Differentiating Between Naturally Occurring Beryllium from Local Soils and that from Site Operations when Evaluating Surface Contamination on Facility Surfaces

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Background

- Due to a dry climate, relatively sparse ground cover, and frequent winds; it is common for soil dust to be blown into LANL buildings and structures.

Background

- This presentation will focus on the approach LANL has taken in differentiating between naturally occurring beryllium from soil vs. that from site operations.
- LANL geologists have determined the naturally occurring concentration of beryllium and other metals in local soils.
  - Mean Be level = 1.2 ppm 95,95 UCL = 3.2 ppm
  - Mean Be/Fe ratio = 8.0×10^{-5} 95,95 UCL = 1.2×10^{-4}
- A set of 8 factors have been identified to aid in the evaluation of conditions and either support or eliminate soil as a source of beryllium contamination on a surface.

Eight Factors to Evaluate

1. History of Facility
2. Soil Source and Pathway
3. Accumulation of Dust
4. Appearance of Dust
5. Mass of Material Collected
6. Concentration of Beryllium
7. Ratio of Beryllium to Other Metals
8. Other Metals that Provide Clues

History, Source, and Pathway

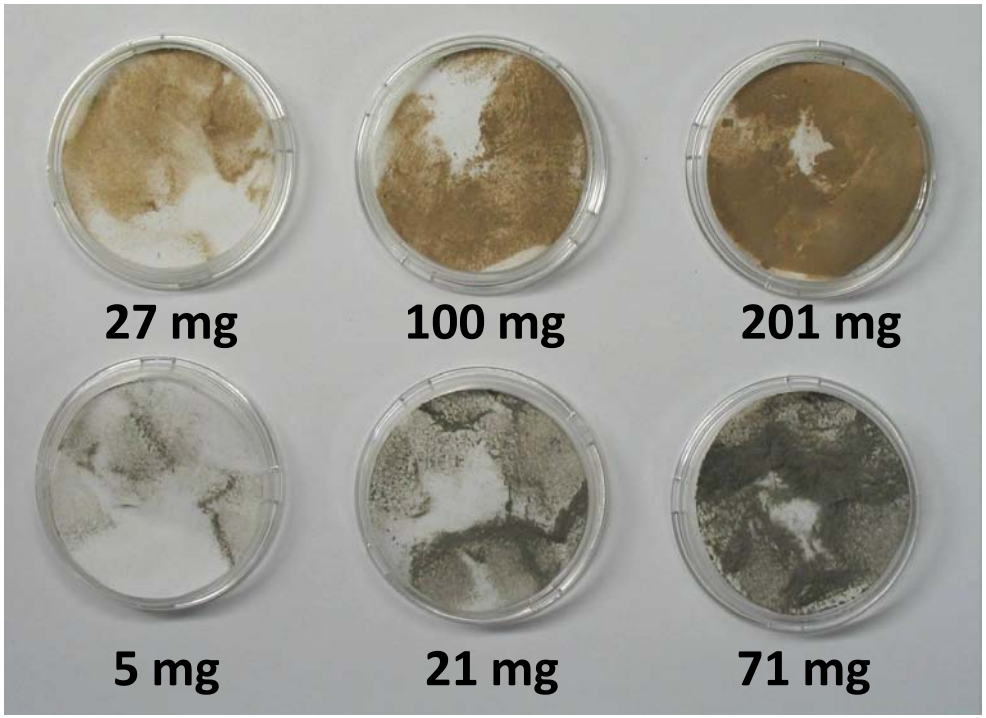
- Is there any history of beryllium operations in the area?
  - A history of aerosol generating beryllium operations makes it difficult to justify attributing beryllium on surfaces to local soils.
- Is it reasonable for the beryllium to be from local soils? Are there a source and a pathway for soil dust?

Accumulated Dust on Surfaces

- Is there sufficient accumulation of dust on surfaces? Will it pass the “Wash Me” test?

Appearance and Adequate Sample Mass

- Did the material on the surface and that collected on the wipe media look like soil?
- Was the wipe media loading sufficient to achieve the level of contamination detected if the beryllium was from soil?



Concentrations in Bulk Samples

- Is the beryllium concentration in material collected on the surface within the UCL for beryllium in the local soil?
  - If greater than UCL you have confidence that it is not from soil.
- Is the beryllium/metal(s) ratio in the sample consistent with that expected for the local soils?
  - If beryllium is well correlated with other metals in local soils, exceeding the range of that ratio indicates that it is not from soil.
- Are there other metals present that might indicate a beryllium source other than from soil?
  - Other metals (e.g. copper, lead, uranium, etc.) at concentrations above that in local soils may indicate that the metals are not from soil and provide clues to operational sources of the beryllium.

Closing Comments

- On two occasions, after considering all of these factors, LANL concluded that beryllium surface contamination that exceeded 0.2 ug/100 cm^2 was due to wind-blown soil. These locations were not controlled as beryllium contamination areas.
- While LANL's method is useful, it may be too conservative an approach and not robust enough to identify all cases where naturally occurring beryllium is the source of contamination.
- LANL recognizes the need for, and recommends the development of a validated consensus standard describing a standard protocol for differentiating between naturally occurring beryllium and that from anthropogenic sources.

Reference

Longmire, P., Reneau, S., Watt, P., McFadden, L., Gardner, J., Duffy, C., Ryti, R., 1996, *Natural Background Geochemistry, Geomorphology, and Pedogenesis of Selected Soil Profiles and Bandelier Tuff Los Alamos, New Mexico*. Los Alamos National Laboratory report LA-12913-MS.

Questions

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