Utah Division of Water Quality
ADDENDUM
Statement of Basis
Wasteload Analysis

Date: **April 20, 2022**

Facility: **Oakley WWTP**
UPDES No. UT020061

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Standards and Technical Services

Receiving water: **Weber River (1C, 2B, 3A, 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 002: Weber River

The design flow for the discharge is 0.25 MGD maximum monthly average discharge.

Receiving Water

The receiving water for Outfall 002 is the Weber River. Per UAC R317-2-13.4.a, the designated uses for the Weber River and tributaries, from Stoddard diversion to headwaters are 1C, 2B, 3A, and 4.

- *Class 1C - Protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water.*

- *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 3A - Protected for cold water species of game fish and other cold-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.*

The critical flow for the wasteload analysis is typically considered the lowest stream flow for seven consecutive days with a ten-year return frequency (7Q10). The 7Q10 flow was calculated using daily mean flow data from USGS monitoring station # 10128500 WEBER RIVER NEAR OAKLEY, UT and subtracting the WEBER-PROVO CANAL (daily flow values) for the period 1996-2021. Seasonal critical low values are presented in Table 1.

Table 1: Seasonal Critical Low Flow Values

Season	Weber River Flows (cfs)
Summer	47.6
Fall	13.2
Winter	9.0
Spring	19.0
Overall	9.1

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. The mixing zone was not delineated for this WLA; however, the discharge is presumed fully mixed within the maximum allowable mixing zone. For chronic conditions, the annual critical low flow was simulated, and for acute conditions, 50% of the critical low flow was simulated.

TMDL

The immediate receiving assessment unit Weber River-9 (UT16020101-023-00, Weber River from Rockport Reservoir to Weber-Provo Canal) is not listed as impaired for any parameters per the *2022 Utah Integrated Report* (DWQ, 2022).

Echo Reservoir (UT-L-16020101-001_00) downstream is impaired for total phosphorus, and Rockport Reservoir (UT-L-16020101-0 02_00), downstream is impaired for pH and *E. coli* (*2022 Utah Integrated Report)*. The *Rockport Reservoir and Echo Reservoir TMDL Final Report* (SWCA Environmental Consultants, 2014) includes waste load allocations for total phosphorus and total nitrogen for Oakley. These load limits are summarized below under effluent limits

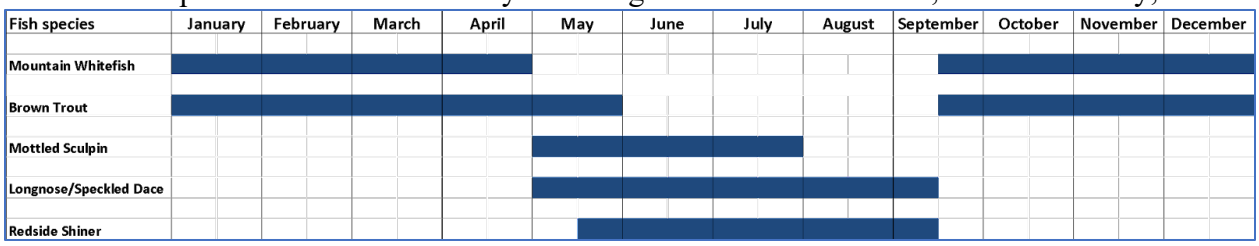
Parameters of Concern

The potential parameters of concern for the discharge/receiving water identified were total suspended solids (TSS), dissolved oxygen (DO), BOD_5, total phosphorus (TP), total nitrogen (TN) and total ammonia (TAN), as determined in consultation with the UPDES Permit Writer.

Dissolved Oxygen 3A (cold water aquatic life) Early Life Stages

The Division of Water Quality staff has determined that ELS are present year-round in the Weber River.

Table 2. ELS periods of Fish for Oakley receiving water of Weber River, Summit County, Utah



Credit to Benjamin Holcomb

Water Quality Modeling

A QUAL2Kw model of the receiving water was built and calibrated under contract by Utah State University (USU). The model was calibrated to synoptic survey data collected in the summer of 2010 by USU and DWQ (Neilson et al., 2012). Subsequently, the model was extended downstream to the confluence with Beaver Creek.

Receiving water quality data was obtained from monitoring site 4928005 Weber River above Oakley City WWTP above Millrace Road for 2002-2022. The average seasonal value was calculated for each constituent in the receiving water.

The calibrated model was used to determine WQBELs for BOD_5, TAN, TN, TP, and DO. Effluent concentrations were adjusted so that water quality standards were not exceeded at the end of the mixing zone. QUAL2Kw rates, input and output for nutrient related constituents are summarized in Appendix A. The calibration and wasteload QUAL2Kw models are available for review by request.

Effluent limits for conservative constituents were determined using a mass balance mixing analysis (DWQ, 2012). The mass balance analysis is summarized in Appendix B.

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}

Season	Percent Effluent
Summer	1%

Fall	3%
Winter	4%
Spring	2%

Effluent Limits

Water quality based effluent limits are summarized in Table 4. The complete list of limits is included in Appendix A and B.

The DO in the Weber River is not significantly impacted by the discharge from the Oakley WWTP. Therefore, secondary treatment requirements (R317-1-3) for BOD_5 are sufficient to meet water quality standards in the receiving water.

Table 4: Water Quality Based Effluent Limits

Effluent Constituent	Acute			Chronic		
	Standard	Limit	Averaging Period	Standard	Limit	Averaging Period
Flow (MGD)		0.50	1 day		0.25	30 days
Dissolved Oxygen (mg/L)	4.0	5.0	Instant	6.5	5.0	30 days
BOD_5 (mg/L)	None	35	7 days	None	25	30 days
Ammonia (mg/l)	Varies	20	1 hour	Varies	20	30 days
Total Phosphorus (kg)						
Summer: April – Sept.					173	
Annual					346	
Total Nitrogen (kg)						
Summer: April – Sept.					1,732	
Annual					3,464	

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 it is a simple renewal.

Files:
WLA Document: *oakley_potw_wla_2022-Final.doc*
QUAL2Kw Wasteload Model: *oakley_potw_wla_2022-Final.xls*
QUAL2Kw Calibration Model: *qual2kw Oakley City Calibration V1.2b.xls*

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

Field Data Collection for QUAL2Kw Model Build and Calibration Standard Operating Procedures Version 1.0. 2012. Utah Division of Water Quality.

Using QUAL2K Modeling to Support Nutrient Criteria Development and Wasteload Analyses in Utah. 2012. Neilson, B.T., A.J. Hobson, N. von Stackelberg, M. Shupryt, and J.D. Ostermiller.

Final 2022 Integrated Report on Water Quality. 2022. Utah Division of Water Quality.

Rockport Reservoir and Echo Reservoir Total Maximum Daily Loads Final Report. 2014. SWCA Environmental Consultants, Inc.

Rockport Reservoir and Echo Reservoir Total Maximum Daily Loads Implementation Plan. 2013. SWCA Environmental Consultants, Inc.

WASTELOAD ANALYSIS [WLA] Date: 3/21/2022

Appendix B: Mass Balance Mixing Analysis for Conservative Constituents

Discharging Facility:	Oakley WWTP		
UPDES No:	UT-0020061		
Permit Flow [MGD]:	0.25	Maximum Monthly Flow	
	0.50	Maximum Daily Flow	
Receiving Water:	Weber River		
Stream Classification:	1C, 2B, 3A, 4		
Stream Flows [cfs]:	9.7	Annual	Chronic Critical Low Flow
	4.9	Annual	Acute Critical Low Flow
Combined Flow [cfs]			
	10.1	Chronic	
	5.6	Acute	
Acute River Width:	50%		
Chronic River Width:	100%		

Modeling Information

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

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.

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)

Parameter	Maximum Concentration
Physical	
pH Minimum	6.5
pH Maximum	9.0
Bacteriological	
E. coli (30 Day Geometric Mean)	206 (#/100 mL)
E. coli (Maximum)	668 (#/100 mL)

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

Parameter	Maximum Concentration		
Physical			
Inorganics	**Chronic Standard (4 Day Average)**	**Acute Standard (1 Hour Average)**	
	Standard **Limit**	**Standard**	**Limit**
Phenol		0.010	0.010 mg/L
Hydrogen Sulfide (Undissociated)		0.002	0.002 mg/L

Total Recoverable Metals

	Chronic Standard (4 Day Average)			Acute Standard (1 Hour Average)		
Parameter (µg/L)	**Standard[1]**	**Background[2]**	**Limit**	**Standard[1]**	**Background[2]**	**Limit**
Aluminum	N/A[3]	35.0	N/A	750	35.0	5,233
Arsenic	150	1.0	3,887	340	1.0	2,466
Cadmium	0.4	0.1	7.7	3.5	0.1	25.0
Chromium VI	11.0	2.0	237	16.0	2.0	103.8
Chromium III	129	2.0	3,320	2,704	2.0	19,644
Copper	14.2	0.6	356	22.3	0.6	158
Cyanide[2]	5.2	3.5	48.7	22.0	3.5	138
Iron				1,000	19.3	7,149
Lead	6.0	0.1	153	153.3	0.1	1,114
Mercury[2]	0.012	0.008	0.112	2.4	0.008	17.4
Nickel	79	0.2	2,062	713	0.2	5,182
Selenium	4.6	1.0	94.9	18.4	1.0	128
Silver				8.9	0.5	61.3
Tributylin[2]	0.072	0.048	0.674	0.46	0.048	3.04
Zinc	182	10.0	4,501	182	10.0	1,262

1: Based upon a Hardness of 164 mg/l as CaCO3

2: Background concentration assumed 67% of chronic standard

3: Where the pH is equal to or greater than 7.0 and the hardness is equal to or greater than 50 ppm as $CaC0_3$ in the receiving water after mixing, the 87 ug/L chronic criterion (expressed as total recoverable) will not apply, and aluminum will be regulated based on compliance with the 750 ug/L acute aluminum criterion (expressed as total recoverable).

Organics [Pesticides]

	Chronic Standard (4 Day Average)			Acute Standard (1 Hour Average)		
Parameter (µg/L)	**Standard**	**Background**	**Limit**	**Standard**	**Background**	**Limit**
Aldrin				1.5	1.000	4.6
Chlordane	0.0043	0.0029	0.0402	1.2	0.003	8.7
DDT, DDE	0.001	0.0007	0.0094	0.55	0.001	3.99
Diazinon	0.17	0.1133	1.59	0.17	0.113	0.53
Dieldrin	0.0056	0.0037	0.0524	0.24	0.004	1.72
Endosulfan, a & b	0.056	0.0373	0.524	0.11	0.037	0.57
Endrin	0.036	0.0240	0.337	0.086	0.024	0.475
Heptachlor & H. epoxide	0.0038	0.0025	0.0356	0.26	0.003	1.87
Lindane	0.08	0.0533	0.75	1.0	0.053	6.9
Methoxychlor				0.03	0.020	0.09
Mirex				0.001	0.001	0.003
Nonylphenol	6.6	4.4	61.8	28.0	4.4	176.0
Parathion	0.0130	0.0087	0.1217	0.066	0.009	0.425
PCB's	0.014	0.0093	0.131			
Pentachlorophenol	15.00	10	140.4	19.0	10.0	75.4
Toxephene	0.0002	0.0001	0.0019	0.73	0.0001	5.31

Radiological

Parameter	Maximum Concentration
Gross Alpha	15 pCi/L

Effluent Limitation for Protection of Agriculture (Class 4 Waters)

	Maximum Concentration		
Parameter	**Standard**	**Background**	**Limit**
Total Dissolved Solids (mg/L)	1,200	521	18,230
Boron (µg/L)	750	110	16,802
Arsenic (µg/L)	100	1.0	2,583
Cadmium (µg/L)	10	0.1	258
Chromium (µg/L)	100	2.0	2,558
Copper (µg/L)	200	0.6	5,201
Lead (µg/L)	100	0.1	2,606
Selenium (µg/L)	50	1.0	1,279
Gross Alpha (pCi/L)	15	10	140