

- increased efficiency in the use of raw materials, energy, water, or other resources
- recycling to reduce the amount of waste and pollutants destined for release, treatment, storage, and disposal.

Pollution prevention is applied to all DOE pollution-generating activities including:

- manufacturing and production operations
- facility operations, maintenance, and transportation
- laboratory research
- research, development, and demonstration,
- weapons dismantlement
- stabilization, deactivation, and decommissioning
- legacy waste and contaminated site cleanup.

## **2.2.6 Decontamination and Decommissioning of Hanford Facilities**

Decontamination is the removal, by chemical or physical methods, of radioactive or hazardous materials from internal and external surfaces of components, systems and structures in a nuclear facility. It is usually the first step toward decommissioning. Decommissioning of a nuclear facility can be defined as the measures taken at the end of the facility's lifetime to assure protection of public health and safety and the environment. Such measures can involve protective storage, entombment, or removal. For protective storage, the facility is left intact after removal of most of the radioactive materials and the appropriate security controls are established to assure public health and safety. Entombment consists of removing radioactive liquids and wastes, sealing all remaining radioactivity within the facility, and establishing appropriate security controls to assure public health and safety. For the removal option, all radioactive materials are removed from the site and the facility is refitted for other use or completely dismantled.

## **2.2.7 Long-Term Stewardship**

Cleanup plans and decisions strive to achieve an appropriate balance between contaminant reduction, use of engineered barriers to isolate residual contaminants and retard their migration, and reliance on institutional controls. Decisions are influenced by several factors:

- risks to members of the public, workers, and the environment
- legal and regulatory requirements
- technical and institutional capabilities and limitations
- current state of scientific knowledge
- values and preferences of interested and affected parties
- costs and related budgetary considerations
- impacts on, and activities at, other sites.

Reliance on institutional controls after contaminants have been reduced and engineered barriers have been put in place is referred to as long-term stewardship. Specific long-term stewardship activities depend on the specific hazards that remain and how those hazards are being controlled. Long-term stewardship activities are intended to continue isolating hazards from people and the environment. Specific long-term stewardship activities can include:

- monitoring to verify the integrity of caps placed over disposal sites
- maintaining caps to ensure their continued integrity
- monitoring groundwater and/or the vadose zone to determine whether systems that contain hazardous materials are performing as expected
- monitoring for surface contamination
- monitoring animals, plants, and the ecosystem
- performing groundwater pump-and-treat operations
- installing and maintaining fences and other barriers
- posting warning signs
- establishing easements and deed restrictions
- establishing zoning and land use restrictions
- maintaining records on clean up activities, remaining hazards, and locations of the hazards
- providing funding and infrastructure (e.g., utilities, roads, communications systems) necessary to support long-term stewardship activities.

DOE does not rely solely on long-term stewardship to protect people and the environment. As indicated in the DOE-sponsored report *Long-Term Institutional Management of U. S. Department of Energy Legacy Waste Sites* (National Research Council 2000), “contaminant reduction is preferred to contaminant isolation and the imposition of stewardship measures.” Contaminant reduction is a large part of the ongoing cleanup efforts at Hanford. The long-term stewardship plan for the Hanford Site was approved in August 2003 (DOE-RL 2003).

## 2.3 References

10 CFR 61. “Licensing Requirements for Land Disposal of Radioactive Waste.” Code of Federal Regulations. Online at: [http://www.access.gpo.gov/nara/cfr/waisidx\\_01/10cfr61\\_01.html](http://www.access.gpo.gov/nara/cfr/waisidx_01/10cfr61_01.html)

10 CFR 71. “Packaging and Transportation of Radioactive Material.” Code of Federal Regulations. Online at: [http://www.access.gpo.gov/nara/cfr/waisidx\\_01/10cfr71\\_01.html](http://www.access.gpo.gov/nara/cfr/waisidx_01/10cfr71_01.html)

10 CFR 962. “Byproduct Material.” Code of Federal Regulations. Online at: [http://www.access.gpo.gov/nara/cfr/waisidx\\_02/10cfr962\\_02.html](http://www.access.gpo.gov/nara/cfr/waisidx_02/10cfr962_02.html)

40 CFR 761. “Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution In Commerce, and Use Prohibitions.” Code of Federal Regulations. Online at: [http://www.access.gpo.gov/nara/cfr/waisidx\\_01/40cfr761\\_01.html](http://www.access.gpo.gov/nara/cfr/waisidx_01/40cfr761_01.html)