

**Response to Written Comments
Draft Waste Discharge Requirements
Order No. R1-2023-0022
National Pollutant Discharge Elimination System (NPDES)
for the
City of Rio Dell
Wastewater Treatment Facility
Regional Water Quality Control Board, North Coast Region
October 5-6, 2023**

Comments Received

The deadline for submittal of public comments regarding draft Waste Discharge Requirements for Order No. R1-2023-0022, National Pollutant Discharge Elimination System Order (Draft Permit) for the City of Rio Dell (Permittee) Wastewater Treatment Facility (Facility) was June 19, 2023. Regional Water Board staff (Staff) received eleven written comments within the allotted public comment period from the Permittee.

This Response to Comments document includes a summary of staff-initiated changes made to the Order. Text added to the Proposed Order is identified by underline and text to be deleted from the Proposed Order is identified by strike-through in this document. The term “Draft Order” refers to the version of the permit that was sent out for public comment. The term “Proposed Order” refers to the version of the order that has been modified in response to comments received and is being presented to the North Coast Regional Water Quality Control Board (Regional Water Board) for consideration.

City of Rio Dell Comments

Comment No. 1:

The total coliform objectives prescribed in the Tentative Order are based on state technology-based requirements, not federal water quality based effluent limitations. As such, the City requests removal of the total coliform effluent limits contained in Provision 4.1.1.2 (applicable to discharges to Waters of the U.S.) and incorporation of year-round limits in Provision 4.3 (applicable to water recycling).

Response to Comment No. 1:

Coliform bacteria are a pollutant of concern in all wastewaters of domestic origin, and therefore the Proposed Order includes effluent limitations for total coliform

bacteria. These effluent limitations ensure that water quality objectives for bacteria, as established by Chapter 3 of the Basin Plan, will be maintained. The effluent limitations for total coliform bacteria in the Proposed Order reflect standards for secondary treated recycled water in the Basin Plan (Section 4, Implementation Plans) and as established by DDW at title 22, division 4, chapter 3 of the CCR. The Permittee consistently met effluent limitations for total coliform bacteria during the last permit term.

No changes were made to the Proposed Order in response to this comment.

Comment No. 2 (part 1):

The Tentative Order implements requirements specified in the Statewide Toxicity Provisions, which specifies numeric Pass/Fail and % Effect limits. Provision 4.1.1.3 includes a narrative limit as well as the prescribed Maximum Daily Effluent Limit (MDEL, 4.1.1.3.1) and the Median Monthly Effluent Limit (MMEL, 4.1.1.3.2). The MMEL is not required to be included or effective before January 1, 2024 if Ceriodaphnia dubia is the most sensitive species. (See Toxicity Provisions at page 27; and Ceriodaphnia dubia specified as the most sensitive species in Attachment E, Provision 5.1.6.). Instead, that limit should currently be specified as a Median Monthly Effluent Target (MMET) to be consistent with the State's Toxicity Provisions due to concerns with using Ceriodaphnia as a chronic test species.

In addition, imposing a duplicative narrative limit is contrary to the directions set forth in the Statewide Toxicity Provisions and unnecessarily adds and additional potential violation if the other limits are exceeded. Thus, the City Requests removal of the narrative limit.

Response to Comment No. 2:

Staff agrees with the Permittee that Draft Order Section 4.1.1.3 appeared to establish a narrative limit, which was not the intent, and therefore the Proposed Permit has revised language to clarify there is no narrative effluent limitation for chronic toxicity.

Regarding the MDEL effective date of January 1, 2024 staff agrees with the Permittee's interpretation of the Statewide Toxicity Provisions (Provisions). Therefore, language has been added to the Proposed Order as follows:

4.1.1.3 Chronic Toxicity. To determine compliance with the water quality objective for toxicity in the Basin Plan, the discharge, as measured at Monitoring Location EFF-001, shall meet the following effluent limitations:

~~As measured at Monitoring Location EFF-001, there shall be no chronic toxicity in treated wastewater discharged to the Lower Eel River at Discharge Point 001. Compliance with this chronic toxicity effluent limitation shall be determined in accordance with section 7.9 of this Order and sections 5.1 and 5.2 of the MRP, Attachment E of this Order.~~

- 4.1.1.3.1 **Maximum Daily Effluent Limitation.** No chronic toxicity test shall result in a “fail” at the IWC for the sub-lethal endpoint measured in the test and a percent effect for the survival endpoint greater than or equal to 50 percent.
- 4.1.1.3.2 **Median Monthly Effluent Target.** Beginning on the effective date of this Order and ending on December 31, 2023, no more than one chronic toxicity test initiated in a calendar month shall result in a “fail” at the IWC for any endpoint.
- 4.1.1.3.3 **Median Monthly Effluent Limitation.** Beginning on January 1, 2024, no more than one chronic aquatic toxicity test initiated in a calendar month shall result in a “fail” at the IWC for any endpoint.

Comment No. 3:

The Permittee asserts that In-stream Waste Concentration (IWC) with regard to toxicity monitoring should reflect a dilution credit of up to 100:1 dilution because discharges are only allowed when effluent is 1% of the receiving water flow.

Response to Comment No. 3:

The Basin Plan requirement for discharges not to exceed one percent of the receiving stream’s flow is a flow limitation, not a dilution credit. The flow limitation requirement ensures protection of the receiving water at the end of pipe. This flow limitation was established in the Basin Plan beginning in the 1970s based on Department of Health Services, Office of Drinking Water (now the State Water Board Division of Drinking Water) view that discharges of wastewater to surface waters used for drinking water should not be allowed to occur if reasonable alternatives are available and that where reasonable alternatives are not available, discharges should be limited to one percent of the receiving water flow to ensure human health protection. This flow limitation provides protection of all beneficial uses in a receiving stream.

The State Water Board Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (State Implementation Policy or SIP) allows regional water boards, on a discretionary basis, to establish and determine compliance with priority pollutant criteria/objectives or the toxicity objective by granting mixing zones and dilution credits to dischargers in accordance with the provisions of the SIP. A mixing zone is established based on a dilution study to establish the mixing characteristics of the effluent with the receiving water and to demonstrate that allowance of a mixing zone is protective of beneficial uses. When authorized, a mixing zone must be as small as practicable and cannot adversely impact beneficial uses. The Permittee has not submitted a formal request for a mixing zone. To make a formal request, the Permittee must submit a work plan for review and approval by the Executive Officer prior to initiating a mixing zone study. This important step would ensure the SIP is followed by the Staff and the Permittee.

The Permittee has discussed this requirement with Regional Water Board staff in the past and appears to be planning a mixing zone study in the next Permit term (See comment 5).

No changes were made to the Proposed Order in response to this comment.

Comment No. 4:

The City sincerely appreciates the Regional Water Board's decision to include interim effluent limits and an in-permit compliance schedule for disinfection byproducts in the Tentative Order. The City requests the Regional Water Board also include the compliance schedule for the activities prescribed in TSO R1-2023-0031 to comply with requirements specified in the Statewide General Waste Discharge Requirements for Sanitary Sewer System (Order 2022-0103-DWQ) since this permit also includes similar discharge prohibitions and standard provisions.

Response to Comment No. 4:

TSO Order No. R1-2023-0031 establishes requirements to comply with the Statewide General Waste Discharge Requirements for Sanitary Sewer System Order No. 2022-0103-DWQ (General Order). The Regional Water Board recognizes that compliance requirements of the General Order are included in the Proposed Order. TSO No. R1-2023-0031 includes requirements that are included solely in the General Order, thus the Regional Water Board finds that a TSO No. R1-2023-0031 should remain in place.

No changes were made to the Proposed Order in response to this comment.

Comment No. 5:

The Permittee has stated that the City may conduct a mixing zone study during the upcoming NPDES permit term to support dilution credits and revised effluent limits for human health-based criteria (e.g., disinfection byproducts). The City further requested that a reopener provision be included in the Proposed Order based on the mixing zone study results.

Response to Comment No. 5:

As stated in response to comment No. 3, the SIP allows regional water boards, on a discretionary basis, to establish and determine compliance with priority pollutant criteria/objectives or the toxicity objective by granting mixing zones and dilution credits to dischargers in accordance with the provisions of the SIP. Staff agrees with the Permittee that if all reasonable alternatives for compliance with human health-based effluent limitations are evaluated and the Permittee conducts a mixing zone study approved by the Regional Water Board Executive Officer, that permit conditions may warrant modification.

Therefore, the Proposed Permit has been modified as follows:

6.3.1.11 Mixing Zone Study. This Order may be reopened to consider modifying effluent limitations and receiving water monitoring locations if the Permittee demonstrates to the satisfaction of the Regional Water Board Executive Officer that it has evaluated all reasonable alternatives for compliance with human health-based effluent limitations and conducts a mixing zone study that provides a basis for determining that permit conditions should be modified.

Comment No. 6:

Per 40 CFR Section 503.18, annual biosolids reporting to the EPA is only required for Class I sludge management facilities, POTWs with design flowrates equal to or greater than 1 million gallons per day (MGD), and POTWs that serve 10,000 people or more. The City does not have a pretreatment program, the design flowrate for the WWTF is 0.40 MGD, and the WWTF serves a population of approximately 3,900. As a result, the City provides information on sludge handling and disposal activities in its Annual Self-Monitoring Report submitted to the Regional Water Board (Attachment E, Provision 10.4.3. 7).

Response to Comment No. 6:

Regional Water Board staff agree with this comment. Accordingly, Section 6.3.4.3 and of the Proposed Order Section 9.3.3 of the MRP has been corrected as follows:

~~6.3.4.3.13. **Annual Biosolids Reporting.** The Permittee shall electronically certify and submit an annual biosolids report to U.S. EPA by February 19 of the following year using U.S. EPA's Central Data Exchange (CDX) Web Site (<https://cdx.epa.gov>). Information regarding registration and use of U.S. EPA's CDX system is also available at the Web Site.~~

~~9.3.3. **Annual Biosolids Reporting.** The Permittee shall electronically certify and submit an annual biosolids report to U.S. EPA by February 19 of the following year using U.S. EPA's Central Data Exchange (CDX) Web Site (<https://cdx.epa.gov>). Information regarding registration and use of U.S. EPA's CDX system is also available at the Web Site.~~

Comment No. 7 & 8:

The Tentative Order includes effluent limits and monthly monitoring requirements for DDT and antimony in the effluent, recycled water, and groundwater. The effluent limits are based on one effluent datapoint that exceeded the water quality objectives. The cost to conduct these analyses is \$300 per sample and represents a significant burden for a small wastewater agency serving a disadvantaged community (DAC). The City requests quarterly effluent and recycled monitoring and semiannual groundwater monitoring along with an offramp to eliminate DDT

and antimony monitoring after one year if the results are less than the water quality objective. Semiannual groundwater monitoring is requested to be consistent with the frequency of other constituents monitored in the groundwater, to preserve WWTF staff routines, and to minimize monitoring costs.

Response to Comment No. 7:

The City of Rio Dell is a disadvantaged community as defined by Division of Financial Assistance (DFA), and the Regional Waterboard recognizes the financial burden of additional monitoring and supports permit revisions to reduce the cost of permit compliance when it is warranted. The Tables E-3, E-4, and E-7 in the MRP of the Proposed Order were modified to decrease the routine monitoring frequency for DDT and antimony in the effluent, recycled water, and groundwater.

Table E-3 Effluent Monitoring - Monitoring Location EFF-001.

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
4,4-DDT	ug/L	Grab	Monthly <u>Quarterly</u> ^{7,20}	Standard Methods ²
Antimony, Total Recoverable	ug/L	Grab	Monthly <u>Quarterly</u> ^{7,20}	Standard Methods ²

Table Notes

2. In accordance with the current edition of Standard Methods for Examination of Water and Wastewater (American Public Health Administration) or by methods approved by the Regional Water Board or State Water Board.

7. Accelerated Monitoring (monthly and quarterly monitoring frequencies). If a test result exceeds an effluent limitation, the Permittee shall take two more samples, one within 7 days and one within 14 days following receipt of the initial sample result. During the intervening period, the Permittee shall take steps to identify the cause of the exceedance and take steps needed to return to compliance.

20. The monitoring frequency for 4,4-DDT and Antimony may be reduced to annually if the first 12 months of monitoring data collected after the effective date of this Order demonstrate that concentrations of 4,4-DDT and Antimony are consistently lower than water quality objectives for protection of surface water.

Table E-4 Recycled Water Monitoring Requirements - Monitoring Location REC-001.

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
4,4-DDT	ug/L	Grab	Monthly <u>Quarterly</u> ⁸	Standard Methods ²
Antimony, Total Recoverable	ug/L	Grab	Monthly <u>Quarterly</u> ⁸	Standard Methods ²

Table Notes

2. In accordance with the current edition of Standard Methods for Examination of Water and Wastewater (American Public Health Administration) or by methods approved by the Regional Water Board or State Water Board.

8. The monitoring frequency for 4,4-DDT and Antimony may be reduced to annually if the first 12 months of monitoring data collected after the effective date of this Order demonstrate that concentrations of 4,4-DDT and Antimony are consistently lower than water quality objectives for protection of groundwater.

Table E-7 Receiving Water Monitoring Requirements - Monitoring Location MW-001 through MW-004.

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
4,4-DDT ⁴	ug/L	Grab	Monthly <u>Semiannually</u> ⁴	Standard Methods ²
Antimony, Total Recoverable ⁴	ug/L	Grab	Monthly <u>Semiannually</u> ⁴	Standard Methods ²

Table Notes

2. In accordance with the current edition of Standard Methods for Examination of Water and Wastewater (American Public Health Administration) or by methods approved by the Regional Water Board or State Water Board.

4. The monitoring frequency for 4,4-DDT and Antimony may be reduced to annually if the first 12 months of monitoring data collected after the effective date of this Order demonstrate that concentrations of 4,4-DDT and Antimony are consistently lower than water quality objectives for protection of surface water.

Comment No. 8:

The Tentative Order includes effluent and upstream receiving water monitoring requirements to obtain data to calculate aluminum criteria for the Eel River. Monthly effluent monitoring is required for aluminum and monthly upstream receiving water monitoring is required for aluminum and dissolved organic carbon. The City requests a decrease in monitoring frequencies to reduce analytical costs by conducting annual monitoring or just collecting the requested data for 2 years.

Response to Comment No. 8:

The City of Rio Dell is a disadvantaged community as defined by Division of Financial Assistance (DFA), and the Regional Waterboard recognizes the financial burden of additional monitoring and supports permit revisions to reduce the cost of permit compliance when it is warranted. Therefore, Tables E-3 and E-5 in the MRP of the Proposed Order were modified to decrease the routine monitoring frequency for Total Recoverable Aluminum and Dissolved Organic Carbon as shown below.

Table E-3 Effluent Monitoring- Monitoring Location EFF-001

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Aluminum, Total Recoverable	µg/L	Grab	<u>Monthly Quarterly</u>	Standard Methods ²

Table Notes

2. In accordance with the current edition of Standard Methods for Examination of Water and Wastewater (American Public Health Administration) or by methods approved by the Regional Water Board or State Water Board.

Table E-5 Receiving Water Monitoring Requirements - Monitoring Location RSW-001.

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Aluminum, Total Recoverable	µg/L	Grab	<u>Monthly Quarterly</u> ⁹	Standard Methods ²
Dissolved Organic Carbon	mg/L	Grab	<u>Monthly Quarterly</u> ⁹	Standard Methods ²

Table Notes

2. In accordance with the current edition of Standard Methods for Examination of Water and Wastewater (American Public Health Administration) or by methods approved by the Regional Water Board or State Water Board.

9. Receiving water monitoring for aluminum, pH, dissolved organic carbon, and hardness shall be conducted concurrently with effluent monitoring for aluminum.

Comment No. 9:

The Tentative Order requires submittal of monthly SMRs, which would be a major change to current operations and require a substantial amount of operations staff time each month to prepare and submit the reports. The City requests continuation of quarterly compliance reporting as allowed in Order No. R1-2017-0007.

Response to Comment No. 9:

Staff agree that quarterly monitoring should continue as required in Order No. R1-2017-0007.

MRP section 10.2.6., has been modified as follows, “**Self-Monitoring Reports.** The Permittee shall submit ~~monthly~~ quarterly SMRs in accordance with the following requirements.”

Comment No. 10:

The Tentative Order includes new effluent and receiving water monitoring requirements for E. Coli to determine reasonable potential in the next NPDES permit. Weekly effluent monitoring and monthly receiving water monitoring are required. The City requests a reduction in effluent monitoring from weekly to monthly to coincide with the other prescribed receiving water monitoring frequency. Coordinating monthly sampling events for E. Coli will save staff time and analytical costs while providing relevant information on possible impacts to the Eel River.

Response to Comment No. 10:

On August 7, 2018, the State Water Board adopted Part 3 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California – Bacteria Provisions and a Water Quality Standards Variance Policy (Statewide Bacteria Provisions), which establishes water quality objectives for reasonable protection of people that recreate within all surface waters, enclosed bays, and estuaries of the state that have the water contact recreation beneficial use. In accordance with the water quality objectives outlined in the Statewide

Bacteria Provisions for the protection of freshwaters used for water contact recreation, disinfected effluent shall not result in the exceedance of the following objectives:

“The bacteria water quality objective for all waters where the salinity is equal to or less than 1 part per thousand (ppt) 95 percent or more of the time during the calendar year is: a **six-week rolling geometric mean** of *Escherichia coli* (*E. coli*) not to exceed 100 colony forming units (cfu) per 100 milliliters (mL), **calculated weekly**, and a statistical threshold value (STV) of 320 cfu/100 mL not to be exceeded by more than **10 percent of the samples collected in a calendar month**, calculated in a static manner (emphasis added).”

As stated in section 7.8.2 of the Permit, “The rolling geometric mean shall be calculated using at least 5 sample results over a 6-week period from a site...” Therefore, in order to accurately determine compliance with the Statewide Bacteria Provisions water quality objective for *E. coli* as a six-week rolling geometric mean, *E. coli* monitoring must be completed weekly.

Section 7.8.2 continues “A minimum of three samples over a six-week period is necessary to calculate the geometric mean. When less than three samples are taken in a six-week period, compliance with the *E. coli* receiving water objective shall be determined using the Statistical Threshold Value (STV). If the Permittee samples less than three times during a six-week period, compliance shall be assessed by comparing the single sample results to the STV.”

The Regional Waterboard recognizes that compliance can be determined based on one sample in a calendar month, however this compliance determination is set in place for cases of intermittent discharge. This compliance determination also relies on a representative previous set of data to generate an STV.

However, the City of Rio Dell is a disadvantaged community as defined by Division of Financial Assistance (DFA), and the Regional Waterboard recognizes the financial burden of additional monitoring and supports permit revisions to reduce the cost of permit compliance when it is warranted. Therefore, Tables E-3, Table E-5 and Table E-6 in the MRP of the Proposed Order were modified to decrease the routine monitoring frequency for *E. coli* as shown below.

Table E-3 Effluent Monitoring- Monitoring Location EFF-001

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
<i>E. coli</i> Bacteria ¹⁹	MPN/100 mL	Grab	Weekly ²⁰	Standard Methods

Table Notes

19. The Permittee may use any *E. coli* method specified in 40 CFR 136 for compliance monitoring.
20. The Permittee shall complete weekly monitoring for a minimum of three distinct 6-week periods, each discharge season (between October 1 and May 14). Monitoring shall be concurrent with *E. coli* monitoring at monitoring location RSW-001 and RSW-002.

Table E-5 Receiving Water Monitoring Requirements - Monitoring Location RSW-001

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
<i>E. coli</i> Bacteria ⁸	MPN/100 mL	Grab	Monthly ¹⁰	Standard Methods ¹⁹

Table Notes

8. The Permittee may use any *E. coli* method specified in 40 CFR 136 for compliance monitoring.
10. The Permittee shall monitor for *E. coli* at least once per 6-week monitoring period, concurrently with *E. coli* monitoring at monitoring location EFF-001 and RSW-002.

Table E-5 Receiving Water Monitoring Requirements - Monitoring Location RSW-001

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
<i>E. coli</i> Bacteria ³	MPN/100 mL	Grab	Monthly ⁴	Standard Methods

Table Notes

3. The Permittee may use any *E. coli* method specified in 40 CFR 136 for compliance monitoring.
4. The Permittee shall monitor for *E. coli* at least once per 6-week monitoring period, concurrently with *E. coli* monitoring at monitoring location EFF-001 and RSW-001

Additionally, the following language was added to Section 7.2.1.3.1. and 7.5.1.4.1. of the Factsheet:

7.2.1.3.1. There are 5 distinct six-week periods between October 1 through May 14 and the Order establishes a monitoring regime that allows the Discharger to select a minimum of three six-week periods annually over the authorized discharge period to monitor its effluent and the receiving water to determine compliance with the bacteria objectives. This monitoring regime allows the Discharger to monitor the receiving water for approximately 60 percent of the discharge season instead of monitoring every week over the 32-week discharge season, reducing the cost of permit compliance for a disadvantaged community, and allowing the Discharger to plan and implement its monitoring program more efficiently.

7.5.1.4.1. There are 5 distinct six-week periods between October 1 through May 14 and the Order establishes a monitoring regime that allows the Discharger to select a minimum of three six-week periods annually over the authorized discharge period to monitor its effluent and the receiving water to determine compliance with the bacteria objectives. This monitoring regime allows the Discharger to monitor the receiving water for approximately 60 percent of the discharge season instead of monitoring every week over the 32-week discharge season, reducing the cost of permit compliance for a disadvantaged community, and allowing the Discharger to plan and implement its monitoring program more efficiently. Receiving water monitoring requirements include three monitoring events concurrent with effluent monitoring to provide a representative characterization of effluent and receiving water conditions at the time of discharge.

Comment No. 11:

The Tentative Order includes a number of non-substantive changes needed to fix typographical errors and other mistakes. A red-line/strikethrough version of the Tentative Order is attached to more easily identify these changes for Regional Water Board consideration.

Response to Comment No. 11:

Several non-substantive, editorial changes were incorporated into the Proposed Order, see Attachment A. Attachment A has been provided to Board members and is available upon request.

Staff Initiated Changes

The following sections describe changes made to the draft Order, initiated by Regional Water Board staff to update, and provide clarification to the Proposed Permit. The modified sections are identified by their section numbers as indicated in the Proposed Order. Regional Water Board staff informed the Permittee of the changes made to the Draft Order on June 18, 2023 and the Permittee did not have any objections to the proposed staff-initiated changes.

Attachment G was updated to reflect the pH and Temperature dependent ammonia effluent limitations based on the site-specific Ammonia Impact Ratio (AIR). The Permittee will be provided with an excel sheet to complete this calculation precisely for a measured pH and temperature. Attachment G provides the Permittee an easily accessible chart, to verify they have reported the limitation correctly.

Table G-1. pH and Temperature Dependent AMEL Ammonia Criteria

pH	Temp (°C)																	
	0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0
6.5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
6.6	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
6.7	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
6.8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
6.9	8	8	8	8	8	8	8	8	8	8	8	8	7.7	7.7	7.7	7.7	7.7	7.7
7.0	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
7.1	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
7.2	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8
7.3	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
7.4	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
7.5	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
7.6	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
7.7	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
7.8	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
7.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
8.0	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
8.1	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
8.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
8.3	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
8.4	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
8.5	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
8.6	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.50
8.7	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.40
8.8	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.35	0.32
8.9	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.30	0.28	0.26
9.0	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.24	0.22	0.21

pH	Temp (°C)																	
	0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0
6.5	12	12	12	12	11	10	9.4	8.6	7.9	7.3	6.7	6.2	5.7	5.3	4.8	4.4	4.1	3.8
6.6	12	12	12	12	11	10	9.0	8.3	7.6	7.0	6.5	5.9	5.5	5.0	4.6	4.3	3.9	3.6
6.7	11	11	11	11	10	9.3	8.6	7.9	7.3	6.7	6.1	5.7	5.2	4.8	4.4	4.1	3.7	3.4
6.8	11	11	11	10	9.5	8.8	8.1	7.4	6.8	6.3	5.8	5.3	4.9	4.5	4.2	3.8	3.5	3.2
6.9	10	10	10	9.6	8.9	8.2	7.5	6.9	6.4	5.9	5.4	5.0	4.6	4.2	3.9	3.6	3.3	3.0
7.0	9.2	9.2	9.2	8.9	8.2	7.5	6.9	6.4	5.9	5.4	5.0	4.6	4.2	3.9	3.6	3.3	3.0	2.8
7.1	8.4	8.4	8.4	8.1	7.5	6.9	6.3	5.8	5.3	4.9	4.5	4.2	3.8	3.5	3.3	3.0	2.8	2.5
7.2	7.5	7.5	7.5	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.7	3.5	3.2	2.9	2.7	2.5	2.3
7.3	6.7	6.7	6.7	6.5	5.9	5.5	5.0	4.6	4.3	3.9	3.6	3.3	3.1	2.8	2.6	2.4	2.2	2.0
7.4	5.8	5.8	5.8	5.7	5.2	4.8	4.4	4.1	3.7	3.4	3.2	2.9	2.7	2.5	2.3	2.1	1.9	1.8
7.5	5.1	5.1	5.1	4.9	4.5	4.2	3.8	3.5	3.2	3.0	2.7	2.5	2.3	2.1	2.0	1.8	1.7	1.5
7.6	4.3	4.3	4.3	4.2	3.9	3.6	3.3	3.0	2.8	2.6	2.3	2.2	2.0	1.8	1.7	1.6	1.4	1.3
7.7	3.7	3.7	3.7	3.6	3.3	3.0	2.8	2.6	2.4	2.2	2.0	1.8	1.7	1.6	1.4	1.3	1.2	1.1
7.8	3.1	3.1	3.1	3.0	2.8	2.5	2.3	2.1	2.0	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1.0	0.9
7.9	2.6	2.6	2.6	2.5	2.3	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.8
8.0	2.1	2.1	2.1	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.8	0.7	0.6
8.1	1.8	1.8	1.8	1.7	1.6	1.5	1.3	1.2	1.1	1.0	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.5
8.2	1.5	1.5	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4
8.3	1.2	1.2	1.2	1.2	1.1	1.0	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4
8.4	1.0	1.0	1.0	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.3	0.3
8.5	0.8	0.8	0.8	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2
8.6	0.7	0.7	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2
8.7	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2
8.8	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1
8.9	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
9.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1

Table G-2. pH and Temperature Dependent MDEL Ammonia Criteria

pH	Temp (°C)																	
	0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0
6.5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
6.6	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
6.7	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
6.8	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
6.9	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
7.0	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
7.1	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
7.2	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
7.3	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
7.4	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
7.5	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
7.6	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
7.7	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3
7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
7.9	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
8.0	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
8.1	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
8.2	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
8.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
8.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
8.5	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0
8.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.6
8.7	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.3
8.8	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1
8.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.91	0.84
9.0	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.79	0.73	0.67

pH	Temp (°C)																	
	0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0
6.5	32	32	32	31	29	27	25	23	21	19	18	16	15	14	13	12	11	10
6.6	31	31	31	30	28	26	24	22	20	18	17	16	14	13	12	11	10	9
6.7	30	30	30	29	26	24	22	21	19	17	16	15	14	13	12	11	10	9
6.8	28	28	28	27	25	23	21	19	18	16	15	14	13	12	11	10	9	8
6.9	26	26	26	25	23	21	20	18	17	15	14	13	12	11	10	9	9	8
7.0	24	24	24	23	21	20	18	17	15	14	13	12	11	10	9.3	8.6	7.9	7.3
7.1	22	22	22	21	19	18	16	15	14	13	12	11	10	9.2	8.5	7.8	7.2	6.6
7.2	20	20	20	19	18	16	15	14	13	12	11	9.8	9.0	8.3	7.6	7.0	6.5	6.0
7.3	17	17	17	17	16	14	13	12	11	10	9.4	8.7	8.0	7.4	6.8	6.2	5.7	5.3
7.4	15	15	15	15	14	13	12	11	9.8	9.0	8.3	7.6	7.0	6.5	5.9	5.5	5.0	4.6
7.5	13	13	13	13	12	11	10	9.2	8.5	7.8	7.2	6.6	6.1	5.6	5.1	4.7	4.4	4.0
7.6	11	11	11	11	10	9.3	8.6	7.9	7.2	6.7	6.1	5.6	5.2	4.8	4.4	4.1	3.7	3.4
7.7	9.6	9.6	9.6	9.3	8.6	7.9	7.3	6.7	6.1	5.7	5.2	4.8	4.4	4.1	3.7	3.4	3.2	2.9
7.8	8.1	8.1	8.1	7.8	7.2	6.6	6.1	5.6	5.2	4.8	4.4	4.0	3.7	3.4	3.1	2.9	2.7	2.4
7.9	6.7	6.7	6.7	6.5	6.0	5.5	5.1	4.7	4.3	4.0	3.7	3.4	3.1	2.8	2.6	2.4	2.2	2.0
8.0	5.6	5.6	5.6	5.4	5.0	4.6	4.2	3.9	3.6	3.3	3.0	2.8	2.6	2.4	2.2	2.0	1.8	1.7
8.1	4.6	4.6	4.6	4.5	4.1	3.8	3.5	3.2	3.0	2.7	2.5	2.3	2.1	2.0	1.8	1.7	1.5	1.4
8.2	3.8	3.8	3.8	3.7	3.4	3.1	2.9	2.6	2.4	2.2	2.1	1.9	1.7	1.6	1.5	1.4	1.3	1.2
8.3	3.1	3.1	3.1	3.0	2.8	2.6	2.4	2.2	2.0	1.8	1.7	1.6	1.4	1.3	1.2	1.1	1.0	1.0
8.4	2.6	2.6	2.6	2.5	2.3	2.1	1.9	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8
8.5	2.1	2.1	2.1	2.1	1.9	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.8	0.7	0.6
8.6	1.8	1.8	1.8	1.7	1.6	1.4	1.3	1.2	1.1	1.0	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.5
8.7	1.5	1.5	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4
8.8	1.2	1.2	1.2	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4
8.9	1.0	1.0	1.0	1.0	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3
9.0	0.9	0.9	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3