**LOW-LEVEL RADIOACTIVE WASTE FORUM, INC.**

**309 Bradley Boulevard, Suite 201, Richland, WA 99352**

**801-580-3201 – dshrum@llwforum.org**

**Disposition Options and Costs for Certain Well Logging**

**Radioactive Sealed Sources**

Well logging is a technique to measure the properties of geologic strata by inserting specialized instruments down a borehole. Most downhole well logging occurs in the oil and mineral exploration industry. Some of these instruments use radioactive sealed sources.

Primary radionuclides used in well logging include Am-241 and Cs-137. These sources range in activity from one-half curie to 20 curies. The cost to transfer these sources to a distributor will range from approximately $2,250 to $6,750 per source. This does not include packaging or transportation. The fee for a service technician to package and transport the sources to the distributor is approximately $6,000 to $8,000, depending on the number of sources and transportation distance.

**Table 1 – Widely Used Radioactive Sealed Sources[[1]](#footnote-2)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device** | **Radionuclide** | **Typical Activity in Curies (Ci) Range** | **IAEA Source Categorya** | **Waste Classb** |
| Well-logging sources used for characterizing subsurface properties such as density and moisture percentages. Most commonly associated with oil and mineral exploration. | Americium-241/ Beryllium | 0.5-20 | 2,3,4 | A, B, C, GTCC |
| Californium-252 | 0.027-1.61 | 3,4 |
| Cesium-137 | 0.5-20 | 3,4 |
| Cobalt-60c | 1-20 | 2,3 |
| Plutonium-238/ Beryllium | 5-70 | 2,3 |
| Radium-226 | 20 | 2 |
| Tritium | 1-20 | 5 |
| a. The International Atomic Energy Agency (IAEA) categorization system is based on “the potential for radioactive sources to cause deterministic health effects. This potential is due partly to the physical properties of the source, especially its activity, and partly to the way in which the source is used.” See, IAEA Safety Guide No. RS-G-1.9, Categorization of Radioactive Sources 2005, Annex I, page 37, available at http:// www-pub.iaea.org/MTCD/publications/PDF/Pub1227\_web.pdf.  b. Refers to Nuclear Regulatory Commission’s (NRC’s) classification of LLRW for land disposal found in 10 CFR Part 61. Activity per unit mass or volume classification limits are related to relative hazard and necessity for waste isolation. Class A represents the least hazard, Class B represents a greater hazard, and Class C the greatest hazard appropriate for near surface disposal. Waste with an activity concentration Greater- Than-Class-C (GTCC) must be disposed of in a geologic repository unless NRC approves an alternate disposal site.  c. There are no limits established for cobalt-60 in Class B or C wastes. Practical considerations such as the effects of external radiation and internal heat generation on transportation, handling, and disposal will limit the concentrations for these wastes. These wastes shall be Class B unless the concentrations of other nuclides in Table 2 in 10 CFR § 61.55 determine the waste to be Class C independently of these nuclides. | | | | |

Please note that this information is intended as a guide only and does not include the entire universe of radioactive sealed sources and devices. The listed costs are provided as estimates only based on current information and guidance and should not be relied upon as determinative of actual future disposal costs.

When radioactive sealed sources have decayed to a point where the source or device no longer functions as designed, the source can either be replaced or the entire source or device can be properly dispositioned (i.e. by return of the item to the manufacturer, transfer to a third party for reuse or recycle, or by disposal as low-level radioactive waste). Depending on the radionuclide and its activity, not all options may be available.

When evaluating alternatives, the user needs to consider the long-term liability associated with the chosen disposition method. Lower activity sources, or sources without adequate documentation, have a minimal reuse potential. Higher activity sources have a greater reuse potential since there may still be a useful purpose for the source. If the source is transferred to a third party for reuse or recycling, the user should seek written assurance or confirmation of the transfer of title to the source. This may help limit future financial liability. Transfer to a third party for recycle or reuse without this title transfer leaves the user liable for future financial expense. Disposal in one of the licensed disposal facilities provides the user with a substantial reduction in long-term liability.

1. Excerpted from *Sealed Source Disposal and National Security – Problem Statement and Solution Set,* which was a deliverable of the Removal and Disposition of Disused Sources Focus Group of the Radioisotopes Subcouncil of the Nuclear Government and Sector Coordinating Councils, dated December 9, 2009. This table identifies some of the sealed source devices and uses, the radionuclides and activity, categorization by the International Atomic Energy Agency (IAEA) and waste classification for disposal purposes. [↑](#footnote-ref-2)