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

Date: **October 20, 2017**

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Standards and Technical Services

Facility: **Neola Lagoons**
UPDES No. UT-0023001

Receiving water: **Irrigation Ditch (2B, 3E, 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: Uintah Number 1 Canal → Roosevelt Lateral → Dry Creek

The mean monthly design discharge is 0.88 MGD (cfs) for the facility.

Receiving Water
The receiving water for Outfall 001 is the Uintah Number 1 Irrigation Canal. The canal flows through a series of irrigation ditches (approximately 10 miles) to the Roosevelt Lateral and then to Dry Gulch Creek, a tributary of the Uintah River.

Per R317-2-13.9, all irrigation canals and ditches statewide, except as otherwise designated, are classified 2B, 3E, 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 3E - Severely habitat-limited waters. Narrative standards will be applied to protect these waters for aquatic wildlife..*

- *Class 4 - Protected for agricultural uses including irrigation of crops and stock watering.*

Uinta River and tributaries, from confluence with Duchesne River to Highway US-40 crossing is classified as 2B, 3B, 4.

- *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.*

Typically, the critical flow for the wasteload analysis is considered the lowest stream flow for seven consecutive days with a ten year return frequency (7Q10). Because the receiving water is an irrigation canal, the 7Q10 is assumed to be zero.

TMDL

DWQ's 2016 Integrated Report lists Dry Gulch Creek and tributaries from Duchesne River confluence to headwaters (Assessment Unit UT14060003-009) as impaired for Total Dissolved Solids (Class 4) and E. coli (Class 2B). A TMDL for TDS was completed (*Uinta River, Deep Creek and Dry Gulch Creek TMDLs for Total Dissolved Solids; Uinta River Watershed, Utah*) in October 9, 2002. Due to the limited and intermittent discharge of the lagoons, no load allocation was given to the facility in the TMDL.

Effluents limits for E.coli and TDS equal to the water quality criteria will ensure that in-stream criteria will not be exceeded at the point of discharge as well as not causing or contributing to the existing impairment downstream in Dry Gulch Creek.

Mixing Zone

The maximum allowable mixing zone is 15 minutes of travel time for acute conditions, not to exceed 50% of stream width, and 2,500 feet for chronic conditions, per UAC R317-2-5. Water quality standards must be met at the end of the mixing zone.

Since the receiving water low flow is considered zero, no mixing zone analysis was considered. Effluent limits revert to end of pipe standards.

Parameters of Concern

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

WET Limits

The percent of effluent in the receiving water in a fully mixed condition, and acute and chronic dilution in a not fully mixed condition are calculated in the WLA in order to generate WET limits. The 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 3: WET Limits for IC_{25}

Outfall	Percent Effluent
Outfall 001	100%

Wasteload Allocation Methods

Effluent limits were determined for conservative constituents using a simple mass balance mixing analysis (UDWQ 2012). The mass balance analysis is summarized in the Wasteload Addendum.

Models and supporting documentation are available for review upon request.

Antidegradation Level I Review

The objective of the Level I ADR is to ensure the protection of existing uses, defined as the beneficial uses attained in the receiving water on or after November 28, 1975. No evidence is known that the existing uses deviate from the designated beneficial uses for the receiving water. Therefore, the beneficial uses will be protected if the discharge remains below the WQBELs presented in this wasteload.

A Level II Antidegradation Review (ADR) is NOT required for this facility as the UPDES permit is being renewed and there is no increase in load or concentration over that which was approved in the previous permit.

Documents:

WLA Document: *Neola_WLADoc_10-20-17.docx*
Wasteload Analysis and Addendum: *Neola_WLA_10-20-17.xlsm*

References:

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

Utah Division of Water Quality. 2002. Uinta River, Deep Creek and Dry Gulch Creek TMDLs for Total Dissolved Solids; Uinta River Watershed, Utah. Prepared by Tetra Tech, Inc.

Lewis, B., J. Saunders, and M. Murphy. 2002. *Ammonia Toxicity Model (AMMTOX, Version2): A Tool for Determining Effluent Ammonia Limits*. University of Colorado, Center for Limnology.

WASTELOAD ANALYSIS [WLA]
Addendum: Statement of Basis
SUMMARY

Discharging Facility: **Neola Lagoons**
UPDES No: UT-0023001
Design Flow 0.88 MGD

Receiving Water: **Irrigation Ditch**
Stream Classification: 2B, 3E, 4

Stream Flows [cfs]:	0.00	Summer (July-Sept)	20th Percentile
	0.00	Fall (Oct-Dec)	20th Percentile
	0.00	Winter (Jan-Mar)	20th Percentile
	0.00	Spring (Apr-June)	20th Percentile
	2.5	Average	
Stream TDS Values:	500.0	Summer (July-Sept)	Average
	500.0	Fall (Oct-Dec)	Average
	500.0	Winter (Jan-Mar)	Average
	500.0	Spring (Apr-June)	Average

Effluent Limits:				**WQ Standard:**
Flow, MGD:	0.88	MGD	Design Flow	
BOD, mg/l:	25.0	Summer	5.0	Indicator
Dissolved Oxygen, mg/l	NA	Summer	5.0	30 Day Average
TNH3, Chronic, mg/l:	NA	Summer	Varies	Function of pH and Temperature
TDS, mg/l:	1200.5	Summer	1200.0	

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

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

Date: 10/18/2017

WASTELOAD ANALYSIS [WLA]
Addendum: Statement of Basis

18-Oct-17
4:00 PM

Facilities: **Neola Lagoons** **UPDES No: UT-0023001**
Discharging to: **Irrigation Ditch**

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

Irrigation Ditch:	2B, 3E, 4
Antidegradation Review:	Level I review completed. Level II review NOT required.

III. Numeric Stream Standards for Protection of Aquatic Wildlife

Total Ammonia (TNH3)	Varies as a function of Temperature and pH Rebound. See Water Quality Standards
Chronic Total Residual Chlorine (TRC)	0.011 mg/l (4 Day Average) 0.019 mg/l (1 Hour Average)
Chronic Dissolved Oxygen (DO)	5.00 mg/l (30 Day Average) N/A mg/l (7Day Average) 3.00 mg/l (1 Day Average
Maximum Total Dissolved Solids	1200.0 mg/l

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**	0.640 lbs/day	750.00	ug/l	5.514 lbs/day
Arsenic	190.00	ug/l	1.397 lbs/day	340.00	ug/l	2.500 lbs/day
Cadmium	0.76	ug/l	0.006 lbs/day	8.73	ug/l	0.064 lbs/day
Chromium III	268.18	ug/l	1.972 lbs/day	5610.83	ug/l	41.251 lbs/day
ChromiumVI	11.00	ug/l	0.081 lbs/day	16.00	ug/l	0.118 lbs/day
Copper	30.49	ug/l	0.224 lbs/day	51.68	ug/l	0.380 lbs/day
Iron				1000.00	ug/l	7.352 lbs/day
Lead	18.58	ug/l	0.137 lbs/day	476.70	ug/l	3.505 lbs/day
Mercury	0.0120	ug/l	0.000 lbs/day	2.40	ug/l	0.018 lbs/day
Nickel	168.51	ug/l	1.239 lbs/day	1515.68	ug/l	11.143 lbs/day
Selenium	4.60	ug/l	0.034 lbs/day	20.00	ug/l	0.147 lbs/day
Silver	N/A	ug/l	N/A lbs/day	41.06	ug/l	0.302 lbs/day
Zinc	387.77	ug/l	2.851 lbs/day	387.77	ug/l	2.851 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 399.93 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	0.011 lbs/day
Chlordane	0.004	ug/l	0.032 lbs/day	1.200	ug/l	0.009 lbs/day
DDT, DDE	0.001	ug/l	0.007 lbs/day	0.550	ug/l	0.004 lbs/day
Dieldrin	0.002	ug/l	0.014 lbs/day	1.250	ug/l	0.009 lbs/day
Endosulfan	0.056	ug/l	0.411 lbs/day	0.110	ug/l	0.001 lbs/day
Endrin	0.002	ug/l	0.017 lbs/day	0.090	ug/l	0.001 lbs/day
Guthion				0.010	ug/l	0.000 lbs/day
Heptachlor	0.004	ug/l	0.028 lbs/day	0.260	ug/l	0.002 lbs/day
Lindane	0.080	ug/l	0.587 lbs/day	1.000	ug/l	0.007 lbs/day
Methoxychlor				0.030	ug/l	0.000 lbs/day
Mirex				0.010	ug/l	0.000 lbs/day
Parathion				0.040	ug/l	0.000 lbs/day
PCB's	0.014	ug/l	0.103 lbs/day	2.000	ug/l	0.015 lbs/day
Pentachlorophenol	13.00	ug/l	95.461 lbs/day	20.000	ug/l	0.147 lbs/day
Toxephene	0.0002	ug/l	0.001 lbs/day	0.7300	ug/l	0.005 lbs/day

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	lbs/day
Chromium			100.0 ug/l	lbs/day
Copper			200.0 ug/l	lbs/day
Lead			100.0 ug/l	lbs/day
Selenium			50.0 ug/l	lbs/day
TDS, Summer			1200.0 mg/l	4.41 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
ocyclohexane (Lindane)			ug/l	lbs/day
Methoxychlor			ug/l	lbs/day
Toxaphene			ug/l	lbs/day

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

	Maximum Conc., ug/l - Acute Standards			
	Class 1C		Class 3A, 3B	
Toxic Organics	[2 Liters/Day for 70 Kg Person over 70 Yr.]		[6.5 g for 70 Kg Person over 70 Yr.]	
Acenaphthene	ug/l	lbs/day	ug/l	lbs/day
Acrolein	ug/l	lbs/day	ug/l	lbs/day
Acrylonitrile	ug/l	lbs/day	ug/l	lbs/day
Benzene	ug/l	lbs/day	ug/l	lbs/day
Benzidine	ug/l	lbs/day	ug/l	lbs/day
Carbon tetrachloride	ug/l	lbs/day	ug/l	lbs/day
Chlorobenzene	ug/l	lbs/day	ug/l	lbs/day
1,2,4-Trichlorobenzene				
Hexachlorobenzene	ug/l	lbs/day	ug/l	lbs/day
1,2-Dichloroethane	ug/l	lbs/day	ug/l	lbs/day

1,1,1-Trichloroethane				
Hexachloroethane	ug/l	lbs/day	ug/l	lbs/day
1,1-Dichloroethane				
1,1,2-Trichloroethane	ug/l	lbs/day	ug/l	lbs/day
1,1,2,2-Tetrachloroethai	ug/l	lbs/day	ug/l	lbs/day
Chloroethane			ug/l	lbs/day
Bis(2-chloroethyl) ether	ug/l	lbs/day	ug/l	lbs/day
2-Chloroethyl vinyl ether	ug/l	lbs/day	ug/l	lbs/day
2-Chloronaphthalene	ug/l	lbs/day	ug/l	lbs/day
2,4,6-Trichlorophenol	ug/l	lbs/day	ug/l	lbs/day
p-Chloro-m-cresol			ug/l	lbs/day
Chloroform (HM)	ug/l	lbs/day	ug/l	lbs/day
2-Chlorophenol	ug/l	lbs/day	ug/l	lbs/day
1,2-Dichlorobenzene	ug/l	lbs/day	ug/l	lbs/day
1,3-Dichlorobenzene	ug/l	lbs/day	ug/l	lbs/day
1,4-Dichlorobenzene	ug/l	lbs/day	ug/l	lbs/day
3,3'-Dichlorobenzidine	ug/l	lbs/day	ug/l	lbs/day
1,1-Dichloroethylene	ug/l	lbs/day	ug/l	lbs/day
1,2-trans-Dichloroethyle	ug/l	lbs/day	ug/l	lbs/day
2,4-Dichlorophenol	ug/l	lbs/day	ug/l	lbs/day
1,2-Dichloropropane	ug/l	lbs/day	ug/l	lbs/day
1,3-Dichloropropylene	ug/l	lbs/day	ug/l	lbs/day
2,4-Dimethylphenol	ug/l	lbs/day	ug/l	lbs/day
2,4-Dinitrotoluene	ug/l	lbs/day	ug/l	lbs/day
2,6-Dinitrotoluene	ug/l	lbs/day	ug/l	lbs/day
1,2-Diphenylhydrazine	ug/l	lbs/day	ug/l	lbs/day
Ethylbenzene	ug/l	lbs/day	ug/l	lbs/day
Fluoranthene	ug/l	lbs/day	ug/l	lbs/day
4-Chlorophenyl phenyl ether				
4-Bromophenyl phenyl ether				
Bis(2-chloroisopropyl) e	ug/l	lbs/day	ug/l	lbs/day
Bis(2-chloroethoxy) met	ug/l	lbs/day	ug/l	lbs/day
Methylene chloride (HM	ug/l	lbs/day	ug/l	lbs/day
Methyl chloride (HM)	ug/l	lbs/day	ug/l	lbs/day
Methyl bromide (HM)	ug/l	lbs/day	ug/l	lbs/day
Bromoform (HM)	ug/l	lbs/day	ug/l	lbs/day
Dichlorobromomethane	ug/l	lbs/day	ug/l	lbs/day
Chlorodibromomethane	ug/l	lbs/day	ug/l	lbs/day
Hexachlorobutadiene(c)	ug/l	lbs/day	ug/l	lbs/day
Hexachlorocyclopentadi	ug/l	lbs/day	ug/l	lbs/day
Isophorone	ug/l	lbs/day	ug/l	lbs/day
Naphthalene				
Nitrobenzene	ug/l	lbs/day	ug/l	lbs/day
2-Nitrophenol	ug/l	lbs/day	ug/l	lbs/day
4-Nitrophenol	ug/l	lbs/day	ug/l	lbs/day
2,4-Dinitrophenol	ug/l	lbs/day	ug/l	lbs/day
4,6-Dinitro-o-cresol	ug/l	lbs/day	ug/l	lbs/day
N-Nitrosodimethylamine	ug/l	lbs/day	ug/l	lbs/day
N-Nitrosodiphenylamine	ug/l	lbs/day	ug/l	lbs/day
N-Nitrosodi-n-propylami	ug/l	lbs/day	ug/l	lbs/day
Pentachlorophenol	ug/l	lbs/day	ug/l	lbs/day

Phenol	ug/l	lbs/day	ug/l	lbs/day
Bis(2-ethylhexyl)phthala	ug/l	lbs/day	ug/l	lbs/day
Butyl benzyl phthalate	ug/l	lbs/day	ug/l	lbs/day
Di-n-butyl phthalate	ug/l	lbs/day	ug/l	lbs/day
Di-n-octyl phthlate				
Diethyl phthalate	ug/l	lbs/day	ug/l	lbs/day
Dimethyl phthlate	ug/l	lbs/day	ug/l	lbs/day
Benzo(a)anthracene (P/	ug/l	lbs/day	ug/l	lbs/day
Benzo(a)pyrene (PAH)	ug/l	lbs/day	ug/l	lbs/day
Benzo(b)fluoranthene (F	ug/l	lbs/day	ug/l	lbs/day
Benzo(k)fluoranthene (F	ug/l	lbs/day	ug/l	lbs/day
Chrysene (PAH)	ug/l	lbs/day	ug/l	lbs/day
Acenaphthylene (PAH)				
Anthracene (PAH)	ug/l	lbs/day	ug/l	lbs/day
Dibenzo(a,h)anthracene	ug/l	lbs/day	ug/l	lbs/day
Indeno(1,2,3-cd)pyrene	ug/l	lbs/day	ug/l	lbs/day
Pyrene (PAH)	ug/l	lbs/day	ug/l	lbs/day
Tetrachloroethylene	ug/l	lbs/day	ug/l	lbs/day
Toluene	ug/l	lbs/day	ug/l	lbs/day
Trichloroethylene	ug/l	lbs/day	ug/l	lbs/day
Vinyl chloride	ug/l	lbs/day	ug/l	lbs/day
				lbs/day
Pesticides				lbs/day
Aldrin	ug/l	lbs/day	ug/l	lbs/day
Dieldrin	ug/l	lbs/day	ug/l	lbs/day
Chlordane	ug/l	lbs/day	ug/l	lbs/day
4,4'-DDT	ug/l	lbs/day	ug/l	lbs/day
4,4'-DDE	ug/l	lbs/day	ug/l	lbs/day
4,4'-DDD	ug/l	lbs/day	ug/l	lbs/day
alpha-Endosulfan	ug/l	lbs/day	ug/l	lbs/day
beta-Endosulfan	ug/l	lbs/day	ug/l	lbs/day
Endosulfan sulfate	ug/l	lbs/day	ug/l	lbs/day
Endrin	ug/l	lbs/day	ug/l	lbs/day
Endrin aldehyde	ug/l	lbs/day	ug/l	lbs/day
Heptachlor	ug/l	lbs/day	ug/l	lbs/day
Heptachlor epoxide				
PCB's				
PCB 1242 (Arochlor 12/	ug/l	lbs/day	ug/l	lbs/day
PCB-1254 (Arochlor 12	ug/l	lbs/day	ug/l	lbs/day
PCB-1221 (Arochlor 12	ug/l	lbs/day	ug/l	lbs/day
PCB-1232 (Arochlor 12	ug/l	lbs/day	ug/l	lbs/day
PCB-1248 (Arochlor 12/	ug/l	lbs/day	ug/l	lbs/day
PCB-1260 (Arochlor 12	ug/l	lbs/day	ug/l	lbs/day
PCB-1016 (Arochlor 10	ug/l	lbs/day	ug/l	lbs/day
Pesticide				
Toxaphene	ug/l		ug/l	lbs/day
Dioxin				
Dioxin (2,3,7,8-TCDD)	ug/l	lbs/day		

Metals				
Antimony	ug/l	lbs/day		
Arsenic	ug/l	lbs/day	ug/l	lbs/day
Asbestos	ug/l	lbs/day		
Beryllium				
Cadmium				
Chromium (III)				
Chromium (VI)				
Copper				
Cyanide	ug/l	lbs/day	ug/l	lbs/day
Lead	ug/l	lbs/day		
Mercury			ug/l	lbs/day
Nickel			ug/l	lbs/day
Selenium	ug/l	lbs/day		
Silver	ug/l	lbs/day		
Thallium			ug/l	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)	0.00	15.0	8.0	0.03	0.10	10.65	0.00	500.0
Fall	0.00	8.0	8.0	0.03	0.10	---	0.00	500.0
Winter	0.00	5.0	8.0	0.03	0.10	---	0.00	500.0
Spring	0.00	10.0	8.0	0.03	0.10	---	0.00	500.0

	Al	As	Cd	CrIII	CrVI	Copper	Fe	Pb
Dissolved Metals	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
All Seasons	2.385*	0.795*	0.0795*	0.795*	3.975*	0.8*	1.25*	0.795*

	Hg	Ni	Se	Ag	Zn	Boron
Dissolved Metals	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
All Seasons	0.159*	0.795*	1.59*	0.15*	0.0795*	1.59*

* ~80% MDL

Projected Discharge Information

Season	Flow, MGD	Temp.
Summer	0.88000	15.0
Fall	0.88000	8.0
Winter	0.88000	5.0
Spring	0.88000	10.0

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	Daily Average	
Summer	0.880 MGD	1.361 cfs
Fall	0.880 MGD	1.361 cfs
Winter	0.880 MGD	1.361 cfs
Spring	0.880 MGD	1.361 cfs

Flow Requirement or Loading Requirement

The calculations in this wasteload analysis utilize the maximum effluent discharge flow of 0.88 MGD. If the discharger is allowed to have a flow greater than 0.88 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 >	99.9% Effluent	[Chronic]

Effluent Limitation for Biological Oxygen Demand (BOD) based upon Water Quality Standards or Regulations

In-stream criteria of downstream segments for Dissolved Oxygen will be met with an effluent BOD limitation as follows:

Season	Concentration	
Summer	25.0 mg/l as BOD5	183.4 lbs/day
Fall	25.0 mg/l as BOD5	183.4 lbs/day
Winter	25.0 mg/l as BOD5	183.4 lbs/day
Spring	25.0 mg/l as BOD5	183.4 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	NA
Fall	NA
Winter	NA
Spring	NA

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

Acute limit calculated with an Acute Zone of Initial Dilution (ZID) to be equal to 100.%.

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

Effluent Limitations for Total Dissolved Solids based upon Water Quality Standards

Season		Concentration		Load	
Summer	Maximum, Acute	1200.5	mg/l	4.40	tons/day
Fall	Maximum, Acute	1200.5	mg/l	4.40	tons/day
Winter	Maximum, Acute	1200.5	mg/l	4.40	tons/day
Spring	4 Day Avg. - Chronic	1200.5	mg/l	4.40	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 399.93 mg/l):

	4 Day Average Concentration		Load	1 Hour Average Concentration		Load
Aluminum*	N/A		N/A	750.5	ug/l	5.5 lbs/day
Arsenic*	190.14	ug/l	0.9 lbs/day	340.2	ug/l	2.5 lbs/day
Cadmium	0.76	ug/l	0.0 lbs/day	8.7	ug/l	0.1 lbs/day
Chromium III	268.38	ug/l	1.3 lbs/day	5,614.9	ug/l	41.3 lbs/day
Chromium VI*	11.01	ug/l	0.1 lbs/day	16.0	ug/l	0.1 lbs/day
Copper	30.52	ug/l	0.1 lbs/day	51.7	ug/l	0.4 lbs/day
Iron*	N/A		N/A	1,362.4	ug/l	10.0 lbs/day
Lead	18.59	ug/l	0.1 lbs/day	477.1	ug/l	3.5 lbs/day
Mercury*	0.01	ug/l	0.0 lbs/day	2.4	ug/l	0.0 lbs/day
Nickel	168.64	ug/l	0.8 lbs/day	1,516.8	ug/l	11.2 lbs/day
Selenium*	4.60	ug/l	0.0 lbs/day	20.0	ug/l	0.1 lbs/day
Silver	N/A	ug/l	N/A lbs/day	41.1	ug/l	0.3 lbs/day

Zinc	388.05 ug/l	1.8 lbs/day	388.1	ug/l	2.9 lbs/day
Cyanide*	5.20 ug/l	0.0 lbs/day	22.0	ug/l	0.2 lbs/day

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

Effluent Limitations for Heat/Temperature based upon Water Quality Standards

Summer	19.0 Deg. C.	66.2 Deg. F
Fall	12.0 Deg. C.	53.6 Deg. F
Winter	9.0 Deg. C.	48.2 Deg. F
Spring	14.0 Deg. C.	57.2 Deg. F

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

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

	4 Day Average Concentration	Load	1 Hour Average Concentration		Load
Aldrin			1.5E+00	ug/l	1.71E-02 lbs/day
Chlordane	4.30E-03 ug/l	3.16E-02 lbs/day	1.2E+00	ug/l	1.36E-02 lbs/day
DDT, DDE	1.00E-03 ug/l	7.34E-03 lbs/day	5.5E-01	ug/l	6.26E-03 lbs/day
Dieldrin	1.90E-03 ug/l	1.39E-02 lbs/day	1.3E+00	ug/l	1.42E-02 lbs/day
Endosulfan	5.60E-02 ug/l	4.11E-01 lbs/day	1.1E-01	ug/l	1.25E-03 lbs/day
Endrin	2.30E-03 ug/l	1.69E-02 lbs/day	9.0E-02	ug/l	1.02E-03 lbs/day
Guthion	0.00E+00 ug/l	0.00E+00 lbs/day	1.0E-02	ug/l	1.14E-04 lbs/day
Heptachlor	3.80E-03 ug/l	2.79E-02 lbs/day	2.6E-01	ug/l	2.96E-03 lbs/day
Lindane	8.00E-02 ug/l	5.87E-01 lbs/day	1.0E+00	ug/l	1.14E-02 lbs/day
Methoxychlor	0.00E+00 ug/l	0.00E+00 lbs/day	3.0E-02	ug/l	3.41E-04 lbs/day
Mirex	0.00E+00 ug/l	0.00E+00 lbs/day	1.0E-02	ug/l	1.14E-04 lbs/day
Parathion	0.00E+00 ug/l	0.00E+00 lbs/day	4.0E-02	ug/l	4.55E-04 lbs/day
PCB's	1.40E-02 ug/l	1.03E-01 lbs/day	2.0E+00	ug/l	2.27E-02 lbs/day
Pentachlorophenol	1.30E+01 ug/l	9.54E+01 lbs/day	2.0E+01	ug/l	2.27E-01 lbs/day
Toxephene	2.00E-04 ug/l	1.47E-03 lbs/day	7.3E-01	ug/l	8.30E-03 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	Loading
Gross Beta (pCi/l)	50.0 pCi/L	
BOD (mg/l)	5.0 mg/l	36.8 lbs/day
Nitrates as N	4.0 mg/l	29.4 lbs/day
Total Phosphorus as P	0.05 mg/l	0.4 lbs/day
Total Suspended Solids	90.0 mg/l	661.7 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	ug/l	lbs/day
Acrolein	ug/l	lbs/day
Acrylonitrile	ug/l	lbs/day
Benzene	ug/l	lbs/day
Benzidine	ug/l	lbs/day
Carbon tetrachloride	ug/l	lbs/day
Chlorobenzene	ug/l	lbs/day
1,2,4-Trichlorobenzene		
Hexachlorobenzene	ug/l	lbs/day
1,2-Dichloroethane	ug/l	lbs/day
1,1,1-Trichloroethane		
Hexachloroethane	ug/l	lbs/day
1,1-Dichloroethane		
1,1,2-Trichloroethane	ug/l	lbs/day
1,1,2,2-Tetrachloroethane	ug/l	lbs/day
Chloroethane		
Bis(2-chloroethyl) ether	ug/l	lbs/day
2-Chloroethyl vinyl ether		
2-Chloronaphthalene	ug/l	lbs/day
2,4,6-Trichlorophenol	ug/l	lbs/day
p-Chloro-m-cresol		
Chloroform (HM)	ug/l	lbs/day
2-Chlorophenol	ug/l	lbs/day
1,2-Dichlorobenzene	ug/l	lbs/day
1,3-Dichlorobenzene	ug/l	lbs/day

1,4-Dichlorobenzene	ug/l	lbs/day
3,3'-Dichlorobenzidine	ug/l	lbs/day
1,1-Dichloroethylene	ug/l	lbs/day
1,2-trans-Dichloroethylene1		
2,4-Dichlorophenol	ug/l	lbs/day
1,2-Dichloropropane	ug/l	lbs/day
1,3-Dichloropropylene	ug/l	lbs/day
2,4-Dimethylphenol	ug/l	lbs/day
2,4-Dinitrotoluene	ug/l	lbs/day
2,6-Dinitrotoluene		
1,2-Diphenylhydrazine	ug/l	lbs/day
Ethylbenzene	ug/l	lbs/day
Fluoranthene	ug/l	lbs/day
4-Chlorophenyl phenyl ether		
4-Bromophenyl phenyl ether		
Bis(2-chloroisopropyl) ether	ug/l	lbs/day
Bis(2-chloroethoxy) methane		
Methylene chloride (HM)	ug/l	lbs/day
Methyl chloride (HM)		
Methyl bromide (HM)		
Bromoform (HM)	ug/l	lbs/day
Dichlorobromomethane(HM)	ug/l	lbs/day
Chlorodibromomethane (HM)	ug/l	lbs/day
Hexachlorocyclopentadiene	ug/l	lbs/day
Isophorone	ug/l	lbs/day
Naphthalene		
Nitrobenzene	ug/l	lbs/day
2-Nitrophenol		
4-Nitrophenol		
2,4-Dinitrophenol	ug/l	lbs/day
4,6-Dinitro-o-cresol	ug/l	lbs/day
N-Nitrosodimethylamine	ug/l	lbs/day
N-Nitrosodiphenylamine	ug/l	lbs/day
N-Nitrosodi-n-propylamine	ug/l	lbs/day
Pentachlorophenol	ug/l	lbs/day
Phenol	ug/l	lbs/day
Bis(2-ethylhexyl)phthalate	ug/l	lbs/day
Butyl benzyl phthalate	ug/l	lbs/day
Di-n-butyl phthalate	ug/l	lbs/day
Di-n-octyl phthlate		
Diethyl phthalate	ug/l	lbs/day
Dimethyl phthlate	ug/l	lbs/day
Benzo(a)anthracene (PAH)	ug/l	lbs/day
Benzo(a)pyrene (PAH)	ug/l	lbs/day
Benzo(b)fluoranthene (PAH)	ug/l	lbs/day
Benzo(k)fluoranthene (PAH)	ug/l	lbs/day
Chrysene (PAH)	ug/l	lbs/day
Acenaphthylene (PAH)		
Anthracene (PAH)		
Dibenzo(a,h)anthracene (PAH)	ug/l	lbs/day
Indeno(1,2,3-cd)pyrene (PAH)	ug/l	lbs/day

Pyrene (PAH)	ug/l	lbs/day
Tetrachloroethylene	ug/l	lbs/day
Toluene	ug/l	lbs/day
Trichloroethylene	ug/l	lbs/day
Vinyl chloride	ug/l	lbs/day
Pesticides		
Aldrin	ug/l	lbs/day
Dieldrin	ug/l	lbs/day
Chlordane	ug/l	lbs/day
4,4'-DDT	ug/l	lbs/day
4,4'-DDE	ug/l	lbs/day
4,4'-DDD	ug/l	lbs/day
alpha-Endosulfan	ug/l	lbs/day
beta-Endosulfan	ug/l	lbs/day
Endosulfan sulfate	ug/l	lbs/day
Endrin	ug/l	lbs/day
Endrin aldehyde	ug/l	lbs/day
Heptachlor	ug/l	lbs/day
Heptachlor epoxide		
PCB's		
PCB 1242 (Arochlor 1242)	ug/l	lbs/day
PCB-1254 (Arochlor 1254)	ug/l	lbs/day
PCB-1221 (Arochlor 1221)	ug/l	lbs/day
PCB-1232 (Arochlor 1232)	ug/l	lbs/day
PCB-1248 (Arochlor 1248)	ug/l	lbs/day
PCB-1260 (Arochlor 1260)	ug/l	lbs/day
PCB-1016 (Arochlor 1016)	ug/l	lbs/day
Pesticide		
Toxaphene	ug/l	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)	#N/A ug/l	#N/A 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						0.0	N/A
Antimony				4303.2		4303.2	
Arsenic	100.1				0.0	100.1	
Barium						0.0	
Beryllium						0.0	
Cadmium	10.0				0.0	10.0	
Chromium (III)					0.0	0.0	
Chromium (VI)	100.1				0.0	100.07	
Copper	200.1					200.1	
Cyanide		22.0	220161.6			220161.6	5.2
Iron						0.0	
Lead	100.1				0.0	100.1	
Mercury				0.15	0.0	0.15	
Nickel				4603.4		4603.4	
Selenium	50.0				0.0	50.0	
Silver					0.0	0.0	
Thallium				6.3		6.3	
Zinc						0.0	
Boron	750.6					750.6	
Sulfate	2001.5					2001.5	

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	0.0	N/A	
Antimony	4303.16		
Arsenic	100.1		Acute Controls
Asbestos	0.00E+00		
Barium			
Beryllium			
Cadmium	10.0		Acute Controls
Chromium (III)	0.0		Acute Controls
Chromium (VI)	100.1		Acute Controls
Copper	200.1		Acute Controls

Cyanide	220161.6	5.2	
Iron	0.0		
Lead	100.1		Acute Controls
Mercury	0.150		Acute Controls
Nickel	4603.4		Acute Controls
Selenium	50.0		Acute Controls
Silver	0.0	N/A	
Thallium	6.3		
Zinc	0.0		Acute Controls
Boron	750.55		
Sulfate	2001.5		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 required because the receiving water for the discharge is a Class 1C Drinking Water Source.

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.