DRAFT FOR PUBLIC REVIEW

Justification for Water Quality Standards in the Pulikla Tribe of Yurok People's 2025 Water Quality Ordinance

Prepared for:

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SUMMARY

This document summarizes and provides justification for the water quality standards in the Pulikla Tribe of Yurok People's 2025 Water Quality Ordinance (Pulikla WQO). It is organized by pollutant. Table numbers correspond to those used in the 2025 Pulikla WQO.

The Pulikla WQO was originally developed in 2002 and then was revised in 2006, 2015, and 2025.

DISCUSSION BY PARAMETER

Water Quality Criteria for Most Parameters

Most of the proposed water quality objectives are identical to those recommended by U.S. EPA in the 2016 Model WQS Template for Waters on Indian Reservations[1] which is based on a 2016 version of the U.S. EPA's National Recommended Water Quality Criteria tables for aquatic life[2], human health[3], and organoleptic effects[4]. Since the criteria for those parameters have already been reviewed by U.S. EPA, it is not necessary to discuss them in this document. The only parameters for which U.S. EPA has updated its National Recommended Water Quality Criteria since the 2016 Model WQS template are Cadmium (U.S. EPA 2016), microcystin, and cylindrospermopsin (U.S. EPA 2019, 2021), PFOA (U.S. EPA 2024c), PFOA (U.S. EPA 2024b) and PFAS (U.S. EPA 2024a), for which we reference the updated recommendations. A recent court decision vacated U.S. EPA's 2016 recommended freshwater chronic aquatic life criterion for cadmium[5], so we instead use U.S. EPA's 2001 freshwater chronic aquatic life criterion for cadmium (U.S. EPA 2001), as extracted from a 2/14/2014 archived version of the U.S. EPA website[6]. We reviewed changes between the 2016 Model WQS Template and the February 2022 Model WQS Template and incorporated changes of substance (not every minor word change), including adding a Definitions section. We extracted the PFOA, PFOA, PFAS criteria and footnotes, and the footnotes for Selenium, from the November 2024 Model WQS Template[7].

We made a few other modifications to U.S. EPA's National Recommended Water Quality Criteria tables and footnotes:

- Excluded all of the saltwater criteria because there is no saltwater on Pulikla Tribe of Yurok People lands.
- Added footnotes n and o to the aquatic life criteria table (Table 7) to define Criteria Maximum Concentration (CMC) and Continuous Criteria Concentration (CCC)

[1] https://www.epa.gov/wqs-tech/water-quality-standards-tools-tribes
[2] https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table
[3] https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table
[4] https://www.epa.gov/wqc/national-recommended-water-quality-criteria-organoleptic-effects
[5] https://www.courthousenews.com/wp-content/uploads/2023/08/cbd-v-epa-summary-judgment.pdf
[6] http://web.archive.org/web/20140209071513/http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm#D
[7] https://www.epa.gov/system/files/documents/2024-12/nov_2024_model-wqs-tribes.docx

- Added footnote k to the human health criteria table (Table 11) to explain the meaning of "Water + Organism" and "Organism Only"
- Added footnote 7 to Table 19 (Design Flows) to explain how the harmonic mean flow differs from the arithmetic mean flow.
- Mercury and methylmercury (discussed below)

The numeric water quality criteria in the 2025 Pulikla WQO are very similar to those proposed by Quartz Valley Indian Reservation (QVIR 2024, Asarian et al. 2024) and currently under review by U.S. EPA. The main differences are in Section 512 Water Body-Specific Criteria and WQS Variances, because those are based on the North Coast Regional Water Quality Control Board's Basin Plan (NCRWCB 2018) and associated Klamath River TMDLs (NCRWQCB 2010) which vary geographically. The 2025 Pulikla WQO also includes Biological Criteria, Wildlife Criteria, and Sediment and Turbidity Criteria that were not included in QVIR's 2024 WQCP. Another difference between the 2025 Pulikla WQO and the QVIR WQCP is that due to its cool coastal climate, the Pulikla Tribe of Yurok People does not have any waters designated Warm Freshwater Habitat (WARM) nor adopted any criteria for that beneficial use. The Pulikla Tribe of Yurok People's list of designated uses is also slightly different, including Commercial and Sport Fishing (COMM) instead of Fish Consumption (FC). The Pulikla Tribe of Yurok People's Fecal Indicator Bacteria Criteria are also different than QVIR's because QVIR's were based in part on site-specific data that are not available for The Pulikla Tribe of Yurok People's Reservation.

Methylmercury and mercury

Proposed objectives:

Excerpt from Table 11. Human Health Criteria:

Pollutant	CAS Number	Water + Organism[k] (µg/L)	Organism Only[k] (µg/L)
Methylmercury[h]	22967926	N/A	0.*04 mg/kg*

h. Methylmercury "Organism Only" criteria are in units of mg/kg (µg/g) fish tissue and are based on the Tribal Subsistence (T-SUB) beneficial use from California Mercury Provisions (SWRCB 2017), not the USEPA Tribal/State Human Health Criteria Calculator. The average methylmercury concentrations shall not exceed 0.04 mg/kg fish tissue within a CALENDAR YEAR. The objective applies to the WET WEIGHT concentration in skinless fillet from a mixture of 70 percent TROPHIC LEVEL 3 fish and 30 percent TROPHIC LEVEL 4 fish as detailed in Attachment C of the California Mercury Provisions. The California Mercury Provisions also provide a table (Table 1 on page A-9 of SWRCB [2017]) with translated fish tissue-to-water column numbers meant to be used for reasonable potential analysis and development of effluent limitations for waterbodies with designated use of Tribal Subsistence Fishing (T-SUB), which WRD adopts: 0.004 µg/L total mercury for flowing waterbodies and 0.001 µg/L total mercury for slow moving water bodies (i.e., wetlands).

k. The "Water + Organism" and "Organism Only" criteria are concentrations in water (units = µg/L), except for methylmercury which is concentration in fish/shellfish tissues (units = mg/kg). "Water + Organism" applies to waters designated for public drinking water supply, whereas "Organism Only" is for other waters designated as protection and propagation of fish, shellfish, and wildlife but not public drinking water supply.

Excerpt from Table 7. Aquatic life criteria:

Compound	CAS Number	Freshwater	
		Criterion Maximum Concentration[n] (CMC) (µg/L)	Criterion Continuous Concentration[o] (CCC) (µg/L)
Mercury	7439976	See Section 505(I)	

Excerpt from section 505(I):

(I) *Mercury criteria to protect wildlife and aquatic life.*

(1) Sport Fish Water Quality Criterion

(i) Application of the Sport Fish Water Quality Criterion
The Sport Fish Water Quality Criterion for mercury applies to waters with the beneficial uses related to fish and wildlife (COMM, COLD, MIGR, SPWN, BIOL, SHELL, T-SUB, CUL-1, WILD, T&E). With respect to those beneficial uses, the Sport Fish Water Quality Criterion may be used to evaluate whether all species are supported only when applied to TROPHIC LEVEL 4 fish. If the criterion is measured using TROPHIC LEVEL 3 fish, protection of all wildlife species within the WILD beneficial uses is not ensured. Therefore, if TROPHIC LEVEL 3 fish are used, then the Prey Fish Water Quality Criterion (as described in paragraph (d)(9)(ii)) shall be used. However, if the Sport Fish Water Quality Criterion is exceeded when applied to TROPHIC LEVEL 3 fish, that is sufficient evidence to indicate that the Prey Fish Water Quality Criteria is also exceeded without having to measure the latter criterion.

(ii) Sport Fish Water Quality Criterion
The average methylmercury concentrations shall not exceed 0.2 milligrams per kilogram (mg/kg) fish tissue within a CALENDAR YEAR . The water quality criterion applies to the WET WEIGHT concentration in skinless fillet in TROPHIC LEVEL 3 or TROPHIC LEVEL 4 fish, whichever is the HIGHEST TROPHIC LEVEL FISH in the water body. Freshwater TROPHIC LEVEL 3 fish are between 150 to 500 millimeters (mm) in total length and TROPHIC LEVEL 4 fish are between 200 to 500 mm in total length, except for sizes specified in Attachment C of the California Mercury Provisions (SWRCB 2017), or as additionally limited in size in accordance with the LEGAL SIZE LIMIT for the species caught.

(2) Prey Fish Water Quality Criterion

(i) Application of the Prey Fish Water Quality Criterion
The Prey Fish Water Quality Criterion applies to waters with beneficial uses related to fish and wildlife (COLD, MIGR, SPWN, BIOL, WILD, T&E) that do not include consumption of organisms by humans. As discussed in paragraph (d)(9)(i), it is not necessary to measure the Prey Fish Water Quality Criterion if the Sport Fish Water Quality Criterion applies to the same water body and is evaluated using TROPHIC LEVEL 4 fish. However, suppose the Sport Fish Water Quality Criterion is exceeded when applied to TROPHIC LEVEL 3 fish. In that case, that is sufficient evidence to indicate that the Prey Fish Water Quality Criterion is also exceeded without having to measure the latter criterion.

(ii) Prey Fish Water Quality Criterion
The average methylmercury concentrations shall not exceed 0.05 mg/kg in WET WEIGHT whole fish tissue of any species between 50 to 150 mm in total length during the breeding season. The breeding season is February 1 through July 31, unless site-specific information indicates another appropriate breeding period.

Justification:
On May 2, 2017, the California State Water Resources Control Board adopted "Part 2 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California—Tribal and Subsistence Fishing Beneficial Uses and Mercury Provisions" (Resolution 2017-0027). The mercury provisions were approved by EPA on July 14, 2017. The Resolution sets statewide mercury fish tissue criteria for the protection of aquatic life, wildlife and human health and creates new beneficial uses for tribal and subsistence fish consumption uses for California Regional Water Quality Control Boards to assign to waterbodies. The Yurok Tribe does not yet have EPA-approved water quality standards, so California's water quality standards are in effect for Clean Water Act purposes on the lands surrounding the Pulikla Tribe of Yurok People, so the Pulikla Tribe of Yurok People is adopting the relevant portions of California's mercury provisions. All Pulikla Tribe of Yurok People surface waters are designated as Tribal Subsistence Fishing (T-SUB), so the Pulikla Tribe of Yurok People's criteria adopt the CA mercury provisions' T-SUB fish tissue concentrations (0.04 mg/kg) and translated fish tissue-to-water column values for flowing waterbodies (0.004 µg/L total mercury) and slow moving waterbodies (0.001 µg/L total mercury). These translated fish tissue-to-water column values are listed in Table 1 on page A-9 of the CA Mercury Provisions: https://www.waterboards.ca.gov/water_issues/programs/mercury/docs/hg_prov_final.pdf.
To protect wildlife and aquatic life designated uses (i.e., WILD, MIGR, T&E, COLD), the Pulikla Tribe of Yurok People is adopting the relevant parts of California's sport fish and prey fish methylmercury fish tissue objectives. Saltwater and least terns do not occur within the Reservation, so the parts of the California objectives that pertain to those subjects are not included in the Pulikla Tribe of Yurok People's WQS.

Fecal Indicator Bacteria Criteria to Protect Contact Recreational, Cultural, and Shellfish Uses

Proposed objectives:

(J) Fecal Indicator Bacteria Criteria to Protect Contact Recreational, Cultural, and Shellfish Uses

(1) For all waters with the designated use of Cultural Contact Water (CUL-1) and Water Contact Recreation (REC-1),

(i) Culturable *E. coli* should not exceed a geometric mean (GM) of 40 colony forming units (cfu) per 100 milliliters (mL) or a statistical threshold value (STV) of 130 cfu/100 mL.

(a) Duration and Frequency: The waterbody GM should not be greater than the selected GM magnitude in any 30-day interval. There should not be greater than a ten percent excursion frequency of the selected STV magnitude in the same 30-day interval.

(b) *E. coli* should be measured using U.S. EPA Method 1603, or any other equivalent method that measures culturable *E. coli.*

(2) At all areas where shellfish may be harvested for human consumption (SHELL, T-SUB), the fecal coliform concentration throughout the water column shall not exceed 43/100 mL for a 5-tube decimal dilution test or 49/100 mL when a three-tube decimal dilution test is used (National Shellfish Sanitation Program, Manual of Operation).

(3) Beach Action Values are not legally part of water quality standards and are not to be used to determine whether a water body is impaired under the Clean Water Act, but rather are triggers which can be used for public health advisory postings. WRD will use a Beach Action Value of 74 cfu *E. coli*/100 mL. When an *E. coli* sample exceeds the BAV, the TWQCO will post a public health advisory, if deemed appropriate.

Justification:
The U.S. EPA's (2012) Recreational Water Quality Criteria provides guidance to states and tribes regarding setting bacterial standards to protect primary contact recreation use. The guidance provides two sets of recommended criteria, one based on an estimated illness rate of 36/1,000 primary contact recreators and the other based on an estimated illness rate of 32/1,000 primary contact recreators. Many members of the Pulikla Tribe of Yurok People, including young children, use waterbodies for recreation, subsistence, and ceremonies throughout the year. Some individuals are immersed in water daily during summer months. At an illness rate of 32/1000, and a corresponding *E. coli* level of 100 cfu/100 mL, an individual who swims every summer day would be expected to become ill three times that summer. For a single individual, three bouts of gastrointestinal illness per summer due to water contact is unacceptable to the

Pulikla Tribe of Yurok People. Therefore, the Pulikla Tribe of Yurok People is setting its criteria based on a lower illness rate.

The recreational water quality objective set by the North Coast Regional Water Quality Control Board (NCRWCB 2018) in waters of California for areas near the Pulikla Tribe of Yurok People is based on fecal coliform, with the median concentration not to exceed 50 cfu fecal coliform/100 mL. The NCRWQCB's fecal coliform objective has been in place for decades and has a long history of acceptance by the public. If the Pulikla Tribe of Yurok People were to adopt an objective based on the U.S. EPA's recommended illness rate of 32/1000 recreators, Tribal members could potentially be subject to a substantially (i.e., 2x as described in the following paragraph) higher illness rate than they have been accustomed to under California's objectives. The Pulikla Tribe of Yurok People agrees with U.S. EPA that *E. coli* is a more accurate indicator of human health risk than fecal coliform. We converted the 50 cfu fecal coliform/100 mL to E. coli using a ratio of 0.8 *E. coli* to 1 fecal coliform. The 0.8 ratio was derived by Voeller et al. (2021) by averaging ratios from several studies. Multiplying the NCRWQCB's (2018) standard of 50 fecal coliform/100 mL by the observed 0.8 ratio yields an equivalent *E. coli* criteria of 40 cfu/100 mL. The expected illness rate for a geometric mean (GM) of 40 cfu *E. coli*/100 mL can be calculated from the equation provided in the U.S. EPA (2012) recreational water quality criteria, derived from analyses from the U.S. EPA (1986):

$$\text{Swimming-associated HCGI illness} = -11.74 + 9.397\ (\text{mean log10 E. coli/100 mL})$$

Mean log10 *E. coli* is the same as a geometric mean, so the log10 of 40 cfu *E. coli*/100 mL (i.e., 1.6) can be inserted into the above equation to yield an HCGI[8] illness rate of 3.3, which can then be multiplied by 4.5 to obtain an NGI[9] illness rate of 14.9, which can then be rounded to a final NGI illness rate of 15. An NGI illness rate of 15/1000 recreators is approximately 2x lower than the U.S. EPA's (2012) recommended NGI illness rate of 32/1000 recreators, and is acceptable to the Pulikla Tribe of Yurok People.

U.S. EPA (2012) recreational water quality criteria recommend setting a statistical threshold value (STV) in addition to a GM. The STV and GM are both derived from the same log-normal distribution, with the GM being the 50th percentile while the STV is the 90th percentile. For a normal distribution, the 90th percentile can be estimated from the mean and the standard deviation using the formula:

$$X=\mu+Z\sigma$$

Where X is the percentile, μ is the mean, Z is the Z-score corresponding to the percentile (i.e., number of standard deviations from the mean), and σ is the standard deviation (WSDOE 2017). The Z-score for the 90th percentile is 1.282 (CDC 2009). The logged standard deviation from the

[8] U.S. EPA (1986) used "highly credible gastrointestinal illnesses" (HCGI) which were defined as "any one of the following unmistakable or combinations of symptoms [within eight to ten days of swimming]: (1) vomiting (2) diarrhea with fever or a disabling condition (remained home, remained in bed or sought medical advice because of symptoms), (3) stomachache or nausea accompanied by a fever."

[9] Following the convention of the National Epidemiological and Environmental Assessment of Recreational Water (NEEAR), U.S. EPA (2012) used NEEAR-GI illness (NGI) which broadened the definition of illness in that diarrhea, stomachache, or nausea is included without requiring the occurrence of fever.

pooled variance in the *E. coli* samples used to generate the 1986 recommended criteria (same dataset used for the 2012 recommended criteria) was 0.40 (U.S. EPA 1986, as cited in U.S. EPA 2012). Inserting the 40 cfu *E. coli* GM and inserting into the log form (base 10) of the equation above and then simplifying yields:

$$\log(X)= \log(40) + (1.282 * 0.4)$$
$$\log(X)=1.6021 + (0.5128)$$
$$\log(X)=2.1149$$

Raising 10 to the 2.1149 power (i.e., anti-log) results in 130. This is the Pulikla Tribe of Yurok People's proposed STV.

U.S. EPA (2012) provides recommended Beach Action Values (BAV), which are not intended to be used as water quality standards but rather used as triggers for public health advisory postings. U.S. EPA (2012) recommends that the BAV be set at the 75th percentile of the same distribution used to set the GM and STV. Inserting the Z-score for the 75th percentile (0.674, CDC 2009) in place of the Z-score for the 90th percentile (1.282) into the equation above yields:

$$\log(X)= \log(40) + (0.674 * 0.4) = 1.8717$$

Raising 10 to the 1.8717 power (i.e., anti-log) results in 74. This is the Pulikla Tribe of Yurok People's proposed BAV.

The Pulikla Tribe of Yurok People's proposed fecal coliform criteria for shellfish are identical to the fecal coliform criteria in the NCRWQCB (2018) Basin Plan.

Cyanobacterial Toxins and Cyanobacteria Cell Density

Proposed objectives:

> Section 505(E) *Cyanobacterial criteria to protect human health.* Concentrations of cyanobacteria (blue-green algae) cells and cyanobacterial toxins shall conform to the limits listed in Table 18. The table provides criteria that differ according to groups of designated uses:
>
> (1) Contact Cultural (CUL-1) and Contact Recreational (REC-1)
>
> (2) Shellfish Harvesting (SHELL), Fish Consumption (FC), Tribal Subsistence (T-SUB)
>
> (3) Drinking water (MUN)

Justification:
The Rationale for Proposed column in Table 18 provides a summary of the justification. The criteria are based largely on those recommended by Kann (2014) in a technical memo prepared during revision of the Karuk Tribe's water quality standards (Karuk Tribe 2014) and also later adopted by the Yurok Tribe (YTEP 2016). In addition, the proposed criteria also include updates to account for new information that has become available since 2014. For example, the Minnesota Department of Public Health updated (MDPH 2015a, 2015b) their previous toxicology and drinking water guidance for microcystin (MDPH 2012a, 2012b), which revised the drinking water guidance upward from 0.04 µg/L to 0.1 µg/L. In addition, U.S. EPA issued recommended recreational water quality criteria for microcystin and cylindrospermopsin (2019, 2021), and also issued drinking water health advisories (HAs) for microcystin and cylindrospermopsin (U.S. EPA 2015a, 2015b, 2015c). However, the U.S. EPA drinking water HAs were for 10-day exposures, whereas the Minnesota drinking water guidance was for chronic exposure; therefore, we recommend that the Pulikla Tribe of Yurok People use the Minnesota (MDPH 2015a, 2015b) values as water quality criteria since the Minnesota chronic exposure guidance value is more protective of public health.

the Pulikla Tribe of Yurok People's proposed recreational criterion of 4.0 µg/L for microcystin is lower than the U.S. EPA (2019, 2021) final recreational criterion for microcystin of 8.0 µg/L, the Hoopa Valley Tribe's (2020) microcystin criterion of 8.0 µg/L, and the 6.0 µg/L Tier II Danger postings level from the 2016 updates (CCHAB 2016) to California's Statewide Voluntary Guidance on CyanoHABs in Recreational Waters (SWRCB 2010). However, the Pulikla Tribe of Yurok People's proposed criterion matches that the Karuk Tribe's (2014) water quality criterion and the Yurok Tribe's (2016) Tier II Danger postings level. The Pulikla Tribe of Yurok People chooses more stringent criteria because members of the Pulikla Tribe of Yurok People and other local Tribes have unique and greater environmental exposures, as described by Middleton et al. (2019) in the following excerpts:

> "…Tribal members may face additional exposures and adverse impacts (beyond those among the general population) through Tribal lifeways that include cultural and ceremonial activities as well as subsistence fishing, hunting, and gathering. Tribal members are integrally related to the environment in ways not typically accounted for in most exposure evaluation models, which reflect exposures largely received in urban and suburban settings and do not consider the extent of Tribal environmental contact."
>
> "...coupled with the Tribe's strong commercial and subsistence fisheries, high utilization due to economic reliance on other coastal and riverine resources, and extensive cultural programs and ceremonial activities, place the Yurok at severe risk of cumulative exposures from multiple contaminants.
>
> "Therefore, while Tribal members face the same routine exposures as do members of mainstream American communities to industrial additives and contaminants in commercial products and foods, exposures to such contaminants may be increased through Tribal-specific activities."

The frequency and duration for the Pulikla Tribe of Yurok People's proposed cyanobacteria criteria for CUL-1 and REC-1 beneficial uses are variations of U.S. EPA (2019 and 2021) recommendations. Given the greater exposure of members of the Pulikla Tribe of Yurok People, we deemed U.S. EPA's (2019 and 2021) recommendation that concentrations shall not be exceeded in "more than *three* 10-day periods per recreational season" to be too high and therefore chose "more than *two* 10-day periods per recreational season" to be more protective of members of the Pulikla Tribe of Yurok People. In addition, U.S. EPA (2019 and 2021) recommendations allow states and authorized tribes flexibility to make a risk management decision in setting the number of years the pattern of exceedances can occur and not impair recreational use. U.S. EPA (2021) mentions rolling 3-year or 5-year periods as examples of recurrence frequencies. Given the greater exposure of members of the Pulikla Tribe of Yurok People, we recommend a rolling 10-year period. The full recommended frequency, duration, and recurrent frequency is: "concentrations shall not be exceeded in more than two 10-day periods per recreational season, for more than one recreational season, over a rolling 10-year period."

The Pulikla Tribe of Yurok People's proposed cyanobacteria criteria are measured as concentrations of toxins and cells in water column samples. In recent years, evidence has emerged of widespread benthic (i.e., living on the riverbed) cyanobacteria in the Klamath River (Genzoli and Kann 2020). These benthic cyanobacteria form mats that pose a public health risk through ingestion. However, sampling protocols are still being developed and we are not aware of any water quality criteria that have been established targeting benthic cyanobacteria. The Pulikla Tribe of Yurok People may revisit this issue in future triennial reviews.

Table 18. Cyanobacterial toxin and cell density criteria, associated public health posting levels, and drinking water health advisories. Frequency and duration CUL-1 and REC-1 water quality criteria: concentrations shall not be exceeded in more than two 10-day periods per recreational season, for more than one recreational season, over a rolling 10-year period.

Parameter	Designated Uses	Proposed Water Quality Criterion, Public Health Posting Level, or Health Advisory		Rationale
***Microcystis aeruginosa* cell density**	Drinking water (MUN)	Health advisory[1]	Below detection	The Minnesota (2015a, 2015b) Heinze-based short-term non-cancer "Health Based Value" of 0.1 µg/L essentially does not allow for the detection of any cells
	Contact Cultural (CUL-1) Contact Recreational (REC-1)	Level 1 Public Health Posting[2]	1,000 cells/mL	Cell density corresponding to toxin levels associated with OEHHA (2012) "Action Level"
		Water Quality Criterion and Level 2 Public Health Posting[3]	5,000 cells/mL	Cell density corresponding to toxin levels associated with 5x OEHHA (2012) "Action Level"
***Total microcystin toxin concentration*[4]**	Drinking water (MUN)	Health advisory[1]	0.1 µg/L total microcystins[4]	Minnesota (2015a, 2015b) Heinze-based short-term non-cancer "Health Based Value" of 0.1 µg/L.
	Contact Cultural (CUL-1) Contact Recreational (REC-1)	Level 1 Public Health Posting[2]	0.8 µg/L total microcystin.	OEHHA (2012) "Action Level"
		Water Quality Criterion and Level 2 Public Health Posting[3]	4.0 µg/L total microcystin	5x OEHHA (2012) "Action Level"
Total potentially toxigenic blue-green algal species[5]	Contact Cultural (CUL-1) Contact Recreational (REC-1)	Water Quality Criterion	100,000 cells/mL or Cyanobacterial scums	WHO/SWRCB guidelines
Cylindrospermopsin	Drinking water (MUN)	Health advisory[1]	0.7 µg/L	U.S. EPA (2015a)
	Contact Cultural (CUL-1) Contact Recreational (REC-1)	Level 1 Public Health Posting[7]	1 ug/L	CCHAB (2016) Caution Action Trigger
		Water Quality Criterion and Level 2 Public Health Posting[8]	15 µg/L	U.S EPA (2019, 2021). CCHAB (2016) Danger Tier II is similar but higher (17 µg/L).
Anatoxin-a	Contact Cultural (CUL-1) Contact Recreational (REC-1)	Level 1 Public Health Posting[7]	Detection[9]	CCHAB (2016)
		Water Quality Criterion and Level 2 Public Health Posting[8]	90 µg/L	OEHHA (2012) "Action Level"
Cyanotoxins in Fish & Shellfish	Shellfish Harvesting, Fish Consumption (SHELL, T-SUB, COMM)	Water Quality Criterion	10 ng/g microcystins, <5000 ng/g anatoxin, <4 ng/g cylindrospermopsin (wet weight)	OEHHA (2012) "Action Level"

Footnotes to Table 18

[1] For treated water, testing for drinking water health advisories should be conducted at entry point into water distribution system. For water that is directly used for drinking water without treatment, including groundwater wells used for water supply, then testing for drinking water health advisories should be conducted on raw water.

[2] The water quality criteria are set at the Level 2 Health Advisory Danger, but the Level 1 Health Advisory Warning are also included in this table for informational and management purposes. The Level 1 Health Advisory Warning posting will include: Avoid contact with or use of river water because public health advisory thresholds for blue-green algae (*Microcystis aeruginosa*) cell counts or associated toxins were exceeded during recent public health monitoring.

[3] The Level 2 Health Advisory Danger posting will include: Water is unsafe for contact or use and poses a high risk of potential health impacts due to levels of *Microcystis aeruginosa* cell counts or associated toxins recently detected at 5x the Public Health advisory thresholds.

[4] Value based on the older WHO studies, and although OEHHA (2012) did not evaluate drinking water "action levels", the Minnesota Department of Health (2015a, 2015b) utilized the Heinze-based lowest-observed-adverse-effect level (LOAEL) of 0.05 mg/kg/day, converted that to a human equivalent dose of 0.012 mg/kg/day, and utilized an uncertainty factor of 300 to arrive at a short-term non-cancer "Health Based Value" of 0.1 μg/L.

[5] While there are numerous congeners of microcystin (e.g., microcystin-LA, RR, and YR) the most extensive toxicological information is available for the microcystin-LR congener. However, the literature indicates that most of these congeners appear to have similar toxicological effects (OEHHA 2012). Therefore, the toxicity criteria apply to the total of all microcystin congeners (if measured separately the concentration of the various congeners is summed), or if ELISA methodology is used then the reported value is already assumed to represent the total.

[6] Includes: *Dolichospermum (formerly known as Anabaena), Microcystis*, *Planktothrix, Gloeotrichia* and *Oscillatoria*

[7] The water quality criteria are set at the Level 2 Health Advisory Danger, but the Level 1 Health Advisory Warning are also included in this table for informational and management purposes. The Level 1 Health Advisory Warning posting will include: Avoid contact with or use of river water because public health advisory thresholds for toxins associated with blue-green algae were exceeded during recent public health monitoring.

[8] The Level 2 Health Advisory Danger posting will include: Water is unsafe for contact or use and poses a high risk of potential health impacts due to high levels of toxins associated with blue-green algae being exceeded during recent public health monitoring.

[9] Must use an analytical method that detects ≤ 1μg/L Anatoxin-a.

Dissolved Oxygen

Proposed objectives:

Section 505(G) *Dissolved Oxygen Criteria.* Dissolved oxygen (DO) concentrations shall conform to the following aquatic life requirements in Table 2. Site-specific DO criteria are listed in Section 512(C).

Table 2. Dissolved Oxygen Aquatic Life Criteria for Fresh Waters

Beneficial Use	Daily Minimum Objective (mg/L)	7-Day Moving Average Objective (mg/L)[10]
Cold Freshwater Habitat (COLD)	6.0	8.0
Spawning, Reproduction, and/or Early Development (SPWN)[11]	9.0	11.0

Section 512(C) *Dissolved oxygen (DO)* shall conform to the following limits:

Table 5. Site-specific dissolved oxygen (DO) objectives for the mainstem Klamath River.

Location	Percent DO Saturation Based on Natural Receiving Water Temperatures[1]	Time Period
Klamath River upstream of Turwar Creek	85%	June 1 through August 31
	90%	Sept. 1 through May 31
Klamath River from Turwar Creek downstream to the western edge of the Pulikla Tribe of Yurok People's Reservation	80%	Aug. 1 through Aug. 31
	85%	Sept. 1 through Oct. 31 and June 1 through July 31
	90%	November 1 through May 31

[1]Corresponding DO concentrations are calculated as daily minima, based on site-specific barometric pressure, site-specific salinity, and natural receiving water temperatures as estimated by the T1BSR run of the Klamath TMDL model and described in Tetra Tech (2009). The estimates of natural receiving water temperatures used in these calculations may be updated as new data or method(s) become available.

[10] A 7-day moving average is calculated by taking the average of each set of seven consecutive daily averages.
[11] Water quality objectives designed to protect SPWN-designated waters apply to all fresh waters designated in Table 1 as SPWN in those reaches and during those periods of time when spawning, egg incubation, and larval development are occurring or have historically occurred. The period of spawning, egg incubation, and emergence generally occur between the dates of September 15 and June 4.

Justification:
The proposed dissolved oxygen objectives are based on the dissolved oxygen objectives adopted by the North Coast Regional Water Quality Control Board (NCRWQCB 2018) and approved by U.S. EPA on April 24, 2017. For purposes of establishing site-specific dissolved oxygen objectives, NCRWQCB (2018) defined three reaches of the Lower Klamath River: "Downstream Hoopa-California boundary to Turwar," "Upper and Middle Estuary," and "Lower Estuary." We use the "Downstream Hoopa-California boundary to Turwar" reach for our "Klamath River upstream of Turwar Creek" in Table 5. According to maps in Appendix 7 of NCRWQCB (2010), the Upper Estuary site is located immediately downstream of the Highway 101 bridge, near the downstream (west) extent of the Pulikla Tribe of Yurok People's Reservation, so we use that site for our "Klamath River from Turwar Creek downstream to the western edge of the Pulikla Tribe of Yurok People's Reservation" in Table 5.

Due to its cool coastal climate, the Pulikla Tribe of Yurok People does not have any waters designated Warm Freshwater Habitat (WARM) nor does it have any Marine Habitat (MAR) or Inland Saline Water Habitat (SAL), so the Pulikla Tribe of Yurok People did not adopt criteria for those beneficial uses in Table 2.

Specific Conductance, pH, Hardness, and Boron

Proposed objectives:

> Section 512(A) *(A) Specific conductance, pH, hardness, and boron*. The water quality objectives for surface water streams and groundwater for specific conductance, pH, hardness, and boron in Table 3 shall apply.

Table 3 Specific Water Quality Objectives for Reservation waterbodies

Waterbody	Specific Conductance (micromhos) @ 25 °C		Hydrogen Ion (pH units)		Hardness (mg/L as $CaCO_3$)	Boron (mg/L as B)	
	90% Upper Limit[1]	50% Upper Limit[2]	Max	Min	50% Upper Limit[2]	90% Upper Limit[1]	50% Upper Limit[2]
Klamath River	300	200	8.5	7.0	75	0.5	0.2
Other streams	200	125	8.5	6.5	25	0.1	0.0
Groundwaters[3]	300	225	8.5	6.5	100	0.1	0.0

[1]90% upper and lower limits represent the 90 percentile values for a calendar year. 90% or more of the values must be less than or equal to an upper limit and greater than or equal to a lower limit.

[2]50% upper and lower limits represent the 50 percentile values of the monthly means for a calendar year. 50% or more of the monthly means must be less than or equal to an upper limit and greater than or equal to a lower limit.

[3]Value may vary depending on the aquifer being sampled. This value is the result of sampling over time, and as pumped, from more than one aquifer.

Justification:
The proposed objectives for specific conductance, pH, hardness, and boron are identical to the objectives for streams and groundwater in the Lower Klamath Hydrologic Area in the North Coast Regional Water Quality Control Board's Basin Plan (NCRWQCB 2018).

Nutrients and Organic Matter

Proposed objectives:

Section 512(D) *Nutrients and Organic Matter*. Nutrients and organic matter shall conform to the limits listed in Table 6.

Table 6. Nutrient and Organic Matter Objectives

Location	Total Nitrogen (TN)	Total Phosphorus (TP)	5-day carbonaceous biochemical oxygen demand ($CBOD_5$)	
	Dry season: May – Oct	Dry season: May – Oct	Dry season: May – Oct	Wet season: Nov – Apr
Klamath River	0.188	0.023	2	2
Other creeks	0.077	0.014	1	1

Justification:
Excessive levels of nutrients and organic matter have been identified as causing deleterious effects to water quality and aquatic ecosystems in the Klamath Basin (NCRWQCB 2010). The proposed criteria are based on the NCRWQCB (2010) Total Maximum Daily Loads (TMDLs) for the Klamath River and its tributaries. The TN and TP objectives apply only in the dry season (months May–October) because those are the months when river flows can be low and there is enough sunlight and warmth for high nutrient concentrations to stimulate high levels of primary production that can degrade water quality. Concentrations in Table 6 for the Klamath River mainstem locations were calculated as seasonal arithmetic mean (i.e., regular averages, not geometric mean) from hourly outputs from the TMDLs' TCD2RN (dams-out) model scenario, obtained from NCRWQCB (Clayton Creager, pers. comm.), and concentrations from tributaries were extracted from NCRWQCB (2010) Table 5.16. The Klamath River objectives are based on the TURWAR node (Klamath River at Turwar) from the TMDL model. The Klamath River objectives are more stringent than the Hoopa Valley Tribe's (HVT 2020) May–October 0.2 mg/L TN and 0.035 mg/L TP for the Klamath River at Saints Rest Bar upstream of the Trinity River, which is to be expected since the relatively clean Trinity River provides substantial dilution of nutrient-rich Klamath River waters.

Drinking Water Criteria

Proposed objectives:

> Section 505(C) *Drinking Water Criteria*
> (1) In no case shall waters designated for use as Municipal and Domestic Supply (MUN) contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCL) and secondary maximum contaminant levels (SMCL) in Table 12, Table 13, Table 14, Table 15, Table 16, and Table 17.
>
> (2) In no case shall groundwaters designated for use as Municipal and Domestic Supply (MUN) contain detectable levels of *E. coli* (i.e., 0 cfu/100 mL or 0 mpn/100 mL).

[The proposed Tables are not included here due to their length, please refer to the 2025 WQO].

Justification:
The proposed objectives in (i) are similar to those in the EPA-approved NCRWQCB (2018) Basin Plan. Instead of including tables of specific values, the Basin Plan incorporates Title 22 of the California Code of Regulations by reference and states that the incorporation by reference is prospective, meaning that any future changes to Title 22 are automatically incorporated. For sovereignty reasons, we elected to extract the current (July 1, 2022) version of relevant tables from Title 22 and insert them into the WQO instead of using the Basin Plan's strategy of prospective incorporation. Specific sources for the tables are:

- Table 12. Maximum Contaminant Levels for Inorganic Chemicals, derived from Title 22 of the California Code of Regulations, Section 64431, accessed July 1, 2022 from: https://web.archive.org/web/*/https://govt.westlaw.com/calregs/Document/I2810C4E12DCC4B40A165E23D1B6C6F0D?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)
- Table 13. Maximum Contaminant Levels for Volatile Organic Chemicals (VOCs), derived from Title 22 of the California Code of Regulations, Section 64444, accessed July 1, 2022 from: https://web.archive.org/web/*/https://govt.westlaw.com/calregs/Document/IA7B3800D18654ABD9E2D24A445A66CB9?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)
- Table 14. Maximum Contaminant Levels for Non-Volatile Synthetic Organic Chemicals (SOCs), Title 22 of the California Code of Regulations, Section 64431, accessed July 1, 2022 from: https://web.archive.org/web/*/https://govt.westlaw.com/calregs/Document/IA7B3800D18654ABD9E2D24A445A66CB9?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)
- Table 15. Secondary Maximum Contaminant Levels "Consumer Acceptance Contaminant Levels" (part 1), Title 22 of the California Code of Regulations, Section 64449, accessed July 1, 2022 from: https://web.archive.org/web/*/https://govt.westlaw.com/calregs/Document/I2260318DFFF045

529B9496276F3A8573?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

- Table 16. Secondary Maximum Contaminant Levels "Consumer Acceptance Contaminant Levels" (part 2), Title 22 of the California Code of Regulations, Section 64449, accessed July 1, 2022 from: https://web.archive.org/web/*/https://govt.westlaw.com/calregs/Document/I2260318DFFF045529B9496276F3A8573?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)
- Table 17. Radionuclide Maximum Containment Levels (MCLs), Title 22 of the California Code of Regulations, Sections 64442 and 64443, accessed July 1, 2022 from: https://web.archive.org/web/*/https://govt.westlaw.com/calregs/Document/IB93A33F77D104879A1E78D4A415DBBF6?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default) and https://web.archive.org/web/*/https://govt.westlaw.com/calregs/Document/I29898BC27579472F89C1ABEB9C3E842A?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

We acknowledge that there is substantial overlap in parameters (values are sometimes the same and sometimes different) between these tables and the other portions of the Pulikla WQO, in particular the Human Health Criteria section (which is based largely on U.S. EPA's National Recommended Water Quality Criteria), but for the sake of ease of future updates to the WQO, we decided to keep the tables separate so they can be replaced in their entirety during future updates, rather than try to blend them together with the Human Health Criteria. Section 505(J) of the WQO includes language to address this overlap: "If multiple numeric water quality criteria are presented for the same parameter, then the more stringent criteria shall apply."

The proposed *E. coli* drinking water criteria in (ii) for groundwaters with a designated use of MUN are designed to protect human health. As noted in Section 501 of the WQO "The Tribe recognizes that groundwater is not considered Waters of the United States for Clean Water Act (CWA) regulatory purposes. The Tribe will regulate groundwater quality using its own legal authorities outside the CWA."

Water Temperature

Proposed objectives:

Section 505(F) *Temperature criteria*.

(1) The natural receiving water temperatures shall not be altered unless it can be demonstrated to the satisfaction of the WRD that such alteration in temperature does not adversely affect beneficial uses.

(2) At no time or place shall the temperature of any cold freshwater habitat (COLD) water be increased by more than 2.8°C (5.0°F) above natural receiving water temperature.

(3) In all flowing waterbodies during the September-June period of salmonid spawning and incubation, the seven-day average of daily maximum temperatures (7DADM) shall not exceed 13°C (55°F)

(4) Site-specific temperature criteria are listed in Section 512(B).

Section 512(B) *Water temperature*. The seven-day average of daily maximum (7DADM) ambient water temperatures shall not exceed the site-specific criteria listed in Table 4, year-round. These objectives are for ambient water temperatures that represent the main portion of flow and therefore cannot be solely met by the presence of localized cold water refugia.

Table 1. Year-round water temperature objectives for Reservation waterbodies.

Waterbody	Salmonid Uses During Summer Maximum Temperature Conditions	Ambient Temperature Objective (7DADM[1])
Klamath River	Salmon and trout rearing and migration	18°C (64°F)
All other streams	Core cold water rearing[2]	16°C (61°F)

[1]7DADM = Seven-day average of daily maximum temperatures

[2]The use of the phrase "Core cold water rearing" for "All other streams" is not intended to suggest that the Klamath River lacks the potential to provide critically important salmonid rearing habitats during the summer months. The difference in designation here only reflects the understanding that large rivers are naturally expected to be warmer than smaller streams in the summer, due to the longer distance along which the water has been exposed to warming.

Justification:
The proposed criteria in 505(F)(1) and 505(F)(2) are based on the NCRWCB (2018) Basin Plan. We converted the NCRWQCB 5°F to 2.8°C because a difference of 5°F is the same as a difference of 2.8°C. The formula for converting F to C is: (F-32) × 5/9. The 32 is an intercept, so when calculating temperature differences, only the slope (i.e., 5/9) applies. For example, 70°F = 21.1°C and 75°F = 23.9°C. Another example is 40°F = 4.4°C and 45°F = 7.2°C.

The proposed criteria in 505(F)(3), 505(F)(4), and 512(B) are based on U.S. EPA's (2003) Region 10 guidance to states and tribes for establishing temperature water quality standards in the Pacific Northwest.

Sediment and Turbidity

Proposed objectives:

Section 505(H) *Sediment and turbidity criteria*.

(1) Sediment: The suspended sediment load and suspended sediment discharge rate to surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

(2) Turbidity: Turbidity shall not be increased more than 20 percent above naturally occurring background levels. Allowable zones of dilution within which higher percentages can be tolerated may be defined for specific discharges upon the issuance of discharge permits or waiver thereof.

Justification:
The proposed criteria in 505(H) are identical to the sediment and turbidity criteria in the NCRWCB (2018) Basin Plan.

Biological Criteria

Proposed objectives:

(E) *Biological Criteria*. The following biological criteria shall apply to the waters of the Reservation.

(1) All surface waters shall be of sufficient quality to support aquatic biota without detrimental changes in the resident aquatic communities;

(2) Waters of the Reservation shall be free from substances, whether attributable to point source discharges, nonpoint sources or instream activities, in concentrations or combinations which would impair the structure or limit the function of the resident aquatic community as it naturally occurs;

(3) The structure and function of the resident aquatic community shall be measured by biological assessment methods approved by the TWQCO.

(4) Determination of impairment or limitation of the resident aquatic community may be based on comparison with the aquatic community found at an appropriate reference site or region.

Justification:
The wildlife criteria were included in the original 2002 Pulikla WQO. Similar criteria have been included in WQS previously approved by U.S. EPA (Port Gamble S'Klallam Tribe 2002). These narrative biological criteria will protect and maintain the ecosystem.

Wildlife Criteria

Proposed objectives:

(F) *Wildlife Criteria*. All surface waters shall be of sufficient quality to protect and support all life stages of resident or migratory wildlife species which lie in, on or near the waters of the Reservation.

Justification:
The wildlife criteria were included in the original 2002 Pulikla WQO. Similar criteria have been included in WQS previously approved by U.S. EPA (Port Gamble S'Klallam Tribe 2002). These narrative wildlife criteria will protect and maintain the ecosystem.

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As noted in the *Water Quality Criteria for Most Parameters* section above, the numeric water quality criteria in the 2025 Pulikla WQO are very similar to those proposed by the Quartz Valley Indian Reservation (QVIR 2024). Jacob Kann and Laurel Genzoli assisted with the development of QVIR's WQS and supporting documentation (Asarian et al. 2024), especially the bacteria and cyanobacteria sections.

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