



## Project Summary

# Feasibility of In Situ Solidification/Stabilization of Landfilled Hazardous Wastes

J. Bruce Truett, Richard L. Holberger, and Kris W. Barrett

**A study was made of the feasibility of solidifying or stabilizing hazardous industrial wastes that are already in place at a landfill. Solidification and stabilization methods were examined for their applicability to specific conditions at the LaBounty waste disposal site at Charles City, Iowa. None of the methods appears suitable for in situ application as a principal means of pollution control at this site because of large variations in the permeability of the fill material and the diverse chemical composition of the wastes.**

***This Project Summary was developed by EPA's Municipal Environmental Research Laboratory, Cincinnati, OH, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).***

### Introduction

This study investigated the feasibility of solidifying or stabilizing hazardous industrial wastes that are already in place at a landfill. Solidification methods considered included (1) incorporating the waste in solid masses formed by cement, lime, lime plus siliceous materials, organic polymers, or thermoplastic materials such as bitumens; (2) fusing the waste with soil to form a vitreous solid; and (3) isolating the waste by enclosing it in impermeable, inert envelopes (surface encapsulation) or smaller capsules (microencapsulation), or by constructing an impermeable barrier of grout or other material that completely surrounds the entire mass of landfilled waste. The study

also considered other waste stabilization methods that do not involve solidification, such as neutralizing or destroying hazardous constituents through chemical reactions, or immobilizing toxic ions by ion-exchange mechanisms. The neutralizing or immobilizing agents can be applied most effectively by injection into the fill or surrounding soils.

None of the solidification methods appears generally applicable to large landfills containing mixed industrial wastes, but two methods, injection of reactive chemical agents and vitrification, appear promising for some specific applications.

The more promising methods were examined for possible application at a specific landfill—the 8.5-acre LaBounty site at Charles City, Iowa. This fill poses several problems for in situ remedial actions, including diverse chemical constituents that are partially below the water table and are in contact with highly-fractured bedrock containing an important aquifer system.

### General Feasibility of In Situ Solidification and Stabilization

A number of methods are available for effectively solidifying or otherwise stabilizing a great variety of hazardous wastes—particularly inorganic wastes, but also an increasing number of organics. Some of these methods have been demonstrated and are commercially available for large-scale applications. All of the demonstrated methods require thorough mixing of the waste and solidification or stabilization agents.

The effective use of existing solidification methods for in situ application to wastes buried in landfills is technically infeasible at the current state of technology with one possible exception—vitrification by electrical energy. But this method is economically infeasible for large-scale use with most industrial hazardous wastes.

On the other hand, existing stabilization methods that do not involve solidification are feasible for in situ application to landfilled wastes under certain conditions where simple neutralization and/or oxidation-reduction reactions are possible. No actual examples of large-scale applications of in situ solidification or stabilization in the United States were identified during the present study.

Two commonly encountered characteristics of industrial landfills that militate against the in situ application of solidification or stabilization technology are.

- Large variations in the permeability of the landfilled wastes (and inter-mixed soils) from one part of the fill to another, and
- Diversity in the chemical constituents of the wastes and variations in their concentration from one part of the fill to another.

Chemical components of some wastes may interfere with the desired action of certain solidification or stabilization agents, whether they are applied before deposition of wastes in a landfill, in situ, or after the wastes have been moved. No generally available base of quantitative data exists on how various concentrations of specific interfering substances affect the performance of specific solidification or stabilization agents.

### **Feasibility of In Situ Solidification and Stabilization at the LaBounty Site**

Identified solidification and stabilization methods are not feasible for in situ application at the LaBounty landfill, principally because of four conditions at this site:

1. Large variations in permeability of the chemical fill and soils from one part of the fill to another;
2. The diverse chemical composition of the landfilled wastes and their

heterogeneous distribution within the fill;

3. The lack of suitability of the principal hazardous constituents of the site to currently available in situ methods; and
4. The highly-fractured condition of the bedrock underlying the site.

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*The complete report, entitled "Feasibility of In Situ Solidification/Stabilization of Landfilled Hazardous Wastes," (Order No. PB 83-261 099; Cost: \$11.50, subject to change) will be available only from:*

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