

**Table 3-8. Facility Average Concentrations of Trace Constituents in Comanaged Wastes (parts per million) (whole waste)\***

Constituent	Managed in Surface Impoundments		Managed in Landfills	
	Mean	Range	Mean	Range
Arsenic	40	6.7–150	20	6.2–38
Barium	1,600	150–8,400	2,900	1,800–3,800
Beryllium	8.4	0.88–16	n/a	n/a
Boron	190	0.03–420	n/a	n/a
Cadmium	6	0.20–24	n/a	n/a
Chromium	85	5.7–290	50	35–78
Cobalt	29	4.7–42	n/a	n/a
Copper	78	2.2–150	105	97–120
Lead	42	5–150	17	6.5–29
Manganese	280	55–660	460	200–820
Nickel	68	1.5–160	51	33–65
Selenium	37	0.025–320	14	0.8–32
Silver	5.2	0.03–14	n/a	n/a
Thallium	27	10.6–48	n/a	n/a
Strontium	1,040	1–4,800	2,100	1,100–2,650
Vanadium	120	20–350	86	23–160
Zinc	150	17–860	84	35

\*All measurements identified as below detection limit were assigned a value equal to one-half the detection limit for use in the calculations. All concentrations are facility-averaged; i.e., multiple measurements from a single site are averaged, and the resulting population of facility averages used to generate the statistics in this table.  
n/a = data not available  
Sources: EPRI, 1991, 1992, 1994a, 1994b, 1996a, 1996b, 1997c, 1997d, 1997e, 1997f, 1997g, 1997h, 1997i, 1997j, 1997k, and 1997l

sites. Compositing the concentrations of all compounds of interest using their respective 2,3,7,8-TCDD equivalency factors, the samples displayed 2,3,7,8-TCDD equivalent concentrations from below detection to 2.1 ng/kg (approximately one order of magnitude above typical detection limits). By comparison, a reference sample of municipal waste incinerator fly ash had a 2,3,7,8-TCDD equivalent concentration of 1,460 ng/kg (parts per trillion) (EPRI, 1998b).

Coal contains and emits low levels of naturally occurring radiation (Radian, 1988). Concentrations of radionuclides in coal vary with coal rank and origin. For example, uranium and thorium concentrations in U.S. coals range from below 0.01 parts per million (ppm) to roughly 75 ppm, based on analyses of more than 6,000 samples (EPA, 1995c). However, the geometric mean concentrations of uranium and thorium for the same sample population are 1.2 ppm and 2.2 ppm, respectively. These concentrations correspond to activities of roughly 0.41 pCi/g and 0.24 pCi/g, respectively. Because they do not volatilize, these elements generally concentrate in coal ash, such that activity levels in the ash increase relative to the radioactivity in source coal (EPA, 1989a). EPA estimates an average increase of roughly 10×, such that average activity levels for uranium and thorium are 4 pCi/g and 2.4 pCi/g, respectively.