APPENDIX D

DATA ON AVAILABLE VITRIFICATION CAPACITY

This appendix has two sections:

D-1: Provides a phone log of vitrification facilities and vendors the Agency contacted.

D-2: Describes the vitrification technology, its applicability, limitations/constraints, and availability/costs.

PHONE LOG OF VITRIFICATION FACILITIES

Mr. Matt Haas
Geosafe Corporation
Location: Richland, WA
Phone: 509-375-0710
Interview conducted by: Gail Shaw
Date of interview: March 7, 1997
Date of follow-up interview: April 11, 1997

Mr. Haas responded that their facility is the only supplier of in-situ vitrification. They currently have one system operating which has an available capacity of 15,000 tons/year. The facility can readily expand its operations to three systems if the demand arises. Therefore, their current maximum capacity would be 45,000 tons/year.

Mr. Doug Rosholt
MSE Technology Applications
Location: Butte, MT
Phone: 406-494-7100
Interview conducted by: Gail Shaw
Date of interview: March 7, 1997
Date of follow-up interview: April 11, 1997

Mr. Rosholt responded that their commercial facility supplies plasma vitrification. Their available capacity is 2,000 tons/year; that is also their maximum capacity.

Ms. Yvonne Eglanton
Vortech Corporation
Location: Collegeville, PA
Phone: 610-489-2255
Interview conducted by: Gail Shaw
Date of interview: March 7, 1997

Ms. Eglanton responded that their corporation is a vendor of vitrification technology equipment.

Mr. Matt Mede
Retech
Location: Ukiah, CA
Phone: 707-462-6522
Interview conducted by: Gail Shaw
Date of interview: March 7, 1997

Appendix D-2

ATTACHMENT TO MEMORANDUM FROM BILL KLINE (U.S. EPA)
TO ICF INCORPORATED, MARCH 17, 1994

Vitrification

1. Process Description

Vitrification is the process by which contaminated soils are converted into chemically inert and stable glass and crystalline materials by a thermal treatment process operating at a temperature of 2000 degrees F to 2800 degrees F. This technology is primarily intended for the treatment of heavy metals; however, an organics content of up to 20% can be handled. A high current of electricity is passed through electrodes inserted into the contaminated soil. The heat causes a melt that gradually works downward through the soil. Organic constituents are destroyed while the inorganic contaminants are immobilized in the high compressive strength glass-like or ceramic end product. A volume reduction of 20% to 45% is achieved. Types of vitrification processes include glass-melting furnaces, ~~high-temperature fluid-~~ wall reactors.

2. Waste Applicability

Vitrification was originally tested as a means of immobilizing low level radioactive metals. However, it can be applied to a wide range of contaminants. The process destroys nitrates and partially decomposes sulfate compounds. Fluoride and chlorine compounds are dissolved into the glass materials up to their limits of solubility. Wastes containing heavy metals, PCBs, for example, will either fuse or vaporize.

3. Limitations/Constraints

Vitrification processes are very energy intensive (800-1000 kw/ton), requiring temperatures up to 2500 degrees F for fusion and melting of the waste-silicate matrix. Commercial waste management companies may not have built vitrification processes because: vitrification is only specified as BDAT for a few relatively small-volume hazardous wastes, there is little,if any operating experience with the process, and RCRA permitting officials have essentially no experience with this process. Total organic concentrations are limited to 20% by weight. Also, inorganic debris is limited to a maximum of 20% by volume.

4. Availability/Capacity/Costs

At this time, vitrification processes have not been widely accepted. As mentioned above, this may be due to the high operation costs, technical complexity of the process, and difficulty in obtaining permits. The cost of this process can go up to $1000 per ton, with an average cost in the range of $400-$600 per ton of soil. The following companies* are believed to provide vitrification processes:

1. B&W Nuclear Environmental Services, Inc.; pilot-scale

unit: 200 lb/hour

2. DOE/Battelle Memorial Institute's Pacific Northwest Laboratory; pilot scale; 3 units constructed, 6 other units planned: 10-25 tons/day
3. Electro-Pyrolysis, Inc.: pilot-scale unit: 100-500 lb./hour
4. EM&C Engineering Assoc.; bench-scale; hoped to go full-scale in 1993
5. Geosafe Corp.; full-scale unit: 4-6 tons/hour; 1 unit constructed, 1 other unit planned
6. J.M. Huber Corp.
7. Penberthy Electromelt International, Inc.
8. Pyrogenics, Inc.
9. Stir-Melter, Inc.(subsidiary of Glasstech, Inc.); full-scale unit: 2 tons/hour
10. Texaco Syngas, Inc.; full-scale unit: 2-4 tons/hour
11. Thagard Research Corp.
12. Western Product Recovery Group, Inc.: full-scale unit: 600-1000 lb./hour; 1 planned unit
13. Vortec Corp.: pilot-scale unit: 20 tons/day
14. Vulcan Resources, Ltd.
15. Westinghouse Electric Corp.

* NOTE: Many of the above-mentioned bench-scale/pilot-scale systems for each of the treatment technologies were reported as being such nearly a year ago. Thus, it is quite feasible that at least some of these systems are now commercially available as full-scale systems.

Mr. Mede responded that their corporation is a vendor of vitrification technology equipment.