

Deep Saline Groundwater Development Rule Narrative

Brackish rules were developed to assist the District with achieving its Chapter 36 mandate to balance the conservation and development of groundwater to meet the needs of the state. The intent of the brackish rules is to promote prudent and responsible development of large reservoirs of saline groundwater in a manner that encourages utilization of saline groundwater, delivers benefits to the District, produces drawdowns that have low impacts to fresh groundwater resources, and has a low risk of failure to achieve the desired protections to fresh groundwater.

As part of the work associated with developing the brackish rules, the volumes of saline groundwater in the District were estimated. Saline groundwaters in the District include approximately 94,500 acre-feet and 77,000 acre-feet of slightly saline and moderately saline groundwater, respectively. Slightly saline groundwater has a total dissolved solids (TDS) concentration between 1,000 and 3,000 mg/L. Moderately saline groundwater has a TDS concentration between 3,000 and 10,000 mg/L.

Benefits to the District

The brackish rules apply to the production of groundwater at depths greater than 1300 feet below ground surface and with TDS concentrations greater than 1,500 mg/l. The district currently has no production in this saline zone despite the fact that the saline groundwater that meets these criteria accounts for more than 35% of useable groundwater in the District. Among the objectives of the brackish rules are to provide benefits to the District that include the following:

- Provide an alternative water supply that could help relieve the growing demand for fresh groundwater
- Provide industry with an alternative water supply that may be more cost-effective or more reliable than the conventional options of buying water from a water supplier
- Gather hydrogeological data for the District's saline aquifers for the purpose of better understanding and managing the District's relevant. The saline aquifers represent more than 50% of the groundwater in the district and are poorly characterized with respect to the District's fresh water aquifers.

Among the reasons for the lack of deep saline groundwater production is the high costs of drilling deep wells, relative high costs of treating saline groundwater, and the uncertainty associated with the production capacity of saline aquifers. To offset the factors contributing to lack saline groundwater production, the brackish rules offer the advantage of higher production rates per acre in the saline aquifers than the current District rules offer in fresh water aquifers. The primary limiting factor in production saline aquifer is that the resulting drawdown and water quality changes must be regulated and monitored to meet safeguards established by the District to protect fresh water resources and production from existing wells. In order to demonstrate that these safeguards are properly achieved, production under brackish rules require an intensive monitoring and reporting program.

Low Impacts to Fresh and Useable Groundwater Resources

The brackish rules were developed to have a low impact on the volume of saline groundwater and on the drawdown produced in the portion of the aquifers containing fresh groundwater.

To help limit the impact of producing saline groundwater on groundwater resources, the maximum annual production limit of both slightly saline and moderately saline groundwater is limited to 0.02% of the estimated volume of both categories of groundwater. Thus, if the maximum saline groundwater production was allowed for 50 years, about 1% of the saline groundwater would be pumped. One of the reasons for limiting the maximum production of saline groundwater is because of the uncertainty in how the deep saline portions of aquifers will response to pumping. To help fill this data gap, the brackish rules require a considerable amount of hydrogeological aquifer characterization and monitoring to occur as part of the

permit requirements. These permit requirements include aquifer pumping tests, detailed assessment of water quality, and long-term measurement of water levels.

To help limit the impact of producing saline groundwater on fresh groundwater resources, the brackish rules require the installation and monitoring of an observation well near the base of fresh water above a deep saline production well. Continuous hourly monitoring of groundwater conditions in the observation well and the production well includes water levels, temperature, and water quality. If the measured drawdown in the observation well exceeds 20 feet then curtailment of production is required until the aquifers recover and drawdown is less than 20 feet.

Across most of the District, the depth to the base of fresh groundwater is less than 1000 feet below ground surface. The brackish rules require that the entire well screen for a deep saline well exist below a depth of 1300 feet below ground surface and that the TDS concentration of the produced water be greater than 1,500 mg. The intent of these two requirements is to create vertical separation of several hundred feet between fresh groundwater and the produced deep saline groundwater. To help insure adequate hydrological separation occurs between existing wells and a deep saline production well, the brackish rules require that a deep saline well pumps from a location that is not closer than 2,640 feet of a well registered with the District which is owned by a person other than the owner of groundwater resources and is screened at depths in excess of 800 feet below the surface of the ground.

Low Risk of Failure to Achieve Desired Protections

The brackish rules require hourly monitoring of water levels and water quality in the pumping well and at least one monitoring well. Additional monitoring is required if the deep saline well field has an average production rate greater than 2,000 acre-feet/year. If the well field production rate is greater than 2,000 acre-feet/year then monitoring water levels in a second observation well and land subsidence is required. The monitoring requirements provides the information that demonstrates that drawdown associated with groundwater production from any deep saline well field remains within limitations and safeguards established by the permit.

The brackish rules include provisions for reducing production if performance standards in the observation wells are exceeded. The curtailment provisions give the District the authority to decrease pumping progressively to minimum levels until performance standards are no longer exceeded in the observation well(s). Besides the monitoring requirements and curtailment provisions, there is a third requisite established by the brackish rules that contributes to the low risk of failure to achieved desired protections for fresh groundwater resources and production from existing wells. The third requisite is the development of a pumping test work plan for each deep saline production well. The pumping test work plan provides predictions of drawdown impacts and a road map for detecting situations that could evolve into problematic drawdowns. In some instances, deviations from the predicted drawdown responses at early times will be helpful in maintaining compliance with the drawdown requirements specified in the permit.