U.S. Department of Energy

In-situ Vitrification

In-situ vitrification was one of several cleanup options examined for the Glass Holes area at Brookhaven National Laboratory. After reviewing the results of a 1996 pilot study, the Laboratory decided to remediate the Glass Holes by excavating them and disposing of the wastes off site.

Pilot study of in-situ vitrification (1996)

In the southeast portion of the Lab site, waste pits referred to as "Glass Holes" were used between the mid-1950s and early 1980s to dispose of wastes including chemical containers, glassware, and biological waste. The pits ranged in size from about 10 to 20 feet wide and eight to 15 feet deep.

Prior to cleaning up these pits, the Laboratory examined several alternatives. An emerging technology, referred to as in-situ vitrification, was one of those considered. After much deliberation, in-situ vitrification was piloted at the Lab under simulated waste pit conditions.

Description: In-situ vitrification (ISV) involves using electricity to melt the waste and surrounding soil in place, then cooling it to form glass. Contaminants not destroyed by the heat are encapsulated within the glass so they cannot leach into the surrounding soil or groundwater.

To melt the waste and soil, electrodes are placed into the ground surrounding each waste pit. An intense electrical current flows between the electrodes, generating enough heat to melt the intervening material and form the glass material.

ISV Pilot Test: In 1996, in-situ vitrification was conducted on a simulated waste pit involving approximately one ton of soil, solid debris and sealed containers. The melting operation itself was successful. Monitoring showed substantial destruction and/or removal of the simulated organic contaminants. Simulated metal contaminants were immobilized in the glass as expected. However, some of the simulated contaminants appeared to be dispersed away from the melt area by the process.

Pilot Test Results: The pilot study raised concerns about the effectiveness of ISV. The ability of ISV to adequately capture or destroy organic contaminants in the pits was uncertain. The possibility of sealed containers rupturing during the process and releasing chemical contaminants to the surrounding soil and groundwater caused additional concern.

Unresolvable concerns were also raised about the pre-vitrification treatment of the soil to modify its conductive properties. It was uncertain whether the contractor could reliably apply the material so that it would be evenly distributed in and below the pit which could result in an incomplete melt. This raised concerns that increased follow-up testing and/or monitoring would be required compared to other cleanup options. It was decided that the process presenting the least risk to the aquifer was excavation.

Following in-situ vitrification, a solid block of glass remains after cooling.

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