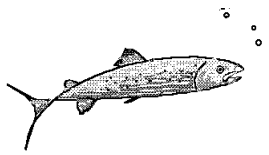
CHAPTER 3
WATER QUALITY OBJECTIVES

TABLES

PHOTOS

3. WATER QUALITY OBJECTIVES

INTRODUCTION



The purpose of this chapter is to designate the water quality objectives for all surface and ground waters in the Region. These water quality objectives are necessary to protect the beneficial uses designated in Chapter 2.

California Water Code (Water Code) section 13050(h) defines "*water quality objectives*" as follows:

"*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.*"

By definition, water quality objectives must protect the most sensitive of the beneficial uses which have been designated for a water body. Water quality objectives may be numerical values for water quality constituents or narrative descriptions. Water quality objectives must be based upon sound scientific water quality criteria needed to protect the most sensitive of the beneficial uses which have been designated for a water body. Water quality objectives must be as stringent or more stringent than water quality criteria. Numerous key terms used throughout this chapter are defined in the Glossary which is included as Appendix A of this Basin Plan.

WATER QUALITY OBJECTIVES

Like the designation of beneficial uses, the designation of water quality objectives must satisfy all of the applicable requirements of the Water Code, Division 7 (Porter-Cologne Act) and the Clean Water Act. Water Code section 13241 provides that each Regional Water Quality Control Board shall establish water quality objectives for the waters of the state i.e. (ground and surface waters) which, in the Regional Board's judgment, are necessary for the reasonable protection of beneficial uses and for the prevention of nuisance. The Clean Water Act section 303 requires that the State adopt water quality objectives (called water quality criteria) for surface waters. The requirements of both Acts applicable to the designation of water quality objectives are summarized below.

WATER QUALITY OBJECTIVE DESIGNATION UNDER THE PORTER-COLOGNE WATER QUALITY CONTROL ACT

Significant points regarding the designation of water quality objectives for waters of the state under the Porter-Cologne Act are:

- Water quality objectives must ensure the reasonable protection of beneficial uses and the prevention of nuisance, recognizing that it may be possible for the quality of the water to be changed to some degree without unreasonably affecting beneficial uses. (Water Code section 13241)

- Protection of beneficial uses may not require that water quality objectives protect the existing quality of water. However, water quality objectives cannot be set at a level that would permit water quality to change to such a degree that the beneficial uses designated for protection are unreasonably affected. (Water Code section 13241)

- Water quality objectives must ensure that the water will be suitable for the beneficial uses which have been designated for protection. (Water Code section 13241)

- In establishing water quality objectives, the Regional Board must provide for the reasonable protection of all beneficial uses which are designated for protection, taking into account existing water quality, environmental and economic considerations. Water Code section 13241 provides that the Regional Board shall consider, but is not limited to, the following factors in establishing water quality objectives:

  - Past, present, and probable future beneficial uses of water;

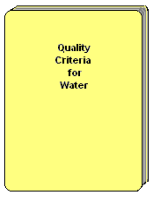
  - Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto;

- Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area;
- Economic considerations;
- The need for developing housing within the region; and
- The need to develop and use recycled water.

WATER QUALITY OBJECTIVE DESIGNATION UNDER THE CLEAN WATER ACT

Section 303 of the Clean Water Act requires the State to submit to the U.S. Environmental Protection Agency (USEPA) for approval, all new or revised water quality standards which are established for surface and ocean waters. Under federal terminology, water quality standards consist of the beneficial uses enumerated in Chapter 2 and the water quality objectives contained in this chapter. Significant points regarding the designation of water quality objectives for surface waters pursuant to the Clean Water Act are:

- Water quality objectives are called water quality criteria in the Clean Water Act.
- Water quality criteria (i.e., water quality objectives) are defined as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular surface water use. Water quality criteria are qualitative or quantitative estimates of the concentration of a water constituent which, when not exceeded, will ensure water quality sufficient to protect a designated beneficial use. Water quality criteria should reflect the latest scientific knowledge on the identifiable effects of pollutants on public health and welfare, aquatic life, and recreation [40 CFR 131.3(b)].
- States must adopt water quality criteria (i.e., water quality objectives) that protect designated surface water beneficial uses. For surface waters with multiple beneficial use designations, the water quality criteria shall support the most sensitive beneficial use [40 CFR 131.11(a)(1)].
- States must adopt water quality criteria (i.e., water quality objectives) for surface waters which are based upon USEPA guidance documents or other scientifically defensible methods. Economics are not considered in the development of water quality criteria for surface waters under the Clean Water Act [40 CFR 131.11(b)].
- Water quality criteria (i.e., water quality objectives) for surface waters can be either numeric or narrative specifications for water quality based on physical, chemical and toxicological data, and scientific judgment. Where numerical specifications cannot be established, narrative criteria must be established based upon biomonitoring methods [40 CFR 131.11(b)].
- The term "*water quality criteria*" has two meanings under the federal Clean Water Act. In one context, water quality criteria is equivalent to water quality objectives. In other words, water quality criteria is the standard that a state must impose to protect a surface water beneficial use. In another context, the term "*water quality criteria*" refers to scientific information USEPA has developed on the relationship that the effect of a constituent concentration has on human health, aquatic life, or other uses of water. USEPA has published information in documents such as the "*Gold Book*" (USEPA, 1986) and in various individual criteria documents.



STATE AND FEDERAL ANTIDEGRADATION POLICIES

Water quality objectives must also conform to USEPA regulations covering antidegradation (40 CFR section 131.12) and State Board Resolution No. 68-16, *Statement of Policy with Respect to Maintaining High Quality of Waters in California*. Application of the antidegradation provisions to the standard setting process requires supporting documentation and appropriate findings whenever a standard (water quality objective or beneficial use) is made

less restrictive to accommodate the discharge of pollutants or other activities of man.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FEDERAL ANTIDEGRADATION POLICY

USEPA water quality standards regulations mandated under the Clean Water Act require that each state have an "*antidegradation*" policy for surface waters [40 CFR 131.6(d)]. Each state's policy must, at a minimum, be consistent with the following three principles (hereinafter referred to as the "*federal antidegradation policy*" set forth in 40 CFR 131.12(a):

(1) The first principle requires that all existing instream water uses shall be maintained and protected.

(2) The second principle protects waters whose quality exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water. For these waters, limited water quality degradation may be allowed if necessary to accommodate important economic or social development in the area in which the waters are located and if the water quality is adequate to protect existing uses fully.

(3) The third principle requires maintenance and protection of all high quality waters which constitute an outstanding national resource.

The federal antidegradation policy serves as a "*catchall*" water quality standard, to be applied where other water quality standards are not specific enough for a particular water body or where other water quality standards do not address a particular pollutant. The policy also serves to provide guidance for standard setting and for other regulatory decisions, to determine when additional control measures should be required to maintain instream beneficial uses or to maintain high quality surface waters. The federal antidegradation policy is not an absolute bar to reductions in surface water quality. Rather, the policy requires that reductions in water quality be justified as necessary to accommodate important social and economic development.

STATE ANTIDEGRADATION POLICY

Water quality objectives for waters of the state must conform to State Board Resolution No. 68-16, *Statement of Policy with Respect to Maintaining High Quality of Waters in California*. Under State Board Resolution No. 68-16, which applies to all waters of the State, the Regional Board and the State Board must have sufficient grounds to adopt findings which demonstrate that any water quality degradation will:

(1) Be consistent with the maximum benefit to the people of the State;

(2) Not unreasonably affect existing and potential beneficial uses of such water; and

(3) Not result in water quality less than described in the Basin Plan.

Resolution No. 68-16 establishes a general principle of nondegradation, with flexibility to allow some changes in water quality which is in the best interests of the State. Changes in water quality are allowed only where it is in the public interest and beneficial uses are not unreasonably affected. The State Board has interpreted Resolution No. 68-16 as incorporating the three part principles set forth in the federal antidegradation policy. The terms and conditions of Resolution No. 68-16 serve as a general narrative water quality objective in all state water quality control plans. A reprint of Resolution No. 68-16 is provided in the back of this Chapter on page 3-35.

DESIGNATED WATER QUALITY OBJECTIVES

The water quality objectives designated for the waters of the San Diego Region are listed below. These water quality objectives are necessary to protect existing and potential beneficial uses described in Chapter 2 and to protect existing high quality waters of the State.

The water quality objectives will be achieved primarily through the establishment of waste discharge requirements, and through the implementation of this water quality control plan.

The Regional Board, in establishing waste discharge requirements, will consider potential effects on beneficial uses within the area of influence of the discharge, the existing quality of receiving waters, and the appropriate water quality objectives. The Regional Board will make a finding as to the beneficial uses to be protected within the area of influence of the discharge and establish waste discharge requirements to protect those uses and to meet water quality objectives.

The water quality objectives are stated in italics and arranged first by the water body type to which they apply (e.g., all waters; all ocean waters; and all inland surface, enclosed bay and estuaries, coastal lagoons, and ground waters). Within each water body type, the water quality objectives are alphabetized by constituent.

In most cases the water quality objective is preceded by a general description of the constituent limited by the objective. The objectives vary in applicability and scope, reflecting the variety of beneficial uses of water which have been identified. Where numerical limits are specified, they represent the maximum levels of constituents that will allow the beneficial use to continue unimpaired. In other cases, an objective 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 adversely affecting 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.

GENERAL ANTIDEGRADATION OBJECTIVE

The following objective shall apply to all waters of the State within the Region.

General Antidegradation Water Quality Objective: *Wherever the existing quality of water is better than the quality of water established herein as objectives, such existing quality shall be maintained unless otherwise provided by the provisions of the State Water Resources Control Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California," including any revisions thereto, or the federal Antidegradation Policy, 40 CFR 131.12 (for surface waters only).*

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OCEAN WATERS

The following objectives shall apply to all ocean waters of the State within the Region:

OCEAN PLAN AND THERMAL PLAN

Ocean Plan and Thermal Plan Water Quality Objective:

The terms and conditions of the State Board's "Water Quality Control Plan for Ocean Waters of California" (Ocean Plan), "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California" (Thermal Plan), and any revisions thereto are incorporated into this Basin Plan by reference. The terms and conditions of the Ocean Plan and Thermal Plan apply to the ocean waters within this Region.

The shoreline segment along Baby Beach within Dana Point Harbor is designated as a water quality limited segment for indicator bacteria pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapter 2, Table 2-3, *Beneficial Uses of Coastal Waters,* Footnote 2, and Chapter 7, *Total Maximum Daily Loads for Indicator Bacteria, Baby Beach in Dana Point Harbor and Shelter Island Shoreline Park in San Diego Bay*.

Certain Pacific Ocean shoreline segments of the following Hydrological Units, Areas, and Subareas are designated as water quality limited segments for indicator bacteria pursuant to Clean Water Act section 303(d): San Joaquin Hills HSA 901.11 and Laguna Beach HAS 901.12, Aliso Creek HSA 901.13, Dana Point HSA 901.14, Lower San Juan HSA 901.27, San Clemente HA 901.30, San Luis Rey HU 903.00, San Marcos HA 904.50, San Dieguito HU 905.00, Miramar Reservoir HA 906.10, Scripps HA 906.30, and Mission San Diego HSA 907.11 and Santee HSA 907.12. Total Maximum Daily Loads have been adopted to address these impairments. See

Chapter 2, Table 2-3, *Beneficial uses of Coastal Waters, Footnotes 1, 6, 9, 10, and 11,* and Chapter 7, *Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)*.

Total Maximum Daily Load (TMDL) Implementation Provisions:

For the purposes of a TMDL, the water quality objectives for total coliform, fecal coliform, and/or enterococcus bacteria in ocean waters designated for contact recreation may be implemented using a reference system and antidegradation approach or natural sources exclusion approach.

See Chapter 4 (Implementation) for further discussion of this implementation provision.

DISSOLVED OXYGEN

Adequate dissolved oxygen is vital for aquatic life. Depression of dissolved oxygen 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.

Water Quality Objective for Dissolved Oxygen:

The dissolved oxygen concentration in ocean waters shall not at any time be depressed more than 10 percent from that which occurs naturally, as the result of the discharge of oxygen demanding waste materials.

HYDROGEN ION CONCENTRATION (pH)

The hydrogen ion concentration of water is called "*pH*". The acidity or alkalinity of water is measured by the pH factor. The pH scale ranges from 1 to 14, with 1 to 6.9 being acid, 7.1 to 14 being alkaline, and 7.0 being neutral. Ranges (pH) of 6.5 to 9.0 are considered harmless. A change of one point on this scale represents a ten-fold increase in acidity or alkalinity. Many pollutants can alter the pH, raising or lowering it excessively. In some cases even small changes in pH can harm aquatic biota. The pH changes can alter the chemical form of certain constituents, thereby increasing their bioavailability and toxicity. For example a decrease in pH can result in an increase in dissolved metal concentrations. Ammonia, which is a major component of sewage discharges, can be completely safe at pH 7.0 and extremely toxic to fish at pH 8.5 for the same total ammonia concentration.

Water Quality Objective for pH:

The pH value shall not be changed at any time more than 0.2 pH units from that which occurs naturally.

INLAND SURFACE WATERS, ENCLOSED BAYS AND ESTUARIES, COASTAL LAGOONS AND GROUND WATERS

The following objectives apply to all inland surface waters, enclosed bays and estuaries, coastal lagoons, and ground waters of the Region as specified below.

THERMAL PLAN

Thermal Plan Water Quality Objective:

The terms and conditions of the State Board's "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California" (Thermal Plan) and any revisions thereto are incorporated into this Basin Plan by reference. The terms and conditions of the Thermal Plan apply to the Inland Surface Waters, Enclosed Bays and Estuaries, and Coastal Lagoons within this Region.

AGRICULTURAL SUPPLY BENEFICIAL USE

Water Quality Objective for Agricultural Supply:

Waters designated for use as agricultural supply (AGR) shall not contain concentrations of chemical constituents in amounts that adversely affect such beneficial use.

AMMONIA, UN-IONIZED

Ammonia is a pungent, colorless, gaseous alkaline compound of nitrogen and hydrogen that is highly soluble in water. Un-ionized ammonia (NH_3) is toxic to fish and other aquatic organisms. In water, NH_3 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.

Water Quality Objective for Un-ionized Ammonia:

The discharge of wastes shall not cause concentrations of un-ionized ammonia (NH_3) to exceed 0.025 mg/l (as N) in inland surface waters, enclosed bays and estuaries and coastal lagoons.

BACTERIA - TOTAL COLIFORM, FECAL COLIFORM, E.COLI, AND ENTEROCOCCI

Total coliform, fecal coliform, *Escherichia coli* (*E. coli*), and enterococci bacteria are used to indicate the likelihood of pathogens of fecal origin in surface waters. Fecal bacteria (e.g., fecal coliform, *E. coli*, and enterococci) are part of the intestinal biota of warm-blooded animals. Their presence in surface waters is an indicator of potential pollution. Total coliform numbers can include non-fecal bacteria, so additional testing is often done to confirm the presence and numbers of fecal bacteria. Water quality objectives for numbers of total coliform, fecal coliform, *E.coli*, and enterococci vary with the beneficial uses of the water, as described below. The water quality objectives for bacteria are expressed in units of organisms per 100 milliliters of water.

The shoreline segment along Shelter Island Shoreline Park within San Diego Bay is designated as a water quality limited segment for indicator bacteria pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapter 2, Table 2-3, *Beneficial Uses of Coastal Waters,* Footnote 5, and Chapter 7, *Total Maximum Daily Loads for Indicator Bacteria, Baby Beach in Dana Point Harbor and Shelter Island Shoreline Park in San Diego Bay*.

Aliso Creek, San Juan Creek, Tecolote Creek, Forrester Creek, San Diego River (lower), and Chollas Creek are designated as water quality limited segments for indicator bacteria pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapter 2, Table 2-2, *Beneficial Uses of Inland Surface Waters, Footnote 3* and Chapter 7*, Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)*.

Surfer at Ocean Beach, San Diego County

(1) Waters Designated for Contact Recreation (REC-1) Beneficial Use

Fecal Coliform Water Quality Objective for Contact Recreation:

The fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200 organisms per 100 ml.

In addition, the fecal coliform concentration shall not exceed 400 organisms per 100 ml for more than 10 percent of the total samples during any 30-day period.

Enterococci and E. Coli Water Quality Objectives for Contact Recreation:

The USEPA published E. coli and enterococci bacteriological criteria applicable to waters designated for contact recreation (REC-1) in the Federal Register, Vol. 51, No. 45, Friday, March 7, 1986, 8012-8016.

USEPA BACTERIOLOGICAL CRITERIA FOR WATER CONTACT RECREATION [1,2]
(in colonies per 100 ml)

	Freshwater		Saltwater
	Enterococci	E.coli	Enterococci
Steady State			
(all areas)	*33*	*126*	*35*
Maximum			
(designated beach)	*61*	*235*	*104*
(moderately or lightly used area)	*108*	*406*	*276*
(infrequently used area)	*151*	*576*	*500*

Total Coliform Water Quality Objective for Contact Recreation for Bays and Estuaries:

In bays and estuaries, the most probable number of total coliform organisms in the upper 60 feet of the water column shall be less than 1,000 organisms per 100 ml (10 organisms per ml); provided that not more than 20 percent of the samples at any sampling station, in any 30-day period, may exceed 1,000 organisms per 100 ml (10 per ml); and provided further that no single sample as described below is exceeded.

The most probable number of total coliform organisms in the upper 60 feet of the water column in no single sample when verified by a repeat sample taken within 48 hours shall exceed 10,000 organisms per 100 ml (100 organisms per ml).

(2) Waters Designated for Non-Contact Recreation (REC-2) Beneficial Use

Fecal Coliform Water Quality Objective for Non-contact Recreation:

In waters designated for non-contact recreation (REC-2) and not designated for contact recreation (REC-1), the average fecal coliform concentrations for any 30-day period, shall not exceed 2,000 organisms per 100 ml nor shall more than 10 percent of samples collected during any 30-day period exceed 4,000 organisms per 100 ml.

(3) Waters Where Shellfish May Be Harvested for Human Consumption (SHELL and COMM) Beneficial Use

Total Coliform Water Quality Objective for Shellfish Harvesting:

In waters where shellfish harvesting for human consumption, commercial or sports purposes is designated (SHELL and COMM), the median total coliform concentration throughout the water column for any 30-day period shall not exceed 70 organisms per 100 ml nor shall more than 10 percent of the samples collected during any 30-day period exceed 230 organisms per 100 ml for a five-tube decimal dilution test or 330 organisms per 100 ml when a three-tube decimal dilution test is used.

(4) San Diego Bay Waters Used for Whole Fish Handling

E. Coli Water Quality Objective for Whole Fish Handling for San Diego Bay:

In San Diego Bay where bay waters are used for whole fish handling, the density of E. coli shall not exceed 7 organisms per ml in more than 20 percent of any 20 daily consecutive samples of bay water.

(5) Total Maximum Daily Load (TMDL) Implementation Provisions

For the purposes of a TMDL, the following provisions may be used to implement bacteria water quality objectives:

The water quality objectives for fecal coliform bacteria for contact recreation may be implemented using a reference system and

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[1] *The criteria were published in the Federal Register, Vol. 51, No. 45/Friday, March 7, 1986/8012-8016. The criteria are based on:*

Cabelli, V. J. 1983. Health Effects Criteria for Marine Recreational Waters. U. S. Environmental Protection Agency, EPA 600/1-80-031, Cincinnati, Ohio.

Dufour, A. P. 1984. Health Effects Criteria for Fresh Recreational Waters. U. S. Environmental Protection Agency, EPA 600/1-84-004, Cincinnati, Ohio.

[2] *The EPA criteria apply to water contact recreation only. The criteria provide for a level of protection based on the frequency of usage of a given water contact recreation area. The criteria may be employed in special studies within this Region to differentiate between pollution sources or to supplement the current coliform objectives for water contact recreation.*

antidegradation approach or natural sources exclusion approach.

The water quality objectives for enterococci and/or *E. coli* in freshwater and/or saltwater may be implemented using a reference system and antidegradation approach or natural sources exclusion approach.

The water quality objectives for coliform organisms in bays and estuaries may be implemented using a reference system and antidegradation approach or natural sources exclusion approach.

The water quality objectives for fecal coliform bacteria for non-contact recreation may be implemented using a reference system and antidegradation approach or natural sources exclusion approach.

See Chapter 4 (Implementation) for a further discussion of this implementation provision.

BIOSTIMULATORY SUBSTANCES

Excessive growth of algae and/or other aquatic plants can degrade water quality. Algal blooms sometimes occur naturally; however, they are often the result of waste discharges or nonpoint source pollutants. Algal blooms depress the dissolved oxygen content of water and can result in fish kills. Algal blooms can also lead to problems with taste, odors, color, and increased turbidity. Floating algal scum and algal mats are also an aesthetically unpleasant nuisance. This general condition is known as eutrophication.

Water Quality Objectives for Biostimulatory Substances:

Inland surface waters, bays and estuaries and coastal lagoon waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growths cause nuisance or adversely affect beneficial uses.

Concentrations of nitrogen and phosphorus, by themselves or in combination with other nutrients, shall be maintained at levels below those which stimulate algae and emergent plant growth. Threshold total phosphorus (P) concentrations shall not exceed 0.05 mg/l in any stream at the point where it enters any standing body of water, nor 0.025 mg/l in any standing body of water. A desired goal in order to prevent plant nuisance in streams and other flowing waters appears to be 0.1 mg/l total P. These values are not to be exceeded more than 10% of the time unless studies of the specific water body in question clearly show that water quality objective changes are permissible and changes are approved by the Regional Board. Analogous threshold values have not been set for nitrogen compounds; however, natural ratios of nitrogen to phosphorus are to be determined by surveillance and monitoring and upheld. If data are lacking, a ratio of N:P = 10:1 , on a weight to weight basis shall be used.

Inland surface waters shall not contain biostimulatory substances in concentrations in excess of the numerical objectives described in Table 3-2.

Rainbow Creek is designated as an impaired water body for total nitrogen and total phosphorus pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads (TMDLs) have been adopted to address these impairments. See Chapter 2, Beneficial Uses Table 2-2. Beneficial Uses of Inland Surface Waters, Santa Margarita River Watershed, Rainbow Creek, Hydrologic Unit Basin Numbers 2.23 and 2.22, Footnote 3 and Chapter 7, Total Maximum Daily Loads.

Note - Certain exceptions to the above water quality objectives are described in Chapter 4 in the sections titled Discharges to Coastal Lagoons from Pilot Water Reclamation Projects and Discharges to Inland Surface Waters.

BORON

Boron occurs as sodium borate (borax) or as calcium borate (colemanite) in mineral deposits and natural waters of southern California. Boron is not considered harmful in drinking waters in concentrations up to 30 mg/l. Boron is an essential element for the growth of plants but there is no evidence that it is required by animals. Naturally occurring concentrations of boron should have no effect on aquatic life. Concentrations of boron in irrigation waters in excess of 0.75 (milligrams per liter) mg/l may be deleterious to sensitive plants such as citrus. The maximum safe concentration of boron for even the most tolerant


Oranges

plants is about 4.0 mg/l. The United States Environmental Protection Agency (USEPA) has established a water quality criterion for boron of 0.75 mg/l for long term-term irrigation on sensitive crops. This criterion is found in *Quality Criteria for Water, 1986* - the "*Gold Book*". Additional information regarding boron concentrations in irrigation waters is presented in Table 3-1.

Water Quality Objectives for Boron:

Inland surface waters shall not contain boron in concentrations in excess of the numerical objectives described in Table 3-2.

Ground waters shall not contain boron in concentrations in excess of the numerical objectives described in Table 3-3.

Table 3-1. Guidelines for Interpretation of Water Quality for Irrigation[a]

Potential Irrigation Problem	Units	Degree or Restriction on use		
		None	Slight to Moderate	Severe
Salinity (affects crop water availability)				
Electrical Conductivity (EC_w[b])	ds/m or mmho/cm	< 0.7	0.7 - 3.0	> 3.0
TDS	mg/l	< 450	450 – 2,000	> 2,000
Permeability (affects infiltration rate of water into soil. Evaluate using EC_w and Sodium Adsorption Ratio (SAR) together) [c, d]				
SAR =			**and EC w =**	
0 - 3		> 0.7	0.7 - 0.2	< 0.2
3 - 6		> 1.2	1.2 - 0.3	< 0.3
6 - 12		> 1.9	1.9 - 0.5	< 0.5
12 - 20		> 2.9	2.9 - 1.3	< 1.3
20 - 40		> 5.0	5.0 - 2.9	< 2.9
Specified ion toxicity (affects sensitive crops)				
Sodium (Na) [e,f]				
surface irrigation	SAR	< 3	3 - 9	> 9
sprinkler irrigation	mg/l	< 70	> 70	-----
Chloride (Cl) [e,f]				
surface irrigation	mg/l	< 140	140 - 350	> 350
sprinkler irrigation	mg/l	< 100	> 100	-----
Boron (B)	mg/l	< 0.7	0.7 - 3.0	> 3.0
Miscellaneous effects (affects susceptible crops)				
Nitrogen (Total-N) [g]	mg/l	< 5	5 - 30	> 30
Bicarbonate (HCO_3) (overhead sprinkler only)	mg/l	< 90	90 - 500	> 500
pH		normal range	6.5 - 8.4	
Residual chlorine (overhead sprinkler only)	mg/l	< 1.0	1.0 - 5.0	> 5.0

Endnotes for Table 3-1

a. Interpretations are based on possible effects of constituents on crops and/or soils. Guidelines are flexible and should be modified when warranted by local experience or special conditions of crop, soil, and method of irrigation. Table 3-1 is based on Table 3-4 contained in "*Irrigation with Reclaimed Municipal Wastewater, A Guidance Manual,*" California State Water Resources Control Board, Report Number 84-1, July 1984.

b. EC_w means electrical conductivity of the irrigation water, reported in mmho/cm or ds/m. TDS means total dissolved solids, reported in mg/l.

c. SAR means sodium adsorption ratio. SAR is sometimes reported as R_{Na}. At a given SAR, infiltration rate increases as salinity (EC_w) increases. Evaluate the potential permeability problem by SAR and EC_w in combination.

$$SAR = \frac{Na}{\sqrt{\frac{(Ca + Mg)}{2}}}$$ Where Na, Ca, and Mg are in milliequivalents per liter.

d. For wastewaters, it is recommended that the SAR be adjusted to include a more correct estimate of calcium in the soil water following an irrigation. The adjusted sodium adsorption ratio (adj RNa) calculated by this product is to be substituted for the SAR value.

$$SAR = \frac{Na}{\sqrt{\frac{(Ca_x + Mg)}{2}}}$$ Where Na, Ca, and Mg are in milliequivalents per liter.

Ca_x is a modified Ca value calculated using Table 3-2, contained in "*Irrigation with Reclaimed Municipal Wastewater, A Guidance Manual.*"

e. Most tree crops and woody ornamentals are sensitive to sodium and chloride; use the values shown. Most annual crops are not sensitive; use the salinity tolerance tables. For boron sensitivity, refer to boron tolerance tables.

f. With overhead sprinkler irrigation and low humidity (<30%), sodium or chloride greater than 70 or 100 mg/l, respectively, have resulted in excessive leaf absorption and crop damage to sensitive crops.

g. Total nitrogen should include nitrate-nitrogen, ammonia-nitrogen, and organic-nitrogen. Although forms of nitrogen in wastewater vary, the plant responds to the total nitrogen.

Table 3-2. Water Quality Objectives

Concentrations not to be exceeded more than 10% of the time during any one year period.

Inland Surface Waters		Hydrologic Unit Basin Number	Constituent (mg/L or as noted)												
			TDS	Cl	SO_4	%Na	N&P	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
SAN JUAN HYDROLOGIC UNIT		**901.00**													
Laguna	HA	1.10	1,000	400	500	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Mission Viejo	HA	1.20	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
San Clemente	HA	1.30	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
San Mateo Canyon	HA	1.40	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
San Onofre	HA	1.50	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
SANTA MARGARITA HYDROLOGIC UNIT		**902.00**													
Ysidora	HA	2.10	750	300	300	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Deluz	HA	2.20	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Deluz Creek	HSA b	2.21	750	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Gavilan	HSA b	2.22	750	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Murrieta	HA	2.30	750	300	300	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Auld	HA	2.40	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Pechanga	HA	2.50	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Wolf	HSA b	2.52	750	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Wilson	HA	2.60	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Cave Rocks	HA	2.70	750	300	300	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Aguanga	HA	2.80	750	300	300	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Oakgrove	HA	2.90	750	300	300	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0

HA – Hydrologic Area

HSA – Hydrologic Sub Area (Lower case letters indicate endnotes following the table).

Table 3-2. Water Quality Objectives (continued)

Concentrations not to be exceeded more than 10% of the time during any one year period.

Inland Surface Waters		Hydrologic Unit Basin Number	Constituent (mg/L or as noted)												
			TDS	Cl	SO_4	%Na	N&P	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
SAN LUIS REY HYDROLOGIC UNIT		**903.00**													
Lower San Luis	HA	3.10	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Monserat	HA	3.20	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Warner Valley	HA	3.30	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
CARLSBAD HYDROLOGIC UNIT		**904.00**													
Loma Alta	HA	4.10	-	-	-	-	-	-	-	-	-	none	20	20	1.0
Buena Vista Creek	HA	4.20	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Agua Hedionda	HA	4.30	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Encinas	HA	4.40	-	-	-	-	-	-	-	-	-	none	20	20	1.0
San Marcos	HA	4.50	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Escondido Creek	HA	4.60	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
SAN DIEGUITO HYDROLOGIC UNIT		**905.00**													
Solana Beach	HA	5.10	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Hodges	HA	5.20	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
San Pasqual	HA	5.30	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Santa Maria Valley	HA	5.40	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Santa Ysabel	HA	5.50	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0

HA – Hydrologic Area

HSA – Hydrologic Sub Area (Lower case letters indicate endnotes following the table).

Table 3-2. Water Quality Objectives (continued)

Concentrations not to be exceeded more than 10% of the time during any one year period.

Inland Surface Waters		Hydrologic Unit Basin Number	Constituent (mg/L or as noted)												
			TDS	Cl	SO_4	%Na	N&P	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
PENASQUITOS HYDROLOGIC UNIT		**906.00**													
Miramar Reservoir	HA	6.10	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Poway	HA	6.20	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Scripps	HA	6.30	-	-	-	-	a	-	-	-	-	none	20	20	-
Miramar	HA	6.40	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Tecolote	HA	6.50	-	-	-	-	a	-	-	-	-	none	20	20	-
SAN DIEGO HYDROLOGIC UNIT		**907.00**													
Lower San Diego	HA	7.10	1,000	400	500	60	a	0.3	0.05	0.5	1.0	none	20	20	-
Mission San Diego	HSA	7.11	1,500	400	500	60	a	1.0	1.00	0.5	1.0	none	20	20	-
Santee	HSA c	7.12	1,000	400	500	60	a	1.0	1.00	0.5	1.0	none	20	20	-
Santee	HSA d	7.12	1,500	400	500	60	a	1.0	1.00	0.5	1.0	none	20	20	-
San Vicente	HA	7.20	300	50	65	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
El Capitan	HA	7.30	300	50	65	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
Boulder Creek	HA	7.40	300	50	65	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
PUEBLO SAN DIEGO HYDROLOGIC UNIT		**908.00**													
Point Loma	HA	8.10	-	-	-	-	-	-	-	-	-	none	20	20	-
San Diego Mesa	HA	8.20	-	-	-	-	-	-	-	-	-	none	20	20	-
National City	HA	8.30	-	-	-	-	-	-	-	-	-	none	20	20	-
SWEETWATER HYDROLOGIC UNIT		**909.00**													
Lower Sweetwater	HA	9.10	1,500	500	500	60	a	0.3	0.05	0.5	0.75	none	20	20	-
Middle Sweetwater	HA	9.20	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Upper Sweetwater	HA	9.30	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0

HA – Hydrologic Area

HSA – Hydrologic Sub Area (Lower case letters indicate endnotes following the table).

Table 3-2. Water Quality Objectives (continued)

Concentrations not to be exceeded more than 10% of the time during any one year period.

Inland Surface Waters		Hydrologic Unit Basin Number	Constituent (mg/L or as noted)												
			TDS	Cl	SO_4	%Na	N&P	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
OTAY HYDROLOGIC UNIT		**910.00**													
Coronado	HA	10.10	-	-	-	-	-	-	-	-	-	-	-	-	-
Otay Valley	HA	10.20	1,000	400	500	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Dulzura	HA	10.30	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
TIJUANA HYDROLOGIC UNIT		**911.00**													
Tijuana Valley	HA	11.10	-	-	-	-	-	-	-	-	-	-	-	-	-
San Ysidro	HSA	11.11	2,100	-	-	-	a	-	-	-	-	none	20	20	-
Potrero	HA	11.20	500	250	250	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
Barrett Lake	HA	11.30	500	250	250	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
Monument	HA	11.40	500	250	250	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
Morena	HA	11.50	500	250	250	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
Cottonwood	HA	11.60	500	250	250	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
Cameron	HA	11.70	500	250	250	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
Campo	HA	11.80	500	250	250	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0

HA – Hydrologic Area

HSA – Hydrologic Sub Area (Lower case letters indicate endnotes following the table).

Endnotes for Table 3-2

a Concentrations of nitrogen and phosphorus, by themselves or in combination with other nutrients, shall be maintained at levels below those which stimulate algae and emergent plant growth. Threshold total Phosphorus (P) concentrations shall not exceed 0.05 mg/l in any stream at the point where it enters any standing body of water, nor 0.025 mg/l in any standing body of water. A desired goal in order to prevent plant nuisances in streams and other flowing waters appears to be 0.1 mg/l total P. These values are not to be exceeded more than 10% of the time unless studies of the specific body in question clearly show that water quality objective changes are permissible and changes are approved by the Regional Board. Analogous threshold values have not been set for nitrogen compounds; however, natural ratios of nitrogen to phosphorus are to be determined by surveillance and monitoring and upheld. If data are lacking, a ratio of N: P = 10:1 shall be used. Note - Certain exceptions to the above water quality objectives are described in Chapter 4 in the sections titled Discharges to Coastal Lagoons from Pilot Water Reclamation Projects and Discharges to Surface Waters.

b These objectives apply to the lower portion of Murrieta Creek in the Wolf HSA (2.52) and the Santa Margarita River from it's beginning at the confluence of Murrieta and Temecula Creeks, through the Gavilan HSA (2.22) and DeLuz HSA (2.21), to where it enters the Upper Ysidora HSA (2.13).

c Sycamore Canyon Subarea, a portion of the Santee Hydrologic Subarea, includes the watersheds of the following north-south trending canyons: Oak Creek, Spring Canyon, Little Sycamore Canyon, Quail Canyon, and Sycamore Canyon. The Sycamore Canyon subarea extends eastward from the Mission San Diego HSA to the confluence of the San Diego River and Forester Creek, immediately south of the Santee Lakes.

d These objectives apply to the Lower Sycamore Canyon portion of the Santee Hydrologic Subarea described as all of the Sycamore Canyon watershed except that part which drains north of the boundary between sections 28 and 33, Township 14 South, Range 1 West.

Table 3-3. Water Quality Objectives

Concentrations not to be exceeded more than 10% of the time during any one year period.

Ground Water			Hydrologic Basin Unit Number	Constituent (mg/L or as noted)												
				TDS	Cl	SO4	%Na	NO3	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
SAN JUAN HYDROLOGIC UNIT			**901.00**													
Laguna	HA		1.10													
San Joaquin Hills	HSA		1.11	1,200	400	500	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Laguna Beach	HSA		1.12	1,200	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Aliso	HSA		1.13	1,200	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Dana Point	HSA		1.14	1,200	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Mission Viejo	HA		1.20													
Oso	HSA		1.21	1,200	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Upper Trabuco	HSA		1.22	500	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Middle Trabuco	HSA		1.23	750	375	375	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Gobernadora	HSA		1.24	1,200	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Upper San Juan	HSA		1.25	500	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Middle San Juan	HSA		1.26	750	375	375	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Lower San Juan	HSA		1.27	1,200	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Ortega	HSA		1.28	1,100	375	450	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
San Clemente	HA		1.30													
Prima Deshecha	HSA		1.31	1,200	400	500	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Segunda Deshecha	HSA		1.32	1,200	400	500	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
San Mateo Canyon	HA	a	1.40	500 [b]	250	250 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
San Onofre	HA	a	1.50	500 [b]	250	250 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
SANTA MARGARITA HYDROLOGIC UNIT			**902.00**													
Ysidora	HA	a	2.10	750 [c]	300 [c]	300 [c]	60	10 [c]	0.3 [c]	0.05 [c]	0.5	0.75 [c]	none	5	15	1.0
Deluz	HA		2.20	500	250	250	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0

HA - Hydrologic Area

HSA - Hydrologic Sub Area (Lower case letters indicate endnotes following the table.)

Table 3-3. Water Quality Objectives (continued)

Concentrations not to be exceeded more than 10% of the time during any one year period.

Ground Water		Hydrologic Basin Unit Number	Constituent (mg/L or as noted)												
			TDS	Cl	SO4	%Na	NO3	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
Deluz Creek	HSA [m]	2.21	750	250	250	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Gavilan	HSA [m]	2.22	750	250	250	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Murrieta	HA	2.30	750 [c]	300 [c]	300 [c]	60	10 [c]	0.3 [c]	0.05 [c]	0.5	0.75 [c]	none	5	15	1.0
Domenigoni	HSA	2.35	2,000	-	-	-	-	-	-	-	-	-	-	-	-
Auld	HA	2.40	500	250	250	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Pechanga	HA	2.50	500	250	250	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Pauba	HSA [o]	2.51	750	250	250	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Wolf	HSA [p]	2.52	750	250	250	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Wilson	HA	2.60	500	250	250	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Cave Rocks	HA	2.70	500	250	250	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Aguanga	HA	2.80	500	250	250	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Oakgrove	HA	2.90	500	250	250	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
SAN LUIS REY HYDROLOGIC UNIT		**903.00**													
Lower San Luis	HA	3.10	800 [r]	300	400	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Mission	HSA [a]	3.11	1,500 [cd]	500 [cd]	500 [cd]	60	45 [cd]	0.85 [cd]	0.15 [cd]	0.5 [d]	0.75 [cd]	none	5	15 [d]	1.0 [d]
Bonsall	HSA	3.12	1,500 [cd]	500 [cd]	500 [cd]	60	45 [cd]	0.85 [cd]	0.15 [cd]	0.5 [d]	0.75 [cd]	none	5	15 [d]	1.0 [d]
Moosa	HSA	3.13	1,200 [r]	300	400	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Valley Center	HSA	3.14	1,100 [r]	300	400	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Monserate	HA	3.20													
Pala	HSA	3.21	900 [c]	300 [c]	500 [c]	60	15 [c]	0.3 [c]	0.05 [c]	0.5	0.75	none	5	15	1.0
Pauma	HSA	3.22	800 [c]	300 [c]	400 [c]	60	10 [c]	0.3 [c]	0.05 [c]	0.5	0.75	none	5	15	1.0
La Jolla Amago	HSA	3.23	500	250	250	60	5	0.3	0.05	0.5	0.75	none	5	15	1.0
Warner Valley	HA	3.30	500	250	250	60	5	0.3	0.05	0.5	0.75	none	5	15	1.0
CARLSBAD HYDROLOGIC UNIT		**904.00**													
Loma Alta	HA	4.10	-	-	-	-	-	-	-	-	-	-	-	-	-

HA - Hydrologic Area

HSA - Hydrologic Sub Area (Lower case letters indicate endnotes following the table).

Table 3-3. Water Quality Objectives (continued)

Concentrations not to be exceeded more than 10% of the time during any one year period.

Ground Water			Hydrologic Basin Unit Number	Constituent (mg/L or as noted)													
				TDS	Cl	SO4	%Na	NO3	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
Buena Vista Creek	HA		4.20													
El Salto	HSA	a	4.21	3,500	800	500	60	45	0.3	0.05	0.5	2.0	none	5	15	1.0
Vista	HSA	a	4.22	1,000 [b]	400 [b]	500 [b]	60	10 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
Agua Hedionda	HA	a	4.30	1,200	500	500	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Los Monos	HSA	a j	4.31	3,500	800	500	60	45	0.3	0.05	0.5	2.0	none	5	15	1.0
Encinas	HA	a	4.40	3,500 [b]	800 [b]	500 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	2.0 [b]	none	5	15	1.0
San Marcos	HA	a e	4.50	1,000	400	500	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Batiquitos	HSA	a e k	4.51	3,500	800	500	60	45	0.3	0.05	0.5	2.0	none	5	15	1.0
Escondido Creek	HA	a	4.60	750	300	300	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
San Elijo	HSA	a	4.61	2,800	700	600	60	45	0.3	0.05	0.5	1.0	none	5	15	1.0
Escondido	HSA		4.62	1,000	300	400	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
SAN DIEGUITO HYDROLOGIC UNIT			**905.00**													
Solana Beach	HA	a	5.10	1,500 [b]	500 [b]	500 [b]	60	45 [b]	0.85 [b]	0.15 [b]	0.5	0.75 [b]	none	5	15	1.0
Hodges	HA		5.20	1,000 [b]	400 [b]	500 [b]	60	10 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
San Pasqual	HA		5.30	1,000 [b]	400 [b]	500 [b]	60	10 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
Santa Maria Valley	HA		5.40	1,000	400	500	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Santa Ysabel	HA		5.50	500	250	250	60	5	0.3	0.05	0.5	0.75	none	5	15	1.0
PENASQUITOS HYDROLOGIC UNIT			**906.00**													
Miramar Reservoir	HA	a f	6.10	1,200	500	500	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Poway	HA		6.20	750 [q]	300	300	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Scripps	HA		6.30	-	-	-	-	-	-	-	-	-	-	-	-	-
Miramar	HA	g	6.40	750	300	300	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Tecolote	HA		6.50	-	-	-	-	-	-	-	-	-	-	-	-	-

HA - Hydrologic Area

HSA - Hydrologic Sub Area (Lower case letters indicate endnotes following the table.)

Table 3-3. Water Quality Objectives (continued)

Concentrations not to be exceeded more than 10% of the time during any one year period.

Ground Water			Hydrologic Basin Unit Number	Constituent (mg/L or as noted)												
				TDS	Cl	SO4	%Na	NO3	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
SAN DIEGO HYDROLOGIC UNIT			**907.00**													
Lower San Diego	HA		7.10													
Mission San Diego	HSA	a	7.11	3,000 [b]	800 [b]	600 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	2.0 [b]	none	5	15	1.0
Santee	HSA		7.12	1,000 [b]	400 [b]	500 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
Santee (alluvial aquifer for lower Sycamore Canyon)	HSA	n	7.12	2,000 [b]	800 [b]	600 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	2.0 [b]	none	5	15	1.0
El Cajon	HSA		7.13	1,200 [b]	250 [b]	500 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
Coches	HSA		7.14	600 [b]	250 [b]	250 [b]	60	5 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
El Monte	HSA		7.15	600 [b]	250 [b]	250 [b]	60	5 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
San Vicente	HA		7.20	600	250	250	60	5	0.3	0.05	0.5	0.75	none	5	15	1.0
El Capitan	HA		7.30	1,000	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Conejos Creek	HSA		7.31	350	60	60	60	5	0.3	0.05	0.5	0.75	none	5	15	1.0
Boulder Creek	HA		7.40	350	60	60	60	5	0.3	0.05	0.5	0.75	none	5	15	1.0
PUEBLO SAN DIEGO HYDROLOGIC UNIT			**908.00**													
Point Loma	HA	i	8.10	-	-	-	-	-	-	-	-	-	-	-	-	-
San Diego Mesa	HA	i	8.20	-	-	-	-	-	-	-	-	-	-	-	-	-
National City	HA	i	8.30	750	250	250	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
SWEETWATER HYDROLOGIC UNIT			**909.00**													
Lower Sweetwater	HA		9.10													
Telegraph	HSA		9.11	3,000 [b]	750 [b]	500 [b]	60	45 [b]	0.3 [b]	0.05 b	0.5	2.0 [b]	none	5	15	1.0
La Nacion	HSA		9.12	1,500 [b]	500 [b]	500 [b]	60	45 [b]	0.3 [b]	0.15 b	0.5	0.75 [b]	none	5	15	1.0
Middle Sweetwater	HA		9.20	1,000	400	500	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
Upper Sweetwater	HA		9.30	500	250	250	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0

HA - Hydrologic Area

HSA - Hydrologic Sub Area (Lower case letters indicate endnotes following the table.)

Table 3-3. Water Quality Objectives (continued)

Concentrations not to be exceeded more than 10% of the time during any one year period.

Ground Water		Hydrologic Basin Unit Number	Constituent (mg/L or as noted)												
			TDS	Cl	SO4	%Na	NO3	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
OTAY HYDROLOGIC UNIT		**910.00**													
Coronado	HA	10.10	-	-	-	-	-	-	-	-	-	-	-	-	-
Otay Valley	HA	10.20	1,500 [b]	500 [b]	500 [b]	60	10 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
Otay Valley	HA [l]	10.20	-	-	-	-	-	-	-	-	-	none	-	-	-
Dulzura	HA	10.30	1,000	400	500	60	10	0.3	0.05	0.5	0.75	none	5	15	1.0
TIJUANA HYDROLOGIC UNIT		**911.00**													
Tijuana Valley	HA [h]	11.10	2,500 [b]	550 [b]	900 [b]	70	-	-	-	-	2.0 [b]	none	-	-	-
Potrero	HA	11.20	500	250	250	60	45	0.3	0.05	0.5	1.0	none	5	15	1.0
Barrett Lake	HA	11.30	500	250	250	60	45	0.3	0.05	0.5	1.0	none	5	15	1.0
Monument	HA	11.40	500	250	250	60	45	0.3	0.05	0.5	1.0	none	5	15	1.0
Morena	HA	11.50	500	250	250	60	45	0.3	0.05	0.5	1.0	none	5	15	1.0
Cottonwood	HA	11.60	500	250	250	60	45	0.3	0.05	0.5	1.0	none	5	15	1.0
Cameron	HA	11.70	500	250	250	60	45	0.3	0.05	0.5	1.0	none	5	15	1.0
Campo	HA	11.80	500	250	250	60	45	0.3	0.05	0.5	1.0	none	5	15	1.0

HA - Hydrologic Area

HSA - Hydrologic Sub Area (Lower case letters indicate endnotes following the table.)

Endnotes for Table 3-3

a The water quality objectives do not apply westerly of the easterly boundary of Interstate Highway 5. The objectives for the remainder of the Hydrologic Area (Subarea) are as shown.

b Detailed salt balance studies are recommended for this area to determine limiting mineral concentration levels for discharge. On the basis on existing data, the tabulated objectives would probably be maintained in most areas. Upon completion of the salt balance studies, significant water quality objective revisions may be necessary. In the interim period of time, projects of ground water recharge with water quality inferior to the tabulated numerical values may be permitted following individual review and approval by the Regional Board if such projects do not degrade existing ground water quality to the aquifers affected by the recharge.

Endnotes for Table 3-3 (continued)

c The recommended plan would allow for measurable degradation of ground water in this basin to permit continued agricultural land use. Point sources, however, would be controlled to achieve effluent quality corresponding to the tabulated numerical values. In future years demineralization may be used to treat ground water to the desired quality prior to use.

d A portion of the Upper Mission Basin is being considered as an underground potable water storage reservoir for treated imported water. The area is located north of Highway 76 an the boundary of hydrologic subareas 3.11 and 3.12. If this program is adopted, local objectives approaching the quality of the imported water would be set and rigorously pursued.

e The water quality objectives do not apply to hydrologic subareas 4.51 and 4.52 between Highway 78 and El Camino Real and to all lands which drain to Moonlight Creek, Cottonwood Creek and Encinitas Creek. The objectives for the remainder of the Hydrologic Area are as shown.

f The water quality objectives do not apply to all lands which drain to Los Penasquitos Canyon from 1.5 miles west of Interstate Highway 15. The objectives for the remainder of the Hydrologic Area are as shown.

g The water quality objectives do not apply west of Interstate Highway 15. The objectives for the remainder of the Hydrologic Area are as shown.

h The water quality objectives do not apply west of Hollister Street. The objectives for the remainder of the Hydrologic Area are as shown.

i No significant amount of ground water in this unit.

j The water quality objectives apply to the portion of Subarea 4.31 bounded on the west by the easterly boundary of the Interstate 5 right-of-way and on the east by the easterly boundary of El Camino Real.

k The water quality objectives apply to the portion of Subarea 4.51 bounded on the south by the north shore of Batiquitos Lagoon, on the west by the easterly boundary of the Interstate 5 right-of-way and on the east by the easterly boundary of El Camino Real.

l The water quality objectives apply to the portion of the Otay HA 10.20 limited to lands within and tributary to Salt Creek on the east and Poggi Canyon on the west and including the several smaller drainage courses between these tributaries of the Otay River.

m These objectives apply to the alluvial ground water beneath the Santa Margarita River from the confluence of Murrieta and Temecula Creeks through the Gavilan and DeLuz HSAs to a depth of 100 feet and a lateral distance equal to the area of the floodplain covered by a 10 year flood event. These objectives do not apply to ground water in any of the basins beneath DeLuz, Sandia, and Rainbow Creeks and other unnamed creeks, which are tributaries of the Santa Margarita River.

Endnotes for Table 3-3 (continued)

n These objectives apply for only the alluvial aquifer in the Lower Sycamore Canyon portion of the Santee Hydrologic Subarea described as all of the Sycamore Canyon watershed except that part which drains north of the boundary between sections 28 and 33, Township 14 South, Range 1 West.

o These objectives apply to ground waters within 250 feet of the surface for the most downstream 4,200 acres of the Pauba HSA (2.51) which drain directly to the most downstream 2.7 mile segment of Temecula Creek. Excluded from this area are all lands upgradient from a point 0.5 miles east of the intersection of Butterfield Stage Road and Highway 79.

p These objectives apply to ground waters within 250 feet of the surface for the most downstream 2,800 acres of the Wolf HSA (2.52) including those portions of the HSA which drain directly to the most downstream 1.5 mile segment of Pechanga Creek. Excluded from this area are all lands of HSA 2.52 which are upgradient of the intersection of Pala Road and Via Eduardo.

q These objectives apply to ground waters of the Poway HSA (6.2) that lie east of the San Diego County Water Authority's (SDCWA) First Aqueduct. Ground water quality objectives west of the SDCWA First Aqueduct are 1,000 mg/l.

r The total dissolved solids (TDS) objective for the alluvial aquifer in the Moosa Hydrologic Subarea (903.13) is 1,200 mg/l. The TDS objective for the alluvial aquifer in the Valley Center Hydrologic Subarea (903.14) is 1,100 mg/l.

CHLORIDES

Most waters contain chlorides because they are present in many rock types and are very soluble in water. Chlorides may be of natural mineral origin or derived from (a) seawater intrusion of ground water supplies, (b) salts spread on fields for agricultural purposes, (c) human or animal sewage or (d) industrial wastes. Chlorides may impart a salty taste to drinking water in concentrations between 100 - 700 mg/l. The secondary drinking water standard for chlorides is 500 mg/l. Elevated chloride concentrations in waters used for industrial process and supply can significantly increase the corrosion rate of steel and aluminum. High chloride concentrations can be toxic to plant life. A safe concentration of chloride for irrigation water is considered to be in the range of 100 - 140 mg/l. Irrigation with water containing 140 - 350 mg/l of chloride may cause slight to moderate plant injury. Additional information regarding chloride concentrations in irrigation waters is presented in Table 3-1.

Water Quality Objectives for Chlorides:

Inland surface waters shall not contain chlorides in concentrations in excess of the numerical objectives described in Table 3-2.

Ground waters shall not contain chlorides in concentrations in excess of the numerical objectives described in Table 3-3.

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.

Water Quality Objectives for Color:

Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses.

The natural color of fish, shellfish or other resources in inland surface waters, coastal lagoon or bay and estuary shall not be impaired.

Inland surface waters shall not contain color in concentrations in excess of the numerical objectives described in Table 3-2.

Ground waters shall not contain color in concentrations in excess of the numerical objectives described in Table 3-3.

DISSOLVED OXYGEN

Adequate dissolved oxygen levels are vital for aquatic life. Depression of dissolved oxygen 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.

Water Quality Objective for Dissolved Oxygen:

Dissolved oxygen levels shall not be less than 5.0 mg/l in inland surface waters with designated MAR or WARM beneficial uses or less than 6.0 mg/l in waters with designated COLD beneficial uses. The annual mean dissolved oxygen concentration shall not be less than 7 mg/l more than 10% of the time.

FLOATING MATERIAL

Floating material is an aesthetic nuisance as well as a substrate for algae and insect vectors.

Water Quality Objective for Floating Material:

Waters shall not contain floating material, including solids, liquids, foams, and scum in concentrations which cause nuisance or adversely affect beneficial uses.

FLUORIDE

Fluoride does not naturally occur in high concentrations in surface waters, but may occur in detrimental concentrations in ground waters. Fluoride, in sufficient quantities, can adversely affect waters used as industrial process or supply in food, beverages, and pharmaceutical industries. The presence of optimal concentrations of fluoride in drinking water supplies can reduce dental decay, especially among children. However, fluoride concentrations in excess of approximately 1.0 mg/l can increase the risk of mottled enamel in children and dental fluorosis in adults.

Water Quality Objectives for Fluoride:

Inland surface waters shall not contain fluoride in concentrations in excess of the numerical objectives described in Table 3-2.

Ground waters shall not contain fluoride in concentrations in excess of the numerical objectives described in Table 3-3.

HYDROGEN ION CONCENTRATION (pH)

The hydrogen ion concentration of water is called "pH". The acidity or alkalinity of water is measured by the pH factor. The pH scale ranges from 1 to 14, with 1 to 6.9 being acid, 7.1 to 14 being alkaline, and 7.0 being neutral. Ranges (pH) of 6.5 to 9.0 are considered harmless. A change of one point on this scale represents a ten-fold increase in acidity or alkalinity. Many pollutants can alter the pH, raising or lowering it excessively. In some cases even small changes in pH can harm aquatic biota. The pH changes can alter the chemical form of certain constituents, thereby increasing their bioavailability and toxicity. For example, a decrease in pH can result in an increase in dissolved metal concentrations. Ammonia, which is a major component of sewage discharges, can be completely safe at pH 7.0 and extremely toxic to fish at pH 8.5 for the same total ammonia concentration.

Water Quality Objectives for pH:

Changes in normal ambient pH levels shall not exceed 0.2 units in waters with designated marine (MAR), or estuarine (EST), or saline (SAL) beneficial uses. Changes in normal ambient pH levels shall not exceed 0.5 units in fresh waters with designated cold freshwater habitat (COLD) or warm freshwater habitat (WARM) beneficial uses.

In bays and estuaries the pH shall not be depressed below 7.0 nor raised above 9.0.

In inland surface waters the pH shall not be depressed below 6.5 nor raised above 8.5.

INORGANIC CHEMICALS - PRIMARY STANDARDS

Water Quality Objective for Domestic or Municipal supply:

Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of inorganic chemicals in excess of the maximum contaminant levels set forth in California Code of Regulations, Title 22, Table 64431-A of section 64431 (Inorganic Chemicals) which is incorporated by reference into this plan. This incorporation by reference is prospective including future changes to the incorporated provisions as the changes take effect. (See Table 3-4).

Table 3-4. Maximum Contaminant Levels for Inorganic Chemicals specified in Table 64431-A of section 64431 of Title 22 of the California Code of Regulations as amended June 12, 2003.

Chemical	Maximum Contaminant Level, mg/l
Aluminum	1.
Antimony	0.006
Arsenic	0.05
Asbestos	7 MFL*
Barium	1.
Beryllium	0.004
Cadmium	0.005
Chromium	0.05
Cyanide	0.15
Fluoride	2.0
Mercury	0.002
Nickel	0.1
Nitrate (as NO_3)	45.
Nitrate + Nitrite (sum as nitrogen)	10.
Nitrite (as nitrogen)	1.
Selenium	0.05
Thallium	0.002

MFL = million fibers per liter, MCL for fibers exceeding 10 um in length.

IRON

Iron may be present in water due to natural origin, corrosion of metallic iron and its alloys by water in the presence of oxygen, and industrial waste discharges containing iron. Iron is undesirable in domestic water supplies because it causes unpleasant tastes, deposits on food during cooking, stains and discolors laundry and plumbing fixtures. The secondary drinking water standard for iron is 0.3 mg/l.

Water Quality Objectives for Iron:

Inland surface waters shall not contain iron in concentrations in excess of the numerical objectives described in Table 3-2.

Ground waters shall not contain iron in concentrations in excess of the numerical objectives described in Table 3-3.

MANGANESE

Manganese is undesirable in domestic water supplies because it causes unpleasant tastes, deposits on food during cooking, stains and discolors laundry and plumbing fixtures, and fosters the growth of some microorganisms in reservoirs, filters, and distribution systems. The secondary drinking water standard for manganese is 0.05 mg/l.

Water Quality Objectives for Manganese:

Inland surface waters shall not contain manganese in concentrations in excess of the numerical objectives described in Table 3-2.

Ground waters shall not contain manganese in concentrations in excess of the numerical objectives described in Table 3-3.

METHYLENE BLUE - ACTIVATED SUBSTANCES

The methylene blue-activated substances (MBAS) test measures the presence of anionic surfactant (commercial detergent) in water. Positive test results can be used to indicate the presence of domestic wastewater. The secondary drinking water standard for MBAS is 0.5 mg/l.

Water Quality Objectives for MBAS:

Inland surface waters shall not contain MBAS in concentrations in excess of the numerical objectives described in Table 3-2.

Ground waters shall not contain MBAS in concentrations in excess of the numerical objectives described in Table 3-3.

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.

Water Quality Objectives for Nitrate:

Inland surface waters shall not contain nitrate (as NO_3) in concentrations in excess of the numerical objectives described in Table 3-2.

Ground waters shall not contain nitrate (as NO_3) in concentrations in excess of the numerical objectives described in Table 3-3.

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 offensive odors and visual impacts. Oil and grease can coat birds and aquatic organisms, adversely affecting respiration and/or thermoregulation.

Water Quality Objective for Oils, Grease, Waxes or other Materials:

Waters shall not contain oils, greases, waxes, or other materials in concentrations which result in a visible film or coating on the surface of the water or on objects in the water, or which cause nuisance or which otherwise adversely affect beneficial uses.

ORGANIC CHEMICALS - PRIMARY STANDARDS

Water Quality Objectives:

Water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels specified in California Code of Regulations, Title 22, Table 64444-A of section 64444 (Organic Chemicals) which is incorporated by reference into this plan. This incorporation by reference is prospective including future changes to the incorporated provisions as the changes take effect. (See Table 3-5).

Table 3-5. Maximum Contaminant Levels for Organic Chemicals specified in Table 64444-A of section 64444 of Title 22 of the California Code of Regulations as amended June 12, 2003.

Chemical	Maximum Contaminant Level, mg/l
(a) Volatile Organic Chemicals (VOCs)	
Benzene	0.001
Carbon Tetrachloride	0.0005
1,2-Dichlorobenzene	0.6
1,4-Dichlorobenzene	0.005
1,1-Dichloroethane	0.005
1,2-Dichloroethane	0.0005
1,1-Dichloroethylne	0.006
cis-1,2-Dichloroethylene	0.006
trans-1,2-Dichloroethylene	0.01
Dichloromethane	0.005
1,2-Dichloropropane	0.005
1,3-Dichloropropene	0.0005
Ethylbenzene	0.3
Methyl-*tert*-butyl ether	0.013
Monochlorobenzene	0.07
Styrene	0.1
1,1,2,2-Tetrachloroethane	0.001
Tetrachloroethylene	0.005
Toluene	0.15
1,2,4-Trichlorobenzene	0.005
1,1,1-Trichloroethane	0.200
1,1,2-Trichloroethane	0.005
Trichloroethylene	0.005
Trichlorofluoromethane	0.15
1,1,2-Trichloro-1,2,2-Trifluoroethane	1.2
Vinyl Chloride	0.0005
Xylenes	1.750*
(b) Non-Volatile Synthetic Organic Chemicals (SOCs)	
Alachlor	0.002
Atrazine	0.001
Bentazon	0.018
Benzo(a)pyrene	0.0002
Carbofuran	0.018
Chlordane	0.0001
2,4-D	0.07
Dalapon	0.2
Dibromochloropropane	0.0002
Di(2-ethylhexyl)adipate	0.4
Di(2-ethylhexyl)phthalate	0.004
Dinoseb	0.007
Diquat	0.02
Endothall	0.1
Endrin	0.002
Ethylene Dibromide	0.00005
Glyphosate	0.7
Heptachlor	0.00001
Heptachlor Epoxide	0.00001
Hexachlorobenezene	0.001
Hexachlorocyclopentadiene	0.05
Lindane	0.0002
Methoxychlor	0.03
Molinate	0.02
Oxamyl	0.05
Pentachlorophenol	0.001
Picloram	0.5
Polychlorinated Biphenyls	0.0005
Simazine	0.004
Thiobencarb	0.07
Toxaphene	0.003
2,3,7,8-TCDD (Dioxin)	3×10^{-8}
2,3,5-TP (Silvex)	0.05

* MCL is for either a single isomer or the sum of the isomers.

PERCENT SODIUM AND ADJUSTED SODIUM ADSORPTION RATIO

Excess concentrations of sodium in irrigation water reduce soil permeability to water and air. The deterioration of sodium in irrigation water is cumulative and is accelerated by poor drainage.

Table 3-1 shows concentration guidelines for sodium, boron, chloride and other chemical constituents present in irrigation waters.

The specific water quality objective for sodium in the Basin Plan is expressed as percent sodium. Percent sodium is calculated as follows:

$$\%\,Na = \frac{Na}{Na + Ca + Mg + K} \; x \;\; 100\ \%$$

where sodium (Na), Calcium (Ca), Magnesium (Mg), and Potassium (K) are expressed in milliequivalent per liter (me/l).

The percent sodium objective was developed for the protection of agricultural uses from the potential hazard due to sodium in irrigation waters. The value of 60% sodium is based upon *Water Quality Criteria*, by McKee and Wolf, 1963.

McKee and Wolf note that because of all the variables involved, the classification of waters for irrigation use must be somewhat arbitrary and

the limits set cannot be too rigid. The three general classifications of irrigation waters are:

CLASS	%SODIUM	DESCRIPTION
I	<30 - 60%	Excellent to good, or suitable for most plants under most conditions.
II	30 - 75%	Good to injurious, harmful to some plants under conditions of soil, climate and practices.
III	70 - 75%	Injurious to unsatisfactory, unsuitable under most conditions.

Since the publication of the percent sodium criteria, technical research has resulted in the development of more applicable criteria for addressing the potential sodium hazard in irrigation water.

The sodium adsorption ratio (SAR) and adjusted sodium adsorption ratios ($Adj.\ SAR$) are measures of the potential hazard in soils due to sodium. SAR and $Adj.\ SAR$ are similar to percent sodium in that their calculated values provide an indication of a soil's potential for permeability and potential aeration problems. However, by taking into consideration the soil's sodicity and the exchange phases between Ca, Na and Mg, the SAR and $Adj.\ SAR$ predict potential sodium build up in soils. The $Adj.\ SAR$ calculation further takes into account the effects of carbonate and bicarbonate ion concentrations of a soil. $Adj.\ SAR$ is the most common method for determining sodium hazard in irrigation water at the present time.

The calculation for SAR is as follows:

$$SAR = \frac{Na}{\sqrt{\frac{(Ca + Mg)}{2}}}$$

where Na, Ca and Mg are in me/l.
The calculation for $Adj.\ SAR$ is as follows:

$$Adj.\ SAR = \frac{Na}{\sqrt{\frac{(Ca_x + Mg)}{2}}}$$

where Na and Mg are in me/l.

Ca_x is a modified Ca value, calculated using the Suarez table (Table 3-3, contained in *Irrigation with Reclaimed Municipal Wastewater, A Guidance Manual*, California State Water Resources Control Board, Report Number 84-1, July 1984). Ca_x takes into account salinity (EC_w), the HCO_3/CO_3 ratio (me/l) and the estimated partial pressure of CO_2 in the top few millimeters of the soil ($P_{CO_2} = 0.0007$ atmospheres).

Water Quality Objectives for Sodium:

Inland surface waters shall not contain percent sodium in excess of the numerical objectives described in Table 3-2.

Ground waters shall not contain percent sodium in excess of the numerical objectives described in Table 3-3.

In some cases, adjusted sodium adsorption ratio may be a better indicator of the potential sodium hazard in irrigation water than percent sodium. The Regional Board Executive Officer may authorize the use of adjusted sodium absorption ratio instead of percent sodium to indicate the potential sodium hazard. In such cases, the adjusted sodium adsorption ratio shall not exceed the slight to moderate range of values referenced in Table 3-1 "Guidelines for Interpretation of Water Quality for Irrigation".

PESTICIDES

Pesticides can enter surface and ground waters directly through industrial process discharges, agricultural discharge, spillage and illegal dumping. Pesticides can also enter surface and ground waters indirectly by drifting away from areas where pesticides are being sprayed, through surface runoff from treated fields, and by leaching or return flows from irrigation. Pesticides can concentrate in plant or animal tissues and many are considered to be carcinogenic to humans. Although many pesticides are designed to deteriorate rapidly when exposed to sunlight and air, they may persist for months or years in water.

California Code of Regulations, Title 22, Table 64444-A of section 64444 (Organic Chemicals) establishes maximum contaminant levels for pesticides in drinking water. (See water quality objective for Organic Chemicals).

Water Quality Objectives for Pesticides:

No individual pesticide or combination of pesticides shall be present in the water column, sediments or biota at concentration(s) that adversely affect beneficial uses. Pesticides shall not be present at levels which will bioaccumulate in aquatic organisms to levels which are harmful to human health, wildlife or aquatic organisms.

Water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of pesticides in excess of the maximum contaminant levels specified in California Code of Regulations, Title 22, Table 64444-A of section 64444 (Organic Chemicals) which is incorporated by reference into this plan. This incorporation by reference is prospective including future changes to the incorporated provisions as the changes take effect. (See Table 3-5).

The Shelter Island Yacht Basin portion of San Diego Bay is designated as an impaired water body for dissolved copper pursuant to Clean Water Act section 303(d). A Total Maximum Daily Load (TMDL) has been adopted to address this impairment. See Chapters 2, Table 2-3, Beneficial Uses of Coastal Waters, San Diego Bay, footnote 3 and Chapter 7, Total Maximum Daily Loads.

PHENOLIC COMPOUNDS

Phenolic compounds are in widespread use as industrial and agricultural chemical intermediates for the preparation of other chemicals. These organic compounds are byproducts of petroleum refining, tanning, and textile, dye, and resin manufacturing. Low concentrations cause taste and odor problems in water, higher concentrations can kill aquatic life and humans. Phenol is occasionally referred to as "*carbolic acid*".

Water Quality Objectives for Phenolic Compounds:

Water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of phenolics in excess of 1.0 ug/l.

Should there be any conflict between this limit and those described under the Organic Chemicals objective the more stringent standards shall apply at all times.

RADIOACTIVITY

Water Quality Objective for Radioactivity:

Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life nor that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal or aquatic life.

Water Quality Objective for Radionuclides:

Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of radionuclides in excess of the levels specified in section 64441 of Title 22 of the California Code of Regulations (Natural Radioactivity) which is incorporated by reference into this plan. This incorporation by reference is prospective including future changes to the incorporated provisions as the changes take effect.

SECONDARY DRINKING WATER STANDARDS

Water Quality Objective for Domestic or Municipal Supply Water:

Water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels specified in Table 64449-A of section 64449 of Title 22 of the California Code of Regulations (Secondary Maximum Contaminant Levels, Consumer Acceptance Limits) which is incorporated by reference into this plan. This incorporation by reference is prospective including future changes to the incorporated provisions as the changes take effect. (See Table 3-6).

Table 3-6. Secondary Maximum Contaminant Levels for Consumer Acceptance Limits specified in Table 64449-A of section 64449 of Title 22 of the California Code of Regulations as amended January 7, 1999.

Constituent	Maximum Contaminant Levels
Aluminum	0.2 mg/l
Color	15 units
Copper	1.0 mg/l
Corrosivity	Noncorrosive
Foaming Agents (MBAS)	0.5 mg/l
Iron	0.3 mg/l
Manganese	0.05 mg/l
Methyl-*tert*-butyl ether (MTBE)	0.005 mg/l
Odor Threshold	3 units
Silver	0.1 mg/l
Thiobencarb	0.001 mg/l
Turbidity	5 units
Zinc	5.0 mg/l

SEDIMENT

Suspended sediment in surface waters can cause harm to aquatic organisms by abrasion of surface membranes, interference with respiration, and sensory perception in aquatic fauna. Suspended sediment can reduce photosynthesis in and survival of aquatic flora by limiting the transmittance of light.

Water Quality Objective for Sediment:

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

SUSPENDED AND SETTLEABLE SOLIDS

Suspended and settleable solids are deleterious to benthic organisms and may cause the formation of anaerobic conditions. They 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.

Water Quality Objective for Suspended and Settleable Solids:

Waters shall not contain suspended and settleable solids in concentrations of solids that cause nuisance or adversely affect beneficial uses.

SULFATE

The most important sources of sulfate in native waters of the San Diego Region are the gypsiferous deposits and sulfide minerals associated with crystalline rocks. Excessive sulfate concentrations in drinking water can cause laxative effects to new users of the water supply. The recommended secondary drinking water standard for sulfate is 250 mg/l with a upper limit of 500 mg/l.

Water Quality Objectives for Sulfate:

Inland surface waters shall not contain sulfate in concentrations in excess of the numerical objectives described in Table 3-2.

Ground waters shall not contain sulfate in concentrations in excess of the numerical objectives described in Table 3-3.

TASTES AND ODORS

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

Water Quality Objectives for Taste and Odor:

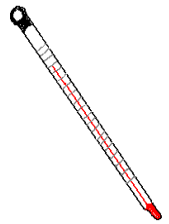
Waters shall not contain taste or odor producing substances at concentrations which cause a nuisance or adversely affect beneficial uses.

The natural taste and odor of fish, shellfish or other Regional water resources used for human consumption shall not be impaired in inland surface waters and bays and estuaries.

Inland surface waters shall not contain odors in concentrations in excess of the numerical objectives described in Table 3-2.

Ground waters shall not contain odors in concentrations in excess of the numerical objectives described in Table 3-3.

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 water discharges from power plants.

Water Quality Objectives for Temperature:

The natural receiving water temperature of intrastate 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.

At no time or place shall the temperature of any COLD water be increased more than 5°F above the natural receiving water temperature.

TOTAL DISSOLVED SOLIDS

Dissolved solids in natural waters may consist of carbonates, bicarbonates, chlorides, sulfates, phosphates, nitrates, magnesium, sodium, iron, manganese and other substances. The recommended secondary drinking water standard for total dissolved solids is 500 mg/l with a upper limit of 1000 mg/l due to taste considerations. High total dissolved solids concentrations in irrigation waters can be deleterious to plants directly, or indirectly through adverse effects on soil permeability. A classification of irrigation waters with respect to total dissolved solids concentration is described in Table 3-1.

Water Quality Objectives for Total Dissolved Solids:

Inland surface waters shall not contain total dissolved solids in concentrations in excess of the numerical objectives described in Table 3-2.

Ground waters shall not contain total dissolved solids in concentrations in excess of the numerical objectives described in Table 3-3.

TOXICITY

Toxicity is the adverse response of organisms to chemicals or physical agents.

Water Quality Objectives for Toxicity:

All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, bioassays of appropriate duration, or other appropriate methods as specified by the Regional Board.

The survival of aquatic life in surface waters subjected to a waste discharge or other controllable water quality factors, shall not be less than that for the same water body in areas unaffected by the waste discharge or, when necessary, for other control water that is consistent with requirements specified in USEPA, State Water Resources Control Board or other protocol authorized by the Regional Board. As a minimum, compliance with this objective as stated in the previous sentence shall be evaluated with a 96-hour acute bioassay.

In addition, effluent limits based upon acute bioassays of effluents will be prescribed where appropriate, additional numerical receiving water objectives for specific toxicants will be established as sufficient data become available, and source control of toxic substances will be encouraged.

The Shelter Island Yacht Basin portion of San Diego Bay is designated as an impaired water body for dissolved copper pursuant to Clean Water Act section 303(d). A Total Maximum Daily Load (TMDL) has been adopted to address this impairment. See Chapters 2, Table 2-3, Beneficial Uses of Coastal Waters, San Diego Bay, footnote 3 and Chapter 7, Total Maximum Daily Loads.

Chollas Creek is designated as a water quality limited segment for dissolved copper, lead, and zinc pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapters 2, Table 2-2, Beneficial Uses of Inland Surface Waters, Footnote 3 and Chapter 7, Total Maximum Daily Loads.

TOXIC POLLUTANTS

The USEPA promulgated a final rule prescribing water quality criteria for toxic pollutants in inland surface waters, enclosed bays, and estuaries in California on May 18, 2000 (The California Toxics Rule or "CTR;" [40 CFR 131.38]). CTR criteria constitute applicable water quality criteria in California. In addition to the CTR, certain criteria for toxic pollutants in the National Toxics Rule [40 CFR 131.36] constitute applicable water quality criteria in California as well.

The Shelter Island Yacht Basin portion of San Diego Bay is designated as an impaired water body for dissolved copper pursuant to Clean Water Act section 303(d). A Total Maximum Daily Load (TMDL) has been adopted to address this impairment. See Chapters 2, Table 2-3, Beneficial Uses of Coastal Waters, San Diego Bay, footnote 3 and Chapter 7, Total Maximum Daily Loads.

Chollas Creek is designated as a water quality limited segment for dissolved copper, lead, and zinc pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapters 2, Table 2-2, *Beneficial Uses of Inland Surface Waters, Footnote 3* and Chapter 7, Total Maximum Daily Loads.

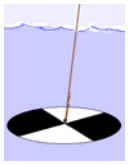
TRIHALOMETHANES

Chlorine is the dominant chemical agent used to disinfect treated water and wastewater. Trihalomethanes are formed when chlorine reacts with aquatic organic material found in water and wastewater. Trihalomethanes are a group of light weight chlorinated hydrocarbons which are suspected carcinogens. The USEPA has established a maximum contaminant level for total trihalomethanes of 0.1 mg/l in *Title 40, Code of Federal Regulations, Part 141.12, (40 CFR 141.12), EPA National Primary Drinking Water Regulations (§141.12 revised at 57 FR 31838, July 17, 1992).* Total trihalomethanes are the sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform) and trichloromethane (chloroform). The federal regulations on trihalomethanes are incorporated by reference into CCR, Title 22, Chapter 15, Articles 4.5, sections 64439.

Water Quality Objective for Trihalomethanes:

Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of trihalomethanes in excess of the criteria set forth in California Code of Regulations, Title 22, section 64439 which is incorporated by reference into this plan. This incorporation by reference is prospective including future changes to section 64439 as the changes take effect.

TURBIDITY



The turbidity of water is attributable to suspended and colloidal matter, the effect of which is to disturb clearness and diminish the penetration of light. High turbidity levels can adversely affect the use of water for drinking. By interfering with the penetration of light, turbidity can adversely affect photosynthesis which aquatic organisms depend upon for survival. High concentrations of particulate matter that produce turbidity can be directly lethal to aquatic life.

Water Quality Objectives for Turbidity:

Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses.

Inland surface waters shall not contain turbidity in excess of the numerical objectives described in Table 3-2.

Ground waters shall not contain turbidity in excess of the numerical objectives described in Table 3-3.

The transparency of waters in lagoons and estuaries shall not be less than 50% of the depth at locations where measurement is made by means of a standard Secchi disk, except where lesser transparency is caused by rainfall runoff from undisturbed natural areas and dredging projects conducted in conformance with waste discharge requirements of the Regional Board. With these two exceptions, increases in turbidity attributable to controllable water quality factors shall not exceed the following limits:

Natural Turbidity	***Maximum Increase***
0-50 NTU	*20% over natural turbidity level*
50-100 NTU	*10 NTU*
Greater than 100 NTU	*10% over natural turbidity level*

In addition, within San Diego Bay, the transparency of bay waters, insofar as it may be influenced by any controllable factor, either directly or through induced conditions, shall not be less than 8 feet in more than 20 percent of the readings in any zone, as measured by a standard Secchi disk. Wherever the water is less than 10 feet deep, the Secchi disk reading shall not be less than 80 percent of the depth in more than 20 percent of the readings in any zone.

WATER QUALITY OBJECTIVES OF INLAND SURFACE WATERS

Specific numerical water quality objectives for inland surface waters are presented by hydrologic area and subarea and watershed in Table 3-2.

The water quality objectives for inland surface water designations described in this table correspond with the beneficial use designations previously described in Chapter 2. Water Quality Objective variations occur in some of the hydrologic areas, subareas and stream reaches. Water quality variations from the objectives may also occur within a given hydrologic area subarea or stream reach. Such local variations will be evaluated when waste discharge requirements, NPDES permits, Cleanup and Abatement Orders, and Cease and Desist Orders are being developed for a given discharger.

The omission of mineral objectives for some areas corresponds to the lack of beneficial uses (AGR, MUN, IND) requiring such objectives.

WATER QUALITY OBJECTIVES OF GROUND WATERS

Specific numerical water quality objectives for ground waters are presented by hydrologic area and subarea in Table 3-3.

A footnote for some ground water basins is listed to show that some water quality objectives are considered tentative until detailed salt balance studies are conducted.

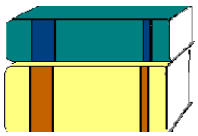
In 1978 the Regional Board, in Resolution No. 78-6, deleted water quality objectives and beneficial uses for certain portions of basins 1.10, 1.20, 1.30, 1.40, 1.50, 2.10, 3.10, 4.10, 4.20, 4.30, 4.40, 4.50, 4.60, 5.10, 6.10, 7.10, and 11.10. Table footnotes are included to identify these basins. The Regional Board elected to delete beneficial uses in portions of these basins, where the uses of ground water were marginal or nonexistent, to promote wastewater reclamation by sewage treatment plants. The deletion of beneficial uses in these areas was based upon a determination that the loss of ground water supplies was outweighed by the long-term increase in wastewater reclamation made possible by allowing reclaimed water discharges which are high in total dissolved solids. It is the Regional Board's intent to protect the water quality in these basins under the terms of State Board Resolution No. 68-16.

For purposes of intrusion barrier formation or ground water recharge, the water quality objective qualifications footnoted in Table 3-3 allow, with approval of the Regional Board, discharge of reclaimed water in areas of equal or poorer ground water quality. Relatively poor quality water could also be used for intrusion barrier formation along the coast.

WATER QUALITY CRITERIA

The literature contains many different water quality criteria designed to protect specific beneficial uses of water. A summary of the specific numerical water quality criteria considered by the Regional Board for designation as water quality objectives is described in Appendix C. The water quality criteria described in Appendix C are not enforceable water quality objectives. The purpose of presenting the information summarized in these tables is to allow interested persons to compare available water quality criteria to the specific water quality objectives designated by the Regional Board described earlier in this Chapter.

REFERENCES



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REPRINT OF RESOLUTION NO. 68-16

STATE WATER RESOURCES CONTROL BOARD
RESOLUTION NO. 68-16

STATEMENT OF POLICY WITH RESPECT TO
MAINTAINING HIGH QUALITY OF WATERS IN CALIFORNIA

WHEREAS the California Legislature has declared that it is the policy of the State that the granting of permits and licenses for unappropriated water and the disposal of wastes into the waters of the State shall be so regulated as to achieve highest water quality consistent with maximum benefit to the people of the State and shall be controlled so as to promote the peace, health, safety and welfare of the people of the State; and

WHEREAS water quality control policies have been and are being adopted for waters of the State; and

WHEREAS the quality of some waters of the State is higher than that established by the adopted policies and it is the intent and purpose of this Board that such higher quality shall be maintained to the maximum extent possible consistent with the declaration of the Legislature;

NOW, THEREFORE, BE IT RESOLVED:

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

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

3. In implementing this policy, the Secretary of the Interior will be kept advised and will be provided with such information as he will need to discharge his responsibilities under the Federal Water Pollution Control Act.

BE IT FURTHER RESOLVED that a copy of this resolution be forwarded to the Secretary of the Interior as part of California's water quality control policy submission.

CERTIFICATION

The undersigned, Executive Officer of the State Water Resources Control Board, does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on October 24, 1968.

Dated: October 28, 1968
Original signed by
Kerry W. Mulligan, Executive Officer
State Water Resources Control Board

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