HEAT AS A GROUND-WATER TRACER AT THE RUSSIAN RIVER RBF FACILITY, SONOMA COUNTY, CALIFORNIA

Jim Constantz[1], Grace W. Su[2], and Christine Hatch[3]

[1]U.S. Geological Survey, Menlo Park, CA 94025; [2]Lawrence Berkeley National Laboratory, Berkeley, CA 94720; [3]University of California, Santa Cruz, CA 95064

Abstract: Temperature is routinely collected as a water quality parameter, but only recently utilized as an environmental tracer of stream exchanges with ground water (Stonestrom and Constantz, 2003). In this paper, water levels and seasonal temperatures were used to estimate streambed hydraulic conductivities and water fluxes. Temperatures and water levels were analyzed from 3 observation wells near the Russian River RBF facility, north of Forestville, Sonoma County, CA. In addition, 9 shallow piezometers were installed in 3 cross-sections across the stream near a pair of collector wells at the RBF facility. Hydraulic conductivities and fluxes were estimated by matching simulated ground-water temperatures to the observed ground-water temperatures with an inverse modeling approach. Using temperature measurements in the shallow piezometers from 0.1 to 1.0 m below the channel, estimates of infiltration indicated a distinct area of streambed clogging near one of the RBF collector wells. For the deeper observation wells, temperature probes were located at depths between 3.5 m to 7.1 m below the channel. Estimated conductivities varied over an order of magnitude, with anisotropies of 5 (horizontal to vertical hydraulic conductivity) generally providing the best fit to observed temperatures.

Key words: Heat, temperature, water levels, hydraulic conductivity, infiltration, streambed clogging.