CHAPTER 4

WATER QUALITY OBJECTIVES

INTRODUCTION

The Porter-Cologne Act defines water quality objectives as "…the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area" (§13050 (h)). Further, the Act directs (§13241) that:

> "Each regional board shall establish such water quality objectives in water quality control plans as in its judgment will ensure the reasonable protection of beneficial uses as the prevention of nuisance; however, it is recognized that it may be possible for the quality of water to be changed to some degree without unreasonably affecting beneficial uses. Factors to be considered by a regional board in establishing water quality objectives shall include, but not necessarily be limited to, all of the following:
>
> (a) Past, present, and probable future beneficial uses of water.
>
> (b) Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto.
>
> (c) Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area.
>
> (d) Economic considerations.
>
> (e) The need for developing housing within the region.
>
> (f) The need to develop and use recycled water."

Two important additional factors which were also considered in setting the water quality objectives in this Plan are (1) historic and present water quality, and (2) the antidegradation policies cited in Chapter 2.

The water quality objectives in this plan supersede and replace those adopted in the 1983 Basin Plan. Perhaps the most significant difference between this and the prior Plan is the inclusion of new objectives for un-ionized ammonia and site-specific objectives for the middle Santa Ana River system for copper, cadmium, and lead.

Some of these water quality objectives refer to "controllable sources" or "controllable water quality factors." Controllable sources include both point and nonpoint source discharges, such as conventional discharges from pipes, as well as discharges from land areas or other diffuse sources. Controllable water quality factors are those characteristics of the discharge and/or the receiving water which can be controlled by treatment or management methods. Examples of other activities which may not involve waste discharges, but which also constitute controllable water quality factors, include the percolation of storm water, transport/delivery of water via natural stream channels, and stream diversions.

The water quality objectives in this Plan are specified according to waterbody type: ocean waters; enclosed bays and estuaries; inland surface waters; and groundwaters.

The narrative water quality objectives below are arranged alphabetically. They vary in applicability and scope, reflecting the variety of beneficial uses of water that have been identified (Chapter 3). Where numerical objectives are specified, they generally represent the levels that will protect beneficial uses. However, in establishing waste discharge requirements for specific discharges, the Regional Board may find that more stringent levels are necessary to protect beneficial uses. In other cases, an objective may prohibit the discharge of specific substances, may tolerate natural or "background" levels of certain substances or characteristics but no increases over those values, or may express a limit in terms of not impacting other beneficial uses. An adverse effect or impact on a beneficial use occurs where there is an actual or threatened loss or impairment of that beneficial use.

OCEAN WATER (The following has been added under Resolution No. 97-20)

Water quality objectives specified in the "Water Quality Control Plan for Ocean Waters of California" (Ocean Plan) and the "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California" (Thermal Plan) are incorporated into this Basin Plan by reference. The provisions of the Ocean Plan and Thermal Plan apply to the ocean waters within this Region. **(End of amendment adopted under Resolution No. 97-20)**

ENCLOSED BAYS AND ESTUARIES

"Enclosed bays" means indentations along the coast which enclose an area of oceanic water within distinct headlands or harbor works. "Estuaries" means waters, including coastal lagoons, located at the mouths of steams which serve as areas of mixing for fresh and ocean waters. Enclosed bays and estuaries do not include ocean waters or inland surface waters (see definition in the Inland Surface Waters section).

The objectives which are included below apply to all enclosed bays and estuaries within the region. In addition to these parameter-specific objectives, the following narrative objective shall apply:

Enclosed bay and estuarine communities and populations, including vertebrate, invertebrate, and plant species, shall not be degraded as a result of the discharge of waste. Degradation is damage to an aquatic community or population with the result that a balanced community no longer exists. A balanced community is one that is (1) diverse, (2) has the ability to sustain itself through cyclic seasonal changes, (3) includes necessary food chain species, and (4) is not dominated by pollution-tolerant *species, unless that domination is caused by physical habitat limitations. A balanced community also (5) may include historically introduced non-native species, but (6) does not include species present because best available technology has not been implemented, or (7) because site-specific objectives have been adopted, or (8) because of thermal discharges.*

Algae

Excessive growth of algae and/or other aquatic plants can degrade water quality. Algal blooms sometimes occur naturally, but they are often the result of excess nutrients (*i.e.,* nitrogen, phosphorus) from waste discharges or nonpoint sources. These blooms can lead to problems with tastes, odors, color, and increased turbidity and can depress the dissolved oxygen content of the water, leading to fish kills. Floating algal scum and algal mats are also an aesthetically unpleasant nuisance.

Waste discharges shall not contribute to excessive algal growth in receiving waters.

Bacteria, Coliform

Fecal bacteria are part of the intestinal flora of warm-blooded animals. Their presence in bay and estuarine waters is an indicator of pollution. Total coliform is measured in terms of the number of coliform organisms per unit volume. Total coliform numbers can include non-fecal bacteria, so additional testing is often done to confirm the presence and numbers of fecal coliform bacterial. Water quality objectives for numbers of total and fecal coliform vary with the uses of the water, as shown below.

Bays and Estuaries

REC-1 *Fecal coliform: log mean less than 200 organisms/100 mL based on five or more samples/30 day period, and not more than 10% of the samples exceed 400 organisms/100 mL for any 30-day period.*

SHEL *Fecal coliform: median concentration not more than 14 MPN (most probable number)/100 ml and not more than 10% of samples exceed 43 mpn / 100 mL*

Chlorine, Residual

Wastewater disinfection with chlorine usually produces a chlorine residual. Chlorine and its reaction products are toxic to aquatic life.

To protect aquatic life, the chlorine residual in wastewater discharged to enclosed bays and estuaries shall not exceed 0.1 mg/L.

Color

Color in water may arise naturally, such as from minerals, plant matter or algae, or may be caused by industrial pollutants. Color is primarily an aesthetic consideration.

Waste discharges shall not result in coloration of the receiving waters which causes a nuisance or adversely affects beneficial uses. The natural color of fish, shellfish or other bay and estuarine water resources used for human consumption shall not be impaired.

Floatables

Floatables are an aesthetic nuisance as well as a substrate for algae and insect vectors.

Waste discharges shall not contain floating materials, including solids, liquids, foam or scum, which cause a nuisance or adversely affect beneficial uses.

Oil and Grease

Oil and grease can be present in water as a result of the discharge of treated wastes and the accidental or intentional dumping of wastes into sinks and storm drains. Oils and related materials have a high surface tension and are not soluble in water, therefore forming a film on the water's surface. This film can result in nuisance conditions because of odors and visual impacts. Oil and grease can coat birds and aquatic organisms, adversely affecting respiration and/or thermoregulation.

Waste discharges shall not result in deposition of oil, grease, wax or other materials in concentrations which result in a visible film or in coating objects in the water, or which cause a nuisance or adversely affect beneficial uses.

Oxygen, Dissolved

Adequate dissolved oxygen (D.O.) is vital for aquatic life. Depression of D.O. levels can lead to fish kills and odors resulting from anaerobic decomposition. Dissolved oxygen content in water is a function of water temperature and salinity.

The dissolved oxygen content of enclosed bays and estuaries shall not be depressed to levels that adversely affect beneficial uses as a result of controllable water quality factors.

pH

pH is a measure of the hydrogen ion concentration of water. pH values generally range from 0 (most acidic) to 14 (most alkaline). Many pollutants can alter the pH, raising or lowering it excessively. These extremes in pH can have adverse effects on aquatic biota and can corrode pipes and concrete. Even small changes in pH can harm aquatic biota.

The pH of bay or estuary waters shall not be raised above 8.6 or depressed below 7.0 as a result of controllable water quality factors; ambient pH levels shall not be changed more than 0.2 units.

Radioactivity
Radioactive materials shall not be present in the bay or estuarine waters of the region in concentrations which are deleterious to human, plant or animal life.

Solids, Suspended and Settleable
Settleable solids are deleterious to benthic organisms and may cause anaerobic conditions to form. Suspended solids can clog fish gills and interfere with respiration in aquatic fauna. They also screen out light, hindering photosynthesis and normal aquatic plant growth and development.

Enclosed bays and estuaries shall not contain suspended or settleable solids in amounts which cause a nuisance or adversely affect beneficial uses as a result of controllable water quality factors.

Sulfides
Sulfides are generated by many industries and from the anaerobic decomposition of organic matter. In water, sulfides can react to form hydrogen sulfide (H_2S), commonly known for its "rotten egg" odor. Sulfides in ionic form are also toxic to fish.

The dissolved sulfide content of enclosed bays and estuaries shall not be increased as a result of controllable water quality factors.

Surfactants (surface-active agents)
This group of materials includes detergents, wetting agents, and emulsifiers.

Waste discharges shall not contain concentrations of surfactants which result in foam in the course of flow or the use of the receiving water, or which adversely affect aquatic life.

Taste and Odor
Undesirable tastes and odors in water may be a nuisance and may indicate the presence of a pollutant(s).

The enclosed bays and estuaries of the region shall not contain, as a result of controllable water quality factors, taste- or odor-producing substances at concentrations which cause a nuisance or adversely affect beneficial uses. The natural taste and odor of fish, shellfish or other enclosed bay and estuarine water resources used for human consumption shall not be impaired.

Temperature
Waste discharges can cause temperature changes in the receiving waters which adversely affect the aquatic biota. Discharges most likely to cause these temperature effects are cooling tower and heat exchanger blowdown.

All bay and estuary waters shall meet the objective specified in the Thermal Plan.

Toxic Substances

Toxic substances shall not be discharged at levels that will bioaccumulate in aquatic resources to level which are harmful to human health.

The concentrations of toxic substances in the water column, sediments or biota shall not adversely affect beneficial uses.

Turbidity

Turbidity is a measure of light scattered due to particulates in water.

Increases in turbidity which result from controllable water quality factors shall comply with the following:

Natural Turbidity	*Maximum Increase*
0-50 NTU	*20%*
50-100 NTU	*10 NTU*
Greater than 100 NTU	*10%*

All enclosed bay and estuaries of the region shall be free of changes in turbidity which adversely affect beneficial uses.

INLAND SURFACE WATERS

Inland surface waters include streams, rivers, lakes, and wetlands in the Region. Ocean waters and enclosed bays and estuaries are not considered inland surface waters.

The narrative objectives which are included below apply to all inland surface waters within the region, including lakes, streams, and wetlands. In addition, specific numerical objectives are listed in Table 4-1. Where more than one objective is applicable, the stricter shall apply. In addition to these objectives, the following shall apply:

Inland surface water communities and populations, including vertebrate, invertebrate, and plant species, shall not be degraded as a result of the discharge of waste. Degradation is damage to an aquatic community or population with the result that balanced community no longer exists. A balanced community is one that is (1) diverse, (2) has the ability to sustain itself through cyclic seasonal changes, (3) includes necessary food chain species, and (4) is not dominated by pollution-tolerant species, unless that domination is caused by physical habitat limitations. A balanced community also (5) may include historically introduced non-native species, but (6) does not include species present because best available technology has not been implemented, or (7) because site-specific objectives have been adopted, or (8) because of thermal discharges.

Algae

Excessive growth of algae and/or other aquatic plants can degrade water quality. Algal blooms sometimes occur naturally, but they are often the result of excess nutrients (*i.e.,* nitrogen, phosphorous) from waste discharges or nonpoint sources. These blooms can lead to problems with tastes, odors, color, and increased turbidity and can depress the dissolved oxygen content of the water, leading to fish kills. Floating algal scum and algal mats are also an aesthetically unpleasant nuisance.

Waste discharges shall not contribute to excessive algal growth in inland surface receiving waters.

Ammonia, Un-ionized

Un-ionized ammonia (NH_3, or UIA) is toxic to fish and other aquatic organisms. In water, UIA exists in equilibrium with ammonium (NH_4+) and hydroxide (OH) ions. The proportions of each change as the temperature, pH, and salinity of the water change.

The 1983 Basin Plan specified an UIA objective of 0.8 mg/L for waterbodies designated **WARM**. The SWRCB directed the Regional Board to review the 0.8 mg/L objective because of concerns that it is not stringent enough to protect aquatic wildlife. The USEPA concurred that this review was necessary.

The Regional Board contracted with California State University, Fullerton to conduct a study of un-ionized ammonia in the Santa Ana River and to develop recommendations regarding the UIA objective. This study, which was conducted in 1985-87, was complemented by additional Regional Board staff analysis. The additional staff analysis focused on adjusting EPA's national criteria for **WARM** waters (published in 1984 and amended in 1992), using the recalculation procedure. With this procedure, cold and warmwater species not found in the Santa Ana Region's **WARM** designated waters were deleted from the database used to derive the national criteria, and new criteria were calculated.

Based on these analyses, this Plan specifies UIA objectives for **WARM** and **COLD** designated waterbodies in the Region. **Note:** site-specific objectives have been developed for the Santa Ana River and certain tributaries (see next page).

Acute (1-hour) UIA-N Objectives for waterbodies designated **COLD**:

Objective = 0.822[0.52/FT/FPH/2], where

$FT = 10^{0.03(20-T)}$	$0 \le T \le 20°C$
FT = 1	$20 \le T \le 30°C$
$FPH = \frac{1+10^{(7.4-pH)}}{1.25}$	$6.5 \le pH \le 8$
FPH = 1	$8 \le pH \le 9$

For waterbodies designated **WARM:**
Objective = 0.822[0.87/FT/FPH/2], where

FT = $10^{0.03(20-T)}$	0≤T≤25°C
FT = 0.7079	25≤T≤30°C
FPH = $\frac{1+10^{(7.4-pH)}}{1.25}$	6.5≤pH≤8
FPH = 1	8≤pH≤9

Chronic (4-day) UIA-N Objectives

For waterbodies designated **COLD:**
Objective = 0.822[0.52/FT/FPH/RATIO], where

FT = $10^{0.03(20-T)}$	0≤T≤15°C
FT = 1.4125	15≤T≤30°C
FPH = $\frac{1+10^{(7.4-pH)}}{1.25}$	6.5≤pH≤8
FPH = 1	8≤pH≤9
RATIO = $\frac{24\left[10^{(7.7-pH)}\right]}{1+10^{(7.4-pH)}}$	6.5≤pH≤7.7
RATIO=13.5	7.7≤pH≤9

For waterbodies designated **WARM**:
Objective = 0.822[0.87/FT/FPH/RATIO], where

FT = $\mathbf{10^{0.03(20-T)}}$	0≤T≤20°C
FT = 1	20≤T≤30°C
FPH = $\mathbf{\frac{1+10^{(7.4-pH)}}{1.25}}$	6.5≤pH≤8
FPH = 1	8≤pH≤9
RATIO = $\mathbf{\frac{24\left[10^{(7.7-pH)}\right]}{1+10^{(7.4-pH)}}}$	6.5≤pH≤7.7
RATIO = 13.5	7.7≤pH≤9

Calculated numerical UIA-N objectives as well as corresponding total ammonia nitrogen concentration for various pH and temperature conditions are shown in Tables

4-2 and 4-3. Table 4-4 lists the above equations in a form that can be entered into a computer or calculator program.

Site-specific Un-ionized Ammonia Objective for the Santa Ana River System In addition to the un-ionized ammonia (UIA) objectives specified above, this Plan includes a chronic (4-day) site-specific UIA objective for the middle Santa Ana River, Chino Creek, Mill Creek (Prado Area), Temescal Creek, and San Timoteo Creek. This site-specific objective is based on carefully controlled chronic toxicity tests on Santa Ana River water conducted as part of the Santa Ana River Use-Attainability Analysis Study. The Santa Ana River water was spiked with UIA concentrations ranging from 0.0 (control) to 1.0 mg/L. The No Observed Effect Level (NOEL) was found to be at a UIA concentration of 0.24 mg/L (or 0.19 mg/L as UIA-nitrogen). Using a 50% safety factor, the UIA objective developed is 0.12 mg/L (or 0.098 mg/L UIA-nitrogen).

To prevent chronic toxicity to aquatic life in the Santa Ana River, Reaches 2, 3, and 4, Chino Creek, Mill Creek (Prado Area), Temescal Creek and San Timoteo Creek, discharges to these waterbodies shall not cause the concentration of un-ionized ammonia (as nitrogen) to exceed 0.098 mg/L) (NH_3-N) as a 4-day average.

Bacteria, Coliform

Fecal bacteria are part of the intestinal flora of warm-blooded animals. Their presence in surface waters is an indicator of pollution. Total coliform is measured in terms of the number of coliform organisms per unit volume. Total coliform numbers can include non-fecal bacteria, so additional testing is often done to confirm the presence and numbers of fecal coliform bacteria. Water quality objectives for numbers of total and fecal coliform vary with the uses of the water, as shown below.

Lakes and Streams

MUN *Total coliform: less than 100 organisms/100 mL*

REC-1 *Fecal coliform: log mean less than 200 organisms/100 mL based on five or more samples/30 day period, and not more than 10% of the samples exceed 400 organisms/100 mL for any 30-day period*

REC-2 *Fecal coliform: average less than 2000 organisms/100 mL and not more than 10% of samples exceed 4000 organisms/100 mL for any 30-day period*

Boron

Boron is not considered a problem in drinking water supplies until concentrations of 20-30 mg/L are reached. In irrigation, boron is an essential element. However, boron concentrations in excess of 0.75 mg/L may be deleterious to certain crops, particularly citrus. The maximum safe concentration of even the most tolerant plants is about 4.0mg/L of boron.

Boron concentrations shall not exceed 0.75 mg/L in inland surface waters of the region as a result of controllable water quality factors.

Chemical Oxygen Demand (COD)
COD is a measure of the total amount of oxidizable material present in a sample, including stable organic materials which are not measured by the BOD test.

Waste discharges shall not result in increases in COD levels in inland surface waters which exceed the values shown in Table 4-1 or which adversely affect beneficial uses.

Chloride
Excess chloride concentrations lead primarily to economic damage rather than public health hazards. Chlorides are considered to be among the most troublesome anions in water used for industrial or irrigation purposes since they significantly affect the corrosion rate of steel and aluminum and can be toxic to plants. A safe value for irrigation is considered to be less than 175 mg/L of chloride. Excess chlorides affect the taste of potable water, so drinking water standards are generally based on potability rather than on health. The secondary drinking water standard for chloride is 500 mg/L.

The chloride objectives listed in Table 4-1 shall not be exceeded as a result of controllable water quality factors.

Chlorine, Residual
Wastewater disinfection with chlorine usually produces a chlorine residual. Chlorine and its reaction products are toxic to aquatic life.

To protect aquatic life, the chlorine residual in wastewater discharged to inland surface waters shall not exceed 0.1 mg/L.

Color
Color in water may arise naturally, such as from minerals, plant matter, or algae, or may be caused by industrial pollutants. Color is primarily an aesthetic consideration, although it can discolor clothes and food. The secondary drinking water standard for color is 15 color units.

Waste discharges shall not result in coloration of the receiving waters which causes a nuisance or adversely affect beneficial uses. The natural color of fish, shellfish or other inland surface water resources used for human consumption shall not be impaired.

Dissolved Solids, Total (Total Filtrable Residue)
The department of Health Services recommends that the concentration of total dissolved solids (TDS) in drinking water be limited to 1000 mg/L (secondary drinking water standard) due to taste considerations. For most irrigation uses, water should have a TDS concentration under 700mg/L. Quality-related consumer cost analyses

have indicated that a benefit to consumers exist if water is supplied at or below 500mg/L TDS.

The dissolved mineral content of the waters of the region, as measured by the total dissolved solids test ("Standard Methods for the Examination of Water and Wastewater, 16th Ed.," 1985: 209B (180˚C), p. 95), shall not exceed the specific objectives listed in Table 4-1 as a result of controllable water quality factors.

Filtrable Residue, Total
See Dissolved Solids, Total

Floatables
Floatables are an aesthetic nuisance as well as a substrate for algae and insect vectors.

Waste discharges shall not contain floating materials, including solids, liquids, foam or scum, which cause a nuisance or adversely affect beneficial uses.

Fluoride
Fluoride in water supply used for industrial or irrigation purposes has certain detrimental effects. Fluoride in optimum concentrations in water supply (concentrations dependent upon the mean annual air temperature) is considered beneficial for preventing dental caries, but concentrations above approximately 1 mg/L, or its equivalent at a given temperature, are considered likely to increase the risk of occurrence of dental fluorosis.

Fluoride concentrations shall not exceed values specified in the table below in inland surface waters designated **MUN** *as a result of controllable water quality factors.*

Annual Average of Maximum Daily Air Temperature (˚C)	Optimum Fluoride Concentration (mg/L)
12.0 and below	1.2
12.1 to 14.6	1.1
14.7 to 17.6	1.0
17.7 to 21.4	0.9
21.5 to 26.2	0.8
26.3 to 32.5	0.7

Hardness (as $CaCO_3$)
The major detrimental effect of hardness is economic. Any concentration (reported as mg/L $CaCO_3$) greater than 100mg/L results in the increased use of soap, scale buildup in utensils, in domestic uses, and in plumbing. Hardness in industrial cooling waters is generally objectionable above 50mg/L.

The objectives listed in Table 4-1 shall not be exceeded as a result of controllable water quality factors. If no hardness objective is listed in Table 4-1, the hardness of *receiving waters used for municipal supply (**MUN**) shall not be increased as a result of waste discharges to levels that adversely affect beneficial uses.*

Inorganic Nitrogen, Total
see Nitrogen, Total Inorganic

Metals
Metals can be toxic to human and animal life.

In 1990, the Environmental Protection Agency (EPA) placed the Santa Ana River, reaches 2, 3, and 4, and Chino Creek on the §304(1) list of "Waters Not Meeting Applicable Water Quality Standards" based on its review of data on certain metals in POTW discharges to the River.

The Santa Ana River dischargers and the Regional Board disagreed with and objected to EPA's §304(1) designation. To demonstrate whether or not the §304(1) designation is correct and what effects, if any, heavy metal levels may have on aquatic life in the Region, the Santa Ana River Dischargers Association and the Santa Ana Watershed Project Authority agreed to conduct a Use-Attainability Analysis (UAA).

The purpose of a Use-Attainability Analysis is to evaluate the "physical, biological, chemical, and hydrological conditions of a river to determine what specific beneficial uses the waterbody can support." If local conditions preclude full attainment of an aquatic life beneficial use for reasons unrelated to water quality, federal and state authorities may allow variances from the generic water quality criteria.

The UAA began in February 1991 and concluded in March 1992. It provided detailed information on chemical, biological, and hydrologic conditions in the middle Santa Ana River aquatic system. Conclusions and recommendations were presented to the Board in June 1992. The information presented is reflected in the Santa Ana River discussion in Chapter 1 and in the new **LWRM** Beneficial Use designation (Chapter 3). Data provided by the UAA was also used to support the adoption of site-specific objectives for three metals, cadmium (Cd), copper (Cu), and lead (Pb) for the Santa Ana River (Reaches 2, 3, and 4) and the perennial portions of some tributaries (including Chino Creek, Cucamonga/Mill Creek, Temescal Creek, and creeks in the Riverside Narrows area).

In adopting these SSOs the Regional Board found (RWQCB Resolution No. 94-1) that:

a. The Site-Specific Water Quality Objectives (SSOs) will protect the beneficial uses of the Santa Ana River.

b. The SSOs are conservative.

c. The SSOs, which represent higher quality than presently exists, will not result in degradation of water quality.

d. Existing levels of cadmium, copper, and lead in the Santa Ana River do not contribute to toxicity in the Santa Ana River.

The toxicity of these metals varies with water hardness. No fixed hardness value is assumed; objectives are calculated using the hardness of the collected sample.

The following equations represent the SSOs which apply to these waterbodies. These SSOs are expressed as the dissolved form of the metals.

SSO for Cadmium:

$$Cd\ SSO = \mathbf{0.85}\left[e^{[0.7852 * ln(TH) - 3.490]}\right]$$

SSO for Copper:

$$Cu\ SSO = \mathbf{0.85}\left[e^{[0.8545 * ln(TH) - 1.465]}\right]$$

SSO for Lead:

$$Pb\ SSO = \mathbf{0.25}\left[e^{[1.273 * ln(TH) - 3.958]}\right]$$

where TH is the total hardness (as $CaCO_3$) in mg/L.

The SSOs for cadmium and copper are simply the hardness-dependent formulas for calculating the objective (national criteria), corrected by the dissolved-to-total (metal) ratio. The SSO for lead is the recalculated* hardness-dependent formula, corrected by the dissolved-to-total ratio.

*****Recalculation for lead was carried out by EPA-Region IX, using the lowest genus mean acute value (GMAV) as the final acute value (FAV) and an acute-to chronic ratio (ACR) of 51.29, resulting in a final chronic value (FCV) of 2.78 and the SSO formula already shown.

The Table below shows the site-specific objectives for cadmium, copper, and lead that would apply to a water sample with 200 mg/L total hardness (as $CaCO_3$).

Metal	Calculated WQO	Recalculated Value	EPA Correction Factor	SSO
Cd	2.0	NA	0.85	1.7
Cu	21.4	NA	0.85	18.2
Pb	7.7	16.2	0.25	4.1

Toxicity testing performed as part of the Santa Ana River Use-Attainability Analysis (UAA) has demonstrated that the levels of dissolved metal shown below are safe and non-toxic in Santa Ana River water.

Cadmium	4	µg/L
Copper	37	µg/L
Lead	28	µg/L

There is also evidence that levels as much as 100% higher than those shown above do not result in chronic toxicity.

Methylene Blue-Activated Substances (MBAS)

The MBAS test is sensitive to the presence of detergents (see surfactants). Positive results may indicate the presence of wastewater. The secondary drinking water standard for MBAS is 0.05 mg/L.

*MBAS concentrations shall not exceed 0.05mg/L I inland surface waters designated **MUN** as a result of controllable water quality factors.*

Nitrate

High nitrate concentrations in domestic water supplies can be toxic to human life. Infants are particularly susceptible and may develop methemoglobinemia (blue baby syndrome). The primary drinking water standard for nitrate (as NO_3) is 45 mg/L or 10 mg/L (as N) in inland surface waters designated MUN as a result of controllable water quality factors.

*Nitrate-nitrogen concentrations shall not exceed 45 mg/L (as NO3) or 10 mg/L (as N) in inland surface waters designated **MUN** as a result of controllable water quality factors.*

Nitrogen, Total Inorganic

The objectives listed in Table 4-1 shall not be exceeded as a result of controllable water quality factors.

Oil and Grease

Oil and grease can be present in water as a result of the discharge of treated wastes and the accidental or intentional dumping of wastes into sinks and storm drains. Oils and related materials have a high surface tension and are not soluble in water, therefore forming a film on the water's surface. This film can result in nuisance conditions because of odors and visual impacts. Oil and grease can coat birds and aquatic organisms, adversely affecting respiration and/or thermoregulation.

Waste discharges shall not result in deposition of oil, grease, wax, or other material in concentrations which result in a visible film or in coating objects in the water, or which cause a nuisance or adversely affect beneficial uses.

Oxygen, Dissolved

Adequate dissolved oxygen (D.O.) is vital for aquatic life. Depression of D.O. levels can lead to fish kills and odors resulting from anaerobic decomposition. Dissolved oxygen content in water is a function of water temperature and salinity.

*The dissolved oxygen content of surface waters shall not be depressed below 5mg/L for waters designated **WARM**, or 6mg/L for waters designated **COLD**, as a result of controllable water quality factors. In addition, waste discharges shall not cause the median dissolved oxygen concentration to fall below 85% of saturation or the 95th percentile concentration or fall below 75% of saturation within a 30-day period.*

pH

pH is a measure of the hydrogen ion concentration of water. pH values generally range from 0 (most acidic) to 14 (most alkaline). Many pollutants can alter the pH, raising or lowering it excessively. These extremes in pH can have adverse effects on aquatic biota and can corrode pipes and concrete. Even small changes in pH can harm aquatic biota.

The pH of inland surface waters shall not be raised above 8.5 or depressed below 6.5 as a result of controllable water quality factors.

Radioactivity

*Radioactivity materials shall not be present in the waters of the region in concentrations which are deleterious to human, plant or animal life. Waters designated **MUN** shall meet the limits specified in the California Code of Regulations, Title 22, and listed here:*

Combined Radium-226 and Radium-228	*5*	*pCi/L*
Gross Alpha particle activity	*15*	*pCi/L*
Tritium	*20,000*	*pCi/L*
Strontium-90	*8*	*pCi/L*
Gross Beta particle activity	*50*	*pCi/L*
Uranium	*20*	*pCi/L*

Sodium

The presence of sodium in drinking water may be harmful to persons suffering from cardiac, renal, and circulatory diseases. It can contribute to taste effects, with the taste threshold depending on the specific sodium salt. Excess concentrations of sodium in irrigation water reduce soil permeability to water and air. The deterioration of soil quality because of the presence of sodium in irrigation water is cumulative and is accelerated by poor drainage.

The sodium objectives listed in Table 4-1 shall not be exceeded as a result of controllable water quality factors.

Solids, Suspended and Settleable

Settleable solids are deleterious to benthic organisms and may cause anaerobic conditions to form. Suspended solids can clog fish gill and interfere with respiration in aquatic fauna. They also screen out light, hindering photosynthesis and normal aquatic plant growth and development.

Inland surface waters shall not contain suspended or settleable solids in amounts which cause a nuisance or adversely affect beneficial uses as a result of controllable water quality factors.

Sulfate

Excessive sulfate, particularly magnesium sulfate ($MgSO_4$) in potable waters can lead to laxative effects, but this effect is temporary. There is some taste effect from magnesium sulfate in the range of 400-600 mg/L as $MgSO_4$. The secondary drinking water standard for sulfate is 500 mg/L. Sulfate concentrations in waters native to this region are normally low, less than 40 mg/L, but imported Colorado River water contains approximately 300 mg/L of sulfate.

The objectives listed in Table 4-1 shall not be exceeded as a result of controllable water quality factors.

Sulfides

Sulfides are generated by many industries and from the anaerobic decomposition of organic matter. In water, sulfides can react to form hydrogen sulfide (H_2S), commonly known for its “rotten egg” odor. Sulfides in ionic form are also toxic to fish.

The dissolved sulfide content of inland surface waters shall not be increased as a result of controllable water quality factors.

Surfactants (surface-active agents)
This group of materials includes detergents, wetting agents, and emulsifiers. See also Methylene Blue-Activated Substances (MBAS).

Waste discharges shall not contain concentrations of surfactants which result in foam in the course of flow or use of the receiving water, or which adversely affect aquatic life.

Taste and Odor
Undesirable tastes and odors in water may be a nuisance and may indicate the presence of a pollutant(s). The secondary drinking water standard for odor (threshold) is about 3 odor units.

The inland surface waters of the region shall not contain, as a result of controllable water quality factors, taste- or odor-producing substances at concentrations which cause a nuisance or adversely affect beneficial uses. The natural taste and odor of fish, shellfish or other regional inland surface water resources used for human consumption shall not be impaired.

Temperature
Waste discharges can cause temperature changes in the receiving waters which adversely affect the aquatic biota. Discharges most likely to cause these temperature effects are cooling tower and heat exchanger blowdown.

*The natural receiving water temperature of inland surface waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses. The temperature of waters designated **COLD** shall not be increased by more than 5˚F as a result of controllable water quality factors. The temperature of waters designated **WARM** shall not be raised above 90˚F June through October or above 78˚F during the rest of the year as a result of controllable water quality factors. Lake temperatures shall not be raised more than 4˚F above established normal values as a result of controllable water quality factors.*

Total Dissolved Solids
See Dissolved Solids, Total

Total Filtrable Residue
See Dissolved Solids, Total

Total Inorganic Nitrogen
See Nitrogen, Total Inorganic

Toxic Substances
Toxic substances shall not be discharged at levels that will bioaccumulate in aquatic resources to levels which are harmful to human health.

The concentrations of contaminants in waters which are existing or potential sources of drinking water shall not occur at levels that are harmful to human health.

The concentrations of toxic pollutants in the water column, sediments or biota shall not adversely affect beneficial uses.

Turbidity

Turbidity is a measure of light scattered due to particulates in water. The secondary drinking water standard for turbidity is 5 NTU (nephelometric turbidity units).

Increases in turbidity which result from controllable water quality factors shall comply with the following:

Natural Turbidity	*Maximum Increase*
0-5 NTU	20%
50-100 NTU	10 NTU
Greater than 100 NTU	10%

All inland surface waters of the region shall be free of changes in turbidity which adversely affect beneficial uses.

GROUNDWATERS

The narrative objectives that are included below apply to all groundwaters, as noted. In addition, specific numerical objectives are listed in Table 4-1. With the exception of the “maximum benefit” objective identified in this Table (see further discussion below and in Chapter 5), where more than one objective is applicable, the stricter shall apply.

Arsenic

*Arsenic concentrations shall not exceed 0.05 mg/L in groundwater designated **MUN** as a result of controllable water quality factors.*

Bacteria, Coliform

Fecal bacteria are part of the intestinal flora of warm-blooded animals. Their presence in groundwater is an indicator of pollution. Total coliform is measured in terms of the number of coliform organisms per unit volume. Total coliform numbers can include non-fecal bacteria, so additional testing is often done to confirm the presence and numbers of fecal coliform bacteria. Water quality objectives for numbers of total fecal coliform vary with the uses of the water, as shown below.

*Total coliform numbers shall not exceed 2.2 organism/100 mL median over any seven-day period in groundwaters designated **MUN** as a result of controllable water quality factors.*

Barium
*Barium concentrations shall not exceed 1.0mg/L in groundwaters designated **MUN** as a result of controllable water quality factors.*

Boron
Boron is not considered a problem in drinking water supplies until concentrations of 20-30 mg/L are reached. In irrigation, boron is an essential element. However, boron concentrations in excess of 0.75 mg/L may be deleterious to certain crops, particularly citrus. The maximum safe concentration of even the most tolerant plants is about 4.0 mg/L of boron.

Boron concentrations shall not exceed 0.75 mg/L in groundwaters of the region as a result of controllable water quality factors.

Chloride
Excess chloride concentrations lead primarily to economic damage rather than public health hazards. Chlorides are considered to be among the most troublesome anion in water used for industrial or irrigation purposes since they significantly affect the corrosion rate of steel and aluminum and can be toxic to plants. A safe value for irrigation is considered to be less than 175 mg/L of chloride. Excess chlorides affect the taste of potable water, so drinking water standards are generally based on potability rather than on health. The secondary maximum contaminant level range - upper for chloride is 500 mg/L (CCR, Division 4, Chapter 15, Article 16, § 64449).

Chloride concentrations shall not exceed 500 mg/L in groundwaters of the region designated MUN as a result of controllable water quality factors.

Color
Color in water may arise naturally, such as from minerals, plant matter or algae, or may be caused by industrial pollutants. Color is primarily an aesthetic consideration, although it can discolor clothes and food. The secondary drinking water standard for color is 15 color units.

Waste discharges shall not result in coloration of the receiving waters which causes a nuisance or adversely affects beneficial uses.

Cyanide
*Cyanide concentrations shall not exceed 0.2mg/L in groundwaters designated **MUN** as a result of controllable water quality factors.*

Dissolved Solids, Total (Total Filtrable Residue)
The Department of Health Services recommends that the concentration of total dissolved solids (TDS) in drinking water be limited to 500 mg/L (secondary maximum contaminant level) (CCR, Division 4, Chapter 15, Article 16, § 64449), due to taste considerations. For most irrigation uses, water should have a TDS concentration under 700 mg/L. Quality-related consumer cost analyses have indicated that a benefit to consumers exists if water is supplied at or below 500 mg/L TDS[2].

The dissolved mineral content of the waters of the region, as measured by the total dissolved solids test ("Standard Methods for the Examination of Water and Wastewater, 20th Ed.," 1998: 2540C (180˚C), p.2-56), shall not exceed the specific objectives listed in Table 4-1 as a result of controllable water quality factors. (See also discussion of management zone TDS and nitrate nitrogen water quality objectives).

Filtrable Residue, Total
See Dissolved Solids, Total

Fluoride
Fluoride in water supply used for industrial or irrigation purposes has certain detrimental effects. Fluoride in optimum concentrations in water supply (concentration dependent upon the mean annual air temperature) is considered beneficial for preventing dental caries, but concentrations above approximately 1 mg/L, or its equivalent at a given temperature, are considered likely to increase the risk of occurrence of dental fluorosis.

*Fluoride concentrations shall not exceed 1.0 mg/L in groundwaters designated **MUN** as a result of controllable water quality factors.*

Hardness (as $CaCO_3$)
The major detrimental effect of hardness is economic. Any concentration (reported as mg/L $CaCO_3$) greater than 100mg/L results in the increased use of soap, scale buildup in utensils in domestic uses, and in plumbing. Hardness in industrial cooling waters is generally objectionable above 50 mg/L.

*The hardness of receiving waters used for municipal supply (**MUN**) shall not be increased as a result of waste discharges to levels that adversely affect beneficial uses.*

Metals
Metals can be toxic to human and animal life.

*Metals concentrations shall not exceed the values listed below in groundwaters designated **MUN** as a result of controllable water quality factors.*

[2] These TDS values are noted for information purposes only. For some management zones, the historic ambient quality, on which the TDS objectives are largely based (see also discussion of maximum benefit objectives for specific management zones), exceeds these recommended levels.

Metal	*Concentration (mg/L)*
Cadmium	0.01
Chromium	0.05
Cobalt	0.2
Copper	1.0
Iron	0.3
Lead	0.05
Manganese	0.05
Mercury	0.002
Selenium	0.01
Silver	0.05

Methylene Blue-Activated Substances (MBAS)
The MBAS test is sensitive to the presence of detergents (see surfactants in inland surface waters discussion). Positive results may indicate the presence of wastewater. The secondary drinking water standard for MBAS is 0.05 mg/L.

*MBAS concentrations shall not exceed 0.05 mg/L in groundwaters designated **MUN** as a result of controllable water quality factors.*

Nitrate
High nitrate concentrations in domestic water supplies can be toxic to human life. Infants are particularly susceptible and may develop methemoglobinemia (blue baby syndrome). The primary drinking water standard for nitrate (as NO_3) is 45 mg/L or 10 mg/L (as N).

Nitrate-nitrogen concentrations listed in Table 4-1 shall not be exceeded as a result of controllable water quality factors. (See also discussion of management zone TDS and nitrate nitrogen water quality objectives below).

Oil and Grease
Oil and grease can be present in water as a result of the discharge of treated wastes and the accidental or intentional dumping of wastes into sinks and storm drains. Oils and related materials have a high surface tension and are not soluble in water, therefore forming a film on the water's surface. This film can result in nuisance conditions because of odors and visual impacts.

Waste discharges shall not result in deposition of oil, grease, wax or other materials in concentrations which cause a nuisance or adversely affect beneficial uses.

pH
pH is a measure of the hydrogen ion concentration of water. pH values generally range from 0 (most acidic) to 14 (most alkaline). Many pollutants can alter the pH,

raising or lowering it excessively. These extremes in pH can corrode pipes and concrete.

The pH of groundwater shall not be raised above 9 or depressed below 6 as a result of controllable water quality factors.

Radioactivity

*Radioactive materials shall not be present in the waters of the region in concentrations which are deleterious to human, plant or animal life. Groundwaters designated **MUN** shall meet the limits specified in the California Code of Regulations, Title 22, and listed here:*

Combined Radium-226 and Radium-228	*5*	*pCi/L*
Gross Alpha particle activity	*15*	*pCi/L*
Tritium	*20,000*	*pCi/L*
Strontium-90	*8*	*pCi/L*
Gross Beta particle activity	*50*	*pCi/L*
Uranium	*20*	*pCi/L*

Sodium

The presence of sodium in drinking water may be harmful to persons suffering from cardiac, renal and circulatory diseases. It can contribute to taste effects, with the taste threshold depending on the specific sodium salt (US Geological Survey, Resources Agency of California – State Water Resources Control Board). Excess concentrations of sodium in irrigation water reduce soil permeability to water and air. The deterioration of soil quality because of the presence of sodium in irrigation water is cumulative and is accelerated by poor drainage (California State Water Resources Control Board).

The California Department of Health Services and the U.S. Environmental Protection Agency have not provided a limit on the concentration of sodium in drinking water. Sodium concentrations shall not exceed 180 mg/L in groundwaters designated MUN as a result of controllable water quality factors.

Groundwaters designated AGR shall not exceed a sodium absorption ration (SAR[3]) of 9 as a result of controllable water quality factors.

[3]Sodium absorption ratio (SAR) = $\frac{Na}{\left[{}^{1}/_{2}(Ca+Mg)\right]^{1/2}}$

Where Sodium (Na), Calcium (Ca) and Magnesium (Mg) are concentrations in milliequivalents per liter

Sulfate

Excessive sulfate, particularly magnesium sulfate ($MgSO_4$) in potable waters can lead to laxative effects, but this effect is temporary. There is some taste effect from magnesium sulfate in the range of 400-600mg/L as MgSO4. The secondary drinking water standard for sulfate is 500mg/L (CCR, Division 4, Chapter 15, Article 16, §64449). Sulfate concentrations in waters native to this region are normally low, less than 40mg/L, but imported Colorado River water contains approximately 300mg/L of sulfate.

Sulfate concentrations shall not exceed 500 mg/L in groundwaters of the region designated MUN as a result of controllable water quality factors.

Taste and Odor

Undesirable tastes and odors in water may be a nuisance and may indicate the presence of a pollutant(s). The secondary drinking water standard for odor (threshold) is 3 odor units.

The groundwaters of the region shall not contain, as a result of controllable water quality factors, taste- or odor-producing substances at concentrations which cause a nuisance or adversely affect beneficial uses.

Total Dissolved Solids

See Dissolved Solids, Total

Total Filtrable Residue

See Dissolved Solids, Total

Total Inorganic Nitrogen

See Nitrogen, Total Inorganic

Toxic Substances

All waters of the region shall be maintained free of substances in concentrations which are toxic, or that produce detrimental physiological responses in human, plant, animal or aquatic life.

Management Zone TDS and Nitrate-nitrogen Water Quality Objectives (The following was added under Resolution No. R8-2004-0001 and No. R8-2010-0039)

The TDS and nitrate-nitrogen objectives specified in the 1975 and 1984 Basin Plans, and initially in this 1995 Basin Plan, were based on an evaluation of groundwater samples from the five year period 1968 through 1972. This period represented ambient quality at the time of preparation of the 1975 Basin Plan. As part of the 2004 update of the TDS/Nitrogen management plan in the Basin Plan, historical ambient quality was reviewed using additional data and rigorous statistical procedures. This update also included characterization of current water quality. A comprehensive description of the methodology employed is published in the "Final Technical Memorandum for Phase 2A of the Nitrogen-TDS Study" (Wildermuth Environmental Inc., July 2000). This effort, coupled with "maximum benefit" demonstrations by certain agencies in the watershed (see further discussion below and in Chapter 5), culminated in the adoption of the TDS and nitrate-nitrogen objectives specified in Table 4-1.

For the most part, the TDS and nitrate-nitrogen water quality objectives for each management zone are based on historical concentrations of TDS and nitrate-nitrogen from 1954 through 1973 and are referred to herein as the "antidegradation" objectives. This period brackets 1968, when the State Board adopted the state's antidegradation policy in Resolution No. 68-16, "Policy with Respect to Maintaining High Quality Waters". This Resolution establishes a benchmark for assessing and considering authorization of degradation of water quality. The 20-year period was selected in order to ensure that at least 3 data points in each management zone would be available to calculate historical ambient quality. In general, the following steps were taken to calculate the TDS and nitrate objectives:

a. Annual average TDS and nitrate-nitrogen data from 1954 – 1973 for each well in a management zone were compiled;
b. For each well, the data were statistically analyzed. The mean plus "t" (Student's t) times the standard error of the mean was calculated;
c. A rectangular grid across all management zones was overlaid. Groundwater storage within each grid was computed; and,
d. The volume-weighted TDS and nitrate-nitrogen concentration for each management zone was computed. These concentrations are the calculated historical ambient quality for each zone. [4]

These volume-weighted TDS and nitrate-nitrogen concentrations for each management zone were typically identified as the appropriate objectives. However, it is important to note that if the calculated nitrate-nitrogen concentration exceeded 10 mg/L, the nitrate-nitrogen objective was set to 10 mg/L to be consistent with the primary drinking water standard, or to current ambient quality if less than 10 mg/L.

Finally, in some cases, certain agencies proposed alternative, less stringent TDS and nitrate-nitrogen objectives for specific management zones, based on additional consideration of antidegradation requirements and the factors specified in Water Code Section 13241 (see below and Chapter 5). Table 4-1 includes both the historical ambient quality TDS and nitrate-nitrogen objectives (the "antidegradation" objectives) and the objectives based on this additional consideration (the "maximum benefit"

[4] In limited cases, data for ammonia-nitrogen and nitrite-nitrogen as well as nitrate-nitrogen were available and included in the analysis. The ammonia-nitrogen and nitrite-nitrogen values were insignificant. The objectives are thus expressed as nitrate-nitrogen, even where ammonia-nitrogen and nitrite-nitrogen data were included in the analysis.

objectives) for specific management zones. Chapter 5 specifies detailed requirements noticed Public Hearing, the Regional Board finds that "maximum benefit" is not being demonstrated, then the "antidegradation" objectives apply for regulatory purposes.

THE SANTA ANA RIVER

Setting objectives for the flowing portions of the Santa Ana River is a significant feature of this Basin Plan. The River provides water for recreation and for aquatic and wildlife habitat. River flows are a significant source of groundwater recharges in lower basin, which provides domestic supplies for more than two million people. These flows account for about 70% of the total recharge.

The dividing line between reaches 2 and 3 of the River, and between the upper and lower Santa Ana Basins, is Prado Dam, a flood control facility built and operated by the U.S. Army Corps of Engineers. The dam includes a subsurface groundwater barrier, and as a result all ground and surface waters form the upper basin are forced to pass through the dam (or over the spillway). For this reason, it is an ideal place to measure flows and monitor water quality.

The Prado Settlement, a stipulated court judgment (Orange County Water District vs. City of Chino, *et al*), which requires that a certain minimum amount of water be released each year from the upper basin, is overseen by the Santa Ana River Watermaster. The U.S. Geologic Survey (USGS) operates a permanent continuous monitoring station immediately below Prado Dam, and the data collected there are utilized by the Watermaster. Orange County Water District (OCWD) samples the river monthly at the USGS gage and determines the water quality. Compliance with the objective for reaches 2 and 3 is monitored by the Regional Board, using the data and information available from the USGS gage and these sources, plus the data from its own specific sampling programs. (see Chapter 6).

The quality of the Santa Ana River is a function of the quantity and quality of the various components of the flows. The two major components of total flow are storm flow and base flow. Storm flow is the water which results directly from rainfall (surface runoff) in the upper basin; it also includes the stormwater runoff form the San Jacinto Basin which may reach the River via Temescal Creek. Most storms occur during the winter rainy season (December through April). Base flow is composed of wastewater discharges, rising groundwater, and nonpoint source discharges. Wastewater discharges are the treated sewage effluents discharged by municipalities to the river and its tributaries. Rising groundwater occurs at a number of locations along the River, including the San Jacinto Fault, Riverside Narrows, and in or near the Prado flood Control Basin. Nonpoint source discharges include uncontrolled runoff from agricultural and urban areas which is not related to storm flows.

Nontributary flow is a third element of total flow. It is generally imported water released in the upper basin, for recharge in the lower basin (Santa Ana Forebay).

The Santa Ana River Watermaster calculates the amount and quality of total flow for each water year (October 1 to September 30). The Watermaster's Annual Report is used to determine compliance with the stipulated judgement referred to earlier, which set quality and quantity limits on the river. The Watermaster's report presents summary data compiled from the continuous monitoring of flow in cfs (cubic feet per second) and salinity as EC (electrical conductivity) at the USGS Prado Gaging Station. The Watermaster's annual determination of total flow quality will be used to determine compliance with the total flow objective in this Plan. In years of normal rainfall, most of the total flow of the river is percolated in the Santa Ana Forebay, and directly affects the quality of the groundwater. For that reason, compliance with the total dissolved solids (TDS) water quality objective for Reach 2 will be based on the five-year moving average of the annual TDS content of total flow. Use of this moving average allows the effects of wet and dry years to be smoothed out over the five-year period.

As was noted earlier, the three components of base flow in the river are wastewater, rising water, and nonpoint source discharges. These three components are present in varying amounts throughout the year, and the contributions and quality of each can be affected by the regulatory activities of the Regional Board. The quantity of storm flow is obviously highly variable; programs to control its quality are in their nascent stages. For these reasons, water quality objectives for controllable constituents are set based on the base flow of the river, rather than on total flow.

The regulatory activities of the Regional Board include setting waste discharge requirements on point source discharges. Waste discharges requirements are developed on the basis of the limited assimilative capacity of the river (see TDS and Nitrogen Wasteload Allocation, Chapter 5). Nonpoint source discharges, generally urban runoff (nuisance water) and agricultural tailwater, will be regulated by requiring compliance with Best Management Practices (BMPs), where appropriate. The rising water component of base flow will be affected by the extraction of brackish groundwater in several subbasins (a Basin Plan implementation action), by regulation of wastewater discharges, and other activities.

In order to determine whether the water quality and quantity objectives for base flow in Reach 3 are being met, the Regional Board will collect a series of grab and composite samples when the influence of storm flows and nontributary flows is at a minimum. This typically occurs during August and September. At this time of year, there is usually no water impounded behind Prado Dam. The volumes of storm flows, rising water and nonpoint source discharges tend to be low. The major component of base flow at this time is municipal wastewater. The results of this sampling will be compared with the continuous monitoring data collected by USGS and data from other sources. These data will be used to evaluate the efficacy of the Regional Board's regulatory approach, including the TDS and nitrogen wasteload allocations (see Chapter 5). Additional sampling in Reach 3 by the Board and other agencies will help evaluate the fate and effects of the various constituents of base flow, including the validity of the 50% nitrogen loss coefficient (discussed in Chapter 5).

Future river flows and quality (TDS and TIN) were projected by computer models. The results indicate that the objectives for TDS and total nitrogen will be met. The objectives for individual mineral constituents are expected to be met if the TDS objective is met.

Prado Basin Surface Water Management Zone

As discussed in Chapter 3 – Beneficial Uses, the Prado Basin Management Zone (PBMZ) is generally defined as a surface water feature within the Prado Basin. It is defined by the 566-foot elevation above mean sea level along the Santa Ana River and the four tributaries to the Santa Ana River in the Prado Basin (Chino Creek, Temescal Creek, Mill Creek and Cucamonga Creek). Nitrogen, TDS and other water quality objectives that have been established for these surface waters that flow within the proposed PBMZ are shown in Table 4-1. For the purpose of regulating discharges that would affect the PBMZ and downstream waters, these surface water objectives apply. This application of the existing surface water objectives assures continued water quality and beneficial use protection for waters within and downstream of the PBMZ.

"MAXIMUM BENEFIT" WATER QUALITY OBJECTIVES

As part of the 2004 update of the TDS/Nitrogen Management plan in the Basin Plan, several agencies proposed that alternative, less stringent TDS and/or nitrate-nitrogen water quality objectives be adopted for specific groundwater management zones and surface waters. These proposals were based on additional consideration of the factors specified in Water Code Section 13241 and the requirements of the State's antidegradation policy (State Board Resolution No. 68-16). Since the less stringent objectives would allow a lowering of water quality, the agencies were required to demonstrate that their proposed objectives would protect beneficial uses, and that water quality consistent with maximum benefit to the people of the state would be maintained (thus, the use of the term "maximum benefit" water quality objectives). In 2010, the Regional Board considered and approved a proposal by Eastern Municipal Water District to incorporate "maximum benefit" objectives for TDS and nitrate-nitrogen for the San Jacinto Upper Pressure Management Zone.

Appropriate beneficial use protection/maximum benefit demonstrations were made by the Chino Basin Watermaster/Inland Empire Utilities Agency, the Yucaipa Valley Water District, the City of Beaumont/San Timoteo Watershed Management Authority, and Eastern Municipal Water District to justify alternative "maximum benefit" objectives for the Chino North, Cucamonga, Yucaipa, Beaumont, San Timoteo, and the San Jacinto Upper Pressure groundwater management zones. These "maximum benefit" proposals, which are described in detail in Chapter 5 – Implementation, entail commitments by the agencies to implement specific projects and programs. While these agencies' efforts to develop these proposals indicate their strong interest to proceed with these commitments, unforeseen circumstances may impede or preclude it. To address this possibility, this Plan includes both the "antidegradation" and "maximum benefit" objectives for the subject waters (See Table 4-1). Chapter 5 specifies the requirements for implementation of these objectives. Provided that these agencies' commitments are met, then the agencies have demonstrated maximum benefit, and the "maximum benefit" objectives included in Table 4-1 for these waters apply for regulatory purposes. However, if the Regional Board finds that these commitments are not being met and that "maximum benefit" is thus not demonstrated, then the "antidegradation" objectives for these waters will apply. Chapter 5 also describes the mitigation requirements that will apply should discharges based on "maximum benefit" objectives occur unsupported by the demonstration of "maximum benefit".

(End of section adopted under Resolution No. R8-2004-0001 and No. R8-2010-0039)

COMPLIANCE WITH OBJECTIVES (The following was added by Resolution No. 00-27)

"The Regional Board recognizes that immediate compliance with new, revised or newly interpreted water quality objectives adopted by the Regional Board or the State Water Resources Control Board, or with new, revised or newly interpreted water quality criteria promulgated by the U.S. Environmental Protection Agency, may not be feasible in all circumstances. Where the Regional Board determines that it is infeasible for a discharger to comply immediately with effluent limitations specified to implement such objectives or criteria, compliance shall be achieved in the shortest practicable period of time, not to exceed ten years after the adoption or interpretation of applicable objectives or criteria. This provision authorizes
schedules of compliance for objectives and criteria that are adopted or revised or newly interpreted after the effective date of this amendment July 15, 2002.

REFERENCES

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California Water Code, Section 13000 "Water Quality," *et seq*.

California State Water Resources Control Board, "Water Quality Criteria, Second Edition," 1963.

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Wildermuth Environmental, Inc., TIN/TDS – Phase 2A of the Santa Ana Watershed, Development of Groundwater Management Zones, Estimation of Historic and Current TDS and Nitrogen Concentrations in Groundwater, Final Technical Memorandum," July 2000.

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US Geological Survey, "Basic Ground-Water Hydrology", Water Supply Paper 2220, pages 64-65, 1984

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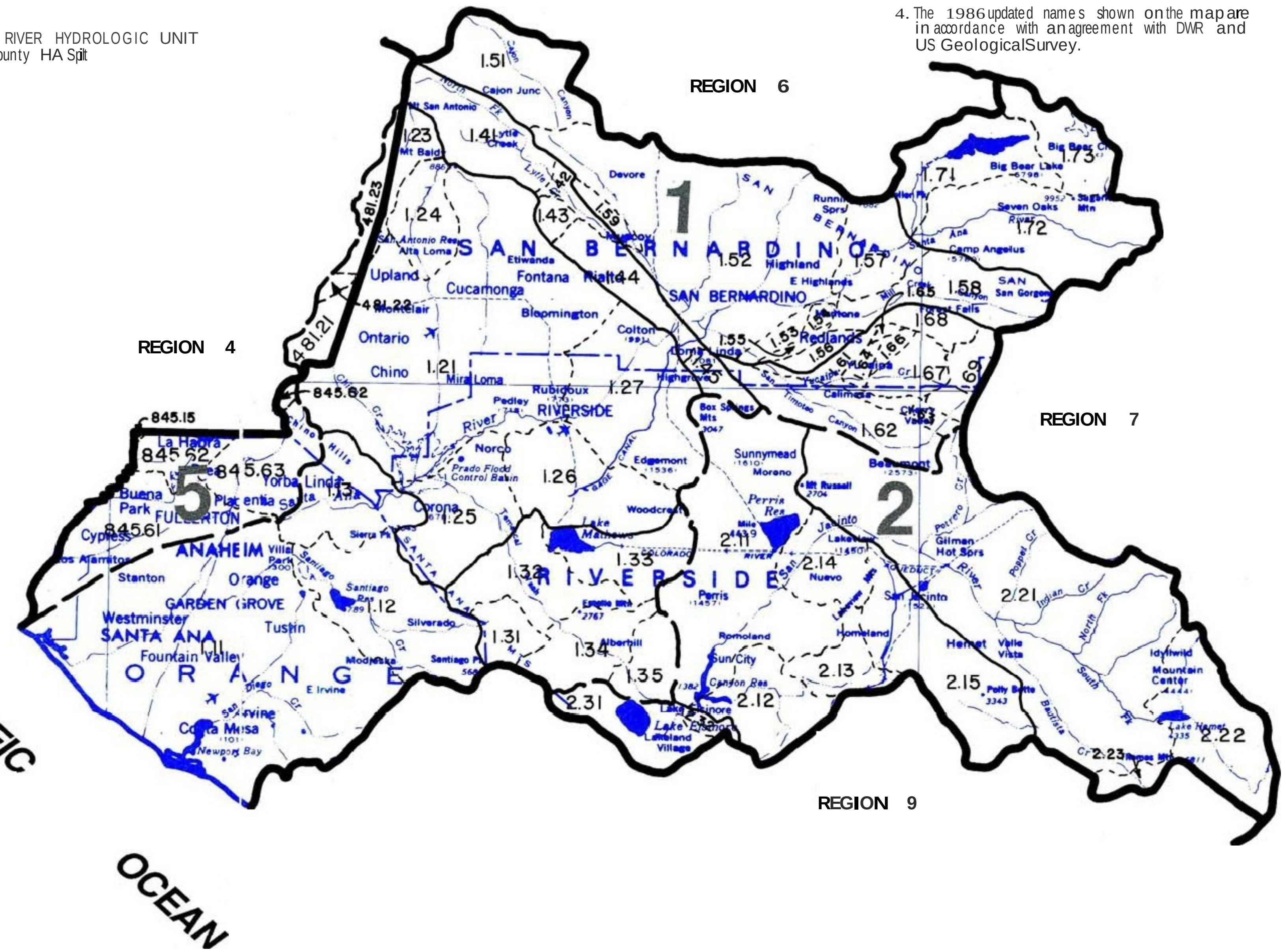
NOTE:

1. The names and areas shown on this map are the same as used by the Department of Water Resources (DWR) in their Bulletin 130 Series except as explained below.

2. The numbering system used on this map is an adaptation of the numbering system used in the 130 Series.

3. The boundary between Region 8 and Region 4 follows the boundary between Los Angeles County and Orange or San Bernardino Counties, not the Hydrologic Boundary. The San Bernardino County line splits Hydrologic Unit 1 (Santa Ana River HU) so that Sub-Areas 481.21, 481.22, and 481.23 are legally in Region 4 but drain into Region 8. Th& Orange County line splits Hydrologic UnitS (Los Angeles-San Gabriel River HU) so that Sub-Areas 845 15, 845.61, 845.62 and 845.63 are legally in Region 8 but drain into Region 4. Therefore, a 5 digit number on the map indicates that a regional boundary divides a hydrologic unit. area or subarea. In these cases the second digit is the number of the region from which the hydrologic area has beern separated by the regional boundary. All other digits are as described in the legend.

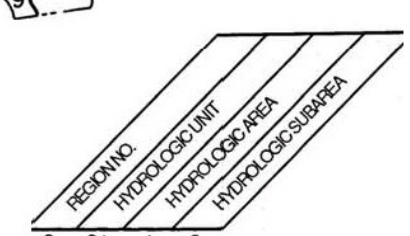
4. The 1986 updated names shown on the map are in accordance with an agreement with DWR and US Geological Survey.



KEY TO REGION

LEGEND

STREAM
REGIONAL BOUNDARY
HYDROLOGIC UNIT BOUNDARY (HU)
HYDROLOGIC AREA OUNDARY (HA)
HYDROLOGIC SUBAREA OUNDARY (SA)
5 HYDROLOGIC UNIT NUMBER



April 1973
Revised: July 1976
Revised: August 1986

State Water Resources Control Board
Surveillance and Monitoring Section
TE. Lavenda, P.E.

State of California
REGIONAL WATER QUALITY CONTROL BOARD
Santa Ana Region (8)
SANTA ANA HYDROLOGIC BASIN PLANNING AREA {SA)

Scale in miles
8 0 8 16 24 32
Scale 1:500,000

Table 4-1 WATER QUALITY OBJECTIVES

OCEAN WATERS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
NEARSHORE ZONE*									
San Gabriel River to Poppy Street in Corona del Mar+	---	---	---	---	---	---	---	801.11	
Poppy Street to Southeast Regional Boundary+	---	---	---	---	---	---	---	801.11	
OFFSHORE ZONE									
Waters Between Nearshore Zone And Limit of State Waters+	---	---	---	---	---	---	---		

* Defined by Ocean Plan Chapter II A.1.: "Within a zone bounded by shoreline and a distance of 1000 feet from shoreline or the 30-foot depth Contour, whichever is further from shoreline…"

\+ Numeric objectives have not been established; narrative objectives apply.

Table 4-1 WATER QUALITY OBJECTIVES - Continued

BAYS, ESTUARIES, AND TIDAL PRISMS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
-	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
Anaheim Bay – Outer Bay+	---	---	---	---	---	---	---	801.11	
Anaheim Bay – Seal Beach National Wildlife Refuge+	---	---	---	---	---	---	---	801.11	
Sunset Bay – Huntington Harbour+	---	---	---	---	---	---	---	801.11	
Bolsa Bay+	---	---	---	---	---	---	---	801.11	
Bolsa Chica Ecological Reserve+	---	---	---	---	---	---	---	801.11	
Lower Newport Bay+	---	---	---	---	---	---	---	801.11	
Upper Newport Bay+	---	---	---	---	---	---	---	801.11	
Santa Ana River Salt Marsh+	---	---	---	---	---	---	---	801.11	
Tidal Prism of Santa Ana River (to within 1000' of Victoria Street) and Newport Slough+	---	---	---	---	---	---	---	801.11	
Tidal Prism of San Gabriel River – River Mouth to Marina Drive+	---	---	---	---	---	---	---	845.61	
Tidal Prisms of Flood Control Channels Discharging to Coastal or Bay Waters+	---	---	---	---	---	---	---	801.11	

\+ Numeric objectives have not been established; narrative objectives apply.

Table 4-1 WATER QUALITY OBJECTIVES - Continued

INLAND SURFACE STREAMS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
LOWER SANTA ANA RIVER BASIN									
Santa Ana River									
Reach 1 – Tidal Prism to 17th Street in Santa Ana+	(Flood Flows Only)							801.11	
Reach 2 - 17th Street in Santa Ana to Prado Dam	650[1]	---	---	---	---	---	---	801.11	801.12
Aliso Creek+	---	---	---	---	---	---	---	845.63	
Carbon Canyon Creek+	---	---	---	---	---	---	---	845.63	
Santiago Creek Drainage									
Santiago Creek									
Reach 1 – below Irvine Lake	600	---	---	---	---	---	---	801.12	801.11
Reach 2 - Irvine Lake (see Lakes, Pg. 4-46)		---	---	---	---	---	---		
Reach 3 – Irvine Lake to Modjeska Canyon	350	260	20	12	2	80	---	801.12	
Reach 4 – in Modjeska Canyon	350	260	20	12	2	80	---	801.12	
Silverado Creek	650	450	30	20	1	275	---	801.12	
Black Star Creek+	---	---	---	---	---	---	---	801.12	
Ladd Creek+	---	---	---	---	---	---	---	801.12	

1 Five-year moving average
\+ Numeric objectives have not been established; narrative objectives apply.

Table 4-1 WATER QUALITY OBJECTIVES - Continued

INLAND SURFACE STREAMS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
San Diego Creek Drainage									
San Diego Creek									
Reach 1 – below Jeffrey Road	1500	---	---	---	13	---	90	801.11	
Reach 2 – above Jeffrey Road to Headwaters	720	---	---	---	5	---	---	801.11	
Other Tributaries: Bonita Creek, Serrano Creek, Peters Canyon Wash, Hicks Canyon Wash, Bee Canyon Wash, Borrego Canyon Wash, Agua Chinon Wash, Laguna Canyon Wash, Rattlesnake Canyon Wash, Sand Canyon Wash and other Tributaries to these Creeks+	---	---	---	---	---	---	---	801.11	
San Gabriel River Drainage									
Coyote Creek (within Santa Ana Regional Boundary)+	---	---	---	---	---	---	---		

\+ Numeric objectives have not been established; narrative objectives apply.

Table 4-1 WATER QUALITY OBJECTIVES - Continued

INLAND SURFACE STREAMS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
UPPER SANTA ANA RIVER BASIN									
Santa Ana River									
Reach 3 – Prado Dam to Mission Blvd. in Riverside – Base Flow[2]	700	350	110	140	10[3]	150	30	801.21	801.27, 801.25
Reach 4 – Mission Blvd. in Riverside to San Jacinto Fault in San Bernardino	550	---	---	---	10	---	30	801.27	801.44
Reach 5 – San Jacinto Fault in San Bernardino to Seven Oaks Dam	300	190	30	20	5	60	25	801.52	801.57
Reach 6 – Seven Oaks Dam to Headwaters (see also Individual Tributary Streams)	200	100	30	10	1	20	5	801.72	
San Bernardino Mountain Streams									
Mill Creek Drainage:									
Mill Creek									
Reach 1 – Confluence with Santa Ana River to Bridge Crossing Route 38 at Upper Powerhouse	200	100	30	10	1	20	5	801.58	
Reach 2 – Bridge Crossing Route 38 at Upper Powerhouse to Headwaters	110	100	25	5	1	15	5	801.58	

[2] Additional Objectives: Boron: 0.75 mg/l
[3] Total nitrogen, filtered sample

Table 4-1 WATER QUALITY OBJECTIVES - Continued

INLAND SURFACE STREAMS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
Mountain Home Creek	200	100	30	10	1	20	5	801.58	
Mountain Home Creek, East Fork	200	---	---	---	---	---	---	801.70	
Monkey Face Creek	200	100	30	10	1	20	5	801.70	
Alger Creek	200	---	---	---	---	---	---	801.70	
Falls Creek	200	100	30	10	1	20	5	801.70	
Vivian Creek	200	---	---	---	---	---	---	801.70	
High Creek	200	---	---	---	---	---	---	801.70	
Other Tributaries: Lost, Oak Cove, Green, Skinner, Momyer, Glen Martin, Camp, Hatchery, Rattlesnake, Slide, Snow, Bridal Veil, and Oak Creeks, and other Tributaries to these Creeks	200	---	---	---	---	---	---	801.70	
Bear Creek Drainage:									
Bear Creek	175	115	10	10	1	4	5	801.71	
Siberia Creek	200	---	---	---	---	---	---	801.71	
Slide Creek	175	---	---	---	---	---	---	801.71	
All other Tributaries to these Creeks+	---	---	---	---	---	---	---	801.71	
Big Bear Lake (see Lakes, pg. 4-46)									

+ Numeric objectives have not been established; narrative objectives apply. .

Table 4-1 WATER QUALITY OBJECTIVES - Continued

INLAND SURFACE STREAMS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
Big Bear Lake Tributaries:									
North Creek	175	---	---	---	---	---	---	801.71	
Metcalf Creek	175	---	---	---	---	---	---	801.71	
Grout Creek	150	---	---	---	---	---	---	801.71	
Rathbone (Rathbun) Creek	300	---	---	---	---	---	---	801.71	
Meadow Creek+	---	---	---	---	---	---	---	801.71	
Summit Creek+	---	---	---	---	---	---	---	801.71	
Other Tributaries to Big Bear Lake: Knickerbocker, Johnson, Minnelusa, Poligue, and Red Ant Creeks, and other Tributaries to these Creeks	175	---	---	---	---	---	---	801.71	
Baldwin Lake (see Lakes, pg. 4-46)									
Baldwin Lake Drainage:									
Shay Creek+	---	---	---	---	---	---	---	801.73	
Other Tributaries to Baldwin Lake: Sawmill, Green, and Caribou Canyons and other Tributaries to these Creeks+	---	---	---	---	---	---	---	801.73	

\+ Numeric objectives have not been established; narrative objectives apply. .

Table 4-1 WATER QUALITY OBJECTIVES - Continued

INLAND SURFACE STREAMS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
Other Streams Draining to Santa Ana River (Mountain Reaches‡)									
Cajon Creek	200	100	30	10	1	20	5	801.51	
City Creek	200	115	30	10	1	20	5	801.57	
Devil Canyon Creek	275	125	35	20	1	25	5	801.57	
East Twin and Strawberry Creeks	475	---	---	---	---	---	---	801.57	
Waterman Canyon Creek	250	---	---	---	---	---	---	801.57	
Fish Creek	200	100	30	10	1	20	5	801.57	
Forsee Creek	200	100	30	10	1	20	5	801.72	
Plunge Creek	200	100	30	10	1	20	5	801.72	
Barton Creek	200	100	30	10	1	20	5	801.72	
Bailey Canyon Creek	200	---	---	---	---	---	---	801.72	
Kimbark Canyon, East Fork Kimbark Canyon, Ames Canyon And West Fork Cable Canyon Creeks	325	---	---	---	---	---	---	801.52	
Valley Reaches‡ of Above Streams	(Water Quality Objectives Correspond to Underlying GW Basin Objectives)							801.52	

‡ The division between Mountain and Valley reaches occurs at the base of the foothills of the San Bernardino or San Gabriel Mountains.

Table 4-1 WATER QUALITY OBJECTIVES - Continued

INLAND SURFACE STREAMS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
Other Tributaries (Mountain Reaches‡): Alder, Badger Canyon, Bledsoe Gulch, Borea Canyon, Breakneck, Cable Canyon, Cienega Seca, Cold, Converse, Coon, Crystal, Deer, Elder, Fredalba, Frog, Government, Hamilton, Heart Bar, Hemlock, Keller, Kilpecker, Little Mill, Little Sand Canyon, Lost, Meyer Canyon, Mile, Monroe Canyon, Oak, Rattlesnake, Round Cienega, Sand, Schneider, Staircase, Warm Springs Canyon and Wild Horse Creeks, and other tributaries to those Creeks	200	100	30	10	1	20	5	801.72	801.71, 801.57
San Gabriel Mountain Streams (Mountain Reaches‡)									
San Antonio Creek	225	150	20	6	4	25	5	801.23	
Lytle Creek (South, Middle, and North Forks) and Coldwater Canyon Creek	200	100	15	4	4	25	5	801.41	801.42, 801.52, 801.59
Day Creek	200	100	15	4	4	25	5	801.21	
East Etiwanda Creek	200	100	15	4	4	25	5	801.21	
Valley Reaches‡ of Above Streams	(Water Quality Objectives Correspond to Underlying GW Basin Objectives)							801.21	

‡ The division between Mountain and Valley reaches occurs at the base of the foothills of the San Bernardino or San Gabriel Mountains.

Table 4-1 WATER QUALITY OBJECTIVES - Continued

INLAND SURFACE STREAMS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
-	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
Cucamonga Creek									
Reach 1 – Confluence with Mill Creek to 23rd St. in Upland+	---	---	---	---	---	---	---	801.21	
Reach 2 (Mountain Reach‡) – 23rd St. in Upland to headwaters	200	100	15	4	4	25	5	801.24	
Mill Creek+	---	---	---	---	---	---	---	801.25	
Other Tributaries (Mountain Reaches+): Cajon Canyon, San Sevaine, Deer, Duncan Canyon, Henderson Canyon, Bull, Fan, Demens, Thorpe, Angalls, Telegraph Canyon, Stoddard Canyon, Icehouse Canyon, Cascade Canyon, Cedar, Failing Rock, Kerkhoff and Cherry Creeks, and other Tributaries to these Creeks	200	---	---	---	---	---	---	801.21	801.23
San Timoteo Area Streams									
San Timoteo Creek **									
Reach 1A – Santa Ana River Confluence to Barton Road	---	---	---	---	---	---	---	801.52	801.53
Reach 1B – Barton Road to Gage at San Timoteo Canyon Rd. u/s of Yucaipa Valley WD discharge	---	---	---	---	---	---	---	801.52	801.53
Reach 2 – Gage at San Timoteo Canyon Road to Confluence with Yucaipa Creek	---	---	---	---	---	---	---	801.52	801.62

\+ Numeric objectives have not been established; narrative objectives apply
‡ The Division between Mountain and Valley reaches occurs at the base of the foothills of the San Bernardino or San Gabriel Mountains
** Surface water objectives not established; underlying Management Zone objectives apply. Biological quality protected by narrative objectives

Table 4-1 WATER QUALITY OBJECTIVES - Continued

INLAND SURFACE STREAMS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
Reach 3** – Confluence with Yucaipa Creek to confluence with Little San Gorgonio and Noble Creeks (Headwaters of San Timoteo Creek)	---	---	---	---	---	---	---	801.62	
Oak Glen, Potato Canyon and Birch Creeks	230	125	50	40	3	45	5	801.67	
Little San Gorgonio Creek	230	125	50	40	3	45	5	801.69	801.62,
Yucaipa Creek	290	175	60	60	6	45	15	801.67	801.61, 801.62
Other Tributaries to these Creeks – Valley Reaches +‡	---	---	---	---	---	---	---	801.62	801.52, 801.53
Other Tributaries to these Creeks – Mountain Reaches‡	290	---	---	---	---	---	---	801.69	801.67
Anza Park Drain+	---	---	---	---	---	---	---	801.27	
Sunnyslope Channel+	---	---	---	---	---	---	---	801.27	
Tequesquite Arroyo (Sycamore Creek)+	---	---	---	---	---	---	---	801.27	

\+ Numeric objectives have not been established; narrative objectives apply

** Surface water objectives not established; underlying Management Zone objectives apply. Biological quality protected by narrative objectives

‡ The Division between Mountain and Valley reaches occurs at the base of the foothills of the San Bernardino or San Gabriel Mountains

Table 4-1 WATER QUALITY OBJECTIVES - Continued

INLAND SURFACE STREAMS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
Prado Area Streams									
Chino Creek									
Reach 1A – Santa Ana River confluence to downstream of confluence with Mill Creek (Prado Area) – Base Flow*	700	350	110	140	10**	150	30	801.21	
Reach 1B – Confluence of Mill Creek (Prado Area) to beginning of concrete-lined channel south of Los Serranos Road	550	240	75	75	8	60	15	801.21	
Reach 2 – Beginning of concrete lined channel south of Los Serranos Road to confluence with San Antonio Creek	---	---	---	---	---	---	---	801.21	
Temescal Creek									
Reach 1 – Lincoln Avenue to Riverside Canal+	---	---	---	---	---	---	---	801.25	
Reach 2 – Riverside Canal to Lee Lake+	---	---	---	---	---	---	---	801.32	801.25
Reach 3 – Lee Lake, (see Lakes, Pg. 4-46)									

* Additional objective: Boron 0.75 mg/l

** Total nitrogen, filtered sample

\+ Numeric objectives have not been established; narrative objectives apply

Table 4-1 WATER QUALITY OBJECTIVES - Continued

INLAND SURFACE STREAMS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
-	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
Reach 4 – Lee Lake to Mid-section line of Section 17 (downstream end of freeway cut)+	---	---	---	---	---	---	---	801.34	
Reach 5 – Mid-section line of Section 17 (downstream end of freeway cut) to Elsinore Groundwater Subbasin Boundary+	---	---	---	---	---	---	---	801.35	
Reach 6 – Elsinore Groundwater Subbasin Boundary to Lake Elsinore Outlet+	---	---	---	---	---	---	---	801.35	
Coldwater Canyon Creek	250	---	---	---	---	---	---	801.32	
Bedford Canyon Creek+	---	---	---	---	---	---	---	801.32	
Dawson Canyon Creek+	---	---	---	---	---	---	---	801.32	
Other Tributaries to these Creeks	250	---	---	---	---	---	---	801.32	

\+ Numeric objectives have not been established; narrative objectives apply

Table 4-1 WATER QUALITY OBJECTIVES - Continued

INLAND SURFACE STREAMS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
San Jacinto River Basin									
San Jacinto River									
Reach 1 – Lake Elsinore to Canyon Lake	450	260	50	65	3	60	15	802.32	802.31
Reach 2 – Canyon Lake (see Lakes, Pg. 4-47)									
Reach 3 – Canyon Lake to Nuevo Road	820	400	---	250	6	---	15	802.11	
Reach 4 – Nuevo Road to North-South Mid-Section Line, T4S/R1W-38*	500	220	75	125	5	65	---	802.14	802.21
Reach 5 – North-South Mid-Section Line, T4S/R1W-SB, to Confluence With Poppet Creek	300	140	30	25	3	40	12	802.21	
Reach 6 – Poppet Creek to Cranston Bridge	250	130	25	20	1	30	12	802.21	
Reach 7 – Cranston Bridge to Lake Hemet	150	100	10	15	1	20	5	802.21	
Bautista Creek – Headwaters to Debris Dam	250	130	25	20	1	30	5	802.21	802.23
Strawberry Creek and San Jacinto River, North Fork	150	100	10	15	1	20	5	802.21	

* Note the quality objective for Reach 4 is not intended to preclude transport of water supplies or delivery to Canyon Lake

Table 4-1 WATER QUALITY OBJECTIVES - Continued

INLAND SURFACE STREAMS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
Fuller Mill Creek	150	100	10	15	1	20	5	802.22	
Stone Creek	150	100	10	15	1	20	5	802.21	
Salt Creek+	---	---	---	---	---	---	---	802.12	
Other Tributaries: Logan, Black Mountain, Juaro Canyon, Indian, Herkey, Poppet and Potrero Creeks, and other Tributaries to these Creeks	150	70	10	12	1	15	5	802.12	802.22

\+ Numeric objectives have not been established; narrative objectives apply.

Table 4-1 WATER QUALITY OBJECTIVES - Continued

LAKES AND RESERVOIRS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
UPPER SANTA ANA RIVER BASIN									
Baldwin Lake*+	---	---	---	---	---	---	---	801.73	
Big Bear Lake**	175	125	20	10	0.15	10	---	801.71	
Erwin Lake+	---	---	---	---	---	---	---	801.73	
Evans Lake	490	---	---	---	---	---	---	801.27	
Jenks Lake	200	100	30	10	1	20	---	801.72	
Lee Lake+	---	---	---	---	---	---	---	801.34	
Mathews, Lake	700	325	100	90	---	290	---	801.33	
Mockingbird Reservoir	650	---	---	---	---	---	---	801.26	
Norconian, Lake	1050	---	---	---	---	---	---	801.25	
LOWER SANTA ANA RIVER BASIN									
Anaheim Lake	600	---	---	---	---	---	---	801.11	
Irvine Lake (Santiago Reservoir)	730	360	110	130	6	310	---	801.12	
Laguna, Lambert, Peters Canyon, Rattlesnake, Sand Canyon, and Siphon Reservoirs	720	---	---	---	---	---	---	801.11	

* Fills occasionally with storm flows; may evaporate completely
** Additional Objective: 0.15 mg/l Phosphorus
\+ Numeric objectives have not been established; narrative objectives apply.

Table 4-1 WATER QUALITY OBJECTIVES - Continued

LAKES AND RESERVOIRS	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
SAN JACINTO RIVER BASIN									
Canyon Lake (Railroad Canyon Reservoir)***	700	325	100	90	8	290	---	802.11	802.12
Elsinore, Lake****	2000	---	---	---	1.5	---	---	802.31	
Fulmor, Lake	150	70	10	12	1	15	---	802.21	
Hemet, Lake	135	---	25	20	1	10	---	802.22	
Perris, Lake	220	110	50	55	1	45	---	802.11	

*** Note: The quality objectives for Canyon Lake is not intended to preclude transport of water supplies or delivery to the Lake.
**** Lake volume and quality highly variable

Table 4-1 WATER QUALITY OBJECTIVES - Continued

WETLANDS (INLAND)	WATER QUALITY OBJECTIVES (mg/l)							Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
San Jacinto Freshwater Marsh**	2000	---	---	---	13	---	90	801.11	
Shay Meadows+	---	---	---	---		---	---	801.73	
Stanfield Marsh+**	---	---	---	---	---	---	---	801.71	
Prado Basin Management Zone @	---	---	---	---	---	---	---	801.21	
San Jacinto Wildlife Preserve+**	---	---	---	---	---	---	---	802.11	802.14
Glen Helen+	---	---	---	---	---	---	---	801.59	

** This is a created wetlands as defined in the wetlands discussion (see Chapter 3)
+ Numeric objectives have not been established; narrative objectives apply
@ includes the Prado Flood Control Basin, a created wetland as defined in the wetlands discussion (see Chapter 3). Chino Creek, Reach 1A, Chino Creek, 1B, Mill Creek (Prado Area) and Santa Ana River, Reach 3 TDS and TIN numeric objectives apply (see discussion).

Table 4-1 WATER QUALITY OBJECTIVES - Continued

GROUNDWATER MANAGEMENT ZONES	WATER QUALITY OBJECTIVES (mg/l)						Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Nitrate as Nitrogen	Sulfate	Primary	Secondary
UPPER SANTA ANA RIVER BASIN								
Big Bear Valley	300	225	20	10	5.0	20	801.73	
Beaumont "maximum benefit"++	330	---	---	---	5.0	---	801.62	801.63, 801.69
Beaumont "antidegradation"++	230	---	---	---	1.5	---	801.62	801.63, 801.69
Bunker Hill - A	310	---	---	---	2.7	---	801.51	801.52
Bunker Hill - B	330	---	---	---	7.3	---	801.52	801.53, 801.54, 801.57 801.58
Colton	410	---	---	---	2.7	---	801.44	801.45
Chino – North "maximum benefit"++	420	---	---	---	5.0	---	801.21	481.21, 481.23, 481.22 801.21, 801.23, 801.24
Chino 1 – "antidegradation"++	280	---	---	---	5.0	---	802.21	481.21
Chino 2 – "antidegradation"++	250	---	---	---	2.9	---	801.21	
Chino 3 – "antidegradation"++	260	---	---	---	3.5	---	801.21	
Chino – East @	730	---	---	---	10.0	---	801.21	801.27
Chino – South @	680	---	---	---	4.2	---	801.21	801.26
Cucamonga "maximum benefit"++	380	---	---	---	5.0	---	801.24	801.21

++ "Maximum benefit" objectives apply unless Regional Board determines that lowering of water quality is not of maximum benefit to the people of the state; in that case, "antidegradation" objectives apply (for Chino North, antidegradation objectives for Chino 1, 2, 3 would apply if maximum benefit is not demonstrated). (see discussion in Chapter 5).

@ Chino East and South are the designations in the Chino Basin Watermaster "maximum benefit" proposal (see Chapter 5) for the management Zones identified by Wildermuth Environmental, Inc., (July 2000) as Chino 4 and Chino 5, respectively.

Table 4-1 WATER QUALITY OBJECTIVES - Continued

GROUNDWATER MANAGEMENT ZONES	WATER QUALITY OBJECTIVES (mg/l)						Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Nitrate as Nitrogen	Sulfate	Primary	Secondary
UPPER SANTA ANA RIVER BASIN								
Cucamonga "antidegradation"++	210	---	---	---	2.4	---	801.24	801.21
Lytle	260	---	---	---	1.5	---	801.41	801.42
Rialto	230	---	---	---	2.0	---	801.41	801.42
San Timoteo "maximum benefit"++	400	---	---	---	5.0	---	801.62	
San Timoteo "antidegradation"++	300	---	---		2.7	---	801.62	
Yucaipa "maximum benefit"++	370	---	---	---	5.0	---	801.61	801.55, 801.54, 801.56, 801.63, 801.65, 801.66 801.67
Yucaipa "antidegradation"++	320	---	---	---	4.2	---	801.61	801.55, 801.54, 801.56, 801.63, 801.65, 801.66 801.67
MIDDLE SANTA ANA RIVER BASIN								
Arlington	980	---	---	---	10	---	801.26	
Bedford**	---	---	---	---	---	---	801.32	
Coldwater	380	---	---	---	1.5	---	801.31	
Elsinore	480	---	---	---	1.0	---	802.31	
Lee Lake**	---	---	---	---	---	---	801.34	

++ "Maximum benefit" objectives apply unless Regional Board determines that lowering of water quality is not of maximum benefit to the people of the state; in that case, "antidegradation" objectives apply (for Chino North, antidegradation objectives for Chino 1, 2, 3 would apply if maximum benefit is not demonstrated). (see discussion in Chapter 5).

** Numeric objectives not established; narrative objectives apply

Table 4-1 WATER QUALITY OBJECTIVES - Continued

GROUNDWATER MANAGEMENT ZONES	WATER QUALITY OBJECTIVES (mg/l)						Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Nitrate as Nitrogen	Sulfate	Primary	Secondary
Riverside - A	560	---	---	---	6.2	---	801.27	
Riverside - B	290	---	---	---	7.6	---	801.27	
Riverside - C	680	---	---	---	8.3	---	801.27	
Riverside - D	810	---	---	---	10.0	---	801.27	
Riverside - E	720	---	---	---	10.0	---	801.27	
Riverside - F	660	---	---	---	9.5	---	801.27	
Temescal	770	---	---	---	10.0	---	801.25	
SAN JACINTO RIVER BASIN								
Gardner Valley	300	100	65	30	2.0	40	802.22	
Idyllwild Area**	---	---	---	---	---	---	802.22	802.21
Canyon	230	---	---	---	2.5	---	802.21	
Hemet - South	730	---	---	---	4.1	---	802.15	802.21
Lakeview – Hemet North	520	---	---	---	1.8	---	802.14	802.15

** Numeric objectives not established; narrative objectives apply

Table 4-1 WATER QUALITY OBJECTIVES - Continued

GROUNDWATER MANAGEMENT ZONES	WATER QUALITY OBJECTIVES (mg/l)						Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Nitrate as Nitrogen	Sulfate	Primary	Secondary
Menifee	1020	---	---	---	2.8	---	802.13	
Perris North	570	---	---	---	5.2	---	802.11	
Perris South	1260	---	---	---	2.5	---	802.11	802.12, 802.13
San Jacinto - Lower	520	---	---	---	1.0	---	802.21	
San Jacinto – Upper "antidegradation"++	320	---	---	---	1.4	---	802.21	802.23
San Jacinto – Upper "maximum benefit" ++	500	---	---	---	7.0	---	802.21	802.23
LOWER SANTA ANA RIVER BASIN								
La Habra**	---	---	---	---	---	---	845.62	
Santiago**	---	---	---	---	---	---	801.12	
Orange	580	---	---	---	3.4	---	801.11	801.13, 845.61, 801.14
Irvine	910	---	---	---	5.9	---	801.11	

** Numeric objectives not established; narrative objectives apply

++ "Maximum benefit" objectives apply unless Regional Board determines that lowering of water quality is not of maximum benefit to the people of the state; in that case, "antidegradation" objectives would apply (see discussion in Chapter 5).

Table 4-2

4-Day Average Concentration for Ammonia
Salmonids or Other Sensitive Coldwater Species Present
(COLD)

Un-ionized Ammonia (mg/liter N)		Temperature, C						
		0	5	10	15	20	25	30
pH	6.50	0.0004	0.0005	0.0007	0.0010	0.0010	0.0010	0.0010
	6.75	0.0006	0.0009	0.0013	0.0018	0.0018	0.0018	0.0018
	7.00	0.0011	0.0016	0.0022	0.0031	0.0031	0.0031	0.0031
	7.25	0.0020	0.0028	0.0040	0.0056	0.0056	0.0056	0.0056
	7.50	0.0035	0.0050	0.0070	0.0099	0.0099	0.0099	0.0099
	7.75	0.0069	0.0097	0.0137	0.0194	0.0194	0.0194	0.0194
	8.00	0.0080	0.0112	0.0159	0.0224	0.0224	0.0224	0.0224
	8.25	0.0080	0.0112	0.0159	0.0224	0.0224	0.0224	0.0224
	8.50	0.0080	0.0112	0.0159	0.0224	0.0224	0.0224	0.0224
	8.75	0.0080	0.0112	0.0159	0.0224	0.0224	0.0224	0.0224
	9.00	0.0080	0.0112	0.0159	0.0224	0.0224	0.0224	0.0224

Total Ammonia (mg/liter N)		Temperature, C						
		0	5	10	15	20	25	30
pH	6.50	1.36	1.27	1.20	1.15	0.796	0.556	0.393
	6.75	1.36	1.27	1.20	1.15	0.796	0.556	0.393
	7.00	1.36	1.27	1.20	1.16	0.798	0.558	0.395
	7.25	1.36	1.27	1.20	1.16	0.800	0.560	0.397
	7.50	1.36	1.27	1.21	1.16	0.804	0.565	0.402
	7.75	1.49	1.40	1.33	1.28	0.890	0.627	0.448
	8.00	0.974	0.913	0.871	0.844	0.589	0.418	0.302
	8.25	0.551	0.519	0.497	0.484	0.341	0.245	0.179
	8.50	0.313	0.297	0.286	0.282	0.202	0.147	0.111
	8.75	0.180	0.172	0.168	0.169	0.123	0.093	0.072
	9.00	0.105	0.101	0.101	0.105	0.079	0.062	0.050

Table 4-3

4-Day Average Concentration for Ammonia
Salmonids or Other Sensitive Coldwater Species Absent [1]
(WARM)

Un-ionized Ammonia (mg/liter N)		Temperature, C						
		0	**5**	**10**	**15**	**20**	**25**	**30**
pH	**6.50**	0.0006	0.0008	0.0012	0.0017	0.0024	0.0024	0.0024
	6.75	0.0010	0.0015	0.0021	0.0030	0.0042	0.0042	0.0042
	7.00	0.0019	0.0026	0.0037	0.0053	0.0074	0.0074	0.0074
	7.25	0.0033	0.0047	0.0066	0.0094	0.0132	0.0132	0.0132
	7.50	0.0059	0.0083	0.0118	0.0166	0.0235	0.0235	0.0235
	7.75	0.0115	0.0162	0.0229	0.0324	0.0458	0.0458	0.0458
	8.00	0.0133	0.0188	0.0265	0.0375	0.0530	0.0530	0.0530
	8.25	0.0133	0.0188	0.0265	0.0375	0.0530	0.0530	0.0530
	8.50	0.0133	0.0188	0.0265	0.0375	0.0530	0.0530	0.0530
	8.75	0.0133	0.0188	0.0265	0.0375	0.0530	0.0530	0.0530
	9.00	0.0133	0.0188	0.0265	0.0375	0.0530	0.0530	0.0530

Total Ammonia (mg/liter N)		Temperature, C						
		0	**5**	**10**	**15**	**20**	**25**	**30**
pH	**6.50**	2.27	2.12	2.01	1.93	1.88	1.31	0.928
	6.75	2.27	2.12	2.01	1.93	1.88	1.31	0.930
	7.00	2.27	2.12	2.01	1.93	1.89	1.32	0.933
	7.25	2.27	2.12	2.01	1.94	1.89	1.32	0.939
	7.50	2.27	2.13	2.02	1.95	1.90	1.33	0.949
	7.75	2.49	2.34	2.22	2.14	2.10	1.48	1.06
	8.00	1.63	1.53	1.46	1.41	1.39	0.987	0.173
	8.25	0.922	0.868	0.831	0.811	0.806	0.578	0.424
	8.50	0.524	0.496	0.479	0.472	0.476	0.348	0.262
	8.75	0.301	0.287	0.281	0.282	0.291	0.219	0.170
	9.00	0.175	0.170	0.170	0.175	0.187	0.146	0.119

1 The values may be conservative, however. If a more refined criterion is desired, EPA recommends a site-specific Criteria modification.

Table 4-4

Equations Used to Calculate UIA-N and Total Ammonia -N Water Quality Objectives for COLD and WARM Waterbodies

COLD-Chronic UIA-N	0≤T≤15	15≤T≤30
6.5≤pH≤7.7	$\frac{0.0223}{10^{(8.3-.03T-pH)}}$	$\frac{0.0158}{10^{(7.7-pH)}}$
7.7≤pH≤8	$\frac{0.0396}{10^{(0.6-0.03T)}+10^{(8.0-0.03T-pH)}}$	$\frac{0.0280}{1+10^{(7.4-pH)}}$
8≤pH≤9	$\frac{0.0317}{10^{(0.6-0.03T)}}$	0.0224

WARM-Chronic UIA-N	0≤T≤15	15≤T≤30
6.5≤pH≤7.7	$\frac{0.0372}{10^{(8.3-.03T-pH)}}$	$\frac{0.0372}{10^{(7.7-pH)}}$
7.7≤pH≤8	$\frac{0.0662}{10^{(0.6-0.03T)}+10^{(8.0-0.03T-pH)}}$	$\frac{0.0662}{1+10^{(7.4-pH)}}$
8≤pH≤9	$\frac{0.0530}{10^{(0.6-0.03T)}}$	0.0530

Total Ammonia-N Objectives:

$$NH_3 - N = UIA - N * \left[1 + 10^{\left(0.09018 + \frac{2729.92}{T+273.15} - pH\right.}\right]$$

Note: For all equations, T is the temperature in °C