2E+05	ug/l	68639.32 lbs/day
Lead	ug/l	lbs/day			
Mercury			0.15	ug/l	0.05 lbs/day
Nickel			4600.00	ug/l	1435.19 lbs/day
Selenium	ug/l	lbs/day			
Silver	ug/l	lbs/day			
Thallium			6.30	ug/l	1.97 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.

(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 cfs	Temp. Deg. C	pH	T-NH3 mg/l as N	BOD5 mg/l	DO mg/l	TRC mg/l	TDS mg/l
Summer (Irrig. Season)	18.90	29.2	7.9	0.10	1.00	6.16	0.00	2105.0
Fall	46.60	13.0	7.9	0.10	1.00	---	0.00	1883.0
Winter	46.00	9.7	7.9	0.10	1.00	---	0.00	2285.0
Spring	20.80	18.0	7.9	0.10	1.00	---	0.00	2684.0

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*	10.00	0.10	2.40	2.40	2.70	31.0	0.24

Dissolved Metals	Hg ug/l	Ni ug/l	Se ug/l	Ag ug/l	Zn ug/l	Boron ug/l	
All Seasons	0.0000	5.10	1.00	0.50	11.30	750.0	* ~80% MDL

Projected Discharge Information

Season	Flow, MGD	Temp.
Summer	25.20000	29.1
Fall	25.20000	22.7
Winter	25.20000	17.5
Spring	25.20000	21.0

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

IX. Effluent Limitations

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

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

Effluent Limitation for Flow based upon Water Quality Standards

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

Season	Max. Monthly Average	Max. Daily
Summer	25.2 MGD	33.6 MGD
Fall	25.2 MGD	33.6 MGD
Winter	25.2 MGD	33.6 MGD
Spring	25.2 MGD	33.6 MGD

Flow Requirement or Loading Requirement

The calculations in this wasteload analysis utilize the maximum effluent discharge flow of 25.2 MGD. If the discharger is allowed to have a flow greater than 25.2 MGD during 7Q10 conditions, and effluent limit concentrations as indicated, then water quality standards will be violated. In order to prevent this from occuring, the permit writers must include the discharge flow limititation 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 segements if the values below are met.

WET Requirements LC50 > 100.0% Effluent [Acute]

IC25 [Chronic]

Season	Percent Effluent	Dilution Ratio
Summer	67.3%	0.5
Fall	45.6%	1.2
Winter	45.9%	1.2
Spring	65.2%	0.5

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	30 Day Avg.	9.0	mg/l as BOD5	1630 lbs/day
Fall	30 Day Avg.	15.0	mg/l as BOD5	2717 lbs/day
Winter	30 Day Avg.	15.0	mg/l as BOD5	2717 lbs/day
Spring	30 Day Avg.	15.0	mg/l as BOD5	2717 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	Minimum	6.00	mg/l
Fall	Minimum	6.00	mg/l
Winter	Minimum	6.00	mg/l
Spring	Minimum	6.00	mg/l

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	1.0	mg/l as N	210 lbs/day
	1 Hour Avg. - Acute	14.7	mg/l as N	3,080 lbs/day
Fall	4 Day Avg. - Chronic	3.0	mg/l as N	630 lbs/day
	1 Hour Avg. - Acute	14.2	mg/l as N	2,978 lbs/day
Winter	4 Day Avg. - Chronic	3.0	mg/l as N	630 lbs/day
	1 Hour Avg. - Acute	13.5	mg/l as N	2,841 lbs/day
Spring	4 Day Avg. - Chronic	2.0	mg/l as N	420 lbs/day
	1 Hour Avg. - Acute	12.3	mg/l as N	2,575 lbs/day

Acute limit calculated with an Acute Zone of Initial Dilution (ZID) to be equal to 50.%.

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	N/A	mg/l	N/A	lbs/day
	1 Hour Avg. - Acute	N/A	mg/l	N/A	lbs/day
Fall	4 Day Avg. - Chronic	N/A	mg/l	N/A	lbs/day
	1 Hour Avg. - Acute	N/A	mg/l	N/A	lbs/day
Winter	4 Day Avg. - Chronic	N/A	mg/l	N/A	lbs/day
	1 Hour Avg. - Acute	N/A	mg/l	N/A	lbs/day
Spring	4 Day Avg. - Chronic	N/A	mg/l	N/A	lbs/day
	1 Hour Avg. - Acute	N/A	mg/l	N/A	lbs/day

Effluent Limitations for Total Dissolved Solids based upon Water Quality Standards

Season		Concentration		Load	
Summer	Maximum, Acute	2360.0	mg/l	247.95	tons/day
Fall	Maximum, Acute	2360.0	mg/l	247.95	tons/day
Winter	Maximum, Acute	2360.0	mg/l	247.95	tons/day
Spring	Maximum, Acute	2360.0	mg/l	247.95	tons/day

TMDL Limits	Determined by Watershed Protection Section
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		
	Concentration		Load	Concentration		Load
Aluminum*	N/A		N/A	931.2	ug/l	195.7 lbs/day
Arsenic*	277.27	ug/l	37.7 lbs/day	420.0	ug/l	88.3 lbs/day
Cadmium	1.07	ug/l	0.1 lbs/day	10.8	ug/l	2.3 lbs/day
Chromium III	397.09	ug/l	53.9 lbs/day	6,971.4	ug/l	1464.9 lbs/day
Chromium VI*	15.17	ug/l	2.1 lbs/day	19.3	ug/l	4.1 lbs/day
Copper	43.98	ug/l	6.0 lbs/day	63.6	ug/l	13.4 lbs/day
Iron*	N/A		N/A	1,234.9	ug/l	259.5 lbs/day
Lead	27.47	ug/l	3.7 lbs/day	592.3	ug/l	124.5 lbs/day
Mercury*	0.018	ug/l	0.0 lbs/day	3.0	ug/l	0.6 lbs/day
Nickel	247.78	ug/l	33.7 lbs/day	1,882.1	ug/l	395.5 lbs/day
Selenium*	6.35	ug/l	0.9 lbs/day	24.6	ug/l	5.2 lbs/day
Silver	N/A	ug/l	N/A lbs/day	50.9	ug/l	10.7 lbs/day
Zinc	570.37	ug/l	77.5 lbs/day	479.1	ug/l	100.7 lbs/day
Cyanide*	7.72	ug/l	1.0 lbs/day	27.3	ug/l	5.7 lbs/day

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

Effluent Limitations for Heat/Temperature based upon Water Quality Standards

Summer	35.1 Deg. C.	95.2 Deg. F
Fall	21.7 Deg. C.	71.1 Deg. F
Winter	18.4 Deg. C.	65.1 Deg. F
Spring	24.1 Deg. C.	75.4 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	4.88E-01 lbs/day
Chlordane	4.30E-03	ug/l	9.04E-01 lbs/day	1.2E+00	ug/l	3.90E-01 lbs/day
DDT, DDE	1.00E-03	ug/l	2.10E-01 lbs/day	5.5E-01	ug/l	1.79E-01 lbs/day
Dieldrin	1.90E-03	ug/l	3.99E-01 lbs/day	1.3E+00	ug/l	4.06E-01 lbs/day
Endosulfan	5.60E-02	ug/l	1.18E+01 lbs/day	1.1E-01	ug/l	3.58E-02 lbs/day
Endrin	2.30E-03	ug/l	4.83E-01 lbs/day	9.0E-02	ug/l	2.93E-02 lbs/day
Guthion	0.00E+00	ug/l	0.00E+00 lbs/day	1.0E-02	ug/l	3.25E-03 lbs/day
Heptachlor	3.80E-03	ug/l	7.98E-01 lbs/day	2.6E-01	ug/l	8.45E-02 lbs/day
Lindane	8.00E-02	ug/l	1.68E+01 lbs/day	1.0E+00	ug/l	3.25E-01 lbs/day
Methoxychlor	0.00E+00	ug/l	0.00E+00 lbs/day	3.0E-02	ug/l	9.75E-03 lbs/day
Mirex	0.00E+00	ug/l	0.00E+00 lbs/day	1.0E-02	ug/l	3.25E-03 lbs/day
Parathion	0.00E+00	ug/l	0.00E+00 lbs/day	4.0E-02	ug/l	1.30E-02 lbs/day
PCB's	1.40E-02	ug/l	2.94E+00 lbs/day	2.0E+00	ug/l	6.50E-01 lbs/day
Pentachlorophenol	1.30E+01	ug/l	2.73E+03 lbs/day	2.0E+01	ug/l	6.50E+00 lbs/day
Toxephene	2.00E-04	ug/l	4.20E-02 lbs/day	7.3E-01	ug/l	2.37E-01 lbs/day

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		Load
Gross Beta (pCi/l)	50.0	pCi/L	
BOD (mg/l)	5.0	mg/l	1050.6 lbs/day
Nitrates as N	4.0	mg/l	840.5 lbs/day
Total Phosphorus as P	0.05	mg/l	10.5 lbs/day
Total Suspended Solids	90.0	mg/l	18911.3 lbs/day

Note: Pollution indicator targets are for information purposes only.

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

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

	Maximum Concentration			
Toxic Organics	**Concentration**		**Load**	
Acenaphthene	4.01E+03	ug/l	7.26E+02	lbs/day
Acrolein	1.16E+03	ug/l	2.10E+02	lbs/day
Acrylonitrile	9.80E-01	ug/l	1.77E-01	lbs/day
Benzene	1.05E+02	ug/l	1.91E+01	lbs/day
Benzidine		ug/l		lbs/day
Carbon tetrachloride	6.53E+00	ug/l	1.18E+00	lbs/day
Chlorobenzene	3.12E+04	ug/l	5.65E+03	lbs/day
1,2,4-Trichlorobenzene				
Hexachlorobenzene	1.14E-03	ug/l	2.07E-04	lbs/day
1,2-Dichloroethane	1.47E+02	ug/l	2.66E+01	lbs/day
1,1,1-Trichloroethane				
Hexachloroethane	1.32E+01	ug/l	2.39E+00	lbs/day
1,1-Dichloroethane				
1,1,2-Trichloroethane	6.24E+01	ug/l	1.13E+01	lbs/day
1,1,2,2-Tetrachloroethane	1.63E+01	ug/l	2.96E+00	lbs/day
Chloroethane				
Bis(2-chloroethyl) ether	2.08E+00	ug/l	3.76E-01	lbs/day
2-Chloroethyl vinyl ether				
2-Chloronaphthalene	6.38E+03	ug/l	1.16E+03	lbs/day
2,4,6-Trichlorophenol	9.65E+00	ug/l	1.75E+00	lbs/day
p-Chloro-m-cresol				
Chloroform (HM)	6.98E+02	ug/l	1.26E+02	lbs/day
2-Chlorophenol	5.94E+02	ug/l	1.08E+02	lbs/day
1,2-Dichlorobenzene	2.52E+04	ug/l	4.57E+03	lbs/day
1,3-Dichlorobenzene	3.86E+03	ug/l	6.99E+02	lbs/day
1,4-Dichlorobenzene	3.86E+03	ug/l	6.99E+02	lbs/day
3,3'-Dichlorobenzidine	1.14E-01	ug/l	2.07E-02	lbs/day
1,1-Dichloroethylene	4.75E+00	ug/l	8.60E-01	lbs/day
1,2-trans-Dichloroethylene1				
2,4-Dichlorophenol	1.17E+03	ug/l	2.12E+02	lbs/day
1,2-Dichloropropane	5.79E+01	ug/l	1.05E+01	lbs/day
1,3-Dichloropropylene	2.52E+03	ug/l	4.57E+02	lbs/day
2,4-Dimethylphenol	3.42E+03	ug/l	6.18E+02	lbs/day
2,4-Dinitrotoluene	1.35E+01	ug/l	2.45E+00	lbs/day
2,6-Dinitrotoluene				
1,2-Diphenylhydrazine	8.02E-01	ug/l	1.45E-01	lbs/day
Ethylbenzene	4.31E+04	ug/l	7.80E+03	lbs/day
Fluoranthene	5.49E+02	ug/l	9.95E+01	lbs/day
4-Chlorophenyl phenyl ether				
4-Bromophenyl phenyl ether				
Bis(2-chloroisopropyl) ether	2.52E+05	ug/l	4.57E+04	lbs/day
Bis(2-chloroethoxy) methane				
Methylene chloride (HM)	2.38E+03	ug/l	4.30E+02	lbs/day
Methyl chloride (HM)				
Methyl bromide (HM)				
Bromoform (HM)	5.35E+02	ug/l	9.68E+01	lbs/day
Dichlorobromomethane(HM)	3.27E+01	ug/l	5.92E+00	lbs/day
Chlorodibromomethane (HM)	5.05E+01	ug/l	9.14E+00	lbs/day
Hexachlorocyclopentadiene	2.52E+04	ug/l	4.57E+03	lbs/day
Isophorone	8.91E+02	ug/l	1.61E+02	lbs/day
Naphthalene				
Nitrobenzene	2.82E+03	ug/l	5.11E+02	lbs/day
2-Nitrophenol				
4-Nitrophenol				
2,4-Dinitrophenol	2.08E+04	ug/l	3.76E+03	lbs/day
4,6-Dinitro-o-cresol	1.14E+03	ug/l	2.06E+02	lbs/day
N-Nitrosodimethylamine	1.20E+01	ug/l	2.18E+00	lbs/day
N-Nitrosodiphenylamine	2.38E+01	ug/l	4.30E+00	lbs/day
N-Nitrosodi-n-propylamine	2.08E+00	ug/l	3.76E-01	lbs/day
Pentachlorophenol	1.22E+01	ug/l	2.21E+00	lbs/day
Phenol	6.83E+06	ug/l	1.24E+06	lbs/day

Bis(2-ethylhexyl)phthalate	8.76E+00	ug/l	1.59E+00	lbs/day
Butyl benzyl phthalate	7.72E+03	ug/l	1.40E+03	lbs/day
Di-n-butyl phthalate	1.78E+04	ug/l	3.23E+03	lbs/day
Di-n-octyl phthlate				
Diethyl phthalate	1.78E+05	ug/l	3.23E+04	lbs/day
Dimethyl phthlate	4.31E+06	ug/l	7.80E+05	lbs/day
Benzo(a)anthracene (PAH)	4.60E-02	ug/l	8.34E-03	lbs/day
Benzo(a)pyrene (PAH)	4.60E-02	ug/l	8.34E-03	lbs/day
Benzo(b)fluoranthene (PAH)	4.60E-02	ug/l	8.34E-03	lbs/day
Benzo(k)fluoranthene (PAH)	4.60E-02	ug/l	8.34E-03	lbs/day
Chrysene (PAH)	4.60E-02	ug/l	8.34E-03	lbs/day
Acenaphthylene (PAH)				
Anthracene (PAH)				
Dibenzo(a,h)anthracene (PAH)	4.60E-02	ug/l	8.34E-03	lbs/day
Indeno(1,2,3-cd)pyrene (PAH)	4.60E-02	ug/l	8.34E-03	lbs/day
Pyrene (PAH)	1.63E+04	ug/l	2.96E+03	lbs/day
Tetrachloroethylene	1.32E+01	ug/l	2.39E+00	lbs/day
Toluene	2.97E+05	ug/l	5.38E+04	lbs/day
Trichloroethylene	1.20E+02	ug/l	2.18E+01	lbs/day
Vinyl chloride	7.80E+02	ug/l	1.41E+02	lbs/day
Pesticides				
Aldrin	2.08E-04	ug/l	3.76E-05	lbs/day
Dieldrin	2.08E-04	ug/l	3.76E-05	lbs/day
Chlordane	8.76E-04	ug/l	1.59E-04	lbs/day
4,4'-DDT	8.76E-04	ug/l	1.59E-04	lbs/day
4,4'-DDE	8.76E-04	ug/l	1.59E-04	lbs/day
4,4'-DDD	1.25E-03	ug/l	2.26E-04	lbs/day
alpha-Endosulfan	2.97E+00	ug/l	5.38E-01	lbs/day
beta-Endosulfan	2.97E+00	ug/l	5.38E-01	lbs/day
Endosulfan sulfate	2.97E+00	ug/l	5.38E-01	lbs/day
Endrin	1.20E+00	ug/l	2.18E-01	lbs/day
Endrin aldehyde	1.20E+00	ug/l	2.18E-01	lbs/day
Heptachlor	3.12E-04	ug/l	5.65E-05	lbs/day
Heptachlor epoxide				
PCB's				
PCB 1242 (Arochlor 1242)	6.68E-05	ug/l	1.21E-05	lbs/day
PCB-1254 (Arochlor 1254)	6.68E-05	ug/l	1.21E-05	lbs/day
PCB-1221 (Arochlor 1221)	6.68E-05	ug/l	1.21E-05	lbs/day
PCB-1232 (Arochlor 1232)	6.68E-05	ug/l	1.21E-05	lbs/day
PCB-1248 (Arochlor 1248)	6.68E-05	ug/l	1.21E-05	lbs/day
PCB-1260 (Arochlor 1260)	6.68E-05	ug/l	1.21E-05	lbs/day
PCB-1016 (Arochlor 1016)	6.68E-05	ug/l	1.21E-05	lbs/day
Pesticide				
Toxaphene	1.11E-03	ug/l	2.02E-04	lbs/day
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				
Dioxin				
Dioxin (2,3,7,8-TCDD)	2.08E-08	ug/l	3.76E-09	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		931.2				931.2	N/A
Antimony				6384.7		6384.7	
Arsenic	148.5	420.0				148.5	277.3
Barium							
Beryllium						0.0	
Cadmium	14.8	10.8				10.8	1.1
Chromium (III)		6971.4				6971.4	397.1
Chromium (VI)	147.3	19.3				19.30	15.17
Copper	295.7	63.6				63.6	44.0
Cyanide		27.3	326658.0			27.3	7.7
Iron		1234.9				1234.9	
Lead	148.4	592.3				148.4	27.5
Mercury		2.98		0.22		0.22	0.018
Nickel		1882.1		6830.1		1882.1	247.8
Selenium	73.8	24.6				24.6	6.3
Silver		50.9				50.9	
Thallium				9.4		9.4	
Zinc		479.1				479.1	570.4
Boron	750.0					750.0	
Sulfate	2969.6					2969.6	

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	931.2	N/A	
Antimony	6384.68		
Arsenic	148.5	277.3	Acute Controls
Asbestos			
Barium			
Beryllium			
Cadmium	10.8	1.1	
Chromium (III)	6971.4	397	
Chromium (VI)	19.3	15.2	
Copper	63.6	44.0	
Cyanide	27.3	7.7	
Iron	1234.9		
Lead	148.4	27.5	
Mercury	0.223	0.018	
Nickel	1882.1	248	
Selenium	24.6	6.3	
Silver	50.9	N/A	
Thallium	9.4		
Zinc	479.1	570.4	Acute Controls
Boron	750.00		
Sulfate	2969.6		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.

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.

State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

L. Scott Baird
Executive Director

DIVISION OF WATER QUALITY
Erica Brown Gaddis, PhD
Director

M E M O R A N D U M

TO: Sarah Ward, UPDES Permit Writer

FROM: Amy Dickey, Lower Colorado River Watershed Coordinator

DATE: June 4, 2020

SUBJECT: Total dissolved solids wasteload allocation for St. George Regional Water Reclamation Facility

Staff Recommendation

As part of the Lower Virgin River Total Maximum Daily Load (TMDL), the wasteload allocation assigned to the St. George Regional Water Reclamation Facility was performed on a Total Dissolved Solids (TDS) Water Quality Standard that no longer applies. Staff recommendation is to include a concentration based TDS limit in the UPDES permit based on the TDS site specific standard of 2,360 mg/L if there is a reasonable potential to exceed the standard. The facility upgrade is essential to support the significant population growth and community expansion in and around St. George. Ideally the TMDL could be revised to reflect the changes in land use and management that have taken place over the last 16 years. However, that is not likely to be of urgency for DWQ as TDS is not a priority parameter for future TMDL development.

Background

A TMDL study for the Lower Virgin River was approved by EPA on September 20, 2004. The pollutant of concern was TDS and the approved TMDL recommended a 5% load reduction from sources in the watershed. A numeric target waste load allocation was included in the TMDL for the St. George Regional Water Reclamation Facility (SGRWRF). A TDS site specific criterion (SSC) of 2,360 mg/L was also recommended and was subsequently included in the standards (UAC R317-2-14).

DWQ is currently reviewing the Level II Antidegradation Form that was submitted on behalf of the SGRWRF. The facility is proposing upgrades and improvements that will increase treatment capacity and enable the facility to more reliably meet current and future wastewater treatment needs for the City and surrounding areas.

The 2004 TMDL included a mass-based TDS wasteload allocation of 20,087 tons/year. That number was based on the design flow capacity of the facility at the time of TMDL development and the 1,200 mg/L TDS standard. The expansion would increase the design flow capacity of the facility from the current 17 MGD to 25 MGD. Based on Discharge Monitoring Reports from 2010 to 2020, the average TDS concentration of the SGRWRF is 1,148 mg/L, well below the SSC of 2,360 mg/L . Increased facility discharge at that concentration would likely result in a decrease in TDS concentration in the Virgin River.

A Margin of Safety was included in the TMDL analysis. It was explicit at 5% of the Loading Allocation at 8,640,720 kg/year (9,525 tons/year). The estimated TDS loading from the facility using the new design flow of 25 MGD and the average effluent concentration of 1,148 mg/L is 39,649,767 kg/yr. Therefore use of the entire MOS would still not be sufficient to cover the difference.

WLA from 2004 TMDL	20,087 tons/year (18,222,620 kg/year)
Current permit loading limit	None assigned
Current TDS site specific standard for receiving waterbody	2,360 mg/L
Current permit concentration limit	1,937 mg/L
Estimated TDS loading with expansion increased flow (25MGD) and average facility effluent concentration (2010-2020 DMRs) of 1,148 mg/L	43,706 tons/year 39,649,767 kg/year