Utah Division of Water Quality
Statement of Basis
ADDENDUM
Wasteload Analysis and Antidegradation Level I Review
UPGRADE TO FULL MECHANICAL TREATMENT PLANT

Date: **May 15, 2014**

Prepared by: **Nicholas von Stackelberg, P.E.**
Water Quality Management Section

Facility: **Logan Wastewater Treatment Plant, Logan, UT**
UPDES No. UT0021920

Receiving water: **Swift Slough (2B, 3B, 3D, 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: Unnamed Irrigation Ditch→Swift Slough

This wasteload is for the proposed treatment plant upgrade at full design capacity. The proposed project involves construction of a mechanical treatment plant to replace the existing lagoon system. The existing polishing wetlands would no longer be used for wastewater treatment.

Design data for the treatment facility was provided by Carollo Engineers under contract to Logan City. The pH is based on monthly influent values from 2005 and 2006; this is a conservative assumption that does not consider the anticipated reduction in pH through the treatment plant. The design parameters for the discharge are summarized in Table 1.

Table 1: Effluent Characteristics

Duration	Flow (MGD)		pH		Temperature (deg C)	
	Max. Daily	Max. Monthly	Max. Daily	Max. Monthly	Max. Daily	Max. Monthly
Summer (Jun-Aug)	25.4	23.7	7.8	7.6	19.0	19.0
Fall (Sep-Nov)	25.4	20.5	7.8	7.6	14.7	14.0
Winter (Dec-Feb)	35.0	20.3	7.8	7.6	4.7	11.0
Spring (Mar May)	21.3	16.5	7.8	7.6	12.3	13.0

Receiving Water

The receiving water for Outfall 001 is an unnamed irrigation ditch that will convey the effluent from the treatment plant to Swift Slough. The beneficial uses for the irrigation ditch are presumed 2B, 3E, and 4 per UAC R317-2-13.9. The irrigation ditch has no background flow during critical conditions.

- *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.*

The unnamed irrigation ditch drains approximately 2.8 miles to Swift Slough. Swift Slough is tributary to Cutler Reservoir. Per UAC R317-2-13.3.a, the designated beneficial uses for Swift Slough (Bear River and tributaries, from Great Salt Lake to Utah-Idaho border) are 2B, 3B, 3D, and 4.

- *Class 2B - Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing.*
- *Class 3B - Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain.*
- *Class 3D - Protected for waterfowl, shore birds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.*
- *Class 4 - Protected for agricultural uses including irrigation of crops and stock watering.*

Typically, the critical flow for the wasteload analysis is considered the lowest stream flow for seven consecutive days with a ten year return frequency (7Q10). Flow records from Swift Slough immediately upstream of Outfall 002 were provided by Logan City for the years 2004-2010. Since this is not a long enough flow record to compute the 7Q10 flow, the lowest 7-day average flow while the wetlands were discharging for each season was used (Table 2).

Table 2: Seasonal critical low flow

Season	Background Flow (cfs)	
	Ditch	Swift Slough
Summer	0.0	4.0
Fall	0.0	8.4
Winter	0.0	8.8
Spring	0.0	2.9

TMDL

Cutler Reservoir has an approved TMDL for total phosphorus (TP) (*Middle Bear River and Cutler Reservoir TMDLs, 2010*). The TMDL allocated load for TP from Logan City Wastewater Treatment Plant is 4,405 kg for May through October and 11,831 kg for November through April.

Mixing Zone

The discharge is considered instantaneously fully mixed since the discharge is more than twice the background receiving water flow. Therefore, no mixing zone is allowed.

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 (TAM), E. coli, pH, total residual chlorine (TRC), total copper, and total lead as determined in consultation with the UPDES Permit Writer.

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

Season	Percent Effluent
Summer	91%
Fall	82%
Winter	81%
Spring	93%

Water Quality Modeling

A QUAL2Kw model of Swift Slough was built and calibrated. The model was calibrated to synoptic survey data collected in September of 2011 by DWQ staff.

Receiving water quality data was primarily obtained from the synoptic survey conducted for the model calibration from 9/15 to 9/19/2011. The sampling site was on the Swift Slough immediately above the plant discharge. Limited water quality data was obtained from STORET 4905050 Swift Slough below confluence with Logan Lagoons Effluent and STORET 4905070 Swift Slough at 1300 West. The average value was calculated for each constituent in the receiving water.

The calibrated model was used for determining WQBELs. Effluent concentrations were adjusted so that water quality standards were not exceeded at the end of the mixing zone. Any potential transformation of constituents during transport through the irrigation ditch prior to discharge to Swift Slough was not considered in this analysis. The calibration model and the wasteload model are available for review by request.

Effluent Limits

The effect of the effluent on the DO in the receiving water was evaluated using the QUAL2Kw model. Due to light and substrate limitation, significant algal growth downstream of the discharge was neither observed nor predicted in the model. Therefore, WQBELs are not required for nitrogen and phosphorus due to algal growth in the Swift Slough. However, as a result of the TMDL for Cutler Reservoir, effluent limits are required for TP. In addition, limits are required for DO to meet instream criteria.

Limits for total residual chlorine were not determined since the proposed treatment plant includes ultraviolet radiation for disinfection.

Table 4: Water Quality Based Effluent Limits

Effluent Constituent	Acute			Chronic		
	Standard	Limit	Averaging Period	Standard	Limit	Averaging Period
Ammonia (mg/L)[1]						
Summer	Varies with pH	11.0	1 hour	Varies with pH and temper-ature	2.5	30 days
Fall		12.0			4.0	
Winter		12.0			4.0	
Spring		11.0			3.5	
Min. Dissolved Oxygen (mg/L)	3.0	5.0	Instantaneous	5.5	5.5	30 days
BOD_5 (mg/L)[2]	None	25	7 days	None	35	30 days

1: Ammonia limit due to toxicity requirements.
2: Secondary standards.

QUAL2Kw rates, input and output for DO and nutrient related constituents are summarized in Appendix A.

Mass balance mixing analysis input and output for conservative constituents are summarized in Appendix B.

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 remain below the WQBELs presented in this wasteload.

A Level II Antidegradation Review (ADR) is required for this discharge since the allowable pollutant load will increase with the treatment plant upgrade.

Documents:
WLA Document: *logan_potw_wla_upgrade_mech_final.docx*
QUAL2Kw Wasteload Model: *logan_potw_wla_upgrade_mech_2037.xlsm*
QUAL2Kw Calibration Model: *logan_q2k_cal_1.3.xlsm*

References:
Neilson, B.T., A.J. Hobson, N. von Stackelberg, M. Shupryt, and J.D. Ostermiller. 2012. *Using QUAL2K Modeling to Support Nutrient Criteria Development and Wasteload Analyses in Utah.* Utah Department of Environmental Quality, Division of Water Quality.

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

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

WASTELOAD ANALYSIS [WLA] Date: 5/15/2014
Appendix A: QUAL2Kw Analysis Results

Discharging Facility:	Logan WWTP		
UPDES No:	UT-0021920		
Permit Flow [MGD]:	24.00	Summer (July-Sept)	Max. Daily
	24.00	Fall (Oct-Dec)	Max. Daily
	24.00	Winter (Jan-Mar)	Max. Daily
	21.30	Spring (Apr-June)	Max. Daily
	23.70	Summer (July-Sept)	Max. Monthly
	20.50	Fall (Oct-Dec)	Max. Monthly
	20.30	Winter (Jan-Mar)	Max. Monthly
	16.50	Spring (Apr-June)	Max. Monthly
Receiving Water:	Swift Slough		
Stream Classification:	2B, 3B, 3D, 4		
Stream Critical Low Flow [cfs]:	3.98	Summer (July-Sept)	
	8.40	Fall (Oct-Dec)	
	8.82	Winter (Jan-Mar)	
	2.88	Spring (Apr-June)	
Fully Mixed:	YES		
Acute River Width:	100%		
Chronic River Width:	100%		

Modeling Information

A QUAL2Kw model 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.

Headwater/Upstream Information	Summer	Fall	Winter	Spring
Flow (cfs)	4.0	8.4	8.8	2.9
Temperature (deg C)	21.6	12.3	1.5	14.9
Specific Conductance (µmhos)	850	610	533	619
Inorganic Suspended Solids (mg/L)	26.5	26.5	26.5	26.5
Dissolved Oxygen (mg/L)	5.8	9.0	12.1	9.4
$CBOD_5$ (mg/L)	4.4	4.4	4.4	4.4
Organic Nitrogen (mg/L)	0.084	0.084	0.084	0.084
NH4-Nitrogen (mg/L)	0.025	0.025	0.025	0.025
NO3-Nitrogen (mg/L)	0.270	0.270	0.270	0.270
Organic Phosphorus (mg/L)	0.025	0.025	0.025	0.025
Inorganic Ortho-Phosphorus (mg/L)	0.025	0.025	0.025	0.025
Phytoplankton (µg/L)	2.6	2.6	2.6	2.6
Detritus [POM] (mg/L)	3.6	3.6	3.6	3.6
Alkalinity (mg/L)	225	225	225	225
pH	8.1	8.0	8.0	8.2

Discharge Information Acute	Summer	Fall	Winter	Spring
Flow (cfs)	24.0	24.0	24.0	21.3
Temperature (deg C)	20.0	15.0	12.0	14.0
Specific Conductance (µmhos)	735	735	735	735
Inorganic Suspended Solids (mg/L)	35.7	35.7	35.7	35.7
Dissolved Oxygen (mg/L)	5.0	5.0	5.0	5.0
$CBOD_5$ (mg/L)	35.0	35.0	35.0	35.0
Organic Nitrogen (mg/L)	5.000	5.000	5.000	5.000
NH4-Nitrogen (mg/L)	11.000	12.000	12.000	11.000
NO3-Nitrogen (mg/L)	5.000	5.000	5.000	5.000
Organic Phosphorus (mg/L)	5.000	5.000	5.000	5.000
Inorganic Ortho-Phosphorus (mg/L)	5.000	5.000	5.000	5.000
Phytoplankton (µg/L)	168.000	168.000	168.000	168.000
Detritus [POM] (mg/L)	0.000	0.000	0.000	0.000
Alkalinity (mg/L)	272	272	272	272
pH	7.8	7.8	7.8	7.8

Chronic	Summer	Fall	Winter	Spring
Flow (cfs)	23.7	20.5	20.3	16.5
Temperature (deg C)	19.0	14.0	11.0	13.0
Specific Conductance (µmhos)	735	735	735	735
Inorganic Suspended Solids (mg/L)	35.7	35.7	35.7	35.7
Dissolved Oxygen (mg/L)	5.5	5.5	5.5	5.5
$CBOD_5$ (mg/L)	25.0	25.0	25.0	25.0
Organic Nitrogen (mg/L)	5.000	5.000	5.000	5.000
NH4-Nitrogen (mg/L)	2.500	4.000	4.000	3.500
NO3-Nitrogen (mg/L)	5.000	5.000	5.000	5.000
Organic Phosphorus (mg/L)	5.000	5.000	5.000	5.000
Inorganic Ortho-Phosphorus (mg/L)	5.000	5.000	5.000	5.000
Phytoplankton (µg/L)	168.000	168.000	168.000	168.000
Detritus [POM] (mg/L)	0.000	0.000	0.000	0.000
Alkalinity (mg/L)	272	272	272	272
pH	7.6	7.6	7.6	7.6

All model numerical inputs, intermediate calculations, outputs and graphs are available for review and comment 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 Limitation for Biological Oxygen Demand (BOD_5) based upon Secondary Standards

In-stream criteria of downstream segments for Dissolved Oxygen will be met with an effluent BOD5 limitation as follows:

	Concentration		
Season	Chronic	Acute	
Summer	25.0	35.0	mg/L as CBOD5
Fall	25.0	35.0	mg/L as CBOD5
Winter	25.0	35.0	mg/L as CBOD5
Spring	25.0	35.0	mg/L as CBOD5

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 DO limitation as follows:

	Dissolved Oxygen		
Season	**Chronic**	**Acute**	
Summer	5.5	5.0	mg/L
Fall	5.5	5.0	mg/L
Winter	5.5	5.0	mg/L
Spring	5.5	5.0	mg/L

Effluent Limitation for Total Phosphorus based upon TMDL
In-stream criteria of downstream segments for Dissolved Oxygen will be met with effluent TP limitation as follows:

	Total Phosphorus	
Season	**Load**	
May - October	4,405	kg
November - April	11,831	kg

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:

	Total Ammonia		
Season	**Chronic**	**Acute**	
Summer	2.5	11.0	mg/L as N
Fall	4.0	12.0	mg/L as N
Winter	4.0	12.0	mg/L as N
Spring	3.5	11.0	mg/L as N

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.

Coefficients and Other Model Information

Parameter	*Value*	*Units*
Stoichiometry:		
Carbon	40	gC
Nitrogen	7.2	gN
Phosphorus	1	gP
Dry weight	100	gD
Chlorophyll	1	gA
Inorganic suspended solids:		
Settling velocity	2	m/d
Oxygen:		
Reaeration model	Internal	
Temp correction	1.024	
Reaeration wind effect	None	
O2 for carbon oxidation	2.69	gO2/gC
O2 for NH4 nitrification	4.57	gO2/gN
Oxygen inhib model CBOD oxidation	Exponential	
Oxygen inhib parameter CBOD oxidation	0.60	L/mgO2
Oxygen inhib model nitrification	Exponential	
Oxygen inhib parameter nitrification	0.60	L/mgO2
Oxygen enhance model denitrification	Exponential	
Oxygen enhance parameter denitrification	0.60	L/mgO2
Oxygen inhib model phyto resp	Exponential	
Oxygen inhib parameter phyto resp	0.60	L/mgO2
Oxygen enhance model bot alg resp	Exponential	
Oxygen enhance parameter bot alg resp	0.60	L/mgO2
Slow CBOD:		
Hydrolysis rate	0	/d
Temp correction	1.047	
Oxidation rate	0.240778	/d
Temp correction	1.047	
Fast CBOD:		
Oxidation rate	10	/d
Temp correction	1.047	
Organic N:		
Hydrolysis	0.2964425	/d
Temp correction	1.07	
Settling velocity	0.147494	m/d
Ammonium:		
Nitrification	0.0772945	/d
Temp correction	1.07	
Nitrate:		
Denitrification	1.8113375	/d
Temp correction	1.07	
Sed denitrification transfer coeff	0.22471	m/d
Temp correction	1.07	
Organic P:		
Hydrolysis	0.1360275	/d
Temp correction	1.07	
Settling velocity	0.11495	m/d
Inorganic P:		
Settling velocity	0.02022	m/d
Sed P oxygen attenuation half sat constant	1.40616	mgO2/L

Phytoplankton:		
Max Growth rate	1.99746	/d
Temp correction	1.07	
Respiration rate	0.49199	/d
Temp correction	1.07	
Death rate	0.97217	/d
Temp correction	1	
Nitrogen half sat constant	22.0366	ugN/L
Phosphorus half sat constant	1.95708	ugP/L
Inorganic carbon half sat constant	1.30E-05	moles/L
Phytoplankton use HCO3- as substrate	Yes	
Light model	Smith	
Light constant	97.3006	langleys/d
Ammonia preference	27.86895	ugN/L
Settling velocity	0.326705	m/d
Bottom Plants:		
Growth model	Zero-order	
Max Growth rate	7.262455	gD/m2/d or /d
Temp correction	1.07	
First-order model carrying capacity	100	gD/m2
Basal respiration rate	0.1455158	/d
Photo-respiration rate parameter	0.39	unitless
Temp correction	1.07	
Excretion rate	0.202475	/d
Temp correction	1.07	
Death rate	3.8662	/d
Temp correction	1.07	
External nitrogen half sat constant	288.016	ugN/L
External phosphorus half sat constant	98.1445	ugP/L
Inorganic carbon half sat constant	1.19E-04	moles/L
Bottom algae use HCO3- as substrate	Yes	
Light model	Half saturation	
Light constant	89.3608	langleys/d
Ammonia preference	21.65055	ugN/L
Subsistence quota for nitrogen	0.5779116	mgN/gD
Subsistence quota for phosphorus	0.1656965	mgP/gD
Maximum uptake rate for nitrogen	636.1775	mgN/gD/d
Maximum uptake rate for phosphorus	136.553	mgP/gD/d
Internal nitrogen half sat ratio	3.4205925	
Internal phosphorus half sat ratio	2.539308	
Nitrogen uptake water column fraction	1	
Phosphorus uptake water column fraction	1	
Detritus (POM):		
Dissolution rate	1.1092505	/d
Temp correction	1.07	
Settling velocity	0.125501	m/d
pH:		
Partial pressure of carbon dioxide	370	ppm

Atmospheric Inputs:	Spring	Fall	Winter	Spring
Max. Air Temperature, F	85.7	45.5	36.9	67.5
Min. Air Temperature, F	57.5	27.9	19.7	43.6
Dew Point, Temp., F	55.7	30.9	22.4	46.2
Wind, ft./sec. @ 21 ft.	5.7	3.5	3.2	5.6
Cloud Cover, %	0.1	0.1	0.1	0.1

Other Inputs:		
Bottom Algae Coverage	100.0%	
Bottom SOD Coverage	100.0%	
Prescribed SOD	0.0	gO2/m2/d

WASTELOAD ANALYSIS [WLA] Date: 5/15/2014

Appendix B: Mass Balance Mixing Analysis for Conservative Constituents

Discharging Facility:	Logan WWTP		
UPDES No:	UT-0021920		
Permit Flow [MGD]:	24.00	Summer (July-Sept)	Max. Daily
	24.00	Fall (Oct-Dec)	Max. Daily
	24.00	Winter (Jan-Mar)	Max. Daily
	21.30	Spring (Apr-June)	Max. Daily
	23.70	Summer (July-Sept)	Max. Monthly
	20.50	Fall (Oct-Dec)	Max. Monthly
	20.30	Winter (Jan-Mar)	Max. Monthly
	16.50	Spring (Apr-June)	Max. Monthly
Receiving Water:	Unnamed Irrigation Ditch		
Stream Classification:	2B, 3E, 4		
Stream Flows [cfs]:	0.0	All Seasons	Critical Low Flow
Downstream Receiving Water:	Swift Slough		
Stream Classification:	2B, 3B, 3D, 4		
Stream Flows [cfs]:	3.98	Summer (Jun-Aug)	Critical Low Flow
	8.40	Fall (Sep-Nov)	
	8.82	Winter (Dec-Feb)	
	2.88	Spring (Mar-May)	
Fully Mixed:	YES		
Acute River Width:	100%		
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.

Headwater/Upstream Information

	Ditch	Swift Slough
	cfs	cfs
Summer	0.0	4.0
Fall	0.0	8.4
Winter	0.0	8.8
Spring	0.0	2.9

Discharge Information

	Flow MGD	
	Max. Daily	Monthly Ave.
Summer	24.0	23.7
Fall	24.0	20.5
Winter	24.0	20.3
Spring	21.3	16.5

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)

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

Dilution in Swift Slough - summer season flows used.

Physical

Parameter	Maximum Concentration
Temperature (deg C)	27
Temperature Change (deg C)	4

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

Dissolved Metals	Chronic Standard (4 Day Average)[1]			Acute Standard (1 Hour Average)[1]		
Parameter	Standard	Background[2]	Limit	Standard	Background[2]	Limit
Aluminum (µg/L)	87.0	58.3	90.1	750.0	58.3	824.1
Arsenic (µg/L)	150.0	100.5	155.4	340.0	100.5	365.6
Cadmium (µg/L)	0.5	0.3	0.5	4.9	0.3	5.4
Chromium VI (µg/L)	11.0	7.4	11.4	16.0	7.4	16.9
Chromium III (µg/L)	157.0	105.2	162.6	1206.7	105.2	1324.7
Copper (µg/L)	19.6	13.1	20.3	31.9	13.1	33.9
Cyanide (µg/L)	22.0	14.7	22.8	5.2	14.7	4.2
Iron (µg/L)				1000.0	670.0	1035.3
Lead (µg/L)	6.7	4.5	7.0	172.3	4.5	190.3
Mercury (µg/L)	0.012	0.008	0.012	2.4	0.0	2.7
Nickel (µg/L)	112.9	75.6	116.9	1016.5	75.6	1117.3
Selenium (µg/L)	4.6	3.1	4.8	18.4	3.1	20.0
Silver (µg/L)				15.6	10.4	16.1
Tributylin (µg/L)	0.072	0.048	0.075	0.46	0.05	0.50
Zinc (µg/L)	256.8	172.0	266.0	254.7	172.0	263.6

1: Based upon a Hardness of 250 mg/l as CaCO3

2: Background concentration assumed 67% of chronic standard

Organics [Pesticides]	Chronic Standard (4 Day Average)			Acute Standard (1 Hour Average)		
Parameter	Standard	Background[1]	Limit	Standard	Background[1]	Limit
Aldrin (µg/L)				1.5	1.0	1.6
Chlordane (µg/L)	0.0043	0.0029	0.0045	1.2	0.0	1.3
DDT, DDE (µg/L)	0.001	0.001	0.001	0.55	0.00	0.61
Diazinon (µg/L)	0.17	0.11	0.18	0.17	0.11	0.18
Dieldrin (µg/L)	0.0056	0.0038	0.0058	0.24	0.00	0.27
Endosulfan, a & b (µg/L)	0.056	0.038	0.058	0.11	0.04	0.12
Endrin (µg/L)	0.036	0.024	0.037	0.086	0.024	0.093
Heptachlor & H. epoxide (µg/L)	0.0038	0.0025	0.0039	0.26	0.00	0.29
Lindane (µg/L)	0.08	0.05	0.08	1.0	0.1	1.1
Methoxychlor (µg/L)				0.03	0.02	0.03
Mirex (µg/L)				0.001	0.001	0.001
Nonylphenol (µg/L)	6.6	4.4	6.8	28.0	4.4	30.5
Parathion (µg/L)	0.0130	0.0087	0.0135	0.066	0.009	0.072
PCB's (µg/L)	0.014	0.009	0.015			
Pentachlorophenol (µg/L)	15.0	10.1	15.5	19.0	10.1	20.0
Toxephene (µg/L)	0.0002	0.0001	0.0002	0.73	0.00	0.81

1: Background concentration assumed 67% of chronic standard

Radiological	Maximum Concentration		
Parameter	Standard	Background[1]	Limit
Gross Alpha (pCi/L)	15	10.1	-10.7

1: Background concentration assumed 67% of chronic standard; TDS is based on observed ambient data

Effluent Limitation for Protection of Agriculture (Class 4 Waters)

No dilution in unnamed irrigation ditch.

	Maximum Concentration	
Parameter	Standard	Limit
Total Dissolved Solids (mg/L)	1200	1200
Boron (µg/L)	75	75
Arsenic (µg/L)	100	100
Cadmium (µg/L)	10	10
Chromium (µg/L)	100	100
Copper (µg/L)	200	200
Lead (µg/L)	100	100
Selenium (µg/L)	50	50
Gross Alpha (pCi/L)	15	15