



Regulating Salinity to Provide Reasonable Protection of the Agricultural (AGR) Beneficial Use in Groundwater

Summary of the Current Regulatory Approach

- 1) DEFINITION OF AGR: The Basin Plans define AGR as "uses of water for farming, horticulture, or ranching including, but not limited to, irrigation (including leaching of salts), stock watering, or support of vegetation for range grazing."
- 2) PRESUMPTION OF AGR: "Unless otherwise designated by the Regional Water Board, all ground waters of the Region are considered suitable or potentially suitable, at a minimum, ...for agricultural supply (AGR)... In making any exception to the AGR beneficial use designation, the Regional Water Board will consider whether this is a pollution, either by natural processes or human activity (unrelated to a specific pollution incident), that cannot reasonably be treated for agricultural use using either BMPs or best economically achievable treatment practices."¹
- 3) NARRATIVE OBJECTIVE: The Basin Plans do not establish explicit numeric water quality objectives for salinity in groundwater for the AGR beneficial use. However, the TLBP does regulate the maximum average annual increase in groundwater salinity (aka "managed degradation" policy). And, both Basin Plans include the following narrative water quality objective: "*Ground waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses.*"
- 4) SALINITY TRANSLATOR: Historically, the Regional Board has assumed that TDS concentrations <450 mg/L and EC levels <700 μ S/cm would not adversely affect the AGR beneficial use (including salt sensitive crops). These values, based on guidelines originally published by Ayers and Westcott (1976, 1985), are used to translate the narrative objective into Waste Discharge Requirements (WDRs), effluent limits, receiving water limitations, and/or waiver conditions by the Regional Board.
- 5) POINT OF COMPLIANCE: The Regional Board requires dischargers to achieve compliance with narrative or numeric salinity objectives at "First Encountered Groundwater" (e.g. at the top of the saturated zone).

¹ Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region - 4th Ed. The Sacramento River Basin and the San Joaquin River Basin. Revised Sept., 2009. Pg. II-3.00.

Concerns with the Current Regulatory Approach

- 1) Irrigation practices designed to move salts past the root zone are considered an integral part of the AGR beneficial use. Efficient irrigation naturally increases the concentration of salts in the leachate. Therefore, water quality degradation is both inevitable and unavoidable.
- 2) It is often impossible to comply with the 700 $\mu\text{S}/\text{cm}$ threshold even after implementing Best Management Practices. For example, if an agricultural operator irrigates with high quality imported water ($\text{EC}=150$) and the leaching fraction is assumed to be 15%, then salinity in the leachate will concentrate more than six-fold ($\text{EC}=1,000$). Given the average salinity of available water supplies, there is no feasible or practicable means of meeting the 700 $\mu\text{S}/\text{cm}$ threshold at First Encountered Groundwater.
- 3) Ayers and Westcott's recommended salinity guideline for "Unrestricted Use" ($<700 \mu\text{S}/\text{cm}$) has been misinterpreted and applied in a manner inconsistent with the author's conclusions. Some salinity impacts can be mitigated by modern irrigation strategies without unreasonably affecting the AGR beneficial use.
- 4) Evaluating compliance with salinity standards at First Encountered Groundwater does not adequately consider the availability of assimilative capacity in the receiving water to mitigate the potential for adverse effects on AGR uses downgradient of the discharge.
- 5) Focusing on salinity concentration as the primary metric for evaluating use protection and water quality degradation conflicts with statewide efforts designed to encourage greater water conservation thru more efficient irrigation. Sound resource management should consider both concentration and mass when regulating salinity effects on groundwater.
- 6) Irrigation water is the largest single source of new salt loads to ground waters in the Central Valley. Therefore, it is appropriate to require BMPs to minimize salt loading (e.g. mass) to the vadose zone but irrigation and leaching should not be deemed "waste transport" per se.
- 7) The regional economy depends on efficient use and re-use of water to maximize agricultural production and minimize waste. Reliance on a single salinity threshold undermines this principle and jeopardizes the industry's ability to grow a variety of different crops with widely varying salt tolerances by reusing water many times.
- 8) The fact that all ground waters are considered "suitable or potentially suitable" for AGR does not mean that subsurface water quality is, or should be, capable of sustaining maximum yield for every conceivable crop. This is particularly true where imported surface water is used to produce crops that would not otherwise be commercially viable if forced to rely on native ground water as the sole source of irrigation supply.

Outcome Sought

- 1) A salinity control strategy that provides "reasonable protection" for all existing and probable future AGR uses in the Central Valley in a manner consistent with the decision criteria described in §13000 of the California Water Code.
- 2) A salinity control strategy that preserves the economic viability of the larger agricultural industry in the Central Valley while minimizing or mitigating the potential for adverse effects when and where salt-sensitive crops are grown.
- 3) A salinity control strategy that recognizes the unique characteristics of the AGR beneficial use, particularly the ability to adapt to changing environmental conditions thru crop selection or irrigation practices, that distinguish it from other beneficial uses.
- 4) A salinity control strategy that is consistent with statewide policies designed to encourage greater water conservation and increased use of recycled water.
- 5) A salinity control strategy that is implemented through an objective, transparent and consistent process to evaluate the real-world probability for the occurrence of adverse effects resulting from increasing salinity loads in ground water.
- 6) A salinity control strategy that recognizes the intrinsic differences between surface water and ground water and provides the flexibility to regulate each in accordance with those distinctions.

Key Assumptions

- 1) Nothing in the proposed approach to managing salinity in ground water is intended to revise any other numeric water quality objectives for salinity that have been previously established for surface water bodies in the Central Valley Region (including those adopted for the Bay Delta as part of the SWRCB's 1995 Salinity Plan).
- 2) The proposed approach for managing salinity in ground water must be implemented in a manner consistent with the statewide Antidegradation Policy (Res. No. 68-16).
- 3) Establishing more flexible salinity standards for the AGR use in ground water does not waive the legal obligation to comply with more stringent salinity standards where necessary to protect other designated uses (e.g. MUN, IND, PRO).
- 4) As always, the Regional Board retains the authority and the discretion to establish appropriate Waste Discharge Requirements, Effluent Limits, Receiving Water Limitations, or Waiver Conditions based on site-specific conditions.

Governing Principles

- 1) Given the enormous number of relevant factors and complex interrelationships between these factors, it is difficult to establish a single numeric water quality objective for salinity in ground waters designated AGR. Therefore, it is appropriate to continue regulating salinity discharges to ground water using a narrative implementation procedure.
- 2) In lieu of using a numeric water quality objective for salinity in ground waters designated AGR, the primary focus should be on preserving existing quality in a manner consistent with the statewide Antidegradation Policy. This policy allows the Regional Board to authorize higher salinity under certain conditions. The first of these conditions is that lowering water quality cannot unreasonably affect beneficial uses. Thus, the AD policy incorporates the requirement to protect existing uses and encourages a more site-specific analysis. Second, lowering water quality must provide "maximum benefit" to the people of California. This allows a more holistic assessment of both the costs and benefits of increasing salinity in groundwater. Finally, the AD policy requires dischargers to Best Practicable Treatment or Controls (BPTC) to minimize water quality degradation.
- 3) There is a long-standing working assumption that designing water quality objectives to protect the most sensitive species or sub-populations will also protect other less sensitive species and the general population. This assumption does not work well when applied to commercial agriculture where crop yield is the primary measure of use attainment or impairment. While it is true that conservative salinity objectives will protect the yields of both salt-sensitive and salt-tolerant crops, the cost of reducing salinity to protect the most salt-sensitive crops may alter the economic viability of many other crops. If the result is a net loss of commercial production, the general AGR use has been adversely affected despite the intention to provide increased protection.
- 4) The salinity guidelines recommended by Ayers & Westcott are best employed as thresholds to trigger more detailed water quality analysis rather than as direct translators of the current narrative objective for chemical constituents. While salinity concentrations <700 $\mu\text{S}/\text{cm}$ are presumed to fully protect nearly all crops, salinity concentrations greater than 700 $\mu\text{S}/\text{cm}$ do not necessarily render water quality "unsuitable" for the AGR use. Ground water salinity in the range between 700-1,500 $\mu\text{S}/\text{cm}$ (500-1,000 mg/L as TDS) remains suitable for all but the most salt-sensitive crops but may require agricultural operators to increase the leaching fraction to maintain yields. This is not an unreasonable requirement as the obligation to apply cost-effective and reasonable BMPs applies equally to all stakeholders (dischargers and water users) in order to assure the most efficient use and reuse of available water supplies in the Region. However, it does depend on an adequate supply of high quality water at a reasonable cost to support the use of higher leaching rates.

Narrative Implementation Procedures

The AGR use will be considered "reasonably protected" under any of the following conditions...

- 1) The average EC in the zone-of-influence below a discharge remains less than 700 uS/cm. This is a rebuttable presumption; however, the burden-of-proof is on those advocating for a lower EC threshold.
- 2) The average EC in the zone-of-influence below a discharge is expected to remain below 1,500 uS/cm and any net increase in groundwater salinity resulting from the authorized discharge is not expected to have more than a 5% probability of reducing existing crop yields by more than 5% based on current common irrigation practices. The burden-of-proof is on the discharger(s) to make this demonstration using models approved by the Regional Board.
- 3) Local groundwater is being used to irrigate crops and the return flows are percolating back to the same aquifer (e.g. no net change in salt mass).
- 4) The average EC concentration in the discharge is less than or equal to than the average EC level in the groundwater to which it percolates.
- 5) High quality water supplies (<700 uS/cm) are used to irrigate crops and the leaching fraction is less than or equal to 15%.
- 6) High quality recycled water (<1,500 uS.cm) is used to irrigate crops presently being grown with imported water or local groundwater.
- 7) The discharger has mitigated any significant adverse effects on downgradient crop yields by an arrangement satisfactory to the affected agricultural operators and the Regional Board. This may include, but is not limited to: a) providing additional water supplies for irrigation in order to increase the leaching fraction; b) providing an alternate water supply of equal or better quality; c) providing economic assistance to change crop selections or offset yield reductions.
- 8) The discharger has implemented Best Practicable Treatment or Controls and there is no reasonable or practicable means of further reducing EC concentrations in the discharge and imposing more stringent waste discharge requirements would result in a de facto moratorium and the discharger participates in a long-term water quality improvement program that is acceptable to the Regional Board. The program may rely on salt "offsets" or focus on implementing more cost-effective controls for other pollutants (i.e.. nitrates, arsenic, selenium) that pose a greater and more urgent risk to public health or the environment.
- 9) In other circumstances as approved by the Regional Board.