US Army Corps of Engineers®
St. Louis District

St. Louis Sites Fact Sheet

HOW FUSRAP INTERPRETS SAMPLE DATA

"Gateway to Excellence"

Clean-up activities at the St. Louis Sites are part of a nationwide U.S. Army Corps of Engineers (USACE) environmental program known as the Formerly Utilized Sites Remedial Action Program (FUSRAP).

These sites contain soils contaminated with uranium, thorium, and radium because of activities associated with the Manhattan Engineer District/Atomic Energy Commission (MED/AEC) during the nation's early atomic program in the 1940s and 1950s.

USACE St. Louis District is conducting a clean-up program for the North St. Louis County FUSRAP Sites (North County Sites). The U.S. Environmental Protection Agency and USACE have signed the Record of Decision that outlines the final remedy to clean up the North St. Louis County sites.

To learn more about FUSRAP, visit the FUSRAP webpage at https://go.usa.gov/xANRb or www.mvs.usace.army.mil/Missions/FUSRAP. Contact the FUSRAP Area Office at 314-260-3905 or by email at STLFUSRAP@usace.army.mil.

USACE has an onsite laboratory to test soil and sediment samples for radionuclides (uranium, thorium, and radium) from Coldwater Creek, other SLAPS Vicinity Properties, and St. Louis Downtown Sites. Three shifts of FUSRAP laboratory technicians work 24 hours a day, 5 days per week to complete sample analyses using alpha and gamma spectroscopy. This work is done in accordance with established scientific procedures.

The sampling and lab process produces a lot of data, but how is that data understood and acted on?

USING MATH TO INTERPRET SAMPLE DATA

When samples present only one radionuclide, the total risk associated with that sample is reached by comparison to clean-up criteria. But when multiple radionuclides are present, FUSRAP personnel must perform calculations to determine the contributions to risk from each radionuclide.

Alpha spectroscopy is used to analyze each sample's individual radiological isotope.

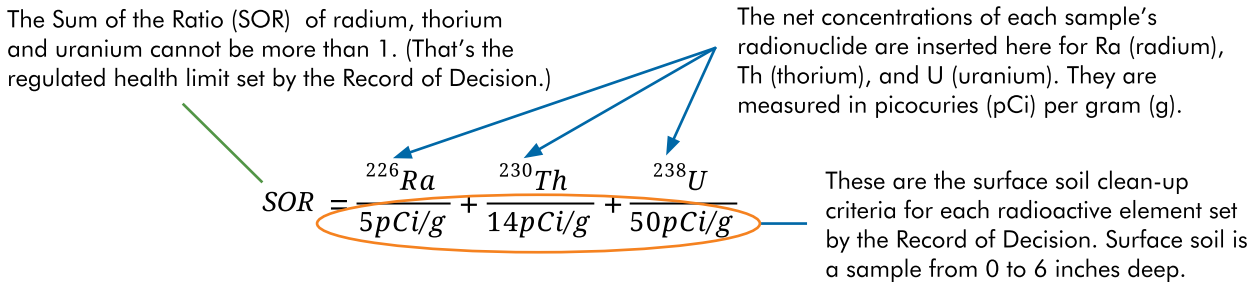
FUSRAP health physicists factor in the amount of risk from each radionuclide concentration when there is a combination of thorium, radium and uranium present to determine the total risk associated with a sample result. Why is this necessary? Because the three radioactive elements contribute different risk levels and must be combined accordingly to understand the total risk.

The radioactivity concentrations for each radionuclide are compared to the specific clean-up criteria identified in the Record of Decision (ROD) in a ratio. Then the ratios between the net concentrations of each sample's radionuclide and the clean-up criteria for that radionuclide are added together to determine overall risk for that sample's location.

SUM OF THE RATIO CALCULATIONS

Health physicists use Sum of the Ratio (SOR) calculations to determine risk at each sample site. They represent the ratios of radionuclide sample concentrations to clean-up criteria as fractions and add them together for total risk. That total cannot exceed the benchmark dose set by the ROD's remediation goals. The risk is too high when the total, the SOR, is more than 1.

If a sample has all three radionuclides, for example, risk is calculated by adding three ratios as fractions. Each ratio pairs each radionuclide's net concentration in the sample to the clean-up criteria. The total is the SOR.



How a Sum of the Ratio (SOR) Calculation Works

For example, if a surface soil sample has a net concentration of 2 pCi/g Ra-226, 10 pCi/g Th-230, and 8 pCi/g U-238, the SOR would be:

$$1.27 = \frac{2pCi/g}{5pCi/g} + \frac{10pCi/g}{14pCi/g} + \frac{8pCi/g}{50pCi/g}$$

SOR of radium, thorium and uranium cannot be more than 1. (That's the regulated health limit set by the Record of Decision.) This example is more than one.

This sample is above the clean-up criteria for one sample result. Notice that none of the individual radionuclide concentrations exceed their respective clean-up criteria. But as a whole, the SOR is greater than 1. So, the sample total would signal need for further evaluation to determine if the average SOR result over 1,076 square feet (100 square meters) is greater than 1 and would require cleanup.

HOW SUM OF THE RATIO ANALYSIS AFFECTS CLEANUP

Each site's ROD sets clear guidelines, approved by federal and state regulators, of acceptable levels of radiological concentrations in soil. The FUSRAP team summarizes their sampling and data analysis and presents an evaluation that includes the SOR calculations. The summary helps USACE determine whether a property does or does not require cleanup or if additional information is needed. Those conclusions are reached by referring to the clean-up goals set in the ROD.

FUSRAP's mission focuses on protecting human health and the environment by cleaning up the radioactive contamination above health-based clean-up guidelines.