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GREATER CONFINEMENT DISPOSAL PROGRAM

by

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ABSTRACT

A demonstration Greater Confinement Disposal facility, consisting of twenty GCD boreholes, began accepting solid low-level radioactive waste at the Savannah River Plant in 1984. Three of the boreholes have been filled with the higher activity fraction of SRP solid waste. They have been stabilized with grout to prevent subsidence and reduce water infiltration. Closure will take place when all twenty boreholes have been filled. A Greater Confinement Disposal trench project is underway, with construction scheduled to begin in November 1985. Trench volume will be 100,000 cubic feet.

INTRODUCTION

The Savannah River Plant is conducting two demonstrations of Greater Confinement Disposal of the higher activity fractions of low-level solid radioactive waste. The first demonstration is a cluster of twenty GCD boreholes which are presently being filled with SRP waste. The second is a GCD trench, with construction scheduled to begin in November 1985.

Greater Confinement Disposal, as defined in DOE Order 5820.2, is "A technique for disposal of waste that uses natural and/or engineered barriers which provide a degree of isolation greater than that of shallow land burial but possibly less than that of a geologic repository." At Savannah River, the techniques are deeper burial, surrounding the waste forms by a foot or more of grout, stabilization of waste emplacement by grout, and closure methods to prevent root intrusion to the waste and to reduce to a minimum the percolation of water to the waste.

GCD BOREHOLES

Borehole Construction Resume

The GCD borehole construction proceeded as follows:

- Concept development and design 1/83 - 11/83
- Construction of 20 boreholes 11/83 - 2/84
- Turnover to operations 2/84 - 7/84
- Prepare operating procedures 7/84 - 9/84
- First waste emplacement 9/84

From concept development to the first waste emplacement took 20 months.

The borehole design is shown in Figure 1. Waste is emplaced in a 7-ft diameter, 20-ft-high fiberglass liner -- total volume 770 cubic feet. The liner is placed on a 1-ft-thick concrete pad in a 9-ft-diameter augered hole. The surface of the pad is 30 ft below grade, making the top of the waste in the fiberglass liner at least 10 ft below grade. The liner is surrounded by a 1-ft-thick annulus of grout. A monitoring well is installed adjacent to the liner. On top of the fiberglass liner is a removable steel collar that prevents soil from collapsing on the liner during construction and waste emplacement and provides support for a safety fence and a rain cover.

The boreholes are spaced 16.5 ft center-to-center in two rows of ten in the SRP burial ground. The area is graded to prevent surface water intrusion, and provided with a hard gravel surface for crane access.

Each borehole can hold six layers of seven 55-gallon drums each, or boxed waste at less volume utilization.

Borehole Operating Status

As of August 1985, three boreholes have been filled with GCD triggered waste, and a fourth is 3/4 full. GCD trigger values are based on the activity/volume split for SRP waste, such that under ideal circumstances 5% of the volume of low-level solid radioactive waste would contain 98% of the activity. This activity/volume split was determined by examination of the computerized burial records maintained by Savannah River. Each waste shipment is accompanied by a burial slip which includes information on the activity and volume of the waste. This information is used to segregate the waste into GCD and SLB fractions. Presently used trigger values are as follows:

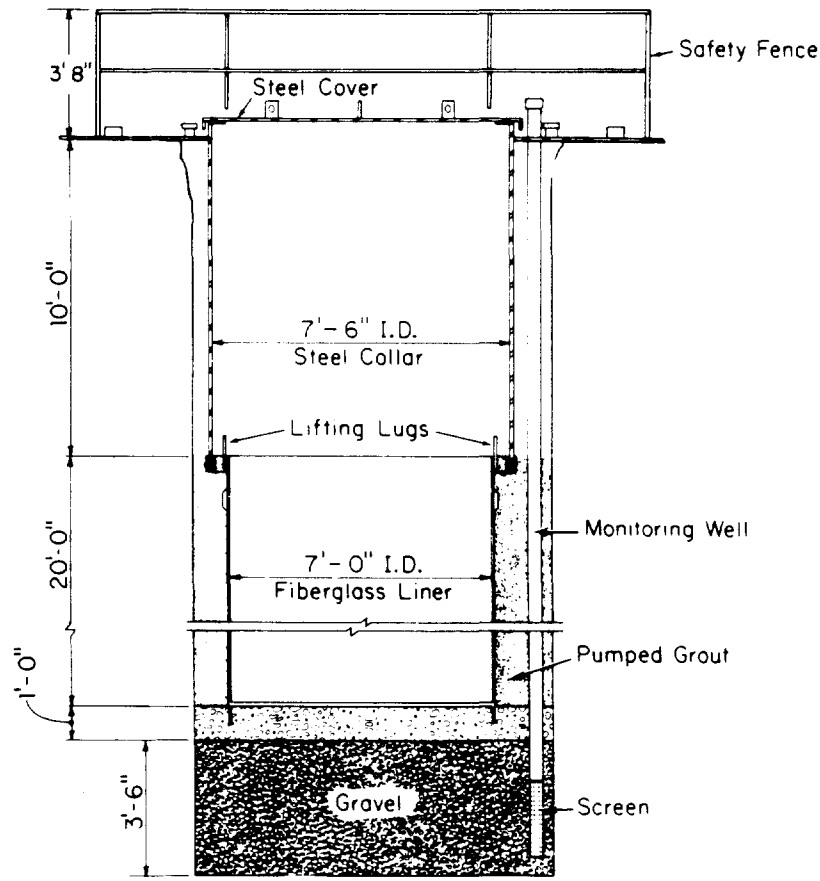

Figure 1. Borehole design.

This shows the design of the borehole. A 9-ft diameter hole is augered to a depth of 34.5 ft. Then a steel collar with a safety fence, a monitoring well, and gravel to cover the screened portion of the well are placed. A concrete pad is poured on top of the gravel and allowed to set. Finally, a fiberglass liner is set on the concrete pad and a cement grout is poured in the annular space around the liner.

Radionuclide	Trigger Value, Micro Ci/cc
Tritium	2
Cobalt-60	100
Strontium-90	0.04
Cesium-137	1
Fission products	Same as strontium
Induced activity	1% of cobalt value

The GCD trigger values for the first four radionuclides are equal to or less than the limits for Class B waste given in 10 CFR 61.

While GCD utilization has been low for the first ten months of operation (September 1984 through June 1985), borehole utilization is expected to increase with increased familiarization with procedures and increased emphasis on segregating the GCD triggered waste.

One of the boreholes contains, among other waste, 54,500 curies of tritium packaged in 40 cubic feet of waste volume, corresponding to a concentration of 48,000 μCi/cc, well above the GCD trigger value for tritiated waste. The other boreholes contain californium-252 waste, for which no trigger values exist at present. The californium waste was emplaced in the GCD boreholes because of its large neutron emission rate. One of the boreholes contains 21,100 μg of Cf-252, corresponding to a neutron emission rate of 5×10^{10} neutrons/second.

Monitoring wells in the GCD boreholes have been dry, making analysis impossible, but indicating that no water is percolating through the borehole system.

Closure Plans

When the twenty boreholes have been filled and the waste grouted in place, the top collars, safety fences, and covers will be removed. These can be reused for another set of boreholes. Soil and a 2-ft-thick clay cap will be constructed over the two rows of ten boreholes to a total depth of 16 ft from the surface to the top of the borehole, as shown in Figure 2. In addition, the monitoring wells will be extended to the surface. The design intent of the 16 ft of soil cover is to reduce the probability of root intrusion to the waste to near zero for plants indigenous to this area.

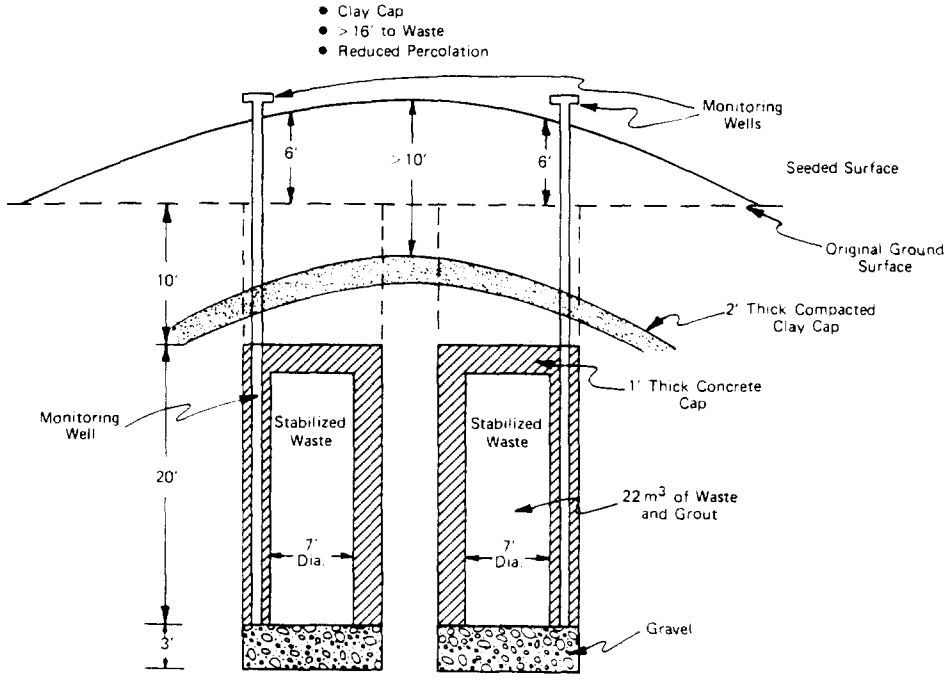

Figure 2. GCD borehole closure.

This is the design for closure of the GCD boreholes. After the boreholes are filled with waste, the collars will be removed and a low-permeability clay cap will be placed over the two rows as shown. Native soil will be added on top of this clay until the grade level is 6 ft above the original grade level. This will make the minimum distance between the waste and grade level 16 ft and will help prevent future root and animal intrusion.

GCD TRENCH

Trench Design

A GCD trench demonstration project is underway, with construction scheduled to begin in November 1985. One trench will be built, which will be divided into four cells, each 25 ft x 50 ft. The trench will have a concrete floor and sheet pile walls. Waste will be emplaced about 1 ft from the walls, and this space will be filled with grout after waste emplacement. Rain covers will be provided for each of the cells.

The general design concepts for the GCD trench are the same as for the boreholes. Waste forms will be stabilized in grout; monitoring wells will be provided to collect any percolating water (none is expected); and a closure design will ensure that root penetration to the waste forms will not occur.

Total GCD trench volume will be 100,000 cubic feet for the demonstration phase. The GCD trench will be able to accept waste forms too large to be emplaced in GCD boreholes. The waste forms will consist mainly of 96 cubic feet B-25 metal boxes, which will be emplaced in the cells by means of a straddle crane. Bulky GCD waste is generated at the rate of about 70,000 cubic feet a year.

A trench demonstration will test construction and waste emplacement methods. The information will be used to develop cost effective designs for improved waste emplacement in new waste disposal areas.

Construction should be completed by the first half of 1986, when waste emplacement should begin.

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