

SALT / NUTRIENT MANAGEMENT PLAN FOR THE CENTRAL AND WEST COAST GROUNDWATER BASINS

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What are Salts and Nutrients in Groundwater?

Salts are defined in chemistry as neutral compounds formed by the union of an acid and a base. Salts in groundwater typically include the cations sodium (Na^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), and potassium (K^+), and the anions chloride (Cl^-), sulfate (SO_4^{2-}), and bicarbonate (HCO_3^-). Salt concentrations in groundwater are commonly measured using Total Dissolved Solids (TDS) analysis, which measures the overall mineral content of water.

Nutrients are chemical elements and compounds found in or applied to the environment that plants and animals need to grow and survive. With respect to groundwater, the various forms of nitrogen and phosphorus are the nutrients of interest. These forms include nitrate, nitrite, ammonia, organic nitrogen (in the form of plant material or other organic compounds), and phosphates (orthophosphate and others). Nitrate is the most common form of nitrogen and phosphates are the most common forms of phosphorus found in groundwater.



Why Are Salts and Nutrients in Groundwater a Concern?

In general, excessive amounts of salts and nutrients lower groundwater quality and reduce its availability as a water resource. This is of great concern in states such as California, which rely heavily on groundwater to supplement its large overall water demand from surface water supplies.

Excessive amounts of salts in groundwater create adverse effects ranging from stressing plants and crops, to causing corrosion or mineral deposits on industrial piping that uses groundwater, to diminishing the taste and “drinkability” of such water.

With respect to nutrients, excessive nitrate in groundwater used as drinking water can result in restriction of oxygen transport in the bloodstream. Infants under the age of 4 months lack the enzyme necessary to correct this condition, resulting in methemoglobinemia (“blue baby syndrome”).

Are Salts and Nutrients Common in the Central and West Coast Basins?

The District’s Regional Groundwater Monitoring Program (described in the Fall 2006 Technical Bulletin) collects water quality data every Spring and Fall from its short-screened, aquifer-specific monitoring wells located across the Central and West Coast Basins (CWCB). The District also continually monitors water quality in production wells throughout the CWCB. Therefore, levels of salts and nutrients in CWCB groundwater are carefully tracked over time. With one exception (elevated TDS concentrations near the coast, described below), salts and nutrients have not been shown to be a concern in the CWCB. However, close monitoring of water quality across the basins will continue, as part of the District’s mandate to protect the region’s groundwater supply.

Although elevated TDS concentrations are generally found in the CWCB near the coast where seawater intrusion has occurred, it can also be found in other areas. The elevated TDS concentrations near the coast correspond to historic seawater intrusion. (Ongoing efforts to halt further seawater intrusion are discussed in detail in the Fall 2007 Technical Bulletin.) Other localized elevated TDS concentrations may stem from a variety of sources, from dissolving aquifer minerals to byproducts of human activities such as fertilizers, oilfield brines, industrial discharges and sewage effluents. TDS can also be brought into groundwater basins in replenishment water if the replenishment water sources are more mineralized than the local groundwater. The

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CWCB aquifers are replenished with local stormwater, imported water from Northern California and the Colorado River, and recycled water from regional water reclamation plants. The District monitors water quality data from all of these replenishment water sources. To date, salt concentrations have not presented a concern, but WRD will continue to monitor the water quality of these replenishment sources.

Nutrients are not common in CWCB groundwater, though potential sources of nitrate exist throughout the basins. Nitrates form when soil microorganisms break down fertilizers, decaying plants, manure and other organic residue — i.e., nitrogen sources. There are many potential sources of nitrogen which can lead to nitrates in groundwater in the CWCB and in most developed basins, such as: agricultural practices including fertilizing crops and producing animal manure waste; nitrous oxide air pollution from industry and automobiles being deposited on land surface; residential practices including fertilizing lawns and keeping domestic pets outside. In addition, low concentrations of nitrogen compounds are in recycled water (below regulatory and permitted levels) and may contribute nitrate to groundwater. As stated above, the District monitors water quality of CWCB replenishment water sources. Nitrate concentrations have not been cause for concern, but the District will continue to monitor water quality of these replenishment sources.

What Are Salt / Nutrient Management Plans?

Salt / Nutrient Management Plans are a new State requirement for all groundwater basins throughout California. The Plans are required as part of the Recycled Water Policy issued by the State Water Resources Control Board (SWRCB) and effective as of May 14, 2009. As stated in the Policy, its purpose is to “establish uniform requirements for recycled water use and to develop sustainable water supplies throughout the state”. The SWRCB therefore “supports and encourages every region...to develop a Salt / Nutrient Management Plan by 2014”.

The Policy notes that some basins contain salts and nutrients that exceed or threaten to exceed water quality objectives established in their Water Quality Control Plans (a.k.a., Basin Plans) issued by their Regional Water Quality Control Board (RWQCB). Furthermore, their Basin Plans may not outline adequate procedures for compliance with salt / nutrient water quality objectives. With respect to recycled water use, the Policy states that salts and nutrients will henceforth be managed on a basin-wide level rather than through SWRCB imposing requirements solely on recycled water projects.

The Policy provides general guidance on preparing Salt / Nutrient Management Plans. Examples are listed below:

- Local water and wastewater entities, and local salt / nutrient contributing stakeholders, will fund locally driven and controlled, collaborative processes open to all stakeholders to prepare Salt / Nutrient Management Plans for each basin / sub-basin in California.
- The process will include compliance with the California Environmental Quality Act (CEQA) and participation by RWQCB staff.
- Plans shall include salt / nutrient source identification, basin assimilative capacity and loading estimates, and fate and transport of salts / nutrients.
- Plans shall include implementation measures to manage salt / nutrient loading on a sustainable basis.

What Are The Next Steps?

Since the Policy was issued, WRD began meeting with other stakeholders and the RWQCB to initiate development of a Salt / Nutrient Management Plan for the CWCB. WRD will continue to take the lead in working with the RWQCB and stakeholders to develop a Plan for the CWCB, and will provide updates as this effort evolves.



Reference Information used for this Technical Bulletin:

1. William J. Deusch, 1997, *Groundwater Geochemistry: Fundamentals and Applications to Contamination*.
2. U.S. Geological Survey Circular 1136, 1996, “*Nutrients in the Nation’s Water—Too Much of a Good Thing?*”.
3. WRD Technical Bulletin, Fall 2006, “*WRD’s Monitoring Wells Give Aquifer-Specific Information*”.
4. WRD Technical Bulletin, Fall 2007, “*Battling Seawater Intrusion in the Central and West Coast Basins*”.
5. California Environmental Protection Agency - State Water Resources Control Board, May 14, 2009, *Recycled Water Policy*.