**Staff Report**

# Proposed Amendment to the Los Angeles Water Quality Control Plan (Basin Plan) – To incorporate 2013 United States Environmental Protection Agency "Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater" in the Los Angeles Region

**April 2023**

**Los Angeles Regional Water Quality Control Board**

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## List of Abbreviations

CMC - Criterion Maximum Concentration

CCC - Criterion Continuous Concentration

CWA - Clean Water Act

ELS - Early Life Stages

EC - Effective Concentration

GMAV - Genus Mean Acute Value

GMCV - Genus Mean Chronic Value

LC - Lethal Concentration

POTW - Publicly Owned Treatment Work

NOEC - No-Observed -Effect-Concentration

NPDES - National Pollutant Discharge Elimination System

SMAC - Species Mean Acute Value

SMCV - Species Mean Chronic Value

SSO - Site-specific Objective

TAN/L - Total Ammonia (as) Nitrogen per Liter

TMDL - Total Maximum Daily Load

U.S. EPA - United States Environmental Protection Agency

US - United States

WQS - Water Quality Standards

## 1. Executive Summary

Ammonia ($NH_3$) is a pollutant commonly found in the wastewater effluent of wastewater treatment plants, some industries, landfill leachate, and agricultural and urban runoff. Due to ammonia's toxicity to aquatic life, the Water Quality Control Plan for the Los Angeles Region (Basin Plan) contains ammonia water quality objectives for the protection of all inland surface waters (including enclosed bays, estuaries, and wetlands) in the Region.

The Basin Plan's current ammonia objectives were adopted on April 25, 2002 (Resolution No. 2002-011). The objectives are based on the 1999 United States Environmental Protection Agency (U.S. EPA) ammonia criteria. The 1999 acute (one-hour average) ammonia criteria were determined by the presence of salmonids, adjusted for pH values, while the chronic (30-day average) ammonia criteria were adjusted for both temperature and pH based on their effects on fish early life stages (ELS). As more data on ammonia toxicity became available, U.S. EPA published *Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater, 2013* in order to provide updated scientific recommendations to states and tribes to protect aquatic life from acute and chronic effects of ammonia in freshwater (2013 U.S. EPA ammonia update). In the 2013 U.S. EPA ammonia update, ammonia criteria depend on the presence or absence of sensitive species (i.e., unionid mussels and salmonids for acute objectives and unionid mussels and fish early life stages (ELS) for chronic objectives). Both acute and chronic objectives are adjusted for pH, and temperature.

The Los Angeles Regional Water Quality Control Board (Los Angeles Water Board) worked with the University of California Santa Barbara to determine the presence of unionid mussels in the Los Angeles Region. Because visual and molecular surveys showed that unionid mussels have been extirpated from the waters of the Los Angeles Region, Los Angeles Water Board staff proposes the following ammonia criteria:

1. For the acute ammonia objective, water quality objectives with either salmonids present or salmonids absent will be implemented. All inland surface waters (including enclosed bays, estuaries, and wetlands) in the Los Angeles Region that are not designated with cold-water habitat (COLD) and/or migratory (MIGR) beneficial uses are subject to the mussels absent and salmonids absent scenario. Conversely, water bodies that are designated with cold-water habitat (COLD) and/or migratory (MIGR) beneficial uses are subject to the mussels absent and salmonids present scenario.

2. For the chronic ammonia objective, all inland surface waters (including enclosed bays, estuaries, and wetlands) in the Los Angeles Region are subject to the mussels absent and fish ELS present scenario at all times of the year, except for a few water bodies that have site specific objectives (SSOs) with

seasonal fish ELS. In these water bodies, the mussels absent and fish ELS absent scenario would apply during certain times of the year.

If unionid mussels are found in a particular water body in the future, the site-specific mussels present scenario will then be implemented for that particular water body.

This staff report includes: the history of ammonia objectives in the Los Angeles Region, calculation procedures to determine the proposed objectives, comparison between the proposed and the existing objectives, and implementation considerations.

To protect aquatic life according to the latest scientific findings, Los Angeles Water Board staff proposes that the Los Angeles Water Board amend the current ammonia objectives in the Basin Plan with the new objectives based on the 2013 U.S. EPA ammonia update.

## 2. Introduction

### 2.1. Background

Ammonia is one of several forms of nitrogen that can be found in water. Unlike other forms of nitrogen, ammonia causes direct toxic effects to aquatic organisms, although plants and animals have different sensitivity to ammonia. When present at high enough concentrations in water, it makes it difficult for aquatic animals to sufficiently excrete the toxicant, leading to toxic buildup in internal tissues and blood, and potentially death. Aquatic plants are approximately two orders of magnitude less sensitive than animals. In water, ammonia toxicity is affected by environmental factors such as pH and temperature (U.S. EPA 2013).

Ammonia is a pollutant routinely found in the effluent of wastewater treatment plants, municipalities, some industries, landfill leachate, and agricultural, landscape and golf course runoff. Ammonia may also come directly from excretion of nitrogenous wastes from animals, including wildlife and indirect means such as decomposition, forest fire, nitrogen fixation by microbes, lightning, and deposition from the atmosphere (U.S. EPA 2013).

Per the 2018 California Integrated Report, ammonia is included on California's list of impaired waters, known as the 303(d) List, as impairing beneficial uses in 28 waterbodies in the Los Angeles Region. The 303(d) List includes eight reaches in Calleguas Creek, four reaches in Los Angeles River, as well as several other reaches and lakes.

In California, water quality standards (WQS) consist of beneficial uses (equivalent to the federal term "designated uses"), narrative and numeric water quality objectives (equivalent to the federal term “water quality criteria”), and an anti-degradation policy,. The Los Angeles Water Board is the California state agency responsible for reviewing, establishing, revising, and enforcing water quality objectives that protect beneficial uses of surface and ground waters in the Los Angeles Region. WQS and implementation programs are set forth in the “Water Quality Control Plan for the Los Angeles Region” (Basin Plan).

The beneficial uses in the Basin Plan that are protected by ammonia water quality objectives include the aquatic life beneficial uses, which are:

**Warm Freshwater Habitat (WARM**) Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

**Cold Freshwater Habitat (COLD)** Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

**Estuarine Habitat (EST)** Uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds).

**Wetland Habitat (WET)** Uses of water that support wetland ecosystems, including, but not limited to, preservation or enhancement of wetland habitats, vegetation, fish, shellfish, or wildlife, and other unique wetland functions which enhance water quality, such as providing flood and erosion control, stream bank stabilization, and filtration and purification of naturally occurring contaminants.

**Marine Habitat (MAR)** Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).

**Wildlife Habitat (WILD)** Uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

**Migration of Aquatic Organisms (MIGR)** Uses of water that support habitats necessary for migration, acclimatization between fresh and salt water, or other temporary activities by aquatic organisms, such as anadromous fish.

**Spawning, Reproduction, and/or Early Development (SPWN)** Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Ammonia water quality objectives are specific to which beneficial uses are being protected and which species are present. For example, ammonia concentrations need to be lower in waters designated as COLD than in waters with other beneficial uses because salmonids are presumably present in waters designated as COLD. Salmonids are highly sensitive to ammonia. The beneficial use MIGR is also used to indicate the salmonid present condition. Salmonids are anadromous fish; they migrate from freshwater to the ocean to feed and grow, then return from the ocean to freshwater to spawn. Ammonia objectives are also determined by the presence of fish early life stages (ELS), which are associated with the SPWN beneficial use. Fish ELS are highly sensitive to ammonia. However, SPWN does not cover the entire range of waterbodies considered to have the ELS present condition. Los Angeles Water Board Resolution No. R05-014 amended the Basin Plan to revise the ELS implementation provision of the freshwater ammonia objectives for inland surface waters. R05-014 explained that the statewide SPWN designation is reserved for high quality habitat. The ELS present condition, however, can be found in waters that are not necessarily “high quality” habitats.

Because ammonia is toxic to aquatic life, the United States Environmental Protection Agency (U.S. EPA) Office of Water provides recommendations on criteria as necessary to protect aquatic life in surface waters of the United States. There are two types of ammonia criteria: acute and chronic. For ammonia, acute criteria refer to the LC50 and EC50. LC stands for “Lethal Concentration” and the LC50 is the concentration of a chemical that is estimated to kill 50% of the test organisms. EC stands for “Effective Concentration” and the EC50 is the concentration of a chemical that is estimated to produce a specific effect in 50% of the test organisms. Meanwhile, chronic criteria for ammonia refer to the EC20. EC20 is the concentration of a chemical that is estimated to result in a 20% effect in a chronic endpoint (e.g., growth, reproduction, and survival) of the test organisms. The durations for these criteria were one-hour (acute) and 30-day (chronic) averaging periods (U.S. EPA 2013).

The first ammonia criteria recommendations were published by U.S. EPA in 1976, followed by a revision in 1984. In 1999, U.S. EPA issued an update to the 1984 criteria to include newer toxicity data from the most sensitive organisms as understood at that time. The 1999 acute criterion magnitude (also known as the CMC, criterion maximum concentration) was based on fish, adjusted for different pH values. Temperature[1] was not adjusted in the 1999 CMC because invertebrates in the dataset were not highly sensitive to ammonia. Only the chronic criterion magnitude (also known as the CCC, criterion continuous concentration) was adjusted for both temperature and pH based on its effects on benthic macroinvertebrate *Hyalella* or fish ELS.

[1] Unless it is specified, ‘temperature’ in this document always refers to ‘water temperature’.

In 2004, as more data on ammonia toxicity became available, U.S. EPA notified the public that they intended to re-evaluate the freshwater ammonia criteria (U.S. EPA 2013). In 2009, U.S. EPA published a draft of ammonia criteria that included all new toxicity data, particularly from sensitive freshwater mollusks.[2] The new acute dataset was derived from 67 genera compared to only 34 genera in the 1999 U.S. EPA acute ammonia criteria. The 67 genera included 20 new species of freshwater mollusks in the 2009 criteria compared to three species in the 1999 U.S. EPA ammonia criteria. The new chronic ammonia criteria were derived from 16 genera, including four new species of freshwater mollusks, compared to only 10 genera in the 1999 U.S. EPA ammonia criteria, which only included one freshwater mollusk species. Based on the new datasets, U.S. EPA concluded that the overall sensitivity of unionid mussels, freshwater clams, and non-pulmonate snails to ammonia is high.

In the 2013 U.S. EPA *Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater* (or 2013 ammonia criteria or 2013 ammonia update), U.S. EPA recommended a national CMC and CCC for ammonia in all waters because "all states have at least one freshwater unionid mussel or bivalve mollusk, or non-pulmonate snail species." These criteria are adjusted based on the same pH and temperature relationships that were used in the 1999 U.S. EPA ammonia criteria.

At pH 7, the national CMC should be protective of: 1) freshwater unionid mussels when water temperatures are higher than 15.7°C, and 2) salmonids[3] and other fish when water temperatures are lower than 15.7°C.

At pH 7, the national CCC should be protective of freshwater mollusks, particularly unionid mussels, at any temperature.

A detailed comparison of 1999 and 2013 ammonia criteria is set forth in Table 1, below.

**Table 1. Comparison of the Ammonia Criteria based on the 1999 U.S. EPA Ammonia Criteria Currently in the Basin Plan and the Proposed Ammonia Criteria Based on the Updated 2013 Ammonia Criteria**

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[2] A large phylum of invertebrates which includes snails, slugs, mussels, clams etc. They have a soft unsegmented body and live in aquatic or damp habitats, and most kinds have an external calcareous shell.

[3] A group of fish species in the order Salmoniformes that include salmon, trout, chars, freshwater whitefishes, and graylings

| 1999 Ammonia Criteria[4] | 2013 Ammonia Criteria |
|---|---|
| 1. Acute criteria are not temperature-dependent but are dependent on pH and fish species present. | 1. Acute criteria depend on both temperature and pH, and the presence or absence of freshwater mussels and *Oncorhynchus* (salmonids) species |
| 2. Recognition of the temperature dependence of the chronic criteria, especially at low temperatures. | 2. Recognition of the temperature dependence of both the acute and chronic criteria, especially at high temperatures – invertebrates are more sensitive to ammonia at higher temperatures. |
| 3. The fish ELS chronic criteria were introduced. | 3. The fish ELS chronic criteria are maintained. |
| 4. Chronic criteria are not dependent on the presence or absence of specified fish species, but are dependent on pH and temperature. | 4. Chronic criteria depend on the presence of freshwater mussels or, in their absence, on fish ELS (Figure 1), and remain dependent on pH and temperature. |
| 5. A 30-day averaging period for the ammonia chronic criteria. | 5. A 30-day averaging period for the ammonia chronic criteria is maintained, but the maximum value should not exceed 2.5 times the CCC as a 4-day average within the 30-day averaging period. Criteria values not to be exceeded more than once in three years on average. |

As the national 2013 ammonia criteria are based primarily on the presence of unionid mussels, in 2017 and 2018 the Los Angeles Water Board staff worked with researchers from the University of California, Santa Barbara to determine the status of unionid mussels in Los Angeles and Ventura Counties (*Assessing the Status of Native Freshwater Mussels (Unionidae) in Los Angeles & Ventura Counties*, 2018, or "2018 mussel survey" by Wilson et al. 2018, included as Appendix 1). Sites that were surveyed in 2017 and 2018 represent the following major watersheds, including both mainstems and major tributaries: the Los Angeles River watershed, San Gabriel River watershed, and various streams in the Santa Monica Mountains in Los Angeles County, as well as

[4] Based on page 4, Final Staff Report (Proposed Amendment of the Water Quality Control Plan – Los Angeles Region – To revise ammonia objectives for inland surface waters - April 25, 2020)

the Ventura River, Santa Clara River, and Calleguas Creek in Ventura County. Sites with historical records of native mussels were also included.

The visual and molecular surveys conducted in 2017 indicate that mussels[5] have been extirpated due to reasons other than water quality impairments (2018 mussel survey by Wilson et al. 2018, included as Appendix 1). These results are consistent with a review by Howard et al. (2015), which included field surveys conducted in 2008 and 2009 and other prior surveys in Southern California. Records of native mussels in the Los Angeles and Ventura Counties are few and dated back to the early 20th century. Since then, the Los Angeles Region has experienced extensive alterations of regional rivers that historically supported mussels (e.g., channelization of the Los Angeles and San Gabriel Rivers). Furthermore, mussels have a parasitic larval stage that is reliant on a fish host. Declining populations of native fishes in the Los Angeles Region contributed to the decline of native mussels to the extent of extirpation. Frequent drought also decimated freshwater mussels that require perennial availability of water for survival. Malibou Lake, an artificial reservoir located in the Santa Monica Mountains, once had supported a population of California floater (*Anodonta californiensis/nuttaliana*) until the 2016 storms smothered the adult mussels and subsequent fish die-offs observed in early 2017 eliminated mussel larvae. No evidence of live mussels was found using subsequent visual and repeated molecular surveys in the area. There are no historical records of *Anodonta* in the Santa Monica Mountains, and it is likely that this remnant population was introduced through fish stocking (2018 mussel survey by Wilson et al. 2018, included as Appendix 1).

Per the *Flexibilities for States Applying EPA's Ammonia Criteria Recommendation* (U.S. EPA 2013b), a state can use the recalculation procedure to remove mussels from the dataset if the state can demonstrate that they are not present on a site-specific basis. In addition, U.S. EPA regulations (40 CFR § 131.11(b)(1)(ii)) provide states with the option to adopt water quality criteria that are "…modified to reflect site-specific conditions." This approach allows site-specific criteria to better represent the species present at the site. When determining the absence of species, *The Revised Deletion Process for the Site-specific Calculation Procedure for Aquatic Life Criteria* (U.S. EPA 2013c) does not include species as "resident" or "occur at the site" when the species (including its life stages) "were once present at the site but cannot exist at the site now due to permanent alterations of the habitat or other conditions that are not likely to change within reasonable planning horizons."

When unionid mussels are absent, the recalculation procedures for acute criteria per the 2013 ammonia update are determined by the presence or absence of commercially,

[5] Unless it is specified, the term "mussel" or "mussels" in this report always refers to native freshwater unionid mussel(s)

historically and recreationally important adult salmonids from the genus *Oncorhynchus*, which represent federally-listed species. Therefore, since there is not a single waterbody that currently supports mussels in Los Angeles and Ventura Counties (Wilson et al. 2018), water quality objectives for acute ammonia based on 'mussels absent' with either salmonids present or salmonids absent will be implemented for all water bodies in the region. In addition, water quality objectives for chronic ammonia based on 'mussels absent' with either fish ELS present or fish ELS absent will be implemented for all water bodies in the region (Figure 1).

In the future, if new data show that mussels are found in a particular water body in Los Angeles and Ventura Counties, then site-specific mussels present objectives will be implemented for that particular water body. The assignment of water body reach subject to mussel present condition will be approved through a separate Basin Plan amendment process.

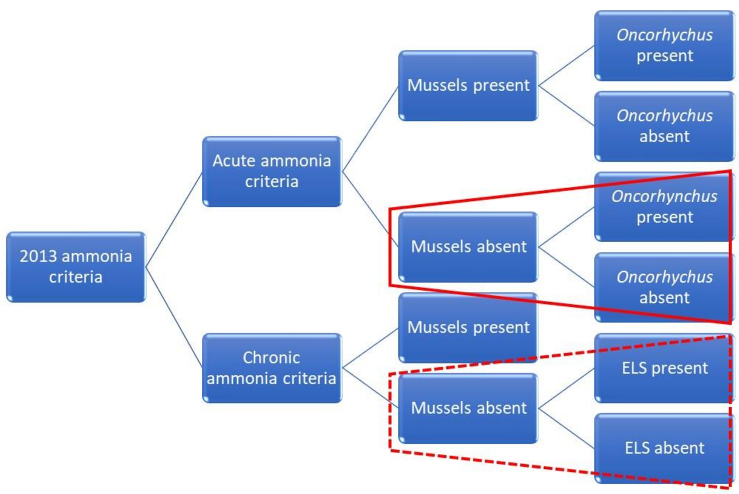


**Figure 1. Flow diagram that depicts the selection of ammonia criteria based on 2013 ammonia update. Scenarios in red indicate acute (solid line) and chronic (dashed line) ammonia criteria that would be implemented to water bodies the Los Angeles Region.**

## 2.2. Purpose of a Basin Plan Amendment

The Clean Water Act (CWA) section 304(a) requires U.S. EPA to update water quality criteria that accurately reflect the latest scientific knowledge. The finalized criteria serve as guidelines to States, Territories and Tribes in adopting water quality standards necessary to protect designated uses of water bodies under section 303(c) of the CWA. However, U.S. EPA's criteria are not regulations, nor do they automatically become part of regional water quality objectives. To incorporate new U.S. EPA recommendations for water bodies in the Los Angeles Region, the Los Angeles Water Board must adopt the updated 2013 ammonia criteria as a Basin Plan amendment.

The 2013 ammonia update contains U.S. EPA's most recent freshwater aquatic life criteria for ammonia. Therefore, this proposed amendment updates the existing ammonia objectives outlined in the Basin Plan for all inland surface waters[6]. The purpose of this amendment is to protect beneficial uses by adopting acute and chronic ammonia objectives specific to the Los Angeles Region that will provide the same level of protection for aquatic life that is intended by the nationally derived CMC and CCC.

### 3. Summary of Proposed Amendments to Update the Current Ammonia Criteria

This proposed Basin Plan amendment will incorporate the 2013 ammonia criteria guidance and change the acute (1-hour average) and chronic (30-day average) ammonia objectives of inland surface waters in Chapter 3 of the Basin Plan. The proposed water quality objectives for ammonia take into account differences that affect the toxicity of ammonia between water bodies that have different beneficial uses.

Los Angeles Water Board staff proposes to implement the following ammonia criteria:

1. For the **acute** (1-hour average) ammonia objectives, all inland surface waters in the Los Angeles Region will be subject to the mussels absent and salmonids absent scenario, except for water bodies that support salmonids.

In the Basin Plan, "it is assumed that salmonids may be present in waters designated in the Basin Plan, as COLD or MIGR and that salmonids are absent in waters not designated in the Basin Plan as COLD or MIGR, in the absence of additional information to the contrary[7]." Therefore, in waters designated as COLD or MIGR, acute ammonia objectives will be based on the mussels absent and salmonids present scenario to protect the commercially, recreationally and historically important adult salmonid species, the most acutely sensitive species in the absence of mussels.

If in the future mussels are found in a particular water body, then the site-specific mussels present scenario, either with salmonids present or salmonids absent, will be implemented to that particular water body.

[6] Inland surface waters include enclosed bays, estuaries, and wetlands.
[7] Chapter 3. Water Quality Objectives

2. For the **chronic** (30-day average) ammonia objectives, all inland surface waters in the Los Angeles Region will be subject to mussels absent and fish ELS present scenario, except for water bodies that only support seasonal fish ELS.

When mussels are absent, the most sensitive organisms to chronic ammonia exposure are fish ELS. Fish ELS are presumptively present and must be protected at all times of the year unless the water bodies have a site-specific or seasonal objective. Site specific objectives for ammonia are listed in Table 3-4 of the Basin Plan.

If in the future mussels are found in a particular water body, then the site-specific mussels present scenario will be implemented for that waterbody. The assignment of water body reach subject toa mussel present condition to a waterbody will be approved through a separate Basin Plan amendment process. Because chronic ammonia objectives based on the mussel present scenario are far less than all chronic values for fish ELS, modification of the objective for ELS present or absent will not be required.

This proposed Basin Plan amendment will also update Table 3-4 and remove Table 3-5 of the Basin Plan.

Basin Plan Table 3-5 is "Water Bodies Subject to 30-day Average Objective Applicable to "ELS Absent" Condition." Basin Plan Table 3-5 notes that:

> *Based on published literature and expert opinion, fish species known to reproduce in significant numbers below 15 degrees Celsius are absent in these water bodies, or the water bodies are known to have physical conditions that preclude reproduction and early development of these species in significant numbers. These species include: steelhead/rainbow trout, three-spine stickleback, brown trout, prickly sculpin, staghorn sculpin, striped mullet, starry flounder, arrow goby, and Pacific lamprey.*

The current chronic ammonia objective (based on the 1999 U.S. EPA ammonia criteria) is relaxed (i.e., less stringent) at temperatures less than 15°C (59°F) when ELS are not present. The proposed ammonia criteria, however, relax the chronic ammonia objective at the higher temperature of less than 23°C (73.4°F) when ELS are not present. Since the number of fish species that reproduce at temperatures less than 15°C (current criteria) is only a subset of fish species that reproduce at temperatures less than 23°C (proposed criteria), and the number of fish species that reproduce at temperatures less than 23°C include potentially all fish species that reproduce in the Los Angeles Region, the proposed amendment will also remove Table 3-5 from the Basin Plan to ensure adequate protection for developing fish.

In addition, while Basin Plan Table 3.5 also included waterbodies which have "*physical conditions that preclude reproduction and early development of these species…*" (i.e. are concrete-lined), there could be some deposition of natural substrate material, on an interim basis, in a concrete-lined channel that could provide limited habitat for reproduction and early development. Additionally, free floating larval stages considered a part of the early development stages could float into concrete lined channels from more natural upstream reaches. Therefore, fish ELS would be presumably present in all streams in the Los Angeles Region and must be protected at all times of the year unless the water body is subject to seasonal ELS present condition listed in Table 3-4 of the existing Basin Plan, or in the case where a site-specific study is conducted to support a Basin Plan amendment applying the ELS absent condition or a seasonal ELS present condition.

Basin Plan Table 3-4 is "Site-Specific 30-day Average Objectives for Ammonia by Waterbody Reach." This table establishes the equations to calculate the chronic objectives depending on the applicable season for 12 waterbodies. The seasonal difference is because, in some waterbodies, the winter season does not require protection of ELS. These site-specific objectives (SSOs) were developed using the Water Effect Ratio (WER) approach. However, the WER method is no longer recognized in the 2013 ammonia update and therefore WER SSOs will be superseded by the proposed chronic ammonia objectives, but with the same seasonal application for the protection of ELS. In addition, waterbodies in Table 3-4 that did not protect for ELS year-round will be changed to a seasonal protection of ELS.

Some ammonia implementation provisions in the Basin Plan are not proposed for changes and these include *Determination of Freshwater, Brackish Water or Saltwater Conditions*, provisions for *Existence of Threatened or Endangered Species*, provisions for *Translation of Objectives into Effluent Limits*, and provisions for *Receiving Water Compliance Determination*.

## 4. Proposed Objectives for Ammonia

Ammonia exists in two forms in water: the un-ionized ammonia ($NH_3$) and the ammonium ion ($NH_4^+$). The total concentration of ammonia (often expressed on the basis of nitrogen as total ammonia nitrogen or TAN) is the sum of $NH_4^+$ and $NH_3$ concentrations. Both $NH_4^+$ and $NH_3$ are toxic, but the un-ionized form ($NH_3$) is more toxic to aquatic life. Because the ratio of $NH_3$ to $NH_4^+$ in water increases with pH and/or temperature, high pH and/or high temperature leads to higher $NH_3$ and higher toxicity. The typical toxicity effects for aquatic life criteria are based on adverse ammonia effects on growth, reproduction, or survival of different species. These species are ranked to form sensitivity distributions, from which toxicity criteria are derived. A detailed description of the proposed acute and chronic ammonia objectives for the Los Angeles Region will be discussed in the next two subsections.

The acute ammonia objective subsection will include a detailed description of the calculation of the objective for four scenarios:

1) Mussels absent and salmonids present,
2) Mussels absent and salmonids absent,
3) Mussels present and salmonids present, and
4) Mussels present and salmonids absent.

The chronic ammonia objective subsection will include a detailed description of the calculation of the objective for three scenarios:

1) Mussels absent and Early Life Stages (ELS) present,
2) Mussels absent and ELS absent, and
3) Mussels present.

While the 2018 mussel survey found no unionid mussels in the Los Angeles Region (i.e., all waterbodies in the Los Angeles Region are *mussels absent*), if in the future mussels are found, the 2013 ammonia update also provides equations for mussel present scenario.

### 4.1. Acute Ammonia Objectives

In the 2013 ammonia update, U.S. EPA determined acute ammonia criteria based on the LC50 or EC50 tests of different species. For each species for which more than one acute value was determined in an LC50 or EC50 test, the Species Mean Acute Value (SMAV) was calculated as the geometric mean of the acute values from all tests. For each genus for which more than one SMAV was available, the Genus Mean Acute Value (GMAV) was calculated as the geometric mean of SMAVs available for the genus. The GMAVs were then numerically ordered from the most to the least sensitive (Appendix 2).

Although the 1999 U.S. EPA ammonia criteria noted the increasing sensitivity of invertebrates to ammonia with increasing temperature, the criteria did not include temperature dependence as part of the criteria calculations because the tested invertebrates were tolerant, in general, to acute ammonia exposures. Consequently, the 1999 acute ammonia criteria are only dependent on pH. However, for the 2013 ammonia update, additional invertebrates were tested; invertebrate sensitivity still showed a temperature dependence and now represented the most sensitive GMAVs. Therefore, invertebrate temperature sensitivity could not be disregarded and in the 2013 ammonia criteria, CMC calculation changes with temperature. In addition, the CMC remains pH-dependent based on the acute pH-toxicity relationship for all aquatic organisms.

For the acute (1-hour average) ammonia objective, the 2013 ammonia update includes a choice between two equations to calculate the acute criteria when mussels are absent, depending on the presence or absence of salmonid species and a choice between two equations when mussels are present, depending on the presence or absence of salmonid species.

### 4.1.1. Mussels absent and salmonids present

U.S. EPA determined the 2013 acute ammonia criteria based on the GMAVs of 69 genera, ranked from the most to the least sensitive (Appendix 2). The four most sensitive GMAVs (closest to the 5$^{th}$ percentile of the distribution) were then used to calculate the final acute value (FAV). The CMC was calculated by dividing the FAV by two, which should be lower than the lowest GMAV and should protect nearly all individuals in 95% of all genera.

At pH 7, the relationship between CMC and temperature can be expressed as Equation [1]:

$$CMC = MIN\left(24.10, \left(45.05 \times 10^{0.036\times(20-T)}\right)\right)$$

[Equation 1]

where T is temperature and MIN is the selection of the minimum value and of either 24.10 or $\left(45.05 \times 10^{0.036\times(20-T)}\right)$

When salmonids are present, the CMC is based on the FAV protective of the species (48.21 mg TAN/L) divided by two, or 24.10 mg TAN/L. This value remains constant from 0°C to 27.5°C to protect salmonids, which is the most sensitive species group in this temperature range. The 45.05 mg TAN/L value in Equation 1 is equivalent to 0.7249 (the CMC – 17 mg TAN/L – divided by the lowest GMAV – 23.41 mg TAN/L for *Lasmigona subviridis* – in the complete acute dataset[8]) multiplied by the GMAV of pebblesnail or *Fluminicola* sp. (62.15 mg TAN/L) (Appendix 2).

At higher temperatures, the magnitude of CMC is determined by the most sensitive invertebrate other than mussels, the pebblesnail (*Fluminicola* sp.), because invertebrates

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[8] *Lasmigona subviridis* is the second most sensitive GMAV in the acute 2013 dataset. The most sensitive species, *Venustaconcha ellipsiformis* (GMAV=23.12 mg TAN/L), is not included in the analysis, because it falls below the 5th percentile in sensitivity distribution of 69 genera.

are increasingly more acutely-sensitive to ammonia as temperature increases. Therefore, at temperatures greater than 27.5°C, the CMC of salmonids present becomes similar to the CMC of salmonids absent (see Figure 2, page 21).

Where mussels are absent and salmonids are present, the CMC can be extrapolated across both temperature and pH using the Equation [2] (extrapolated values are provided in Appendix 6):

$$CMC = MIN(\left(\frac{0.275}{1 + 10^{7.204-pH}} + \frac{39}{1 + 10^{pH-7.204}}\right), \left(0.7249 \times \left(\frac{0.0114}{1 + 10^{7.204-pH}} + \frac{1.6181}{1 + 10^{pH-7.204}}\right) \times (62.15 \times 10^{0.036 \times (20-T)})\right))$$

[Equation 2]

where T is temperature and MIN is the selection of the minimum value.

### 4.1.2. Mussels absent and salmonids absent

If both unionid mussels and *salmonid* are absent, the CMC is calculated based on the following four most sensitive GMAVs, from the most sensitive to the least sensitive: mountain whitefish (*Prosopium williamsoni*) – a salmonid, Lost River sucker (*Deltistes luxatus*) – a federally listed species, pebblesnail (*Fluminicola* sp.), and golden shiner (*Notemigonus crysole ucas*) (Appendix 3). In the 2013 ammonia update[9], U.S. EPA also specified that when both mussels and salmonids are absent, criteria derivation should: "1) retains all tested species in the Order Salmoniformes as tested surrogate species representing untested freshwater fish resident in the U.S. from another Order; and 2) maintains the SSD [species sensitivity distribution] relationship from the complete acute dataset (i.e., CMC is equal to the lowest GMAV multiplied by 0.7249)."

At pH 7, the CMC and temperature relationship is expressed as Equation [3]:

$$CMC = 0.7249 \times MIN(51.93, (62.15 \times 10^{0.036 \times (20-T)}))$$

[Equation 3]

where T is temperature and MIN is the selection of the minimum value.

The ammonia concentration of 51.93 mg TAN/L is the lowest GMAV of *Prosopium* sp. and 62.15 mg TAN/L is the GMAV of invertebrate *Fluminicola* sp. At temperatures

[9] Appendix N. Site-specific criteria for ammonia

between 0°C and 22.1°C, the formula produces a constant CMC of 37.65 mg TAN/L, which is protective of the most sensitive fish, *Prosopium* sp. At higher temperatures, invertebrate pebblesnail (*Fluminicola* sp.) becomes the most sensitive GMAV, and the CMC decreases with increasing temperature (see Figure 2, page 21).

The CMC can be extrapolated across both temperature and pH using Equation [4] (extrapolated values are provided in Appendix 6):

$$CMC = 0.7249 \times \left(\frac{0.0114}{1 + 10^{7.204-pH}} + \frac{1.6181}{1 + 10^{pH-7.204}}\right) \times MIN(51.93, \left(62.15 \times 10^{0.036\times(20-T)}\right))$$

[Equation 4]

where T is temperature and MIN is the selection of the minimum value.

### 4.1.3. Mussels present and salmonids present

When mussels are present in water bodies that also support salmonids, the adult rainbow trout is the most sensitive species at low temperatures. However, invertebrates, including mussels, become the more sensitive species to ammonia as temperature increases. The CMC at pH 7, using Equation [5], thus equals the lower of: 1) the FAV protective of adult rainbow trout (48.21 mg TAN/L) divided by two or 24.10 mg TAN/L or, 2) 0.7249 times the temperature adjusted lowest invertebrate GMAV (i.e., *Venustaconcha*, which has a GMAV of 23.12 mg TAN/L; Appendix 2):

$$CMC = MIN\ (24.10, \left(0.7249 \times 23.12 \times \left(10^{0.036\times(20-T)}\right)\right))$$

Equation [5]

where T is temperature and MIN is the selection of the minimum value.

The CMC can be extrapolated across different temperatures and pH using Equation [6], below (extrapolated values are provided in Appendix 6):

$$CMC = MIN(\left(\frac{0.275}{1 + 10^{7.204-pH}} + \frac{39}{1 + 10^{pH-7.204}}\right), \left(0.7249 \times \left(\frac{0.0114}{1 + 10^{7.204-pH}} + \frac{1.6181}{1 + 10^{pH-7.204}}\right) \times \left(23.12 \times 10^{0.036\times(20-T)}\right)\right))$$

Equation [6]

where T is temperature and MIN is the selection of the minimum value.

### 4.1.4. Mussels present and salmonids absent

Where salmonid species are absent, U.S. EPA retains all other tested species in the Order Salmoniformes, including *Prosopium* in the salmonid absent calculations. At pH 7, the CMC equals Equation [7], the lower of: 1) 0.7249 multiplied by the temperature adjusted lowest invertebrate GMAV (i.e., *Venustaconcha*, which has a GMAV of 23.12 mg TAN/L) or 2) 0.7249 multiplied by the lowest freshwater fish GMAV (i.e., *Prosopium*, which has a GMAV of 51.93 mg TAN/L):

$$CMC = 0.7249 \times MIN(51.93, 23.12 \times 10^{0.036 \times (20-T)})$$

Equation [7]

where T is temperature and MIN is the selection of the minimum value.

The CMC increases with decreasing temperature as a result of increased invertebrate insensitivity until it reaches a plateau of 37.65 mg TAN/L at 10.2°C and below (51.93 mg TAN/L × 0.7249), where the most sensitive taxa switch to the temperature invariant *Prosopium*.

The CMC can then be extrapolated across both temperature and pH using Equation [8] below (extrapolated values are provided in Appendix 6):

$$CMC = 0.7249 \times \left(\frac{0.0114}{1 + 10^{7.204-pH}} + \frac{1.6181}{1 + 10^{pH-7.204}}\right) \times MIN(51.93, 23.12 \times 10^{0.036 \times (20-T)})$$

Equation [8]

where T is temperature and MIN is the selection of the minimum value.

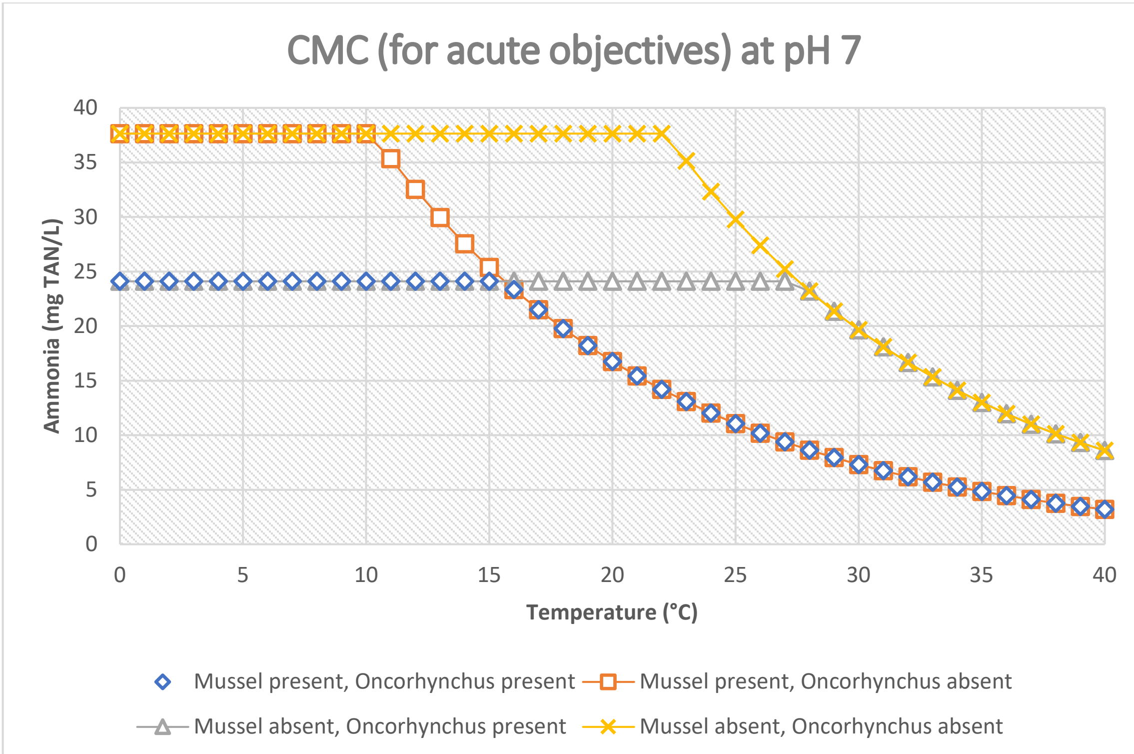


**Figure 2. Ammonia Criterion Maximum Concentration (CMC) for Different Temperatures at pH 7 under Different Waterbody Scenarios**

## 4.2. Chronic Ammonia Objectives

In the 2013 ammonia update, U.S. EPA determined chronic ammonia criteria based on toxicity tests of 16 genera. The CCC was then derived using the same method used for the CMC. Genus Mean Chronic Values (GMCVs) were rank-ordered from the most to the least sensitive, and the Final Chronic Value (FCV) was calculated using the four most sensitive GMCVs. Unlike the FAV used in the calculation of acute objectives, however, the FCV directly serves as the basis for the CCC without dividing it by two because the endpoint measured represents a low level (e.g., EC20 or NOEC[10]).

For the chronic (30-day average) ammonia objective, the 2013 ammonia update includes a choice between two equations to calculate the chronic ammonia criteria when mussels are absent, depending on the presence or absence of fish ELS, and a third equation when mussels are present regardless of the presence or absence of fish ELS. For any scenario, the 30-day averaging period for chronic criteria has been retained from the 1999 chronic

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[10] EC20 is the concentration of a chemical that is estimated to result in a 20% effect in a chronic endpoint (e.g., growth, reproduction, and survival) of the test organisms. NOEC stands for “No-Observed -Effect-Concentration”. It is the highest test concentration at which none of the observed effects are statistically different from the control.

ammonia criteria, as has the restriction that the highest 4-day average ammonia concentration within the 30 days may be no greater than 2.5 times the calculated CCC more than once every three years on average.

### 4.2.1. Mussels absent and ELS present

U.S. EPA determined the 2013 chronic ammonia criteria based on the four most sensitive genera when mussels were absent which were *Lepomis* (ELS), *Musculium*, *Fluminicola*, and *Pimephales* (ELS), which resulted in a CCC of 6.508 mg TAN/L at pH 7.0 and 20º C (Appendix 4). Depending on the temperature, CCC at pH 7 can shift from the temperature-independent vertebrate of genus *Lepomis* and the temperature-dependent invertebrate of genus *Musculium* based on equation [9] below:

$$CCC = 0.9405 \times MIN\ (6.920, (7.547 \times 10^{0.028\times(20-T)})$$

[Equation 9]

where T is temperature and MIN is the selection of the minimum value.

An ammonia concentration of 6.920 mg TAN/L is the GMCV of *Lepomis* ELS, and 7.547 mg TAN/L is the GMCV of *Musculium*.

The ratio of the CCC to the most sensitive GMCV (the ELS of *Lepomis* sp.) when unionid mussels are absent is 0.9405, or 6.508 mg TAN/L divided by 6.920 mg TAN/L. At pH 7, the equation results in a CCC equal to 6.508 mg TAN/L at 0 - 21.3°C, which is protective of ELS of the most sensitive GMCV (*Lepomis*). At temperatures greater than 21.3°C, the CCC decreases with increasing temperature because the GMCV shifts to the most sensitive invertebrate *Musculium* (see Figure 3, page 24).

At different pH and temperatures, the CCC can be extrapolated as Equation [10] (extrapolated values are available in Appendix 6):

$$CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\ (6.920, (7.547 \times 10^{0.028\times(20-T)}))$$

[Equation 10]

where T is temperature and MIN is the selection of the minimum value.

### 4.2.2. Mussels absent and ELS absent

In the four most sensitive genera for chronic criteria (Appendix 4), two are based on ELS (*Lepomis* and *Pimephales*). When ELS is absent, the clam *Musculium*, with a GMCV of 7.547 mg TAN/L became the most sensitive genus in the dataset. Therefore, the CCC at pH 7 is expressed as Equation [11]:

$$CCC = 0.9405 \times (7.547 \times 10^{0.028\times(20-MAX(T,7)})$$

[Equation 11]

where T is temperature and MAX is the selection of the maximum value.

Equation [11] shows that at temperatures lower than 7ºC, the CCC plateaus at 16.41 mg TAN/L, which is fully protective of the lowest *adult Lepomis* and which has a GMCV of 21.3 mg TAN/L (Figure 3, page 24). The CCC then decreases as temperature increases, following the invertebrate-temperature relationship.

At other pH and temperatures, the CCC can be extrapolated using Equation [12] below (extrapolated values are available in Appendix 6):

$$CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7)}))$$

[Equation 12]

where T is temperature and MAX is the selection of the maximum value.

### 4.2.3. Mussels present

According to the 2013 ammonia update, mussels are insensitive to ammonia at a temperature of 7°C and below; therefore, at pH 7 and a temperature of 7°C, the CCC plateaus at a maximum value of 4.363 mg TAN/L based on Equation 13 below:

$$CCC = 0.8876 \times (2.126 \times 10^{0.028\times(20-MAX(T,7))})$$

Equation [13]

where T is temperature and MAX is the selection of the maximum value.

The lowest GMCV is 2.126 mg TAN/L for the *Lampsilis* species of mussel and the ratio of the CCC to the lowest GMCV is 0.8876 (Appendix 5). The CCC across temperature and pH can then be calculated using Equation [14] below (extrapolated values are available in Appendix 6):

$$CCC = 0.8876 \times (\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}) \times (2.126 \times 10^{0.028\times(20-MAX(T,7))})$$

[Equation 14]

where T is temperature and MAX is the selection of the maximum value.

The chronic objectives based on the mussel present scenario are inherently protective of fish ELS because the CCC magnitude when mussels are present (4.363 mg TAN/L) is far less than the CCC magnitude for the most sensitive fish ELS from the genus Lepomis multiplied by the ratio of the CCC to the lowest GMCV (or 6.920 mg TAN/L × 0.8876 = 6.142 mg TAN/L) (Figure 3).

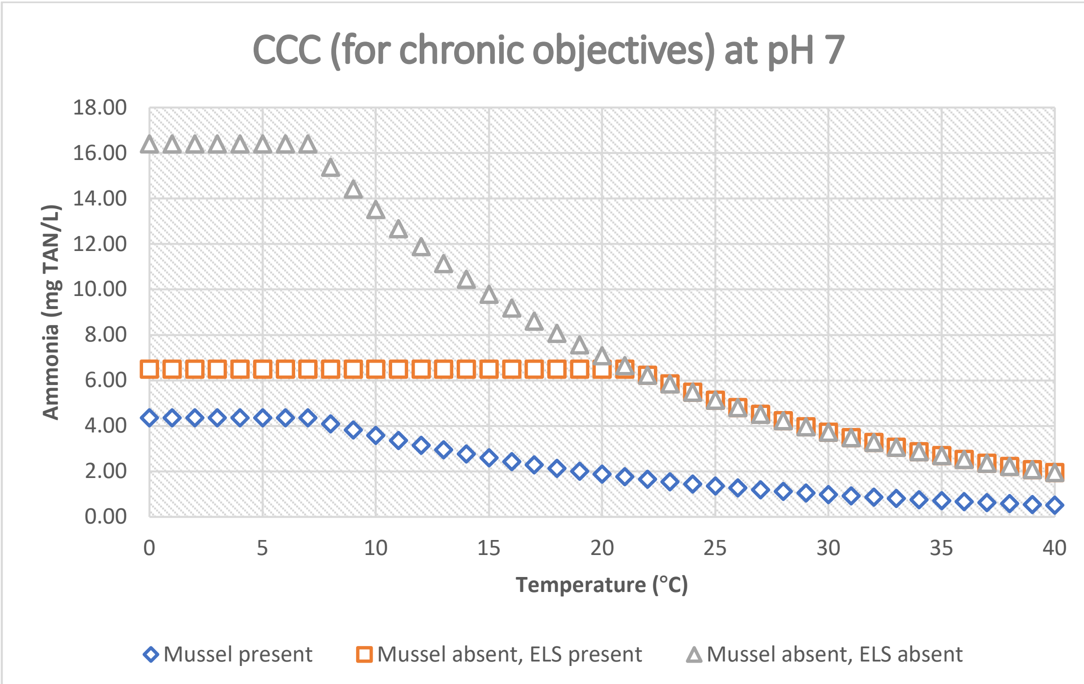


**Figure 3. Ammonia Criterion Continuous Concentration (CCC) at pH 7 Under Different Scenarios**

## 5. Implementation Considerations

### 5.1. Selection of Acute and Chronic Ammonia Objectives – Mussels Present vs. Mussels Absent

The 2013 ammonia update includes data for several sensitive freshwater mussel species in the Family Unionidae that had not previously been assessed for ammonia toxicity. Waterbodies in Los Angeles and Ventura Counties at one time were inhabited by three native freshwater unionid mussel species: California floater (*Anodonta californiensis*), Western pearlshell mussel (*Margaritifera falcata*) and Western ridged mussel (*Gonidea angulata*). However, extensive changes in river and stream habitats (e.g., urbanization, channelization) lead to declining populations of fish hosts and drying streams, and all these species have been extirpated as evidenced by visual and molecular surveys conducted by researchers from University of California, Santa Barbara (Wilson et al., 2018 – Appendix 1). Los Angeles Water Board staff thus propose the mussels absent scenario for both acute and chronic ammonia objectives to be assigned to all inland surface waters in the Los Angeles Region.

However, if new data and information provide substantial evidence of the return of mussels to a waterbody, whether due to a reintroduction effort or a natural return, both the acute and chronic freshwater quality objectives will be revised to protect mussels in the waterbody. Evidence to support the implementation of mussel present condition may include but not limited to field surveys and/or molecular surveys, supported by: (1) adequate perennial water, (2) the availability of suitable fish hosts, (3) the requisite type of substrate, and (4) water quality, that may determine the success of a restoration plans or a healthy mussel population (Wilson et al., 2018). The assignment of a mussel present condition to a specific waterbody will be approved through a separate Basin Plan amendment process.

### 5.2. Selection of Freshwater vs. Saltwater Ammonia Objectives

The 2013 ammonia update addresses ammonia criteria in freshwater. However, inland surface waters also include enclosed bays, estuaries, and wetlands that are often characterized by a brackish environment (i.e., an environment with salinity levels in between those of freshwater and saltwater). When determining whether a waterbody is subject to the freshwater ammonia criteria, the inclusion or exclusion of a brackish environment, the Basin Plan mandates the following criteria:

1. For inland surface waters in which the salinity is equal to or less than 1 part per thousand 95% or more of the time, the applicable objectives are the freshwater objectives.

2. For waters in which the salinity is equal to or greater than 10 parts per thousand 95% or more of the time, the applicable objectives are a 4-day average concentration of 0.035 mg un-ionized $NH_3$/L and a one-hour average concentration of 0.233 mg un-ionized $NH_3$/L.

3. For waters in which the salinity is between 1 and 10 parts per thousand, the applicable objectives are the more stringent of the freshwater or saltwater objectives.

In addition, per the Basin Plan, the Los Angeles Water Board may also adopt a resolution to approve the use of either freshwater or saltwater objectives for an enclosed bay, wetland, or estuary based on site-specific, scientifically defensible findings and data. When determining the characteristics of a water body, the following factors may include, but are not limited to: the driving factors that lead to the characteristics (e.g., natural vs. anthropogenic), the historical conditions of the water body, and the reversibility of the existing conditions.

Staff does not propose any change to these provisions.

### 5.3. Selection of Acute Ammonia Objectives – Salmonids Present vs. Salmonids Absent

To determine which acute ammonia objectives are applicable in a water body, it is necessary to determine whether salmonids are present or absent. In light of the beneficial use designations, it is assumed that salmonids are present in waters designated in the Basin Plan as COLD and absent in waters not designated as COLD. At low temperatures, salmonids are more sensitive to ammonia toxicity in comparison to invertebrates. Therefore, the acute 2013 ammonia objectives under mussels absent and salmonids present scenario are inherently protective of invertebrates in waters designated as COLD.

In addition, the beneficial use MIGR is used to indicate the salmonid present condition. Salmonids are anadromous fish; they migrate from freshwater to the ocean to feed and grow, then return from the ocean to freshwater to spawn. According to the Basin Plan[11], MIGR (migration of aquatic organisms) is the beneficial use that "support habitats necessary for migration, acclimatization between fresh and salt water, or other temporary activities by aquatic organisms, such as anadromous fish."

### 5.4. Selection of Chronic Ammonia Objectives – ELS Present vs. ELS Absent

A determination of where ELS are present is necessary because where ELS are present, chronic ammonia objectives are more stringent to protect developing fish.

The Basin Plan was updated by Resolution No. 2005-014 to revise the ELS implementation provision of the ammonia objectives. Resolution No. 2005-014 both updated the Basin Plan to state that "…early life stages of fish are presumptively present and must be protected at all times of the year…" and established Basin Plan Table 3-5, which is a list of waterbodies which are exceptions to ELS present presumption. Table 3-5 assigned year-round ELS absent to waterbodies where cold-water fish species, known to reproduce in significant numbers below 15°C, are absent, or where the waterbodies are known to have physical conditions that preclude reproduction and early development of these species in significant numbers. The cold-water species included the steelhead/rainbow trout, three-spine stickleback, brown trout, prickly sculpin, staghorn sculpin, striped mullet, starry flounder, arrow goby, and Pacific lamprey.

The 1999 U.S. EPA ammonia criteria relax the chronic ammonia objective at temperatures less than 15°C (59°F) *when ELS are not present*. The proposed ammonia criteria, however, only relax the chronic ammonia objective at temperatures less than 22°C (71.6°F) when ELS are not present. Since there are potentially more fish species

[11] Chapter 2. Beneficial Uses

that reproduce at temperatures less than 22°C than at temperatures less than 15°C, Water Board staff proposes a conservative approach to protect fish ELS: the removal of Table 3-5 from the Basin Plan. While some of the channels listed in Table 3-5 are made of concrete and therefore provide poor habitat, assuming ELS absent in concrete channels could be under-protective in some instances because there could be some deposition of natural substrate material, on an interim basis, in a concrete lined channel that could provide limited habitat for reproduction and early development. Additionally, free floating larval stages considered a part of the early development stages could float into concrete lined channels from more natural upstream reaches. Therefore, fish ELS would be presumably present in all streams in the Los Angeles Region but some of them may be subject to seasonal fish ELS absent condition as discussed, below.

While changes from ELS absent to ELS present will lead to more stringent ammonia criteria for the waterbodies currently listed in Basin Plan Table 3-5, the more stringent criteria are only at temperatures less than or equal to 13°C (55°F) (Figure 4), which is unlikely to occur in the Los Angeles Region[12], particularly during summer which corresponds to ELS present period. The proposed chronic ammonia objectives under the ELS present scenario would be less stringent than the current ELS absent objectives at temperatures greater than 13°C (Figure 4), while remaining protective of beneficial uses. In addition, the removal of Table 3-5 from the Basin Plan would offer protection to temperature-invariant fish ELS in more water bodies in the Los Angeles Region.

[12] Between 2015 and 2020, in different river reaches that have SSOs, only LA River Reaches 3 and 5, Burbank Western Channel, San Jose Creek and San Gabriel River Reach 2 occasionally recorded temperatures below 55°F in the month of January and December (California Integrated Water Quality System)

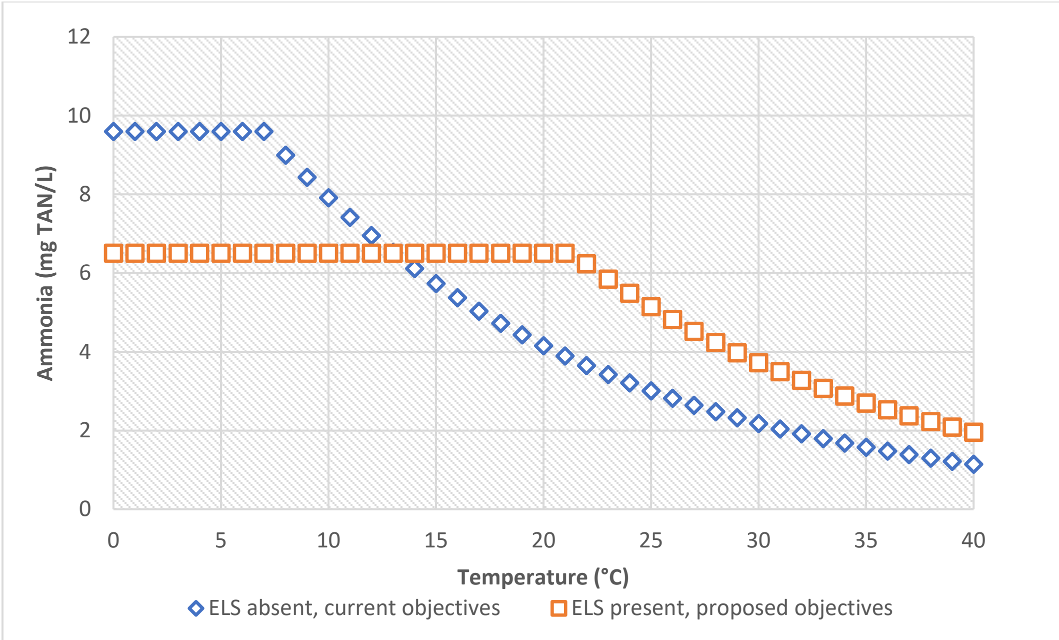


**Figure 4. Comparison between current objectives during ELS absent and proposed objectives during ELS present at pH 7**

A determination of the time of the year when ELS are present or absent in waterbodies is necessary for the waterbodies with an established seasonal ELS present or absent condition as established in Table 3-4 of the Basin Plan.

The Basin Plan[13] states that "early life stages of fish are presumptively present and must be protected at all times of the year … unless a site-specific study is conducted, which justifies applying the ELS absent condition or *a seasonal ELS present condition*." In Resolution No. 2007-005, which amended the Basin Plan to revise the ELS implementation provision of the ammonia objectives, the Los Angeles Water Board adopted seasonal ELS present or absent ammonia objectives for eight waterbody reaches, which are listed in Table 3-4 of the Basin Plan. Staff do not propose changing these seasonality determinations as part of this Basin Plan update.

However, Table 3-4 of the Basin Plan established several reaches as ELS absent *year-round* including four waterbody reaches: Los Angeles River Reach 4, Burbank Western Channel, San Gabriel River Reach 1 and Coyote Creek.

Because there are warm-water fish in reaches upstream and downstream of Los Angeles River Reach 4 and Burbank Western Channel (i.e., Los Angeles River Reaches 3 and 5) and upstream and downstream of San Gabriel River Reach 1 and Coyote Creek (i.e., San

[13] Chapter 3, Water Quality Objectives

Gabriel River Reaches 2 and 3), that reproduce at some time during the year (see Table 2), applying seasonal fish ELS in those four reaches is more scientifically defensible than converting it to year-round ELS present as Table 3-5 is removed from the Basin Plan. Therefore, the previously established year-round fish ELS absent condition in the following reaches will be changed according to the seasonality of fish ELS present in their confluences or upstream reaches:

- Los Angeles River Reach 4 will follow the seasonal fish ELS present in Los Angeles River Reaches 5 and 3 (Figure 5)
- Correspondingly, the Burbank Western Channel confluence with Los Angeles River Reach 4 will follow the seasonal fish ELS present in Los Angeles River Reaches 5 and 3 (Figure 5)
- San Gabriel River Reach 1 will follow the seasonal fish ELS present in San Gabriel River Reaches 3 and 2 (Figure 6)
- Correspondingly, the Coyote Creek confluence with San Gabriel River Reach 1 will follow the seasonal fish ELS present in San Gabriel River Reaches 3 and 2 (Figure 6)

When ELS are present (i.e., April through September), the ELS present objective shall be applied and when ELS are absent (i.e., October through March), the ELS absent objective shall be applied to Los Angeles River Reach 4, Burbank Western Channel, San Gabriel River Reach 1, and Coyote Creek (Figure 9).

**Table 2. Proposed Seasonal Changes in Waterbodies that have SSOs**

| Reach | Basin Plan | | Proposed Update | |
|---|---|---|---|---|
| | **ELS present** | **ELS absent** | **ELS present** | **ELS absent** |
| Los Angeles River Reach 3 & 5 | Apr-Sep | Oct-Mar | Apr-Sep | Oct-Mar |
| Los Angeles River Reach 4 | - | Year round | Apr-Sep (following Los Angeles River Reach 3 & 5) | Oct-Mar (following Los Angeles River Reach 3 & 5) |
| Burbank Western Channel | - | Year round | Apr-Sep (following Los Angeles River Reach 3 & 5) | Oct-Mar (following Los Angeles River Reach 3 & 5) |

| | | | | |
|---|---|---|---|---|
| San Gabriel River Reach 2 & 3 | Apr-Sep | Oct-Mar | Apr-Sep | Oct-Mar |
| San Gabriel River Reach 1 | - | Year round | Apr-Sep (following San Gabriel River Reach 2 & 3) | Oct-Mar (following San Gabriel River Reach 2 & 3) |
| Coyote Creek | - | Year round | Apr-Sep (following San Gabriel River Reach 2 & 3) | Oct-Mar (following San Gabriel River Reach 2 & 3) |
| Rio Hondo | Apr-Sep | Oct-Mar | Apr-Sep | Oct-Mar |
| San Jose Creek | Apr-Sep | Oct-Mar | Apr-Sep | Oct-Mar |
| Santa Clara River Reach 5 & 6 | Feb-Sep | Oct-Jan | Feb-Sep | Oct-Jan |

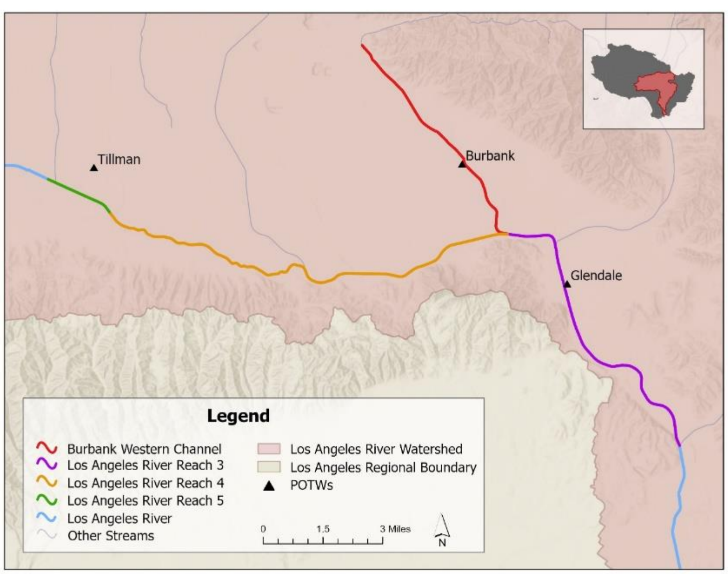

**Figure 5. Los Angeles River Reach 4 and Burbank Western Channel with their surrounding reaches and confluences**

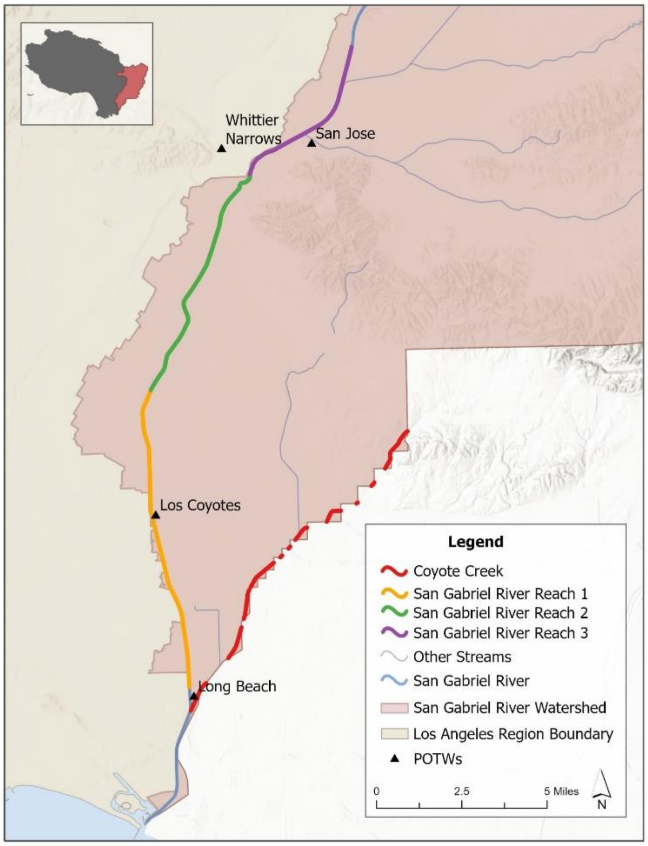


**Figure 6. San Gabriel River Reach 1 and Coyote Creek with their confluences and surrounding reaches.**

**Table 3. Fish Species and Corresponding ELS Present Period for SSO Waters**

| Reach Name | Upstream and Downstream Points | Fish Species | ELS Present Period |
|---|---|---|---|
| Los Angeles River Reach 5 | Sepulveda Basin | carp (*Cyprinus carpio*)<br>tilapia (*Oreochromis mossambicus*)<br>catfish (likely bullhead (*Ictalurus* sp.))<br>arroyo chub (*Gila orcutti*) | April through September |
| Los Angeles River Reach 3 | Riverside Drive to Figueroa Street | fathead minnow (*Pimephales promelas)*<br>goldfish (*Carassius auratus*)<br>mosquitofish (*Gambusia affinis*)<br>tilapia (*Oreochromis mossambicus*) | April through September |
| San Jose Creek | Pomona WRP to confluence | mosquitofish (*Gambusia affinis*)<br>carp (*Cyprinus carpio*) | April through September |

| Reach Name | Upstream and Downstream Points | Fish Species | ELS Present Period |
|---|---|---|---|
| | with San Gabriel River | | |
| San Gabriel River Reaches 2 and 3 | Confluence of San Jose Creek to Firestone Boulevard | carp (*Cyprinus carpio*)<br>green sunfish (*Lepomis cyanellus*)<br>bluegill (*Lepomis macrochirus*)<br>catfish (likely bullhead (*Ictalurus* sp.)) | April through September |
| Rio Hondo | Upstream of Whittier Narrows Dam | catfish (likely bullhead (*Ictalurus* sp.))<br>carp (*Cyprinus carpio*) green sunfish (*Lepomis cyanellus*)<br>mosquitofish (*Gambusia affinis*)<br>tilapia (*Oreochromis mossambicus*) | April through September |
| Santa Clara River Reach 6 | Bouquet Canyon Road Bridge to West Pier Highway 99 | goldfish (*Carassius auratus*)<br>carp (*Cyprinus carpio*)<br>mosquitofish (*Gambusia affinis*)<br>arroyo chub (*Gila orcutti*)<br>unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*)<br>Santa Ana sucker (*Catostomus santaanae*) | February through September |
| Santa Clara River Reach 5 | West Pier Highway 99 to Blue Cut gauging station | goldfish (*Carassius auratus*)<br>carp (*Cyprinus carpio*)<br>mosquitofish (*Gambusia affinis*)<br>arroyo chub (*Gila orcutti*)<br>unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*)<br>Santa Ana sucker (*Catostomus santaanae*) | February through September |

Table 3-4 of the Basin Plan also includes site-specific equations to calculate the chronic objectives for all 12 of the waterbodies in Table 3-4, including the eight seasonal and four year-round waterbodies. These SSO were developed using the WER approach and were adopted by the Los Angeles Water Board in 2007 (Resolution No. R07-005). The purpose of the development of SSOs was to ensure that "the ammonia objectives that would be the basis for TMDLs and, ultimately, effluent limits in permits were as precise as possible as these agencies planned for facility upgrades and adjustments to treatment processes (i.e., nitrification/Denitrification [N/DN]) to meet TMDL and permit requirements." (Staff Report 2007). However, the WER method is no longer recognized in the updated 2013 ammonia criteria and therefore WER SSOs will be superseded by the proposed chronic ammonia objectives, but with the same seasonal application of the protection of ELS.

Los Angeles Water Board staff proposes to update the chronic ammonia objectives per the 2013 ammonia update in waterbodies subject to seasonal fish ELS (Figure 9). The derivation of the equations is detailed in section 4 above.

**Table 4. Proposed Chronic Ammonia Objectives in Waterbodies Subject to Seasonal Fish ELS**

| Stream Reach | Proposed Chronic Ammonia Objective |
|---|---|
| **Los Angeles River, Reach 5 (Sepulveda Basin)** | **ELS Present (April 1 – September 30)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\left(6.920, (7.547 \times 10^{0.028\times(20-T)})\right)$ [Equation 10] |
| **Los Angeles River, Reach 5 (Sepulveda Basin)** | **ELS Absent (October 1 – March 31)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times \left(7.547 \times 10^{0.028\times(20-MAX(T,7))}\right)$ [Equation 12] |
| **Los Angeles River, Reach 4 (Sepulveda Dam to Riverside Drive)** | **ELS Present (April 1 – September 30)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\left(6.920, (7.547 \times 10^{0.028\times(20-T)})\right)$ [Equation 10] |
| **Los Angeles River, Reach 4 (Sepulveda Dam to Riverside Drive)** | **ELS Absent (October 1 – March 31)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times \left(7.547 \times 10^{0.028\times(20-MAX(T,7))}\right)$ [Equation 12] |
| **Los Angeles River, Reach 3 (Riverside Drive to Figueroa Street)** | **ELS Present (April 1 – September 30)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\left(6.920, (7.547 \times 10^{0.028\times(20-T)})\right)$ [Equation 10] |
| **Los Angeles River, Reach 3 (Riverside** | **ELS Absent (October 1 – March 31)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times \left(7.547 \times 10^{0.028\times(20-MAX(T,7))}\right)$ [Equation 12] |

| Stream Reach | Proposed Chronic Ammonia Objective |
|---|---|
| **Drive to Figueroa Street)** | |
| **Burbank Western Channel (Burbank Water Reclamation Plant to confluence with LA River)** | **ELS Present (April 1 – September 30)**<br>$CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\,(6.920, (7.547 \times 10^{0.028\times(20-T)}))$<br>[Equation 10] |
| **Burbank Western Channel (Burbank Water Reclamation Plant to confluence with LA River)** | **ELS Absent (October 1 – March 31)**<br>$CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7))})$<br>[Equation 12] |
| **San Gabriel River, Reaches 2 and 3 (Confluence with San Jose Creek to Firestone Blvd.) (including all San Jose Creek WRP discharges)** | **ELS Present (April 1 – September 30)**<br>$CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\,(6.920, (7.547 \times 10^{0.028\times(20-T)}))$<br>[Equation 10] |
| **San Gabriel River, Reaches 2 and 3 (Confluence with San Jose Creek to Firestone Blvd.)** | **ELS Absent (October 1 – March 31)**<br>$CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7))})$<br>[Equation 12] |

| Stream Reach | Proposed Chronic Ammonia Objective |
|---|---|
| **(including all San Jose Creek WRP discharges)** | |
| **San Gabriel River, Reach 1 (Firestone Blvd. to Willow St. or start of estuary)** | **ELS Present (April 1 – September 30)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\left(6.920, \left(7.547 \times 10^{0.028\times(20-T)}\right)\right)$ [Equation 10] |
| **San Gabriel River, Reach 1 (Firestone Blvd. to Willow St. or start of estuary)** | **ELS Absent (October 1 – March 31)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times \left(7.547 \times 10^{0.028\times(20-MAX(T,7))}\right)$ [Equation 12] |
| **Santa Clara River, Reach 6 (Bouquet Canyon Rd. Bridge to West Pier Hwy 99)** | **ELS Present (February 1 – September 30)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\left(6.920, \left(7.547 \times 10^{0.028\times(20-T)}\right)\right)$ [Equation 10] |
| **Santa Clara River, Reach 6 (Bouquet Canyon Rd. Bridge to West Pier Hwy 99)** | **ELS Absent (October 1 – January 31)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times \left(7.547 \times 10^{0.028\times(20-MAX(T,7))}\right)$ [Equation 12] |
| **Santa Clara River, Reach 5 (West Pier Hwy 99 to Blue Cut gauging station)** | **ELS Present (February 1 – September 30)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\left(6.920, \left(7.547 \times 10^{0.028\times(20-T)}\right)\right)$ [Equation 10] |

| Stream Reach | Proposed Chronic Ammonia Objective |
|---|---|
| **Santa Clara River, Reach 5 (West Pier Hwy 99 to Blue Cut gauging station)** | **ELS Absent (October 1 – January 31)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7)})$ [Equation 12] |
| **San Jose Creek (Pomona WRP to confluence with San Gabriel River)** | **ELS Present (April 1 – September 30)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\,(6.920, (7.547 \times 10^{0.028\times(20-T)}))$ [Equation 10] |
| **San Jose Creek (Pomona WRP to confluence with San Gabriel River)** | **ELS Absent (October 1 – March 31)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7)})$ [Equation 12] |
| **Rio Hondo (Upstream of Whittier Narrows Dam)** | **ELS Present (April 1 – September 30)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\,(6.920, (7.547 \times 10^{0.028\times(20-T)}))$ [Equation 10] |
| **Rio Hondo (Upstream of Whittier Narrows Dam)** | **ELS Absent (October 1 – March 31)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7)})$ [Equation 12] |
| **Coyote Creek (Long Beach WRP to confluence with San Gabriel River)** | **ELS Present (April 1 – September 30)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\,(6.920, (7.547 \times 10^{0.028\times(20-T)}))$ [Equation 10] |
| **Coyote Creek (Long Beach WRP to confluence with San Gabriel River)** | **ELS Absent (October 1 – March 31)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7)})$ [Equation 12] |

## 5.6. Applicable pH and Temperature for Ammonia Objectives

Not all pH and temperature ranges in Appendix 6 are applicable to inland surface water conditions in the Los Angeles Region. The Basin Plan[14] states that "the pH of inland surface waters shall not be depressed below 6.5 or raised above 8.5 as a result of waste discharges." The Basin Plan states that at no time shall the temperature of WARM-designated waters be raised above 80°F, which is equivalent to 26.67°C. Therefore, the portions of objectives (Appendix 6) that are most relevant to the Los Angeles Region are those with pH between 6.5 and 8.5 and temperature 27°C or below[15].

# 6. Comparison between the current and proposed ammonia objectives

## 6.1. Acute Ammonia Objectives[16]

In summary, the acute ammonia objectives in the current Basin Plan that are based on the 1999 U.S. EPA ammonia criteria are different from the proposed Basin Plan ammonia objectives based on the 2013 ammonia update in two ways. First, the current objectives are only differentiated based on the presence or absence of salmonids. However, the 2013 ammonia update differentiates acute objectives based on the presence or absence of mussels, as well as the presence or absence of salmonids. Second, the current acute objectives depend only on pH. In contrast, the proposed acute ammonia objectives depend on both pH and temperature. Such differences arise because more species were tested for determining the 2013 ammonia update. Figure 7 shows four graphs to illustrate the differences between acute ammonia objectives in the current Basin Plan and in the proposed Basin Plan update.

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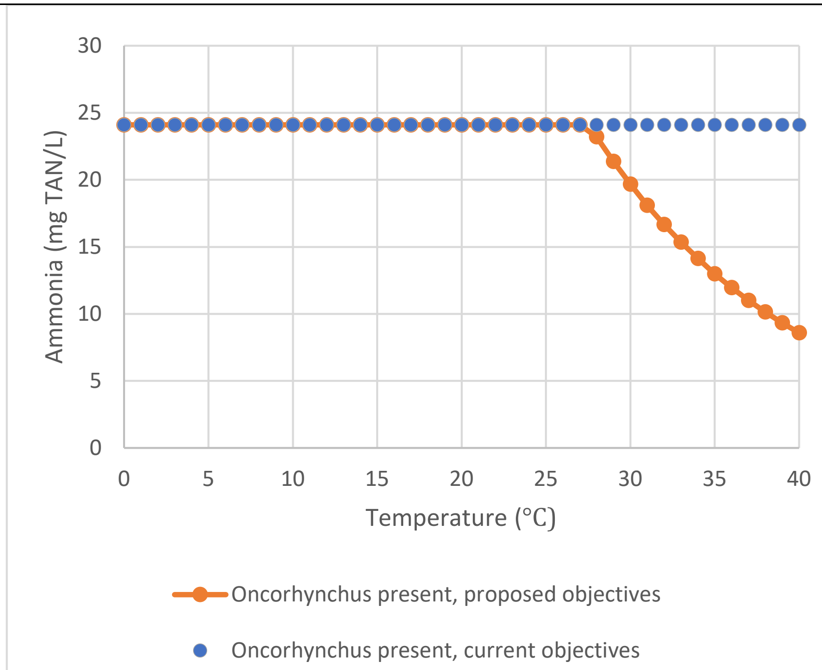
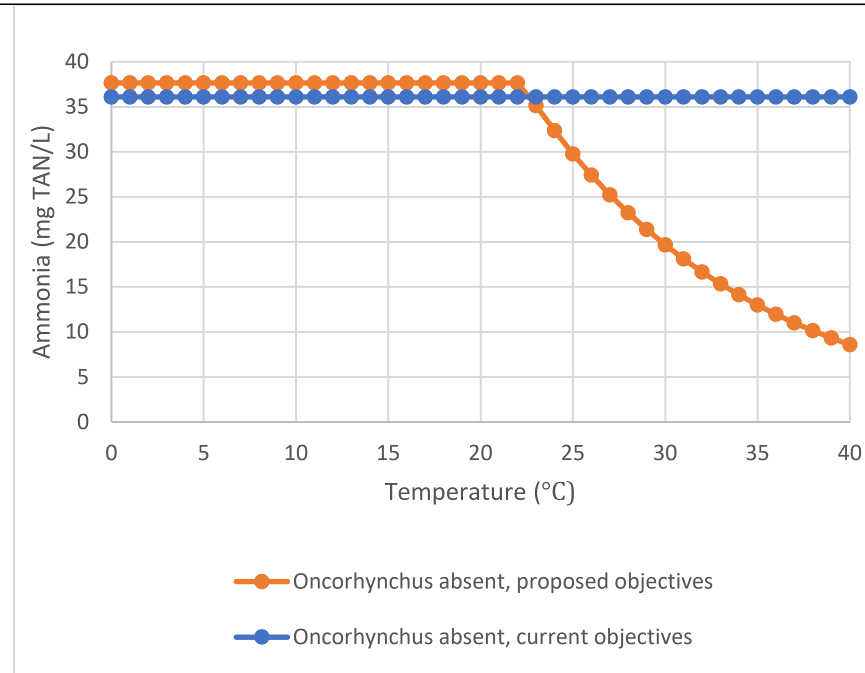
[14] Basin Plan: Chapter 3. Water Quality Objectives

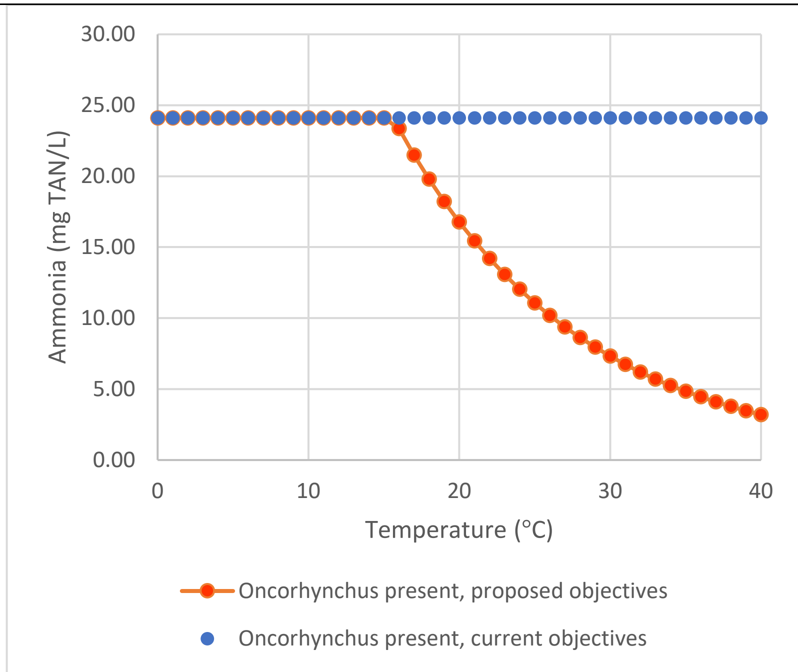
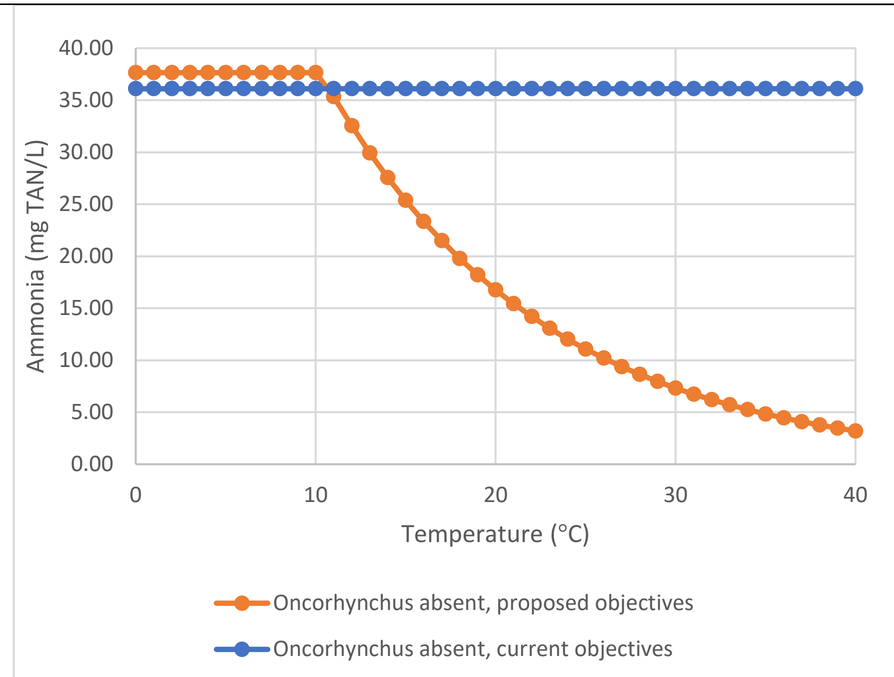
[15] Based on data that range between 2013 and 2022, pH and temperature range for several reaches that have SSOs are as follows. **In San Gabriel River and its tributaries:** pH = 6.6-8.3 and temperature = 21.7-31.1°C for Coyote Creek (ELS absent), pH = 6.9-9 (ELS absent), 6.9-8.7 (ELS present) and temperature = 9.6-28.9 (ELS absent), 19.2-34°C (ELS present) for San Jose Creek, pH = 7.3-7.6 and temperature = 21.1-29.3°C for San Gabriel River Reach 1, pH = 7.2-8 (ELS absent), 7.0-7.8 (ELS present) and temperature = 20.6-26.1°C (ELS absent) and 22.9-31.1°C (ELS present) for San Gabriel River Reach 2, pH = 7.1-8.8 (ELS absent), 7.1-9.1 (ELS present) and temperature = 12.3-27.9°C (ELS absent) and 18.0-33.1°C (ELS present) for San Gabriel River Reach 3. **In Los Angeles River and its tributaries:** pH = 6.7-7.6 and temperature = 19.8-31.1°C for Los Angeles River Reach 3, pH = 6.6-7.6 and temperature = 20.6-30.0°C for Los Angeles River Reach 4 (ELS absent). **In Santa Clara River and its tributaries:** pH = 6.8-7.7 and temperature = 21.1-29.7°C for Santa Clara River Reach 5, pH = 7.0-7.9 and temperature = 17.2-30.1°C for Santa Clara River Reach 6. Note that some reaches may not have ELS present based on SSOs or TMDL.

[16] Tables that detail both the current and proposed acute ammonia objectives across pH range (6.5-9) and temperature (0-30°C) are available in Appendix 6.

**Figure 7. Comparison of Current Acute Ammonia Objectives and the Proposed Update at pH 7 and Temperature 0-30°C under Four Different Scenarios**

Note differences in the scale of the y-axis.

| Mussel | Salmonids present | Salmonids absent |
|---|---|---|
| Absent |   |   |

<table>
<tr><td>Mussel</td><td>Salmonids present</td><td>Salmonids absent</td></tr>
<tr><td>Present</td><td>
</td><td>
</td></tr>
</table>

As shown in Figure 7, the current acute ammonia objectives based on the 1999 U.S. EPA ammonia criteria are not adjusted for temperature; therefore, the objectives remain constant, regardless of temperature. In contrast, the proposed acute ammonia objectives based on the 2013 ammonia update are adjusted for temperature, resulting in the following changes:

1. When mussels are absent from water bodies that are designated as COLD and/or MIGR (presumptively salmonids present), the proposed acute ammonia objectives are similar to the current objectives at temperatures 0-27°C. The proposed objectives then become lower (more stringent) than the current objectives at temperatures greater than or equal to 28°C. Similar changes are found when mussels are present, except that the proposed objectives become lower (more stringent) than the current objectives at temperatures greater than or equal to 16°C. Holding pH constant, the magnitude of difference between the current and the proposed acute objectives are greater as temperature increases (Figure 7, and Appendix 6).
2. When mussels are absent from water bodies that are not designated as COLD and/or MIGR (presumptively salmonids absent), the proposed acute ammonia objectives are higher (less stringent) than the current objectives at temperatures 0-22°C. At temperatures greater than or equal to 23°C, the proposed objectives are lower (more stringent) than the current objectives, holding pH constant. Similarly, the proposed acute ammonia objectives are higher (less stringent) than the current objectives at temperatures 0-10°C when mussels are present, but these proposed objectives are lower (more stringent) than the current objectives at temperatures greater than, or equal to 11°C. Again, the magnitude of difference between the current and the proposed acute objectives is greater as temperature increases (Figure 7, and Appendix 6).

## 6.2. Chronic Ammonia Objectives[17]

### 6.2.1. Chronic ammonia objectives for water bodies that do not have site-specific objectives (SSOs)

For chronic objectives, waterbodies in the Los Angeles Region that do not have SSOs are divided into two groups. First, waterbodies that are listed in Table 3-5 but that are not included in the SSO sub-group (i.e., Los Angeles River reaches 3, 4 and 5, Rio Hondo Reaches 1, 2, and 3, Burbank Western Channel, San Gabriel River Reaches

[17] Tables that detail both the current and proposed chronic ammonia objectives across pH range (6.5-9) and temperature (0-30°C) are available in Appendix 6

1, 2 and 3, San Jose Creek Reaches 1 and 2, and Coyote Creek). Second, all other waterbodies where fish ELS are presumptively present and must be protected at all times of the year.

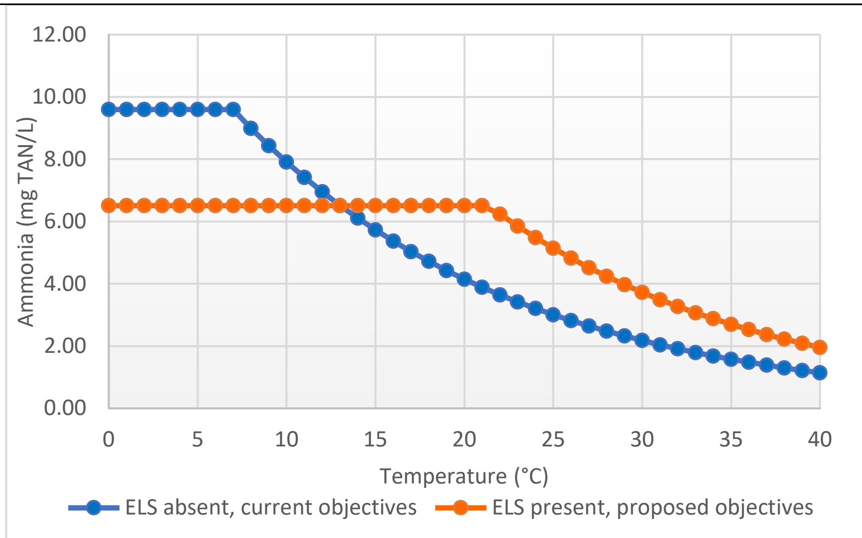
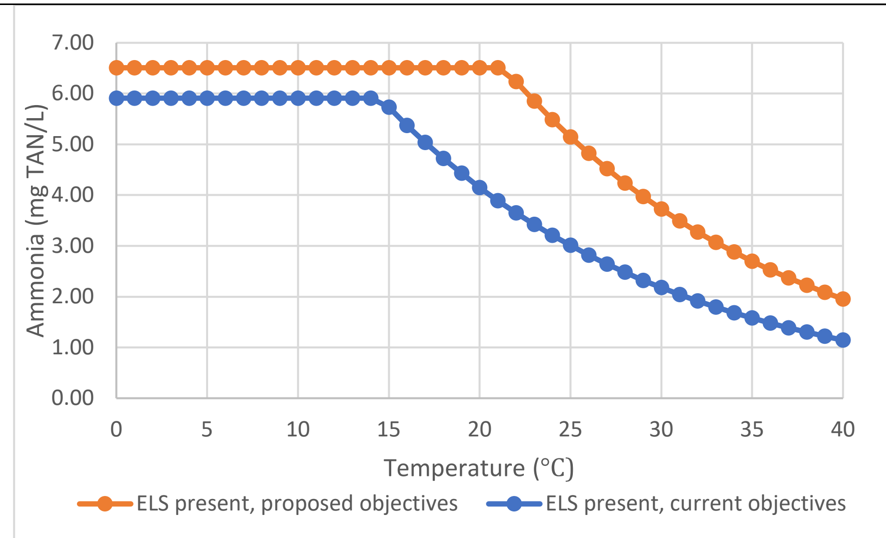
For the first group, waterbodies that are listed in Table 3-5 but that are not included in the SSO sub-group, because Table 3-5 is proposed for removal from the Basin Plan, ELS present objectives will be introduced in these currently ELS-absent reaches. As discussed in section 5.4, per Resolution No. R05-014, which revised the ELS implementation provision of the ammonia objectives, ELS absent was determined by only nine fish species that reproduce below 15°C in the Los Angeles Region. But because the 2013 ammonia update only relaxes the ammonia criteria at temperatures below 22°C, more fish species may be present in waterbodies than those previously deemed to be devoid of the nine fish species. To protect fish species, the proposed update takes a conservative approach by introducing ELS present objectives in all waterbody reaches in the Los Angeles Region – except those with SSOs.

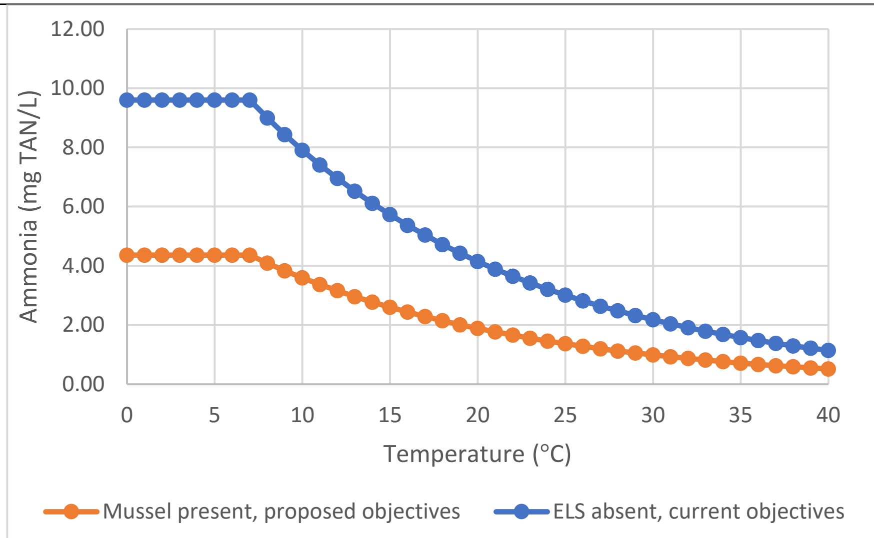
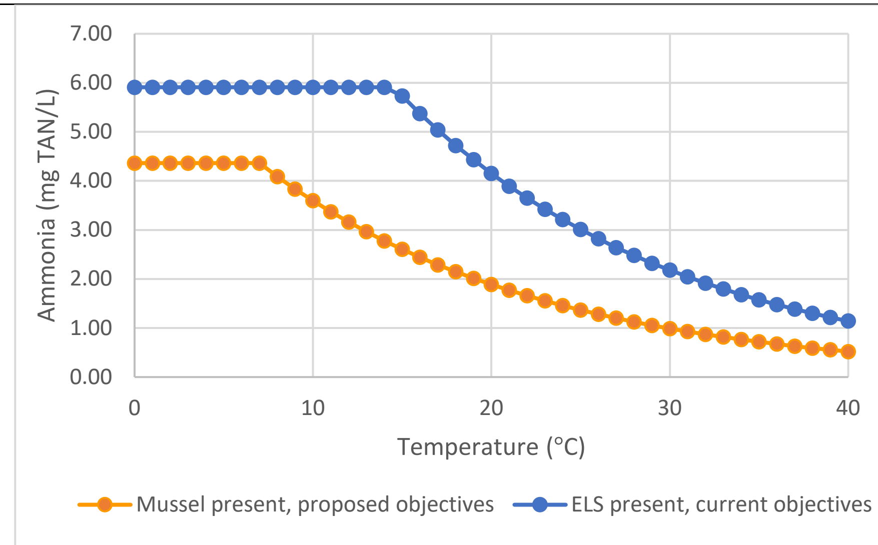
For the second group, where fish ELS are already presumptively present and must be protected all times of the year, there will be no changes in the criteria. Fish ELS will remain present in these reaches all year round.

Details of the current ammonia objectives in the Basin Plan and the proposed update are shown in the graphs in Figure 8, below.

**Figure 8. Comparison of Current Chronic Ammonia Objectives and the Proposed Update at pH 7 and Temperature 0-30°C under Three Different Scenarios in Waterbodies that do not have Site-specific Objectives (SSOs)**

Note differences in the scale of the y-axis.

| Mussels | ELS absent (listed in Table 3-5 of the Basin Plan) | ELS present (not listed in Table 3-5 of the Basin Plan) |
|---|---|---|
| Absent |  |  |

| Mussels | ELS absent* | ELS present* |
|---|---|---|
| Present |   |   |

*The graphs illustrating i) mussels present and ELS absent and ii) mussels present and ELS present are shown only for comparison purposes between the current and proposed objectives. The proposed chronic criterion magnitude when mussels are present does not discriminate between ELS present and ELS absent because its value is more stringent than the chronic values for fish ELS (i.e., are inherently protective of fish ELS).

As shown in Figure 8, for water body reaches that do not have SSOs and that are not listed in Table 3-5 of the Basin Plan, chronic ammonia concentrations under the proposed ELS present scenario are higher (less stringent) than those allowed for similar temperature and pH conditions under the current ammonia objectives listed in Table 3-2 of the Basin Plan.

For water body reaches that do not have SSOs but are listed in Table 3-5 of the Basin Plan, chronic ammonia concentrations under the proposed mussel absent and ELS present scenario are lower (more stringent) than the current ammonia objectives listed in Table 3-3 of the Basin Plan at low temperature.

Compared with the current objectives, chronic ammonia concentrations allowed under the 2013 ammonia update when mussels are present are lower (more stringent) than those allowed for similar temperature and pH conditions under the current ammonia objectives listed in Table 3-2 (ELS present) and Table 3-3 (ELS absent) of the Basin Plan throughout the temperature (0-30°C) and pH (6.5-9) ranges.

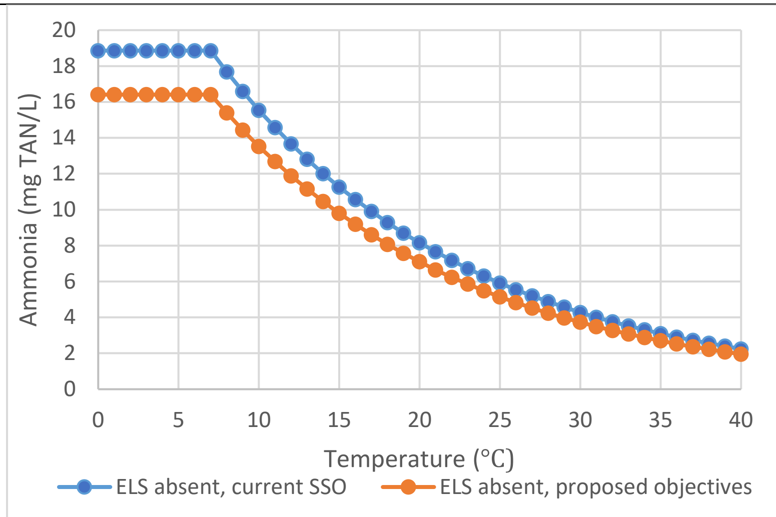
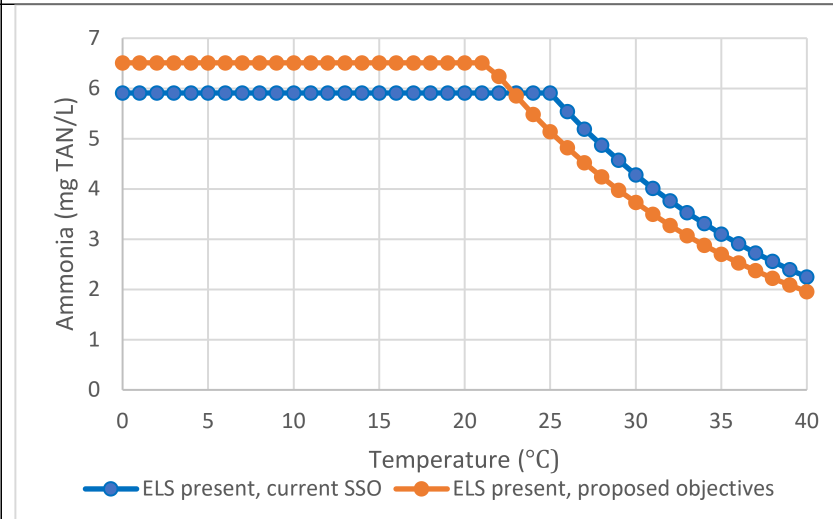
### 6.2.2. Chronic ammonia objectives for water bodies that currently have site-specific objectives (SSOs)

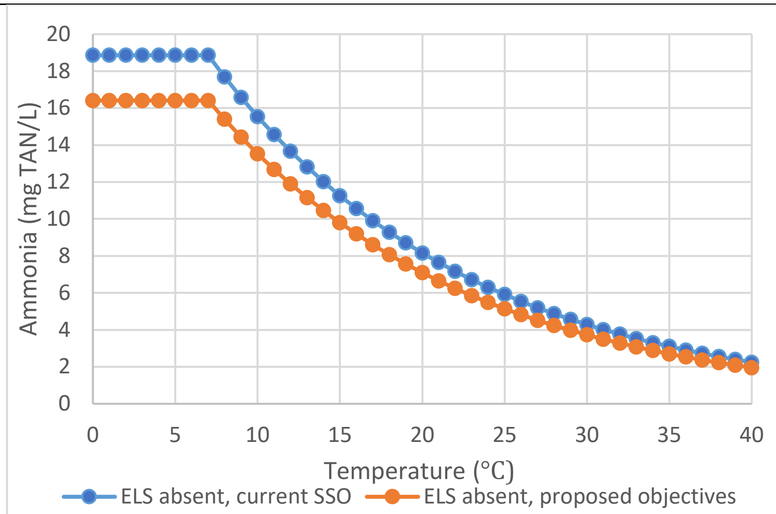
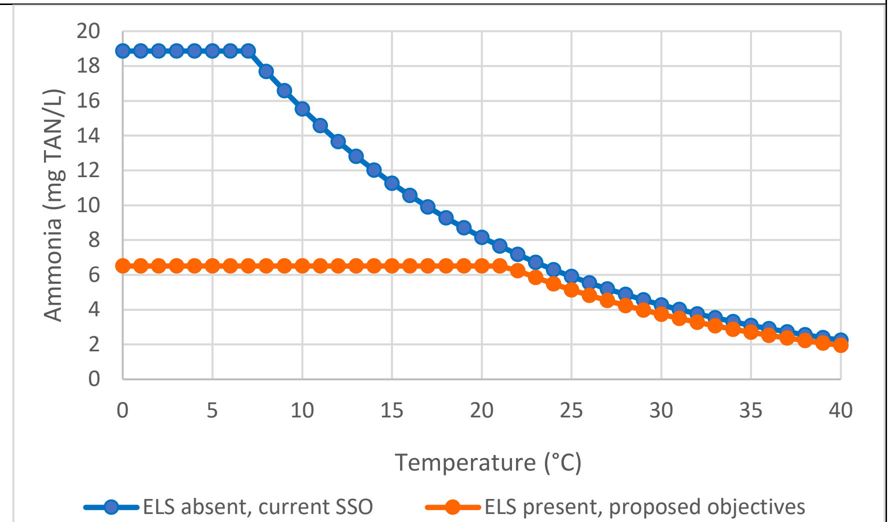
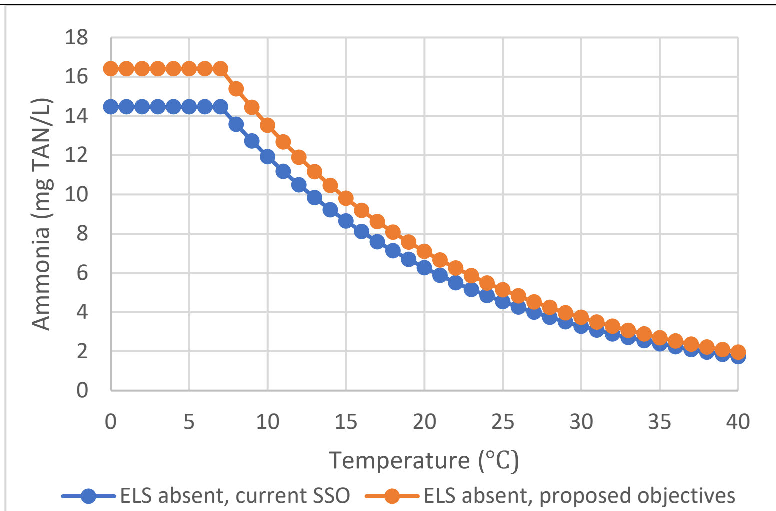
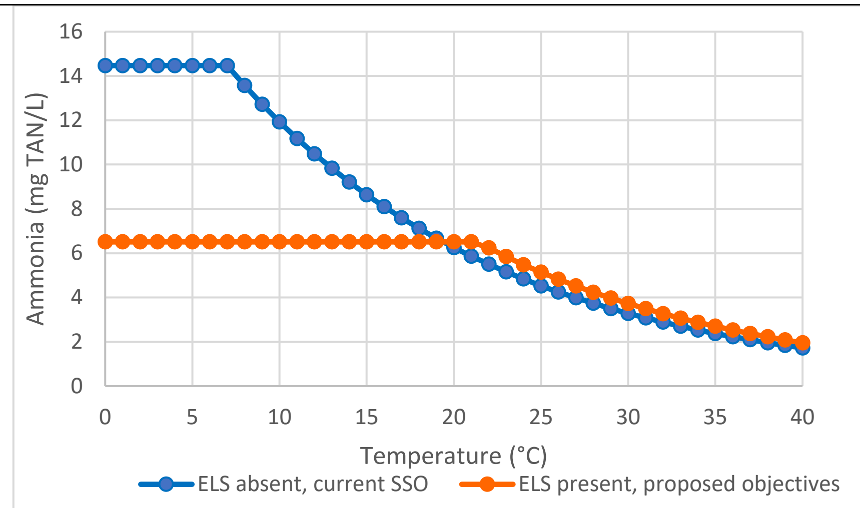
For waterbodies that currently have SSOs and are included in Table 3-4 of the Basin Plan, *Site-Specific 30-day Average Objectives for Ammonia by Waterbody Reach*, the proposed Basin Plan Amendment will change the SSOs to the chronic ammonia objectives based on the 2013 ammonia update. The SSOs were based on WER recalculation methods, and the WER method is no longer recognized in the updated 2013 ammonia criteria.

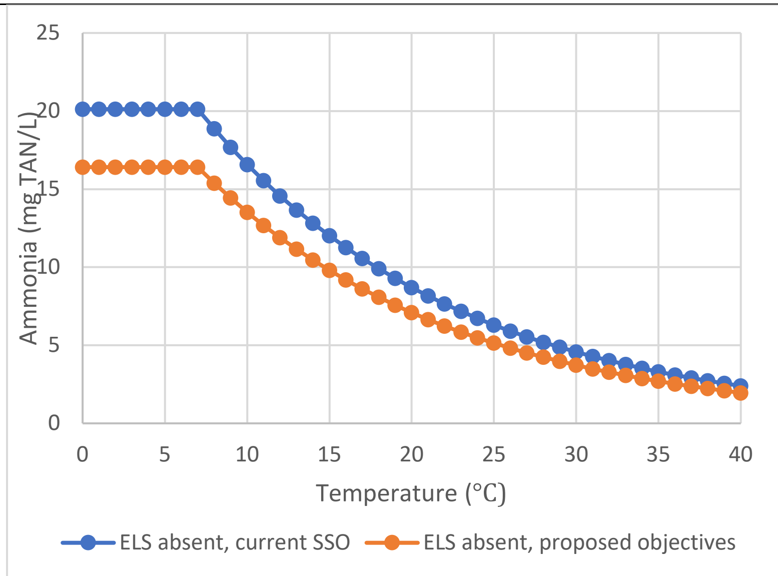
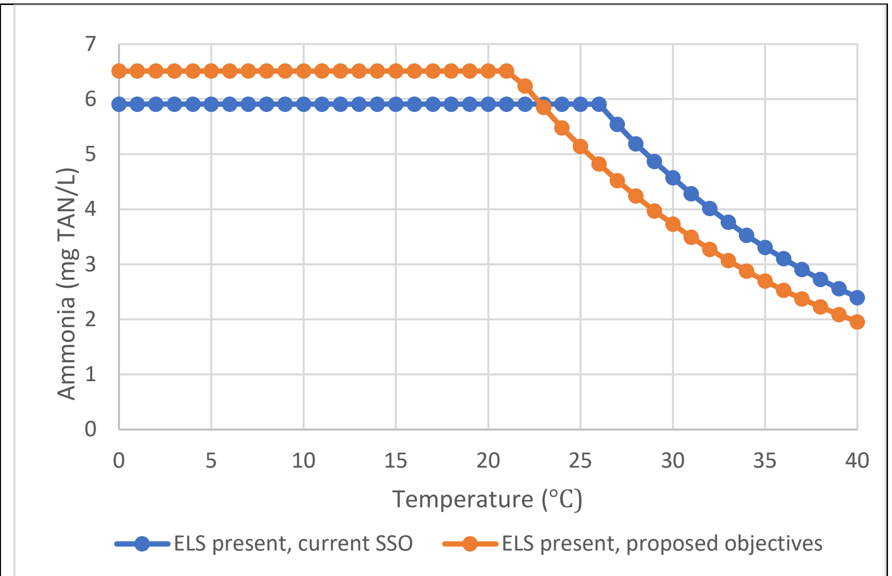
There are 10 different equations in Table 3.4 of the Basin Plan used to calculate SSOs for the 12 waterbodies also listed in Table 3.4. The comparison of the current and the proposed objectives for all reaches that have SSOs are shown in Figure 9. Note that with waterbodies with year-round ELS absent will now follow the seasonal shift ELS present of their upstream reaches (see section 3 and section 5.4 for detailed explanation).

**Figure 9. Comparison of Chronic Ammonia Objectives at pH 7 and Temperature 0-30°C between the SSOs listed in Table 3-4 of the Basin Plan and the Proposed Update for Different waterbody reaches during ELS Absent and ELS Present Periods**

Note differences in the scale of the y-axis.

| Water body reach | ELS absent | ELS present |
|---|---|---|
| Los Angeles River Reaches 3 and 5 |  |  |

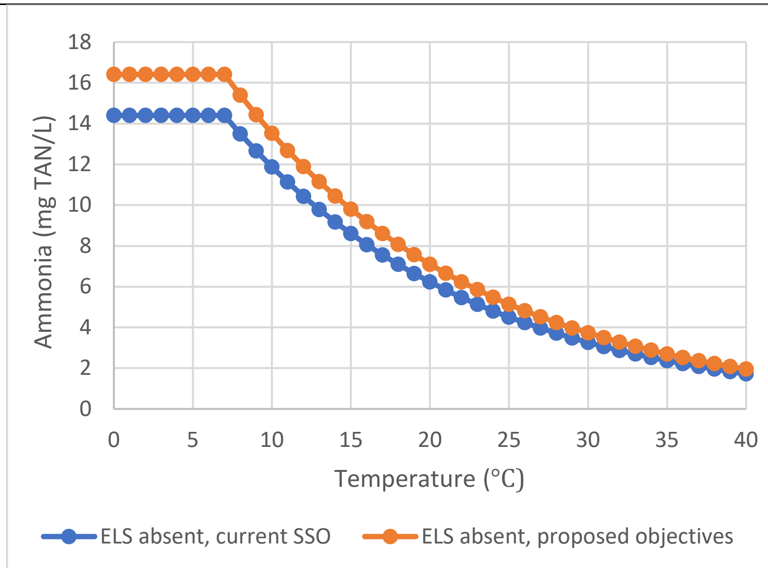
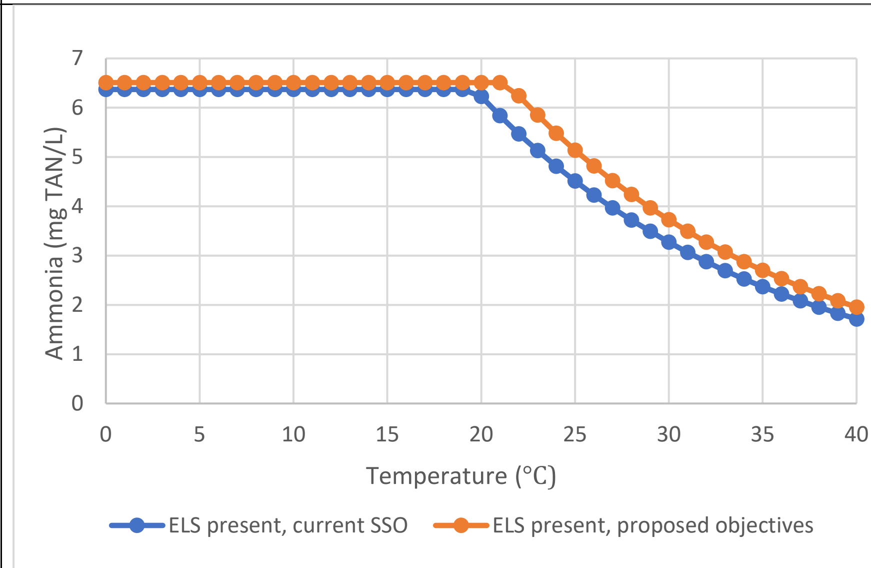
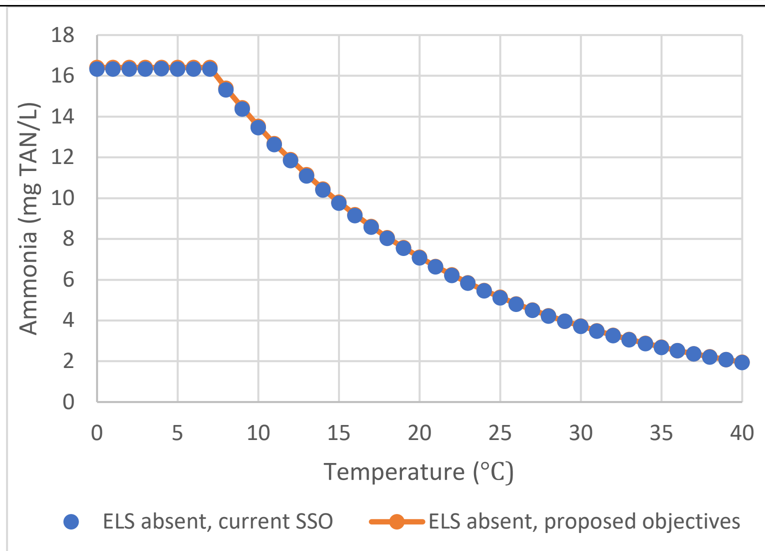
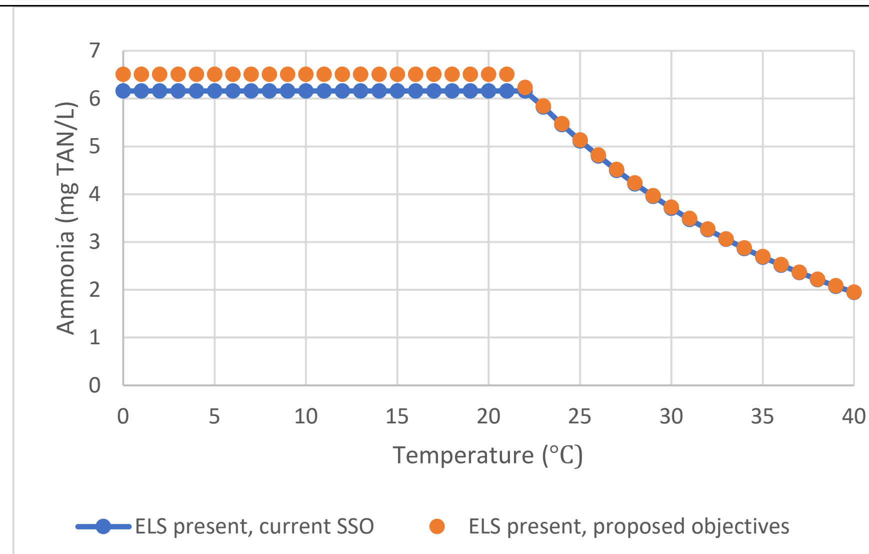
<table>
<tr><th>Water body reach</th><th>ELS absent</th><th>ELS present</th></tr>
<tr><td>Los Angeles River Reach 4</td><td>
</td><td>
</td></tr>
<tr><td>Burbank Western Channel</td><td>
</td><td>
</td></tr>
</table>

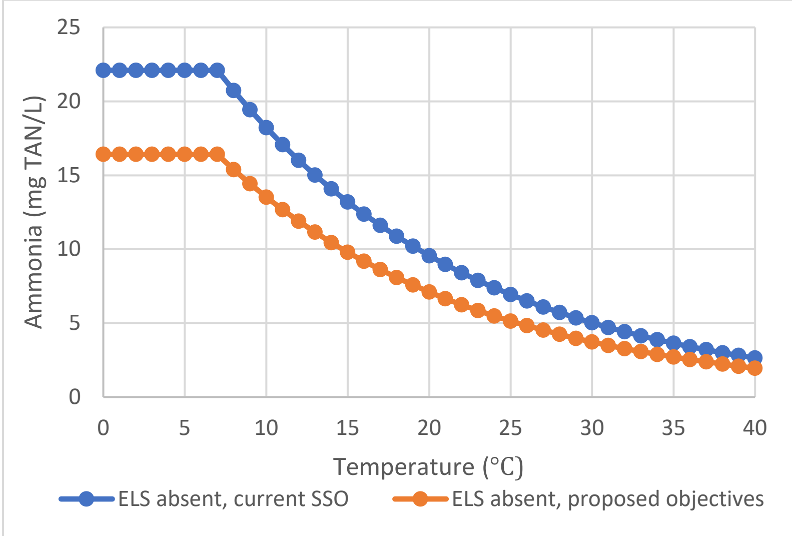
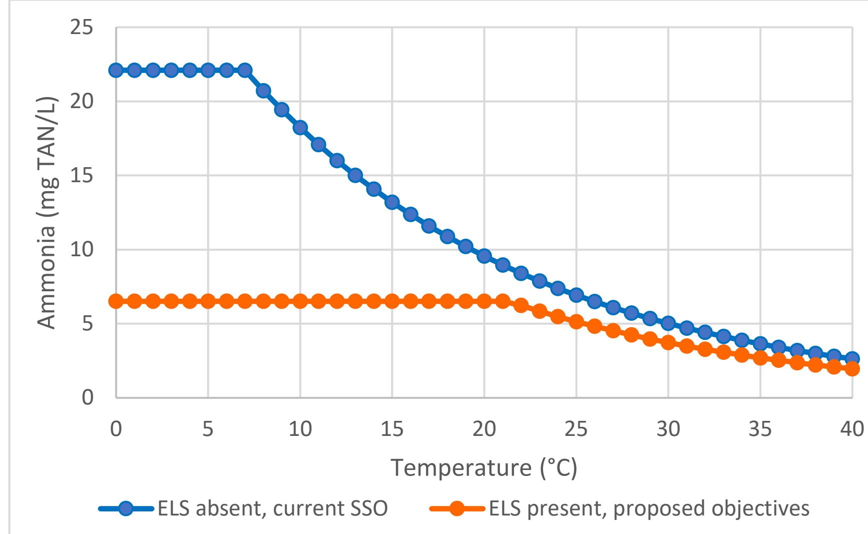
| | | |
|---|---|---|
| Rio Hondo |  |  |

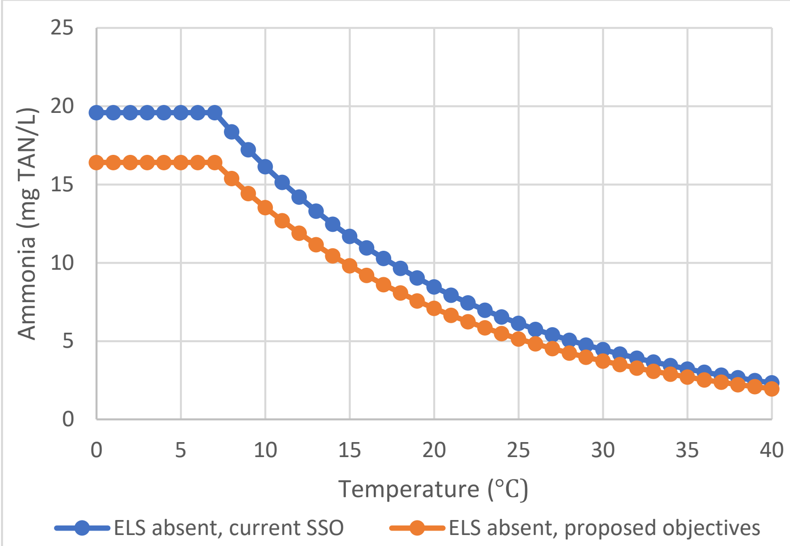
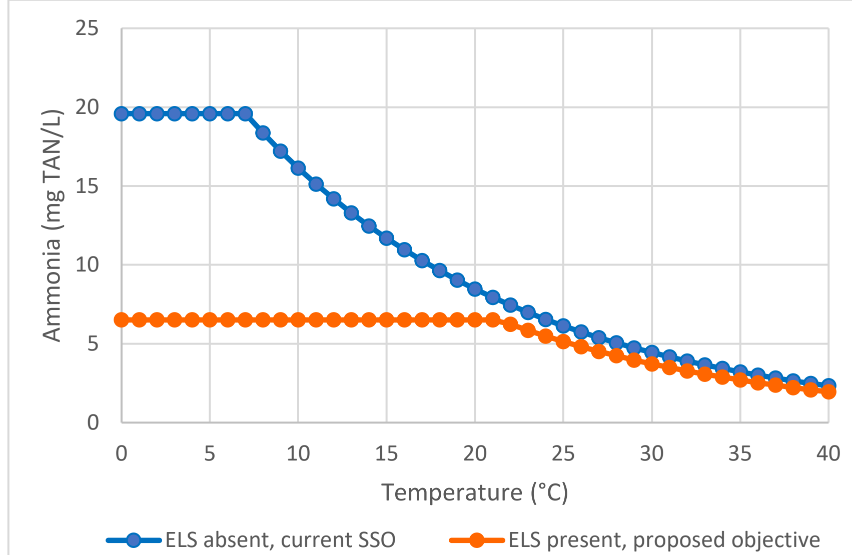

25
20
15
10
5
0
0
5
10
15
20
25
30
35
40
Ammonia (mg TAN/L)
Temperature (°C)
ELS absent, current SSO
ELS absent, proposed objectives

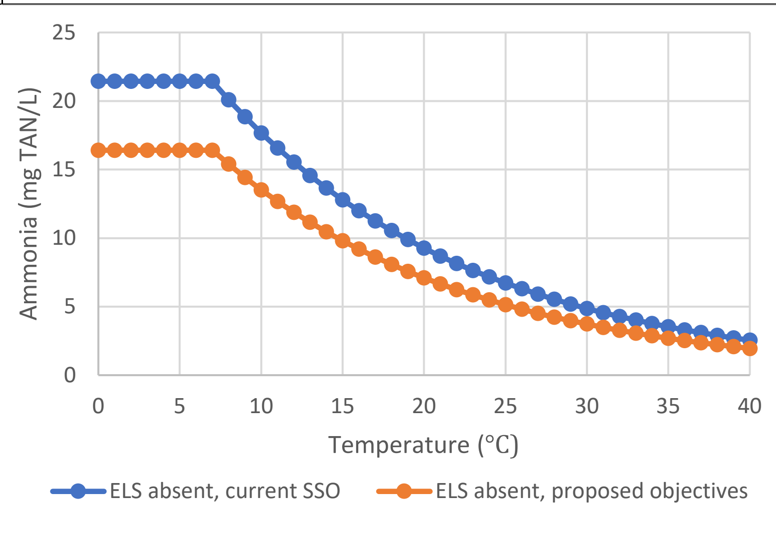
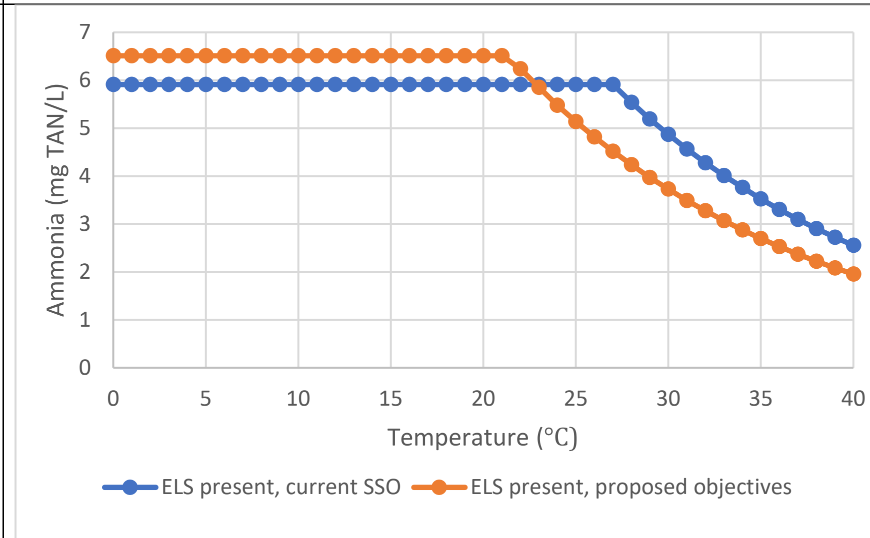
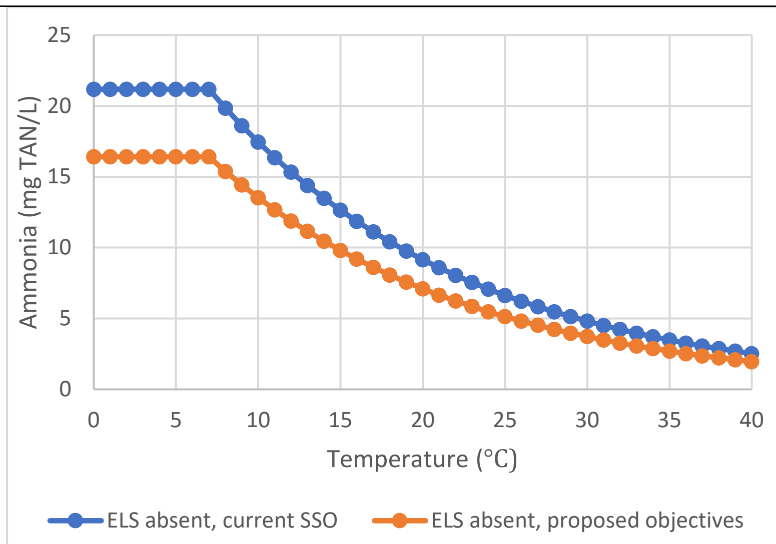
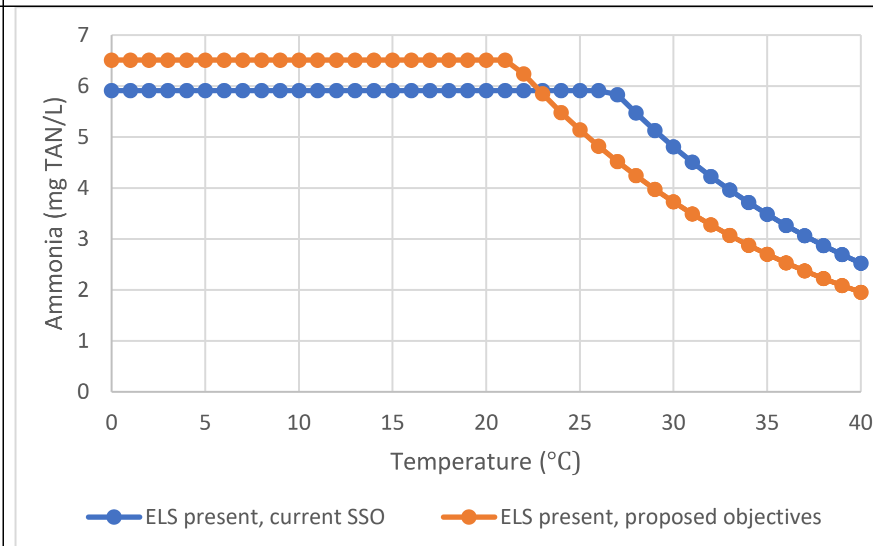


7
6
5
4
3
2
1
0
0
5
10
15
20
25
30
35
40
Ammonia (mg TAN/L)
Temperature (°C)
ELS present, current SSO
ELS present, proposed objectives

| Water body reach | ELS absent | ELS present |
|---|---|---|
| San Jose Creek |   |   |
| San Gabriel River Reaches 2 and 3 |   |   |

| Water body reach | ELS absent | ELS present |
| --- | --- | --- |
| San Gabriel River Reach 1 |  |  |

| | | |
|---|---|---|
| Coyote Creek |  |  |

| Water body reach | ELS absent | ELS present |
|---|---|---|
| Santa Clara River Reach 6 |  |  |
| Santa Clara River Reach 5 |  |  |

As shown in Figure 9, during an ELS absent period, the proposed chronic (30-day) objectives based on the 2013 ammonia update in Los Angeles River Reaches 3, 4, and 5, Coyote Creek, San Gabriel River Reach 1, Rio Hondo, and Santa Clara River Reaches 5 and 6 are lower (more stringent) than the current SSOs throughout temperature range (0-30°C) and pH range (6.5-9). The magnitude of the difference varies from one waterbody reach to another (Table 5), but it decreases as temperature increases above 7°C, with pH constant. The largest magnitude of difference for each reach that is expected to occur between 0-7°C is shown in Figure 9. Only San Gabriel Reaches 2 and 3 and San Jose Creek have current chronic SSOs that are similar to or higher (less stringent) than the proposed objectives throughout temperature range (0-30°C) and pH range (6.5-9) when ELS are absent (Figure 9, and Appendix 6). However, permits for discharges to these sites would still be subject to state and federal anti-backsliding requirements.

**Table 5. Maximum difference between the proposed objectives (more stringent) and the current SSOs at pH 7 during ELS absent period for different water body reaches**

| Water body reach | Maximum difference (mg TAN/L)* |
|---|---|
| Los Angeles River Reaches 3, 4, and 5 | 2.45 |
| Rio Hondo | 3.71 |
| Coyote Creek | 3.18 |
| San Gabriel River Reach 1 | 5.69 |
| Santa Clara River Reach 6 | 5.03 |
| Santa Clara River Reach 5 | 4.77 |

*Maximum difference occurs at 0-7°C, see the graphs in the left panels of Figure 7

For reaches with SSOs that currently have an ELS present period, the proposed chronic objectives would be less stringent (i.e., have a higher allowable ammonia concentration) than the current SSOs listed in Table 3-4 of the Basin Plan until a temperature of 22°C across the pH range (6.5-9). At temperature 23°C and above, the proposed objectives become more stringent (have a lower allowable ammonia concentration) than the current SSOs in Los Angeles River Reaches 3 and 5, Rio Hondo and Santa Clara River Reaches 5 and 6. Only San Jose Creek and San Gabriel River Reaches 2 and 3 have current SSOs similar to or higher (less stringent) than the proposed objectives at temperature 23°C and above (Figure 9, and Appendix 6).

For reaches with SSOs where ELS present is introduced (i.e., Los Angeles River Reach 4, Burbank Western Channel and Coyote Creek), the proposed objectives during ELS present period would be significantly lower (more stringent) than the current SSOs, particularly at low temperature (<20°C). However, low temperatures are not expected to occur frequently during ELS present period in these reaches, as the months when ELS present (April-October) correspond to summer. The likelihood of low summer temperatures occurring is also less given the trend of increasing temperatures due to climate change. Only Burbank Western Channel has proposed objectives higher (less stringent) than the current SSOs at temperature 20°C and above with the introduction of ELS present (Figure 9, and Appendix 6).

## 7. Compliance with the Proposed Ammonia Objectives

If approved, the proposed ammonia objectives would be reflected in revised effluent and receiving water limitations in NPDES permits and non-NPDES waste discharge requirements (WDRs). The Basin Plan authorizes the use of compliance schedules in NPDES permits and non-NPDES WDRs for effluent limits and receiving water limits to achieve new, revised, or newly interpreted water quality standards.

All 10 wastewater treatment plants (i.e., Pomona, San Jose Creek, Whittier Narrows, Long Beach, Los Coyotes, Saugus and Valencia, Burbank, Glendale and D.C. Tilman) that discharge to waterbodies listed in Table 3-4 of the Basin Plan (waterbodies with ammonia SSOs) have nitrification/denitrification (N/DN) capability.

The average ammonia levels measured in the immediate downstream receiving water stations with the application of N/DN are on average less than 1 mg/L[18], which is lower than most of the proposed objectives that are relevant to the Los Angeles Region (see section 5.6: "Applicable pH and temperature range" section of this report). Although Water Code section 13360 prohibits the Los Angeles Water Board from specifying the manner of compliance with its orders, wastewater treatment plants that are operating with N/DN will continue to operate in N/DN and other wastewater treatment plants may need to upgrade their facilities. The use of N/DN to achieve ammonia objectives has already been implemented prior to this proposed Basin Plan amendment in order to comply with previously adopted water quality objectives and TMDLs. As stated in page 31 of the 2007 ammonia staff report, "The need for N/DN was prompted by the requirements of the 1994 Basin Plan ammonia objectives. As mentioned earlier, a plant that uses N/DN and chloramination can reliably reduce ammonia to below 3.0 mg/L (total ammonia as N). While the SSOs will allow for slightly increased concentrations of ammonia in some local waterbodies, the POTWs [Publicly Owned Treatment Works] that currently do not operate in N/DN will still need to upgrade their facilities and the other POTWs that are operating with N/DN will continue to operate in N/DN".

[18] Based on Figure 9, Final Staff Report (Proposed amendments to the water quality control plan – Los Angeles Region – To incorporate site-specific ammonia objectives for select inland surface waters in the San Gabriel River, Los Angeles River and Santa Clara River Watersheds – July 2007)

The utilization of N/DN technology (tertiary level treatment) will also be beneficial to wastewater treatment plants to meet the criteria of some upcoming regulations such as the new mercury objectives associated with Tribal Beneficial Uses (State Water Resources Control Board, 2017). Tertiary level of nitrogen treatment would also assist in addressing nutrient over enrichment and meeting the goal for increased use of recycled water. As a result, the use of N/DN may also help dischargers comply with other existing and/or upcoming regulations.

For waterbodies that have SSOs, the proposed ammonia objectives are different for different waterbodies, depending on temperature (Figure 9). For San Jose Creek, Burbank Western Channel, and San Gabriel River Reaches 2 and 3, the proposed objectives will, for the most part, be less stringent with the degree being dependent on temperature.

For other waterbodies with SSOs, the proposed ammonia objectives are, for the most part, more stringent, and complying with more restrictive discharge requirements might be more difficult in summer. Under the ELS present scenario, more stringent proposed objectives than the current SSOs occur in Santa Clara River Reaches 5 and 6, Los Angeles River Reaches 3 and 5, and Rio Hondo Reaches 1 and 2 when temperature is greater than or equal to 23°C (Figure 9). Because the periods of ELS present correspond to higher temperatures during summer months, it is likely that the temperature may exceed 23°C. Similarly, the periods of ELS absent correspond to low temperatures during winter months. When temperature is low, there is a greater difference between the more stringent proposed objectives and the current SSOs in the Los Angeles River Reaches 3, 4, 5, Coyote Creek, San Gabriel River Reach 1, Rio Hondo, and Santa Clara River Reaches 5 and 6 (Figure 9). In addition, dischargers that use biological treatment of ammonia usually experience more performance variability when the temperature is low.

Despite the challenges associated with ammonia removal, new methods, research, and information are becoming available. They range from retrofitting an existing plant to using an entirely new group of bacteria to oxidize ammonia anaerobically. Depending on the methods, there will be variability in costs, but unit costs (i.e., total capital cost per effluent volume) generally decrease as the size of the plant increases due to economies of scale. U.S. EPA, supported by industry initiatives, has disseminated information to wastewater professionals with the latest nutrient removal strategies such as Biological Nutrient Removal Processes and Costs (2007), Side Stream Nutrient Removal (2007), Municipal Nutrient Removal Technologies Reference Document (2008) and Emerging Technologies for Wastewater Treatment and In-Plant Wet Weather Management (2013). They provide performance and/or cost information to wastewater facilities on nutrients, including ammonia removal.

Currently, some reaches in the Calleguas Creek, Malibu Creek, Ballona Creek, Dominguez Channel, Los Angeles River, and San Gabriel River watersheds are listed in Table 3-5 of the Basin Plan as waterbodies that are always subject to the ELS absent condition. Because the Los Angeles Water Board staff proposes the removal of Table 3-5 (see section 5.4: Selection of Chronic Ammonia Objectives – ELS Present vs ELS Absent), these reaches would become subject to the ELS present condition. While changes from ELS absent to ELS present conditions will lead to more stringent ammonia criteria, the scenario will only be applicable at temperatures greater than 13°C (55°F). As temperatures less than 13°C are very rarely observed in the Los Angeles Region, the proposed chronic ammonia objectives would offer partial relief to comply with possibly less stringent ammonia limits in those reaches. Similarly, low temperature during summer is not expected to occur frequently in reaches with SSOs where seasonal ELS present is introduced (April-October). The likelihood of having low summer temperature is also lessened by warming temperature as climate change progresses.

For waterbodies that receive discharge from approximately 97,000 acres of irrigated agricultural fields (approximately 2,100 operations) that are or may be generating nonpoint source pollution in Los Angeles Region, compliance with the “Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands within the Los Angeles Region” or with the expected “Waste Discharge Requirements for Discharges from Irrigated Lands within the Los Angeles Region” will be the primary mechanism to control discharge.

## 8. Antidegradation Analysis

Both the U.S. EPA (40 CFR 131.12) and the State of California (State Board Resolution No. 68-16) have adopted antidegradation policies. The Los Angeles Water Board must ensure that its actions do not violate the Federal and State antidegradation policies. This section of the Staff Report analyzes whether approval of the proposed ammonia objectives would be consistent with the federal and State antidegradation policies.

### 8.1. Federal Antidegradation Policy

The federal antidegradation policy provides, in part (40 CFR §131.12(a)):

1. Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.
2. Where the quality of waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the State’s continuing planning process, that allowing lower water quality is

necessary to accommodate important economic or social development in the area in which the waters are located…. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control. …

(ii) Before allowing any lowering of high water quality… the State shall find, after an analysis of alternatives, that such a lowering is necessary to accommodate important economic or social development in the area in which the waters are located. The analysis of alternatives shall evaluate a range of practicable alternatives that would prevent or lessen the degradation associated with the proposed activity. When the analysis of alternatives identifies one or more practicable alternatives, the State shall only find that a lowering is necessary if one such alternative is selected for implementation.

**3.** Where high quality waters constitute an outstanding National resource, such as waters of National and States parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected. **State Antidegradation Policy**

Antidegradation provisions of State Board Resolution No. 68-16 ("Statement of Policy with Respect to Maintaining High Quality Waters in California") state, in part:

1. Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies.

2. Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.

In 1990, the California State Water Resources Control Board (SWRCB) issued guidance to the Regional Water Boards for implementing Resolution No. 68-16 in NPDES permitting in Administrative Procedures Update (APU) 90-004. Because the proposed objectives may result in an increase in effluent concentration to surface water, an antidegradation analysis is necessary to identify and address potential water quality impacts where the proposed amendment would make existing water quality objectives less stringent. Based on APU 90-004, an antidegradation analysis should “compare receiving water quality to the water quality objectives established to protect designated beneficial uses”:

- If baseline water quality is equal to or less than the quality as defined by the water quality objective, water quality shall be maintained or improved to a level that achieves the objectives …
- If baseline water quality is better than the water quality as defined by the water quality objective, the baseline water quality shall be maintained unless poorer water quality is necessary to accommodate important economic or social development and is considered to be of maximum benefit to the people of the State.

Some receiving waters within the area covered by the proposed Basin Plan amendment are not meeting water quality objectives for ammonia. Under both federal and state antidegradation policies, these receiving waters are not considered “high quality” waters for these pollutants. For receiving waters that are not high quality waters, the federal antidegradation policy requires that regulatory actions ensure that existing instream uses and the level of water quality necessary to protect the existing uses is maintained and protected. The proposed Basin Plan amendment ensures that existing instream (beneficial) uses and the level of water quality necessary to protect the existing uses is maintained and protected because the updated 2013 ammonia criteria were developed by U.S. EPA to provide an appropriate level of protection from ammonia toxicity for aquatic life based on newly available data, particularly from sensitive freshwater mollusks.

As discussed in section 6.1 of this staff report, based on a comparison between the current and the proposed acute ammonia objectives, the proposed acute ammonia objective will:

1. Be identical to current objectives in waters designated COLD because the acute ammonia objectives do not differ for temperatures below 27°C and COLD waters are expected to be below 27°C,

2. Decrease in water bodies designated MIGR which support anadromous fish (e.g., estuarine waterbodies) at temperatures greater than or equal to 23°C, and

3. Decrease in water bodies that have other habitat-related beneficial uses (e.g., WARM, WILD), which protect invertebrates, particularly at temperatures greater than or equal to 23°C.

As discussed in section 6.2 of this staff report, based on a comparison between the current and the proposed chronic ammonia objectives, the proposed chronic ammonia concentration is expected to increase for reaches that are currently under the ELS present condition. However, the proposed objectives remain protective of aquatic life in the Los Angeles Region because existing data from sensitive freshwater snails and non-unionid bivalves are maintained for ammonia objective recalculation procedures in the absence of mussels. The proposed chronic objectives are also protective of fish ELS because: 1) two of the four most sensitive genera are fish ELS when mussels are absent and 2) all reaches, except for 12 reaches that have seasonal ELS absent in Los Angeles Region, are converted into ELS present condition to meet the proposed ammonia criteria and to protect more fish species.

Some receiving waters within the area covered by the proposed Basin Plan amendment are high quality waters with regard to ammonia. Any degradation of high quality waters is necessary to accommodate important economic or social development in the area and is consistent with the maximum benefit to the people of the state for the following reasons: Where the ammonia objectives based on the 2013 ammonia update are less stringent than the existing objectives, such objectives are fully protective of beneficial uses of such waters. In addition, the proposed objectives take a conservative approach to protect beneficial uses by presuming ELS present in all water bodies.[19] Finally, changes in ammonia objectives due to this proposal are not significantly different from the current objectives in the Basin Plan (see Figures 7, 8, and 9) and will not result in a reduction in nitrogen management practices that are required for other reasons. Dischargers affected by the proposed Basin Plan amendment will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained[20]. Recent data (2015-2020) from the California Integrated Water Quality System (CIWQS) show that N/DN treatment plants managed to reduce ammonia concentration below the maximum allowable ammonia limit under the current NPDES permits. Of the 10 POTWs that have ammonia SSOs, only Burbank (in October 2017) and Pomona (in January 2015) have ever recorded an effluent concentration exceedance. As stated above, other POTWs were already expected to upgrade their facilities to ensure the protection of beneficial uses.

[19] except for 12 reaches that have seasonal ELS absent

[20] In California, the best available technologies for nitrate removal are ion exchange, reverse osmosis, and electrodialysis (Cal. Code of Regs, tit. 22, § 64447.2). But the State Water Board has conditionally accepted six (6) biological treatment technologies for nitrate removal following extensive acceptance testing. Unlike these technologies, the major advantage of operating a biological treatment system is that under anaerobic conditions, the treatment system can remove nitrate with very little energy. In addition, there is no disposal of a brine solution, which is very difficult and costly to dispose of.

While agricultural users often add nitrogen as ammonia to crops for fertilization, the State must assure that best management practices for non-point source pollution control are implemented. Nitrogen management in agricultural fields can be achieved by implementing management practices common agricultural practices, such as crop rotation, no-tillage, and fertilizer scheduling as required by regulatory orders for irrigated agricultural lands.

Further, technology-based effluent limits will ensure that the current performance of the POTWs' wastewater treatment plants' N/DN technology continues. Antibacksliding requirements (Clean Water Act section 402(o) and 40 C.F.R. §122.44(*l*)), permit-specific antidegradation analyses, and existing TMDLs will further limit degradation resulting from less stringent criteria. The proposed amendment will not supersede any TMDL, but in the future, waste load allocations in existing TMDLs may be modified based on the new objectives.

### 9. Human Right to Water

Water Code section 106.3 declares that "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes" (*id.*, subd. (a)) and promotes the adoption of policies, regulations, and grant criteria pertinent to those uses of water (*id.*, subd. (c)). Although the 2013 ammonia update does not directly pertain to drinking water, according to World Health Organization (2003), ammonia in source water can reduce disinfection efficiency because chlorine may react with the ammonia and become unavailable for disinfection. If the concentration of ammonia is lower in surface water prior to disinfection, it will be less costly for water treatment facilities to provide a satisfactory level of disinfecting compounds and eventually safe, clean drinking water.

### 10. Water Code Section 13241 Considerations

When adopting or modifying water quality objectives, Section 13241 of the California Water Code lists factors that must be considered by the Los Angeles Water Board. These factors, which are related to the proposed ammonia objectives based on the 2013 ammonia update, are summarized below.

***Past, present and probable future beneficial uses.*** The proposed 2013 ammonia update primarily protects beneficial uses of freshwater that are related to aquatic life. They may include, but not limited to, warm freshwater habitat (WARM), cold freshwater habitat (COLD), wildlife habitat (WILD), rare, threatened or endangered species (RARE), migration of aquatic organisms (MIGR), spawning, reproduction, and/or early development (SPWN), wetland habitat (WET), estuarine habitat (EST), aquaculture (AQUA), commercial and sport fishing (COMM), and shellfish harvesting (SHELL). These beneficial uses are listed in Chapter 2 of the Basin Plan, which are hereby incorporated by reference to address this factor.

***Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto.*** See Chapters 1 through 3 of the Basin Plan for information on the environmental setting of the affected waters and on water quality in relation to specific beneficial uses, which are hereby incorporated by reference to address this factor.

***Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area*.** Water quality conditions that reasonably could be achieved through the coordinated control of all factors which affect water quality in the area have been considered. Water quality is primarily affected by environmental conditions (e.g., climate, soil, topography) and human activities (e.g., agriculture, industry, tourism). The environmental conditions affecting water quality and beneficial uses of the Los Angeles Region are discussed in Chapter 1 of the Basin Plan. Implementation of the TMDLs that are currently in effect and of those under development will ensure that the Los Angeles Region's inland surface waters protect beneficial uses of freshwater listed in Chapter 2 of the Basin Plan. If approved, the update will supersede the current objectives listed in Chapter 3 of the Basin Plan as the baseline or benchmark of water quality conditions that can reasonably be achieved.

***Economic considerations.*** The wastewater treatment plants discharging to water bodies in the Los Angeles Region are expected to be the primary parties involved in compliance with the proposed objectives. All wastewater treatment plants that discharge to water bodies listed in Table 3-4 of the Basin Plan currently have N/DN capability. Other wastewater treatment plants may still need to upgrade their facilities to N/DN[21]. The capital cost of installing N/DN treatment varies depending on the application and overall effluent requirements, as well as whether it is a new plant or a retrofit. Operational costs mostly consist of energy costs associated with backwashing, air-scour, and nitrogen-release cycles, along with a proper accounting of the frequency of these operations. According to a study by Vineyard et al. (2020), a 15 MGD plant reducing 8 ppm-N to 5 ppm-N costs $15.56/kg N removed (2018 USD). Underlying assumptions, data and

[21] The only wastewater treatment plants that discharge to inland surface waters, enclosed bays, or estuaries that do not currently have nitrification/denitrification are the Terminal Island and Malibu Mesa water reclamation plants. The Terminal Island plant discharges to the Los Angeles Harbor and only has nitrification. Malibu Mesa recycles all its water and only retains coverage under the NPDES permit in case it needs to discharge, but the discharger is planning on upgrading the facility to a membrane bioreactor to provide full NDN by 2026.

methods used to calculate the price is available on Vineyard et al. (2020)[22]. Wastewater treatment plants might consider resources that are available in partnership with U.S. EPA, for example Clean Water State Revolving Fund, Searchable Clearinghouse of Wastewater Technology, Environmental Finance Center Grants and Water Finance Clearinghouse.

Agricultural dischargers will still need to implement management practices as required by irrigated lands regulatory orders in order to attain water quality objectives and the cost will not change. Management practices may include, but are not limited to, common agricultural practices such as, crop rotation and fertilizer scheduling. Therefore, the economic cost of this amendment will not be significant for crop growers.

***Need for developing housing within the region*.** With increasing population, land uses are changing, usually agriculture and open space are converted to residential and commercial uses. However, the proposed ammonia criteria are not expected to affect the development of housing in the Los Angeles Region because the proposed chronic objectives are generally less stringent than those that they replace for the majority of water bodies. Water treatment plants also continuously adjust their technology and capacity in response to increasing population and associated wastewater.

***Need to develop and use recycled water.*** "Recycled water means water which, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur and is therefore considered a valuable resource" (Water Code, § 13050(n)). The State Water Resources Control Board adopted the Recycled Water Policy to help meet the state's growing water supply demand and protect public health and the environment. Adopting the proposed ammonia objectives should not affect dischargers ability to recycle their effluent and comply with the recycled water policy.

### 11. Water Code Section 14149.2 Considerations

The Los Angeles Water Board has satisfied the outreach requirements set forth in Water Code section 189.7 by conducting outreach in potentially affected disadvantaged and tribal communities.

When adopting or modifying water quality objectives, section 13149.2 of the California Water Code requires the Los Angeles Water Board to make a concise, programmatic finding on potential environmental justice, tribal impact, and racial equity considerations related to the adoption.

The Los Angeles Water Board expects the impacts of this proposed adoption to be low to tribal and disadvantaged communities for several reasons. First, the adoption of the

[22] Economic analysis of electrodialysis, denitrification, and anammox for nitrogen removal in municipal wastewater treatment - ScienceDirect

2013 ammonia criteria that implement mussel absent scenario only generates a few changes that relax the existing water quality objectives. Second, as discussed above, certain facilities have already implemented N/DN and wastewater treatment plants that currently do not operate with N/DN will need to upgrade their facilities. Third, this proposed amendment will not supersede any TMDL, which will also assure the attainment of the water quality standard. Last, and most importantly, despite being less stringent in a few scenarios, the ammonia objectives in this proposed update are fully protective of beneficial uses. The ammonia objectives in this proposed amendment are based on the most recent U.S. EPA recommendations which considered the ammonia toxicity to more species than in previous EPA recommendations. The proposed amendment also takes a conservative approach to protect beneficial uses by subjecting all streams to the ELS present condition, with the exception of a very few reaches that have SSOs.

## 12. Recommended Alternative

Los Angeles Water Board staff recommend that the Board adopt the Resolution with the attached Basin Plan amendment to incorporate the changes to the Basin Plan as discussed in this Staff Report.

## 13. References

California Regional Water Quality Control Board Los Angeles Region. 2002. Amendment to the Water Quality Control Plan for the Los Angeles Region to Update the Ammonia Objectives for Inland Surface Waters (including enclosed bays, estuaries and wetlands) with Beneficial Use designation for protection of "Aquatic Life." Resolution No. 2002-011, including Staff Report.

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