

Water supply development for a new 17.5 MGD (66,200 m³/d) brackish-water RO facility for the City of Hialeah, Florida

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ABSTRACT

Freshwater supply limitations in Southeast Florida have caused a change in the water supply strategy for the next 30 years. As a result of the move away from the use of fresh groundwater, a 17.5 MGD (66,200 m³/d) brackish-water desalination plant is under design for the City of Hialeah, Florida. Feedwater for this facility will be developed from the upper part of the Floridan Aquifer System at depths ranging from 1,080 to 1,480 ft (329–451 m) below surface. The initial water quality is mildly brackish with a total dissolved solids concentration (TDS) of about 2,300 mg/l. The anticipated volume of raw water required to operate the RO plant will be about 23.3 MGD (88,200 m³/d). The raw water will be obtained from 12 primary production wells and two backup capacity wells. A critical design issue for any RO plant is the maintenance of feedwater quality over the operating life-cycle of the facility. The wellfield water quality is anticipated to change in time because of the upward leakage of greater salinity water from deeper within the aquifer system. The SEAWAT code was utilized to model the anticipated changes in TDS over an operating period of 30 years. Some initial calibration to the model was obtained from the existing City of Hollywood brackish-water wellfield, located about 15 miles (24 km) from the site. The framework of the model utilized both regional aquifer data obtained from various hydrogeologic testing programs conducted in the past and from a detailed aquifer performance test conducted on-site. The solute-transport modeling results indicate that the rate of TDS increase will be gradual and relatively steady over the next 30 years. The TDS concentration is expected to remain low enough so that it will be economic to treat with brackish-water membranes over the proposed operational period of the system. Modeling results were used to determine the well spacing and pumping rates that optimize the cost of construction versus the cost to treat higher salinity water. Solute-transport modeling should not be a one time exercise. Wellfield water quality should be continuously compared to model-predicted values to confirm that salinity trends are staying within the plant design parameters. The solute-transport model can be recalibrated against actual operational data if the data are deviating from predicted trends. In this manner, the refined model can provide a time lead for wellfield modification or changes in the process design as a management tool for wellfield operation.

Keywords: Reverse osmosis; Desalination; Brackish water; Florida

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