

AMMONIA PERMITTING OPTION
Proposed NPDES Permit Renewal
Nevada County Sanitation District No. 1
Cascade Shores Wastewater Treatment Plant

PERMIT OPTION: The Permit before the Central Valley Water Board regulates total ammonia nitrogen (as N) using the 1999 USEPA national recommended water quality criteria for the protection of aquatic life from the toxic effects of ammonia in freshwater (“1999 Criteria”).

The Board has the option of regulating total ammonia nitrogen (as N) using the 2013 USEPA national recommended water quality criteria (the “2013 Criteria”).

If the Board chooses the ammonia permitting option based on the 2013 criteria, the changes shown in underline/strikeout format in this document would be implemented and the effluent limitations for ammonia in the adopted NPDES permit would be established using the 2013 Criteria.

1. Limitations and Discharge Requirements - Section IV.A.1.a

- a. The Discharger shall maintain compliance with the effluent limitations specified in Table 4:

Table 1. Effluent Limitations

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Conventional Pollutants						
Biochemical Oxygen Demand (5-day @ 20°C)	mg/L	10	15	20	--	--
	lbs/day ¹	2.2	3.3	4.3	--	--
pH	standard units	--	--	--	6.5	8.0
Total Suspended Solids	mg/L	10	15	20	--	--
	lbs/day ¹	2.2	3.3	4.3	--	--
Priority Pollutants						
Copper, Total Recoverable	µg/L	1.6	--	3.2	--	--
Zinc, Total Recoverable	µg/L	23	--	46	--	--
Non-Conventional Pollutants						
Ammonia Nitrogen, Total (as N)	mg/L	4.3 <u>1.6</u>	4.3 <u>3.3</u>	--	--	--
	lbs/day ¹	0.3	0.79	--	--	--
Nitrate Nitrogen, Total (as N)	mg/L	10	17	--	--	--

¹ Based on a design flow of 20 million gallons per day (MGD).

2. Attachment – F. Section IV.C.3.b. Determining the Need for WQBEL's – Constituents With Reasonable Potential.

ii. Ammonia

- (a) **WQO.** ~~The 1999 USEPA National Ambient Water Quality Criteria (NAWQC) for the protection of freshwater aquatic life for total ammonia (the "1999 Criteria"), recommends acute (1-hour average; criteria maximum concentration or CMC) standards based on pH and chronic (30-day average; criteria continuous concentration or CCC) standards based on pH and temperature. USEPA also recommends that no 4-day average concentration should exceed 2.5 times the 30-day CCC. USEPA found that as pH increased, both the acute and chronic toxicity of ammonia increased. Salmonids were more sensitive to acute toxicity effects than other species. However, while the acute toxicity of ammonia was not influenced by temperature, it was found that invertebrates and young fish experienced increasing chronic toxicity effects with increasing temperature.~~

~~The USEPA recently published national recommended water quality criteria for the protection of aquatic life from the toxic effects of ammonia in freshwater (the "2013 Criteria")¹. The 2013 Criteria is an update to USEPA's 1999 Criteria, and varies based on pH and temperature. Although the 2013 Criteria reflects the latest scientific knowledge on the toxicity of ammonia to certain freshwater aquatic life, including new toxicity data on sensitive freshwater mussels in the Family Unionidae, the species tested for development of the 2013 Criteria may not be present in some Central Valley waterways. The 2013 Criteria document therefore states that, "unionid mussel species are not prevalent in some waters, such as the arid west ..." and provides that, "In the case of ammonia, where a state demonstrates that mussels are not present on a site-specific basis, the recalculation procedure may be used to remove the mussel species from the national criteria dataset to better represent the species present at the site." In August 2013, U.S. EPA updated its National Ambient Water Quality Criteria (NAWQC) for the protection of freshwater aquatic life for total ammonia. The 2013 NAWQC for ammonia recommends acute (1-hour average; criteria maximum concentration or CMC) and chronic (30-day average; criteria continuous concentration or CCC) standards that vary based on pH and temperature. U.S. EPA also recommends that no 4-day average concentration should exceed 2.5 times the 30-day~~

¹ [Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater](#), published August 2013 [EPA 822-R-13-001]

CCC. The 2013 NAWQC for ammonia takes into account data for several sensitive freshwater mussel species and non-pulmonate snails that had not previously been tested.

U.S. EPA found that as pH and temperature increased, both the acute and chronic toxicity of ammonia increased for invertebrates. However, U.S. EPA found that only pH significantly influenced acute and chronic ammonia toxicity for fish. Therefore, the 2013 acute NAWQC for ammonia is primarily based on the ammonia effects on species in the genus *Oncorhynchus* (salmonids) at lower temperatures and invertebrates at higher temperatures. However, due to the significant sensitivity unionid mussels have to the chronic toxicity effects of ammonia, the 2013 chronic NAWQC for ammonia is determined primarily by the effects of mussels.

The 2013 ammonia NAWQC document states that “unionid mussel species are not prevalent in some waters, such as the arid west.” The 2013 ammonia NAWQC also states that, “In the case of ammonia, where a state demonstrates that mussels are not present on a site-specific basis, the recalculation procedure may be used to remove the mussel species from the national criteria dataset to better represent the species present at the site.” The 2013 ammonia NAWQC document, therefore, includes a recalculation procedure for acute and chronic criteria for waters where mussels are not present. The 2013 ammonia NAWQC also provides criteria for waters where *Oncorhynchus* species are not present and where protection of early life stages of fish genera is unnecessary.

A report prepared by The Nature Conservancy, *Sensitive Freshwater Mussel Surveys in the Pacific Southwest Region: Assessment of Conservation Status* (published August 2010), demonstrates the results of a strategic mussel study and survey conducted during 2008-2009. Results from the study around the locality of the Facility’s discharge are summarized in the table below. The study indicates mussels were historically present at several locations in the San Joaquin River. However, in the 2008-2009 survey, mussels were present only downstream of Windmill Cove (near Stockton). Therefore, the likelihood of mussels occurring in the San Joaquin River in the vicinity of the discharge is uncertain at this time and the site-specific ammonia criteria for waters where mussels are not present were used. San Joaquin River has a beneficial use of cold freshwater habitat (COLD) and the presence of salmonids and early fish life stages in the San Joaquin River is well-documented, therefore, the recommended ammonia criteria for waters where salmonids and early life stages are present were used.

The Central Valley Water Board issued a 3 April 2014 *California Water Code Section 13267 Order for Information: 2013 Final*

Ammonia Criteria for Protection of Freshwater Aquatic Life (13267 Order) requiring the Discharger to either participate in an individual or group study to determine the presence of mussels or submit a method of compliance for complying with effluent limitations calculated assuming mussels present ~~using the 2013 Criteria~~. The Discharger submitted a letter to the Central Valley Water Board indicating their participation in the Central Valley Clean Water Association Freshwater Collaborative Mussel Study. ~~Studies are currently underway to determine how the latest scientific knowledge on the toxicity of ammonia reflected in the 2013 Criteria can be implemented in the Central Valley Region as part of a Basin Planning effort to adopt nutrient and ammonia objectives. Until the Basin Planning process is completed, the Central Valley Water Board will continue to implement the 1999 Criteria to interpret the Basin Plan's narrative toxicity objective. The Central Valley Water Board may require additional information from the Discharger in the future to evaluate whether more restrictive ammonia criteria for other species (i.e., unionid mussels) is applicable for the San Joaquin River. There is some uncertainty to whether mussels are present or absent in the San Joaquin River in the vicinity of the discharge. Thus, at this time, ammonia criteria have been calculated with the assumption that mussels are not present.~~

~~Because Bear River has a beneficial use of cold freshwater habitat and the presence of salmonids and early fish life stages in the Bear River is well-documented, the recommended 1999 criteria for waters where salmonids and early life stages are present, were used in this Order. The maximum permitted observed effluent pH is was 8.0, standard units, based on 1,081 samples from September 2011 through August 2014 as described in section IV.C.3.b.vi of this Fact Sheet. In order to protect against the worst-case short-term exposure of an organism, a pH value of 8.0-7.7 was used to derive the acute criterion. The resulting acute criterion is 5.629-85 mg/L (as N).~~

A chronic criterion was calculated for each day when paired temperature data and pH were measured using effluent data for temperature and pH. Rolling 30-day average criteria were calculated from effluent data using the criteria calculated for each day and the minimum observed 30-day average criterion was established as the applicable 30-day average chronic criterion, or 30-day CCC. The most stringent 30-day CCC was ~~3.722-43~~ mg/L (as N). The 4-day average concentration is derived in accordance with the U.S. EPA criterion as 2.5 times the 30-day CCC. Based on the 30-day CCC of ~~3.722-43~~ mg/L (as N), the 4-day average concentration that should not be exceeded is ~~95.32~~ mg/L (as N).

- (b) **RPA Results.** The Facility is a POTW that treats domestic wastewater. Untreated domestic wastewater contains ammonia in

concentrations that, without treatment, would be harmful to fish and would violate the Basin Plan narrative toxicity objective if discharged to the receiving water. Reasonable potential therefore exists and effluent limitations are required.

Federal regulations at 40 C.F.R. §122.44(d)(1)(i) requires that, "*Limitations must control all pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) which the Director determines are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality.*" For priority pollutants, the SIP dictates the procedures for conducting the RPA. Ammonia is not a priority pollutant. Therefore, the Central Valley Water Board is not restricted to one particular RPA method. Due to the site-specific conditions of the discharge, the Central Valley Water Board has used professional judgment in determining the appropriate method for conducting the RPA for this non-priority pollutant constituent.

U.S. EPA's September 2010 NPDES Permit Writer's Manual, page 6-30, states, "*State implementation procedures might allow, or even require, a permit writer to determine reasonable potential through a qualitative assessment process without using available facility-specific effluent monitoring data or when such data are not available...A permitting authority might also determine that WQBEL's are required for specific pollutants for all facilities that exhibit certain operational or discharge characteristics (e.g., WQBEL's for pathogens in all permits for POTW's discharging to contact recreational waters).*" U.S. EPA's TSD also recommends that factors other than effluent data should be considered in the RPA, "*When determining whether or not a discharge causes, has the reasonable potential to cause, or contributes to an excursion of a numeric or narrative water quality criterion for individual toxicants or for toxicity, the regulatory authority can use a variety of factors and information where facility-specific effluent monitoring data are unavailable. These factors also should be considered with available effluent monitoring data.*" With regard to POTW's, U.S. EPA recommends that, "*POTW's should also be characterized for the possibility of chlorine and ammonia problems.*" (TSD, p. 50).

Nitrification is a biological process that converts ammonia to nitrite and nitrite to nitrate. Denitrification is a process that converts nitrate to nitrite or nitric oxide and then to nitrous oxide or nitrogen gas, which is then released to the atmosphere. The Discharger currently uses nitrification to remove ammonia from the waste stream. Inadequate or incomplete nitrification may result in the discharge of ammonia to the receiving stream. Ammonia is known to cause toxicity to aquatic organisms in surface waters. Discharges of ammonia in concentrations that produce detrimental physiological responses to human, plant, animal, or aquatic life

would violate the Basin Plan narrative toxicity objective. Although the Discharger nitrifies the discharge, inadequate or incomplete nitrification creates the potential for ammonia to be discharged and provides the basis for the discharge to have a reasonable potential to cause or contribute to an in-stream excursion above the NAWQC. Therefore, the Central Valley Water Board finds the discharge has reasonable potential for ammonia and WQBEL's are required.

- (c) **WQBEL's.** The Central Valley Water Board calculates WQBEL's in accordance with SIP procedures for non-CTR constituents, and ammonia is a non-CTR constituent. The SIP procedure assumes a 4-day averaging period for calculating the long-term average discharge condition (LTA). However, U.S. EPA recommends modifying the procedure for calculating permit limits for ammonia using a 30-day averaging period for the calculation of the LTA corresponding to the 30-day CCC. Therefore, while the LTAs corresponding to the acute and 4-day chronic criteria were calculated according to SIP procedures, the LTA corresponding to the 30-day CCC was calculated assuming a 30-day averaging period. The lowest LTA representing the acute, 4-day CCC, and 30-day CCC is then selected for deriving the average monthly effluent limitation (AMEL) and the average weekly effluent limitation (AWEL). The remainder of the WQBEL calculation for ammonia was performed according to the SIP procedures. This Order contains an AMEL and AWEL for ammonia of ~~1.6-3~~ mg/L and ~~3.34-4~~ mg/L, respectively, based on the NAWQC.
- (d) **Plant Performance and Attainability.** Based on 320 samples collected between September 2011 and August 2014, the maximum weekly effluent ammonia concentration was 6.86 mg/L. The maximum concentration is one of 5 results out of 320 samples that exceeded the AMEL. The remaining 4 samples were 1.4 mg/L or less. Typically, the Facility removes ammonia to concentrations about 0.03 mg/L. Thus the Central Valley Water Board concludes that immediate compliance with these effluent limitations is feasible.

3. Attachment F – Section IV.C.4. WQBEL Calculations.

Summary of Water Quality-Based Effluent Limitations at Discharge Point No. 001

Table F-16-Summary of Water Quality-Based Effluent Limitations

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
<i>Conventional Pollutants</i>						

AMMONIA PERMITTING OPTION
 NEVADA COUNTY SANITATION DISTRICT No. 1
 CASCADE SHORES WASTEWATER TREATMENT PLANT
 PROPOSED NPDES PERMIT RENEWAL

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Biochemical Oxygen Demand (5-day @ 20°C)	mg/L	10	15	20	--	--
	lbs/day ¹	2.2	3.3	5.4	--	--
pH	standard units	--	--	--	6.5	8.0
Total Suspended Solids	mg/L	10	15	20	--	--
	lbs/day ¹	2.2	3.3	5.4	--	--
Priority Pollutants						
Copper, Total Recoverable	µg/L	1.6	--	3.2	--	--
Mercury, Total Recoverable	lbs/year	0.0040 ²	--	--	--	--
Zinc, Total Recoverable	µg/L	23	--	46	--	--
Non-Conventional Pollutants						
Ammonia Nitrogen, Total (as N)	mg/L	1.63	3.34	--	--	--
	lbs/day ¹	0.3	0.79	--	--	--
Nitrate Nitrogen, Total (as N)	mg/L	10	17	--	--	--
Total Coliform Organisms	MPN/100 mL	--	2.2 ³	23 ⁴	--	240

¹ Based on average dry weather flow of 0.026 MGD.

² The total annual mass discharge of total mercury shall not exceed 0.0040 pounds/year for a calendar year.

³ Applied as a 7-day median effluent limitation.

⁴ Not to be exceeded more than once in any 30-day period.

4. Attachment F – Section IV.D. Final Effluent Limitations.

Summary of Final Effluent Limitations at Discharge Point No. 001.

Table F-18. Summary of Final Effluent Limitations

Parameter	Units	Effluent Limitations					Basis ¹
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum	
Average Dry Weather Flow	MGD	0.026 ²	--	--	--	--	DC
Conventional Pollutants							
Biochemical Oxygen Demand (5-day @ 20°C)	mg/L	10	15	20	--	--	TTC
	lbs/day ³	2.2	3.3	4.3	--	--	
	% Removal	85	--	--	--	--	CFR
pH	standard units	--	--	--	6.5	8.0	BP, PB
Total Suspended Solids	mg/L	10	15	20	--	--	TTC
	lbs/day ³	2.2	3.3	4.3	--	--	
	% Removal	85	--	--	--	--	CFR
Priority Pollutants							
Copper, Total Recoverable	µg/L	1.6	--	3.2	--	--	CTR
Mercury, Total Recoverable	lbs/year	0.0040 ⁴	--	--	--	--	PB
Zinc, Total Recoverable	µg/L	23	--	46	--	--	CTR
Non-Conventional Pollutants							
Ammonia Nitrogen, Total (as N)	mg/L	1.6 3	3.3 4.1	--	--	--	NAWQC
	lbs/day ¹	0.3	0.79	--	--	--	
Nitrate Nitrogen, Total (as N)	mg/L	10	17	--	--	--	MCL
Total Coliform Organisms	MPN/100 mL	--	2.2 ⁵	23 ⁶	--	240	Title 22
Acute Toxicity	% Survival	70 ⁷ /90 ⁸	--	--	--	--	BP

AMMONIA PERMITTING OPTION
 NEVADA COUNTY SANITATION DISTRICT No. 1
 CASCADE SHORES WASTEWATER TREATMENT PLANT
 PROPOSED NPDES PERMIT RENEWAL

Parameter	Units	Effluent Limitations					Basis ¹
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum	

- ¹ DC – Based on the design capacity of the Facility.
 TTC – Based on tertiary treatment capability. These effluent limitations reflect the capability of a properly operated tertiary treatment plant.
 C.F.R. – Based on secondary treatment standards contained in 40 C.F.R. Part 133.
 BP – Based on water quality objectives contained in the Basin Plan.
 PB – Based on Facility performance.
 CTR – Based on water quality criteria contained in the California Toxics Rule and applied as specified in the SIP.
 NAWQC – Based on U.S. EPA's National Ambient Water Quality Criteria for the protection of freshwater aquatic life.
 MCL – Based on the Primary Maximum Contaminant Level.
 Title 22 – Based on DDW Reclamation Criteria, CCR, Division 4, Chapter 3 (Title 22).
- ² The average dry weather flow shall not exceed 0.026 MGD.
- ³ Based on an average dry weather flow of 0.026 MGD.
- ⁴ The total annual mass discharge of total mercury shall not exceed 0.0040 pounds/year for a calendar year.
- ⁵ Applied as a 7-day median effluent limitation.
- ⁶ Not to be exceeded more than once in any 30-day period.
- ⁷ 70% minimum survival for any one bioassay.
- ⁸ 90 % median for any three consecutive bioassays.

5. Attachment G – Summary of Reasonable Potential Analysis.

Constituent	Units	MEC	B	C	CMC	CCC	Water & Org	Org. Only	Basin Plan	MCL	Reasonable Potential
Aluminum, Total Recoverable	µg/L	20.5	--	87	750 ¹	87 ²	--	--	--	200	No
Ammonia Nitrogen, Total (as N)	mg/L	6.86	--	3.722 43	5.32 9.85 ¹	3.722 3 ³	--	--	--	--	Yes
Chloride	mg/L	33.4	--	230	860 ¹	230 ²	--	--	--	250	No
Chloroform	µg/L	21.2	--	80	--	--	5.7	470	--	80 ⁴	No
Copper, Total Recoverable	µg/L	16.6	--	3.5	4.8	3.5	1,300	--	--	1,000	Yes
Dichlorobromomethane	µg/L	0.01	--	0.56	--	--	0.56	46	--	80 ⁴	No
Electrical Conductivity @ 25°C	µmhos/cm	355 ⁶	52 ⁶	900	--	--	--	--	--	900	No ⁴
Mercury, Total Recoverable	µg/L	0.0013	--	0.050	--	--	0.050	0.051	--	2	Yes ⁵
Nitrate Nitrogen, Total (as N)	mg/L	15	--	10	--	--	10	--	--	10	Yes
Sulfate	mg/L	33 ⁶	--	250	--	--	--	--	--	250	No
Total Dissolved Solids	mg/L	222	--	500	--	--	--	--	--	500	No
Zinc, Total Recoverable	µg/L	112	--	46	46	46	7,400	26,000	--	5,000	Yes

General Note: All inorganic concentrations are given as a total recoverable.

MEC = Maximum Effluent Concentration

B = Maximum Receiving Water Concentration or lowest detection level, if non-detect

C = Criterion used for Reasonable Potential Analysis

CMC = Criterion Maximum Concentration (CTR or NTR)

CCC = Criterion Continuous Concentration (CTR or NTR)

Water & Org = Human Health Criterion for Consumption of Water & Organisms (CTR or NTR)

Org. Only = Human Health Criterion for Consumption of Organisms Only (CTR or NTR)

Basin Plan = Numeric Site-specific Basin Plan Water Quality Objective

MCL = Drinking Water Standards Maximum Contaminant Level

NA = Not Available

ND = Non-detect

Footnotes:

- (1) U.S. EPA National Recommended Ambient Water Quality Criteria, Freshwater Aquatic Life Protection, 1-hr average.
- (2) U.S. EPA national Recommended Ambient Water Quality Criteria, Freshwater Aquatic Life Protection, 4-day average.
- (3) U.S. EPA National Recommended Ambient Water Quality Criteria, Freshwater Aquatic Life Protection, 30-day average.
- (4) Represents the Primary MCL for total trihalomethanes, which includes bromoform, chloridibromomethane, chloroform, and dichlorobromomethane.
- (5) See section IV.C.3 of the Fact Sheet (Attachment F) for a discussion of the RPA results.
- (6) Represents the maximum observed annual average concentration for comparison with the MCL.

6. Attachment H – Calculation of QWBEL’s.

Human Health QWBEL’s Calculations															
Parameter	Units	Criteria	Mean Background Concentration	Dilution Factor	AMEL Multiplier	AMEL/MDEL Multiplier	AMEL	AWEL							
Nitrate Nitrogen, Total (as N)	mg/L	10	--	--	1.53	1.70	10	17							
Aquatic Life QWBEL’s Calculations															
Parameter	Units	Criteria		Dilution Factors		Aquatic Life Calculations						Final Effluent Limitations			
		CMC	CCC	CMC	CCC	ECA Multiplier ^{acute}	LTA ^{acute}	ECA Multiplier ^{chronic}	LTA ^{chronic}	AMEL Multiplier ⁹⁵	AWEL Multiplier ⁹⁸	MDEL Multiplier ⁹⁹	AMEL ¹	AWEL ²	MDEL ³
Ammonia Nitrogen, Total (as N)	mg/L	5.32 9.85	3.72 2.13	--	--	0.08	0.48	0.25	0.920 1.5	3.682 4.9	5.3	--	1.64 3	3.34 4	--
Copper, Total Recoverable	µg/L	4.8	3.5	--	--	0.34	1.6	0.55	1.9	1.51	--	2.94	1.6	--	3.2
Zinc, Total Recoverable	µg/L	46	46	--	--	0.32	15	0.53	24	1.55	--	3.11	23	--	46

¹ Average Monthly Effluent Limitations are calculated according to Section 1.4 of the SIP using a 95th percentile occurrence probability.

² Average Weekly Effluent Limitations are calculated according to Section 1.4 of the SIP using a 98th percentile occurrence probability.

³ Maximum Daily Effluent Limitations are calculated according to Section 1.4 of the SIP using a 99th percentile occurrence probability.