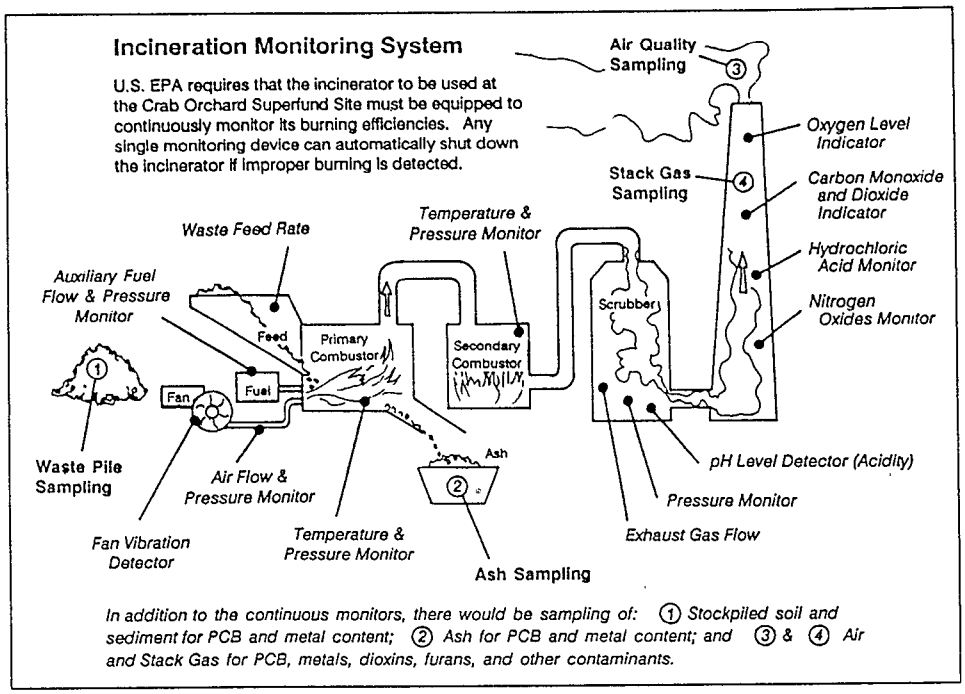
Treatment by Incineration

Crab Orchard National Wildlife Refuge Superfund Site

Williamson County, Illinois

August 1990



The Final Clean Up Plan

Treatment of PCB-contaminated soil and sediment by incineration

The 30,000 cubic yards of PCB-contaminated soil and sediment would be excavated, then burned in a mobile incinerator at the Crab Orchard site. The incinerator would destroy or remove 99.9999 percent of the PCBs, breaking it down into non-toxic elements like hydrogen and carbon. The ash resulting from incineration would then be tested to determine if it is contaminated with hazardous metals. If contamination is found, then the ash would be encased in a cement-like material and placed in a landfill which would be constructed at the Refuge.

How long will the mobile incinerator be present at Crab Orchard?

U.S. EPA estimates that the total cleanup of the PCB-contaminated areas would take between two and a half to five years. The mobile incinerator would actually be burning material for slightly less than one year. The remaining time needed for the cleanup project would be used for developing the incinerator specifications, selecting a contractor, excavating the soil and sediment, bringing the incinerator to the site, conducting a complex series of tests to make sure the incinerator will operate correctly, constructing a landfill for ash, incinerating the materials, landfilling ash, and moving the incinerator off-site when the burning is complete.

Would the incinerator be used to burn materials from other sites?

No. While at the Refuge, the incinerator would only accept PCB-contaminated soils and sediments from Crab Orchard. It would be illegal to accept waste from other sites.

Who would be responsible for the safe operation of the mobile incinerator?

U.S. EPA would be responsible for the safe operation of the incinerator. U.S. EPA would ensure that the incinerator selected for the site, and the contractor selected to run it, are able to meet safety and performance standards. To further ensure that the incinerator is operated safely, an independent contractor would continuously monitor the operation of the incinerator. Additionally, U.S. EPA and Illinois EPA would periodically inspect the operation and would review all quality control equipment and procedures and all performance, sampling, and other data produced by monitoring the incinerator. Finally, information concerning the incinerator, its operator and operations would be placed in the Crab Orchard information repositories.

One key factor in preferring incineration over other alternatives was that by destroying the PCBs the public health and environmental threat would be eliminated to the maximum extent possible. Superfund regulations require U.S. EPA to choose alternatives that permanently address contamination problems and that use treatment to decrease the toxicity, mobility, or volume of hazardous material present.

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Does incineration result in health risks?

No incinerator or presently known technology can destroy 100 percent of the hazardous waste. For PCBs, U.S. EPA requires that 99.9999 percent must be destroyed or removed. Emissions from the incinerator at the smoke stack may not exceed levels which might result in the risk of one person in a million contracting cancer. Since the incinerator would be operated in an area with restricted public access, health risks from emissions would be at much lower levels. Tests of operating state-of-the-art incinerators have found them capable of meeting or surpassing performance and emissions standards.

Currently, the PCB-contaminated soil poses a one-in-a-thousand cancer risk from periodic contact by humans. In contrast, a person breathing emissions right next to the incinerator during the entire period of operation would have more than a 10,000 times lower risk of contracting cancer than from conditions presently existing at the site.

Will the incinerator cause air pollution?

One potential problem with incineration is the formation of toxic chemicals called dioxins and furans. These can result from improperly operated incinerators that do not completely burn material. The chemicals can be formed in the incinerator and released through the smoke stack. In order to ensure that these materials are not formed, the incinerator would be equipped to automatically shut down if the incinerator temperature drops below the level needed to completely burn the material. The incinerator would stop well before the temperature inside drops to the point where dioxins and furans may be formed. A second safety feature of the incinerator would be sampling equipment, which would monitor emissions to ensure complete burning.

Because metals can not be destroyed by incineration, the metals which contaminate some of the soil could be emitted during incineration. However, the incinerator would include air pollution control equipment designed to capture those metals so that they would not be released into the air. The most significant metal present at Crab Orchard is lead. U.S. EPA has developed air quality standards which are designed to protect the public from health threats caused by the inhalation of lead. The incinerator must meet or exceed these standards at all times during operations.

Finally, concern has been expressed that small particles emitted from the incinerator may pose a health risk. U.S. EPA has established standards for the emission of small particulates, which limit emissions to below levels which may pose a health risk. The incinerator must meet or exceed these standards at all times during operation. Small particulate emissions would be controlled with air pollution control equipment and monitored to ensure compliance.

For More Information

U.S. EPA Officials

If you would like to speak to a U.S. EPA official about this fact sheet or anything related to the Crab Orchard site, please contact:

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Toll Free: 1(800) 525-2515, 9a.m. to 4p.m.

Information Repository

Information repositories are notebooks maintained by U.S. EPA in your community that contain information about the Superfund program and the Crab Orchard National Wildlife Refuge site. The remedial investigation (RI) report, feasibility study (FS) report, all Crab Orchard site fact sheets, and the proposed plans are among the documents available for review in the repository. You are encouraged to consult these documents for more detailed information about the activities described in this fact sheet.

U.S. EPA maintains four repositories for the Crab Orchard site:

Marion Carnegie
Public Library
206 South Market Street
Marion, Illinois 62959

Crab Orchard National
Wildlife Refuge
Refuge Headquarters
Carterville, Illinois 62918

Southern Illinois University
Morris Library
Carbondale, Illinois 62901

Carbondale Public Library
405 W. Main
Carbondale, Illinois 62901

Treatment by In-situ Vitrification

Crab Orchard National Wildlife Refuge Superfund Site

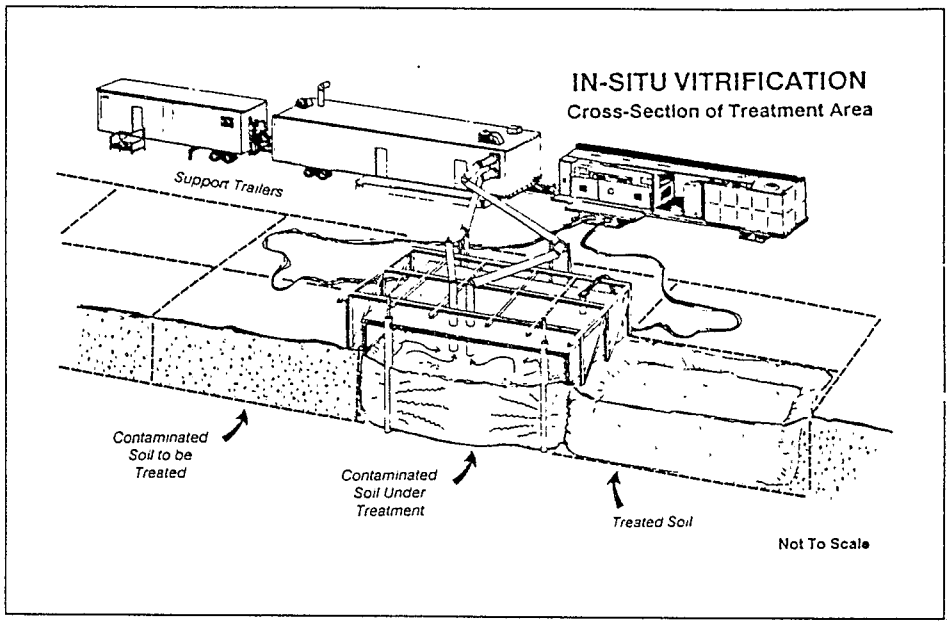
Williamson County, Illinois August 1990

Treatment of PCB-contaminated soil and sediment

Following a thorough review of public comments, U.S. EPA reevaluated and modified the proposed plan for cleaning up the PCB Areas Operable Unit. As outlined in the proposed plan, incineration of PCB-contaminated soils and sediment was the treatment technology selected. However, in-situ vitrification (ISV), an innovative alternative treatment technology, may be used instead of incineration if a successful demonstration of the technology is made. If a demonstration of ISV is not satisfactorily completed, the use of a mobile on-site incinerator will be implemented.

U.S. EPA believes that treatment of PCBs is required to protect public health and the environment and to comply with Superfund regulations. The selected remedy will permanently destroy PCBs by incineration or vitrification. Vitrification is a new technology which has not been fully demonstrated. However, to respond to community concerns and Superfund regulations which encourage the use of innovative technology, U.S. EPA will allow ISV to be substituted for incineration if it can be shown to be as effective as incineration.

If ISV is successfully demonstrated, PCB-contaminated soil and sediment would be excavated and moved to one of the existing areas of contamination. Vitrification would be used to treat contaminated material. The vitrified area and other areas where soil and sediment are excavated would be covered with a low permeability cap.



How does vitrification work?

In-situ vitrification (ISV) is a treatment process that converts contaminated soil, in place, into a glass-like material. The ISV process uses heat generated by electricity to melt contaminated soil. Some hazardous chemicals are destroyed while others are incorporated into the glass-like material which is expected to remain stable for thousands of years.

Following treatment, the glass-like material is covered with clean soil. Gases created by the vitrification process are collected through a hood placed over the area being treated. The gases are treated before being released into the air.

During full-time operation, the ISV system will be continuously monitored. Backup pollution control equipment located in the hood and gas treatment system can be automatically activated in the event of a failure in the primary system or if the primary power source is shut down. Electricity for the melt electrodes will automatically shut off in response to improper operating conditions. In addition, monitors located at critical points throughout the system will notify the operators of any deficiencies. Also, U.S. EPA will periodically inspect the operation and review all performance, sampling and other data.

Who would be responsible for the safe operation of the ISV system?

U.S. EPA is responsible for the safe operation of ISV at Superfund sites. U.S. EPA would ensure that the ISV system selected for the site, and the contractor selected to run it, are able to meet safety and performance standards. To further ensure that the ISV system is operated safely, an independent contractor would continuously

monitor the operation of the ISV treatment process. Additionally, U.S. EPA and Illinois EPA would periodically inspect the operation and would review all quality control equipment and procedures and all performance, sampling, and other data produced by monitoring the system. Finally, information concerning the technology, its operator and operations would be placed in the Crab Orchard information repositories.

ISV treatment must comply with a wide array of federal and state environmental regulations. These laws are designed to ensure that public health and the environment are not threatened by the ISV treatment.

Before the ISV treatment system can begin operation at a site, it must undergo a demonstration test using representative samples of waste that contain all the different contaminants found on-site. ISV treatment must meet or surpass treatment, pollution control and safety standards set by U.S. EPA and achieved by incineration. The demonstration test is used to set the performance levels and operating conditions which the entire ISV treatment system must maintain throughout treatment on-site, including the air pollution control system.

Does ISV result in health risks?

The ISV treatment process would pose no significant health risk to the public. No presently known technology can destroy 100 percent of the hazardous waste. For PCBs, U.S. EPA requires that 99.9999 percent must be destroyed or removed. Further, emissions from the ISV system at the smoke stack may not exceed levels which might result in the risk of one person in a million contracting cancer. Since the ISV system would be operated in an area with restricted public access, actualhealth risks from emissions would be at much lower levels. Demonstration tests of the ISV system has found it capable of meeting or exceeding performance and emissions standards.

Will ISV treatment result in air pollution?

Before treatment begins, a gas collection hood is placed over the area to be treated. Gases resulting from treatment, combustion products, and air are drawn from the hood into the gas treatment system. A backup generator is available to supply power to a backup blower in the event of power loss to the site. This backup system operates for a maximum of three hours after a power shut down to allow the surface of the vitrified material to solidify and concentrations of contaminants to reduce to less than normal operating stack levels.

Gases, air, and combustion products drawn from beneath the hood during treatment are treated using a system that cools, scrubs, filters and absorbs emissions from under the hood. The gas is first cooled using a glycol cooling system. Similar to a radiator, the cooling system removes heat from the gas. The gas is then treated by a scrubber to remove particulates and contaminants. The gases then flow through filters and charcoal absorption units to ensure safe air emissions. Following treatment, emissions are released into the air through a stack. Contaminants, particulates, and used activated carbon and filters are placed in subsequent ISV settings for treatment.

A backup scrubber and pump used to circulate scrubber fluids are automatically started up in the event of a primary pump or scrub tank failure.

For More Information

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