

Maple Ridge Cleanup Site Fictional Site Fact Sheet

BACKGROUND

Site Description

The Maple Ridge Industrial Site occupies 2200 acres, including 100 acres of buried waste, adjacent to the small town of Maple Ridge, Tennessee, population 30,000. The cleanup site is a former U.S. Department of Energy (DOE) Cold War production plant near a major highway and the Clinton River. The plant generated radioactive waste materials during the development of U.S. nuclear weapons. Waste from the uranium enrichment operations conducted at the plant between 1942 and 1964 were buried onsite in disposal trenches.

The site includes two distinct cleanup areas:

- ▶ zone 1- the light industrial area outside the main plant comprised primarily of contaminated buildings and infrastructure and
- ▶ zone 2- the heavily contaminated main plant which includes waste burial areas. (see Figure 1). The 2200 acre cleanup area contains approximately 100 acres of buried waste. There are 4 primary disposal trenches within the 100 acre burial area. Each waste area was re-stabilized in 1993 by covering the trenches with a minimal amount of soil for re-contouring.

Acquisition History

In 1940, the U.S. Atomic Energy Commission (AEC) bought the site from the County of Maple Ridge. Under terms of this agreement, AEC and its successor agency, DOE, own the land containing the Maple Ridge Cleanup Site. DOE is responsible for long-term custody and care of the facility and the radioactive materials left in place. The plant site was partially converted (clean areas only) to an industrial park in 1995 with plans to complete the conversion following waste cleanup to industrial exposure standards.

Site Highlights

Site Category: No Long-term (ongoing) DOE mission site will be converted to an industrial park (brownfields concept).

Total Site Area: 2200 acres

Implemented Remedy: Source material excavation and capping of contaminated soil; decontamination and/or demolition of infrastructure (buildings)

Estimated Volume of Disposed Waste: 250,000 gallons of mixed waste in 5,000 buried 55-gallon drums; 35,000 pounds of solid mixed waste

Primary Contaminants: uranium, chromates, nitrates, mercury

Major Long-Term Stewardship

Activities: Cap performance monitoring; access restrictions; deed restrictions (water use, digging, etc)

Expected Entry Into Long-Term Stewardship: August 15, 2015

Current Landlord: U.S. Department of Energy, Office of Environmental Management

Expected Future Landlord: U.S. Department of Energy, Office of Legacy Waste Programs Management

Operational History

The Maple Ridge Plant generated waste from uranium enrichment operations using the gaseous enrichment process. The Maple Ridge Plant was involved with the enrichment of uranium from reactor grade (4%) to weapons grade (90%). The waste from the plant consisted of liquid waste, dry solid waste, sludges, scrap, debris, equipment, and other heterogeneous materials. This waste was deposited into the zone 2 disposal areas

(see Figure 1). The predominant contaminant (90%) was uranium-235 with small amounts of uranium-233, -234, and -238.

Some of the uranium-contaminated sludges were also contaminated with machining oils and cleaning solvents (e.g., trichloroethylene) that were absorbed in Oil-Dri (a kitty litter-type substance) and placed in plastic bags before being disposed.

By the time operations ended in 1964, Maple Ridge Plant had designated approximately 100 acres of waste areas comprised primarily of buried waste trenches. The waste disposal practices varied through the years. In the early years, the wastes were sometimes in containers that were neatly placed in the active trenches, and at other times, waste was dumped into the trenches because of concerns about worker exposures. As health physics monitoring improved and burial space became limited, a portion of the waste was physically treated (cutting, compaction, etc) to reduce the volume of material prior to burial. The volume reduced waste was containerized and placed in the trenches.

Regulatory Requirements

DOE's Office of Environmental Management is conducting cleanup activities under the conditions established in a Federal Facility Agreement (FFA) signed by DOE, the U.S. Environmental Protection Agency, and the State of Tennessee. The FFA coordinates cleanup activities conducted at the site under both Resource Conservation and Recovery Act of 1976 (RCRA) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulations.

Site Characterization

Due to historical cleanup practices, contaminants leaked from the burial areas into the soil below. In addition to the source materials (waste) in the trenches, the primary contaminants of concern identified in soils at Maple Ridge include, uranium-238, nitrates, chromates, and mercury. The presence of these contaminants in the subsurface was determined to pose a threat to human

health and the environment, which required remediation. Methods of potential exposure included chemical leaching into groundwater, contact with the materials by plants or animals, and direct exposure to onsite workers.

REMEDIAL ACTION

Remedial Action Objectives

The Proposed Plan for Maple Ridge includes excavation of source material and soil in the top 10 feet of the surface of the trench areas and capping of contaminated soil below 10 feet. Contaminated buildings will be decontaminated or demolished. A Record of Decision was signed on July 12, 2004, for the Maple Ridge Plant site that specified the following remedial action objectives that must be met and maintained for as long as the waste remains in place:

- Protect the industrial worker by having at least 10 feet of non-contaminated material above the source material and associated contaminated soils to eliminate external dose to workers as well as eliminate flux of volatile organic compound vapors to the surface.
- Control leaching of contaminants to groundwater by applying a cap to minimize infiltration.
- Prevent erosion by using surface water drainage channels.
- Minimize biointrusion (e.g., plants and animals) into the waste material.
- Decontaminate and/or demolish contaminated buildings and structures
- Implement institutional controls, including site fencing and land-use restrictions.
- Implement groundwater monitoring to determine effectiveness of remedy in preventing groundwater contaminants associated with waste materials

DOE agreed to remediate the cleanup areas to industrial cleanup levels. Currently, no contaminants have been found outside the zone 2 cleanup areas (except for contaminated buildings which will be decontaminated or demolished).

Remedial Design

To achieve the remedial action objectives mentioned above, the following actions will be taken:

- Trenches located in cleanup area 4 were excavated to industrial cleanup levels *regardless of depth* (see Figure 2). It was necessary to retrieve and dispose of this source material to prevent migration of contamination into the nearby river.
- All four cleanup areas will be excavated to 10 feet and capped under one single cap. The remedial cap will consist of several layers:
 - A topsoil and vegetative layer.
 - A geocomposite drainage layer and biotic barrier.
 - A low-permeability clay layer.
 - A 0.6-meter (2-foot) compacted, native soil layer.
 - Geogrid reinforcement material (riprap or other gravel) overlaying the waste.
- Drainage channels will be constructed to prevent surface water flow into the trenches and erosion of the cap.

LONG-TERM STEWARDSHIP

Long-Term Stewardship (LTS) Program activities are structured to protect human health and the environment by ensuring compliance with exposure limits established in Title 10 *Code of Federal Regulations* Part 20. Long-term stewardship activities at Maple Ridge will continue until all cleanup objectives are met and maintained.

Roles and Responsibilities

DOE is responsible for maintaining all lands and structures at this site, including those that are not associated with radioactive materials. DOE administers the institutional controls at the site that prevent access to and dispersion of the isolated radioactive materials.

DOE's Office of Environmental Management (environmental restoration) is responsible for all activities at the site. DOE has entered into an agreement with a local stakeholder organization to pursue the development of the site as an industrial park. Currently, a portion of the uncontaminated buildings in zone 1 are leased to private companies. DOE anticipates that all remedial activities will be completed by August 2010, at which time the Office of Environmental Management's mission will end. The Office of Legacy Management will have responsibility for long-term stewardship activities following cleanup.

Long-Term Monitoring Requirements

The capped trenches will be monitored in accordance with RCRA regulations. Three groundwater wells will be installed to monitor potential subsurface migration to groundwater. One monitoring well will be installed upgradient of the site and two wells will be installed downgradient of the site. Depth to groundwater is 8.8 yards, as illustrated in an idealized depiction of the subsurface in Figure 3.

As part of the design process, the following key uncertainties were identified, with respect to the integrity and performance of the cap, that warrant monitoring over time:

- Surface erosion that could cause degradation of the cap.
- Subsidence or loss of surface elevation because of removal of subsurface support, such as a sinkhole.
- Lateral infiltration of water or horizontal flow of water through the ground (i.e., perched water zone)

Figure 1: Zone 2 Disposal Locations

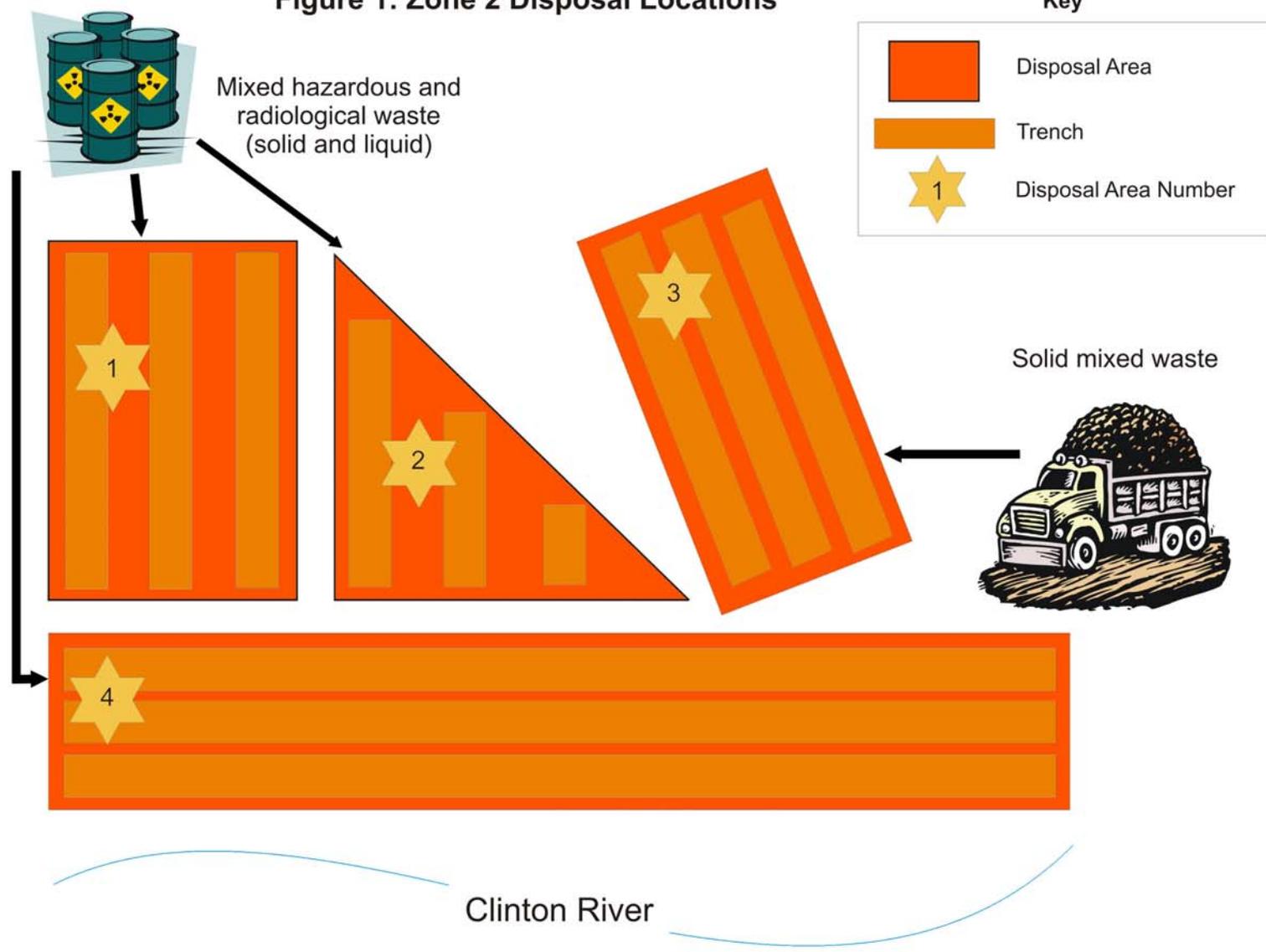


Figure 2: Remedial Action: Source Material Excavation and Capping

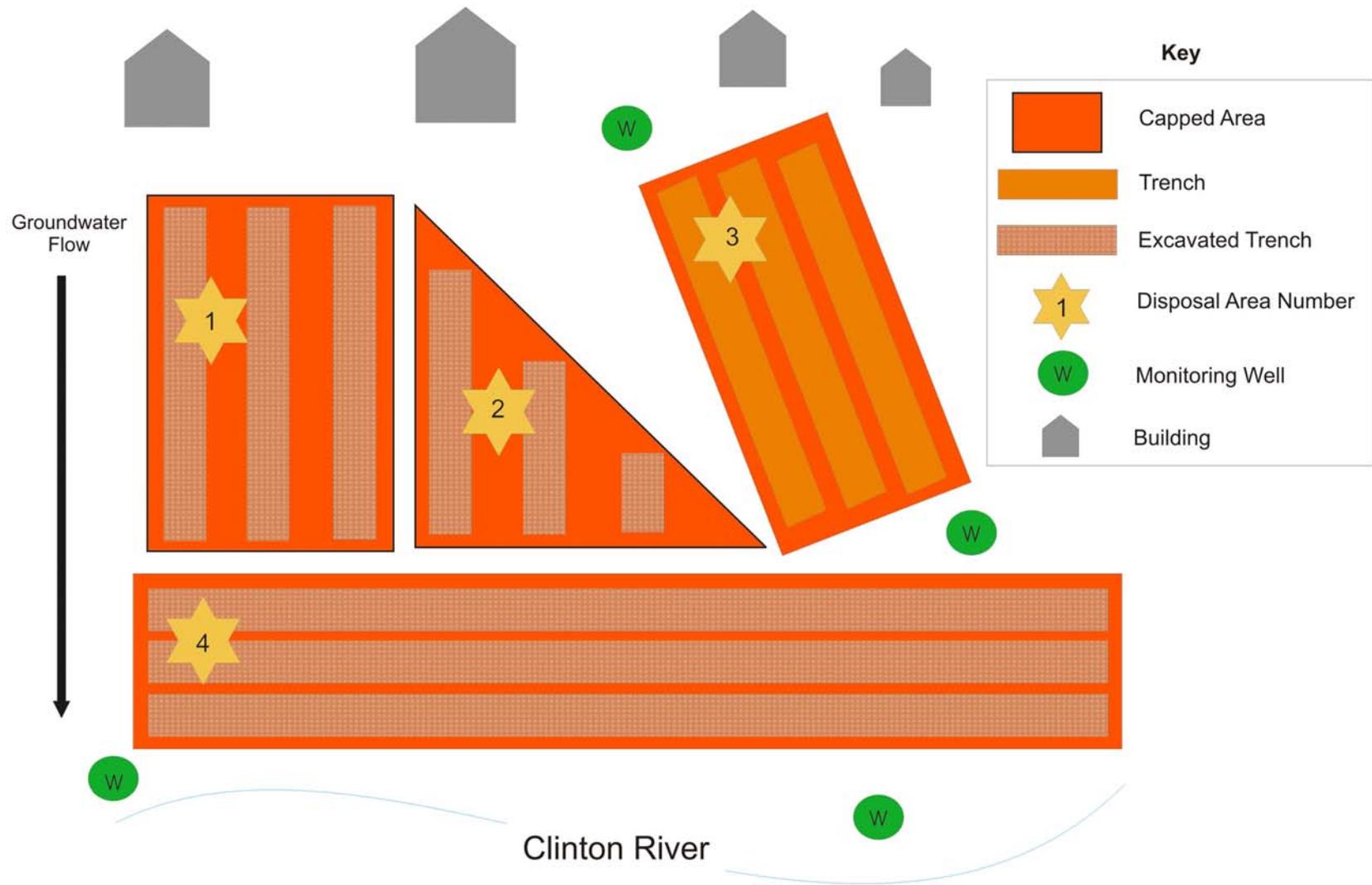


Figure 3. Subsurface cross section of the Maple Ridge Site (not to scale).
(Table 1 provides hydrologic and geologic characteristics of the subsurface.)

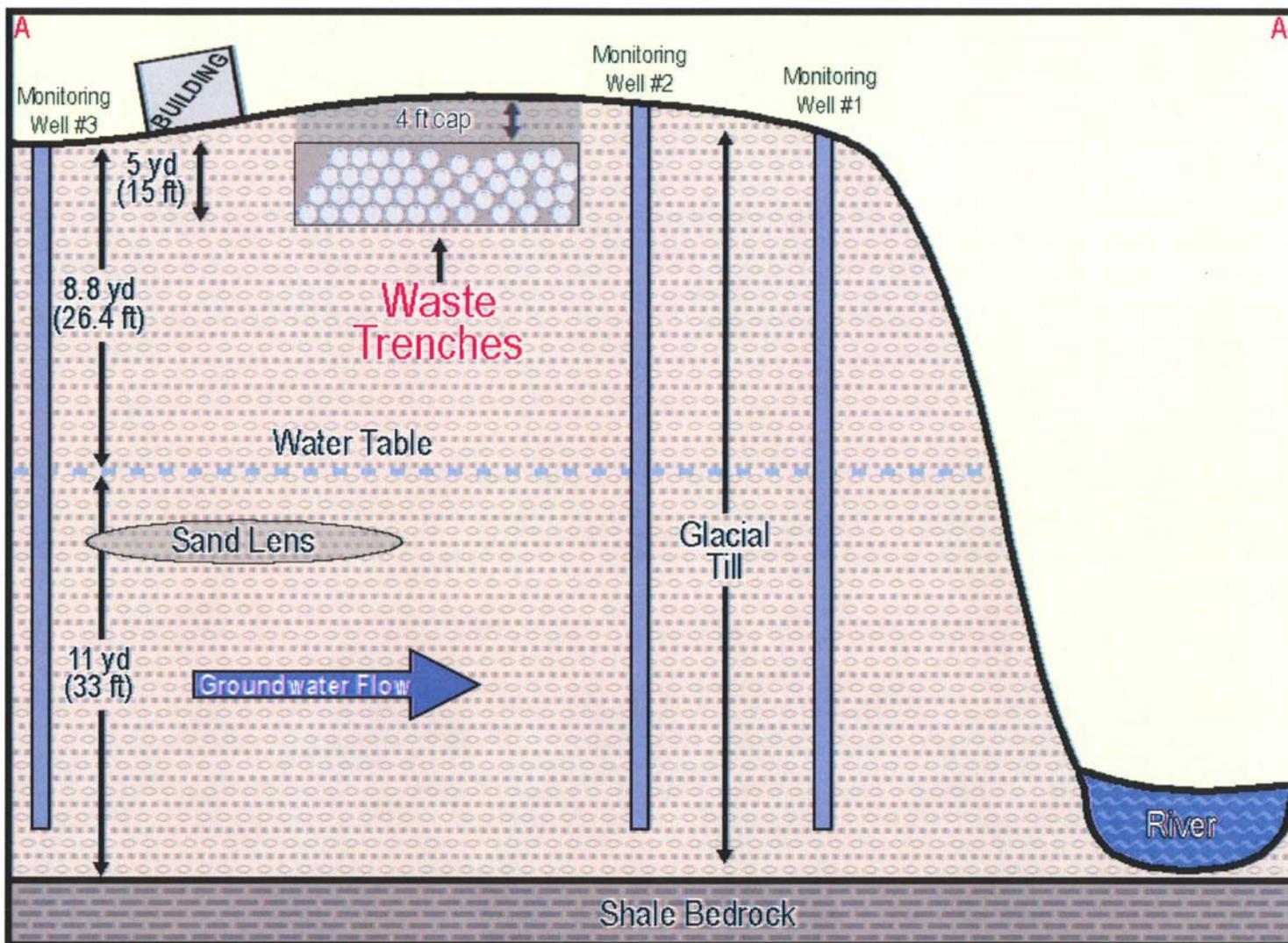


Table 1. Hydrologic and Geologic Characteristics of the Maple Ridge Cleanup Site.

Parameter	Values
Precipitation	64 in./yr
Percentage of precipitation that infiltrates the soil	40 to 60%
Depth to water table	8.8 yards
Depth to top of waste trench	4 feet
Waste trench depth	5 yards
Saturated thickness	10.9 yards

Saturated thickness – the distance from the water table surface to the base of aquifer

Glacial Till – an unsorted loose mixture of particles from clay to boulder size

Note: The movement of a contaminant through the ground relative to groundwater maybe retarded because of various factors, e.g., nature of contaminant, characteristics of the aquifer.

Regulators Group Breakout Summary Sheet

GENERAL INFORMATION

Group Name: Regulators (state and national representatives responsible for enforcement of environmental laws)

Fictional Site: Maple Ridge Disposal Site (humid/rural/long-term mission)

Relationship: Those responsible for oversight of land.

Group Spokesperson:

RESULTS OF BREAKOUT SESSION

- **What are the most important issues to the regulators?**

- **What do the regulators envision for this site 100 years from now?**

- **What activities can the regulators participate in to ensure long-term stewardship of this Disposal Site?**

- **What are the key factors in retaining and preserving information about the disposal site for future generations? (Consider current systems such as county property title and deed registration, Global Positioning Systems and Maps, Computer software and hardware, etc.) How do you think information will be managed in 50 to 100 years?**

Owners Group Breakout Summary Sheet

GENERAL INFORMATION

Group Name: Owners (those who have ownership of contaminated land)

Fictional Site: Maple Ridge Disposal Site (humid/rural/long-term mission)

Relationship: Government agency and/or private individuals that have proprietary interest in contaminated land.

Group Spokesperson:

RESULTS OF BREAKOUT SESSION

- **What are the most important issues to the owners of contaminated land?**

- **What do the owners envision for this site 100 years from now?**

- **What activities can the owners participate in to ensure long-term stewardship of this Disposal Site?**

- **What are the key factors in retaining and preserving information about the disposal site for future generations? (Consider current systems such as county property title and deed registration, Global Positioning Systems and Maps, Computer software and hardware, etc.) How do you think information will be managed in 50 years? 100 years?**

Neighbors Group Breakout Summary Sheet

GENERAL INFORMATION

Group Name: Neighbors (The individuals or groups that own clean land adjacent to the contaminated property)

Fictional Site: Maple Ridge Disposal Site (humid/rural/long-term mission)

Relationship: Neighbors that live close to disposal site

Group Spokesperson:

RESULTS OF BREAKOUT SESSION

- What are the most important issues to the neighbors of the contaminated land?
- What do the neighbors envision for this site 100 years from now?
- What activities can the neighbors participate in to ensure long-term stewardship of this Disposal Site?
- What are the key factors in retaining and preserving information about the disposal site for future generations? (Consider current systems such as county property title and deed registration, Global Positioning Systems and Maps, Computer software and hardware, etc.) How do you think information will be managed in 50 to 100 years?