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Aquifer Storage and Recovery, Myrtle Beach, South Carolina

Phase III: Results of the Myrtle Beach Injection Test of 1994

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ABSTRACT

A second and final long-term injection test was completed at the Myrtle Beach Aquifer Storage and Recovery site. About 16 million gallons of potable water were injected into deep Cretaceous aquifers of the Coastal Plain in 1994. The injected water, which was obtained from the Atlantic Intracoastal Waterway and treated, has low concentrations of dissolved solids, sodium, and chloride. The native ground water, typical of Black Creek aquifers, is soft, alkaline, and low in iron, but it has objectionable concentrations of fluoride, sodium, and dissolved solids.

Air clogging of the test well and aquifer, after 11 million gallons were injected, forced the suspension of the injection test. Air, introduced through faulty valves and vents, lodged in pore spaces of the aquifer and reduced its transmissivity and storage capacity. A short pumping cycle, instituted as a remedial procedure, immediately rehabilitated the well and restored the storage capacity of the aquifer. An additional 5 million gallons of treated water were stored in the aquifer after the test well was rehabilitated.

Gas chromatography of water samples collected during the recovery period showed that the gas is mostly nitrogen and dissolved carbon dioxide. Possible sources of these gases are air entrainment for the nitrogen and bacterial activity for the carbon dioxide. Nitrogen, more than carbon dioxide, dominates the gas phase observed in water samples. A solution to the air-entrainment problem could be the injection of water under positive pressure. A flow-control valve, installed along the pump column, would generate enough energy loss to create a positive pressure during injection, thus avoiding air entrainment.

Analysis of the data suggests that the geochemical processes affecting the quality of the recovered water are sufficiently replicable to allow the use of observed trends in geochemical modeling. These processes, although important in the understanding of the chemical evolution of the water, were of limited scope. Mixing, however, had a much larger effect on the quality of the recovered water. Biological processes, moreover, appeared to have successfully reduced the concentration and potential formation of trihalomethane. On the basis of chloride concentration, a recovery efficiency of 70 percent was obtained at this site. At this efficiency, recovered water could be returned to the distribution system without additional treatment, because all concentrations were below the National Secondary Drinking Water Standards and the State of South Carolina drinking water rules.

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