

Utah Division of Water Quality
Salt Lake City, Utah

FILE COPY

WASTELOAD ANALYSIS [WLA]
Addendum: Statement of Basis
SUMMARY

Discharging Facility: St. George WWTP
UPDES No: UT-0024686
Current Flow: 17.00 MGD Design Flow
Design Flow 17.00 MGD

Receiving Water: Virgin River
Stream Classification: 2B, 3B, 4
Stream Flows [cfs]:
37.6 Summer (July-Sept) 20th Percentile
81.0 Fall (Oct-Dec) 20th Percentile
117.0 Winter (Jan-Mar) 20th Percentile
77.0 Spring (Apr-June) 20th Percentile
431.0 Average
Stream TDS Values:
1675.0 Summer (July-Sept) 80th Percentile
1743.0 Fall (Oct-Dec) 80th Percentile
1374.0 Winter (Jan-Mar) 80th Percentile
1100.0 Spring (Apr-June) 80th Percentile

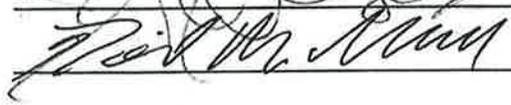
Effluent Limits:		WQ Standard:
Flow, MGD:	17.00 MGD Design Flow	
BOD, mg/l:	17.0 Summer	5.0 Indicator
Dissolved Oxygen, mg/l:	5.5 Summer	5.5 30 Day Average
TNH ₃ , Chronic, mg/l:	3.2 Summer	Varies Function of pH and Temperature
TDS, mg/l:	3338.3 Summer	2360.0 Site Specific

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

Level 1 Antidegradation Level Completed: Level II Review not required

Date: 2/10/2012

Permit Writer:  _____

WLA by:  _____ 2-10-12

WQM Sec. Approval: _____

TMDL Sec. Approval: _____

**Utah Division of Water Quality
Salt Lake City, Utah**

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

10-Feb-12
4:00 PM

Facilities: St. George WWTP
Discharging to: Virgin River

UPDES No: UT-0024686

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:	#REF!

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	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**	12.332 lbs/day	750.00	ug/l	106.314 lbs/day
Arsenic	190.00 ug/l	26.933 lbs/day	340.00	ug/l	48.196 lbs/day
Cadmium	1.02 ug/l	0.144 lbs/day	13.12	ug/l	1.860 lbs/day
Chromium III	372.37 ug/l	52.784 lbs/day	7790.71	ug/l	1,104.345 lbs/day
ChromiumVI	11.00 ug/l	1.559 lbs/day	16.00	ug/l	2.268 lbs/day
Copper	42.95 ug/l	6.088 lbs/day	75.38	ug/l	10.686 lbs/day
Iron			1000.00	ug/l	141.752 lbs/day
Lead	30.94 ug/l	4.386 lbs/day	794.00	ug/l	112.551 lbs/day
Mercury	0.0120 ug/l	0.002 lbs/day	2.40	ug/l	0.340 lbs/day
Nickel	236.53 ug/l	33.528 lbs/day	2127.44	ug/l	301.568 lbs/day
Selenium	4.60 ug/l	0.652 lbs/day	20.00	ug/l	2.835 lbs/day
Silver	N/A ug/l	N/A lbs/day	81.80	ug/l	11.596 lbs/day
Zinc	544.56 ug/l	77.193 lbs/day	544.56	ug/l	77.193 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 597.08 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	1.480 lbs/day	1.200	ug/l	0.170 lbs/day
DDT, DDE	0.001 ug/l	0.344 lbs/day	0.550	ug/l	0.078 lbs/day
Dieldrin	0.002 ug/l	0.654 lbs/day	1.250	ug/l	0.177 lbs/day
Endosulfan	0.056 ug/l	19.275 lbs/day	0.110	ug/l	0.016 lbs/day
Endrin	0.002 ug/l	0.792 lbs/day	0.090	ug/l	0.013 lbs/day
Guthion			0.010	ug/l	0.001 lbs/day
Heptachlor	0.004 ug/l	1.308 lbs/day	0.260	ug/l	0.037 lbs/day
Lindane	0.080 ug/l	27.536 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	4.819 lbs/day	2.000	ug/l	0.284 lbs/day
Pentachlorophenol	13.00 ug/l	4474.600 lbs/day	20.000	ug/l	2.835 lbs/day
Toxephene	0.0002 ug/l	0.069 lbs/day	0.7300	ug/l	0.103 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	167.27 tons/day

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

	4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard	
	Concentration	Load*	Concentration	Load*
Metals				
Arsenic			ug/l	lbs/day
Barium			ug/l	lbs/day
Cadmium			ug/l	lbs/day
Chromium			ug/l	lbs/day
Lead			ug/l	lbs/day
Mercury			ug/l	lbs/day
Selenium			ug/l	lbs/day
Silver			ug/l	lbs/day
Fluoride (3)			ug/l	lbs/day
to			ug/l	lbs/day
Nitrates as N			ug/l	lbs/day
Chlorophenoxy Herbicides				
2,4-D			ug/l	lbs/day
2,4,5-TP			ug/l	lbs/day
Endrin			ug/l	lbs/day
ocyclohexane (Lindane)			ug/l	lbs/day
Methoxychlor			ug/l	lbs/day
Toxaphene			ug/l	lbs/day

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

	Maximum Conc., ug/l - Acute Standards			
	Class 1C [2 Liters/Day for 70 Kg Person over 70 Yr.]		Class 3A, 3B [6.5 g for 70 Kg Person over 70 Yr.]	
Toxic Organics				
Acenaphthene	ug/l	lbs/day	2700.0 ug/l	929.34 lbs/day
Acrolein	ug/l	lbs/day	780.0 ug/l	268.48 lbs/day
Acrylonitrile	ug/l	lbs/day	0.7 ug/l	0.23 lbs/day
Benzene	ug/l	lbs/day	71.0 ug/l	24.44 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	1.51 lbs/day
Chlorobenzene	ug/l	lbs/day	21000.0 ug/l	7228.20 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	34.08 lbs/day

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1,1,1-Trichloroethane				
Hexachloroethane	ug/l	lbs/day	8.9 ug/l	3.06 lbs/day
1,1-Dichloroethane				
1,1,2-Trichloroethane	ug/l	lbs/day	42.0 ug/l	14.46 lbs/day
1,1,2,2-Tetrachloroethane	ug/l	lbs/day	11.0 ug/l	3.79 lbs/day
Chloroethane			0.0 ug/l	0.00 lbs/day
Bis(2-chloroethyl) ether	ug/l	lbs/day	1.4 ug/l	0.48 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	1480.06 lbs/day
2,4,6-Trichlorophenol	ug/l	lbs/day	6.5 ug/l	2.24 lbs/day
p-Chloro-m-cresol			0.0 ug/l	0.00 lbs/day
Chloroform (HM)	ug/l	lbs/day	470.0 ug/l	161.77 lbs/day
2-Chlorophenol	ug/l	lbs/day	400.0 ug/l	137.68 lbs/day
1,2-Dichlorobenzene	ug/l	lbs/day	17000.0 ug/l	5851.40 lbs/day
1,3-Dichlorobenzene	ug/l	lbs/day	2600.0 ug/l	894.92 lbs/day
1,4-Dichlorobenzene	ug/l	lbs/day	2600.0 ug/l	894.92 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	1.10 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	271.92 lbs/day
1,2-Dichloropropane	ug/l	lbs/day	39.0 ug/l	13.42 lbs/day
1,3-Dichloropropylene	ug/l	lbs/day	1700.0 ug/l	585.14 lbs/day
2,4-Dimethylphenol	ug/l	lbs/day	2300.0 ug/l	791.66 lbs/day
2,4-Dinitrotoluene	ug/l	lbs/day	9.1 ug/l	3.13 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	0.19 lbs/day
Ethylbenzene	ug/l	lbs/day	29000.0 ug/l	9981.80 lbs/day
Fluoranthene	ug/l	lbs/day	370.0 ug/l	127.35 lbs/day
4-Chlorophenyl phenyl ether				
4-Bromophenyl phenyl ether				
Bis(2-chloroisopropyl) ether	ug/l	lbs/day	170000.0 ug/l	58514.00 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	550.72 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	123.91 lbs/day
Dichlorobromomethane	ug/l	lbs/day	22.0 ug/l	7.57 lbs/day
Chlorodibromomethane	ug/l	lbs/day	34.0 ug/l	11.70 lbs/day
Hexachlorobutadiene(c)	ug/l	lbs/day	50.0 ug/l	17.21 lbs/day
Hexachlorocyclopentadiene	ug/l	lbs/day	17000.0 ug/l	5851.40 lbs/day
Isophorone	ug/l	lbs/day	600.0 ug/l	206.52 lbs/day
Naphthalene				
Nitrobenzene	ug/l	lbs/day	1900.0 ug/l	653.98 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	4818.80 lbs/day
4,6-Dinitro-o-cresol	ug/l	lbs/day	765.0 ug/l	263.31 lbs/day
N-Nitrosodimethylamine	ug/l	lbs/day	8.1 ug/l	2.79 lbs/day
N-Nitrosodiphenylamine	ug/l	lbs/day	16.0 ug/l	5.51 lbs/day
N-Nitrosodi-n-propylamine	ug/l	lbs/day	1.4 ug/l	0.48 lbs/day
Pentachlorophenol	ug/l	lbs/day	8.2 ug/l	2.82 lbs/day

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Phenol	ug/l	lbs/day	4.6E+06 ug/l	1.58E+06 lbs/day
Bis(2-ethylhexyl)phthala	ug/l	lbs/day	5.9 ug/l	2.03 lbs/day
Butyl benzyl phthalate	ug/l	lbs/day	5200.0 ug/l	1789.84 lbs/day
Di-n-butyl phthalate	ug/l	lbs/day	12000.0 ug/l	4130.40 lbs/day
Di-n-octyl phthlate				
Diethyl phthalate	ug/l	lbs/day	120000.0 ug/l	41304.00 lbs/day
Dimethyl phthlate	ug/l	lbs/day	2.9E+06 ug/l	9.98E+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	3786.20 lbs/day
Tetrachloroethylene	ug/l	lbs/day	8.9 ug/l	3.06 lbs/day
Toluene	ug/l	lbs/day	200000 ug/l	68840.00 lbs/day
Trichloroethylene	ug/l	lbs/day	81.0 ug/l	27.88 lbs/day
Vinyl chloride	ug/l	lbs/day	525.0 ug/l	180.71 lbs/day
				lbs/day
				lbs/day
Pesticides				
Aldrin	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Dieldrin	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Chlordane	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
4,4'-DDT	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
4,4'-DDE	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
4,4'-DDD	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
alpha-Endosulfan	ug/l	lbs/day	2.0 ug/l	0.69 lbs/day
beta-Endosulfan	ug/l	lbs/day	2.0 ug/l	0.69 lbs/day
Endosulfan sulfate	ug/l	lbs/day	2.0 ug/l	0.69 lbs/day
Endrin	ug/l	lbs/day	0.8 ug/l	0.28 lbs/day
Endrin aldehyde	ug/l	lbs/day	0.8 ug/l	0.28 lbs/day
Heptachlor	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Heptachlor epoxide				
PCB's				
PCB 1242 (Arochlor 124	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1254 (Arochlor 124	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1221 (Arochlor 124	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1232 (Arochlor 124	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1248 (Arochlor 124	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1260 (Arochlor 124	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1016 (Arochlor 10'	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Pesticide				
Toxaphene	ug/l		0.0 ug/l	0.00 lbs/day
Dioxin				
Dioxin (2,3,7,8-TCDD)	ug/l	lbs/day		

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Metals

Antimony	ug/l	lbs/day		
Arsenic	ug/l	lbs/day	4300.00 ug/l	1480.06 lbs/day
Asbestos	ug/l	lbs/day		
Beryllium				
Cadmium				
Chromium (III)				
Chromium (VI)				
Copper				
Cyanide	ug/l	lbs/day	2.2E+05 ug/l	75724.00 lbs/day
Lead	ug/l	lbs/day		
Mercury			0.15 ug/l	0.05 lbs/day
Nickel			4600.00 ug/l	1583.32 lbs/day
Selenium	ug/l	lbs/day		
Silver	ug/l	lbs/day		
Thallium			6.30 ug/l	2.17 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)	37.6	25.5	8.1	0.05	0.10	6.70	0.00	1675.0		
Fall	81.0	12.0	8.0	0.04	0.10	---	0.00	1743.0		
Winter	117.0	7.4	8.1	0.18	0.10	---	0.00	1743.0		
Spring	77.0	18.1	8.1	0.04	0.10	---	0.00	1743.0		
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	1.59*	0.53*	0.053*	0.53*	2.65*	0.53*	0.83*	0.53*		
Dissolved Metals	Hg	Ni	Se	Ag	Zn	Boron				
	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l				
All Seasons	0.0000	0.53*	1.06*	0.1*	0.053*	10.0		* 1/2 MDL		

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Projected Discharge Information

Season	Flow, MGD	Temp.	TDS mg/l	TDS tons/day
Summer	17.00000	26.8	0.00	0.00000
Fall	17.00000	21.4		
Winter	17.00000	17.2		
Spring	17.00000	21.4		

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	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 >	EOP Effluent	[Acute]
	IC25 >	41.2% 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	3.2 mg/l as N	446.6 lbs/day
	1 Hour Avg. - Acute	16.7 mg/l as N	2,362.4 lbs/day
Fall	4 Day Avg. - Chronic	7.8 mg/l as N	1,111.5 lbs/day
	1 Hour Avg. - Acute	22.9 mg/l as N	3,244.7 lbs/day
Winter	4 Day Avg. - Chronic	10.2 mg/l as N	1,439.9 lbs/day
	1 Hour Avg. - Acute	34.2 mg/l as N	4,849.3 lbs/day
Spring	4 Day Avg. - Chronic	8.2 mg/l as N	0.0 lbs/day
	1 Hour Avg. - Acute	23.6 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	0.027	mg/l	3.77	lbs/day
	1 Hour Avg. - Acute	0.046	mg/l	6.52	lbs/day
Fall	4 Day Avg. - Chronic	0.045	mg/l	6.32	lbs/day
	1 Hour Avg. - Acute	0.077	mg/l	10.95	lbs/day
Winter	4 Day Avg. - Chronic	0.059	mg/l	8.43	lbs/day
	1 Hour Avg. - Acute	0.103	mg/l	14.61	lbs/day
Spring	4 Day Avg. - Chronic	0.043	mg/l	0.00	lbs/day
	1 Hour Avg. - Acute	0.074	mg/l	0.00	lbs/day

Effluent Limitations for Total Dissolved Solids based upon Water Quality Standards

	Season		Concentration		Load
Summer	Maximum, Acute	3338.3	mg/l	236.61	tons/day
Fall	Maximum, Acute	3241.2	mg/l	229.72	tons/day
Winter	Maximum, Acute	3768.2	mg/l	267.07	tons/day
Spring	4 Day Avg. - Chronic	4159.5	mg/l	294.81	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 597.08 mg/l):

	4 Day Average		1 Hour Average		
	Concentration	Load	Concentration	Load	
Aluminum	N/A	N/A	1,283.9	ug/l	182.0 lbs/day
Arsenic	460.22 ug/l	42.2 lbs/day	582.2	ug/l	82.5 lbs/day
Cadmium	2.36 ug/l	0.2 lbs/day	22.4	ug/l	3.2 lbs/day
Chromium III	903.05 ug/l	82.7 lbs/day	13,353.4	ug/l	1892.9 lbs/day
Chromium VI	21.03 ug/l	1.9 lbs/day	24.6	ug/l	3.5 lbs/day
Copper	103.15 ug/l	9.5 lbs/day	128.6	ug/l	18.2 lbs/day
Iron	N/A	N/A	1,713.2	ug/l	242.8 lbs/day
Lead	74.00 ug/l	6.8 lbs/day	1,360.4	ug/l	192.8 lbs/day
Mercury	0.03 ug/l	0.0 lbs/day	4.1	ug/l	0.6 lbs/day
Nickel	573.20 ug/l	52.5 lbs/day	3,646.1	ug/l	516.8 lbs/day
Selenium	8.90 ug/l	0.8 lbs/day	33.1	ug/l	4.7 lbs/day
Silver	N/A ug/l	N/A lbs/day	140.2	ug/l	19.9 lbs/day

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Zinc	1,322.19 ug/l	121.2 lbs/day	933.4	ug/l	132.3 lbs/day
Cyanide	12.63 ug/l	1.2 lbs/day	37.7	ug/l	5.3 lbs/day

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

Summer	35.2 Deg. C.	95.3 Deg. F
Fall	28.4 Deg. C.	83.1 Deg. F
Winter	29.2 Deg. C.	84.6 Deg. F
Spring	33.8 Deg. C.	92.9 Deg. F

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

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

	4 Day Average		1 Hour Average		Load
	Concentration	Load	Concentration	Load	
Aldrin			1.5E+00	ug/l	3.29E-01 lbs/day
Chlordane	4.30E-03 ug/l	6.10E-01 lbs/day	1.2E+00	ug/l	2.63E-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	2.74E-01 lbs/day
Endosulfan	5.60E-02 ug/l	7.94E+00 lbs/day	1.1E-01	ug/l	2.41E-02 lbs/day
Endrin	2.30E-03 ug/l	3.26E-01 lbs/day	9.0E-02	ug/l	1.97E-02 lbs/day
Guthion	0.00E+00 ug/l	0.00E+00 lbs/day	1.0E-02	ug/l	2.19E-03 lbs/day
Heptachlor	3.80E-03 ug/l	5.39E-01 lbs/day	2.6E-01	ug/l	5.70E-02 lbs/day
Lindane	8.00E-02 ug/l	1.13E+01 lbs/day	1.0E+00	ug/l	2.19E-01 lbs/day
Methoxychlor	0.00E+00 ug/l	0.00E+00 lbs/day	3.0E-02	ug/l	6.58E-03 lbs/day
Mirex	0.00E+00 ug/l	0.00E+00 lbs/day	1.0E-02	ug/l	2.19E-03 lbs/day
Parathion	0.00E+00 ug/l	0.00E+00 lbs/day	4.0E-02	ug/l	8.77E-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	708.8 lbs/day
Nitrates as N	4.0 mg/l	567.0 lbs/day
Total Phosphorus as P	0.05 mg/l	7.1 lbs/day
Total Suspended Solids	90.0 mg/l	12757.6 lbs/day

Note: Pollution indicator targets are for information purposes only.

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

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

	Maximum Concentration	
	Concentration	Load
Toxic Organics		
Acenaphthene	6.56E+03 ug/l	9.29E+02 lbs/day
Acrolein	1.89E+03 ug/l	2.68E+02 lbs/day
Acrylonitrile	1.60E+00 ug/l	2.27E-01 lbs/day
Benzene	1.72E+02 ug/l	2.44E+01 lbs/day
Benzidine	ug/l	lbs/day
Carbon tetrachloride	1.07E+01 ug/l	1.51E+00 lbs/day
Chlorobenzene	5.10E+04 ug/l	7.23E+03 lbs/day
1,2,4-Trichlorobenzene		
Hexachlorobenzene	1.87E-03 ug/l	2.65E-04 lbs/day
1,2-Dichloroethane	2.40E+02 ug/l	3.41E+01 lbs/day
1,1,1-Trichloroethane		
Hexachloroethane	2.16E+01 ug/l	3.06E+00 lbs/day
1,1-Dichloroethane		
1,1,2-Trichloroethane	1.02E+02 ug/l	1.45E+01 lbs/day
1,1,2,2-Tetrachloroethane	2.67E+01 ug/l	3.79E+00 lbs/day
Chloroethane		
Bis(2-chloroethyl) ether	3.40E+00 ug/l	4.82E-01 lbs/day
2-Chloroethyl vinyl ether		
2-Chloronaphthalene	1.04E+04 ug/l	1.48E+03 lbs/day
2,4,6-Trichlorophenol	1.58E+01 ug/l	2.24E+00 lbs/day
p-Chloro-m-cresol		
Chloroform (HM)	1.14E+03 ug/l	1.62E+02 lbs/day
2-Chlorophenol	9.71E+02 ug/l	1.38E+02 lbs/day
1,2-Dichlorobenzene	4.13E+04 ug/l	5.85E+03 lbs/day
1,3-Dichlorobenzene	6.31E+03 ug/l	8.95E+02 lbs/day

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1,4-Dichlorobenzene	6.31E+03 ug/l	8.95E+02 lbs/day
3,3'-Dichlorobenzidine	1.87E-01 ug/l	2.65E-02 lbs/day
1,1-Dichloroethylene	7.77E+00 ug/l	1.10E+00 lbs/day
1,2-trans-Dichloroethylene1		
2,4-Dichlorophenol	1.92E+03 ug/l	2.72E+02 lbs/day
1,2-Dichloropropane	9.47E+01 ug/l	1.34E+01 lbs/day
1,3-Dichloropropylene	4.13E+03 ug/l	5.85E+02 lbs/day
2,4-Dimethylphenol	5.58E+03 ug/l	7.92E+02 lbs/day
2,4-Dinitrotoluene	2.21E+01 ug/l	3.13E+00 lbs/day
2,6-Dinitrotoluene		
1,2-Diphenylhydrazine	1.31E+00 ug/l	1.86E-01 lbs/day
Ethylbenzene	7.04E+04 ug/l	9.98E+03 lbs/day
Fluoranthene	8.98E+02 ug/l	1.27E+02 lbs/day
4-Chlorophenyl phenyl ether		
4-Bromophenyl phenyl ether		
Bis(2-chloroisopropyl) ether	4.13E+05 ug/l	5.85E+04 lbs/day
Bis(2-chloroethoxy) methane		
Methylene chloride (HM)	3.89E+03 ug/l	5.51E+02 lbs/day
Methyl chloride (HM)		
Methyl bromide (HM)		
Bromoform (HM)	8.74E+02 ug/l	1.24E+02 lbs/day
Dichlorobromomethane(HM)	5.34E+01 ug/l	7.57E+00 lbs/day
Chlorodibromomethane (HM)	8.26E+01 ug/l	1.17E+01 lbs/day
Hexachlorocyclopentadiene	4.13E+04 ug/l	5.85E+03 lbs/day
Isophorone	1.46E+03 ug/l	2.07E+02 lbs/day
Naphthalene		
Nitrobenzene	4.61E+03 ug/l	6.54E+02 lbs/day
2-Nitrophenol		
4-Nitrophenol		
2,4-Dinitrophenol	3.40E+04 ug/l	4.82E+03 lbs/day
4,6-Dinitro-o-cresol	1.86E+03 ug/l	2.63E+02 lbs/day
N-Nitrosodimethylamine	1.97E+01 ug/l	2.79E+00 lbs/day
N-Nitrosodiphenylamine	3.89E+01 ug/l	5.51E+00 lbs/day
N-Nitrosodi-n-propylamine	3.40E+00 ug/l	4.82E-01 lbs/day
Pentachlorophenol	1.99E+01 ug/l	2.82E+00 lbs/day
Phenol	1.12E+07 ug/l	1.58E+06 lbs/day
Bis(2-ethylhexyl)phthalate	1.43E+01 ug/l	2.03E+00 lbs/day
Butyl benzyl phthalate	1.26E+04 ug/l	1.79E+03 lbs/day
Di-n-butyl phthalate	2.91E+04 ug/l	4.13E+03 lbs/day
Di-n-octyl phthlate		
Diethyl phthalate	2.91E+05 ug/l	4.13E+04 lbs/day
Dimethyl phthlate	7.04E+06 ug/l	9.98E+05 lbs/day
Benzo(a)anthracene (PAH)	7.53E-02 ug/l	1.07E-02 lbs/day
Benzo(a)pyrene (PAH)	7.53E-02 ug/l	1.07E-02 lbs/day
Benzo(b)fluoranthene (PAH)	7.53E-02 ug/l	1.07E-02 lbs/day
Benzo(k)fluoranthene (PAH)	7.53E-02 ug/l	1.07E-02 lbs/day
Chrysene (PAH)	7.53E-02 ug/l	1.07E-02 lbs/day
Acenaphthylene (PAH)		
Anthracene (PAH)		
Dibenzo(a,h)anthracene (PAH)	7.53E-02 ug/l	1.07E-02 lbs/day
Indeno(1,2,3-cd)pyrene (PAH)	7.53E-02 ug/l	1.07E-02 lbs/day

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Pyrene (PAH)	2.67E+04 ug/l	3.79E+03 lbs/day
Tetrachloroethylene	2.16E+01 ug/l	3.06E+00 lbs/day
Toluene	4.86E+05 ug/l	6.88E+04 lbs/day
Trichloroethylene	1.97E+02 ug/l	2.79E+01 lbs/day
Vinyl chloride	1.27E+03 ug/l	1.81E+02 lbs/day

Pesticides

Aldrin	3.40E-04 ug/l	4.82E-05 lbs/day
Dieldrin	3.40E-04 ug/l	4.82E-05 lbs/day
Chlordane	1.43E-03 ug/l	2.03E-04 lbs/day
4,4'-DDT	1.43E-03 ug/l	2.03E-04 lbs/day
4,4'-DDE	1.43E-03 ug/l	2.03E-04 lbs/day
4,4'-DDD	2.04E-03 ug/l	2.89E-04 lbs/day
alpha-Endosulfan	4.86E+00 ug/l	6.88E-01 lbs/day
beta-Endosulfan	4.86E+00 ug/l	6.88E-01 lbs/day
Endosulfan sulfate	4.86E+00 ug/l	6.88E-01 lbs/day
Endrin	1.97E+00 ug/l	2.79E-01 lbs/day
Endrin aldehyde	1.97E+00 ug/l	2.79E-01 lbs/day
Heptachlor	5.10E-04 ug/l	7.23E-05 lbs/day
Heptachlor epoxide		

PCB's

PCB 1242 (Arochlor 1242)	1.09E-04 ug/l	1.55E-05 lbs/day
PCB-1254 (Arochlor 1254)	1.09E-04 ug/l	1.55E-05 lbs/day
PCB-1221 (Arochlor 1221)	1.09E-04 ug/l	1.55E-05 lbs/day
PCB-1232 (Arochlor 1232)	1.09E-04 ug/l	1.55E-05 lbs/day
PCB-1248 (Arochlor 1248)	1.09E-04 ug/l	1.55E-05 lbs/day
PCB-1260 (Arochlor 1260)	1.09E-04 ug/l	1.55E-05 lbs/day
PCB-1016 (Arochlor 1016)	1.09E-04 ug/l	1.55E-05 lbs/day

Pesticide

Toxaphene	1.82E-03 ug/l	2.58E-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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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.

Utah Division of Water Quality
801-538-6052
File Name: StGeorge_WLA_2-10-12.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 2.569	REAER. Coeff. (Ka)20 (Ka)/day 12.905	REAER. Coeff. FORCED 1/day 0.000	REAER. Coeff. (Ka)T 1/day 14.686	NBOD Coeff. (Kn)20 1/day 0.400	NBOD Coeff. (Kn)T 1/day 0.608
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 5.138	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 43.961
BENTHIC DEMAND (SOD)20 gm/m2/day 1.000	BENTHIC DEMAND (SOD)T gm/m2/day 1.409						
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

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Level I Antidegradation Review for: St. George WWTP
StGeorge_WLA_2-10-12.xls

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 found that the proposed activity meets the requirements of R317-2-3.5(b)(1) (water quality will not be lowered by the proposed activity) and, therefore does not require a Level II review. The proposed activity is a basic permit renewal. No increase in effluent concentration or load is requested over that allowed under the current UPDES Permit.

Review by: 

3/6/2013