Comparative Results of Four Sr-90 Groundwater Analytical Methods

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Abstract

Data are presented for 51 Long Island groundwater samples each measured for Strontium-90 using 4 different analytical methods. Groundwater samples were obtained at Brookhaven National Laboratory (BNL) from 17 geoprobe wells sunk to depths ranging from 76' to 92' below grade. Strontium-90 activity concentrations ranged from 1 pCi/L to 500 pCi/L. Twenty-nine of the 51 samples (57%) were above the EPA ^{90}Sr Drinking water standard of 8 pCi/L. All samples were initially pre-screened for Tritium, gross alpha/beta and gamma emitters using EPA Methods. Gross Beta activity levels were typically a factor of 2 greater than the measured Strontium-90 levels, ranging from a minimum detectable level (MDL) of 3 pCi/L beta to 1,100 pCi/L beta. Distilled Tritium activity concentrations ranged from an MDL of 400 pCi/L to 14, 000 pCi/L which are below the EPA ^{3}H Drinking Water Standard of 20,000 pCi/L. Besides naturally occuring gamma emitting radionuclides, ^{22}Na, ^{40}K and ^{137}Cs were detected with activity concentrations all < 6 pCi/L.

Strontium-90 results for three of the four Sr methods evaluated (EIChrom Sr-Spec™, 3M Sr Empore™ Rad Disks and Cerenkov Counting) are statistically compared to the 51 validated values reported by 2 off-site contractor laboratories that used the EPA-905.0 Strontium in Water Method or its equivalent. The 2 off-site contractor laboratories, General Engineering-Environmental Physics, Inc. (GE/EPI), Charleston, SC and IEA/AEN Labs, Cary, NC, were chosen based on past performance evaluation (PE) data in 2 national radiological programs. The Sr results obtained using the 4 methods are intercompared at 3 activity concentrations ranging from 1 -10 pCi/L , 11 - 100 pCi/L and 101 - 600 pCi/L. For each of the methods, only validated (batch) results that fulfilled prescribed data quality objectives were statistically intercompared. Performance Evaluation samples of known activity concentrations, prepared at either BNL, the U.S. EPA NERL-LV and the U.S. DOE/EML were included in this ^{90}Sr intercomparison to determine intra-lab bias and accuracy.