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Extension FactSheet

Community Development, 700 Ackerman Road, Suite 235, Columbus, OH 43202

Abandoned Dumps: Yesterday and Tomorrow

Kerry L. Hughes, Ann D. Christy, and **Joe E. Heimlich**

Yesterday's Solution Is Today's Problem

The production of solid waste has always been associated with human settlement. When humans lived in small communities, the solid waste produced by these communities could easily be burned or buried. The potential environmental impact of this waste was minor because the material was rarely hazardous and was not being produced in large quantities. As towns and cities developed, people began to live in densely populated areas, and the production of waste became a health problem. In response to this threat, towns and cities designated dumping areas for solid waste, usually on the outskirts of the towns. All forms of solid waste were dumped, including industrial, medical, and household waste.

Solid waste disposal remained, for the most part, unregulated until the 20th Century. Dumps in most towns were left uncovered, and there was no attempt to treat the waste. Fires sometimes started spontaneously in these dumps; rodents and insects often became severe problems. Burning refuse in an uncontrolled manner resulted in severe air pollution and noxious odors.

The adverse environmental impacts of these open dumps became apparent early in the 20th Century. Today we know that open dumps pose many risks to the environment and community health. In open dumps, rain water moves through the refuse and absorbs any organic and inorganic compounds (including metals, pesticides, and solvents) that are in the refuse. This liquid is known as leachate. This leachate then enters the soil below the dump and may eventually enter the ground water. For communities that depend on ground water to supply their drinking water, the formation and movement of leachate through the soil and into aquifers poses a risk to the environment and also to human health, especially if the leachate contains toxic chemicals. For more information about the movement of water through the environment, see OSU Extension Fact Sheet AEX-461-94, *Ohio's Hydrologic Cycle.*

Dumps also pose a risk to the environment in a different manner. Microorganisms present in the refuse use the refuse as a food source. Under the anaerobic (no oxygen) conditions typical in most dumps, these microorganisms convert the organic material in the refuse to methane and carbon dioxide. As the gas rises through the dump and escapes into the atmosphere, it sometimes picks up other organic compounds. The presence of large amounts of methane in this uncontrolled environment may result in explosions and fires. Additionally, this untreated gas may contain other compounds that pose a substantial health risk to nearby communities.

As people learned more about what happens in dump sites, it became apparent that this initial attempt to manage solid waste disposal had created new problems. At some sites, these problems are still being addressed. It was obvious that an alternative method of disposal was essential.

Today's Solution to Solid Waste

Guidelines for municipal solid waste (MSW) landfills were first issued in 1959 by the American Society of Civil Engineers. These landfills were constructed to replace open dumps. Modern landfills are highly engineered containment systems, designed to isolate the solid waste from the environment and, therefore, to minimize the environmental impact of the solid waste. These landfills include mechanisms to control and treat the leachate and gas produced from refuse. Further information on modern landfills can be found in Fact Sheets CDFS-137-05, *Landfills: Science and Engineering Aspects,* and CDFS-138-05, *Landfill Types and Liner Systems.*

While modern landfills continue to be our solution to much of the solid waste we generate as a society today, the dumps of the past have not disappeared. Many of these dumps were

unregulated and forgotten over time. They now are, or have the potential to become, major risks to the environment and to community health.

Today's Investigations of Open Dumps

The first step in dealing with the open dump problem was to prevent the creation of new dumps. It is now illegal to dump any solid waste except at permitted facilities. When an open dump site is discovered, a series of steps occurs to minimize the risks to the community and the environment. The federal standards for the cleanup of abandoned dumps were established in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 1980).

Site Remedial Investigation

Before any plans can be drawn up or any action taken, the problem must be assessed. Every open dump presents different risks, depending on the types of wastes the dump contains, the environmental conditions at the site, and the proximity of vulnerable communities. A site investigation is conducted to describe and quantify the risks posed by the site.

The first phase of the site assessment involves several activities:

- Examination of any records pertaining to the site.
- Visitation and inspection of the site.
- Interviews to assess the extent of the problem.

Often, the first stage of the site visit is the identification of the dump's boundaries. These identification methods may include searching records and historical documents, walking the probable location of the dump, and using aerial surveys.

If the site is found to pose a significant potential risk to the environment or community health, the second phase of the site assessment is conducted. This process evaluates the types and concentrations of contaminants present, the transport pathways (through air, surface water, ground water, and soil), the scope of the problem, and the goals of the remediation. The scope of each cleanup will be different depending on how far the contamination has spread, whether leachate is being produced, and if the leachate has contaminated the soil or any underlying aquifer. Gas sampling will also be conducted to determine the threats posed by any gas being emitted from the site.

Feasibility Study

In this phase, the cost and length of time to remediate the site are estimated. The end use of the remediated site is also considered, and broad categories of reuse are proposed (including commercial, residential, and recreational). There are several cleanup and containment options for abandoned dumps. The technology or process chosen will depend on the results from the site investigation. Several factors influence the choice of cleanup technology — the type of contamination present, the extent of the contamination, the goals for the site after remediation, and the budget. A list of feasible cleanup and/or containment technologies will be made and the most appropriate alternative chosen in conjunction with the community to minimize the risk posed by the abandoned dump.

Site Cleanup

The options for cleaning up a dump site may be broadly classified as removal, containment, and treatment. A site cleanup often uses combinations of these technologies to effectively deal with the contamination.

Waste Removal

Waste removal may seem to be the obvious solution to an abandoned dump, but many times it is not feasible. If the dump contains only a limited quantity of waste, it may be economically feasible to dig up the waste and rebury it in a licensed facility. Usually, however, abandoned dumps contain large volumes of waste that would be incredibly expensive to dig up and transport to an alternate disposal site. Additionally, abandoned dumps may contain significant quantities of hazardous waste. The presence of hazardous waste in a dump may require significant pretreatment prior to disposal in a hazardous waste landfill, and during this procedure, the waste may pose a significant threat to workers at the site.

It is often impossible to know what was dumped at the site. Usually many different types of wastes were buried, including industrial and, sometimes, hazardous wastes. Exposing workers and the environment to these previously buried wastes may result in larger problems than those originally posed by the abandoned dump. Therefore, the favored remediation action at abandoned dumps is frequently containment of the waste mass with simultaneous treatment of any contaminated soil and ground water. In some sites, *hot spots* (areas of the site that contain high concentrations of toxic material) may be excavated and disposed of in a licensed facility. Other remedial actions will then be applied to less contaminated areas.

Containment of the Waste

The installation of a cap over the abandoned dump is usually part of the containment process. The cap consists of multiple layers designed to minimize the amount of water that can enter the dump. The cap contains a gas collection system. Landfill gas that is collected in this system is piped to a flare where it is burned. This system minimizes the potential risk posed by landfill gas. The final cap also serves to

reduce rodent infestation and suppress fires. The cap usually has an uppermost layer of soil. This layer allows revegetation of the site and, ultimately, may facilitate future reclamation of the abandoned dump.

Leachate collection and treatment systems may be part of a containment system for an abandoned dump that is producing leachate. Installation of a cap will minimize the amount of leachate produced by reducing the infiltration of rain water into the dump, but remediation options are required for leachate that has already been produced. Leachate may be within the landfill, in the soil underlying the landfill, or in subsurface aquifers. If the leachate has reached the ground water in the aquifer, extraction and treatment of the ground water and leachate will be required. Wells may be drilled and ground water and/or leachate pumped from these wells to prevent further movement of the contaminants. The contaminated ground water can then be treated before being returned to the environment.

Waste Treatment

Waste treatment may occur while the waste is buried within the dump *(in situ),* or the waste may be dug up and treated on site. *In situ* treatment is used if only a few types of wastes were disposed of at the site. Many technologies are available to treat solid, liquid, and gaseous wastes. These technologies can be classified as chemical, physical, or biological processes. Chemical processes use chemical reactions to reduce the toxicity of the waste. Physical processes include the use of heat, gravity, and filtration, among other methods. Biological techniques use microorganisms and plants to remove organic and metal contaminants. Combinations of these techniques are usually used in remediation of abandoned dumps.

Site Monitoring

Regardless of the remedial activities used at a given site, certain long-term programs will be established at the site. A monitoring program will be established to determine the effectiveness of the remedial activity. This may include air, ground water, and soil sampling in the vicinity of the site to test for hazardous compounds. Regular inspections and repair, as needed, will maintain the integrity of the cap. The landfill gas collection system will be monitored, and contaminant levels in the gas, leachate, and/or ground water will be determined.

How to Report a Dump

This fact sheet is not designed to be a comprehensive resource on abandoned dumps. Please contact the nearest local office of the Ohio Environmental Protection Agency. Ask to speak to the Special Investigations Unit staff member in the Division of Emergency and Remedial Response if you suspect an abandoned dump in your region. The telephone numbers and locations of the Ohio EPA district offices are listed here:

Northeast: Twinsburg 1-800-686-6330
Southeast: Logan 1-800-686-7330
Central: Columbus 1-800-686-2330
Southwest: Dayton 1-800-686-8930
Northwest: Bowling Green 1-800-686-6930

For More Information

These sources provide additional information on abandoned dumps and remediation options:

Shah, K. L. 2000. *Basics of Solid and Hazardous Waste Management Technology.* Prentice Hall, Upper Saddle River, N.J.

Tchobanoglous, G., Theisen, H., and Vigil, S. 1993. *Integrated Solid Waste Management: Engineering Principles and Management Issues.* McGraw-Hill, Boston, Mass.

U.S. Environmental Protection Agency, 1991. *Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites.* EPA 540-P-91-001.

U.S. Environmental Protection Agency, 1993. *Presumptive Remedies for CERCLA Municipal Landfill Sites.* EPA 540-F-93-035/PB93-963339.

U.S. Environmental Protection Agency, 1999. *Reuse of CERCLA Landfills and Containment Sites.* EPA 540-F-99-015.

United States Code Title 42, Chapter 103. *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).*

Related Fact Sheets

OSU Extension Fact Sheet AEX-461-94, *Ohio's Hydrologic Cycle.*

OSU Extension Fact Sheet CDFS-137-05, *Landfills: Science and Engineering Aspects.*

OSU Extension Fact Sheet CDFS-138-05, *Landfill Types and Liner Systems.*

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