LA-UR-15-21620
Approved for public release; distribution is unlimited.

Title: Naturally Occurring Radionuclides for EIM and Intellus

Author(s): Mcnaughton, Michael
Fuehne, David Patrick
Whicker, Jeffrey Jay
Patel, Nita
Gillis, Jessica Mcdonnel
McClory, Aysha Reede

Intended for: Web

Issued: 2015-03-05

Naturally Occurring Radionuclides for EIM and Intellus

Michael McNaughton, David Fuehne, Jeffrey Whicker, Nita Patel, Jessica Gillis, Aysha McClory

The purpose of this note is to explain the designation “Naturally Occurring Radionuclide" in the LANL environmental database. For these radionuclides in the environment of LANL, anthropogenic occurrence has not been detected in the past and is extremely unlikely in the future. Naturally occurring radionuclides will continue to be reported as always, with the additional Reporting Reason Code designation of R33. This change is reflected in LANL SOP-5166, Routine Validation of Gamma Spectroscopy, Chemical Separation Alpha Spectroscopy, Gas Proportional Counting and Liquid Scintillation Analytical Data.

Most of these radionuclides are decay products of primordial uranium. The uranium used at LANL is chemically refined to remove thorium, radium, and subsequent short-lived decay products, and it takes thousands of years for these to grow-in to detectable concentrations.

Smaller quantities of refined thorium have been used for research at LANL. However, LANL-produced thorium-232 has not been detected in the environment, and the decay products of thorium-232 have been observed to be overwhelmingly naturally occurring.

Included in the list of naturally occurring radionuclides is the cosmogenic radionuclide, beryllium-7. Although this short-lived radionuclide has occasionally been detected at LANSCE, environmental detections have been cosmogenic, and are likely to be so in the future.

The following radionuclides are designated as naturally occurring.

Primordial (U-238 Series)	Primordial (Th-232 Series)	Primordial (Other)	Cosmogenic
Po-210	Tl-208	K-40	Be-7
Pb-210	Bi-212		
Pb-214	Ra-224		
Bi-210	Ra-228		
Bi-214			
Ra-226			
Th-230			

There are others that are likely to be natural. Some are not listed above because on rare occasions they could originate from LANL; others are not listed because they are extremely unlikely to be detected. However, if a radionuclide is in secular equilibrium with one or more of the nuclides in the above list, this indicates it is natural. For example, in most samples of soil or storm water Th-234 is in secular equilibrium with Bi-214, indicating naturally occurring uranium. However, in some samples from TA-15, Th-234 is in secular equilibrium with U-238 while the Bi-214 concentration is lower, which indicates LANL uranium.