

RCRA Resource Guide No. 1
1978

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solid
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LANDFILLS: LEFTOVERS' LEGACY

It's time to face the facts. Source separation, resource recovery, and waste reduction can significantly alleviate our solid waste woes, but there's no way around it: at least 60 to 70 percent of our wastes will still need to be disposed of—and the vast majority of them will end up on the land. Because of this, well placed, well managed landfills are a vitally important part of the total solid waste management picture, and will be into the foreseeable future.

While there certainly are many competently managed landfill sites throughout the nation, too often these are the exception, rather than the rule. Take what happened in Rockford, Illinois, where noxious liquid from the local landfill seeped through the soil and mixed with nearby ground water. A problem was first noticed when four industrial drinking wells were fouled beyond use and subsequently were abandoned in 1966. In the following years further ground water contamination forced four residential wells to be abandoned (1970) and a public well to close (1972). In addition, potentially explosive methane gas produced by the decomposing wastes migrated into a nearby industrial plant and also into the public well. The landfill finally was closed in 1972.

As similar reports flow in from across the country, the extent of the problem begins to be revealed. According to the U.S. Environmental Protection Agency (EPA), a 1974 survey of ground water pollution in the Northeast alone pinpointed landfills as the culprit in some 100 cases. Depending on the types of waste present, the local environmental impact may range from a slight tainting of natural ground water quality to the concentration of high amounts of potent chemicals, heavy metals, and radioactive wastes.

That's just part of the story. Because ground water moves so slowly—often less than two feet per day—it may take years or even decades for the befouled water to inch its way from the disposal site to a drinking water supply. Since almost every known incident of ground water pollution was discovered only after the pollutants had infiltrated an actively used drinking water supply, we can expect many more such reports in the

future as the impact of decades of careless waste disposal catches up with us.

The degree of ground water pollution is alarming, for we depend upon this hidden resource far more than most people realize. Over half of the population derives its drinking water from this fresh-water source and it supplies some 94 percent of the drinking water in rural areas. The silent seepage from waste disposal sites is particularly destructive because once a subterranean water passageway (called an **aquifer**) is contaminated, it remains contaminated for many years. It may take decades, centuries, or even longer, for the aquifer to cleanse itself, even after the source of contamination has been removed.

WHERE THE GARBAGE GOES

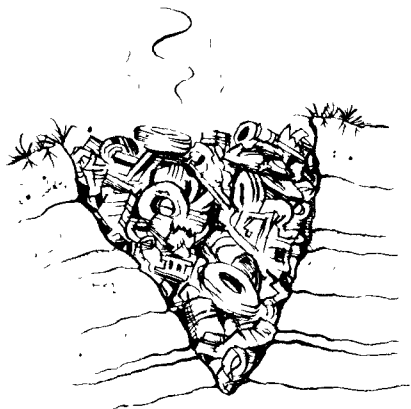
The problem starts when last week's uneaten dinner is lumped together with a vast array of other wastes which may include industrial processing wastes, septic tank pumpings, and potent industrial sludges. Once deposited at the landfill, the unsavory mixture of pepperoni and plastics, broken glass and old paint, weed killers and defunct toasters begins to undergo biological and chemical changes. Bacteria attack the organic wastes, and chemical reactions take place. As the materials slowly break down, they produce two main end products: leachate and gases.

Leachate is the technical name for the liquid formed when rain and moisture inside the landfill seep through the decomposing garbage, picking up various minerals, organic materials, and chemicals as they go. If dangerous chemicals are present, this fluid may become a witch's brew of hazardous materials including cyanide, cadmium, chromium, chlorinated hydrocarbons, and/or other toxic chemicals.

The extent of damage caused by the leachate will be determined by how well the landfill is sited and operated. If the landfill is poorly placed, rain may wash some of the contaminated effluent into nearby streams. Often, much of the leachate will percolate down through the garbage and soil. Although the soil can absorb some of it—a property called **attenuation**—almost inevitably some of the liquid will continue to filter downwards. If the landfill lies above an aquifer or close to the water table,

the leachate will probably pollute the water; the degree of pollution will depend upon the quantity and composition of the contaminated liquid.

Methane and **carbon dioxide** are the most common gases produced by the interaction of microbes and organic wastes in the absence of air. Methane, the more worrisome of the two, can be a local troublemaker if it accumulates and explodes



within the landfill or travels through the soil. For example, methane gas from a landfill in Cherry Hill, New Jersey, migrated through the soil into the back yards and basements of 28 houses adjacent to the disposal site. It was responsible for causing two house fires in 1971 and for killing back yard vegetation. Further investigations revealed the presence of high concentrations of the combustible gas in the soil beneath the crawl space of most of the nearby houses.

The potential for leachate pollution and methane migration exists at every solid waste disposal site. How much of a problem materializes depends upon the *type* of wastes being disposed of, *where* the disposal site is, and *how* the wastes are handled.

There's no doubt that solid waste management took a major stride forward in the 1960's with the widespread adoption of landfills—particularly in urban areas. Unfortunately, this has not proven to be the simple panacea we had hoped for, in part because the pollution problems have proved far more subtle than we first imagined, but more importantly because landfills seldom are located or run as they should be.

The story behind the Rockford, Illinois incident that we mentioned earlier is typical. Beginning in 1947, an old sand and gravel pit was used for the open dumping of residential, commercial, and industrial wastes, including large amounts of metal finishings and foundry wastes. Little care was taken in handling the refuse, much of which was placed near to or directly in the ground water that surfaced in the pit. When the site was converted to a "sanitary" landfill in the early 1960's, little more was done than to apply a daily soil cover. As a result, although the garbage was much better protected from the wind, rain, rats, and vermin, the landfill still leaked like a sieve.

Prompted by a combination of ignorance and convenience, many other communities did exactly the same when they switched to landfilling their wastes. Instead of relocating poorly placed disposal sites or significantly upgrading them, local leaders converted their open dumps to landfills simply by covering over the daily refuse additions. Out of sight, out of mind. In addition, newer landfill sites usually are chosen on the basis of political viability and economic convenience and not

on good siting practices, with the result that all too often they are located close to the water table or on the **wrong** kind of land.

The adverse environmental impacts of bad siting frequently are compounded by inadequate landfill design and operation. According to a 1976 nationwide survey, only about one-third of the 15,893 known land disposal sites were "license permitted, or otherwise recognized" as being in compliance with state regulations for sanitary landfills.

RIGHTING REFUSE WRONGS

Although great strides have been made in solid waste management in recent years, from the national standpoint existing state regulation remains a patchwork effort. While some states have strict laws governing a wide variety of disposal methods, others have lax standards and fail to cover all types of disposal. Recognizing the need to address the problem more thoroughly on a national level, Congress passed the Resource Conservation and Recovery Act (RCRA) in October, 1976. This Act requires EPA to establish minimum standards for the environmentally sound disposal of all solid wastes, it calls on the states to adopt these standards and to develop comprehensive plans for solid waste management. Through a combination of regulations, guidelines, technical assistance, and federal dollars, EPA will work with the states to make RCRA a reality.

RCRA expands the federal role in solid waste management in two major ways. First, it broadens EPA's focus and jurisdiction by defining solid waste to include a wide array of municipal and industrial solids, sludges, liquids, and gaseous wastes. Secondly, it brings hazardous wastes under regulatory control for the first time.

Two of the most important sections of the Act are Subtitle C which addresses hazardous waste management, and Subtitle D which focuses on overall waste management. **Subtitle C** requires EPA to develop a "cradle-to-grave" program for tracking and carefully controlling hazardous wastes from their origin to disposal. EPA must develop a long list of specific regulations that must be met by those who produce, handle, store, transport, treat, and dispose of hazardous wastes. In addition, the Agency must establish guidelines for state hazardous waste programs. If states do not adopt a similar or more stringent program, EPA is legally responsible for enforcing the federal regulations.

Subtitle D is the cornerstone of the Act, for it calls on both EPA and the states to tackle the problem of overall solid waste management. Specifically, if a state wishes to receive federal funding for waste management, it must develop an EPA-approved plan for comprehensive solid waste management. At a minimum this plan must include a ban on open dumping (as defined by EPA), a compliance schedule for closing or upgrading existing open dumps, and provisions for resource conservation, resource recovery, disposal in sanitary landfills, or any combination thereof "necessary to use or dispose of ...waste in a manner that is environmentally sound." Other specific requirements are outlined in the Act.

EPA is required to issue criteria for defining what constitutes acceptable land disposal practices. Conversely, any solid waste

disposal facility that does not meet these standards is an open dump and is prohibited by federal law. (See box, page 3, for details.) A year after publication of the "landfill criteria" EPA must publish an inventory of the nation's open dumps. All existing open dumps must either be closed or placed on a compliance schedule and upgraded within 5 years.

Soon your state governor should be designating a regional planning group that will be responsible for developing and implementing your state plan. This group, or possibly your state solid waste agency, will be responsible for conducting the open dump inventory during the next year or so.

What does RCRA mean to you? It means that considerable improvements will be made in our nation's solid waste management. Properly implemented, it means that all states will adopt good solid waste management plans, that the bad siting of landfills will end, and that our sanitary landfills really will pose little danger to public health and the environment.

But how can we make sure that hazardous wastes are safely handled? How can we make certain that landfills are properly sited and operated? Who will foot the bill for sound solid waste disposal?

Despite its noble intentions, the act will mean little if it is not enforced. For starters, that means adequate financial and technical assistance must begin to come through from the federal government to the state and local levels. It also means that citizens should become involved from the beginning. Specifically,

THE LANDFILL CRITERIA

Officially they are billed as "The Criteria for the Classification of Solid Waste Disposal Facilities;" more informally they are called "The Landfill Criteria." Whichever name you use, these Criteria are important for they will describe what conditions land disposal facilities must meet to be considered "sanitary landfills" under RCRA. Required by Section 4004 (under Subtitle D) of RCRA, they will apply to *all solid waste disposal facilities* (including traditional landfills, industrial disposal sites, and sewage sludge landspreading operations). Any disposal facility that does not measure up to the Criteria will be considered an open dump in violation of Federal law.

Now available in proposed form (and open for public comment), the Criteria cover:

- **environmentally sensitive areas** such as wetlands, 100 year flood plains, critical habitats and others;
- **ground water, surface water, and air emissions;**
- **land application of sewage sludge** including specifics on cadmium application, pH control, pathogen content, and other factors
- **disease-causing agents;**
- **safety issues** including explosive and toxic gases, fires, bird hazards to aircraft, and others.

EPA does not have authority to enforce the finalized criteria unless the states wish to receive federal funding (in which case they must be adopted). However, citizen suites can be filed in federal district court against any facility that fails to meet the criteria because that facility is violating federal law. (See Section 7002 of RCRA regarding the procedure for filing a citizen suit.)

RCRA provides an opportunity for public input throughout the entire planning process—at both the state and federal level. Your state planning process should include specific provisions for public participation to enable you to say something about how your garbage is handled. Citizens have been given some clout, too under the citizen suit provision of the law. If your state refuses to close its open dumps, you can force the matter into the federal courtroom. (See our *Garbage Guide* "Citizens in Action" for a discussion of public participation and RCRA.)

LANDFILLS, RCRA, AND YOU

We urge you to directly participate both locally and at the state level. Here are some pointers on what you can do.

On the local scene. First, it is important to be aware of the complexities of the problem. Proper siting is absolutely crucial to running a safe and successful landfill. This means citizens should monitor the siting process from the beginning, and be ready to deal with landfill placement on the basis of what is best for the environment. Our garbage is a problem that won't go "away"—and by pushing a landfill away from a choice spot because it is aesthetically unappealing is a sure way to make the disposal dilemma worse.

Until the EPA landfill criteria are published and specific technical guidelines are issued on how to meet them, here is the best available information on what to look for if your community is about to buy land for a landfill. Try to make sure that:

- it is located at a safe distance from rivers, lakes, wells, and other water sources;
- it has no direct hydrologic connection to any nearby ground water (a professional hydrologist should survey it);
- it is not located in a wetlands area or a flood plain. A disposal facility located in either of these places can be very destructive to the local habitat and greatly increases the chances of erosion and flooding.
- it is thoroughly surveyed to determine the types of soil present, the geologic conditions—i.e. the physical and chemical properties of the bedrock as they relate to the movement of water and gas—soil permeability, and soil workability.

In addition, you should insist on careful landfill operation:

- wastes should never be placed directly in ground or surface waters; doing so invites pollution problems;
- a daily soil cover should *always* be placed over unprocessed wastes. When tightly compacted, the soil cover will minimize the amount of snow, rain, and surface runoff that infiltrate the fill, as well as eliminate rats and other pests. Although the amount of cover needed will vary according to the amount of rainfall in a given area—it's less of a problem in New Mexico than in Maine—EPA itself recommends "a compacted earth cover of at least 6 inches in thickness applied daily...for preventing the emergence of flies and for discouraging rodents from burrowing through the fill."
- the daily soil cover should be sloped to encourage runoff to drain away from the landfill. If needed, suitable drainage should be provided to carry this runoff to a collection site where

it can be tested and treated to remove contaminants before its release into the environment:

- cover material should be compactable, workable, relatively impermeable, and present in sufficient quantity (20 to 25 percent of the fill should be soil cover). According to EPA "if gravel is fairly well graded and contains 10 to 15 percent or more fines, it can make an excellent cover."

- precautionary measures should be taken to prevent gases from concentrating in sewers or other structures located on or near the landfill. Since methane gas leaves the landfill along the path of least resistance, it is important to be aware of any natural geological formations or artificial paths—such as pipes—that will encourage lateral migration. Some ways to control and vent gases include gravel filled trenches, vented standing pipes, and impermeable barriers—such as clay—placed around the landfill perimeter;

- subsurface drains and ditches should be used to intercept leachate;

- monitoring and periodic sampling of ground water should be part of any landfill operation.

- the landfill should be closed once it is full, and the wastes should be buried in a new sanitary landfill. This common-sense rule often is ignored as officials postpone choosing new, often controversial, disposal sites.

Finally, you should be aware that maintenance is important once the landfill closes down. If your town landfill has been filled to the brim, check out what the town council has planned in the way of upkeep and monitoring.

- The surface of the landfill should be periodically regraded to maintain good drainage.

- Any small depressions that develop should be filled. If this is not done, water that accumulates in these depressions may seep into the fill and cause leachate problems.

- Because it takes about 15 years for a landfill to finally settle and because of the potential for gas problems, construction of buildings on completed landfills should be avoided, and care should be exercised in building near them

On the state level. Take advantage of your right to participate in the development of your state plan. Contact your state solid waste management agency for specific information on how to help.

Why should you be involved? Because it's your water and air

that are at stake—and you are paying for it with your taxes and your health. As Mark Sullivan, Solid Waste Director of the National Wildlife Federation puts it: "If any disposal system is going to work, you're going to have to participate in it, and you'll end up paying for it; you should be concerned with getting the most efficient system you can."

Landfills aren't bad, but poorly sited and poorly managed ones threaten us all. Your participation *can* make a difference!

RESOURCES

Although the following publications are old, fairly technical, and a bit dry, they will give you a good idea of what goes into making a good sanitary landfill. This is the best information available at this time.

Sanitary Landfill Facts is the oldest but most readable of the lot. Order number 47.

Sanitary Landfill Design & Operation contains a good discussion of the waste problem. It is technical, but gives a thorough and readable presentation of the subject. Order number 287.

Decision-Makers Guide in Solid Waste Management, second edition, devotes pages 109 - 117 to a brief discussion of land-filling techniques. Order number 500.

The above can be ordered by writing to: Solid Waste Information, U.S. Environmental Protection Agency, Cincinnati, OH 45268.

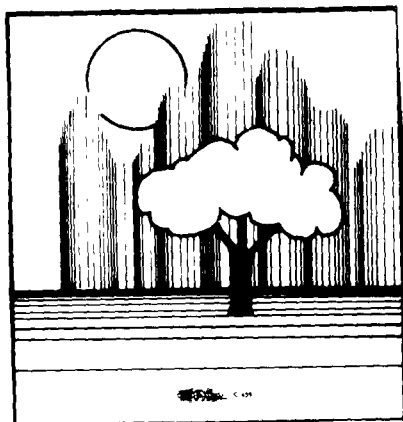
For more information about RCRA and landfills, write to the Technical Information Communications Branch (WH-562), Office of Solid Waste, U.S. Environmental Protection Agency, Washington, D. C. 20460.

The Environmental Action Foundation is a non-profit, tax-exempt citizens' organization devoted to research and education on a variety of environmental issues.

The Solid Waste Project is an information clearinghouse and citizens' communication network. The Garbage Guide is produced by the project staff: Lois Florence, Elizabeth Tennant, and Marchant Wentworth.

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Environmental Action Foundation.
U.S. EPA, 1979.

SW-806



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