

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

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Facility: Huntington Wastewater Treatment Facility
Castle Valley Special Service District
UPDES No. UT0021296

Receiving water: Huntington Creek (2B, 3C, 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: Huntington Creek

The maximum daily design discharge is 0.8 MGD and the maximum monthly design discharge is 0.4 MGD for the facility.

Receiving Water

The receiving water for Outfall 001 is Huntington Creek, which is tributary to Cottonwood Creek, which drains to the San Rafael River and the Colorado River.

Per UAC R317-2-13.1(b), the designated beneficial uses for Huntington Creek and tributaries, from confluence with Cottonwood Creek to Highway U-10 crossing are 2B, 3C 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 3C - Protected for nongame fish and other aquatic life, including the necessary aquatic organisms in their food chain.*
- *Class 4 - Protected for agricultural uses including irrigation of crops and stock watering.*

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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). Due to a lack of flow records for Huntington Creek, the 20th percentile of flow measurements taken immediately upstream of the outfall was calculated to estimate annual critical flow in the receiving water (Table 1).

Table 1: Annual critical low flow for Huntington Creek above lagoon outfall

Season	Flow (cfs)
Annual	1.0

Receiving water quality data were obtained from monitoring site 4930520 Huntington Creek above Huntington Lagoons Outfall. The average seasonal value was calculated for each constituent with available data in the receiving water. Effluent parameters were characterized using data from monitoring site 4930510 Huntington Lagoons Outfall.

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.

The actual length of the mixing zone was not determined; however, it was presumed to remain within the maximum allowable mixing zone dimensions. Acute limits were calculated using 50% of the seasonal critical low flow.

Parameters of Concern

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

TMDL

Huntington Creek is listed as impaired for selenium according to the 2010 303(d) list. The San Rafael River downstream of the confluence with Cottonwood Creek is listed as impaired for benthic macroinvertebrates.

Per UAC R317-2-14, Huntington Creek has a site specific criterion for TDS concentration of 4,800 mg/L that is based upon the EPA approved Total Maximum Daily Load (TMDL) *Price River, San Rafael River, and Muddy Creek TMDLs for Total Dissolved Solids, West Colorado Watershed Management Unit, Utah* (MFG Inc., 2004).

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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 LC₅₀ (lethal concentration, 50%) percent effluent for acute toxicity and the IC₂₅ (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 LC₅₀ is typically 100% effluent and does not need to be determined by the WLA.

Table 2: WET Limits for IC₂₅

Season	Percent Effluent
Annual	38%

Effluent Limits

Effluent limits for conservative pollutants were determined using a mass balance mixing analysis (UDWQ 2012). The mass balance analysis is summarized in Appendix A.

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 analysis is summarized in Appendix B.

The effluent limits for DO and BOD₅ in order to meet minimum DO criteria in the receiving water was evaluated using the Utah River Model. The analysis is summarized in Appendix B.

The limits for total residual chlorine were determined assuming a decay rate of 20 /day (at 20 °C) and a travel time of 25 minutes; 10 minutes in the outlet pipe prior to discharge to Huntington Creek (approximately 500 linear feet at 1.0 feet per second velocity) and 15 minutes in the mixing zone. The analysis for TRC is summarized in Appendix C.

Table 3: Water Quality Based Effluent Limits Summary

Effluent Constituent	Acute			Chronic		
	Standard	Limit	Averaging Period	Standard	Limit	Averaging Period
Flow (MGD)		0.8	1 day		0.4	30 days
Ammonia (mg/L)			1 hour			30 days
Summer (Jul-Sep)	3.6	8.6		1.3	3.5	
Fall (Oct-Dec)	3.6	7.4		2.0	5.3	
Winter (Jan-Mar)	3.6	6.9		2.1	5.6	
Spring (Apr-Jun)	3.6	8.7		2.0	5.4	
CBOD ₅ (mg/L)	N/A	65	Daily	N/A	30	30 days
Dissolved Oxygen (mg/L)	3.0	3.0	Minimum	5.0	5.0	30 days
Total Dissolved Solids (mg/L)	4,800	4,800	Maximum			
Total Residual Chlorine (mg/L)	0.019	0.04	1 hour	0.011	0.04	4 days

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Model 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 discharge since the pollutant concentration and load is not increasing under this permit renewal.

Documents:

WLA Document: *huntington_potw_wla_2014_preliminary.docx*
Wasteload Analysis: *huntington_potw_utstreamdo_wla_2014.xlsm*

References:

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

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.

MFG Inc. 2004. *Price River, San Rafael River, and Muddy Creek TMDLs for Total Dissolved Solids, West Colorado Watershed Management Unit, Utah*. Utah Division of Water Quality.

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WASTELOAD ANALYSIS [WLA]

Date: 9/11/2014

Appendix A: Mass Balance Mixing Analysis for Conservative Constituents

Discharging Facility:	Huntington Lagoons		
UPDES No:	UT-0021296		
Permit Flow [MGD]:	0.80 Annual	Max. Daily	
	0.40 Annual	Max. Monthly	
Receiving Water:	Huntington Creek		
Stream Classification:	2B, 3C, 4		
Stream Flows [cfs]:	1.0 All Seasons	Critical Low Flow	
Fully Mixed:	NO		
Acute River Width:	50%		
Chronic River Width:	100%		

Modeling Information

A simple mixing analysis was used to determine the effluent limits.

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

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 reflect the environmental conditions expected at low stream flows.

Effluent Limitations for Protection of Recreation (Class 2B Waters)

No dilution in unnamed irrigation ditch.

Physical

Parameter	Maximum Concentration
pH Minimum	6.5
pH Maximum	9.0
Turbidity Increase (NTU)	10.0

Bacteriological

E. coli (30 Day Geometric Mean)	206 (#/100 mL)
E. coli (Maximum)	668 (#/100 mL)

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Effluent Limitations for Protection of Aquatic Wildlife (Assumed Class 3C Waters)

Inorganics	Chronic Standard (4 Day Average)		Acute Standard (1 Hour Average)
	Parameter	Standard	Standard
Phenol (mg/L)			0.010
Hydrogen Sulfide (Undissociated) [mg/L]			0.002

Metals-Total Recoverable

Parameter	Chronic (4-day ave)			Acute (1-hour ave)		
	Standard ¹	Background	Limit	Standard ¹	Background	Limit
Aluminum (µg/L)	87.0	20.3	194.8	750.0	20.3	1044.8
Arsenic (µg/L)	150.0	1.7	389.7	340.0	1.7	476.7
Cadmium (µg/L)	0.6	0.40	1.0	7.7	0.40	10.7
Chromium III (µg/L)	11.0	4.5	21.5	16.0	4.5	20.6
Chromium VI (µg/L)	230.7	4.5	596.2	1773.3	4.5	2487.9
Copper (µg/L)	29.3	6.1	66.7	49.6	6.1	67.2
Cyanide (µg/L) ²	5.2	3.5	8.0	22.0	3.5	29.5
Iron (µg/L)				1000.0	23.0	1394.7
Lead (µg/L)	10.9	1.9	25.6	280.8	1.9	393.5
Mercury (µg/L) ²	0.012	0.008	0.018	2.4	0.008	3.4
Nickel (µg/L)	168.0	8.3	426.2	1512.9	8.3	2120.8
Selenium (µg/L)	4.6	3.9	5.7	18.4	3.9	24.3
Silver (µg/L)				34.9	1.0	48.6
Tributyltin (µg/L) ²	0.072	0.048	0.110	0.46	0.048	0.63
Zinc (µg/L)	382.4	20.0	968.1	379.3	20.0	524.5

1: Based upon a Hardness of 400 mg/l as CaCO₃

2: Background concentration assumed 67% of chronic standard

Organics [Pesticides]

Parameter	Chronic (4-day ave)		Acute (1-hour ave)	
	Standard	Limit	Standard	Limit
Aldrin (µg/L)			1.5	1.5
Chlordane (µg/L)	0.0043	0.0043	1.2	1.2
DDT, DDE (µg/L)	0.001	0.001	0.55	0.55
Diazinon (µg/L)	0.17	0.17	0.17	0.17
Dieldrin (µg/L)	0.0056	0.0056	0.24	0.24
Endosulfan, a & b (µg/L)	0.056	0.056	0.11	0.11
Endrin (µg/L)	0.036	0.036	0.086	0.086
Heptachlor & H. epoxide (µg/L)	0.0038	0.0038	0.26	0.26
Lindane (µg/L)	0.08	0.08	1.0	1.0
Methoxychlor (µg/L)			0.03	0.03
Mirex (µg/L)			0.001	0.001
Nonylphenol (µg/L)	6.6	6.6	28.0	28.0
Parathion (µg/L)	0.0130	0.0130	0.066	0.066
PCB's (µg/L)	0.014	0.014		
Pentachlorophenol (µg/L)	15.0	15.0	19.0	19.0
Toxephene (µg/L)	0.0002	0.0002	0.73	0.73

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Radiological	Parameter	Maximum Concentration Standard
	Gross Alpha (pCi/L)	15

Effluent Limitation for Protection of Agriculture (Class 4 Waters)

Parameter	Maximum Concentration			
	Standard	Background	Limit	
Total Dissolved Solids (mg/L)	4800	4800	4800	Site specific standard
Boron (mg/L)	0.75	0.2	2	
Arsenic, Dissolved (µg/L)	100	1.7	259	
Cadmium, Dissolved (µg/L)	10	0.4	26	
Chromium, Dissolved (µg/L)	100	4.5	254	
Copper, Dissolved (µg/L)	200	6.1	513	
Lead, Dissolved (µg/L)	100	1.9	259	
Selenium, Dissolved (µg/L)	50	3.9	124	
Gross Alpha (pCi/L)	15	0.0	39	

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Projected Discharge Information

Season	Flow (MGD)		Temp.	pH	pH	Org N	NO3
	Max Daily	Ave Monthly	Deg. C	Ave	Max	mg/L as N	mg/L as N
Summer	0.8	0.4	19.7	8.20	8.50	1.00	5.00
Fall	0.8	0.4	9.1	8.20	8.50	1.00	5.00
Winter	0.8	0.4	5.1	8.20	8.50	1.00	5.00
Spring	0.8	0.4	13.1	8.20	8.50	1.00	5.00

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 reflect the environmental conditions expected at low stream flows.

Effluent Limitations for Protection of Aquatic Wildlife (Assumed Class 3C Waters)

Temperature (deg C)	Maximum
Instantaneous	27.0
Change	4.0

pH	Concentration
Minimum	6.5
Maximum	9.0

Dissolved Oxygen (mg/L)	Standard	Limit
Instantaneous Minimum	3.0	5.0
30-day Average Minimum	5.0	5.0

CBOD5 (mg/L)	Standard	Limit
Daily Maximum	N/A	65.0
30-day Average	N/A	30.0

Ammonia-Total (mg/L)	Chronic (30-day ave)			Acute (1-hour ave)		
	Season	Standard	Background	Limit	Standard	Background
Summer	1.3	0.06	3.5	3.6	0.06	8.6
Fall	2.0	0.05	5.3	3.6	0.05	7.4
Winter	2.1	0.06	5.6	3.6	0.06	6.9
Spring	2.0	0.07	5.4	3.6	0.07	8.7

Model Rate Parameters and Coefficients

CBOD	CBOD	REAER.	REAER.	NBOD	NBOD		
Kd(20)	Kd(T)	Ka(20)	Ka(T)	Kn(20)	Kn(T)		
/day	/day	/day	/day	/day	/day		
2.00	2.06	20.0	20.3	0.40	0.42		
NH3	NH3	NO3	NO3	BENTHIC	BENTHIC		
LOSS	LOSS	LOSS	LOSS	DEMAND	DEMAND		
K5(20)	K5(T)	K6(20)	K6(T)	SOD(20)	SOD(T)		
/day	/day	/day	/day	gm/m2/day	gm/m2/day		
4.00	4.12	0.00	0.00	1.00	1.04		
Kd	Ka	Kn	K4	K5	K6	KCI	SOD
CBOD	Reaer.	NH3	Open	NH3 Loss	NO2+3	TRC	Benthic
{theta}	{theta}	{theta}	{theta}	{theta}	{theta}	{theta}	{theta}
1.047	1.024	1.08	1	1.047	1.045	1.06	1.065

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**WASTELOAD ANALYSIS [WLA]
Appendix C: Total Residual Chlorine**

Date: 9/11/2014

Discharging Facility: Huntington Lagoons
UPDES No: UT-0021296

CHRONIC

Discharge (cfs) TRC (mg/L)	Season	Receiving Water	Standard	Total Effluent	Mixing Zone Boundary	Effluent Limit Without Decay	Temperature (°C)	Decay Rate (/day)			Travel Time (min)	Decay Coefficient	Effluent Limit
								@ 20 deg C	@ T deg C				
	Annual	1.0	0.011	0.6	1.6			20	20.0		25	0.71	0.041
	Annual	0.000	0.011			0.029	20.0	20	20.0			0.71	0.041

ACUTE

Discharge (cfs) TRC (mg/L)	Season	Receiving Water	Standard	Total Effluent	Mixing Zone Boundary	Effluent Limit Without Decay	Temperature (°C)	Decay Rate (/day)			Travel Time (min)	Decay Coefficient	Effluent Limit
								@ 20 °C	@ T °C				
	Annual	0.5	0.019	1.2	1.7			20	20.0		25	0.71	0.038
	Annual	0.000	0.019			0.027	20.0	20	20.0			0.71	0.038