Guidance Document:

Evaluating Compliance with

California's Antidegradation Policy

for Reclaimed Water Projects

in the Santa Ana River Watershed

(draft: September, 2002)

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1.0 INTRODUCTION

1.1 Purpose of Guidance

As the population of Southern California continues to grow, the demand for increased supply of freshwater will also escalate. Because water resources are relatively scarce in a semi-arid region such as southern California, large-scale projects to reclaim water will be built to help meet the rising demand.

The Santa Ana River already serves as one of the largest natural reclamation projects in the nation. Groundwater is used and reused as it moves downstream from the San Bernardino Mountains to the Pacific Ocean. Water from the river replenishes groundwater reserves which are the primary drinking water supply for nearly 5 million people. Assuring a continuing supply of freshwater is essential to maintain a high quality-of-life in San Bernardino, Riverside and Orange counties.

The people of California, through their elected representatives, have declared a primary interest in encouraging more water reclamation throughout the state. The people of the state also set forth their expectation that water quality will continue to be protected to the fullest practical extent.

Together with other regulatory agencies, it is the California Regional Water Quality Control Board's ("Regional Board") responsibility to review and permit water reclamation projects. This Reclamation Guidance Document ("Guidance" or "Document") was developed to describe the permitting process. It sets forth the specific legal, scientific and economic demonstrations that must be made before a reclamation permit may be approved by the Regional Board. The goal of this Document is to facilitate the planning and implementation of reclamation projects in the Santa Ana River watershed.

Increased reclamation often involves inherent tradeoffs between the quality, quantity and cost of water. This Guidance describes the Regional Board's legal discretion to balance these competing interests and how such discretion will most likely be exercised.

The Guidance was developed to provide greater specificity on what the Regional Board regards as probable water quality impacts related to reclamation projects. In particular, the Guidance defines what constitutes full protection of beneficial uses. It also illustrates under what conditions a reclamation project is likely to provide maximum benefit to the people of California and, therefore, may be approved despite lowering water quality.

Regardless of specific circumstances, the Regional Board's foremost objective is to protect the beneficial uses of water throughout the Santa Ana watershed. The Regional Board is also committed to encouraging reuse and reclamation when these activities can be accomplished in conformance with the provisions of the California Water Code ("CWC") and requirements of the State Water Resources Control Board ("State Board").

1.2 Development of Guidance

The Reclamation Guidance Document was developed as part of a watershed-wide planning project ("Project") to review and update the Regional Board's basin plan. Scoping for the Project was initiated in 1994 and development efforts began in 1996.

Water suppliers and wastewater agencies from throughout the watershed were encouraged to participate on the project Task Force. Most of the major water and wastewater agencies operating in the region were represented on the Task Force. Representatives from the Santa Ana Regional Board's staff were also active participants on the Task Force. The entire Project was administered and coordinated by the Santa Ana Watershed Project Authority (SAWPA). Copies of all minutes and reports for the Task Force are maintained in SAWPA's library and at the Regional Board's office.

Although federal and state regulation govern approval and implementation of water reclamation projects, many of the specific regulatory requirements are only vaguely defined. And, there is very little official guidance to lead applicants through the permitting process. Seeking to standardize the criteria for reviewing the scientific and legal status of each proposed reclamation project, the Task Force developed objective scientific methods to:

- Identify aquifer boundaries
- Estimate ambient groundwater quality
- Calculate available assimilative capacity
- Validate existing groundwater objectives in the Basin Plan

The Task Force also developed formal decision criteria to evaluate some of the more subjective review factors for reclamation projects, including:

- When are beneficial uses "fully protected?"
- When is water quality degraded ("lowered") by a project?
- Under what specific circumstances should basin plan objectives be changed?
- Who has the burden-of-proof to demonstrate compliance?
- When do anti-degradation policies apply?

From the outset, the Task Force was committed to achieving widespread agreement on the most critical issues. Only after obtaining consensus among all participants were final recommendations presented to the Regional Board for approval.

Furthermore, the Task Force limited its final recommendations to methods and procedures which comply with current laws and regulations. Alternatives that were inconsistent with previous administrative and judicial precedents were dismissed. Regulatory options that required amendments to the CWC were also outside the Task Force's chartered scope.

1.3 Limitations on Guidance

This Guidance reviews and describes the specific federal and state requirements governing protection of beneficial uses and preservation of high quality waters. In addition, it focuses on the specific evidentiary demonstrations which must be made before a reclamation project permit may be approved by the Regional Board.

This Guidance focuses primarily on managing total dissolved solids (TDS) and nitrogen waste discharges in the watershed. While every effort was made to provide generic insight to beneficial use protection and antidegradation, one should not assume that each recommendation is appropriate for every water quality parameter of concern. Nevertheless, the principles of regulatory review related to evaluating beneficial use protection and anti-degradation do not vary dramatically based on individual chemical constituents. Therefore, this guidance may provide a useful starting point for pollutants other than nitrates and TDS.

The recommendations set forth in this Document suggest a reasonable approach to making the necessary evidentiary demonstrations. This text is neither proscriptive nor binding; it is for interpreting regulation, not a surrogate for regulation. Each proposed reclamation permit will continue to be evaluated on its individual merits. This Guidance provides structure for that evaluation.

In every instance, this guidance is intended only to explain relevant state and federal requirements. No portion of the text should be construed as superseding statute or regulation. Guidance should always be interpreted in a manner consistent with the law.

Although this Document was initially drafted by the Task Force, the Santa Ana Regional Board actively oversaw the development effort and regularly reviewed the work-in-progress. Although the Guidance cannot anticipate or end all disagreements over reclamation regulations, it can make the entire permitting process more predictable and fair.

By adopting the Guidance, the Regional Board signifies its endorsement of the recommendations provided herein. The general methods described in this Guidance constitute the Regional Board's preferred criteria for reviewing and approving water reclamation permits.

From time to time, this Document may be updated to conform with new state and federal requirements or to include additional clarification on Regional Board policies.

2.0 REGULATORY REQUIREMENTS

2.1 Protect Beneficial Uses of Water

The primary purpose of water quality regulation is to protect resources for future use. To that end, the federal Clean Water Act requires states to develop water quality standards consisting of a detailed hydrologic description of the waterbodies, the beneficial uses which apply to each water body, and the water quality criteria (objectives) to protect those uses.

> *"Each state must specify appropriate water uses to be achieved and protected. The classification of the waters of the state must take into consideration the use and value of water for public water supplies, protection and propagation offish, shellfish and wildlife, recreation in and on the water, agricultural, industrial and other purposes including navigation."* 40 CFR 131.10(a):

In addition, according to 40 CFR 131.11(a):

> *"States must adopt water quality criteria that protect the designated use.*

There are several specific regulatory obligations that should be highlighted:

1) States must designate existing and potential beneficial uses for all surface waterbodies whether or not the uses are actually being attained.

2) Where beneficial uses already exist, they must be formally recognized and designated.

3) Water quality criteria must be established which protect the designated uses. And, the water quality criteria must protect the most sensitive of those uses.

4) The water quality criteria must be based on EPA guidance [3 04(a)] or other scientifically defensible methods.

When setting standards, the state must also ensure that downstream uses are also protected.

> *"In designating uses of a water body and the appropriate criteria for those uses, the state shall take into consideration the water quality standards of downstream waters and shall ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters." 40 CFR 131.10(b)*

Only the eastern-most segments of the Santa Ana River (Reaches *5* & 6) are classified for municipal water supply (MUN). However, in California, surface waters are often tributary to groundwater. Therefore, affected groundwaters must also be considered when evaluating "downstream" impacts of a reclamation project. This relationship has been codified in a special beneficial use classification "Groundwater Recharge (GWR)". The GWR designation refers to:

> *"...waters used for natural or artificial recharge of groundwater for purposes that may include, but are not limited to, future extraction, maintaining water quality or halting saltwater intrusion into freshwater aquifers." (SAR Basin Plan, 1995, p. 3-2)*

All of the groundwater basins in the Santa Ana watershed are used to provide municipal water supplies and are designated "MUN" by the Regional Board. Although several stream segments in the Santa Ana watershed are exempt from the MUN designation, in accordance with California's "Sources of Drinking Water Policy," these same segments must meet most of the primary and secondary drinking water standards because they are tributary to municipal drinking water supplies and are designated GWR. Therefore, the upstream surface waters, which provide recharge for local groundwaters, must be managed so as to fully protect the subsurface drinking water supply.

The distinction between MUN waters and GWR waters provides some flexibility for developing water quality objectives. Where water quality is transformed, in some respect, between the time it is discharged at the surface and the time it seeps into the aquifers, those changes should be accounted for when assessing whether downstream uses are protected. This is true regardless of whether the transformation improves or degrades water quality after it is discharged.

2.2 Avoid Water Quality Degradation

In 1968, the State Board adopted a policy to preclude water quality degradation in the state unless specific conditions are satisfied. Resolution No. 68-16, entitled "Statement of Policy with Respect to Maintaining High Quality of Waters in California," states:

> *"Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies became effective, such existing high quality will be maintained until it has been demonstrated to the state that any change will be consistent with the 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."*

In 1977, the State Board clarified the meaning of the phrase "prescribed in the policies" found in Resolution No. 68-16:

"The nondegradation policy of the State Board (Resolution No. 68-16) applies to surface and groundwaters that are currently better quality than the quality established in 'adopted policies.' In terms of water quality objectives, the basin plans are the source of adopted policies."

In 1986, the State Board interpreted 68-16 to incorporate federal anti-degradation policy in cases where the federal policy is applicable (see
WQ 86-17):

"Existing in stream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.. .In allowing such degradation or lower water quality, the state shall assure water quality adequate to protect existing uses fully." (40 CFR 131.12)

Some reclamation projects have the potential to lower water quality in local surface waters and, therefore, in local groundwater basins. In particular, it is possible that increased recharge of reclaimed wastewater will increase the concentration of total inorganic nitrogen (TIN) and total dissolved solids (TDS) in surface and subsurface waterbodies. Nevertheless, the State Board has consistently concluded that the non-degradation policy:

"...does not absolutely require that existing high water quality be maintained; rather, any change must be both consistent with maximum public benefit and not unreasonably affect beneficial uses...Resolution 68-16 is not a 'zero-discharge' standard but rather a policy statement that existing quality be maintained when it is reasonable to do so." (WQ 86-8)

Before water reclamation projects can be approved by the Regional Board, the project proponents must demonstrate that:

1) No significant water quality degradation would occur, or...

2) That beneficial uses would remain fully protected, despite limited water quality degradation, and that lower water quality provides maximum benefit to the people of California. (WQ 68-16)

Although not directly applicable to groundwater, the federal anti-degradation policy uses similar language to describe when it is permissible to allow lower water quality:

"Where the quality of the waters exceed levels necessary to support propagation offish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the state finds.., that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located." (40 CFR 131.12[2])

In general, EPA's antidegradation guidance emphasizes the need to protect uses at the point of discharge and downstream of that location. It also reiterates the necessity of implementing best available technology ("BAT") prior to allowing any reduction in water quality. The evidence necessary to demonstrate "important economic or social development in the area" can be especially difficult to develop. EPA often requires substantial macro- and micro-economic analysis (see, for example, Economic Guidance for Water Quality Standards Handbook, 1997).

2.3 Encourage Water Reclamation

The California state legislature has declared that:

> *"...the people of the state have a primary interest in the development of facilities to reclaim water containing waste to supplement existing surface and underground water supplies and to assist in meeting the future water requirements of the state... it is the intention of the legislature that the state undertake all possible steps to encourage development of water reclamation facilities..."*
> *(CWC, Sec. 13510 & 13512)*

The California Water Code further specifies that:

> *"...adequately treated reclaimed water should, where feasible, be made available to supplement existing surface and underground supplies and to assist in meeting future water requirements of the coastal zone." (CWC, Sec. 13142.5)*

In 1977, the State Board reaffirmed their commitment to encourage the use of reclaimed water in Resolution No. 77-1. The State Board's Chief Counsel described that commitment as follows:

> *"The Legislature has mandated that the Board both protect water quality (CWC, Sec. 13001) and encourage reclamation and reuse (CWC, Sec. 13510-13512). Although the State Board has previously given substantial guidance to Regional Boards with respect to water quality maintenance, guidance with regard to a proper approach to reclamation has been limited. The Policy and Action Plan for Water Reclamation in California (WQ 77-1) represents an effort to provide the necessary guidance as to how reclamation and reuse can be accomplished where appropriate within the framework of the responsibilities of the State and Regional Boards to protect the beneficial uses of the State 's waters. (Memorandum dated 12/29/76, pg. 7).*

Resolution 77-1 is a general statement of State Board policy. As such, it carries the same force and effect as Resolution 68-16. Regional Board's must consider both policies when they set or revise water quality objectives. Among the most critical implications of Resolution 77-1 is that basin plan objectives adopted prior to 1977 may need to be updated to comply with the Policy and Action Plan for Water Reclamation in California.

> *"Since only recently has the State Board developed a specific Policy and Action Plan for Water in California (now proposed) to implement the statutory mandate of Water Code Sections 13500, et seq., during the basin planning process completed in 1975, the Regional Boards may not have considered the relative costs and benefits, economic, environmental and social, which might be associated with the use of reclaimed water in their basins. To the extent that these issues did not formerly receive consideration, it may be appropriate for the Regional Boards to re-examine the beneficial uses and water quality objectives identified in their basin plans on a case-by-case basis as reclamation projects are proposed. Further, the reclamation policy should be taken into account during the updating of the basin plans." (SWRCB General Counsel Memorandum ("Memorandum ") dated 1 2/29/76 @ pg. 8)*

2.4 Set Water Quality Objectives

Under state and federal law, the Regional Board is required to adopt water quality objectives to protect the designated uses.

> •*…the State requires implementation of water resources management programs which will conform to the following general principles: (1)... water quality control decisions must assure protection of available fresh water... resources for maximum beneficial use." (insert citation)*

The CWC defines how the Regional Board must establish water quality objectives:

> *"...activities and factors which may affect the quality of the waters of the state shall be regulated to attain the highest water quality which is reasonable, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible." (CWC, Sec. 13000)*

In practice, the Regional Board seeks first to assure that designated beneficial uses are fully protected. If ambient quality is better than necessary to protect the designated uses, then groundwater objectives are likely to be set to preserve the existing high quality of state waters. This is consistent with CWC:

"It is recognized that it may be possible for the quality of water to be changed to some degree without unreasonably affecting beneficial uses. Factors to be considered by a regional board in establishing water quality objectives shall include, but not necessarily be limited to, all of the following: (a) Past, present, and probable future beneficial uses of water. (b) Environmental characteristics of the hydrographic unit under consideration, including quality of water available thereto. (c) Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area. (d) Economic considerations. (e) The need for developing housing within the region. (f) *The need to develop and use recycled water." (CWC,, Sec. 13241).*

It is important to note that factors (e) and (f) were added to the list after groundwater objectives were already adopted by the Regional Board. Groundwater objectives were first incorporated into the 1975 Santa Ana River Basin Plan. Where groundwater objectives were adopted prior to 1977, the State Board recommends:

"In light of this new reclamation policy (Resolution No. 77-1), the Regional Boards may want to re-examine the beneficial use and water quality objective portions of the basin plans for certain waters within their regions in terms of relative costs and benefits from economic, environmental, and social perspectives." (Policy and Action Plan for Water Reclamation in California, January, 1977, pg. 19)

On at least two occasions, the State Board has recommended that Regional Boards update their basin plans to allow increased reclamation (Orders No. WQ 76-24 and WQ 77-13). The State Board has also affirmed the primacy of Regional Board discretion in making such determinations:

". ..the Regional Boards with their detailed knowledge of regional and basin hydrology are best able to make an initial determination of what effluent limitations will assure implementation of the basin plans and reasonably protect beneficial uses." (Memorandum dated 12/29/76 @pg. 8).

2.5 Obtain Water Reclamation Permit

State Board resolution No. 68-16 requires the Regional Board to issue waste discharge permits (WDRs) and/or water reclamation permits:

"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 California will be maintained."

By law, WDRs must implement the requirements set forth in the Basin Plan. The CWC states:

> *"The requirements shall implement relevant water quality control plans, if any have been adopted, and shall take into consideration the beneficial uses to be protected, the water quality objectives reasonably required for that purpose, other waste discharges, the need to prevent nuisance, and the provisions of Section 13241."*

When competing interests must be balanced, the Regional Board does so at the time water quality objectives are adopted. Thereafter, the Regional Boards lack authority to issue discharge permits that fail to comply with the Basin Plan. The State Board affirmed this restriction in the Rancho Caballero decision (Order No. 73-4):

> *"In adopting waste discharge requirements to implement the objectives contained in the [basin] plan, the Regional Board need not determine anew the beneficial uses to be protected, the water quality objectives reasonably required for that purpose or make findings regarding the provisions of Section 13241. The Regional Board in adopting the plan has already taken these factors into consideration. The waste discharge requirements need only implement the provisions of the plan*

If the Regional Board desires to issue discharge permits that are less restrictive than the basin plan, then that basin plan must be amended first. The Executive Officer of the State Board provided the following guidance:

> *"Recently questions have arisen as to the ability of Regional Boards to fully participate in the encouragement of reclamation projects which could result in some degradation of groundwater quality in light of the State Board's Rancho Caballero order (Order No. WQ 73-4) and its non-degradation policy (Resolution No. 68-16)... there is nothing in the Rancho Caballero order or the non-degradation policy which prohibits a Regional Board from modifying the water quality objectives or beneficial uses set forth in its basin plan for a particular groundwater basin under appropriate circumstances. Rancho Caballero, in a nutshell, holds that waste discharge requirements must be consistent with the applicable basin plan. It does not prohibit modification of a basin plan under appropriate circumstances in order to permit reclamation where a Regional Board goes through the evaluation and hearing process specified in Water Code Sections 132241 and 13244 and finds such changes to be reasonable." (Internal Memorandum from Larry F. Walker, Executive Director of State Water Resources Control Board to Regional Board Executive Officers, dated March 30, 1978).*

2.6 Consistent with Federal Guidance

The federal antidegradation policy is sometimes interpreted as applicable only to surface waters designated with certain beneficial use classifications (e.g. human recreational exposure and aquatic life habitat). EPA recently proposed new "clarifications" asserting that the federal anti-degradation policy applies to all beneficial use classifications, including municipal drinking water and groundwater recharge GWR (see ANPRM, 1998). While the issue remains undecided, California's antidegradation policy is not limited to surface waters or only a few beneficial use categories. It applies to all waters of the state including groundwater. And, it applies to all designated beneficial uses including groundwater recharge or municipal drinking water supply.

Although federal jurisdiction, under the Clean Water Act, does not apply directly to groundwaters, the EPA does have the power to review state regulations and enforcement. Because California has classified some surface waters for groundwater recharge (GWR), the federal government has the authority to ensure that California regulators are properly implementing state water quality standards. Their authority is defined in 40 CFR *131.5:*

> *"Under Section 303(c) of the Clean Water Act, EPA is to review and to approve or disapprove state-adopted water quality standards. The review involves a determination of(a) Whether the state has adopted water uses which are consistent with the requirements of the Clean Water Act; (b) Whether the state has adopted criteria that protect the designated water uses; (c) Whether the State has followed its legal procedures for revising or adopting standards..."*

If the state implements groundwater protection by imposing a wasteload allocation on surface water discharges, then the regulatory action is functionally equivalent to establishing a Total Maximum Daily Load (TMDL). EPA may review any TMDL adopted to protect surface water beneficial uses including GWR. Therefore, the Task Force and Regional Board have made every effort to ensure that the general approach used to develop a Waste Load Allocation for groundwaters is also consistent with federal guidance for implementing TMDLs.

3.0 DEMONSTRATING BENEFICIAL USE PROTECTION

3.1 Compliance With Basin Plan Objectives

The most direct way to demonstrate that beneficial uses are protected is to comply with water quality objectives in the basin plan. Because, by law, basin plan objectives must be set at a level that assures protection of designated beneficial uses. Therefore, when a discharge complies with the basin plan objective, beneficial uses are presumed to be fully protected.

In general, the MUN use is protected when groundwater quality meets basin plan objectives. Beneficial uses are impaired when water quality declines to the point where additional l treatment is required to reduce TDS or nitrate concentrations in the groundwater before it can be served to the public.

Nitrates pose a serious health threat to human infants. Most scientific and regulatory authorities, including EPA and the California Department of Health Services ("DHS"), recommend that nitrate concentrations be limited to a maximum of 45 mg/L (as NO_3) or 10 mg/L (as N). These levels were set to protect the most sensitive members of the at-risk population and include appropriate safety factors (see Appendix A).

Where nitrate concentrations exceed EPA's recommended standard (10 mg/L nitrate-nitrogen), water quality is presumed to be impaired and the MUN use is not attained. Where nitrate concentrations are less than 5 mg/L, the Regional Board presumes that the MUN use is fully protected unless there is substantial evidence to the contrary. In the range between 5 mg/L and 10 mg/L, the beneficial use is unimpaired but further reductions in water quality may adversely impact those uses and are strongly discouraged.

The Regional Board established formal nitrate criteria in the basin plan based on the EPA/DHS recommendations. Specific water quality objectives are assigned to each groundwater basin based on those criteria or on historical ambient groundwater quality, whichever was better.

Total dissolved solids (TDS) do not pose the same risks to human health as nitrates (see Appendix B). However, the MUN use may still be compromised as salt concentrations increase. EPA secondary drinking water standards recommend that TDS concentrations should not exceed 500 mg/L.

The State Board requires that all waters with TDS concentrations less than 3000 mg/L be designated MUN. However, DHS recommends that TDS concentrations in drinking water supplies be limited to 500 mg/L wherever possible. Therefore, in the Santa Ana region, the MUN beneficial use is presumed to be fully protected when TDS concentrations in groundwater are less than 500 mg/L TDS. Beneficial uses may also be fully protected at concentrations higher than 500 mg/L, however, it is not automatically assumed that they are.

There are some areas of the watershed where local groundwaters have historically high TDS concentrations. Given the lack of economically attainable alternatives, these groundwaters are sometimes used to meet limited public demand. In such cases, the water quality objectives are set to protect the highest level of water quality actually attained. Further degradation of these marginal source waters is disallowed. If, and when, the groundwater quality improves, the water quality objectives will be revised to protect the higher water quality.

All reclamation projects must comply with the basin plan. If the proposed discharge quality is less than or equal to the basin plan objective, compliance is presumed. The project may not discharge pollutant concentrations higher than objectives unless there is sufficient assimilative capacity to ensure that ambient groundwater quality will continue to meet basin plan objectives even after the project goes on-line (see Section 4).

3.2 Point-of-Compliance

Compliance with water quality objectives is assessed at the point where the designated use occurs. Therefore, compliance with groundwater objectives is evaluated in the aquifers themselves.

In some cases, surrogate sampling locations are used to facilitate compliance monitoring. Surface water measurements are frequently used in lieu of more expensive and difficult groundwater sampling. For example, surface water sampling below Prado Dam has often been used as a surrogate to assess recharge quality occurring in Orange County. If water quality complies with the wasteload allocation at Prado Dam it is also presumed to fully protect the groundwater objectives in Orange County. The Regional Board will, of course, consider any credible scientific evidence that rebuts this presumption.

Generally, the project sponsor must demonstrate use protection by analyzing the direct effects of reclamation on local groundwaters. However, if the Regional Board has established surrogate points-of-compliance, the project sponsor may elect to demonstrate use protection, indirectly, at the defined surrogate location using approved translator procedures. Where conclusions may differ depending on the choice of sampling location, direct analyses of groundwater impacts shall be preferred to indirect analyses based on surrogate surface-level water quality data.

When a project sponsor demonstrates that the quality of reclaimed water complies with basin plan objectives at the point of discharge, then it is presumed that the recharge also complies with downstream objectives provided that the objectives were set based on historical ambient concentrations. If the project sponsor seeks to revise basin plan objectives, then the presumption of downstream use protection is waived. The sponsor must then make an affirmative demonstration that beneficial uses will be protected at the point of recharge and at all downstream locations affected by the discharge.

3.3 Burden-of-Proof

In the interest of promoting increased reclamation, while continuing to protect beneficial uses, it is reasonable to indicate who has the burden-of-proof when such projects are proposed for permitting. It is also useful to define how that burden-of-proof is met during the review process. If there are no objective criteria for knowing when a use is attained and protected, the uncertain cost of making such a demonstration may discourage reclamation projects whose benefits outweigh the limited degradation in water quality that may occur.

The burden-of-proof is always on the project sponsor to demonstrate that the reclaimed water quality protects beneficial uses. The burden-of-proof has been met if the reclaimed water quality complies with applicable basin plan objectives.

After a sponsor demonstrates that a project's water quality will meet applicable water quality objectives, the burden-of-proof shifts to those who claim that beneficial uses will be impaired despite compliance with the basin plan. However, project opponents need not prove that an entire groundwater basin will violate basin plan objectives in order to demonstrate use impairment. It is sufficient to show that a proposed project will degrade water quality produced at specific wells to the point where uses are no longer protected.

When examining the effects of a reclamation project on specific wells, the Regional Board will assign the burden-of-proof based on an analysis of the probable pumped water quality after a reclamation project is fully implemented and recharge flows are affecting downgradient wells. Specifically:

1) If resulting pumped water quality from a well is less than 5 mg/L nitrate-nitrogen or less than 500 mg/L total dissolved solids, beneficial uses will be presumed "fully protected." The burden-of-proof shall be on opponents of the reclamation project to demonstrate otherwise.

2) If resulting pumped water quality from a well is between 5 mg/L and 10 mg/L nitrate-nitrogen or between 500 mg/L and 1000 mg/L TDS, the burden-of-proof remains on the project proponent to demonstrate that beneficial uses will be fully protected at that well.

3) If resulting pumped water quality from a well is likely to be more than 10 mg/L nitrate-nitrogen or more than 1000 mg/L TDS beneficial uses are not adequately protected. The project will not be permitted without appropriate mitigation to assure compliance with water quality objectives in the basin plan.

In all cases, the estimate of water quality pumped from a well is calculated after accounting for the ultimate impact of the proposed reclamation project on local groundwater quality. Regardless of local effects on groundwater quality, the proposed project must comply with the basin plan objectives assigned to the entire aquifer to which reclaimed water is recharged. Compliance may also depend on whether assimilative capacity is available (see section 4.3).

3.4 CEQA Issues

Water quality is protected by the California Water Code (adopted as the Porter-Cologne Water Quality Control Act) and by the California Environmental Quality Act (CEQA). The CWC governs water quality at a relatively large-scale. Regulatory compliance is generally assessed for entire stream segments or groundwater basins. CEQA governs water quality on a more project specific basis. Environmental impacts are generally assessed from a more focused perspective. Therefore, it is not unusual for a reclamation project to comply with all provisions of the California Water Code while, at the same time, causing adverse local impacts.

Where localized impacts may cause beneficial uses to be impaired, discharge permits must specify appropriate limits to prevent the degradation. However, where a reclamation project degrades local groundwaters but does not unreasonably affect beneficial uses for specific wells, the impacted parties should seek appropriate redress through the CEQA process.

It is not automatically assumed that all water quality degradation is functionally-equivalent to beneficial use impairment. It is possible to lower water quality without unreasonably affecting beneficial uses. It is a matter of degree.

The decision as to whether a proposed reclamation project causes sufficient degradation to necessitate regulatory intervention, in the form of permit limits or mandatory mitigation, depends on the level of effect expected. The Regional Board will examine the historical water quality, the current water quality, and the resulting water quality in relation to the thresholds described in Section 3.3 (above), to assess each situation.

When resulting pumped water quality, after a reclamation project is implemented, is likely to remain less than or equal to 5 mg/L nitrate-nitrogen and 500 mg/L TDS, beneficial uses are presumed fully protected even if local groundwater quality is degraded by the project. This assumes that the project complies with all applicable basin plan objectives. The affected well owner may still be entitled to seek mitigation or receive compensation for lower water quality under CEQA.

On the other hand, if resulting pumped quality is likely to be greater than 5 mg/L nitrate-nitrogen or 500 mg/L total dissolved solids, then beneficial uses may be unreasonably affected. The Regional Board is more likely to mandate mitigation as part of the waste discharge requirements. As before, nothing in that requirement prevents affected well-owners from seeking additional relief, under CEQA, for any unmitigated damages caused if the Regional Board approves a discharge permit for the reclamation project.

The Regional Board has authority to protect “waters of the State.” Water quality objectives were developed to assure that source waters are adequately protected. Agencies that rely on blending high quality supplies with lower quality supplies to meet water demand, should not expect that the Regional Board will preserve that blending ratio.

Just as the Regional Board cannot tell wastewater agencies which treatment strategies to adopt in order to comply with water quality criteria, the Board is not obligated to defend the specific operating strategies of a water supply agency. The Regional Board's regulatory program strives to ensure that water quality objectives are met before it is pumped and when it is recharged. The Board is not responsible for meeting basin plan objectives after the water leaves their jurisdiction and is no longer considered "waters of the State."

Nevertheless, CEQA does provide the extra measure of protection that most water agencies seek. If a reclamation project degrades groundwater quality at downgradient wells, the affected water agency may be entitled to mitigation under CEQA regardless of whether the Regional Board declares beneficial uses are protected for the greater groundwater basin. Nothing in this guidance document should be construed so as to limit the normal application of CEQA rights and responsibilities.

4.0 DEMONSTRATING NON-DEGRADATION

4.1 Activities That Trigger An Anti-Degradation Review

In general, an anti-degradation review is required for any activity that may result in lower water quality (higher pollutant concentrations). In 1994, the State Board affirmed the importance of Resolution No. 68-16 and clarified the application of California's antidegradation policy:

> "Resolution No. 68-16 applies to the maintenance of 'high quality waters' and applies to discharges of waste to existing high quality waters. The Resolution applies to all state waters, including groundwater.. .The Resolution applies to regulated discharges, including NPDES permits and waste discharge requirements. The Resolution applies to unpermitted discharges, including cleanup of spills." (Memorandum from Craig M. Wilson - Asst. Chief Counsel to William R. Attwater - Chief Counsel to the SWRCB, dated May 9, 1994 @ pg. 2)

Historically, anti-degradation reviews were most commonly conducted when issuing, reissuing, amending, or revising an NPDES permit. However, other activities that discharge waste to, or increase the concentration of waste in, waters of the state are subject to review under Resolution No. 68-16.

> "...an antidegradation analysis is needed to support all regulatory actions, that in the Regional Board's judgment, will result in a significant increase in pollutant loadings. The Regional Boards must consider antidegradation effects and conduct an antidegradation analysis when the proposed activity results in: 1) A substantial increase in mass emissions of a pollutant, even if there is no other indication that the receiving waters are polluted; or 2) Mortality or significant growth or reproductive impairment of resident species. In particular, an antidegradation finding should be made and, if necessary, an analysis should be conducted when performing the following permit activities: 1) Issuance of a permit for any new discharge, including Section 401 certifications; or 2) Material and substantial alterations to the permitted facility, such as relocation of an existing discharge; or 3) Reissuance or modification of permits which would allow a significant increase in the concentration or mass emission or any pollutant in the discharge." (SWRCB, Administrative Procedures Update, APU #90-004, July 2, 1990 @ pg. 3).

In the Santa Ana Region, salts and nitrates are both regulated wastes. The plain language of Resolution No. 68-16 states that any activity that increases the mass or concentration of these, or other pollutants, in surface or groundwaters requires a waste discharge permit. The application of waste discharge requirements (WDR's) is not limited solely to disposal of municipal or industrial effluent.

Other activities, including groundwater recharge projects, that cause the mass or concentration of pollutants to increase are also subject to WDR's and antidegradation reviews regardless of the source of recharge water (potable or reclaimed). Even activities that produce no discharge, but otherwise change lower groundwater quality, may be required to make a formal anti-degradation demonstration. Examples of such activities include: increased or decreased groundwater pumping, increased or decreased recharge of potable water, increased or decreased storm water recharge, and various stream diversions.

> "The State and Regional Boards must deal with waste discharges uniformly throughout the State regardless of whether a pollutant is in the discharge because it was there in the source water or because it was put there by a user along the line. Decisions must be made regardless of whether the best way to solve the problem is to treat the source or the waste. Waste discharge requirements must always do one thing: they must implement the applicable Water Quality Control Plan and at all times assure that the discharge does not cause the receiving waters to violate the objectives of that Plan. *(Presentation of Ronald B. Robie, Vice-Chairman of SWRCB to Riverside County Water Assn. Dated April 13, 1973 entitled: 'The Rancho Caballero Case')*

There is only one condition under which an antidegradation finding is not necessary:

> "A Regional' Board may decide that an antidegradation finding is not required because the proposed discharge is prohibited under either the State or federal policies. For example, if the proposed discharge would violate water quality objectives in the receiving water, no discharge will be allowed and therefore no antidegradation analysis is required." (SWRCB, Administrative Procedures Update, #90-004, July 2, 1990 @ p. 2).

4.2 Preliminary Antidegradation Analysis: Is Degradation Significant?

The preliminary determination as to whether a project will lower water quality is made by comparing average quality of the project's discharge with the current average quality in the receiving waters. Antidegradation is always reviewed on a pollutant-by-pollutant basis and ambient water quality is computed based on long-term, volume-weighted averages.

While an antidegradation review is required for any activity that may lower water quality, the level of detail required during the subsequent antidegradation analysis varies on a case-by-case basis. The simplest case occurs when the proposed recharge water quality complies with applicable basin plan objectives and the concentration of pollutants discharged is less than the current long-term average in the receiving waters:

> *". . .if the Regional Board has no reason to believe that existing water quality will be reduced due to the proposed action, no antidegradation analysis is required." (SWRCB, Administrative Procedures Update, #90-004, July 2, 1990 @ p. 2)*

When the concentration of pollutants discharged is higher than the average pollutant concentration found in the receiving waters, the project is assumed to degrade water quality over time. However, even when a project is likely to reduce groundwater quality, a comprehensive antidegradation analysis may not be required:

> *"Based on information available to the Regional Board and any other background material the Regional Board believes is necessary, a complete antidegradation analysis will not be required if: "1) A Regional Board determines that the reduction in water quality will be spatially localized or limited with respect to the water body; e.g. confined to the mixing zone; or 2) A Regional Board determines the reduction in water quality is temporally limited and will not result in any long-term deleterious effects on water quality; e.g., will cease after a storm event is over; or 3) A Regional Board determines the proposed action will produce minor effects which will not result in a significant reduction of water quality; e.g. a POTW has a minor increase in the volume of discharge subject to secondary treatment. . ." (SWRCB, Administrative Procedures Update, #90-004, July 2, 1990 @ p. 2)*

Where the Regional Board conducts an abbreviated antidegradation analysis, they must still make the necessary findings before issuing a permit to the proposed project. Specifically, the Board must declare that lower water quality is "not significant." Such a declaration must be based on substantive evidence that demonstrates beneficial uses are not unreasonably affected and that the degradation is temporary or confined to a limited area (see State Board Order No. WQ 77-13 @ p. 7).

The Regional Board will review the combined impact of all proposed and approved reclamation projects to assure that the cumulative effects are also "insignificant." Permit limits will be established to ensure that the long-term effects remain insignificant throughout the life of the proposed project.

If the pollutant concentration in a proposed discharge is greater than the current baseline quality, then the reclamation project is presumed to reduce water quality. Where a project is likely to lower receiving water quality, and the effects are not deemed "insignificant," a more comprehensive antidegradation analysis must be performed.

4.3 Comprehensive Antidegradation Analysis: Evaluating Assimilative Capacity

The initial antidegradation review is made by comparing the quality of a project's proposed discharge with the current baseline quality in the receiving waters. The comprehensive analysis evaluates the net impact of project recharges on groundwater quality over time.

". . .the quality of wastewater as discharged at the initial point of discharge may be different quality than the quality of the discharge as it eventually reaches the groundwater due to a number of factors, including mixing with waters already in or subsequently recharged to the system and removal of waste constituents as the water percolates through the ground." (SWRCB, Order No. 73-4, a.k.a. Rancho Caballero decision; February 23, 1973 @ p. 7)

"The Regional Board may, in its discretion, apply a maximum limitation on the TDS of a discharge which exceeds the TDS numerical groundwater objective given in the basin plan, if it has been demonstrated that the water is diluted after discharge such that it does not exceed the numerical water quality objective when it actually reaches the groundwater. (Memorandum from William R. Attwater, Chief Counsel for SWRCB, to Bill B. Dendy, Exec. Officer of Reg. Water Quality Control Board - Santa Ana Region, dated December 29, 1976 @ p. 6).

When receiving waters are able to absorb increased pollutant loads without exceeding the applicable basin plan objective, then "assimilative capacity" is said to exist. Where assimilative capacity is available, it may be possible to discharge higher pollutant concentrations without exceeding the basin plan objective.

The Regional Board is not obligated to allocate assimilative capacity to proposed project even when it is available:

"While today we recognize the practicality and necessity in many cases of utilizing the waste assimilative capacity of water, since 1959 the Regional Boards have not been required to utilize the entire waste assimilative capacity of any receiving waters (see Calif. Water Code Sec. 13263-b).. .seldom, if ever, does a Regional Board allow the entire waste assimilative capacity to be used by a discharger." (Presentation of Ronald B. Robie, Vice-Chairman of SWRCB to Riverside County Water Assn. entitled: 'The Rancho Caballero Case; April 13, 1973 @p. 5)

There are many reasons why the Regional Board may elect not to allocate assimilative capacity when it is available. For example, recent analysis indicates there may be some assimilative capacity for TDS in the Orange County groundwater basin. Nevertheless, it has been concluded that it would not be in the best interests of the people of California to allocate that assimilative capacity.

TDS concentrations in the Orange County groundwater basin are already in excess of 500 mg/L. The small level of local assimilative capacity will provide the residents of Orange County a buffer against degradation caused by droughts, increased storm water runoff from upstream development and the legacy contamination in the vadose zone from uncontrolled historical factors. In addition, it may be necessary to allocate some available assimilative capacity to offset nominal TDS increases that occur incidentally when other groundwater pollutants are remediated.

4.4 The Burden-of-Proof

The project proponent has the initial burden-of-proof to demonstrate that proposed recharges will not lower groundwater quality. The project sponsors may meet their burden-of-proof by showing that:

- The proposed recharge water quality complies with the basin plan and the concentration of pollutants in the discharge is less than the current long-term average ambient concentration in the receiving waters, or...

- Any actual reduction in water quality is "insignificant."

Once the project proponent makes a successful demonstration under option 1 (above), then the burden-of-proof shifts to opponents of the project to demonstrate lower water quality is likely to occur. If the project sponsor elects to make an antidegradation demonstration under option 2, then the burden-of-proof remains on the proponents throughout the permitting process.

The potential for lower water quality is assessed based on expected impacts to the entire groundwater basin receiving the recharge. Compliance with Resolution No. 68-16 is established for each basin, sub-basin or groundwater management zone formally identified in the basin plan. Local reductions in groundwater quality that do not otherwise cause objectives to be exceeded when calculated on a basin-wide basis, do not trigger a more comprehensive antidegradation analysis provided that beneficial uses remain fully protected. Such reductions continue to remain subject to review, and possible mitigation, under CEQA.

The State Board has reviewed many cases related to California's non-degradation policy. Their subsequent rulings indicate that some common claims do not provide sufficient evidence to meet project sponsor's burden-of-proof. For example:

1) The time frame in which the degradation occurs is irrelevant. Even if lower water quality does not actually occur for 30-50 years after the discharge "the degradation would be inconsistent with the Basin water quality objective." (see SWRCB Order No. 76-24 @ pg. *4-5).*

2) The TDS exemptions in the Porter-Cologne Act do not apply to waste discharge requirements. Section 13523.5 states:

   "A Regional Board may not deny issuance of water reclamation requirements to a project which violates only a salinity standard in the basin plan."

   Waste discharge requirements (WDRs) are separate and distinct from water reclamation permits. Therefore, a WDR permit must be issued when a project is expected to discharge waste regardless of whether the activity is primarily a disposal or recharge. Section 13532.5 does not provide any exception for meeting TDS requirements in a waste discharge permit (WDR).

3) Poor quality of supply water does not waive the discharger's responsibilities under Resolution No. 68-16. This was one of the questions raised and answered by the Rancho Caballero case (see SWRCB Order No. 73-4).

"There is no basis in law or reason for assuming that a discharger whose disposal is caused by his water supply rather than by waste added to his system is entitled to any special treatment or any different consideration. The statement in the Porter-Cologne Act that a discharge is a privilege, and not a right, applies to everyone. . .The most serious effect of the Regional Boards' procedure prior to Rancho Caballero was that the procedure effectively removed any incentive to upgrade water supplies.." (Presentation of Ronald B. Robie, Vice-Chairman of SWRCB to Riverside County Water Assn. entitled: 'The Rancho Caballero Case', April 13, 1973 @ p. 9)

4) Improving already degraded water quality is irrelevant. On occasion, current ambient groundwater quality may be substantially worse (higher pollutant concentration) than specified by the basin plan objectives. In addition, a reclamation project may propose to recharge water that fails to comply with groundwater objectives but is significantly better (lower concentration) than ambient background quality in the receiving waters. In such cases, project proponents frequently assert that they are "improving groundwater quality" by diluting ambient pollutant concentrations. While the assertion is technically correct, it is irrelevant to the question of permit approval (see SWRCB Order No. 73-4) because it fails to adequately address the quality impacts on downgradient groundwater basins.

The Regional Board cannot issue discharge or recharge permits that fail to implement the water quality objectives defined in the basin plan (see CWC Sec. 13263). If a project genuinely improves groundwater quality, that may provide a justification for revising water quality objectives. It does not waive the requirement to comply with the applicable basin plan provisions.

When there is no assimilative capacity available, the only options are to disapprove the project or raise the water quality objective sufficiently to allow higher discharge limits. Raising the water quality objectives, in effect, "creates" assimilative capacity and allows the project to comply with the basin plan. However, groundwater objectives cannot be raised, in order to permit lower water quality, unless doing so is proven to produce maximum benefit to the people of California and beneficial uses remain fully protected.

5) The Regional Board is not precluded from adopting water quality objectives that are more stringent than ambient groundwater quality. Nor is the Board constrained to adopt water quality objectives that are less stringent than ambient groundwater quality, provided that beneficial uses remain fully protected.

"Discharge requirements may be set at levels more stringent than objectives if they can be met using best efforts. Resolution No. 68-16 is meant to maintain high quality water, not to allow degradation down to the water quality objectives." (Memorandum from Craig M. Wilson, Asst. Chief Counsel-SWRCB to William R. Attwater, Chief Counsel-SWRCB, dated May 9, 1994 @ p. 2).

". . .depending on the hydrology of the groundwater basin, the use to which the reclaimed water is applied and its quality, it may be appropriate for the Regional Board to adopt discharge requirements containing effluent limitations either above or below water quality objectives. For instance, in the case of agricultural use, due to the fact that evapotranspiration may concentrate the TDS present in the water prior to its contact with the groundwater, it may be reasonable for a Regional Board to adopt TDS effluent limitations which are lower than the applicable water quality objectives." (Memorandum from William R. Attwater, Chief Counsel for SWRCB, to Bill B. Dendy, Exec. Officer of Reg. Water Quality Control Board - Santa Ana Region, dated December 29, 1976 @ p. 6-7).

4.5 Compliance Alternatives

When a proposed recharge project is likely to produce lower water quality in the receiving waters, the project proponent has four options to achieve compliance. In all cases, however, the sponsor must first assure that the project implements "best practicable treatment (BPT)." Lower water quality will not be authorized until all reasonable steps have been taken to minimize the potential for degradation by the discharge.

"Any discharge to high quality waters must meet requirements that result in best practicable treatment or control that, at a minimum, prevents pollution or nuisance. Best practicable treatment or control means levels that can be achieved using best efforts and reasonable control methods."(Memorandum from Craig M. Wilson, Asst. Chief Counsel-SWRCB to William R. Attwater, Chief Counsel-SWRCB, dated May 9, 1994 @ p. 2).

Option 1: Mitigation

The sponsor may elect to achieve compliance by mitigating all water quality degradation caused by the project. Where receiving water quality is better than objectives, then it may be necessary to apply additional treatment to maintain the high ambient quality regardless of fact that the discharge already meets basin plan objectives.

Compliance with regulatory requirements is most often judged by characterizing the impact of a proposed reclamation project on the entire groundwater basin receiving the recharge. Discharge quality is compared to basin plan objectives and to existing ambient quality to assess aggregate water quality impacts. However, it is possible for a reclamation project to comply with basin plan objectives and still be subject to some mitigation requirements. Such requirements are most likely to be imposed when a reclamation project interferes with the beneficial use of water from individual wells that are under direct influence from the recharge project.

Project sponsors have the option to move the reclamation project to avoid impacting downgradient well-fields. Consistent with the California Environmental Quality Act (CEQA), they may also negotiate appropriate mitigation and/or compensation to those who are adversely impacted by the planned recharge project.

Option 2: Offsets

In some cases, a discharger may elect to use offset credits obtained from another project or agency. Such credits are gained when an agency implements a remediation program that produces water quality benefits in excess of those required by the project permit. Whether a project sponsor develops offset credits themselves or purchases them from another agency, the Regional Board must formally approve the use of such credits when used to demonstrate compliance with the Basin Plan or to meet antidegradation requirements.

When evaluating proposed offsets for projects that do not meet basin plan objectives, the Regional Board will apply the following decision criteria when no assimilative capacity is available:

i) Offsets should occur in the same groundwater basin where water quality is most directly degraded by the proposed reclamation project. An exception may be made where the resulting groundwater quality will continue to fully protect beneficial uses throughout the life of the proposed project and off-site mitigation serves to restore or enhance beneficial use protection in a groundwater basin not currently meeting water quality standards.

ii) Offsets should be implemented in a manner that maintains the overall water quality balance with the receiving groundwater basin. The planned offset must ensure that the net concentration of pollutants is not increased as a result of the project.

Option 3: Assimilative Capacity

The sponsor may request that the Regional Board allocate available assimilative capacity to a project in order to achieve compliance with basin plan objectives. As always, the project proponents must demonstrate that beneficial uses will remain protected and that lowering ambient groundwater quality will provide maximum benefit to the people of California.

Option 4: Revise Basin Plan Objectives

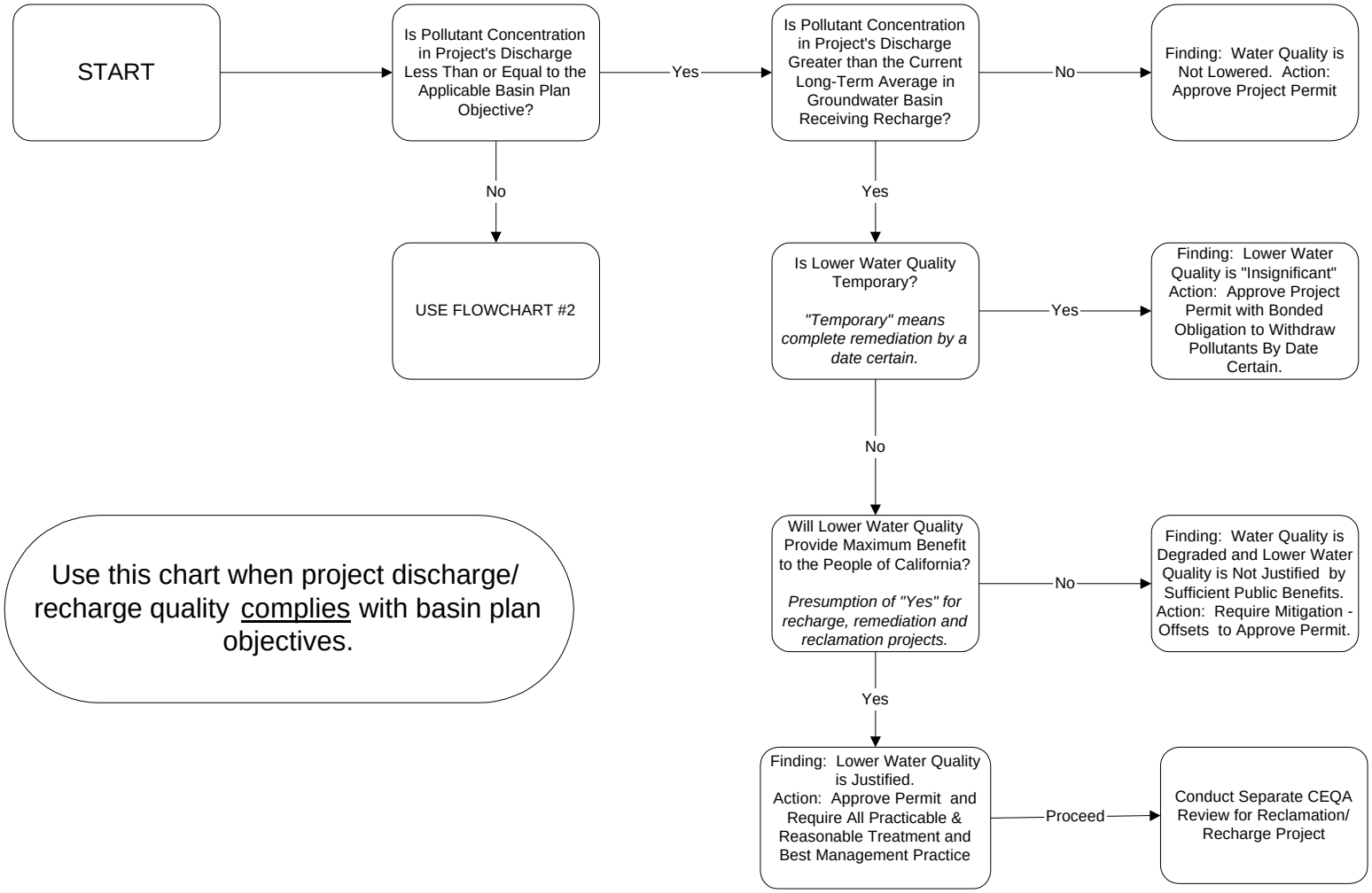
The project proponents may petition the Regional Board to increase basin plan objectives to allow lower water quality. This option is only available where existing objectives are significantly lower than the water quality thresholds deemed necessary to protect beneficial uses. And, raising the objectives may only be approved where doing so would provide maximum benefit to the people of California.

To avoid imposing mitigation requirements, the Regional Board must make specific findings that lower water quality continues to fully protect existing beneficial uses and would provide maximum benefit to the people of California. It is unlikely that a reclamation project would be found to provide maximum benefit to the people of California if those most directly affected downgradient from the recharge did not concur in that finding.

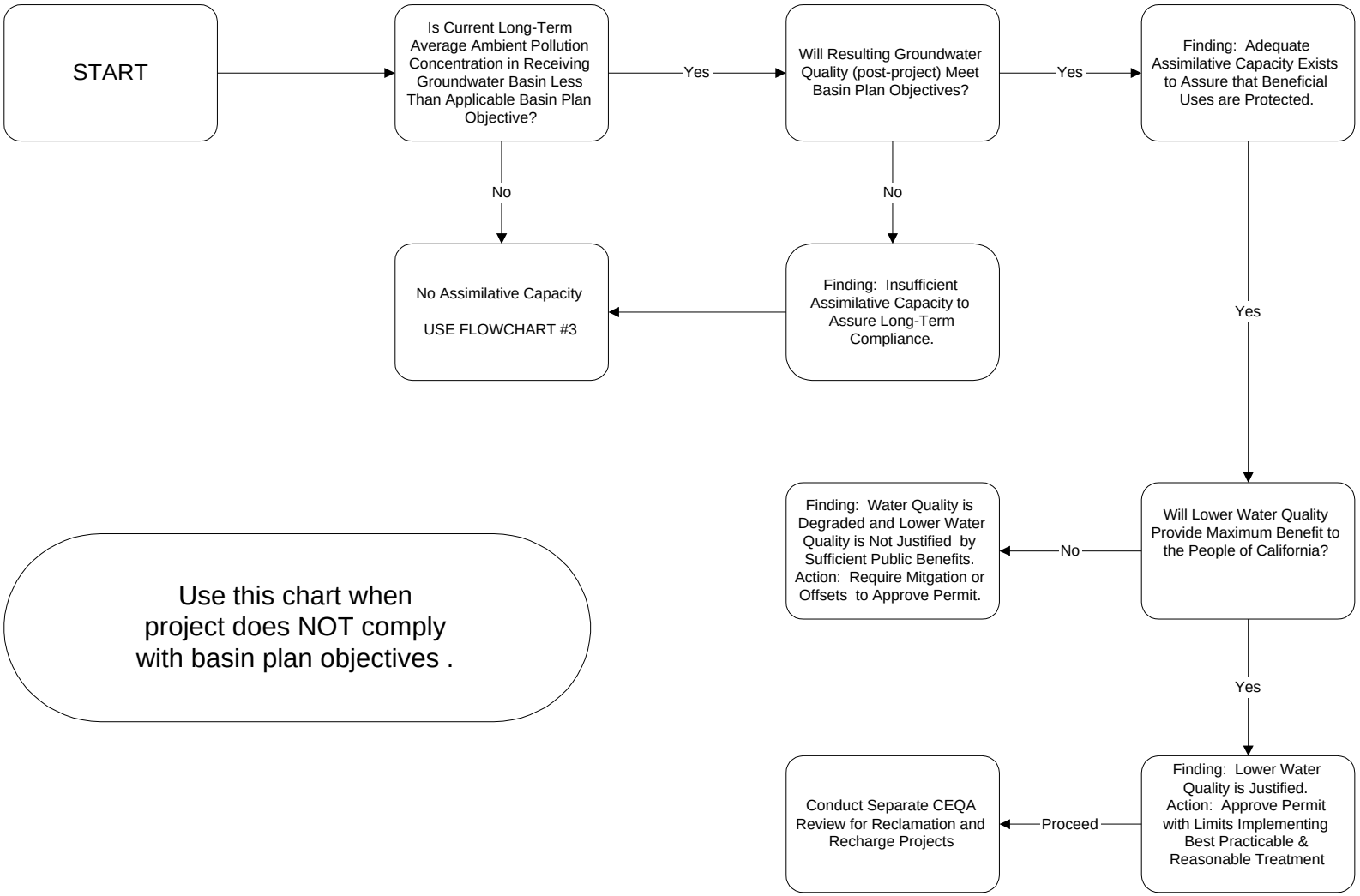
> *"...there is nothing in the Rancho Caballero order or the non-degradation policy which prohibits a Regional Board from modifying the water quality objectives or beneficial uses set forth in its basin plan for a particular groundwater basin under appropriate circumstances. Rancho Caballero holds that waste discharge requirements must be consistent with the applicable basin plan. It does not prohibit modification of a basin plan under appropriate circumstances in order to permit reclamation where a Regional Board goes through the evaluation and hearing process specified in Water Code Sections 13241 and 13244 and finds such changes to be reasonable." (Memorandum from Larry F. Walker, Executive Officer of the SWRCB to Regional Board Executive Officers entitled: Impact of Rancho Caballero Order and Nondegradation Policy on Reclamation Efforts; April 5, 1978 @ p. 1)*

The general antidegradation analysis process is described by Flowcharts 1 thru 3. A more detailed discussion of the specific evidence required to demonstrate "maximum benefit" is provided in Section *5* of this guidance document.

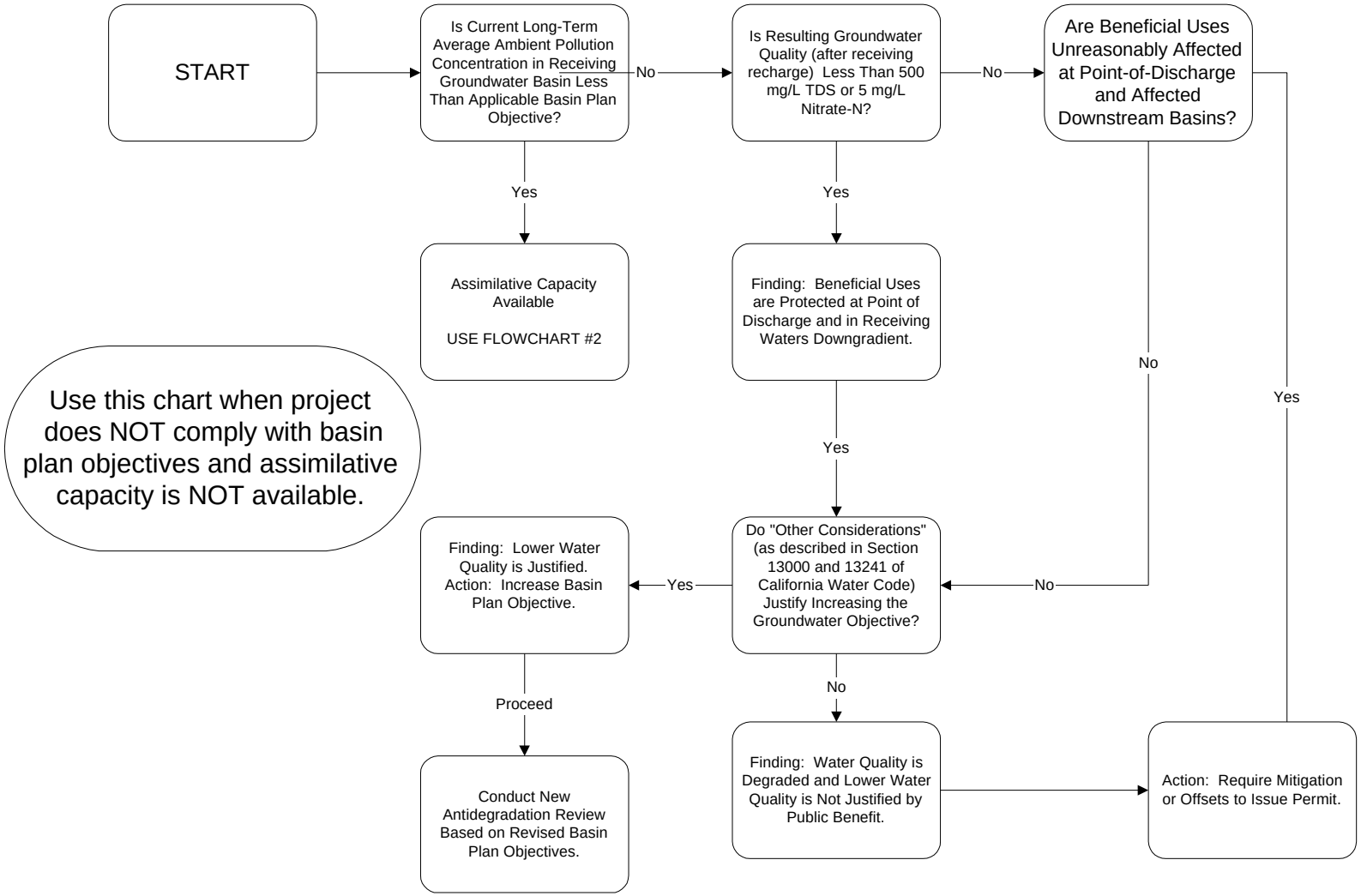
FLOWCHART #1:
Antidegradation Review for Water Recharge & Wastewater Reclamation Permitting



FLOWCHART #2:
Antidegradation Review for Water Recharge & Wastewater Reclamation Permitting



FLOWCHART #3:
Antidegradation Review for Water Recharge & Wastewater Reclamation Permitting



5.0 REVISING WATER QUALITY OBJECTIVES

Each time water is used, the quality erodes. Therefore, it is reasonable to expect reclamation projects to increase the risk of groundwater degradation. Such impacts are prohibited unless it can be demonstrated that beneficial uses will remain fully protected and the water quality degradation will provide "maximum benefit to the people of California" (WQ No. 68-16).

If maximum benefit is demonstrated, the Regional Board may permit the proposed reclamation by revising water quality objectives to accommodate the project. The maximum benefit demonstration does not waive the requirement to comply with basin plan objectives. Rather, it provides legal and scientific justification to revise the groundwater objectives when appropriate to do so.

5.1 Definition of "Maximum Benefit"

The California Water Code highlights the critical factors that the Regional Board must consider when setting or revising water quality objectives:

> *"It is recognized that it may be possible for the quality of water to be changed to some degree without unreasonably affecting beneficial uses. Factors to be considered by a Regional Board in establishing water quality objectives shall include, but not necessarily be limited to, all of the following: a) Past, present, and probable future beneficial uses of water. b) Environmental characteristics of the hydrographic unit under consideration, including quality of water available thereto, c) Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area, d) Economic considerations, e) The need for developing housing within the region f) The need to develop and use recycled water." (Section 13241).*

The aforementioned factors provide a clear indication of how "maximum benefit" claims should be evaluated. In particular, water quality objectives may not be revised in a manner that fails to protect the designated uses at the point of discharge/recharge and in downgradient aquifers.

Degradation will not be allowed where higher quality can reasonably be maintained through "coordinated control of all factors which affect water quality in the area." Thus, there is an obligation to adopt best management practices (BMP) and best available and practical control technology (BAT-BCT) prior to giving consideration to revising basin plan objectives. [see Memorandum from Office of Chief Counsel SWRCB dated May 4, 1994, p. 2].

Historically, coordinated control has imposed an obligation on local water purveyors to locate and serve the best available water supply. Voluntary reliance on relatively poor quality source waters is not considered "best available control technology." Degradation caused by discharge of such water will not be permitted without requirements to mitigate the adverse impacts of lower water quality.

The California legislature has made it clear that economic factors, including the need to develop new housing, are critical factors. This is consistent with the federal antidegradation policy that allow lower water quality provided it is "necessary to accommodate important social and economic development in the region." (40 CFR 131.12).

The state antidegradation policy was designed to minimize the adverse impacts of growth, not to preclude growth. Because continued population growth in the Santa Ana River watershed is inevitable, and water resources are finite, it is likely that increased reclamation will be necessary to meet future demand for freshwater supply.

> *"The factors compelling the initiation of an action plan . . .are (a) impending water shortages in certain areas of California, b) the higher levels of treatment now given to wastewaters, and c) the constraints and unknowns involved with the use of reclaimed water to augment freshwater supplies... The plan emphasizes reclamation and reuse of treated municipal wastewater. The coastal areas are of particular interest because of shortage of local water supplies and, without reuse, loss of treated water to the ocean." {SWRCB, Policy and Action Plan for Water Reclamation in California, 1977, p. 3].*

In general, the costs and benefits of lower water quality must be weighed against one another to assess the net impact on public interests.

> *"A discharge to high quality water, which is likely to reduce water quality, is not permitted unless the reduction in water quality is offset by maximum public benefit to the people of the State…the severity and extent of water quality reduction should be weighed when evaluating the benefits required to compensate for that degradation." [Administrative Procedures Update 90-004, p. 4-5].*

5.2 Water Reclamation Must Provide Maximum Benefit to the People of California to Justify Degrading Water Quality

In establishing their policy for water quality control, the State Water Resources Control Board (SWRCB) wrote:

> *"...the State requires implementation of water resources management programs which will conform to the following general principles: 1) . . .water quality control decisions must assure protection of available fresh water . . . resources for maximum beneficial use. . . 9) wastewater reclamation and reuse systems which assure maximum benefit from available fresh water resources shall be encouraged. Reclamation systems must be an appropriate integral part of the long-range solution to the water resources needs of an area and incorporate provisions for salinity control. . ." (1972).*

In 1977, the SWRCB adopted Resolution No. 77- 1 affirming the statewide commitment to encourage the use of reclaimed water:

> *"The California Constitution provides that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that waste or unreasonable use…be prevented…The California Legislature has declared that the people of the State have a primary interest in the development of facilities to reclaim water containing waste to supplement existing surface and underground water supplies (and)…that the State shall undertake all possible steps to encourage the development of water reclamation facilities so that reclaimed water may be made available to help meet the growing water requirements of the State..."*

By virtue of maximizing the use and reuse of water, reclamation projects are initially presumed to provide maximum benefit to the people of California. However, the presumption in favor of water reclamation is rebuttable. Proposed reclamation projects may "not adversely impact vested water rights or unreasonably impair in stream beneficial uses or place an unreasonable burden on present water supply systems." [WQ No. 77-1].

While all reclamation projects enjoy this presumption, some are singled out for special consideration:

> *"The State Board and the Regional Boards shall encourage, and consider or recommend funding, water reclamation projects which meet Condition 1,2, or 3 below... 1) Beneficial use will be made of wastewaters that would otherwise be discharged to marine or brackish receiving waters or evaporation ponds, 2) Reclaimed water will replace or supplement the use of fresh water or better water quality, 3) Reclaimed water will be used to preserve, restore or enhance in stream beneficial uses which include, but are not limited to, fish, wildlife, recreation and esthetics associated with any surface water or wetlands. [WQ No. 77-1].*

5.3 The Burden-of-Proof for Demonstrating Maximum Benefit

When evaluating whether a reclamation project provides maximum benefit to the people of the State, the initial burden of proof rests on the project sponsors. Project proponents must demonstrate that beneficial uses will remain fully protected and that existing water rights remain unaffected.

There is no special requirement to demonstrate that water reclamation, per se, is advantageous. State law and regulatory policy presumes that reclamation should be strongly encouraged because it is in the public interest to do so. . Therefore, assuming project proponents demonstrate that beneficial uses will be fully protected and that increased reclamation will occur, then the burden of proof shifts to those who claim that a specific reclamation project does not provide maximum benefit to the people of the State.

> *"A number of potential benefits and constraints are associated with the use of reclaimed water. Although these will vary for different projects and must be evaluated on a case-by-case basis, some of the potential benefits and constraints that have been identified are listed below. The list is not all inclusive. The potential benefits include: 1) augmentation of local supplies and improvement of groundwater quality in many instances; 2) postponement of the need for water development and conveyance project construction; 3) reduction of the need for further inter-basin freshwater transfers in the State; 4) reduction of energy requirements in situations where reclamation is an alternative to importation of freshwater or disposal of freshwater; 5) reduction of pollution loads; 6) reduction of land subsidence and groundwater overdrafting when used for groundwater recharge; 7) availability of nutrients to certain crops when used for irrigation water; 8) Augmentation of stream flow, development of wetlands and lakes, restoration and enhancement o fish and wildlife habitat; and 7) creation of scenic water bodies for recreational and esthetic enjoyment. The potential constraints to using reclaimed water include: 1) the possible presence of pathogenic organisms, such as bacteria and virus; and toxic constituents, such as stable organic compounds, heavy metals, etc., which raises questions that need resolution for certain uses and requires that the quality of reclaimed water be carefully matched to other beneficial uses; 2) environmental impacts, such as groundwater degradation, accumulation of toxic materials in soil, plants, animals, etc.; 3) a requirement that the reliability of conventional waste treatment facilities be maintained at a high level; 4) a requirement for the development of improved and more expensive monitoring techniques; 5) the possible economic disadvantage including energy costs when compared with the pricing structure of many other water supply sources; and 6) the lack of public and user understanding of reclamation and the potential uses of reclaimed water."*
>
> *[SWRCB, Policy and Action Plan for Water Reclamation in California, March, 1978 p. 5].*

The burden-of-proof varies based on the existing groundwater quality, the magnitude of the proposed project and the cumulative long-term change in ambient groundwater quality. All of these factors will be weighed against the probable project benefits. The burden-of-proof increases proportionately to the estimated degradation in water quality.

So important is the Policy and Action Plan for Water Reclamation in California, the State Board recommended that Regional Boards reconsider basin plan provisions that were adopted prior to the Action Plan and without special consideration for reclamation.

> *"The nondegradation policy will permit reclamation programs to be implemented where the Regional Board finds them acceptable and appropriate, subject to the review of the State Board. In light of this new reclamation policy, the Regional Boards may want to reexamine the beneficial use and water quality objective portions of the basin plans for certain waters within their Regions in terms of relative costs and benefits from economic, environmental, and social perspectives." [Action Plan, 1977, p. 19]*

Assuming that appropriate antidegradation demonstrations are made, including specific evidence to support any claim that the proposed project provides maximum benefit, then the Regional Board may amend the basin plan objectives to permit the project.

5.4 Examples of Reclamation/Recharge Projects that Meet the Maximum Benefit Test

Ideally, it would be preferable to establish an objective mathematical formula to evaluate the statewide costs and benefits of each proposed reclamation project. Unfortunately, the relevant factors are too complex and subjective to develop such a model. The Regional Board has often had to balance the conflicting interests and priorities associated with assuring adequate water supplies while protecting water quality. By examining the previous decisions, it is possible to derive general decision criteria for evaluating whether a proposed project provides "maximum benefit to the people of California."

***Example A*: Projects that maximize potable water supply provide maximum benefit.**

Historically, water imported from the Colorado River was used to recharge local groundwater basins. The average TDS concentration in the river water was frequently greater than the ambient concentrations in the aquifers receiving recharge. The practical effect was to degrade groundwater quality in the Santa Ana watershed. Nevertheless, such practices were tolerated because there was no reasonable alternative available to meet demand for potable water. When the California aqueduct was built, local water agencies shifted their import strategy.

Although State Project Water ("SPW") provides much better quality water than imports from the Colorado River, it may still degrade groundwater quality depending on where it is recharged. The average TDS concentration of SPW is approximately 250-300 mg/L. Such concentrations are higher than the water quality objectives in some of the most productive groundwater basins (i.e., Chino-North & Bunker Hill A & B).

California water law requires all activities that may increase the mass or concentration of pollutants in groundwater to be reviewed to assess their potential to adversely impact water quality . In particular, such activities are subject to the state's antidegradation policy.

To date, potable water recharge has not been subject to the same regulatory scrutiny that controls wastewater discharges. However, comprehensive programs to protect groundwater quality require active management of all controllable water quality factors including potable water recharge.

The Regional Board has previously chosen not to regulate fresh water recharge, provided that the recharge uses the best quality source water available. In the past, such activities did not undergo formal review. Concern for the cumulative impact on downgradient aquifers increases the likelihood that similar projects will receive much greater scrutiny in the future.

All activities that may degrade water quality are subject to Regional Board review and permit authority. If a project proposes to recharge raw water that does not comply with the applicable groundwater objective, and there is not assimilative capacity available, then the basin plan objective must be revised or suitable mitigation will be required, in order for the project to be approved.

In general, it is not reasonable or practical to require desalination for raw water recharges. The high treatment cost, excessive energy use, and brine disposal impacts outweigh the public value derived from meeting the basin plan objective provided that beneficial uses remain protected. Nevertheless, those who recharge fresh water (e.g. State Project Water) must implement best management practices to minimize the adverse environmental impacts caused by their activities. This may include long-term commitments to import and store more State Project Water when the quality is relatively high.

***Example B*: Projects that provide net environmental improvements provide maximum benefit.**

Some of the groundwater basins in the Santa Ana region are contaminated by pollutants that preclude beneficial use of the water. Volatile organics (TCE or PCB) and perchlorates are two such examples.

Many efforts are underway to remediate the legacy of groundwater contamination. However, some of the clean-up programs may cause water quality to be degraded in some other pollutant of concern (notably TDS).

Because, by definition, the state antidegradation policy is intended to protect beneficial uses, it would be counterproductive if that policy were interpreted so as to forestall groundwater remediation projects. Removing TCE or PCB would help restore an aquifer to full attainment status. Even if TDS concentrations are increased, the net impact on groundwater quality would be beneficial to the people of California.

The fact that the proposed cleanup project provides maximum benefit does not waive requirements to comply with the basin plan, rather, it provides a reasonable justification for revising water quality objectives to permit the project to go forward. This provides a formal mechanism by which the benefits and impacts can be weighed in a public hearing process.

Another example of projects that may provide net environmental benefit, when evaluated on a statewide basis, occurs when water reclamation is used to offset the demand for imported water. Because SPW is frequently drawn from environmentally-sensitive areas, reduced exports to southern California may help protect endangered and threatened ecosystems such as the Bay-Delta. If lower water quality, caused by degradation in southern California, does not unreasonably affect beneficial uses, the net environmental gain provides maximum benefit.

***Example C*: Projects that displace demand for potable water provide maximum benefit.**

The California Legislature has consistently affirmed their commitment to avoid "wasting" water. Using potable water for non-potable irrigation is considered a waste. Use of potable domestic water for nonpotable uses, including, but not limited to, cemeteries, golf courses, parks, highway landscaped areas, and industrial and irrigation uses, is a waste or an unreasonable use of the water... (CWC, Sec. 13550)

> *"…a person or public agency, including a state agency, city, county, district or some other political subdivision of the state, shall not use water from any source of quality suitable for potable domestic use for non-potable uses…if suitable recycled water is available . . any use of recycled water in lieu of water suitable for potable domestic use shall, to the extent of the recycled water so used, be deemed to constitute a reasonable beneficial use of that water… (CWC, Section 13550-13551)."*

Other factors that the Regional Board will examine to determine whether reclaimed water is "suitable" include:

> *"…the use of recycled water from the proposed source will not be detrimental to public health. The use of recycled water for these uses will not adversely affect downstream water rights, will not degrade water quality, and is determined not to be injurious to plant life, fish, and wildlife. . . the state board shall consider the impact of the cost and quality of the nonpotable water on each individual user. " (CWC, Section 13550[3 &4]).*

The fact that reclaimed water is deemed “suitable” to substitute for potable water does not waive the obligation to comply with the applicable water quality objectives. Where substitution is likely to degrade groundwater quality, and there is no assimilative capacity available, the basin plan objectives must be revised or the degradation must be fully mitigated.

At first glance, Section 13550 of the California Water Code appears to make it illegal to reduce water quality under any circumstances. That is not the case. The term "degrade" does not merely refer to the concentration of a given pollutant but, rather, to the concentration relative to the level necessary to protect beneficial uses. The State Board has consistently approved reductions in water quality where such changes have no significant impact on beneficial uses. While the language may appear confusing and contradictory, the history of antidegradation implementation clearly demonstrates that Regional Board's have the authority to allow lower water quality under certain circumstances.

***Example D*: Projects required to meet a compelling state interest provide maximum benefit.**

Occasionally, water quality may be degraded by large-scale public works projects such as the construction of a dam or other flood control conveyances. Such projects have undergone rigorous pubic review through the CEQA and NEPA processes. To the extent such projects are intended to protect public safety, there is a presumption that they provide maximum benefit to the people of California.

In such cases, the Regional Board will continue to require that project managers implement best reasonable and practical treatment to minimize the anticipated water quality degradation. However, the degradation may be allowed provided that beneficial uses remain fully protected. If necessary, water quality objectives will be revised to permit the public works project.

***Example E*: Projects that generate a net increase in the use of reclaimed water in the region or the state provide a maximum benefit.**

The Legislature has already established a statewide commitment to maximize the use and reuse of water. Sustained growth in the region requires increased reliance on reclaimed water. There is already considerable reclamation activities occurring in the Santa Ana watershed, particularly Orange County.

While reclamation is believed to be intrinsically advantageous, all reclamation projects are not equally beneficial. If a project proposes to justify lower water quality based on the benefits of increased reclamation, then the sponsor must demonstrate that the reclamation would not otherwise occur unless the degradation is allowed. To meet this condition, there must be a net increase, at the margin, in the total number of uses made of the water. For example, the T-levees operated by Orange County Water District capture and recharge river water that would otherwise be wasted to the ocean.

State regulations require that “maximum benefit” be assessed on a state-wide basis. If a proposed project would increase reclamation upstream, then it is essential to know whether the new reclamation adds an additional use to the water or if the proposed project merely shifts the location for reclamation that is already occurring elsewhere.

Shifting the location at which reclamation occurs is not illegal, particularly if there is no adverse impact on water quality. However, it is unlikely that the Board would allocate assimilative capacity or revise water quality objectives to allow degradation, if the proposed project merely displaces reclamation that is already occurring downstream unless there is also a net increase in the total reclamation that can occur in the watershed.

APPENDIX A: USE PROTECTION THRESHOLDS FOR NITRATE

The Santa Ana River Basin Plan establishes water quality criteria for nitrates in groundwaters designated MUN. The rationale is:

> *"High nitrate concentrations in domestic water supplies can be toxic to human life. Infants are particularly susceptible and may develop methemoglobinemia (blue baby syndrome). The primary drinking water standard for nitrate (as NO_3) is 45 mg/L or 10 mg/L (as N)." (pg. 4-13)*

The 45 & 10 standard is not new; it has been the recognized industry standard for finished drinking water for nearly 40 years. It is also consistent with EPA's recent recommendations on setting water quality criteria for nitrate.

EPA's criteria document summarizes the most significant research regarding nitrates' effect on human beings. Infants (<3 mos. old) are deemed most susceptible because the low pH in their intestinal tracts tends to support bacteria which turn nitrate into nitrite. Nitrite converts hemoglobin to methemoglobin. Methemoglobin prevents the blood from transporting oxygen properly thereby inducing a form of "chemical suffocation." Older children (>6 mos.) and adults are significantly less vulnerable than infants.

The 10 mg/L nitrate-nitrogen criteria was established based on a comprehensive review of available research that showed there was no recorded incidence of methemoglobinemia caused by public drinking water supplies where the concentration of nitrate was at or below the 20 mg/L (as N). Nitrate-nitrogen concentrations less than 10 mg/L were deemed presumptively safe and, therefore, fully protective of the drinking water beneficial use.

Many of the recorded cases of methemoglobinemia occurred where the infant was fed water from shallow agricultural wells. The wells were often heavily contaminated by nitrates and bacteria from livestock. Subsequent studies indicate that the bacterial contamination is the more significant factor and can cause methemoglobinemia independently (even when nitrate is not present).

Bacterial infection can cause diarrhea which, in turn, can result in endogenous nitrate formation. Some studies show that infants with diarrhea excreted up to ten times more nitrate then they ingested (400% more than normal). High concentrations of nitrate in contaminated drinking water increases the risk factor.

In 1995, at the request of EPA, the National Research Council undertook an independent review of the recommended water quality criteria for nitrate/nitrite. The NRC confirmed previous recommendations. The Research Council noted that the present drinking water criteria for nitrates would protect the most sensitive beneficial use: infant formula feeding. It is important to recognize that the 10 mg/L nitrate-nitrogen is a primary drinking water standard applicable to finished water at the tap. Therefore, if the same standard is applied to groundwater aquifers and tributary surface streams, then the MUN and GWR beneficial uses are fully protected as well.

Both the EPA and NRC noted that there were other potential hazards associated with high nitrate concentrations. In some cases, such as cancer risks, they stated that there was insufficient reliable evidence to draw any conclusion. In all other cases, such as livestock feeding, the adverse effects occurred at concentrations that were considerably higher than the level needed to protect human infants.

Because water quality criteria must be set at a level that will "fully protect" the most sensitive beneficial use, and because there is frequently considerable uncertainty in determining what constitutes "full protection," policymakers and regulators often apply conservative assumptions when developing the criteria. The result of this conservatism is a safety factor around the water quality objective.

When pollutant concentrations are less than the water quality objective, it is presumed that beneficial uses can be fully attained. When pollutant concentrations are greater than the applicable objective, beneficial uses are assumed to be threatened, impaired or precluded. The probability of impairment depends on the size of the safety factor and the degree to which the water quality objective is exceeded by recharge of reclaimed water.

Safety factors tend to vary by the nature of the hazard to be avoided and the degree of uncertainty surrounding the most appropriate criteria. Generally, the safety factor increases as the threat-factor increases and the amount of available data decreases.

The average infant concentration of methemoglobin is approximately 1%. Adults routinely have about 2-3% methemoglobin in their blood. The scientific literature shows no clinical symptoms of hemoglobinemia until bloodstream concentrations exceed 10%. Studies show that when very young infants (<3 mos.) are fed a steady diet of nitrate-nitrogen at 20 mg/L their blood concentration of methemoglobin rises to approximately 3-7%. This implies that the effective safety factor may be closer to 200% when measured as the probability of achieving blood concentrations which would produce clinically detectable symptoms. Therefore, it is reasonable to conclude that a water quality objective set to 10 mg/L nitrate-nitrogen will fully protect the most sensitive beneficial use without needing to apply additional safety factors.

The Regional Board has established the maximum water quality objective at 8 mg/L nitrate-nitrogen. Although EPA's recommended "safe level" is 10 mg/L, the Regional Board has applied an additional "operational" safety factor.

By managing groundwater basins to a maximum concentration of 8 mg/L nitrate-nitrogen, the Regional Board intends to assure that ambient water quality will never exceed 10 mg/L despite known variability in nitrate concentrations or analytical methods. This is important because state and federal regulations require mandatory public warnings when nitrate-nitrogen concentrations exceed 10 mg/L in public water supplies.

Where the historical long-term ambient groundwater concentration were less than 8 mg/L the nitrate-nitrogen objectives were set to protect that better water quality. The Regional Board will consider raising those objectives provided that beneficial uses remain fully protected and lower water quality provides maximum benefit to the people of California.

In general, uses are presumed to be fully protected when nitrate-nitrogen concentrations are less than 5 mg/L. Concentrations greater than 8 mg/L are deemed to be impaired. Ambient groundwater concentrations between 5 mg/L and 8 mg/L will continue to assure beneficial use attainment, however, beneficial uses may be unreasonably affected and it is extremely unlikely that any further degradation will be approved by the Regional Board (see Figure A).

FIGURE A: NITRATE-NITROGEN (NN)

	Basis	Use Protection	Burden of Proof	Approvable Outcome
10 mg/L	No Observed Effect Concentration; EPA Primary Drinking Water Standard; DHS Drinking Water Standard	Nitrate-nitrogen concentrations less than 10 mg/L have no known adverse effects on human health (including infants).	There is a non-rebuttable presumption that nitrate-nitrogen concentrations greater than 10 mg/L do not protect the designated MUN use.	Regional Board will not approve objectives greater than 10 mg/L for groundwaters designated as MUN.
8 mg/L	The increment between 8 mg/L and 10 mg/L is intended to provide an operational safety factor in order to minimize the possibility that the EPA/DHS criteria will be exceeded, even temporarily, thereby triggering significant reporting requirements and undermining pubic confidence in water supplies.	Initial groundwater objectives will not be set greater than 8 mg/L unless the higher concentration represents the best water quality achieved since 1968. Public health risk increases in proportion to the rising concentration of nitrate-nitrogen.	Burden-of-proof is on sponsors and proponents of reclamation projects throughout the review process to demonstrate beneficial uses remain fully protected in all receiving waters downgradient from the point of discharge/recharge. The burden-of-proof is proportionate to the change in water quality; increasing as the resulting nitrate-nitrogen concentration changes from 5 mg/L to 8 mg/L.	Established groundwater objective is not likely to be revised above 5 mg/L unless there is a compelling state interest (such as drought-induced water shortages or significant reduction in State Project Water supplies) to justify lowering water quality.
5 mg/L	Preferred by the water agencies for managing drinking water supplies because it provides maximum resource flexibility with minimal need for blending.	All beneficial uses are presumed to be fully protected at concentrations less than 5 mg/L.	Beneficial uses are not unreasonably affected at concentrations below 5 mg/L. Burden-of-proof on those who claim NN<5 mg/L impairs beneficial use.	There is a presumption in favor of permitting reclamation projects provided groundwater quality remains at or below 5 mg/L after all project impacts are accounted for.

APPENDIX B: USE PROTECTION THRESHOLDS FOR TDS

Total dissolved solids (TDS), also known as total filterable residue (TFR), is a secondary drinking water standard because it poses little direct threat to human health. The principle concern is that higher TDS concentrations lead to lower consumer acceptance (due to poor taste characteristics) and shorter appliance lifetimes. Water quality is also less suitable for producing some crops notably avocados and strawberries when TDS concentrations exceed 750 mg/L..

The Santa Ana River Basin Plan states:

> *"The Department of Health Services recommends that the concentration of total dissolved solids in drinking water be limited to 1000 mg/L (secondary drinking water standard) due to taste considerations. For most irrigation uses, water should have a TDS concentration under 700 mg/L. Quality-related consumer cost analyses have indicated that a benefit to consumers exists if water is supplied at or below 500 mg/L." (pg. 4-7)*

More specifically, in Title-22 of California's drinking water regulations, the Department of Health Services states that 500 mg/L TDS is the "recommended" maximum contaminant level, 1000 mg/L TDS is the "upper" maximum contaminant level for long-term exposures and 1,500 is the "short term" maximum contaminant level. They also state:

> *"For constituents (such as TDS), no fixed consumer acceptance contaminant level has been established. Constituent concentrations lower than the Recommended contaminant level are desirable for a higher degree of consumer acceptance. Constituent concentrations ranging to the Upper Contaminant Level (UCL) are acceptable if it is neither reasonable nor feasible to provide more suitable waters. Constituent concentrations ranging to the short-term contaminant level are acceptable only for existing systems on a temporary basis pending construction of treatment facilities or development of acceptable new water sources." (Title-22, Section 64449)*

The question of taste is highly subjective. Nevertheless, serious research has been conducted to correlate specific TDS concentrations with subjective perceptions of water quality (excellent, good, fair, poor, unacceptable).

Examining the results from thirteen separate studies, Bruvold and Daniels (1990) constructed a model that relates TDS concentration to perceived quality. In general, they concluded that 75% of the population will rate public water supplies as "good to excellent" if the TDS concentration remains below 450 mg/L. Not coincidentally, approximately 26% of the population will elect to use bottled water when the TDS concentration exceeds 450 mg/L. This threshold is quite close to the secondary drinking water standard of 500 mg/L.

When TDS concentrations fall between 450 and 760 mg/L, almost one-third of the population will rate the taste unfavorably (fair, poor, or unacceptable). Nearly 100% of the population will rate the water taste as unacceptable when the TDS concentration exceeds 1000 mg/L. Such data provides an empirical basis for EPA's secondary drinking water standard for TDS.

There are fewer studies describing the affects of high TDS concentrations on water heaters, dishwashers, clothes washers, garbage disposals, or car radiators. Most such studies were conducted in the late 60's and early 70's.

An independent review of the scientific literature on economic damages which result from residential use of mineralized water was conducted by the Colorado Water Resources Research Institute at Colorado State University and published in August, 1993. Among the conclusions highlighted in the detailed report are:

1) Most of the negative impact of high TDS concentrations occurs between zero and 500 mg/L. There is negligible marginal negative impact to residential consumers above 500 mg/L TDS.

2) The previous studies assumed that the impact relationship was linear throughout the entire TDS concentration range. Evidence then, and more recently, indicates that the actual function is nonlinear. The result is that previous studies may overestimate annual excess costs per household by 200-400%.

3) Reducing TDS from 1000 mg/L to 500 mg/L would produce an annual average estimated household benefit of $11.60; reducing TDS from 1000 to 200 mg/L would provide an estimated annual average benefit of $25.68 per household (1992 dollars).

4) The average water heater lasted 16 years in 1974; today the average new hot water heater lasts more than 26 years. The average clothes washer lasted 11 years in 1974; new washers last more than 20 years today. Two decades ago, the average garbage disposal lasted almost 10 years; newer model now last more than 19 years. The expected improvement in mean service life for modern appliances if TDS concentrations were reduced from 1000 mg/L to 500 mg/L is approximately 1-2 years.

The hazards associated with higher concentrations of TDS are less threatening to most people. The secondary drinking water standards reflect the lower risk levels. Water concentrations below 500 mg/L of TDS are deemed fully protective of the beneficial use. Water concentrations above 500 mg/L, but below 1000 *mg/L*, TDS are deemed economically-impaired.

As a practical matter, water concentrations above 1000 mg/L TDS are believed to preclude the drinking water beneficial use. The best evidence to support this characterization is that people shift rapidly to bottled water when TDS concentrations rise above 1000 mg/L TDS. Thus, using an objective behavioral definition, the drinking water use is "precluded" when the majority of consumers choose to spend significantly more money to acquire a better-tasting source of water rather than continue drinking municipal tap water containing high TDS concentrations.

Although it might appear that taste is merely an aesthetic concern, public acceptance is still a reliable measure for evaluating whether and when the MUN beneficial use is protected. The fact that taste is relatively subjective does not mean it cannot be objectively quantified and correlated with TDS concentrations. It is reasonable and appropriate to set use protection thresholds designed to increase public acceptance of local water supplies.

As long as TDS concentrations remain less than 500 mg/L, beneficial uses are deemed to be fully protected. Higher TDS concentrations may also provide adequate protection for beneficial uses but the burden-of-proof is on the project sponsor to demonstrate that claim. Regional Board policy strongly discourages raising TDS objectives beyond 500 mg/L without a compelling state interest (see Figure B).

FIGURE B: TOTAL DISSOLVED SOLIDS (TDS)

	Basis	Use Protection	Burden of Proof	Approvable Outcome
3000 mg/L	SWRCB	Basins less than 3000 mg/L must be designated MUN	Basins with long-term average greater than 3000 mg/L should not be classified MUN.	Objectives higher than 1,500 mg/L will not be approved by the Regional Board.
1500 mg/L	DHS Temporary Maximum	Acceptable for short-term where there are no practical alternatives for higher quality sources of supply.	N/A	Initial objectives higher than 1,000 mg/L will only be approved when such high concentrations represent the best water quality attained since 1968.
1000 mg/L	DHS Long-Term Maximum	Acceptable for drinking water supply, MUN beneficial use is protected. Some crops (avocados) are adversely affected at TDS concentrations greater than 750 mg/L..	Beneficial uses are presumed to be unreasonably affected at concentrations greater than 750 mg/L.	Regional Board will not approve petitions to increase basin plan objectives to any value greater than 750 mg/L. Mitigation will be required above 750 mg/L.
750 mg/L	Last Practical Use	Highest concentration that allows for an additional increment of use (250 mg/L) before exceeding long-term maximum of 1000 mg/L	Beneficial uses are assumed to be economically and aesthetically-impaired (reduced consumer acceptance) at concentrations greater than 500 mg/L. Burden of proof is on project proponents to demonstrate maximum benefit.	Mitigation requirements more probable as TDS concentrations rise above 500 mg/L and approach 750 mg/L. Regional Board will weigh net benefits to watershed.
500 mg/L	Recommended EPA/DHS Criteria	Preferable for drinking water supply,	Beneficial uses are presumed to be fully protected when TDS concentrations are below 500 mg/L. Burden-of-proof on those who claim TDS<500 impairs beneficial uses.	Probable project approval without significant mitigation. Presumption in favor of reclamation projects.