observed site averages are l

of 20 pCi/g or more have been observed in isolated spots in central Florida where phosphate deposits are exposed or near the land surface.

Available data indicate that the radionuclide concentrations in many mining materials, coal, and coal ash are generally within the range reported for typical background. For example, as shown in the Technical Background Document supporting this proposed rule, all available data on the uranium-238 and thorium-232 concentrations in iron ore, zinc ore, limestone, clay, and fluorspar are within the range reported by Myrick et al. for background surface soils. Ninety-eight percent of all coal samples analyzed in support of EPA's 1989 final airborne emission standards for radionuclides were also within the typical background range; concentrations significantly above this range (between 20 and 43 pCi/g of uranium-238) were observed in only two out of more than 3,700 coal samples analyzed. The radioactivity of coal ash is usually higher than that of coal (estimated to be about ten times higher). However, typical coal ashes are expected to contain 4.3 pCi/g of uranium-238 and 3.5 pCi/g of thorium-232, which are only slightly higher than the background range reported by Myrick et al. Bauxite (aluminum) ore also can contain radionuclide concentrations that are slightly elevated compared to normal background (around 6 pCi/g of thorium-232 and 7 pCi/g of uranium-238), but still relatively low compared to the levels that naturally exist in surface rocks and soils in some areas of the country.

Most data indicate that radionuclide concentrations in copper ores are at or near typical background levels. For example, a 1982 EPA study 3 reports that the uranium-238 concentration in copper ore ranges from 0.79 pCi/g at an underground mine to 2.2 pCi/g at a surface mine. The concentration of thorium-232 is reported to range from 0.62 pCi/g at an underground mine to 3.1 pCi/g at a surface mine. These levels fall within the background ranges for surficial soils as reported by Myrick et al. Elevated levels, however, have been observed in certain copper ores from Arizona, Utah, and New Mexico (see the Technical Background Document for more information). Based on current information and understanding, EPA believes that many of these elevated readings are probably reflective of a biased sampling program, and that large

site averages are likely to be lower and approaching typical background levels. EPA requests more reliable and current data on the radionuclide concentrations in copper ores along with comments on how these ores should be treated for the purpose of the final reporting exemption rule. If found to be necessary based on data and other information submitted during the comment period, land disturbance incidental to copper mining could be grouped with those mining sectors that would not be granted a reporting exemption in the final rule.

The relatively low radionuclide concentrations reported for these different materials do not necessarily mean that the risks associated with radionuclide releases from many types of extraction sites and coal and coal ash piles are low or representative of undisturbed background. Indeed, many factors associated with the nature of the materials, management practices, and environmental and population characteristics at these sites would need to be studied in substantially more detail before it could be demonstrated that such risks are low in all or most cases. However, based on the relatively low radionuclide concentrations and the generally low-level, diffuse releases associated with the activities involved (land disturbance incidental to mining extraction; transporting, dumping, and storing coal; and transporting, dumping, storing, and disposing of coal ash), EPA believes that a CERCLA removal or remedial response to such radionuclide releases would very rarely, if ever, be necessary. Moreover, it is not clear that it would be feasible or practical to mount a CERCLA response at these types of sites, since the materials in question already have radionuclide concentrations that are likely to be at or near background and CERCLA responses would not normally clean up to below background levels. Any effort to remove the subject extraction materials, coal, or coal ash or cover these materials with soil, for example, would leave exposed soils that would have comparable concentrations of naturally occurring radionuclides. Therefore, EPA believes that reporting exemptions are warranted because continued evaluation and reporting of such radionuclide releases serves no useful purpose and, in fact, places an unnecessary burden on society. CERCLA response and liability provisions, however, would remain intact, enabling a response if a serious radiation threat is ever discovered by other means (e.g., Regional and State inspections) at an exempted mine or coal or coal ash pile.

This same logic does not necessarily hold for other types of extraction sites that handle ores and other raw materials that routinely have radionuclide concentrations well above background levels. As discussed in more detail in the Technical Background Document supporting this proposed rule ("Technical Background Document Supporting Proposed Administrative **Reporting Exemptions for Certain** Releases of Radionuclides," available for inspection in the Superfund Docket), the materials extracted at uranium, phosphate, tin, titanium, zirconium, hafnium, vanadium, and rare earth mines can have elevated concentrations of uranium-238 and/or thorium-232, along with their respective decay products. For example:

- Uranium ore has a uranium-238 concentration on the order of 280–560 pCi/g, although concentrations as high as 760 pCi/g are reported in the literature.
- Uranium-238 concentrations in phosphate rock range from 3–4 pCi/g in Tennessee to 20–60 pCi/g in other States (Florida, North Carolina, Idaho, Montana, Wyoming, and Utah).
 Concentrations as high as 270 pCi/g of uranium-238 have been reported.
 No data are available on the
- radionuclide concentrations in domestically mined tin ores. However, available data show that tin slag (produced from tin ore processing) contains 17–34 pCi/g of uranium-238. In addition, concentrated processed ores from Malaysia have been shown to contain 1,160 to 8,830 pCi/g of thorium-238.
- Some titanium ores (rutile and leucoxene) are reported to contain 12– 14 pCi/g of uranium-238 and 1–10 pCi/g of thorium-232.
- -Zircon (zirconium and hafnium ore) has been measured to contain 13 pCi/ g of radium-226, a decay product of uranium-238 (which would be expected to be present at about the same concentration as radium-226). Measurements of radium-226 concentrations in processed ore concentrates from South Africa are as high as 200 pCi/g.
- Vanadium-bearing ores are commonly the same as uranium ores, because vanadium is often recovered as a coproduct from uranium ore. Ores recovered primarily for their vanadium content contain lower radionuclide concentrations than uranium ore, but still appear to contain uranium at levels higher than typical background (in the 30 to 58 pCi/g range).
- Monazite, an ore mined for its rare earth and thorium content, typically

³U.S. EPA, "Emissions of Naturally Occurring Radioactivity from Aluminum and Copper Facilities," Office of Radiation Programs, Las Vegas Facility, NV, EPA–520/6–82–018, 1982.