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Regional Solid Waste Management Plan

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CHAPTER SIX: RESOURCE RECOVERY (FINAL DRAFT)

Introduction

Resource recovery is a field of both tremendous opportunity and complexity which as population grows, land values increase, distances to landfill sites lengthen, virgin materials become more scarce, and conservation becomes more popular, will be increasingly relevant to solid waste management.

Resource recovery is the attempt to decrease the use of virgin materials and the necessity for landfills by reclaiming whatever can be reclaimed either in the form of materials or energy from the solid waste stream. The kinds of activity which are lumped together under the heading of resource recovery can range from privately organized efforts involving recycling aluminum and old newspapers to capital investment in large-scale facilities which mechanically remove the recyclable materials from the mixed waste stream and then put the remaining solid waste through a process which generates energy in the form of heat, steam or electricity.

The central purpose of this chapter is to outline a means by which the Tucson Metropolitan Area can develop a resource recovery program which is appropriate for the area. Because resource recovery technology and conditions in the area change over time, the development of such a program will be a continuing process. Throughout, four central issues must be addressed: economic feasibility, legal and institutional relationships, public opinion, and coordination and planning.

Arizona Department of Health Services and the Pima County Health Department.

This chapter will outline the roles of these participants and indicate which agencies will be responsible for carrying out the management tasks discussed in the three previous chapters on hazardous waste, resource recovery and collection and disposal. An estimate of the costs of implementing the short-term tasks will be included. (Short-term tasks are defined as those to be undertaken during the next two or three years).

The plan should be considered as a means for achieving sound solid waste management in the PAG planning area. It is thus important that the planning process remain flexible enough to account for changes in local conditions, technological improvements, and more complete information about the possibilities and problems associated with solid waste management techniques. To ensure that the appropriate adaptations are made, the plan will be reviewed every three years.

Two other regulations set guidelines for determining when source separation (the separate collection and recycling of certain materials like newspaper and aluminum) and resource recovery facilities should be considered (Title 40, Chapter 1, Parts 246,245). The latter is of particular interest to the Tucson area because it instructs federal agencies or facilities located in a community which is engaged in resource recovery to cooperate financially with that effort (245.200-2).

At the end of June 1980, the federal Energy Security Act (also known as the Synthetic Fuels Act) was passed. Title II of the act authorizes the appropriation of funds for loans to local governments for the construction of energy recovery plants. The act instructs the Secretary of Energy to prepare specific regulations for this program within ninety days. In addition, the act provides for price supports for the sale of fuel derived from solid waste. If Congress makes the necessary appropriations, both these programs could have implications for the economic feasibility of instituting a local solid waste energy recovery system.

The state government has also begun to address the resource recovery alternative to solid waste management. According to a draft of the "State Strategy and Policy for Resource Conservation and Recovery," (February, 1980), the state's role involves "facilitation rather than implementation"; the actual implementation of resource recovery would be in the hands of local governments or private businesses (VIII-F-3). However, there are several areas where the state will take an active role. These "Elements of the State Strategy" and the issues they address are presented below:

<u>Legal and Institutional Relationships</u>

Element A - The identification, assessment and elimination of existing legal and institutional barriers to the implementation and

conduct of resource recovery and resource conservation activities.

Economic Feasibility

Element B - The assessment of market potential for the utilization of recovered resources within State Government.

Element C - The implementation of affirmative actions applicable to State Government designed to stimulate the utilization of recovered and recoverable resources.

Public Opinion

Element D - The conduct of public education and the dissemination of technical information regarding the benefits, costs, capabilities and limitations of resource conservation and recovery.

Coordination and Planning

Element E - The development of the State's capability to provide technical, planning and other forms of assistance to its constituents in the development and implementation of resource recovery and resource conservation systems. (p.VIII-F-11)

The draft document emphasizes that short-term progress toward resource recovery is likely to be limited by technological, economic and institutional barriers (p.VIII-F-3).

Economic Feasibility

Although resource recovery is considered to be a worthy goal in environmental terms, it is generally agreed that a resource recovery program must be able to compete economically with the costs of conventional disposal. Before a resource recovery program appropriate to the Tucson area is chosen, therefore, certain specific information has to be accumulated. First, the range of approaches to resource recovery and the cost of the technology involved must be understood. Then, detailed data on the composition of the local solid waste stream, the demand for recovered resources, and the cost of landfilling operations in the area must be evaluated.

Approaches to Resource Recovery

Resource recovery systems can be categorized by the process they involve and their scale. Each system must be evaluated in terms of the specific requirements of the locality in which it will exist if it is to have a chance of success.

The two major types of resource recovery are energy recovery and materials recovery. Energy recovery refers to the thermal reduction of solid waste to reclaim its energy value. The great advantages of energy recovery are that the volume of solid waste can be reduced up to 90 percent, significantly decreasing the need for landfills (EPA, Decision-Makers Guide in Solid Waste Management, 1976, p. 88), and energy can be generated from the solid waste stream rather than from fossil fuels.[1]

There are several energy recovery processes. The simplest and apparently the most workable at present is the direct incineration method whereby solid waste is burned without, or with only minimal, pretreatment.[2]

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1 Depending on the process, a pound of solid waste can generate about half the amount of heat generated by a pound of coal.

2 Conversation with Dr. Abert, National Center for Resource Recovery, July 15, 1980.

The resulting heat can be used to create steam to generate electricity or to drive an absorbtion heating and cooling system. One advantage of this type of system is that the scale can vary depending on the quantity of heat or energy required. For example, the Tucson Unified School District now operates a small-scale heating and cooling plant at Rincon High School which is fueled by the trash generated by the district each day. On a much larger scale, the same process could provide power for an electric company.

Other processes produce various types of fuel from solid waste. In one case, the solid waste is pulverized and made into fluff or briquets (called refuse derived fuel-RDF) which can be burned as an alternative to coal. The City of Tucson has investigated the possibility of using this system to produce fuel for the Arizona Portland Cement Company's kilns. According to calculations made for the city by Dr. Raymond Sierka, "the total amount of energy in Tucson's solid wastes could be used by the Arizona Portland Cement Company."[1]

A more complicated process called pyrolysis is now being developed. In this case, solid waste is decomposed through the use of very high temperatures in the absence of oxygen. Low-grade gas or an oil similar to a No. 6 fuel oil is produced. These systems have the advantage of producing a product that can be transported, but they do require a large-scale operation.

The major drawbacks of these energy recovery systems are that the technology is still not reliable, and the capital investment required is usually very great. Air pollution can also be a problem. An example is a facility in Milwaukee which was supposed to generate electricity by incinerating solid waste. Since the program was begun in 1977, it has operated at only a third of its capacity because of technological problems

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1 Raymond A. Sierka, "Energy and Resource Recovery from the Solid Wastes of the City of Tucson - A Preliminary Survey," March 1978, p. 104.

involving slagging in the boiler and damage to the pollution control system. The remainder of the solid waste stream has had to be landfilled at the expense of the company which operates the plant. As a result, the effort may soon be abandoned (Electrical Week, July 7, 1980, p. 90). Similar problems are being encountered in energy recovery plants elsewhere in the country (New York Times, July 7, 1980, p. B6).

Materials recovery is the other type of resource recovery. Materials recovery refers to retrieving reusable or recyclable materials from the solid waste stream. Materials which are presently being recovered in the Tucson area include newspaper, corrugated paper, glass, ferrous metals, and aluminum. In the future, plastic may also be recovered.

The main advantages of materials recovery are a decreased need for virgin materials and a reduction in the amount of landfill space required. In some cases, notably aluminum and glass, there is a clear advantage in using recovered materials. It is cheaper to produce new aluminum beverage containers from old ones than to purchase and process the necessary ore, and in glass manufacturing, the addition of a certain amount of glass cullet (recycled glass) hastens the melting process. Old newspapers can be made into new newsprint, and both newspapers and corrugated paper can be transformed into cellulose insulation. Ferrous metals can be used in copper smelting.

The scale of materials recovery varies depending on local conditions. It can be used in place of or in combination with energy recovery. It can be implemented before collection, in which case it is called source separation and is usually done manually by the generator, or after collection when it has been mixed with the rest of the solid waste stream. In this case, it is done manually or mechanically. Although the City of Tucson is assessing the potential for a postcollection system, source separation is

is composed of chief administrators and/or elected officials of the five member jurisdictions. Following Management Committee review, the plan is presented to the elected officials of each jurisdiction for their review and approval prior to PAG Regional Council approval.

In addition to local review, the solid waste management plan will also be reviewed by the State and EPA.

Plan Implementation

When the plan is implemented, the PAG staff will be responsible for designing and carrying out a series of public information programs dealing with hazardous waste, resource recovery and illegal dumping. The primary responsibility for areawide solid waste management, however, will remain with those agencies which have been highly involved in planning and implementing the area's solid waste management system heretofore: The Pima County Wastewater Management Department and the City of Tucson Department of Operations. Because it provides only collection service and because the population of South Tucson is expected to be fairly constant, that city's Department of Operations has a fairly limited role in areawide solid waste management.

Volume I of this plan, entitled the PAG Solid Waste Disposal Needs Survey, 1980-2000, March 1980, pp. 56-74 (elsewhere referred to as the "Needs Assessment"), describes the roles of the County Wastewater Management Department and the Tucson Department of Operations in some detail. Both agencies are responsible for planning and operating sanitary landfills to service their jurisdictions. The Tucson Water Department assists by supplying information about water quality in city wells situated near landfills. The Tucson Department of Operations also provides collection services for its jurisdiction and has been actively involved in developing a large-scale resource/energy recovery program.

cannot be generalized from one community to another. A comparison between EPA estimates of solid waste composition for the nation as a whole and local composition studies suggest, for instance, that the Tucson area's solid waste stream has more paper, metal, and wood and less yard debris and glass than other parts of the country (Sierka, 1978, p.4). This could have implications for resource recovery. The greater quantity of paper and wood, combined with the low moisture of this area, could mean that the local solid waste stream has a greater heat value than occurs elsewhere. The higher metal content might suggest a greater opportunity for economically recovering metals, while the lower component of glass might suggest that it would not be worth trying to recover glass here since large volumes are necessary to make the effort pay for itself.

In addition to determining the present composition of the solid waste stream, the future composition must also be estimated. If large capital investment is to be made in either energy or materials recovery, there must be some assurance that changes in the composition and volume of the waste stream will not adversely affect it. For instance, if an energy recovery system were initiated and the paper component of the solid waste stream were to decrease dramatically because of newspaper recycling or the direct sale of corrugated boxes by commercial establishments to manufacturing firms, the efficiency of the energy recovery program could drop significantly. If a beverage container deposit law were passed by the state after a materials recovery plant had been put into operation, large amounts of glass and aluminum would be withdrawn from the waste stream. Either situation could have serious effects on the system's ability to pay for its operation because the market situation would alter. Shifts in population growth, packaging and consumption habits could also have repercussions.

Market Demand

A knowledge of the markets available and the prices paid for the recovered materials or energy is a precondition to the establishment of any resource recovery program, particularly when it involves anything more than voluntary source separation and sale of recyclable materials. Even the separate municipal collection of newspapers is hard to justify if there is no market for them once they are accumulated. The effort will not pay for the labor involved. If a massive investment is to be made for energy recovery or postcollection materials recovery, the markets and prices for the recovered resources must be guaranteed ahead of time.

The type of resource recovery program undertaken must mesh with the markets available. For instance, several small steam-generating facilities might cost more than a single large one, but they might make more sense in the geographically dispersed Tucson Metropolitan Area because steam cannot be transported long distances. The buyer's product specifications and quantities required must also be entirely clear. Copper smelters may refuse steel cans which have been crushed, and many glass manufacturers cannot use cullet that is not color separated.

The market must be stable. If a purchaser of recovered resources, whether materials or energy, were to go out of business or his operations were to be shut down by a lack of raw materials or an extended strike, it could cause severe solid waste management problems in the area. Although the recovered materials could be stored or landfilled, the heat, steam, and electricity generated from the solid waste could not. In either case, large costs could result.

Costs

Having defined the composition of the local solid waste stream and the demand for the recovered materials, a careful analysis must be made of the costs of establishing a resource recovery system appropriate

to local conditions compared with the costs of present and future landfilling operations. Among the many items which must be evaluated are the availability and cost of sites for landfills and resource recovery facilities, the capital and operating costs of the various approaches, the savings to be derived from needing fewer landfill sites, and the net return on the sale of the solid waste or the recovered materials and/or energy.

Such calculations are extremely complex, particularly when the technology of resource recovery is still being developed and new federal standards for landfills are still being established. Furthermore, they are likely to vary with time and locale. As of 1980, the Department of Operations reports its operating costs for landfilling to be under $2.00/ton. It expects these to increase about 8 percent a year over the next ten years, assuming that the rates of increase of population and fuel costs remain fairly constant. The combined capital and operating costs for Pima County are reported by the Wastewater Management Department to be about $4.00/ton, which is close to the national figure. A 1976 summary of resource recovery by EPA indicated the costs of large-scale resource recovery facilities (including amortization of capital costs and operating and maintenance costs) to be in the range of $11.00 to $24.00 per ton annually, depending on the process used and the local situation.[1] As technology improves, virgin resources become more expensive, and landfilling costs rise, the gap between these figures may narrow.

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1 Office of Solid Waste Management Programs, EPA, Decision-Makers Guide in Solid Waste Management, 1976, p. 94.

Institutional and Legal Arrangements

Resource recovery can involve a complex mix of public and private sector relationships. One of the first decisions to be made is what entity will be responsible for resource recovery. If the local situation and the technology are such that no large-scale public operation is indicated, the public role can be limited to encouraging private efforts through citizen education, government procurement policies, and local ordinances such as bottle laws, which reduce the volume of solid waste to be landfilled. Because of the relatively low cost of landfilling in the Tucson area, private, small-scale resource recovery has been the rule here thus far.

If large-scale resource recovery were indicated in the Tucson area, a regional approach would be required to ensure a sizable and predictable volume of solid waste. This means that the relationships among the governments of the area with respect to solid waste management would have to be defined. Private companies involved in solid waste management such as SCA Services would also have to be considered.

Various regional approaches are possible. For instance, a region can set up an authority to own, construct, and operate the whole system; one government can become the lead agency and deal with the other governments on a contractual basis; the private sector can own and operate the system and contract with the region's governments for the supply of solid waste; or the system can be owned by the public sector, but operated by the private sector. Any of these approaches would require that a government be able to make long-term contracts with other governments or private companies. This is essential to ensuring both a stable supply of solid waste and recovered materials to a market and to ensuring that the demand for them will continue.

Public Opinion

The fate of any resource recovery program is greatly influenced by the attitudes of the citizenry. A small-scale source separation program, whether public or private, is dependent on the support of the household and commercial generators of solid waste. Revenue bonds, which are often used to finance large-scale municipally organized energy or materials recovery facilities,require public approval. Thus, an assessment of local public opinion is needed before a resource recovery approach is chosen.

The fact that private recycling efforts have been in operation in the Tucson area for several years indicates some public interest here. However, public education concerning the benefits of resource recovery will be necessary to encourage greater participation.

Coordination and Planning

Some means of achieving centralized coordination and planning is important to successfully developing an areawide resource recovery program: The kinds of information which must be accumulated and assimilated are both diverse and technical; both local governments and private entities will be involved; and the resource recovery program will have implications for other programs like zoning and industrial development. Finally, developing a resource recovery program requires a continuing effort. If there is not some central entity to guide the process and to raise the appropriate policy questions, the effort could become disjointed, and rational decisions would be difficult to make. In the Tucson Metropolitan Area, the Pima Association of Governments could provide this kind of centralized coordination and planning.

Resource Recovery in the Tucson Metropolitan Area

Small-Scale Resource Recovery

At present, resource recovery activity in the Tucson Metropolitan Area is on a fairly small scale. The City of Tucson has instituted a source separation program in which newspapers are picked up by the Operations Department crews during the regular twice-a-week schedule. Each collection vehicle carries a separate container for the papers. They are sold to Consolidated Fibers and recycled for newsprint. The Department of Operations estimates that 9 to 13 percent of the city's households participate and that the project pays for itself.

There are four private materials recycling firms operating in the Tucson area. The Lern Company recycles newspapers, the Golden Goat coin-vending machines accept aluminum cans, and Recyco and BIRP (Beverage Industry Recycling Program) buy newspapers, aluminum, steel and glass. BIRP is the largest and the oldest effort. It is a statewide, nonprofit operation which, since its founding in 1971, has handled 71.4 million lbs. of aluminum, 11.3 million lbs. of steel, 38.0 million lbs. of glass, and 39.0 million lbs. of newspaper. Twelve to fifteen percent of its material comes from industrial accounts and the rest from the general public, primarily individuals. According to its Phoenix manager, the firm tends to break even on steel cans and newspapers and to incur losses on glass. The return for the aluminum is what really carries the operation. (This is typical of other recycling efforts.) He estimated that in 1978, BIRP recycled two out of three of the aluminum cans, 1 percent of the steel containers (including beverage and food containers), 25 percent of the newspapers and 5 to 6 percent of the paper found in the State's solid waste stream.

A successful energy recovery program is operated by the Tucson Unified School District at Rincon High School. Seven tons of trash from the school system are incinerated there daily, providing all of the steam necessary for hot water and space heating and 75 percent of the steam necessary for summer air conditioning. The district is now considering another similar facility.

The school district program is an example of the potential for small-scale energy recovery facilities. It should be noted, however, that because the paper content of the waste being incinerated by the school system is much greater than that found in residential solid waste its heating value is probably higher and fewer technological complications are likely to arise.

It has been suggested that other small-scale energy recovery facilities might be developed at local hospitals and other complexes which now have absorbtion heating and cooling systems. Many of their plants are now powered by natural gas, and with rising prices, they might seek alternative fuels. To burn solid waste or refuse derived fuel would require boiler conversions, but the rest of the system could be left intact.

Large-Scale Resource Recovery

During the past several years, the City of Tucson has actively investigated the possibilities for larger scale resource recovery efforts. A preliminary survey of the local situation was made for the city by Raymond Sierka in 1978.[1] Several composition studies were compared, potential markets, including Davis Monthan Air Force Base, the University of Arizona, Superior Farming Company, Anamax Mining Company, Tucson Gas and Electric Company and Arizona Portland Cement Company, were investigated, and the existing resource recovery technologies were reviewed. The related problems

1 Raymond Sierka, "Energy and Resource Recovery from the Solid Wastes of the City of Tucson - A Preliminary Survey," March 1978.

of noise, water and air pollution were discussed.

The City of Tucson has also put out a request for a proposal for the design of a transfer station. The immediate purpose of the transfer station is to decrease the number of trips to the landfills by collection trucks, but the proposal will include a plan for adding a materials recovery system to the facility in the future.

In a conversation on July 2, 1980, Dr. Sierka expressed the belief that although the technologies for resource recovery are still not well developed, the volume of solid waste being generated in the Tucson area is such that larger scale resource recovery could begin to make economic sense in the near future. An EPA guideline indicates that the most efficient energy recovery plants are those which handle between 500 and 2000 tons of solid waste per day (Decision-Makers Guide, p. 94). For mechanized materials recovery facilities, the larger the plant, the lower the processing cost per ton. EPA recommends that communities generating fewer than 150 tons per day should not consider such a plant (Decision-Makers Guide, p. 100).

According to county and city staff, the Tucson Metropolitan Area disposes of about 5 lbs. of solid waste per person per day.[1] Of this, 3.25 lbs. could be used for resource recovery. By relating this figure to the combined population projections for the City of Tucson, the City of South Tucson, and the metropolitan part of Pima County, the following projections of solid waste volume can be derived:

Volume of Recoverable Solid Waste
Tons Per day

	So. Tucson	Tucson	Metro Pima	Total
1980	10.0	540.9	248.2	799.1
1985	10.3	574.2	313.7	898.2
1990	10.1	584.8	376.8	971.7
1995	10.0	608.7	459.8	1078.5
2000	9.9	640.3	564.8	1215.0

1 This figure includes residential, commercial, institutional and industrial waste. The rate is not expected to alter significantly during the next twenty years

These figures demonstrate that the volume of solid waste being generated in the Tucson metropolitan area is such that an areawide resource recovery program should be evaluated.. and that only an areawide approach can guarantee sufficient volume for large-scale resource recovery.

Objectives

The overriding objective is to develop a staged, areawide resource recovery program appropriate to local conditions. This program could take many different forms depending on information yet to be accumulated and policy decisions yet to be made.

The working consensus, based on preliminary investigation, is that at the present time an areawide resource recovery facility would not be justified in economic terms because the costs of landfilling are still relatively low and the capital investment which would be required for such a facility would be very high.[1] Furthermore, much of the resource recovery technology is still not well proven. Some communities have made big capital investments only to find that the facilities do not work properly or up to capacity. They are then left with the problem of disposing of the solid waste that was to be recovered. For the present, therefore, the governments of the Tucson Metropolitan Area must emphasize landfilling.

As technology improves, the quantity of solid waste requiring disposal increases, the cost of landfilling rises, and environmental and social factors create pressure for resource recovery, the situation may change, and the large-scale resource recovery alternative may become more attractive. In the interim, the Tucson Metropolitan Area should encourage as much private resource recovery activity as possible while laying the necessary groundwork in terms of data gathering, institutional arrangements, and popular education so that an areawide facility can be begun as soon as it is economically and technologically appropriate. This is important because

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1 This judgement is based on conversations with city and county staff, representatives of private industry, two University of Arizona professors who have some knowledge of resource recovery facilities and a brief survey of EPA publications on the subject.

the technological problems may be solved rapidly, but several years may elapse between the time when a given facility is selected and when it is in regular operation.[1] Thus, the following short-term objectives have been established:

1. Continue to assess the economic feasibility of undertaking resource recovery on a larger scale in the Tucson Metropolitan Area.
2. Assess and overcome legal and institutional barriers to implementing an appropriate resource recovery program in the area.
3. Assess and encourage public support for resource recovery throughout the area.
4. Develop a means to achieve areawide resource recovery planning and coordination.

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1 Office of Solid Waste Management Programs, Decision-Makers Guide in Solid Waste Management, U.S. EPA, 1976, p. 97.

Management Tasks

Coordination and Planning

One entity should be designated by the local jurisdictions to provide overall coordination and planning for the resource recovery effort in the Tucson area. Among its responsibilities should be the following:

1. Initiate economic feasibility studies and public opinion surveys concerning resource recovery in the Tucson area.

2. Initiate and coordinate the study of legal questions which can impede or enhance resource recovery efforts on the local level.

3. Maintain current information on federal and state activity in the field of resource recovery.

4. When the economic feasibility studies are complete, compare the net costs of resource recovery options with those of landfilling. This evaluation will have to be made periodically as local conditions and resource recovery technology change.

5. Maintain communication among the local jurisdictions concerning local resource recovery options and developments.

6. Delineate issues which have to be resolved by local jurisdictions. Among them are the following:

    a) What mix of public and private resource recovery activity is appropriate for the Tucson area?

    b) On what scale should resource recovery be undertaken in the Tucson area?

    c) To what extent should resource recovery be promoted because of its environmental advantages even though it cannot immediately compete with the cost of landfilling?

7. Coordinate resource recovery planning so that short-term programs will not impede long-term resource recovery goals.

8. Coordinate resource recovery planning with other local planning efforts such as the siting of new landfills and transfer stations, the development of new business and industrial centers, and efforts to attract new industries to the area.

Economic Feasibility

1. A study must be made of the present composition of the solid waste stream in the Tucson area. The study should distinguish between residential and commercial solid waste composition and between densely and sparsely populated areas. The waste stream should be analyzed in terms of volume, weight, heat value, and material content and form.

2. On the basis of current solid waste composition and projections of population and industrial growth, projections of the future composition of the area's solid waste stream should be made. Assumptions concerning changes in consumption patterns must be made clear.

3. A marketing study to identify the potential for sale of solid waste, refuse derived fuels, energy in the form of steam or electricity and recyclable materials such as paper, glass and aluminium should be made. The study should determine what prices the resources could command, the purchaser's quantity and quality specifications, and his willingness to sign long-term purchase agreements. The study should include data on the current and future potential for creating new markets for recovered resources. It should also be updated every two or three years to keep pace with changing technology and local industrial growth.

4. The resource recovery technologies in use or being developed in the United States and Europe and Japan, should be screened. An up-to-date file should be kept on those which might be applicable in the Tucson area, and their technological reliability should be evaluated.

5. A detailed study of landfilling costs in the Tucson area should be made. The operating costs which result from collection should be distinguished from those which result from transportation to and disposal in landfills. Projections of the future operating costs of existing landfills and the capital and operating costs related to establishing new landfills should be made for the following situations: (1) resource recovery remains at its present levels in the Tucson area, (2) there is a substantial increase in resource recovery activity, and (3) a large-scale, areawide materials and energy recovery program is put into operation.

Legal and Institutional Relationships

1. The local jurisdictions should develop a formal agreement to cooperate in establishing an areawide resource recovery program if it is shown to be economically feasible.

2. The local jurisdictions must determine what their interrelationships and responsibilities with respect to resource recovery will be and whether resource recovery should be handled primarily by the public or the private sector.

3. A study of what financing options are available for resource recovery programs must be made. Federal and state funding sources, as well as local sources should be evaluated. Special attention should be paid to the problems of financing an areawide program in which several jurisdictions are involved.

4. A study of legal questions which could enhance or impede resource recovery programs must be made. Among the questions to be addressed are the following:

   a) When does solid waste become the property of a municipality?

   b) In order to ensure an adequate long-term supply of solid waste for a resource recovery plant, could local ordinances be passed which would stipulate the final disposal point for all refuse, whether publically or privately collected?

   c) Are there legal restrictions on the signing of long-term contracts among the local jurisdictions or between the local jurisdictions and private companies which could impede a resource recovery program?

   d) Can local jurisdictions legally restrict private resource recovery activity?

   e) Can local ordinances be passed to encourage the procurement of recovered energy, or goods containing recovered materials?

   f) Can a local beverage container deposit ordinance be passed to encourage reduction in the amount of solid waste generated?

   g) Can source separation ordinances be passed?

5. When legal or institutional impediments are discovered, the local jurisdictions must make specific plans to remove them.

Public Opinion

1. A survey of citizen support for resource recovery activity should be made. Individuals, political leaders, public interest groups, business groups and representatives of local industry should be contacted to determine their interest in and understanding of various resource recovery options.
   Community groups and organizations should be solicited to participate in the implementation of surveys and questionnaires.

2. A continuing program of citizen education about the advantages and potential of resource recovery should be initiated.
3. A program should be initiated to provide information about the advantages, techniques and opportunities for resource recovery to local businesses, industries, and government agenceis which generate recoverable resources or which might provide markets for recovered products.

CHAPTER SEVEN: COLLECTION AND DISPOSAL (FINAL DRAFT)

Introduction

Sanitary landfilling has been considered to be reliable, economical and when properly engineered, an environmentally sound method of disposing of solid waste, particularly in the arid Southwest. Until the technological and economic barriers to resource recovery are overcome, it will remain the backbone of the areawide disposal program. Even with the implementation of large-scale energy recovery, some sanitary landfills will still be required to dispose of residues and the unprocessible portions of the solid waste stream. However, the cost of developing new landfills to accomodate widespread urban development, as well as the cost of transporting solid waste to distant landfill sites, render sanitary landfills a less than perfect solution to solid waste disposal.

After a brief review of federal and state regulation, this chapter will deal with three problem areas:

1) The problem of identifying and controlling landfills which are no longer in use so that they do not become health or safety hazards. This section will include a discussion of methane gas generation, leachate production and subsidence.

2) The problems of maintaining an efficient collection system, ensuring the environmentally sound and aesthetically acceptable operation of sanitary landfills, and eliminating illegal dumping.

3)The problem of ensuring adequate landfill space and economical collection services in the future. This section will focus on identifying publically and environmentally acceptable landfill sites and acquiring the land for them and on developing a system of transfer stations which will reduce transportation expenses and provide the basis for the transition to a resource recovery system when it becomes feasible for this area.

State and Federal Programs

Federal

The Resource Conservation and Recovery Act authorizes the Environmental Protection Agency to establish guidelines for solid waste management and to identify minimum performance levels which will protect health and welfare (Section 1008). The act specifically mentions the protection of ground and surface waters from leachate and runoff, the protection of ambient air quality, disease and vector control, safety and aesthetics. The act prohibits open dumping and requires EPA to publish an inventory of all open dumps in the country (Section 4005). EPA is also required to establish criteria defining what differentiates open dumping from sanitary landfilling (Section 4004). For the purposes of the act, the two are mutually exclusive (Section 4005). Those disposal sites which are classified as open dumps but which can be upgraded to meet sanitary landfilling requirements, may continue to operate as long as a schedule for their improvement is enforced (Section 4005). Those which are not upgraded must be closed.

As a result of the act, EPA promulgated two sets of guidelines and the "Criteria for Classification of Solid Waste Disposal Facilities and Practices"(See Appendices 1-3). The guidelines are mandatory for federal agencies and recommended for all other groups engaged in solid waste management. The "Criteria" apply to all new and existing disposal facilities regardless of ownership and are the basis for deciding whether a facility may or may not operate. Old landfills are not covered.

The "Guidelines for the Land Disposal of Solid Wastes" (Title 40, Part 241) specify criteria by which to evaluate potential landfill sites. The criteria include the hydrogeology of the site, the availablility of cover material, the environmental, socioeconomic and climatic conditions of the site, the site's accessibility regardless of the weather, and its

distance from airports. The guidelines also require that new sites have professional engineering plans which include details on exactly how the site will be constructed and operated and how it will be used and maintained after closure. Other guidelines define procedures to protect water and air quality, control disease vectors and methane gas, and ensure a site's aesthetics.

The "Guidelines for the Storage and Collection of Residential, Commercial and Institutional Solid Waste" (Title 40, Part 243) establish standards for storage containers and collection equipment, operating procedures for collectors, and a schedule for the frequency of collection of various types of wastes. They also require that complete records of capital, operating and maintenance costs be kept and reviewed periodically with a view to altering the collection system to make it more economical. The importance of minimizing transportation costs through proper routing, compaction and the use of transfer stations where warranted is stressed.

The "Criteria for Classification of Solid Waste Disposal Facilities and Practices" (Title 40, Part 257) establish standards regarding the location of landfills in floodplains, the protection of endangered or threatened species, the protection of surface and ground water, the control of disease vectors, and the maintenance of air quality. In terms of safety, they define acceptable concentrations of methane gas within the boundaries of a landfill, establish procedures for preventing fires, delineate the closest distance a landfill may be from an airport to ensure that if birds are attracted to the landfill they will not interfere with air traffic, and prohibit uncontrolled public access to disposal sites.

State

State law requires that local jurisdictions maintain landfills for public use. If they do not own appropriate land, they must "lease,

purchase or otherwise control sufficient property for the dumping grounds." Fees may be charged for the use of these landfills to help defray the costs of providing them (A.R.S. 9-441). Dumping anywhere other than the public landfills is a misdemeanor (A.R.S.13-1603). Incorporated cities and towns may provide collection for their jurisdictions, but according to a ruling by the Pima County Attorney, Pima County may not do so either directly or by contract because state law does not specifically give counties the responsibility for providing collection services.

Regulating solid waste disposal systems in the state is the responsibility of the Arizona Department of Health Services (A.R.S. 36--136), but as was mentioned in the Needs Assessment (p. 72), ADHS can delegate this responsibility to the County Health Departments. ADHS regulation involves inspection of existing disposal sites and collection stations and plan review and approval of all proposed disposal sites and of all proposed changes in disposal methods at existing sites (Regulatory and Enforcement Program - Draft, March, 1980, "Arizona State Solid Waste Management Plan. P. VIII-D-10-20).

In the course of developing the Arizona State Solid Waste Management Plan as required by RCRA (Section 4003), ADHS has reviewed its statutory authority and its current regulations. The department has concluded that it has sufficient authority to regulate solid waste management in the state in accordance with RCRA: The decision to develop new legislation for solid waste management will be primarily a matter of choice rather than necessity" ("The Legal Framework - Revised Draft, June 1980,"Arizona State Solid Waste Management Plan, p. V-29). ADHS has also concluded that although its regulations are not always as specific as the federal guidelines described above, "its existing regulatory standards are substantially equivalent to the federal criteria, and sufficient to ensure compliance with the Act (RCRA)"("Regulatory and Enforcement Program - Draft, March,

1980," Arizona State Solid Waste Management Plan, p. VIII-D-8).

As far as the local jurisdictions are concerned, these decisions by ADHS mean that state regulation of the area's solid waste disposal practices will be essentially the same as that outlined in the guidelines and criteria promulgated by EPA. In addition, ADHS is implementing two programs which will help eliminate hazards which may result from improper control of old landfills.

Old Landfills

Three serious hazards are associated with all landfills: water pollution, methane gas production, and subsidence. Each of these is aggravated when improper siting or maintenance enables moisture to enter a landfill. As a result, governments at every level are now regulating the siting and operation of landfills much more stringently. In the past, however, this was not the case. Landfill sites were chosen largely on the basis of convenience and the availability of land. When they were filled, they were covered and left, sometimes with no routine maintenance.

The Areawide Wastewater Management Plan has identified more than thirty landfills in the area which are no longer used (PAG, June 1978, p.64). Some of these are privately owned; others are on public land. Those who compiled the list suggest that because they were somewhat dependent on the memories of long-time residents to locate old sites, the list may not be complete; other sites may be uncovered as construction takes place (Conversation with Dr. Gray Wilson, 9/3/80).

Water Pollution Potential

The two potential sources of water pollution associated with landfills in this area are washouts caused by floods and leachate caused by the percolation of water through a landfill into the underlying water table. By siting landfills outside of floodplains, washouts can be avoided. According to ADHS, by siting them so that the water table is at least 100 feet below the bottom of the landfill and by maintaining proper cover over the landfill so that water cannot permeate it, the danger of leachate formation can be minimized.

The Areawide Wastewater Management Plan indicates that about twenty of the old sites which have been identified are located in the floodplains of Pantano Wash and the Rillito and Santa Cruz Rivers and could, therefore, be potential sources of pollution. An analysis made in that plan suggested that eight of those landfills have a "good possibility" of causing groundwater pollution in the "near future" (p. 64).

Two pilot projects were conducted by PAG and the County Wastewater Management Department to monitor leachate production in old landfills in the metropolitan area. Monitoring at the old El Camino del Cerro Landfill showed no leachate production thus far. Monitoring near a completed section of the Ina Road Landfill showed contamination of the groundwater in the vicinity of the landfill. The report on this project hypothesized that storm water and erosion of the banks of the Santa Cruz River near the landfill were causing leachate production in the landfill and that this was contributing to the contamination (PAG, "Landfill Leachate and Groundwater Quality Analysis: Ina Road Landfill - Draft, "Vol.I, July, 1980, p.1).

Landfills which are not located in floodplains can also be subject to leachate production if they are not properly graded and maintained. For example, if the contours of an old landfill are changed to accommodate construction, increased penetration by rainfall and runoff can occur. The resulting increase in moisture content encourages leachate production. A similar problem could occur if an old landfill were converted into a park or playground and irrigated.

Subsidence

All landfills settle to some extent. The amount and rate of subsidence is dependent on the moisture content of the landfill. Other factors include the dimensions of the landfill, the composition of the material it holds and the amount of compaction which was done during the disposal process. The EPA Decision-Makers Guide in Solid Waste Management

(1976) says that most of the settling takes place within the first five years of closure and the rest during a much longer period (p. 116). In this arid area, however, the settling goes on slowly during many years. If additional moisture is introduced into the landfill, the rate will increase.

Methane Gas Generation

As the contents of a landfill decompose, methane gas is produced. In high enough concentrations, methane can explode. In sanitary landfills, this problem is handled by maintaining a thick cover of soil so that moisture cannot enter the landfill and hasten the rate of decomposition and by implanting venting systems if the concentrations of methane begin to increase.

According to EPA Decision-Makers Guide, under normal circumstances, "the rate of gas production is likely to reach a peak within the first two years and then taper off" (p. 115). If this were true for this area, the problem of methane generation at old landfills would not be serious. The arid nature of the Southwest, however, means that rates of methane generation are slowed. The peak may come as late as ten years or more after closure of a landfill (Conversation with James Angell, ADHS, 9/4/80). Furthermore, if the cover over an old landfill is not adequate and there is an unusual flood or rainy season or if the contours of the land are altered such that more moisture enters the landfill, methane will begin to generate at increased rates regardless of when the landfill was closed.

The Arizona Department of Health Services recently checked several old landfill sites in the Tucson area for methane gas. They found high concentrations of methane at only one site - the old Broadway Landfill in the floodplain of Pantano Wash near Kolb Road. The concentrations of gas were well above the 5 percent figure that is considered

to be safe. This site is now privately owned, and the owner has been planning to use part of it for a housing development. There are existing homes near one boundary of the site in which the gas could accumulate at dangerous levels.

Because of the problem of subsidence and methane gas generation, EPA recommends that no permanent structures be placed on completed landfills unless special designs are used (Decision-Makers Guide, p.116). Such designs might include venting systems, liners over the landfill to prevent the entry of moisture, and pylons placed through the landfill to protect any structure from settling. This kind of design has been used in the Phoenix area (James Angell, ADHS, 9/4/80). In general, however, ADHS does not approve of such plans (Stuart Baker, ADHS, 8/20/80).

In order to control the hazards which can develop from old landfills several things need to be done. First, they must be located and their dimensions and distance from the water table ascertained. Second, their condition must be evaluated with respect to subsidence, methane gas production, and water pollution potential. If maintenance and remedial measures are required, they must be carried out. Finally, the way in which old landfills and adjoining land are used must be controlled to ensure that their development does not create a hazard.

The Arizona Department of Health Services is initiating two programs which will involve the identification and evaluation of old landfills. The first is the Imminent Hazards Program which allows state agencies to act to alleviate any condition which presents a clear and present danger to health. The other is the Uncontrolled Hazards Program under which two investigators are trying to identify areas such as old landfills which

have the potential for creating environmental problems. When such hazards are located, the State Attorney General will conduct an investigation to establish liability on a case by case basis. This could lead to assessments of damages and suits for injunctive relief.

Illegal Dumping

According to the County Health Department, illegal dumping in the area is a serious problem. Dumps range in size from small piles of debris dropped by individuals to large areas covering several acres. The areas most affected are the rural area west of the Tucson Mountains, the west and southwest parts of the metropolitan area, and sections of land along the Tanque Verde Wash and the Rillito River in the eastern and northeast parts of the metropolitan area. A local official of the State Land Department says that on state land alone, there are areas east and west of Tucson where thousands of tons of solid waste have been dumped illegally.

Efforts have been made by the Pima County Wastewater Management Department to clean up the areas, but the dumping continues, often right next to public landfills (John Beimfohr, 8/28/80).

The kind of material which is deposited in these dumps is largely herbicides, dead animals, domestic garbage, vegetation and yard trimmings in the City of Tucson. In unincorporated areas, everything from garbage to demolition materials is found. There is no profile of those people who are involved, but the County Health Department suggests that the dumps accumulate from a multiplicity of small loads carried by individuals or by small-scale private haulers hired by individuals.

The impact of illegal dumping may become even more serious with the new disposal regulations for hazardous wastes, regulations which will probably increase the costs for generators of hazardous waste and provide an incentive for illegal disposal. An article in the Christian Science Monitor suggests that some generators in the eastern states are hurriedly dumping their hazardous wastes in order to be rid of them before the new regulations take effect in November 1980 (August 19, 1980, pp. 1, 17).

The local agencies which have to deal with the problem of illegal dumping agree that the legal structure is inadequate. Illegal dumping is a misdemeanor under A.R.S. 13-1603, and the State Health Code (Article 4) makes the individual generator responsible for the proper disposal of his solid waste. In addition, the local jurisdictions have ordinances prohibiting littering and making individuals responsible for the maintenance of their own property. The problem is that these regulations have been extremely hard to enforce because unless a law enforcement officer actually sees someone dumping illegally, it is very hard to prove in court that he did so. As a result, the County Health Department has had to rely on requests for voluntary compliance when evidence of ownership of illegally dumped debris can be found.

Various approaches have been suggested for dealing with illegal dumping. The primary one is to instill people with an environmental ethic through public education efforts. News media exposure can help on a temporary basis, but longer-term efforts are really needed. Some ideas include adding more information about the hazards of illegal dumping to school curricula, sentencing violators to clean up the area where they dumped their material, and hiring service groups to clean up illegal dumps.

Legal changes could be made which would improve the County Health Department's ability to enforce the rules against illegal dumping. The main one which was suggested by the various local agencies concerned with solid waste management was to make the generator personally responsible for the final disposal of his solid waste. This has been done in California. If anything can be found in the dumped material which identifies its owner, such as labels on magazines and addresses on letters, the owner can be fined regardless of who transported the material. Another approach

is to require every transporter of solid waste to have a permit and to require that generators of solid waste hire only those transporters who can produce a permit. The generator can be prosecuted for making any other arrangements.

There is some indication that the type of collection service available may have an impact on the amount of illegal dumping. In the county, where individuals must carry their own debris to the landfills or pay a private carrier to do so, the problem is more severe than it is in local jurisdictions which provide collection services. However, the provision of a collection service by the county would require special authorization from the State Legislature.

The increased use of transfer stations could help prevent illegal dumping by providing convenient disposal points for individuals and small private haulers who would otherwise have to make long trips to reach legal landfills. Pima County now operates three small-scale transfer stations consisting of large containers which are emptied periodically. They are located at Ryan Field, Three Points and Ariwaca A fourth is planned for Lakewood. The City of Tucson is planning a large-scale transfer station to reduce the transportation costs of its collection system. It is the first in a series planned for various parts of the city. If these transfer stations could provide dumping facilities for individuals and small private haulers, it might decrease the amount of illegal dumping elsewhere.

Finally, more vigorous enforcement of the laws against wildcat dumping which do exist might discourage the phenomenon. Fines could be increased. Publishing the names of offenders in local newspapers has been suggested.

Two studies will help in the evaluation of the approaches outlined above. First, a profile of those engaged in illegal dumping should be developed. From this it might be possible to determine whether stricter laws, changes in the collection system, more numerous legal dumping facilities, or other factors would have the greatest impact on illegal dumping. Second, a study of the efforts of other communities to control illegal dumping should be made to see which techniques are effective and could be applied in this area.

Present System of Collection

Collection and transportation to disposal sites in this area are provided by both public and private entities depending on the local jurisdiction (See PAG, State Planning Region II: Solid Waste Disposal Needs Survey, 1980 to 2,000, March 1980 pp. 62-72. This document will be referred to as the "Needs Assessment" hereinafter). According to the Arizona Department of Health Services and the County Health Department which are responsible for preventing health hazards, the present collection systems in the area are efficient and effective. No immediate changes in procedure are necessary.

If the City of Tucson annexes new sections of county land, however, its collection system may temporarily become overburdened. One short-term solution could be to have the City hire private carriers to provide the service. If there is unexpected growth in rural areas of Pima County, new transfer stations will be needed. Finally, if it is determined that illegal dumping in the county is strongly related to the fact that collection services are not publicly provided in that jurisdiction, a law allowing Pima County to provide collection services will be needed.

Present System of Disposal

Disposal takes place in this area at sanitary landfills operated either by the City of Tucson or Pima County. The Arizona Department of Health Services regulates disposal practices. The system is generally well operated, but there are several issues which should be addressed. Some of these were noted during an ADHS inspection (June-July 1980) of the existing city and county landfills in accordance with the "Open Dump Inventory" required by the Resource Conservation and Recovery Act.

Access

All of the existing landfills are fenced. Access to them can and should be limited to the hours during which there are personnel on duty. This is important to ensure that the incoming loads of solid waste are properly and safely handled. In addition to equipment operators, there should be spotters at the landfills to help ensure that hazardous wastes are admitted only to a specially designed hazardous waste facility. Access to the county's transfer stations should be similarly controlled.

Training

Personnel at the landfills and their supervisors need a training program to help them recognize potentially dangerous materials. Hazardous liquid wastes are particularly difficult to recognize, so a procedure for certifying their content may have to be devised.

Disposal Charges

The City of Tucson imposed fees for use of its landfills as of August 1, 1980. There are no disposal charges at county landfills. The County Wastewater Management Department estimates that since the implementation of the city's fee structure, there has been a 10 percent increase in the use of the county's Ina Road Landfill. The volume of liquid wastes

has increased noticeably since the fee for using the Los Reales hazardous waste site was implemented (Charles Nowak, 8/26/80). The effect of the differential in cost for using city and county landfills must be studied both in terms of capacity utilization at the various landfills and in terms of guarding against the illegal disposal of hazardous waste in regular landfills.

Litter

Both city and county landfills have litter problems which are primarily caused by private vehicles delivering loads of debris. The problem could be reduced through better enforcement by the City Police and County Sheriff's Department of the state and local regulations requiring that loads be covered.

Operating personnel pick up the litter at the landfills on a regular basis, and additional cleanup approaches are being tried. There is an agreement between the City of Tucson and the Beacon Foundation, for instance, by which the foundation is reimbursed for cleaning up litter in the area of a city landfill. The County Wastewater Management Department is investigating the possibility of contracting with private service organizations to provide a similar service at county landfills. This type of arrangement serves three purposes: The litter is removed, the organizations generate income, and those who participate receive a graphic education in the importance of solid waste management.

Methane Gas Generation

According to the ADHS inspections of the area's operating landfills during June and July 1980, only the Speedway B & R Landfill is generating unacceptable levels of methane. The fact that there are apartment buildings in the vicinity which could accumulate the gas make immediate action imperative. The City Department of Operations is now installing methane monitoring equipment in the northwest and southwest corners of the landfill and a venting system in its south and east walls to remedy the problem.

A system for monitoring methane production on a regular basis at all operating landfills should be established.

Water Pollution

According to the Arizona Department of Health Services, leachate monitoring is necessary for any landfill site the bottom which is within 100 feet of the water table. (Other landfills may also require monitoring depending on their particular location and condition.) The only operating landfill which falls in this category is the Ina Road Landfill. The pilot monitoring project which was conducted there during the last half of 1979 did indicate leachate production. Monitoring at the site should, therefore, be continued until the seriousness of the pollution problem is determined. There is no formal monitoring system at any of the oper operating landfills, but the Tucson Department of Water does provide some water quality analysis from its wells which are down gradient from city and county landfills.

Three potential washout problems have been identified at landfills in the area. At the Ina Road Landfill, a bank protection project is now being carried out by the County Highway Department. The project involves placing a liner along the bank and covering it with rip rap. Seven hundred feet have been completed and there are 2000 feet still to be covered.

In addition, the Arizona Department of Health Services has asked Pima County to provide information regarding preventative measures to be taken against washouts and other water penetration at a new trench being established at the Catalina Landfill. Similar information has been requested from the City of Tucson with respect to the Speedway B & R Landfill (Letters to George Brinsko and Carlos Valencia from Barry Abbott, ADHS, 6/25/80 and 8/15/80).

Closures

According to calculations made in the "Needs Assessment" (p. 5), although there is adequate landfill space in the area for the planning period, by the year 2000, the only landfills with remaining capacity will by the Marana, Sahuarita and Western Regional landfills operated by Pima County. (The Western Regional Landfill is still in the planning stages.) Most of the landfills which will close during the plan period will become parks. This could pose special maintenance problems if the parks are to be irrigated. The responsibility for their safe maintenance will belong to the jurisdiction or private person who owns the land on which they are located.

Because of the potential hazards described under the section on old landfills, the use and maintenance of the completed landfills must be controlled. This could be done under the terms of any lease or sale agreement involving the property or it could be done through zoning or health ordinances detailing how closed landfills and the properties adjacent to them may be used. No consistent approach has yet been developed, and the governments involved have been dealing with problems which arise on a case by case basis.

Future Collection and Disposal System

The projections of population and landfill use contained in the "Needs Assessment" (pp. 5, 41) and discussions with the Pima County Department of Wastewater Management and the City of Tucson Department of Operations indicate that there is adequate landfill capacity in the area for the next twenty years. This assumes that the Western Regional Landfill is completed within the next few years, that the PAG projections are fairly accurate, and that a large-scale energy recovery system is not implemented.

The pressing problem during the plan period will be the location of the landfills. According to the "Needs Assessment" (p. 5), by the year 2000, the only ones which will have remaining capacity will be the Marana, Sahuarita and Western Regional landfills operated by Pima County. All three are fifteen to twenty miles from downtown Tucson and even further from the rapidly growing eastern metropolitan area. The Department of Operations estimates that a round trip to any of these landfills would take at least an hour and that the city trucks get about four miles to the gallon. Thus, as the landfills nearer the metropolitan area are closed, transportation expenses for both the City of Tucson and private haulers will increase, especially as labor costs and gasoline prices rise. This could encourage illegal dumping by small private haulers and individuals.

Current Planning Efforts

Although Pima County does not provide collection service, both the Department of Operations and the County Department of Wastewater Management are working to provide more convenient disposal facilities. Both departments express a need for additional space in the northwestern and eastern parts of the metropolitan area. The Department of Wastewater Management indicates that the Green Valley area will also require space

in the near future.

In addition to the Western Regional Landfill which the county hopes to have operational in 1981, the Department of Wastewater Management has also completed a preliminary design for a site on land acquired from the state in the Tangerine Road area. This site would have a twenty-year capacity and could open as early as August 1981, assuming approval by the Arizona Department of Health Services and public acceptance. In the rural areas, the county is planning to add small-scale transfer stations as collection points for communities which lack landfills.

The Department of Operations is evaluating the expansion of the Speedway B & R Landfill under an agreement with the Bureau of Land Management and a private trust. The department is also considering a large tract of state land southwest of the city. The land is now being mined. When the mining is complete, the city may request that the state lease the land, for reclamation through landfilling.

In an effort to reduce transportation costs without having to build new landfills, the Department of Operations is developing a plan for a series of transfer stations to be located in parts of the city which need convenient disposal facilities. The first of these is now being designed. The initial plan is to have some of the LAMs (loadmatic packer vehicles described in the "Needs Assessment", p.63) which will haul loads to the landfills deliver their loads to the transfer station. The solid waste will be reloaded into large trailers which will transport it to the landfills. In the beginning, no additional compaction will be done. Although the net costs of this sytem have not been calculated, it is expected that a net cost savings will be realized through fewer trips to the

landfills and less nonproductive transportation time spent by the pickup crews. Eventually, compaction and/or shredding could be added to the system, particularly if large-scale energy recovery is implemented.

Future Collection Needs

If the transfer station being planned by the city results in substantial net cost savings, as is expected, several more will be built during the plan period, and the pressure to construct new conveniently located landfills will consequently be somewhat reduced. Transfer stations will become the cornerstone of the city's collection system. The City of South Tucson and the private collection agencies servicing the unincorporated parts of the county may find it economical to participate in the use of the transfer stations. This would require agreements among the various private agencies and local jurisdictions.

The location of the transfer stations must be considered carefully to ensure that they are accepted by the public and do not present any hazard to the adjacent areas. It has been suggested that they might be put in industrial parts of the city or on old landfill sites. The latter would require special building precautions. Another factor which must be considered is the potential implementation of areawide resource recovery. The stations should be located such that if resource recovery is begun on a large scale, they will be convenient to transportation routes and markets.

Future Disposal Needs

According to the "Needs Assessment," if no new landfills are constructed during the next twenty years, the area will run out of landfill capacity shortly after the year 2000 (p. 5). Even if the barriers to resource recovery were suddenly removed such that large-scale energy recovery could be undertaken, more landfills would eventually be needed to dispose of the residues and unprocessible wastes. As a result, planning for new

landfills should be done during the plan period.

The actual construction of a sanitary landfill can be the least time-consuming part of developing a new site. Depending on the terrain, it can take less than a year. The more serious issues are encountered before construction begins and must be dealt with concurrently: An environmentally acceptable site must be found and engineering designs which meet state and federal standards must be drawn up; the land must be acquired; and the public must approve the site. The fact that this process is increasingly expensive and difficult argues for a cooperative planning effort on the part of the area's solid waste disposal agencies.

1. Environmental Acceptability. As was described in the section on federal and state regulation, the "Criteria for Classification of Solid Waste Disposal Facilities and Practices" established by the EPA in 1979 in accordance with RCRA are much more stringent than the standards for landfilling operations in the past. In enforcing these standards, ADHS is developing its own criteria for the siting and operation of new landfills. Local solid waste management agencies must submit plans for all proposed disposal facilities and ADHS must approve them before the facilities can be used. The "Sanitary Landfill Site Selection and Development Guidelines" (See Appendix 4) are the basis for plan submissions to ADHS. They require detailed environmental information and operations descriptions. In addition, they require that there be a discussion of why the new facility is needed.

2. Acquisition of Land. Because of public opposition to having landfills near residential areas and because of the growth of the metropolitan area, the local jurisdictions are more and more dependent on using state or federal land for new landfill sites (See the map on p. 13 of the "Needs Assessment"). The land can be acquired through leases,

limited sales, service agreements, and land trades. However, the terms by which the state and federal governments will release land for the construction of sanitary landfills are becoming increasingly strict.

State land can be acquired either by commercial lease or by limited sale, but in either case, the fair market value of the land based on "probable alternative uses" will be considered. Under a commercial lease, the state will charge 8 percent of the land's fair market value plus a percentage of any gross income generated by its use. The usual duration of the lease will be ten years. Under a limited sales agreement, the land will be sold at its appraised fair market value. The buyer will pay 10 percent down and the balance over a twenty-year period at 7 percent interest. (The interest rate may be adjusted to reflect market conditions.) The sales agreement will include a reversionary clause so that when the landfill is completed, the land will return to the State Land Trust.

When applying to the State Land Department for either a lease or a limited sale, the local jurisdiction will have to justify its need for the land by demonstrating that other land has been considered for the same purpose and indicating why state land is preferred. Additional elements of the application will include consideration of the hydrological and geological conditions of the tract, a commitment to restore the land to its original configuration or to prepare it for an accepted future use when the landfill is complete, and a bond to insure against future problems which might develop at the site as a result of its use as a landfill. There may also be a requirement that public support for the project be demonstrated, perhaps through public hearings. An application for a landfill which demonstrates that long-range areawide planning has been done will be received more favorably by the department than a series of applications from jurisdictions in the same area which have not jointly

evaluated their landfill requirements. If the plans are adequate, the department is not adverse to committing land for a landfill site well in advance of its use. (This section is based on a conversation with Dennis McCarthy, State Land Department, 8/27/80.)

According to the Department of Operations, one of the results of the new "fair market value" approach of the State Land Department is that the cost of leasing state land for a landfill has risen from $1 per acre per year to $40 per acre per year.

The cost of leasing federal land is minimal by comparison. The rate is set by statute at $.25 per acre per year. No federal land is sold for landfills. Like the State Land Department, the Federal Bureau of Land Management requires that applications for leases demonstrate why the land is needed, what the environmental impacts of using it would be and how much land will be used each year. Unlike the State Land Department, the Bureau of Land Management will not tie up federal land for future use. Ordinarily, the land must be used for the purpose specified within two years of the agreement. Otherwise it reverts to federal control. (This section is based on a conversation with Bob Archibald, Bureau of Land Management, 8/27/80.)

3. Public Acceptance. Landfills have a bad public image. People fear that if a landfill operation is conducted near their residence or business, it will reduce their property values and quality of life. As a result, landfill sites have been blocked in the past by public outcries. An example is the present debate over the proposed Western Regional Landfill. Pima County has held public hearings, purchased the land and completed the engineering designs. At the early hearings, little opposition was expressed, and the plan went forward. Now, after the expenditure of over $200,000, the residents of the area are adamently

opposed to the site and the whole project may have to be relocated (Charles Nowak, 8/26/80).

To minimize such problems and expenditures, the public should be educated about the need for additional landfill sites and should be given an active part in deciding on their locations. Some communities have set up special citizens' task forces to assure participation from the earliest planning stages.

The location of future landfills should be made public so that their presence would be acknowledged before other development took place in their vicinity. A requirement that potential property buyers be informed by property sellers of the location of a future landfill in the vicinity should be considered.

4. Areawide Planning. To minimize expensive duplication of effort and to encourage approval of new landfill sites by the relevant federal and state agencies, the local jurisdictions of the PAG area should cooperate in locating acceptable landfill sites. They should also cooperate in determining which sites need to be developed when and by which jurisdiction. If it can be demonstrated that all environmentally acceptable sites have been considered and that the need for additional landfills in certain areas has been jointly established, gaining the support of state and federal agencies will be simplified and public opposition to the sites which are chosen may be reduced.

Objectives

1. Ensure that the quality of the area's groundwater is not degraded.
2. Ensure that old landfill sites do not result in public safety hazards.
3. Ensure that the sanitary landfills now in operation meet federal and state standards.
4. Ensure that the present collection system is efficient and satisfies the area's needs.
5. Eliminate illegal dumping.
6. Identify technically and publicly acceptable sites for sanitary landfills to meet future needs.
7. Implement a series of transfer stations to (1) reduce transportation costs, (2) make a first step toward developing an areawide resource recovery capability, and (3) discourage illegal dumping.

Management Tasks

Old Landfills

1. An investigation to locate all the old landfills in the area, ascertain their dimensions and distance from the water table, and evaluate their conditions should be made.
2. Action to alleviate any problems found at old landfills relating to water quality, gas production or subsidence should be taken.
3. A procedure should be established for regulating the use of old landfills and the adjacent land to ensure public safety.
4. Responsibility for safely maintaining old landfills should be established so that case by case adjudication can be avoided..

Illegal Dumping

1. Information on illegal dumpers should be collected so that the situations which encourage illegal dumping can be understood.
2. A study of how other communities have tried to deal with illegal dumping should be made in an effort to find techniques which are applicable to this area.
3. Strong anti-littering legislation for the state legislature should be drafted and promoted.
4. Legislation to allow Pima County to franchise and regulate private solid waste haulers should be drafted and promoted.
5. A public education campaign concerning the hazards of illegal dumping should be instituted through newspapers, schools,

neighborhood associations, and public service groups.

6. Provision for cleaning up the existing wildcat dumps must be made. Interagency cooperation, public and private particiaption and cooperative funding of clean-up projects will be crucial to the successful completion of this task.

Present Collection and Disposal System

1. The agencies operating the disposal system must limit access to the landfills and transfer stations to times when an operator is on duty.

2. The agencies operating the disposal system should designate personnel at all landfills and transfer stations to check the contents of the incoming loads. Operators should oversee landfill operations to prevent inappropriate materials from being deposited.

3. A training program for landfill and transfer station personnel and their supervisors should be set up to help them recognize hazardous waste.

4. The possibility of requiring a laboratory analysis of liquid wastes before allowing their disposal in sanitary landfills should be evaluated.

5. Pima County should study the possibility of imposing disposal fees for the use of its landfills.

6. The local enforcement agencies should enforce the laws requiring that loads of solid waste be covered.

7. An effective system for preventing the accumulation of litter at and near landfills and transfer stations should be implemented.

8. The department of Operations must take the necessary steps to prevent dangerous accumulations of methane gas at the Speedway B & R landfill.

9. Evaluate all landfills for methane gas generation, to determine needs for monitoring for methane leachate, especially near residential areas.

10. The washout prevention work at the Ina Road Landfill must be completed.

11. A leachate monitoring system should be established at any landfill which could present a water quality hazard because of its hydrology.

Future Collection and Disposal System

1. The City of Tucson should complete construction of the first large-scale transfer station. Provision for public dumping at the transfer station should be made to reduce traffic at the landfills and discourage illegal dumping. The transfer station should be designed and sited so that conversion for resource recovery is feasible.
2. The City of Tucson should add large-scale transfer stations as needed to ensure economical and efficient solid waste management.
3. Pima County and other local jurisdictions should add small-scale transfer stations as population growth warrants them.
4. The local jurisdictions should cooperate in conducting a survey of all potential landfill and develop a 20 year plan for landfills in Pima County.
5. The local jurisdictions should cooperate in determining which local agency should develop which landfill sites.
6. When the division of responsibility for providing the landfills is complete, the local jurisdictions should individually begin negotiations to secure the required space for future use.

Appendix One

Part 241 - Guidelines for the Land Disposal of Solid Wastes

Taken From: Code of Federal Regulations, Title 40, Protection of Environment, Parts 100 to 399, Revised as of July 1, 1979.

(11) Emission measurements and laboratory analyses required by the responsible agency.

(12) Complete records of monitoring instruments.

(13) Problems encountered and methods of solution.

(d) An annual report should be prepared which includes at least the following information:

(1) Minimum, average, and maximum daily volume and weight of waste received and processed, summarized on a monthly basis.

(2) A summary of the laboratory analyses including at least monthly averages.

(3) Number and qualifications of personnel in each job category; total manhours per week; number of State certified or licensed personnel; staffing deficiencies; and serious injuries, their cause and preventive measures instituted.

(4) An identification and brief discussion of major operational problems and solutions.

(5) Adequacy of operation and performance with regard to environmental requirements, the general level of housekeeping and maintenance, testing and reporting proficiency, and recommendations for corrective actions.

(6) A copy of all significant correspondence, reports, inspection reports, and any other communications from enforcement agencies.

(e) Methodology for evaluating the facility's performance should be developed. Evaluation procedures recommended by the U.S. Environmental Protection Agency should be used whenever possible (see bibliography).

APPENDIX—RECOMMENDED BIBLIOGRAPHY

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6. Zausner, E. R. An accounting system for incinerator operations. Public Health Service Publication No. 2032. Washington, U.S. Government Printing Office, 1970. 17 p.

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PART 241—GUIDELINES FOR THE LAND DISPOSAL OF SOLID WASTES

Subpart A—General Provisions

Subpart B—Requirements and Recommended Procedures

AUTHORITY: Sec. 209(a) of the Solid Waste Disposal Act of 1965 (Pub. L. 89-272) as amended by the Resource Recovery Act of 1970 (Pub. L. 91-512).

SOURCE: 39 FR 29333, Aug. 14, 1974, unless otherwise noted.

Subpart A—General Provisions

§241.100 Scope.

(a) The guidelines are generally applicable to the land disposal of all solid waste materials. However, the guidelines do not apply to hazardous, agricultural, and mining wastes because of the lack of sufficient information upon which to base recommended procedures. Concerning the specific practice of land disposal of milled solid wastes, EPA guidance is contained in a position statement issued in November 1972.

(b) The requirement sections contained herein delineate minimum levels of performance required of any solid waste land disposal site operation. The recommended procedures sections are presented to suggest preferred methods by which the objectives of the requirements can be realized.[1] The recommended procedures are based on the practice of sanitary landfilling municipal solid waste: Normally, residential, and commercial solid waste generted within a community. Sanitary landfilling is the most widely applied environmentally acceptable land disposal method. If techniques other than the recommended procedures are used, or wastes other than municipal solid wastes are disposed, it is the obligation of the proposed facility's owner and operator to demonstrate to the responsible agency in advance by means of engineering calculations and data that the techniques employed will satisfy the requirements.

(c) Pursuant to section 211 of the Solid Waste Disposal Act, as amended, these guidelines are mandatory for Federal agencies. In addition, they are recommended to State, interstate, regional, and local government agencies for use in their activities.

(d) These guidelines are intended to provide for environmentally acceptable land disposal site operations. The guidelines do not establish new standards but set forth requirements and recommended procedures to ensure that the design, construction, and operation of both existing and future land disposal sites meet the health and environmental standards for the area in which they are located. The guidelines are intended to apply equal-

[1] Further guidance may be found in the EPA publication, "Sanitary Landfill Design and Operation," which served as a basis for the development of these guidelines.

ly to all solid waste generated by Federal agencies, regardless of whether processed or disposed of on or off Federal property; and solid waste generated by non-Federal entities, but processed or disposed of on Federal property. However, in the case of many Federal facilities such as Post Offices, military recruiting stations, and other offices, local community solid waste processing and disposal facilities are utilized, and processing and disposal is not within the management control of the Federal agency. Thus, implementation of the guidelines can be expected only in those situations where the Federal agency is able to exercise direct management control over the processing and disposal operations. However, every effort must be made by the responsible agency, where off-site facilities are utilized, to attain processing and disposal facilities that are in compliance with the guidelines. Where non-Federal generated solid waste is processed and disposed of on Federal land and/or facilities, those facilities and/or sites must be in compliance with these guidelines. Determination of compliance to meet the requirements of the guidelines rests with the responsible agency, and they have the authority to determine how such compliance may occur.

[39 FR 29333, Aug. 14, 1974; 40 FR 5159, Feb. 4, 1975]

§ 241.101 Definitions.

As used in these guidelines:

(a) "Cell" means compacted solid wastes that are enclosed by natural soil or cover material in a land disposal site.

(b) "Cover material" means soil or other suitable material that is used to cover compacted solid wastes in a land disposal site.

(c) "Daily cover" means cover material that is spread and compacted on the top and side slopes of compacted solid waste at least at the end of each operating day in order to control vectors, fire, moisture, and erosion and to assure an aesthetic appearance.

(d) "Final cover" means cover material that serves the same functions as daily cover but, in addition, may be permanently exposed on the surface.

(e) "Free moisture" means liquid that will drain freely by gravity from solid materials.

(f) "Groundwater" means water present in the saturated zone of an aquifer.

(g) "Hazardous wastes" means any waste or combination of wastes which pose a substantial present or potential hazard to human health or living organisms because such wastes are nondegradable or persistent in nature or because they can be biologically magnified, or because they can be lethal, or because they may otherwise cause or tend to cause detrimental cumulative effects.

(h) "Infectious waste" means: (1) Equipment, instruments, utensils, and fomites of a disposable nature from the rooms of patients who are suspected to have or have been diagnosed as having a communicable disease and must, therefore, be isolated as required by public health agencies; (2) laboratory wastes, such as pathological specimens (e.g. all tissues, specimens of blood elements, excreta, and secretions obtained from patients or laboratory animals) and disposable fomites (any substance that may harbor or transmit pathogenic organisms) attendant thereto; (3) surgical operating room pathologic specimens and disposable fomites attendant thereto and similar disposable materials from outpatient areas and emergency rooms.

(i) "Intermediate cover" means cover material that serves the same functions as daily cover, but must resist erosion for a longer period of time, because it is applied on areas where additional cells are not to be constructed for extended periods of time.

(j) "Leachate" means liquid that has percolated through solid waste and has extracted dissolved or suspended materials from it.

(k) "Municipal solid wastes" means normally, residential, and commercial solid waste generated within a community.

(l) "Open burning" means burning of solid wastes in the open, such as in an open dump.

(m) "Open dump" means a land disposal site at which solid wastes are disposed of in a manner that does not protect the environment, is susceptible to open burning, and is exposed to the elements, vectors, and scavengers.

(n) "Plans" means reports and drawings, including a narrative operating description, prepared to describe the land disposal site and its proposed operation.

(o) "Residue" means all the solids that remain after completion of thermal processing, including bottom ash, fly ash, and grate siftings.

(p) "Responsible agency" means the organizational element that has the legal duty to ensure that owners, operators or users of land disposal sites comply with these guidelines.

(q) "Runoff" means the portion of precipitation that drains from an area as surface flow.

(r) "Salvaging" means the controlled removal of waste materials for utilization.

(s) "Sanitary landfill" means a land disposal site employing an engineered method of disposing of solid wastes on land in a manner that minimizes environmental hazards by spreading the solid wastes in thin layers, compacting the solid wastes to the smallest practical volume, and applying and compacting cover material at the end of each operating day.

(t) "Scavenging" means uncontrolled removal of solid waste materials.

(u) "Sludge" means the accumulated semiliquid suspension of settled solids deposited from wastewaters or other fluids in tanks or basins. It does not include solids or dissolved material in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial wastewater effluents, dissolved materials in irrigation return flows or other common water pollutants.

(v) "Solid wastes" means garbage, refuse, sludges, and other discarded solid materials resulting from industrial and commercial operations and from community activities. It does not include solids or dissolved material in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial wastewater effluents, dissolved materials in irrigation return flows or other common water pollutants.

(w) "Vector" means a carrier, usually an arthropod, that is capable of transmitting a pathogen from one organism to another.

(x) "Water table" means the upper water level of a body of groundwater.

(y) "Working face" means that portion of the land disposal site where solid wastes are discharged and are spread and compacted prior to the placement of cover material.

Subpart B—Requirements and Recommended Procedures

§ 241.200 Solid wastes accepted.

§ 241.200-1 Requirement.

In consultation with the responsible agencies the owner/operator shall determine what wastes shall be accepted and shall identify any special handling required. In general, only wastes for which the facility has been specifically designed shall be accepted; however, other wastes may be accepted if it has been demonstrated to the responsible agency that they can be satisfactorily disposed with the design capability of the facility or after appropriate facility modifications.

§ 241.200-2 Recommended procedures: Design.

The plans should specify the procedures to be employed for wastes requiring special handling.

§ 241.200-3 Recommended procedures: Operations.

(a) Routine sanitary landfill techniques of spreading and compacting solid wastes and placing cover material at the end of each operating day should be used to dispose of municipal solid wastes.

(b) Certain bulky wastes, such as automobile bodies, furniture, and appliances may be salvaged in a controlled manner at a point other than the working face. Otherwise, they should be crushed on solid ground and then pushed onto the working face near the bottom of the cell. Other bulky items, such as demolition and construction debris, tree stumps, and large timbers, should be pushed onto

the working face near the bottom of the cell.

(c) Procedures for disposing of dead animals have been established by law in most States, and the operation should comply accordingly. In most cases, small carcasses should be placed on the working face with other municipal solid wastes and covered immediately. In the absence of applicable State laws, large carcasses should be placed in a pit and provided with a cover of compacted soil or other suitable material to encourage runoff of precipitation.

(d) Water treatment plant sludges containing no free moisture and digested or heat treated waste water treatment plant sludges containing no free moisture should be placed on the working face along with municipal solid wastes and covered with soil or municipal solid wastes. The quantities accepted should be determined by operational problems encountered at the working face.

(e) Incinerator and air pollution control residues containing no free moisture should be incorporated into the working face and covered at such intervals as necessary to prevent them from becoming airborne.

§ 241.201 Solid wastes excluded.

§ 241.201-1 Requirement.

Using information supplied by the waste generator/owner, the responsible agency and the disposal site owner/operator shall jointly determine specific wastes to be excluded and shall identify them in the plans. The generator/owner of excluded wastes shall consult with the responsible agency in determining an alternative method of disposal for excluded wastes. The criteria used in considering whether a waste is unacceptable shall include the hydrogeology of the site, the chemical and biological characteristics of the waste, alternative methods available, environmental and health effects, and the safety of personnel. Disposal of pesticides and pesticide containers shall be consistent with the Federal Environmental Pesticides Control Act of 1972 (Pub. L. 92-516) and recommended procedures and regulations promulgated thereunder.

§ 241.201-2 Recommended procedures: Design.

Under certain circumstances it may be necessary to accept special wastes at land disposal sites. The following special wastes require specific approval of the responsible agency for acceptance at the site: Hazardous wastes, infectious institutional wastes, bulk liquids and semi-liquids, sludges containing free moisture, highly flammable or volatile substances, raw animal manure, septic tank pumpings, raw sewage sludge, and certain industrial process wastes. Where the use of the disposal site for such wastes is planned, a special assessment is required of the following items: The site characteristics, nature and quantities of the waste, and special design and operations precautions to be implemented to insure environmentally safe disposal.

§ 241.201-3 Recommended procedures: Operations.

Regular users of the land disposal site should be provided with a list of the materials to be excluded. The list should also be displayed prominently at the site entrance. If a regular user persists in making unacceptable deliveries, he should be barred from the site and reported to the responsible agency.

§ 241.202 Site selection.

§ 241.202-1 Requirement.

Site selection and utilization shall be consistent with public health and welfare, and air and water quality standards and adaptable to appropriate land-use plan.

§ 241.202-2 Recommended procedures: Design.

(a) The hydrogeology of the site should be evaluated in order to design site development in a manner to protect or minimize the impact on groundwater resources. Unacceptable hydrogeologic conditions may be altered to render the site acceptable, but all alterations should be detailed in the plans. Precipitation, evapotranspiration, and other climatological conditions should be considered in site selection and design.

(b) [illegible] characteristics of the site should be evaluated with respect to their effects on site operations, such as vehicle maneuverability and use as cover material.

(c) Environmental factors, climatological conditions, and socioeconomic factors should be given full consideration as selection criteria.

(d) The site should be accessible to vehicles which the site is designed to serve by all-weather roads leading from the public road system; temporary roads should be provided as needed to deliver wastes to the working face.

(e) The site should not be located in an area where the attraction of birds would pose a hazard to low-flying aircraft.

§ 241.202-3 Recommended procedures: Operations.

Not applicable.

§ 241.203 Design.

§ 241.203-1 Requirement.

Plans for the design, construction, and operation of new sites or modifications to existing sites shall be prepared or approved by a professional engineer. The plans shall be submitted to the responsible agency for review and, if warranted, approval.

§ 241.203-2 Recommended procedures: Design.

(a) The types and quantities of all solid wastes expected to be disposed of at the facility should be determined by survey and analysis to form a basis for design.

(b) Site development plans should be prepared or approved by a professional engineer and should include: The various design factors addressed elsewhere in the guidelines, as well as:

(1) Initial and final topographies at contour intervals of 5 feet or less.

(2) Land use and zoning within one-quarter mile of the site including location of all residents, buildings, wells, water courses, arroyos, rock outcroppings, roads, and soil or rock borings. All airports within the vicinity of the site should be identified to aid in assessing the potential hazard of birds to aircraft.

(3) Location of a [illegible] within 500 feet of the site.

(4) Employee convenience and equipment maintenance facilities.

(5) Narrative descriptions, with associated drawings, indicating site development and operation procedures.

(c) Plans should describe the projected use of the completed land disposal site. In addition to maintenance programs and provisions, where necessary, for monitoring and controlling decomposition gases and leachate, the plans should address the following ultimate use criteria:

(1) *Cultivated area.* The major concern if the completed site is to be cultivated is that the integrity of the final cover not be disturbed by agricultural cultivation activities. In this regard, a sufficient depth of cover material to allow cultivation and to support vegetation should be applied in addition to that recommended for final cover.

(2) *Structures.* It is not recommended practice to construct major structures on a completed land disposal site. If major structures are to be built near a completed land disposal site, a professional engineer should approve their design and construction including provision for protection against potential hazards of solid waste decomposition gases.

§ 241.203-3 Recommended procedures: Operations.

Not applicable.

§ 241.204 Water quality.

§ 241.204-1 Requirement.

The location, design, construction, and operation of the land disposal site shall conform to the most stringent of applicable water quality standards established in accordance with or effective under the provisions of the Federal Water Pollution Control Act, as amended. In the absence of such standards, the land disposal site shall be located, designed, constructed and operated in such a manner as to provide adequate protection to ground and surface waters used as drinking water supplies.

§ 241.204-2 Recommended procedures: Design.

(a) Plans should include:

(1) Current and projected use of water resources in the potential zone of influence of the land disposal site.

(2) Groundwater elevation and movement and proposed separation between the lowest point of the lowest cell and the predicted maximum water table elevation.

(3) Potential interrelationship of the land disposal site, local aquifers, and surface waters based on historical records or other sources of information.

(4) Background and initial quality of water resources in the potential zone of influence of the land disposal site.

(5) Proposed location of observation wells, sampling stations, and testing program planned, when appropriate.

(6) Description of soil and other geologic material to a depth adequate to allow evaluation of the water quality protection provided by the soil and other geologic material.

(7) Provision for surface water runoff control to minimize infiltration and erosion of cover material.

(8) Potential of leachate generation and proposed control systems, where necessary, for the protection of ground and surface water resources.

(b) If a land disposal site is located in a flood plain, it should be protected against at least the 50-year design flood by impervious dikes and other appropriate means to prevent the floodwaters from contacting municipal solid waste.

§ 241.204-3 Recommended procedures: Operations.

(a) Surface water courses and runoff should be diverted from the land disposal site (especially from the working face) by means such as trenches, conduits, and proper grading. The land disposal site should be constructed and graded so as to promote rapid surface water runoff without excessive erosion. Regrading should be done as required during construction and after completion to avoid ponding of precipitation and to maintain cover material integrity.

(b) Siltation or retention basins or other approved methods of retarding runoff should be used where necessary to avoid stream siltation or flooding problems due to excessive runoff.

(c) Leachate collection and treatment systems should be used where necessary to protect ground and surface water resources.

(d) Municipal solid wastes and leachate therefrom should not be allowed to contact ground or surface water so as to impair the water's use.

§ 241.205 Air quality.

§ 241.205-1 Requirement.

The design, construction, and operation of the land disposal site shall conform to applicable ambient air quality standards and source control regulations established under the authority of the Clean Air Act, as amended, or State or local standards effective under that Act, if the latter are more stringent.

§ 241.205-2 Recommended procedures: Design.

Plans should include an effective dust control program.

§ 241.205-3 Recommended procedures: Operations.

(a) Open burning of municipal solid waste should be prohibited.

(b) Dust control measures should be initiated as necessary to protect the health and safety of facility personnel, nearby residents, and persons using the facility.

§ 241.206 Gas control.

§ 241.206-1 Requirement.

Decomposition gases generated within the land disposal site shall be controlled on site, as necessary, to avoid posing a hazard to occupants of adjacent property.

§ 241.206-2 Recommended procedures: Design.

Plans should assess the need for gas control and indicate the location and design of any vents, barriers, or other control measures to be provided.

§ 241.206-3 Recommended procedures: Operations.

(a) Decomposition gases should not be allowed to migrate laterally from the land disposal site to endanger occupants of adjacent properties. They should be vented to the atmosphere directly through the cover material, cutoff trenches, or ventilation systems in such a way that they do not accumulate in explosive or toxic concentrations, especially within structures. (Information on the limits of flammability of gases is available in such references as the "Handbook of Chemistry and Physics," 54th ed. CRC Press, Inc., Cleveland, 1973.)

(b) Decomposition gases should not be allowed to concentrate in a manner that will pose an explosion or toxicity hazard.

§ 241.207 Vectors.

§ 241.207-1 Requirement.

Conditions shall be maintained that are unfavorable for the harboring, feeding, and breeding of vectors.

§ 241.207-2 Recommended procedures: Design.

Plans should include contingency programs for vector control, and the operator should be prepared at all times to implement those procedures.

§ 241.207-3 Recommended procedures: Operations.

Vector control contingency programs should be implemented when necessary to prevent or rectify vector problems.

§ 241.208 Aesthetics.

§ 241.208-1 Requirement.

The land disposal site shall be designed and operated at all times in an aesthetically acceptable manner.

§ 241.208-2 Recommended procedures: Design.

Plans should include an effective litter control program.

§ 241.208-3 Recommended procedures: Operations.

(a) Portable litter fences or other devices should be used in the immediate vicinity of the working face and at other appropriate locations to control blowing litter. At the end of each operating day, or more often as required, litter should be [illegible] fences and incorporated into the cell being used. Alternatively, the litter may be containerized for disposal on the next operating day.

(b) Wastes that are easily moved by wind should be covered, as necessary, to prevent their becoming airborne and scattered.

(c) On-site vegetation should be cleared only as necessary. Natural windbreaks, such as green belts, should be maintained where they will improve the appearance and operation of the land disposal site. Buffer strips should be planted and/or berms constructed as necessary to screen the working force from nearby residences or major roadways.

(d) Salvage operations should be conducted in such a manner as to not detract from the appearance of the land disposal site. Salvaged material should be removed from the land disposal site frequently enough to maintain aesthetic acceptability.

§ 241.209 Cover material.

§ 241.209-1 Requirement.

Cover material shall be applied as necessary to minimize fire hazards, infiltration of precipitation, odors, and blowing litter; control gas venting and vectors; discourage scavenging; and provide a pleasing appearance.

§ 241.209-2 Recommended procedures: Design.

Plans should specify:

(a) Cover material sources and soil classifications (Unified Soil Classification System or U.S. Department of Agriculture Classification System).

(b) Surface grades and side slopes needed to promote maximum runoff, without excessive erosion, to minimize infiltration.

(c) Procedures to promote vegetative growth as promptly as possible to combat erosion and improve appearance of idle and completed areas.

(d) Procedures to maintain cover material integrity, e.g., regarding and recovering.

§ 241.2[illegible] Recommended procedures: Operations.

(a) Daily cover should be applied regardless of weather; sources of cover material should, therefore, be accessible on all operating days. The thickness of the compacted daily cover should not be less than 6 inches.

(b) Intermediate cover should be applied on areas where additional cells are not to be constructed for extended periods of time; normally, 1 week to 1 year. The thickness of the compacted intermediate cover should not be less than 1 foot.

(c) Final cover should be applied on each area as it is completed or if the area is to remain idle for over 1 year. The thickness of the compacted final cover should not be less than 2 feet.

§ 241.210 Compaction.

§ 241.210-1 Requirement.

In order to conserve land disposal site capacity, thereby preserving land resources, and to minimize moisture infiltration and settlement, municipal solid waste and cover material shall be compacted to the smallest practicable volume.

§ 241.210-2 Recommended procedures: Design.

(a) Arrangements should be made and indicated in the plans whereby substitute equipment will be available to provide uninterrupted service during routine equipment maintenance periods or equipment breakdowns.

(b) An equipment maintenance facility should be provided onsite, or appropriate contract arrangements should be made to receive such service.

(c) Equipment manuals, catalogs, and spare parts lists should be compiled and readily available onsite.

§ 241.210-3 Recommended procedures: Operations.

(a) Municipal solid waste handling equipment should on any operating day be capable of performing the following functions:

(1) Spread the solid waste accepted in layers no more than 2 feet thick while confining it to the smallest practicable area;

(2) Compact the spread solid wastes to the smallest practicable volume (several such compacted layers will form a cell); and

(3) Place, spread, and compact the cover material over the cell at least by the end of each day's operation.

(b) A preventive maintenance program should be employed to maintain equipment in operating order.

(c) An operating manual describing the various tasks that must be performed during a typical shift should be available to employees for reference.

§ 241.211 Safety.

§ 241.211-1 Requirement.

The land disposal site shall be designed, constructed, and operated in such a manner as to protect the health and safety of personnel associated with the operation. Pertinent provisions of the Occupational Safety and Health Act of 1970 (Pub. L. 91-596) and regulation promulgated thereunder shall apply.

§ 241.211-2 Recommended procedures: Design.

A manual describing safety precautions and procedures to be employed should be developed.

§ 241.211-3 Recommended procedures: Operations.

(a) A safety manual should be available for use by employees, and they should be instructed in application of its procedures.

(b) Personal safety devices such as hardhats, gloves, safety glasses, and footwear should be provided to facility employees.

(c) Safety devices, including but not limited to such items as rollover protective structures, seatbelts, audible reverse warning devices, and fire extinguishers should be provided on all equipment used to spread and compact solid wastes or cover material at the facility.

(d) Provisions should be made to extinguish any fires in wastes being delivered to the site or which occur at the working face or within equipment or personnel facilities.

(e) Communications equipment should be available onsite for emergency situations.

(f) Scavenging should be prohibited at all times to avoid injury and to prevent interference with site operations.

(g) Access to the site should be controlled and should be by established roadways only. The site should be accessible only when operating personnel are on duty. Large containers may be placed at the site entrance so that users can conveniently deposit waste after hours. The containers and the areas around them should be maintained in a sanitary and litter-free condition.

(h) Traffic signs or markers should be provided to promote an orderly traffic pattern to and from the discharge area, maintain efficient operating conditions, and, if necessary, restrict access to hazardous areas. Drivers of manually discharging vehicles should not hinder operation of mechanically discharging vehicles. Vehicles should not be left unattended at the working face or along traffic routes. If a regular user persistently poses a safety hazard, he should be barred from the site and reported to the responsible agency.

§ 241.212 Records.

§ 241.212-1 Requirement.

The owner/operator of the land disposal site shall maintain records and monitoring data to be provided, as required, to the responsible agency.

§ 241.212-2 Recommended procedures: Design.

Where appropriate, plans should prescribe methods to be used in maintaining records and monitoring the environmental impact of the land disposal site. Information on recording and monitoring requirements should be obtained from the responsible agency.

§ 241.212-3 Recommended procedures: Operations.

(a) Records should be maintained covering at least the following:

(1) Major operational problems, complaints, or difficulties.

(2) Qualitative and quantitative evaluation of the environmental impact of the land disposal site, with regard to the effectiveness of gas and leachate control, including results of: (i) Leachate sampling and analyses; (ii) gas sampling and analyses; (iii) ground and surface water quality sampling and analyses upstream and downstream of the site.

(3) Vector control efforts.

(4) Dust and litter control efforts.

(5) Quantitative measurements of the solid wastes handled. This should be accomplished through routine or periodic utilization of scales and topographic surveys of the site.

(6) Description of solid waste materials received, identified by source of materials.

(b) Upon completion of the site, a detailed description, including a plat, should be recorded with the area's land recording authority. The description should include general types and locations of wastes, depth of fill, and other information of interest to potential landowners.

Appendix—Recommended Bibliography

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Appendix Two

Part 243 - Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste

Taken From: Code of Federal Regulations, Title 40, Protection of Environment, Parts 100 to 399, Revised as of July 1, 1979.

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PART 243—GUIDELINES FOR THE STORAGE AND COLLECTION OF RESIDENTIAL, COMMERCIAL, AND INSTITUTIONAL SOLID WASTE

Subpart A—General Provisions

Subpart B—Requirements and Recommended Procedures

AU[illegible]TY: S[illegible]9(a) of the Solid Waste Disposal Act of 1965 (Pub. L. 89-272), as amended by the Resource Recovery Act of 1970 (Pub. L. 91-512).

SOURCE: 41 FR 6769, Feb. 13, 1976, unless otherwise noted.

Subpart A—General Provisions

§ 243.100 Scope.

(a) These guidelines are promulgated in partial fulfillment of section 209(a) of the Solid Waste Disposal Act, as amended (Pub. L. 89-272).

(b) The guidelines apply to the collection of residential, commercial, and institutional solid wastes and street wastes. Explicitly excluded are mining, agricultural, and industrial solid wastes; hazardous wastes; sludges; construction and demolition wastes; and infectious wastes.

(c) The "Requirement" sections contained herein delineate minimum levels of performance required of solid waste collection operations. Under section 211 of the Solid Waste Disposal Act, as amended, and Executive Order 11752, the "Requirement" sections of these guidelines are mandatory for Federal agencies. In addition, they are recommended to State, interstate, regional, and local governments for use in their activities.

(d) The "Recommended procedures" sections are presented to suggest additional actions or preferred methods by which the objectives of the requirements can be realized. The "Recommended procedures" are not mandatory for Federal agencies.

(e) The guidelines apply equally to Federal agencies generating solid waste whether the solid waste is actually collected by a Federally operated or non-Federally operated collection system, except in the case of isolated Federal facilities such as post offices, military recruiting stations, and other offices where local community solid waste collection systems are utilized, which are not within the managerial control of the Federal agency.

(f) The guidelines shall be implemented in those situations where the Federal agency is able to exercise direct managerial control over the collection system through operation of the system or by contracting for collection service. Where non-Federal collection systems are utilized, service contracts should require conformance with the guidelines requirements unless service meeting such requirements is not reasonably available. It is left to the head of the responsible agency to decide how the requirements of the guidelines will be met.

(g) The Environmental Protection Agency will give technical assistance and other guidance to Federal agencies when requested to do so under section 3(D)1 of Executive Order 11752.

(h) Within 1 year after the final promulgation of these guidelines, Federal agencies shall decide what actions shall be taken to adopt the requirements of these guidelines and shall, within 60 days of this decision, submit to the Administrator a schedule of such actions.

(i) Federal agencies that decide not to adopt the requirements contained herein, for whatever reason, shall make available to the Administrator a report of the analysis and rationale used in making that decision. The Administrator shall publish notice of availability of this report in the FEDERAL REGISTER. EPA considers the following reasons to be valid for purposes of non-compliance: costs so high as to render compliance economically impracticable, and the technical inhibitions to compliance specifically described in the guidelines.

(1) The following points are to be covered in the report.

(i) A description of the proposed or on-going practices which will not be in compliance with these guidelines. This statement should identify all agency facilities which will be affected by noncompliance including a brief description of how such facilities will be affected.

(ii) A description of the alternative actions considered with emphasis on those alternatives which, if taken, would be in compliance with these guidelines.

(iii) The rationale for the action chosen by the agency including technical data and policy considerations used in arriving at this decision.

In covering these points, agencies should make every effort to present the information succinctly in a form easily understood, but in sufficient detail so that the Administrator and the public may understand the factors influencing the decision not to adopt the requirements of these guidelines.

(2) The report shall be submitted to the Administrator as soon as possible after a final agency decision has been made not to adopt the requirements of these guidelines, but in no case later than 60 days after the final decision. The Administrator will indicate to the agency his concurrence/nonconcurrence with the agency's decision, including his reasons.

(3) Implementation of actions not in compliance with these guidelines shall be deferred, where feasible, in order to give the Administrator time to receive, analyze, and seek clarification of the required report.

(4) It is recommended that where the report on non-compliance concerns an action for which an Environmental Impact Statement (EIS) is required by the National Environmental Policy Act, that the report be circulated simultaneously with the EIS, since much of the information to satisfy the requirements of the report will be useful in the preparation of the EIS.

§ 243.101 Definitions.

As used in these guidelines:

(a) "Alley collection" means the collection of solid waste from containers placed adjacent to or in an alley.

(b) "Agricultural solid waste" means the solid waste that is generated by the rearing of animals, and the producing and harvesting of crops or trees.

(c) "Bulky waste" means large items of solid waste such as household appliances, furniture, large auto parts, trees, branches, stumps, and other oversize wastes whose large size precludes or complicates their handling by normal solid wastes collection, processing, or disposal methods.

(d) "Carryout collection" means collection of solid waste from a storage area proximate to the dwelling unit(s) or establishment.

(e) "Collection" means the act of removing solid waste (or materials which have been separated for the purpose

of recycling) from a central storage point.

(f) "Collection frequency" means the number of times collection is provided in a given period of time.

(g) "Commercial solid waste" means all types of solid wastes generated by stores, offices, restaurants, warehouses, and other non-manufacturing activities, excluding residential and industrial wastes.

(h) "Compactor collection vehicle" means a vehicle with an enclosed body containing mechanical devices that convey solid waste into the main compartment of the body and compress it into a smaller volume of greater density.

(i) "Construction and demolition waste" means the waste building materials, packaging, and rubble resulting from construction, remodeling, repair, and demolition operations on pavements, houses, commercial buildings, and other structures.

(j) "Curb collection" means collection of solid waste placed adjacent to a street.

(k) "Federal facility" means any building, installation, structure, land, or public work owned by or leased to the Federal Government. Ships at sea, aircraft in the air, land forces on maneuvers, and other mobile facilities are not considered "Federal facilities" for the purpose of these guidelines. United States Government installations located on foreign soil or on land outside the jurisdiction of the United States Government are not considered "Federal facilities" for the purpose of these guidelines.

(l) "Food waste" means the organic residues generated by the handling, storage, sale, preparation, cooking, and serving of foods, commonly called garbage.

(m) "Generation" means the act or process of producing solid waste.

(n) "Hazardous waste" means a waste or combination of wastes of a solid, liquid, contained gaseous, or semisolid form which may cause, or contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness, taking into account the toxicity of such waste, its persistence and degradability in nature, its potential for accumulation or concentration in tissue, and other factors that may otherwise cause or contribute to adverse acute or chronic effects on the health of persons or other organisms.

(o) "Industrial solid waste" means the solid waste generated by industrial processes and manufacturing.

(p) "Infectious waste" means: (1) Equipment, instruments, utensils, and formites of a disposable nature from the rooms of patients who are suspected to have or have been diagnosed as having a communicable disease and must, therefore, be isolated as required by public health agencies; (2) laboratory wastes, such as pathological specimens (e.g., all tissues, specimens of blood elements, excreta, and secretions obtained from patients or laboratory animals) and disposable fomites (any substance that may harbor or transmit pathogenic organisms) attendant thereto; (3) surgical operating room pathologic specimens and disposable fomites attendant thereto, and similar disposable materials from outpatient areas and emergency rooms.

(q) "Institutional solid waste" means solid wastes generated by educational, health care, correctional, and other institutional facilities.

(r) "Mining wastes" means residues which result from the extraction of raw materials from the earth.

(s) "Residential solid waste" means the wastes generated by the normal activities of households, including, but not limited to, food wastes, rubbish, ashes, and bulky wastes.

(t) "Responsible agency" means the organizational element that has the legal duty to ensure compliance with these guidelines.

(u) "Rubbish" means a general term for solid waste, excluding food wastes and ashes, taken from residences, commercial establishments, and institutions.

(v) "Satellite vehicle" means a small collection vehicle that transfers its load into a larger vehicle operating in conjunction with it.

(w) "Scavenging" means the uncontrolled and unauthorized removal of materials at any point in the solid waste management system.

(x) "Sludge" means the accumulated semiliquid suspension of settled solids deposited from wastewaters or other fluids in tanks or basins. It does not include solids or dissolved material in domestic sewage or other significant pollutants in water resources, such as silt, dissolved materials in irrigation return flows or other common water pollutants.

(y) "Solid waste" means garbage, refuse, sludges, and other discarded solid materials, including solid waste materials resulting from industrial, commercial, and agricultural operations, and from community activities, but does not include solid or dissolved materials in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial wastewater effluents, dissolved materials in irrigation return flows or other common water pollutants. Unless specifically noted otherwise, the term "solid waste" as used in these guidelines shall not include mining, agricultural, and industrial solid wastes; hazardous wastes; sludges; construction and demolition wastes; and infectious wastes.

(z) "Stationary compactor" means a powered machine which is designed to compact solid waste or recyclable materials, and which remains stationary when in operation.

(aa) "Storage" means the interim containment of solid waste after generation and prior to collection for ultimate recovery or disposal.

(bb) "Solid waste storage container" means a receptacle used for the temporary storage of solid waste while awaiting collection.

(cc) "Street wastes" means materials picked up by manual or mechanical sweepings of alleys, streets, and sidewalks; wastes from public waste receptacles; and material removed from catch basins.

(dd) "Transfer station" means a site at which solid wastes are concentrated for transport to a processing facility or land disposal site. A transfer station may be fixed or mobile.

(ee) "Vector" means a carrier that is capable of transmitting a pathogen from one organism to another.

Subpart B—Requirements and Recommended Procedures

§ 243.200 Storage.

§ 243.200-1 Requirement.

(a) All solid wastes (or materials which have been separated for the purpose of recycling) shall be stored in such a manner that they do not constitute a fire, health, or safety hazard or provide food or harborage for vectors, and shall be contained or bundled so as not to result in spillage. All solid waste containing food wastes shall be securely stored in covered or closed containers which are nonabsorbent, leakproof, durable, easily cleanable (if reusable), and designed for safe handling. Containers shall be of an adequate size and in sufficient numbers to contain all food wastes, rubbish, and ashes that a residence or other establishment generates in the period of time between collections. Containers shall be maintained in a clean condition so that they do not constitute a nuisance, and to retard the harborage, feeding, and breeding of vectors. When serviced, storage containers should be emptied completely of all solid waste.

(b) Storage of bulky wastes shall include, but is not limited to, removing all doors from large household appliances and covering the item(s) to reduce the problems of an attractive nuisance, and the accumulation of solid waste and water in and around the bulky items.

(c) Reusable waste containers which are emptied manually shall not exceed 75 pounds (34.05 kg) when filled, and shall be capable of being serviced without the collector coming into physical contact with the solid waste.

(d) In the design of all buildings or other facilities which are constructed, modified, or leased after the effective date of these guidelines, there shall be provisions for storage in accordance with these guidelines which will accommodate the volume of solid waste anticipated, which may be easily cleaned and maintained, and which will allow for efficient, safe collection.

§ 243.202-2 Recommended procedures: Design.

(a) Reusable waste containers should be constructed of corrosion resistant metal or other material which will not absorb water, grease, or oil. The containers should be leakproof, including sides, seams, and bottoms, and be durable enough to withstand anticipated usage without rusting, cracking, or deforming in a manner that would impair serviceability. The interior of the container should be smooth without interior projections or rough seams which would make it difficult to clean or interfere with its emptying. The exterior of the container should be safe for handling with no cracks, holes, or jagged edges. Containers should be stored on a firm, level, well-drained surface which is large enough to accommodate all of the containers and which is maintained in a clean, spillage-free condition.

(1) Reusable waste containers which are emptied manually should have a capacity of no more than 35 gallons (132.51) in volume, unless they are mounted on casters and can be serviced by being rolled to the collection vehicle and tilted for emptying. The containers should be constructed with rounded edges and tapered sides with the larger diameter at the top of the container to facilitate discharge of the solid waste by gravity. Containers should have two handles or bails located directly opposite one another on the sides of the container. Containers should have covers which are tight-fitting to resist the intrusion of water and vectors, and should be equipped with a suitable handle. Containers should be designed so that they cannot be tipped over easily.

(2) Reusable waste containers which are emptied mechanically should be designed or equipped to prevent spillage or leakage during on-site storage, collection, or transport. The container should be easily cleanable and designed to allow easy access for depositing the waste and removing it by gravity or by mechanical means. The containers should be easily accessible to the collection vehicle in an area which can safely accommodate the dimensions and weight of the vehicle.

(b) Single-use plastic and paper bags should meet the National Sanitation Foundation Standard No. 31 for polyethylene refuse bags and Standard No. 32 for paper refuse bags, respectively. However, such bags do not need to have been certified by the National Sanitation Foundation. Single-use bags containing food wastes should be stored within the confines of a building or container between collection periods.

§ 243.201 Safety.

§ 243.201-1 Requirement.

Collection systems shall be operated in such a manner as to protect the health and safety of personnel associated with the operation.

§ 243.201-2 Recommended procedures: Operations.

(a) All solid waste collection personnel should receive instructions and training in safe container and waste handling techniques, and in the proper operation of collection equipment, such as those presented in *Operation Responsible: Safe Refuse Collection.*

(b) Personal protective equipment such as gloves, safety glasses, respirators, and footwear should be used by collection employees, as appropriate. This equipment should meet the applicable provisions of the Occupational Safety and Health Administration Standards for Subpart I—Personal Protective Equipment (29 CFR Part 1910.132-137).

(c) Scavenging should be prohibited at all times to avoid injury and to prevent interference with collection operations.

(d) When conducting carryout collection, a leakproof and puncture-proof carrying container should be used to minimize the potential for physical contact between the collector and the solid waste or the liquids which may derive from it.

§ 243.202 Collection equipment.

§ 243.202-1 Requirement.

(a) All vehicles used for the collection and transportation of solid waste (or materials which have been separated for purposes of recycling) which are considered to be operating in interstate or foreign commerce shall meet all applicable standards established by the Federal Government, including, but not limited to, Motor Carrier Safety Standards (49 CFR Parts 390-396) and Noise Emission Standards for Motor Carriers Engaged in Interstate Commerce (40 CFR Part 202). Federally owned collection vehicles shall be operated in compliance with Federal Motor Vehicle Safety Standards (49 CFR Parts 500-580).

(b) All vehicles used for the collection and transportation of solid waste (or materials which have been separated for the purpose of recycling) shall be enclosed or adequate provisions shall be made for suitable cover, so that while in transit there can be no spillage.

(c) The equipment used in the compaction, collection, and transportation of solid waste (or materials which have been separated for the purpose of recycling) shall be constructed, operated, and maintained in such a manner as to minimize health and safety hazards to solid waste management personnel and the public. This equipment shall be maintained in good condition and kept clean to prevent the propagation or attraction of vectors and the creation of nuisances.

(d) Collection equipment of the following types used for the collection, storage, and transportation of solid waste (or materials which have been separated for the purpose of recycling) shall meet the standards established by the American National Standards Institute (ANSI Z245.1, Safety Standards for Refuse Collection Equipment) as of the effective date(s) established in ANSI Z245.1:

(1) Rear-loading compaction equipment.

(2) Side-loading compaction equipment.

(3) Front-loading compaction equipment.

(4) Tilt-frame equipment.

(5) Hoist-type equipment.

(6) Satellite vehicles.

(7) Special collection compaction equipment.

(8) Stationary compaction equipment.

equipment before the effective dates of ANSI Z245.1, equipment which meets the standards shall be obtained if available.

§ 243.202-2 Recommended procedures: Design.

(a) Whenever possible, enclosed, metal, leak-resistant compactor vehicles should be used for the collection of solid wastes.

(b) Safety devices, including, but not limited to, the following should be provided on all collection vehicles:

(1) Exterior rear-view mirrors.

(2) Back-up lights.

(3) Four-way emergency flashers.

(4) Easily accessible first aid equipment.

(5) Easily accessible fire extinguisher.

(6) Audible reverse warning device.

(c) If crew members ride outside the cab of the collection vehicle for short trips the vehicle should be equipped with handholds and platforms big enough to safeguard against slipping.

(d) Vehicle size should take into consideration: Local weight and height limits for all roads over which the vehicle will travel; turning radius; and loading height in the unloading position to insure overhead clearance in transfer stations, service buildings, incinerators, or other facilities.

(e) Engines which conserve fuel and minimize pollution should be used in collection vehicles to reduce fuel consumption and air pollution.

§ 243.202-3 Recommended procedures: Operations.

(a) Collection vehicles should be maintained and serviced according to manufacturers' recommendations, and receive periodic vehicle safety checks, including, but not limited to, inspection of brakes, windshield wipers, taillights, backup lights, audible reverse warning devices, tires, and hydraulic systems. Any irregularities should be repaired before the vehicle is used. Vehicles should also be cleaned thoroughly at least once a week.

(b) Solid waste should not be allowed to remain in collection vehicles over 24 hours and should only be left in a vehicle overnight when this prac-

tice does not constitute a fire, health, or safety hazard.

§ 243.203 Collection frequency.

§ 243.203-1 Requirement.

Solid wastes (or materials which have been separated for the purpose of recycling) shall be collected with frequency sufficient to inhibit the propagation or attraction of vectors and the creation of nuisances. Solid wastes which contain food wastes shall be collected at a minimum of once during each week. Bulky wastes shall be collected at a minimum of once every 3 months.

§ 243.203-2 Recommended procedures: Operations.

(a) The minimum collection frequency consistent with public health and safety should be adopted to minimize collection costs and fuel consumption. In establishing collection frequencies, generation rates, waste composition, and storage capacity should be taken into consideration.

(b) When solid wastes are separated at the point of storage into various categories for the purpose of resource recovery, a collection frequency should be designated for each waste category.

§ 243.204 Collection management.

§ 243.204-1 Requirement.

The collection of solid wastes (or materials which have been separated for the purpose of recycling) shall be conducted in a safe, efficient manner, strictly obeying all applicable traffic and other laws. The collection vehicle operator shall be responsible for immediately cleaning up all spillage caused by his operations, for protecting private and public property from damage resulting from his operations, and for creating no undue disturbance of the peace and quiet in residential areas in and through which he operates.

§ 243.204-2 Recommended procedures: Operations.

(a) Records should be maintained detailing all costs (capital, operating, and maintenance) associated with the collection system. These records should be used for scheduling maintenance and replacement, for budgeting, and for system evaluation and comparison.

(b) The collection system should be reviewed on a regular schedule to assure that environmentally adequate, economical, and efficient service is maintained.

(c) Solid waste collection systems should be operated in a manner designed to minimize fuel consumption, including, but not limited to, the following procedures.

(1) Collection vehicle routes should be designed to minimize driving distances and delays.

(2) Collection vehicles should receive regular tuneups, tires should be maintained at recommended pressures, and compaction equipment should be serviced regularly to achieve the most efficient compaction.

(3) Compactor trucks should be used to reduce the number of trips to the disposal site.

(4) When the distance or travel time from collection routes to disposal sites is great, transfer stations should be used when cost effective.

(5) Residential solid waste containers which are serviced manually should be placed at the curb or alley for collection.

(6) For commercial wastes which do not contain food wastes, storage capacity should be increased in lieu of more frequent collection.

APPENDIX—RECOMMENDED BIBLIOGRAPHY

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PART 244—SOLID WASTE MANAGEMENT GUIDELINES FOR BEVERAGE CONTAINERS

Subpart A—General Provisions

Subpart B—Requirements

AUTHORITY: Sec. 209(a) of the Solid Waste Disposal Act of 1965 (Pub. L. 89-272) as amended by the Resource Recovery Act of 1970 (Pub. L. 91-512).

SOURCE: 41 FR 41203, Sept. 21, 1976, unless otherwise noted.

Subpart A—General Provisions

§ 244.100 Scope.

(a) The "Requirement" sections contained herein delineate minimum actions for Federal agencies for reducing beverage container waste.

(b) Section 211 of the Act and Executive Order 11752 make the "Requirements" section of the guidelines mandatory upon Federal agencies. They are recommended for adoption by State and local governments and private agencies.

(c) *Intent and Objectives*—(1) These Guidelines for Beverage Containers are intended to achieve a reduction in beverage container solid waste and litter, resulting in savings in waste collection and disposal costs to the Federal Government. They are also intended to achieve the conservation and more efficient use of energy and material resources through the development of effective beverage distribution and container collection systems.

(2) The guidelines are intended to achieve these goals by making all beverage containers returnable and encouraging reuse of recycling of the returned containers. To accomplish the return of beverage containers, a deposit of at least five cents on each returnable beverage container is to be paid upon purchase by the consumer and refunded to the consumer when the empty container is returned to the dealer. This refund value provides a positive incentive for consumers to return the empty containers. Once containers are returned, nonrefillable containers can be recycled and refillable bottles can be reused.

(3) The minimum deposit of five cents has been chosen because it is deemed a large enough incentive to induce the return of most containers,

Appendix Three

Part 257 - Criteria for Classification of Solid Waste Disposal Facilities and Practices

Taken From: Federal Register, Vol. 44, No. 179, September 13, 1979.

were public-use airports. The FAA agrees with this approach. EPA, in consultation with the FAA, may broaden the class of airports of concern if it receives information demonstrating that a similar bird hazard exists at other fields.

In defining the airports of concern EPA has also eliminated the proposed criteria's reference to "runways planned to be used." As several commenters pointed out, such a reference would not be workable because it would require speculation about future siting of airports.

EPA also makes it clear that the "bird hazard" of concern is "an increase in the likelihood of bird/aircraft collisions." Solid waste disposal within the danger zone may continue as long as it can be shown that the operation can be managed in such a way as to not increase the risk of collision within the specified distances.

After considering public comments, EPA has deleted portions of the proposed standard. Several commenters stated that the use of the conical surface in the criteria was ambiguous and not applicable to this standard. The conical surface is an imaginary plane delineating an airspace segment 150 feet above the established airport elevation. The FAA prohibits stationary objects in this space because they might interfere with approaching and departing aircraft. This is inapplicable to solid waste disposal activities for two reasons: (1) Birds, the "obstructions" of concern in this regulation, are hardly stationary; and (2) solid waste disposal activities are typically low-profile operations (below 150 feet) and are not likely to constitute obstructions into the conical surface.

Commenters asked who was responsible for determining whether a facility posed a bird hazard to aircraft. The Act and the CWA create the implementing mechanisms for these criteria. However, in this instance consultation with the FAA and the Fish and Wildlife Service would be very helpful. Furthermore, actions at *both* the airport and the disposal facility can reduce or eliminate hazards. Therefore, where appropriate this determination should be made in consultation with these agencies, as well as with the owners and operators of the airport of concern.

(4) *Access.* Materials and activities associated with solid waste disposal facilities can cause injury or death to persons at the facilities. Potential causes of such harm include:

(a) Operation of heavy equipment and haul vehicles;

(b) Hazards associated with the types of waste, including sharp objects, pathogens, and toxic, explosive, or flammable materials; and

(c) Accidental or intentional fires.

The proposed criteria required that entry to the facility be controlled in order to minimize exposure of the public to hazards of heavy equipment operation and exposed waste.

The final criteria call for control of access to protect the public from on-site exposure to health and safety hazards.

The importance of access control cannot be overstated, since persons have suffered injury and even death at uncontrolled waste disposal facilities. Furthermore, in most cases, there is little economic impact on solid waste disposal operations in accomplishing such control.

During normal operating hours, proper management controls can minimize safety hazards. For example, potential harm to facility operating personnel can be reduced through proper training, use of safety equipment, control of waste types, and other practices. The most effective means of minimizing the risk of injury to other persons is by complete prohibition of access to the site by non-users (e.g. by suitable fencing) and strict control of users while on the site. For individuals disposing of small amounts of wastes, storage or special disposal facilities can be provided at the entrance to the facility or away from the area being utilized by professional solid waste management personnel.

The principal change from the proposed regulation is the broadening of the regulation's coverage. Accidents at solid waste disposal sites are not limited to hazards caused by heavy equipment operation and exposed waste. EPA believes that particular types of hazards should not be specified in the regulation, thereby allowing for flexibility in how the standard is applied. Therefore, the criteria seek to avoid public exposure to all potential health and safety hazards at solid waste disposal sites.

Two commenters stated that the proposed requirement for fencing was unreasonable. It should be noted that the Agency did not propose a requirement for fencing. At many facilities natural barriers exist which make public access very difficult; however, even if the criteria were complied with through the installation of a fence around the entire property the cost would be relatively insignificant when compared to the other costs required to properly operate a disposal facility.

V. Environmental and Economic Impacts

Voluntary environmental and economic impact analyses onthis regulation have been performed and are presented in the "Final Environmental Impact Statement on the Criteria for Classification of Solid Waste Disposal Facilities". These analyses are not required by the National Environmental Policy Act but provide information pertinent to the development and use of this regulation. Copies of this two-volume report may be obtained on request from: Solid Waste Information, U.S. EPA, 26 West St. Clair, Cincinnati, Ohio 45268.

EPA has also prepared a number of background documents that respond to public comments not addressed in the Preamble. These documents may be examined at E.P.A., 401 M Street, S.W., Washington, D.C. 20460 in room 2632. If there are apparent inconsistencies between these documents and this Preamble, the latter shall represent the Agency's position.

Dated: September 10, 1979.

Douglas M. Costle,

Administrator.

Title 40 CFR is amended by adding a new Part 257 to read as follows:

PART 257—CRITERIA FOR CLASSIFICATION OF SOLID WASTE DISPOSAL FACILITIES AND PRACTICES

Sec.

Authority: Sec. 1008(a)(3), and sec. 4004(a), Pub. L. 94-580, 90 Stat. 2803 and 2815 (42 U.S.C. 6907(a)(3), 6944); sec. 405(d), Pub. L. 95-217, 91 Stat. 1591, 1606 (33 U.S.C. 1345).

§ 257.1 Scope and purpose.

(a) These criteria are for use under the Resource Conservation and Recovery Act (the Act) in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment.

(1) Facilities failing to satisfy these criteria will be considered open dumps for purposes of State solid waste management planning under the Act.

(2) Practices failing to satisfy these criteria constitute open dumping, which is prohibited under Section 4005 of the Act.

(b) These criteria also provide guidelines for sludge utilization and disposal under Section 405(d) of the Clean Water Act, as amended. To comply with Section 405(e) the owner or operator of any publicly owned treatment works must not violate these criteria in the disposal of sludge on the land.

(c) These criteria apply to all solid waste disposal facilities and practices with the following exceptions:

(1) The criteria do not apply to agricultural wastes, including manures and crop residues, returned to the soil as fertilizers or soil conditioners.

(2) The criteria do not apply to overburden resulting from mining operations intended for return to the mine site.

(3) The criteria do not apply to the land application of domestic sewage or treated domestic sewage. The criteria do apply to disposal of sludges generated by treatment of domestic sewage.

(4) The criteria do not apply to the location and operation of septic tanks. The criteria do, however, apply to the disposal of septic tank pumpings.

(5) The criteria do not apply to solid or dissolved materials in irrigation return flows.

(6) The criteria do not apply to industrial discharges which are point sources subject to permits under Section 402 of the Clean Water Act, as amended.

(7) The criteria do not apply to source, special nuclear or byproduct material as defined by the Atomic Energy Act, as amended (68 Stat. 923).

(8) The criteria do not apply to hazardous waste disposal facilities which are subject to regulation under Subtitle C of the Act.

(9) The criteria do not apply to disposal of solid waste by underground well injection subject to the regulations (40 CFR Part 146) for the Underground Injection Control Program (UICP) under the Safe Drinking Water Act, as amended, 42 U.S.C. 3007 et seq.

§ 257.2 Definitions.

The definitions set forth in Section 1004 of the Act apply to this Part. Special definitions of general concern to this Part are provided below, and definitions especially pertinent to particular sections of this Part are provided in those sections.

"Disposal" means the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters.

"Facility" means any land and appurtenances thereto used for the disposal of solid wastes.

"Leachate" means liquid that has passed through or emerged from solid waste and contains soluble, suspended or miscible materials removed from such wastes.

"Open dump" means a facility for the disposal of solid waste which does not comply with this part.

"Practice" means the act of disposal of solid waste.

"Sanitary landfill" means a facility for the disposal of solid waste which complies with this part.

"Sludge" means any solid, semisolid, or liquid waste generated from a municipal, commercial, or industrial wastewater treatment plant, water supply treatment plant, or air pollution control facility or any other such waste having similar characteristics and effect.

"Solid waste" means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 Stat. 880), or source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923).

"State" means any of the several States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands.

§ 257.3 Criteria for classification of solid waste disposal facilities and practices.

Solid waste disposal facilities or practices which violate any of the following criteria pose a reasonable probability of adverse effects on health or the environment:

§ 257.3-1 Floodplains.

(a) Facilities or practices in floodplains shall not restrict the flow of the base flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste, so as to pose a hazard to human life, wildlife, or land or water resources.

(b) As used in this section:

(1) "Based flood" means a flood that has a 1 percent or greater chance of recurring in any year or a flood of a magnitude equalled or exceeded once in 100 years on the average over a significantly long period.

(2) "Floodplain" means the lowland and relatively flat areas adjoining inland and coastal waters, including flood-prone areas of offshore islands, which are inundated by the base flood.

(3) "Washout" means the carrying away of solid waste by waters of the base flood.

§ 257.3-2 Endangered species.

(a) Facilities or practices shall not cause or contribute to the taking of any endangered or threatened species of plants, fish, or wildlife.

(b) The facility or practice shall not result in the destruction or adverse modification of the critical habitat of endangered or threatened species as identified in 50 CFR Part 17.

(c) As used in this section:

(1) "Endangered or threatened species" means any species listed as such pursuant to Section 4 of the Endangered Species Act.

(2) "Destruction or adverse modification" means a direct or indirect alteration of critical habitat which appreciably diminishes the likelihood of the survival and recovery of threatened or endangered species using that habitat.

(3) "Taking" means harassing, harming, pursuing, hunting, wounding, killing, trapping, capturing, or collecting or attempting to engage in such conduct.

§ 257.3-3 Surface Water.

(a) A facility or practice shall not cause a discharge of pollutants into waters of the United States that is in violation of the requirements of the National Pollutant Discharge Elimination System (NPDES) under Section 402 of the Clean Water Act, as amended.

(b) A facility or practice shall not cause a discharge of dredged material or fill material to waters of the United States that is in violation of the requirements under Section 404 of the Clean Water Act, as amended.

(c) A facility or practice shall not cause non-point source pollution of waters of the United States that violates applicable legal requirements implementing an areawide or Statewide water quality management plan that has been approved by the Administrator under Section 208 of the Clean Water Act, as amended.

(d) Definitions of the terms "Discharge of dredged material", "Point source", "Pollutant", "Waters of the United States", and "Wetlands" can be found in the Clean Water Act, as amended, 33 U.S.C. 1251 et seq., and implementing regulations, specifically 33 CFR Part 323 (42 FR 37122, July 19, 1977).

§ 257.3-4 Ground Water.

(a) A facility or practice shall not contaminate an underground drinking water source beyond the solid waste boundary or beyond an alternative boundary specified in accordance with paragraph (b) of this section.

(b) Only a State with a solid waste management plan approved by the Administrator pursuant to Section 4007 of the Act may establish an alternative boundary to be used in lieu of the solid waste boundary. A State may specify such a boundary only if it finds that such a change would not result in contamination of ground water which may be needed or used for human consumption. This finding shall be based on analysis and consideration of all of the following factors:

(1) The hydrogeological characteristics of the facility and surrounding land;

(2) The volume and physical and chemical characteristics of the leachate;

(3) The quantity, quality, and directions of flow of ground water;

(4) The proximity and withdrawal rates of ground-water users;

(5) The availability of alternative drinking water supplies;

(6) The existing quality of the ground water including other sources of contamination and their cumulative impacts on the ground water; and

(7) Public health, safety, and welfare effects.

(c) As used in this section:

(1) "Aquifer" means a geologic formation, group of formations, or portion of a formation capable of yielding usable quantities of ground water to wells or springs.

(2) "Contaminate" means introduce a substance that would cause:

(i) The concentration of that substance in the ground water to exceed the maximum contaminant level specified in Appendix I, or

(ii) An increase in the concentration of that substance in the ground water where the existing concentration of that substance exceeds the maximum contaminant level specified in Appendix I.

(3) "Ground water" means water below the land surface in the zone of saturation.

(4) "Underground drinking water source" means:

(i) An aquifer supplying drinking water for human consumption, or

(ii) An aquifer in which the ground water contains less than 10,000 mg/1 total dissolved solids.

(5) "Solid waste boundary" means the outermost perimeter of the solid waste (projected in the horizontal plane) as it would exist at completion of the disposal activity.

§ 257.3-5 Application to land used for the production of food-chain crops (interim final).

(a) *Cadmium.* A facility or practice concerning application of solid waste to within one meter (three feet) of the surface of land used for the production of food-chain crops shall not exist or occur, unless in compliance with all requirements of paragraph (a)(1) (i) through (iii) of this section or all requirements of paragraph (a)(2) (i) through (iv) of this section.

(1)(i) The pH of the solid waste and soil mixture is 6.5 or greater at the time of each solid waste application, except for solid waste containing cadmium at concentrations of 2 mg/kg (dry weight) or less.

(ii) The annual application of cadmium from solid waste does not exceed 0.5 kilograms per hectare (kg/ha) on land used for production of tobacco, leafy vegetables or root crops grown for human consumption. For other food-chain crops, the annual cadmium application rate does not exceed:

Time period	Annual Cd application rate (kg/ha)
Present to June 30, 1984	2.0
July 1, 1984 to Dec. 31, 1986	1.25
Beginning Jan. 1, 1987	0.5

(iii) The cumulative application of cadmium from solid waste does not exceed the levels in either paragraph (a)(1)(iii)(A) of this section or paragraph (a)(1)(iii)(B) of this section.

(A)

Soil cation exchange capacity (meq/100g)	Maximum cumulative application (kg/ha)	
	Background soil pH <6.5	Background soil pH ≥ 6.5
<5	5	5
5-15	5	10
>15	5	20

(B) For soils with a background pH of less than 6.5, the cumulative cadmium application rate does not exceed the levels below: *Provided,* That the pH of the solid waste and soil mixture is adjusted to and maintained at 6.5 or greater whenever food-chain crops are grown.

Soil cation exchange capacity (meq/100g)	Maximum cumulative application (kg/ha)
<5	5
5-15	10
>15	20

(2)(i) The only food-chain crop produced is animal feed.

(ii) The pH of the solid waste and soil mixture is 6.5 or greater at the time of solid waste application or at the time the crop is planted, whichever occurs later, and this pH level is maintained whenever food-chain crops are grown.

(iii) There is a facility operating plan which demonstrates how the animal feed will be distributed to preclude ingestion by humans. The facility operating plan describes the measures to be taken to safeguard against possible health hazards from cadmium entering the food chain, which may result from alternative land uses.

(iv) Future property owners are notified by a stipulation in the land record or property deed which states that the property has received solid waste at high cadmium application rates and that food-chain crops should not be grown, due to a possible health hazard.

(b) *Polychlorinated Biphenyls (PCBs).* Solid waste containing concentrations of PCBs equal to or greater than 10 mg/kg (dry weight) is incorporated into the soil when applied to land used for producing animal feed, including pasture crops for animals raised for milk. Incorporation of the solid waste into the soil is not required if it is assured that the PCB content is less than 0.2 mg/kg (actual weight) in animal feed or less than 1.5 mg/kg (fat basis) in milk.

(c) As used in this section:

(1) "Animal feed" means any crop grown for consumption by animals, such as pasture crops, forage, and grain.

(2) "Background soil pH" means the pH of the soil prior to the addition of substances that alter the hydrogen ion concentration.

(3) "Cation exchange capacity" means the sum of exchangeable cations a soil can absorb expressed in milli-equivalents per 100 grams of soil as determined by sampling the soil to the depth of cultivation or solid waste placement, whichever is greater, and analyzing by the summation method for distinctly acid soils or the sodium acetate method for neutral, calcareous or saline soils ("Methods of Soil Analysis, Agronomy Monograph No. 9." C. A. Black, ed., American Society of Agronomy, Madison, Wisconsin, pp 891-901, 1965).

(4) "Food-chain crops" means tobacco, crops grown for human

consumption, and animal feed for animals whose products are consumed by humans.

(5) "Incorporated into the soil" means the injection of solid waste beneath the surface of the soil or the mixing of solid waste with the surface soil.

(6) "Pasture crops" means crops such as legumes, grasses, grain stubble and stover which are consumed by animals while grazing.

(7) "pH" means the logarithm of the reciprocal of hydrogen ion concentration.

(8) "Root crops" means plants whose edible parts are grown below the surface of the soil.

(9) "Soil pH" is the value obtained by sampling the soil to the depth of cultivation or solid waste placement, whichever is greater, and analyzing by the electrometric method. ("Methods of Soil Analysis, Agronomy Monograph No. 9," C.A. Black, ed., American Society of Agronomy, Madison, Wisconsin, pp. 914–926, 1965.)

§ 257.3–6 Disease.

(a) *Disease Vectors.* The facility or practice shall not exist or occur unless the on-site population of disease vectors is minimized through the periodic application of cover material or other techniques as appropriate so as to protect public health.

(b) *Sewage sludge and septic tank pumpings (Interim Final).* A facility or practice involving disposal of sewage sludge or septic tank pumpings shall not exist or occur unless in compliance with paragraphs (b) (1), (2) or (3) of this section.

(1) Sewage sludge that is applied to the land surface or is incorporated into the soil is treated by a Process to Significantly Reduce Pathogens prior to application or incorporation. Public access to the facility is controlled for at least 12 months, and grazing by animals whose products are consumed by humans is prevented for at least one month. Processes to Significantly Reduce Pathogens are listed in Appendix II, Section A. (These provisions do not apply to sewage sludge disposed of by a trenching or burial operation.)

(2) Septic tank pumpings that are applied to the land surface or incorporated into the soil are treated by a Process to Significantly Reduce Pathogens (as listed in Appendix II, Section A), prior to application or incorporation, unless public access to the facility is controlled for at least 12 months and unless grazing by animals whose products are consumed by humans is prevented for at least one month. (These provisions do not apply to septic tank pumpings disposed of by a trenching or burial operation.)

(3) Sewage sludge or septic tank pumpings that are applied to the land surface or are incorporated into the soil are treated by a Process to Further Reduce Pathogens, prior to application or incorporation, if crops for direct human consumption are grown within 18 months subsequent to application or incorporation. Such treatment is not required if there is no contact between the solid waste and the edible portion of the crop; however, in this case the solid waste is treated by a Process to Significantly Reduce Pathogens, prior to application; public access to the facility is controlled for at least 12 months; and grazing by animals whose products are consumed by humans is prevented for at least one month. If crops for direct human consumption are not grown within 18 months of application or incorporation, the requirements of paragraphs (b) (1) and (2) of this section apply. Processes to Further Reduce Pathogens are listed in Appendix II, Section B.

(c) As used in this section:

(1) "Crops for direct human consumption" means crops that are consumed by humans without processing to minimize pathogens prior to distribution to the consumer.

(2) "Disease vector" means rodents, flies, and mosquitoes capable of transmitting disease to humans.

(3) "Incorporated into the soil" means the injection of solid waste beneath the surface of the soil or the mixing of solid waste with the surface soil.

(4) "Periodic application of cover material" means the application and compaction of soil or other suitable material over disposed solid waste at the end of each operating day or at such frequencies and in such a manner as to reduce the risk of fire and to impede vectors' access to the waste.

(5) "Trenching or burial operation" means the placement of sewage sludge or septic tank pumpings in a trench or other natural or man-made depression and the covering with soil or other suitable material at the end of each operating day such that the wastes do not migrate to the surface.

§ 257.3–7 Air.

(a) The facility or practice shall not engage in open burning of residential, commercial, institutional or industrial solid waste. This requirement does not apply to infrequent burning of agricultural wastes in the field, silvicultural wastes for forest management purposes, land-clearing debris, diseased trees, debris from emergency clean-up operations, and ordnance.

(b) The facility or practice shall not violate applicable requirements developed under a State implementation plan approved or promulgated by the Administrator pursuant to Section 110 of the Clean Air Act.

(c) As used in this section "open burning" means the combustion of solid waste without (1) control of combustion air to maintain adequate temperature for efficient combustion, (2) containment of the combustion reaction in an enclosed device to provide sufficient residence time and mixing for complete combustion, and (3) control of the emission of the combustion products.

§ 257.3–8 Safety.

(a) *Explosive gases.* The concentration of explosive gases generated by the facility or practice shall not exceed:

(1) Twenty-five percent (25%) of the lower explosive limit for the gases in facility structures (excluding gas control or recovery system components); and

(2) The lower explosive limit for the gases at the property boundary.

(b) *Fires.* A facility or practice shall not pose a hazard to the safety of persons or property from fires. This may be accomplished through compliance with § 257.3–7 and through the periodic application of cover material or other techniques as appropriate.

(c) *Bird hazards to aircraft.* A facility or practice disposing of putrescible wastes that may attract birds and which occurs within 10,000 feet (3,048 meters) of any airport runway used by turbojet aircraft or within 5,000 feet (1,524 meters) of any airport runway used by only piston-type aircraft shall not pose a bird hazard to aircraft.

(d) *Access.* A facility or practice shall not allow uncontrolled public access so as to expose the public to potential health and safety hazards at the disposal site.

(e) As used in this section:

(1) "Airport" means public-use airport open to the public without prior permission and without restrictions within the physical capacities of available facilities.

(2) "Bird hazard" means an increase in the likelihood of bird/aircraft collisions that may cause damage to the aircraft or injury to its occupants.

(3) "Explosive gas" means methane (CH_4).

(4) "Facility structures" means any buildings and sheds or utility or drainage lines on the facility.

(5) "Lower explosive limit" means the lowest percent by volume of a mixture of explosive gases which will propagate

a flame in air at 25°C and atmospheric pressure.

(6) "Periodic application of cover material" means the application and compaction of soil or other suitable material over disposed solid waste at the end of each operating day or at such frequencies and in such a manner as to reduce the risk of fire and to impede disease vectors' access to the waste.

(7) "Putrescible wastes" means solid waste which contains organic matter capable of being decomposed by microorganisms and of such a character and proportion as to be capable of attracting or providing food for birds.

§ 257.4 Effective date.

These criteria become effective October 15, 1979.

Appendix I

The maximum contaminant levels promulgated herein are for use in determining whether solid waste disposal activities comply with the ground-water criteria (§ 257.3—4). Analytical methods for these contaminants may be found in 40 CFR Part 141 which should be consulted in its entirety.

1. *Maximum contaminant levels for inorganic chemicals.* The following are the maximum levels of inorganic chemicals other than fluoride:

Contaminant	Level (milligrams per liter)
Arsenic	0.05
Barium	1.
Cadmium	0.010
Chromium	0.05
Lead	0.05
Mercury	0.002
Nitrate (as N)	10.
Selenium	0.01
Silver	0.05

The maximum contaminant levels for fluoride are:

Temperature[1] degrees Fahrenheit	Degrees Celsius	Level (milligrams per liter)
53.7 and below	12 and below	2.4
53.8 to 58.3	12.1 to 14.6	2.2
58.4 to 63.8	14.7 to 17.6	2.0
63.9 to 70.6	17.7 to 21.4	1.8
70.7 to 79.2	21.5 to 26.2	1.6
79.3 to 90.5	26.3 to 32.5	1.4

[1] Annual average of the maximum daily air temperature.

2. *Maximum contaminant levels for organic chemicals.* The following are the maximum contaminant levels for organic chemicals:

	Level (milligrams per liter)
(a) Chlorinated hydrocarbons:	
Endrin (1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo, endo-5,8-dimethano naphthalene)	0.0002
Lindane (1,2,3,4,5,6-Hexachlorocyclohexane, gamma isomer)	0.004
Methoxychlor (1,1,1-Trichloro-2,2-bis (p-methoxyphenyl) ethane)	0.1
Toxaphene ($C_{10}H_{10}Cl_8$-Technical chlorinated camphene, 67 to 69 percent chlorine)	0.005
(b) Chlorophenoxys:	
2,4-D (2,4-Dichlorophenoxy-acetic acid)	0.1
2,4,5-TP Silvex (2,4,5-Trichlorophenoxypropionic acid)	0.01

3. *Maximum microbiological contaminant levels.* The maximum contaminant level for coliform bacteria from any one well is as follows:

(a) using the membrane filter technique:

(1) Four coliform bacteria per 100 milliliters if one sample is taken, or

(2) Four coliform bacteria per 100 milliliters in more than one sample of all the samples analyzed in one month.

(b) Using the five tube most probable number procedure, (the fermentation tube method) in accordance with the analytical recommendations set forth in "Standard Methods for Examination of Water and Waste Water", American Public Health Association, 13th Ed. pp. 662–688, and using a Standard sample, each portion being one fifth of the sample:

(1) If the standard portion is 10 milliliters, coliform in any five consecutive samples from a well shall not be present in three or more of the 25 portions, or

(2) If the standard portion is 100 milliliters, coliform in any five consecutive samples from a well shall not be present in five portions in any of five samples or in more than fifteen of the 25 portions.

4. *Maximum contaminant levels for radium-226, radium-228, and gross alpha particle radioactivity.* The following are the maximum contaminant levels for radium-226, radium-228, and gross alpha particle radioactivity:

(a) Combined radium-226 and radium-228—5 pCi/l;

(b) Gross alpha particle activity (including radium-226 but excluding radon and uranium)—15 pCi/l.

Appendix II

A: Processes to Significantly Reduce Pathogens

Aerobic digestion: The process is conducted by agitating sludge with air or oxygen to maintain aerobic conditions at residence times ranging from 60 days at 15° C to 40 days at 20° C, with a volatile solids reduction of at least 38 percent.

Air Drying: Liquid sludge is allowed to drain and/or dry on under-drained sand beds, or paved or unpaved basins in which the sludge is at a depth of nine inches. A minimum of three months is needed, two months of which temperatures average on a daily basis above 0° C.

Anaerobic digestion: The process is conducted in the absence of air at residence times ranging from 60 days at 20° C to 15 days at 35° to 55° C, with a volatile solids reduction of at least 38 percent.

Composting: Using the within-vessel, static aerated pile or windrow composting methods, the solid waste is maintained at minimum operating conditions of 40° C for 5 days. For four hours during this period the temperature exceeds 55° C.

Lime Stabilization: Sufficient lime is added to produce a pH of 12 after 2 hours of contact.

Other methods: Other methods or operating conditions may be acceptable if pathogens and vector attraction of the waste (volatile solids) are reduced to an extent equivalent to the reduction achieved by any of the above methods.

B. Processes to Further Reduce Pathogens

Composting: Using the within-vessel composting method, the solid waste is maintained at operating conditions of 55° C or greater for three days. Using the static aerated pile composting method, the solid waste is maintained at operating conditions of 55° C or greater for three days. Using the windrow composting method, the solid waste attains a temperature of 55° C or greater for at least 15 days during the composting period. Also, during the high temperature period, there will be a minimum of five turnings of the windrow.

Heat drying: Dewatered sludge cake is dried by direct or indirect contact with hot gases, and moisture content is reduced to 10 percent or lower. Sludge particles reach temperatures well in excess of 80° C, or the wet bulb temperature of the gas stream in contact with the sludge at the point where it leaves the dryer is in excess of 80° C.

Heat treatment: Liquid sludge is heated to temperatures of 180° C for 30 minutes.

Thermophilic Aerobic Digestion: Liquid sludge is agitated with air or oxygen to maintain aerobic conditions at residence times of 10 days at 55–60° C, with a volatile solids reduction of at least 38 percent.

Other methods: Other methods or operating conditions may be acceptable if pathogens and vector attraction of the waste (volatile solids) are reduced to an extent equivalent to the reduction achieved by any of the above methods.

Any of the processes listed below, if added to the processes described in Section A above, further reduce pathogens. Because the processes listed below, on their own, do not reduce the attraction of disease vectors, they are only add-on in nature.

Beta ray irradiation: Sludge is irradiated with beta rays from an accelerator at dosages of at least 1.0 megarad at room temperature (ca. 20° C).

Gamma ray irradiation: Sludge is irradiated with gamma rays from certain isotopes, such as ^{60}Cobalt and ^{137}Cesium, at dosages of at least 1.0 megarad at room temperature (ca. 20° C).

Pasteurization: Sludge is maintained for at least 30 minutes at a minimum temperature of 70° C.

Other methods: Other methods or operating conditions may be acceptable if pathogens are reduced to an extent equivalent to the reduction achieved by any of the above add-on methods.

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ENVIRONMENTAL PROTECTION AGENCY

[40 CFR Part 257]

[FRL 1234-2]

Criteria for Classification of Solid Waste Disposal Facilities and Practices Amendment

AGENCY: Environmental Protection Agency.

ACTION: Proposed Rule.

SUMMARY: This proposed amendment would expand the list of maximum contaminant levels (MCL's) used in the ground-water quality standard of the Criteria for Classification of Solid Waste Disposal Facilities and Practices (40 CFR Part 257). The criteria were developed and issued as a regulation under the authority of the Resource Conservation and Recovery Act of 1976. The purpose of the criteria is to provide the basis for determining whether solid waste disposal facilities or practices pose no reasonable probability of adverse effects on health or the environment.

The ground-water quality standard which has been promulgated in the criteria contains maximum contaminant levels for health-related parameters (specific inorganic and organic chemicals, coliform bacteria, and radioactive contamination). This amendment proposes limits for the following additional eleven contaminants: Chloride, color, copper, foaming agents, iron, manganese, odor, pH, sulfate, total dissolved solids, and zinc. These additions are designed to protect ground water from odor, discoloration, and taste-causing contaminants.

DATES: Comments are due November 13, 1979. One hearing will be held: it will be on November 1, 1979 at 9:00 AM. Registration for the hearing will begin at 8:30 AM.

ADDRESSES: The official record for this amendment (Docket No. 4004.2) is located in room 2107, 401 M Street, SW, Washington, D.C. 20460. The record is available for viewing from 9:00 AM to 4:00 PM Monday through Friday, excluding holidays.

The public hearing will be held in room 3906, 401 M Street, SW, Washington, D.C. Persons wishing to make oral presentations are requested to restrict their presentations to less than ten minutes.

Written comments may be submitted at the hearing or mailed to: Comments Clerk, Amended Criteria, Office of Solid Waste (WH-564), EPA, Washington, D.C. 20460.

FOR FURTHER INFORMATION CONTACT: Mr. Truett V. DeGeare, Jr., P.E. at the above address or at (202) 755-9120.

SUPPLEMENTARY INFORMATION:

Authority

The statutory authorities for this proposed amendment are Sections 1008 (a)(3) and 4004 (a) of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6907(A)(3) and 6944(a)), later referred to as RCRA or the Act; also, Section 405(d) of the Clean Water Act, as amended (33 U.S.C. 1345).

Discussion

This action proposes to amend the Criteria for Classification of Solid Waste Disposal Facilities and Practices (40 CFR Part 257) which has been promulgated pursuant to the above authorities.

The purpose of the criteria is to provide the basis for determining whether solid waste disposal activities pose "* * * no reasonable probability of adverse effects on health or the environment * * *" (RCRA, Section 4004). The criteria define an open dump (RCRA Section 4004), the minimum elements of prohibited open dumping practices (RCRA Section 1008(a)(3)), and the effects which must be avoided by POTW owners and operators (CWA Section 405). For a full discussion of the criteria's role see the Preamble to that regulation.

The criteria provide a ground-water quality standard consisting of specified substances or parameters. When a facility or practice causes protected ground water to exceed the contamination levels specified in that standard, the facility fails to comply with the criteria. The standard which has been promulgated in the criteria contains maximum contaminant levels for health-related parameters. This amendment proposes limits for the following additional eleven contaminants: chloride, color, copper, foaming agents, iron, manganese, odor, pH, sulfate, total dissolved solids, and zinc, in order to protect against malodorous, discoloring, foul-tasting substances in ground water.

The criteria provide that solid waste disposal facilities or practices shall not *contaminate* an *underground drinking water source* beyond the *solid waste boundary*. The italicized terms are specifically defined for their use in the ground-water section of the criteria.

Underground drinking water sources are aquifers supplying drinking water for human consumption or aquifers in which the ground water contains less than 10,000 mg/l total dissolved solids. *Solid waste boundary* is the outermost perimeter of the solid waste (projected in the horizontal plane) as it would exist at completion of the disposal activity. (There is a provision in the criteria allowing a State with an approved State solid waste management plan to establish an alternative boundary to be used in lieu of the solid waste boundary in accordance with specified procedures and conditions). *Contamination* is defined as the introduction of listed substances to ground water so as to cause (1) the concentration of the substance in the ground water to exceed the maximum contaminant level specified, or (2) an increase in the concentration of the substance in the ground water where the existing concentration of the substance exceeds the specified maximum contaminant level.

As promulgated, the criteria establish specified maximum contaminant levels which were designed to be protective of the health of persons consuming the ground water. It includes levels for ten inorganic chemicals, six organic chemicals, coliform bacteria, and radioactive contaminants. These levels are based on the National Interim Primary Drinking Water Regulations (40 CFR Part 141).

The criteria were initially proposed for public comment at 43 FR 4942 on February 6, 1978. In that proposal, the water quality standard for ground water used or usable for human consumption was that the water not be made unfit for

influences. A reasonable range of pH at the water table may be considered to lie between 4 and 9, numbers which also represent the reported range of the pH of leachate. Naturally occurring pH in ground water is slightly basic in most regions of the country, with sufficient buffering capacity to withstand significant stresses associated with solid waste disposal activities. Leachate from mixed municipal wastes is quite erratic, varying by both age and constituents of the waste. The occurrence of contaminated ground water in which the MCL for pH is exceeded after a reasonable mixing zone is highly indicative of adverse health and environmental effects.

Most of the comments received by the Agency concerned the upper limit for pH. Since raw leachate seldom exceeds the upper limit, these comments are not applicable for the Criteria. The remainder of the comments concerned corrosivity. The Agency is still evaluating tests and maximum concentration levels for corrosivity; these comments and the issue of corrosivity in leachate will be addressed on conclusion of the evaluations.

I. *Sulfate* (250 mg/l). Sulfate is a commonly occurring natural constituent of ground water in many regions of the country. Some States report as much as 10 percent of the underground drinking water supplies exceed the MCL. Sulfate is listed in the Secondary Drinking Water Regulations principally because of its cathartic or laxative effect in humans and to a lesser extent because of taste considerations. Its presence in leachate is frequently attributable to industrial sources of refuse such as textile and paper industries. Leachate analyses frequently report sulfate far below MCL, with occasional reports as high as 1500 to 2000 mg/l. For these facilities it is a good indicator of the extent of contamination, and its laxative and taste effects are useful indices of the adverse effects.

Comments received by the Agency were not appropriate to this amendment, considering the objectives of the criteria. Cost of treatment, and long-term acclimatization do not suggest allowing greater concentrations to result from land disposal.

J. *Total Dissolved Solids (TDS)* (500 mg/l). Dissolved solids content is useful as the single parameter which most closely describes a given water in terms of usefulness of the native water and influence of a heterogenous contaminant source. It reflects the influence of all the dissolved constituents. It reflects mineralization and, thus, the taste of water. Additionally it accelerates deterioration of plumbing and water fixtures. (One study finds a reduction of one year of water heater life per 200 mg/l TDS). Although it is a very non-specific indicator which may be difficult to isolate by source, it is useful for covering both hardness and corrosivity effects which are not otherwise a part of the water quality standard of the criteria.

In some regions of the country, particularly in the Southwest, the ground water commonly exceeds the MCL for TDS. A dissolved solids limit (10,000 mg/l) is used as the demarcation in the criteria for water too contaminated to warrant protection. Leachate is high in TDS, commonly reported between 5,000 and 40,000 mg/l.

Excessive hardness, taste, mineral deposition and corrosion are among the associated adverse effects listed in the rationale for limiting TDS in the Drinking Water Regulations. Comments received on TDS were mostly requests for flexibility or for a higher limit from water suppliers in area of high background TDS levels. No comments of concern to the criteria addressed areas of low background TDS.

K. *Zinc* (5 mg/l). Like copper, zinc is an essential and beneficial element in human metabolism, but it imparts an undesirable taste to water. It also can create a milky appearance in water and cause a greasy film on boiling. In native ground water it is seldom found in concentrations exceeding 2 or 3 mg/l. Frequently, it is reported in leachate at concentrations below the MCL; however, in industrial areas zinc concentrations in leachate have been reported up to 370 mg/l. The Agency received no comments on the proposed MCL.

Key Issues

EPA believes that this list of eleven maximum concentration levels may be appropriate for addition to the criteria. In order to properly solicit public comment, yet not delay State implementation of RCRA, the Agency is promulgating the criteria at the same time as this amendment is being proposed; the alternative of promulgating interim regulations, with the expanded ground-water quality standard in effect during the comment period, was rejected.

Several key questions are specifically highlighted for public comment. First, are these eleven proposed contaminant levels appropriate for the objectives of the criteria? Are they characteristic of leachate? Are they too commonly present in ground water to serve the purpose? Secondly, are there additional contaminants or characteristics which should be used to determine adverse effects on health and environment? Thirdly, what effect will the expansion of the standard have on compliance with the criteria? Will only those facilities with impervious liners for the prevention of discharges be acceptable, or will there be only a small incremental increase in non-complying facilities consisting of sites which do cause adverse environmental effects?

We specifically highlight for comment the fact that several States have considered these contaminant levels as they were proposed in the National Secondary Drinking Water Regulations and have chosen to promulgate State drinking water regulations based on higher or lower levels. Should these criteria permit similar State-by-State variations in the ground-water quality standard? This question should be addressed considering that without State discretion, some State agencies may be in the awkward position of requiring facilities to close or upgrade for causing effects which the State considers acceptable in drinking water supplies. Yet, on the other hand, in order to protect against the potential for inconsistencies and abuses, a flexible standard will require adding a justification and approval process. This is a level of EPA oversight not otherwise needed in implementation of the regulation.

Comments are also requested on the practicality of implementation (such as replicability of taste and odor tests), potential impacts of this amendment on segments of society and the economy, and the adequacy of the amended regulation in providing for protection of the public health and the environment. Written public comment is invited on all issues raised by the proposal.

Dated: September 10, 1979.

Douglas M. Costle,

Administrator.

Appendix A [Amended]

Accordingly, 40 CFR Part 257 is amended by adding to Appendix A a paragraph 6 as follows:

* * * * *

6. *Maximum contaminant levels for other than health effects.*

The following are the maximum levels for odor, taste and miscellaneous contaminants:

Contaminant	Level
Chloride	250 mg/l.
Color	15 Color units.
Copper	1 mg/l.
Foaming agents	0.5 mg/l.
Iron	0.3 mg/l
Manganese	0.05 mg/l.
Odor	3 Threshold odor No.
pH	6.5–8.5.
Sulfate	250 mg/l.
TDS	500 mg/l.
Zinc	5 mg/l.

[FR Doc. 79-28533 Filed 9-12-79, 8:45 am]

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Appendix Four

Sanitary Landfill Site Selection and Development Guidelines

Taken From: "Regulatory and Enforcement Program (Draft-3/80)," Arizona State Solid Waste Management Plan, pp. VIII-16.

SANITARY LANDFILL SITE SELECTION AND DEVELOPMENT GUIDELINES

When proposing a sanitary landfill, you should provide the following information in your plan:

I. MAPS

A. Topographic Map - of a section (6 miles x 6 miles) showing location with respect to towns, or populated areas, mountain ranges, rivers, etc. - U.S. Geological Survey Maps, or equivalent, will suffice.

B. Plot Map - Scale: 200' per inch or less, showing landfill area in detail:

1. All existing and planned all-weather roads
2. Utility and water lines
3. Fire breaks
4. Water runoff and drainage controls
5. Permanent and portable fences

II. DESCRIPTION, OPERATION, AND CONSTRUCTION - Narrative

A. Brief Description of Site - legal description, location and type (area or trench) of sanitary landfill, operational authority, etc.; "introduction". Include discussion of "need" for proposed site.

B. Population and Waste-Type Study

1. Present and future population - how many people are going to use this sanitary landfill?
2. Types of Wastes:
   a. Household
   b. Commercial
   c. Institutional
   d. Dead animals, carcasses, remains
   e. Septage
   f. Other
   g. Combination of above

3. Estimated life or size requirement for sanitary landfill

a. Assumptions:

1. Population (from para. II.B.1)

2. Daily amount of waste per capita $\left(\frac{lb}{day}\right)$

3. In-place refuse compaction factor $\left(\frac{lb}{yd^3}\right)$

4. Depth of fill area (ft)

b. Estimated weight of refuse per year:

$$\text{Yrly Amt of Refuse}\left(\frac{lb}{yr}\right) = (\text{Population}) \times \left(\frac{\text{Per Capita}}{day}\right) \times \left(365\ \frac{days}{yr}\right)$$

c. Estimated volume of refuse per year:

$$\text{Yrly Vol of Refuse}\left(\frac{yd^3}{yr}\right) = \left(\text{Yrly Amt of Refuse}\right) \div \left(\text{Refuse Compaction Factor}\right)$$

d. Estimated volume of cover material per year:

$$\text{Yrly Cover Vol}(ft^3) = (.24) \times (\text{Yrly Vol of Refuse})$$

e. Estimated total volume of refuse and cover material per year:

$$\text{Total Yrly Vol}\left(\frac{ft^3}{yr}\right) = (\text{Yrly Vol of Refuse}) + (\text{Yrly Cover Vol})$$

f. Estimated land use requirement per year:

$$\text{Yrly Land Use}\left(\frac{acre}{yr}\right) = \left(\text{Total Yrly Vol}\right) \div \left(1613\ \frac{yd^3}{acre\text{-}ft}\right) \div \left(\text{Depth of Fill}\right)$$

g. Calculate appropriate item:

1. Estimated life of landfill:

   Life(yrs) = (Size) ÷ (Yrly Land Use)

2. Estimated size required for landfill:

   Size(acres) = (Yrly Land Use) X (Life)

C. <u>Site Characteristics</u>

1. Climate, weather conditions
2. Slope
3. Type of site (gully, wash, flat meadow, desert, etc.)
4. Soil data - check with Soil Conservation Office for possible information
   a. Surface
   b. Subsurface strata
   c. Bedrock

5. Water data
   a. 100-year floodplain data, or other area subject to inundation
   b. Depth to groundwater
   c. Quality of groundwater
   d. Proximity to wells
   e. Proximity to rivers or lakes

      NOTE: Include rationale for why this operation will not result in the degradation of either surface or groundwater.

D. Operation Plan

1. Types of wastes that will be accepted and plan for their handling
2. Salvage plan
3. Types of wastes that will not be accepted
4. Location of first trench or cell
5. Progression plan ["roadmap" for anticipated progression (location) of future trenches or cells for the life of the site]
6. Maintenance of site - daily (if a variance is requested, incorporate it into the plan)
7. Compaction and cover (minimum requirements)
   a. Daily cover - six (6) inches of compacted earth
   b. Intermediate cover - twelve (12) inches of compacted earth (may include daily cover, if already applied). Intermediate cover must be applied to all fill areas which:
      (1) Will remain inactive for more than thirty (30) days, or
      (2) Will be subjected to user trafficking
   c. Final cover - twenty-four (24) inches of compacted earth (may include daily or intermediate cover, if already applied). Final cover must be applied to all fill areas which:
      (1) Will remain inactive for more than one (1) year, or
      (2) Are completed

8. Landfill equipment
   a. Type(s) and size(s)
   b. Backup equipment
9. Vector control plan
10. Fire contingency plan
11. Litter control plan
   a. Fencing
   b. On-site collection of trash and windblown litter
   c. Off-site collection of trash and windblown litter
12. Provisions for dust control
13. Provisions for methane gas production
14. Inclement weather operation plan
15. Provisions for access control both to and on the site
16. Provisions for maintenance of all-weather access road
17. Post-closure consideration
   a. Planned use
   b. Provision for maintenance of completed fill area, if necessary

E. Description of Items that may have to be constructed:
1. Preliminary excavation - leveling
2. Cover material site - if different from that of landfill
3. All-weather access roads
4. Signs - posted on all appropriate highways
5. Employee facilities
6. Maintenance shacks
7. Fences and gates limiting access
8. Drainage ditches, culverts, etc.
9. Fee and weighing stations, if used
10. Water Supply

JTD:dar
(Rev. 1/79)

CHAPTER EIGHT: MANAGEMENT AND IMPLEMENTATION PLAN (FINAL DRAFT)

Introduction

It is a measure of the complexity of solid waste management that so many agencies and jurisdictions are involved in it. In addition to the elected officials at each level of government, in the PAG planning area, the following federal, state and local agencies have roles in solid waste management planning:

Federal - Environmental Protection Agency
Department of Energy
Bureau of Land Management
Department of Commerce
Department of Housing and Urban Development

State - Arizona Department of Health Services
State Land Department
Department of Public Safety
Division of Emergency Services
Attorney General

Local - PAG Staff
County Health Department
County Wastewater Management Department
County Sheriff
Department of Emergency Services
Tucson Department of Operations
Tucson Police Department
Tucson Water Department
Tucson Fire Department
South Tucson Department of Operations

Most of them also have some operating responsibility for solid waste management. The three monitoring agencies are the Environmental Protection Agency, the

Arizona Department of Health Services and the Pima County Health Department.

This chapter will outline the roles of these participants and indicate which agencies will be responsible for carrying out the management tasks discussed in the three previous chapters on hazardous waste, resource recovery and collection and disposal. An estimate of the costs of implementing the short-term tasks will be included. (Short-term tasks are defined as those to be undertaken during the next two or three years).

The plan should be considered as a means for achieving sound solid waste management in the PAG planning area. It is thus important that the planning process remain flexible enough to account for changes in local conditions, technological improvements, and more complete information about the possibilities and problems associated with solid waste management techniques. To ensure that the appropriate adaptations are made, the plan will be reviewed every three years.

Federal Agencies

The Environmental Protection Agency (EPA) is responsible for overseeing the implementation of the Resource Conservation and Recovery Act (RCRA) of 1976. As has been described in previous chapters, the act was aimed at controlling hazardous waste, encouraging resource recovery, eliminating open dumping, and promoting state solid waste management planning. In each of these areas, the EPA was assigned specific tasks:

1. The EPA defines what hazardous waste is and sets the standards to which generators, transporters, and treatment, storage and disposal facilities must adhere. It must also approve any state hazardous waste control program operated in lieu of the federal program.

2. The EPA is responsible for accumulating information related to product specifications, markets and technology for resource recovery. Some EPA grants are available to fund full-scale resource recovery facilities, and through the regional EPA offices, Technical Assistance Panel (TAP) grants are available to states and localities for a variety of solid waste management planning efforts.

3. RCRA charged the EPA with defining the difference between open dumping and sanitary landfilling. The act requires that the agency publish an inventory of all open dumps in the country. The EPA must also review and approve all state solid waste management plans to ensure that they conform to the guidelines established by the act.

The EPA has worked closely with the Arizona Department of Health Services to fulfill its obligations under RCRA. Public funding made available through EPA, has been the source of most of the funding for the state's development of a hazardous waste program, and has been a significant financial factor, contributing to the state's solid waste management plan and to the conduct of the open dump inventory in the state.

Four other federal agencies have peripheral involvement in solid waste planning or management in the area. The Bureau of Land Management determines the conditions under which federal land will be available to local jurisdictions for landfilling and approves the lease of particular sites. The bureau is also responsible for dealing with any illegal dumping which takes place on the land it manages.

The Department of Energy has the authority under the Synthetic Fuels Act of 1980 to make loans for the construction of energy recovery plants. An application for one of these loans has recently been made by the Tucson Department of Operations. The project would involve a cooperative effort between the City of Tucson and the Arizona Portland Cement Company. According to the Arizona Department of Health Services, the Department of Housing and Urban Development could also become involved in local solid waste management planning through its comprehensive grant program (Phil King, 10/30/80).

Finally, the Department of Commerce is required under RCRA (Secs. 5003,5004) to promote resource recovery by identifying potential and existing markets for recovered resources, identifying barriers to resource recovery, encouraging the development of new markets for recovered resources, and evaluating the commercial feasibility of resource recovery facilities.

State Agencies

In accordance with Sections 4002 and 4006 of RCRA, the Arizona Department of Health Services (ADHS) was designated by the Governor as the agency responsible for developing the state solid waste management plan. Accordingly, the ADHS Bureau of Waste Control has drafted the Arizona State Solid Waste Management Plan. The plan is a comprehensive document, addressing a wide range of issues including the state's present solid waste management system, its future solid and hazardous waste management needs, recommended approaches to satisfying these needs, and the state regulatory and enforcement structure.

In addition to the above, ADHS has developed a plan for hazardous waste control on the basis of which the state has applied to EPA under Section 3006 of RCRA for interim authorization to operate a state program. If the authorization is granted, ADHS will be responsible for regulating hazardous waste management in the state for the succeeding two years, at which time the state hopes to receive EPA authorization to operate a permanent program.

ADHS has broad regulatory powers with respect to the management of nonhazardous solid waste. The department is conducting the inventory of open dumps required by Section 4005 of RCRA, and it will be responsible for monitoring the improvement of or closing any landfills which do not meet EPA sanitary landfill standards. The department must also approve all plans for new sanitary landfills and all changes in operations of existing ones.

RCRA does not specifically deal with the management of old landfills, but ADHS has implemented two programs to control any potential hazards generated by them and has initiated a survey of old landfill sites.

With respect to resource recovery, the ADHS role will primarily be to support locally operated programs. Legal impediments to resource recovery will be examined and efforts made to remove them. The department will also implement a program of public education and provide limited technical and planning assistance to local jurisdictions.

Although ADHS plays the key role in solid waste management at the state level, three other agencies have some planning and operational responsibilities. The State Land Department, like the BLM, sets standards which local jurisdictions must meet to acquire state land for landfilling sites, and it approves the limited sale or lease of particular parcels for the purpose. The department is also responsible for handling the problem of illegal dumping on state land. The Arizona Division of Emergency Services has written the "Hazardous Materials Emergency/Spill Response Plan" defining the responsibilities and appropriate actions to be taken by state agencies in case of a hazardous materials emergency. The Department of Public Safety is involved in planning and implementing a hazardous materials emergency task force for Pima County and some other parts of southern Arizona. The department is also responsible for the enforcement of state laws prohibiting littering and illegal dumping.

An agency which may become involved in solid waste management issues as the state plan is implemented is the Attorney General's Office. This office may have to consider the legalities related to establishing responsibility for illegal dumping and old landifll maintenance and for implementing resource recovery programs.

Local Agencies

In accordance with the recommendation of Section 4006(b) of RCRA, the elected officials who make up the PAG Regional Council designated the City of Tucson Department of Operations and the Pima County Wastewater Management Department as the co-lead agencies for solid waste management planning in Region II of Arizona. PAG was assigned the responsibility of coordinating this joint planning process. These designations were formally approved by the Governor. As a result, this plan document was developed by a Technical Committee made up of staff members from the Tucson Operations Department, the County Wastewater Management Department and PAG.

Plan Review

Each section of the plan was reviewed by the Solid Waste Subcommittee of the PAG Environmental Planning Advisory Committee (EPAC). The subcommittee is composed of staff from the City of Tucson Department of Operations, the City of South Tucson Department of Operations, the Pima County Wastewater Management and Health departments, other city and county staff, representatives of the State Land Department and Davis-Monthan Air Force Base, private citizens from the 5 PAG jurisdictions, and representatives of local economic and environmental interests. The subcommittee's contribution to the document and the plan's subsequent approval by EPAC constitute the first phase of plan review.

A second phase of plan review involves a public process during which workshops, public meetings, and public hearings will be held. Citizen review may also be elicited by such means as questionnaires, staff presentations to local organizations, and media exposure.

The third phase is a jurisdictional review process which takes place within the organizational framework of the PAG Regional Council. After EPAC review, the plan is presented to the PAG Management Committee which

is composed of chief administrators and/or elected officials of the five member jurisdictions. Following Management Committee review, the plan is presented to the elected officials of each jurisdiction for their review and approval prior to PAG Regional Council approval.

In addition to local review, the solid waste management plan will also be reviewed by the State and EPA.

Plan Implementation

When the plan is implemented, the PAG staff will be responsible for designing and carrying out a series of public information programs dealing with hazardous waste, resource recovery and illegal dumping. The primary responsibility for areawide solid waste management, however, will remain with those agencies which have been highly involved in planning and implementing the area's solid waste management system heretofore: The Pima County Wastewater Management Department and the City of Tucson Department of Operations. Because it provides only collection service and because the population of South Tucson is expected to be fairly constant, that city's Department of Operations has a fairly limited role in areawide solid waste management.

Volume I of this plan, entitled the PAG Solid Waste Disposal Needs Survey, 1980-2000, March 1980, pp. 56-74 (elsewhere referred to as the "Needs Assessment"), describes the roles of the County Wastewater Management Department and the Tucson Department of Operations in some detail. Both agencies are responsible for planning and operating sanitary landfills to service their jurisdictions. The Tucson Water Department assists by supplying information about water quality in city wells situated near landfills. The Tucson Department of Operations also provides collection services for its jurisdiction and has been actively involved in developing a large-scale resource/energy recovery program.

The Pima County Health Department has operating and monitoring responsibilities in the areas of illegal dumping and the elimination of any other health hazard. In the past, it has also monitored intermittently the operation of local landfills under a delegation of authority from ADHS (ARS 36-132.01), even though ADHS has retained this function as one of its primary responsibilities. Whether County Health will retain this function as ADHS increases its activity in the area of solid waste management is still being determined.

A Task Force comprised of the Pima County Sheriff's Department, the Tucson Police and Fire Departments, the Tucson-Pima County Department of Emergency Services, the University of Arizona, the Arizona Department of Public Safety, the Arizona Corporation Commission and citizen groups, have coordinated an effort to ensure an immediate and united response to any hazardous waste emergency. The Task Force has concluded that existing regulations for transporting hazardous materials are adequate and that area-wide emergency response plans in each jurisdiction need to be brought up to date. The Task Force anticipates that the update will be concluded by September 30, 1981.

The Tucson Police Department and the County Sheriff's Department also have enforcement responsibilities with respect to the laws prohibiting illegal dumping and littering.

Hazardous Wastes: Management Tasks

The most pressing issue with respect to short-term hazardous waste management is the timely development of the State Class I facility at Rainbow Valley. Directly related to the above is the problem of hazardous waste disposal by area-wide and state-wide generators and transporters, at a time when a certified hazardous waste disposal facility does not exist in the State of Arizona. Given that fact, it is incumbent upon ADHS to develop the Rainbow Valley site as quickly as possible.

With that in mind, certain management tasks must be addressed by the State and any other jurisdiction or agency interested in engaging in hazardous waste disposal.

1. A leachate monitoring system must be in place before disposal begins.
2. A program to train site operators must be conducted to ensure safe disposal practices and appropriate responses to hazardous waste emergencies.
3. Incentives must be developed to encourage proper disposal of hazardous waste by generators not covered by state and federal regulations.

Whether or not an interim site is established, several other tasks must be completed within the next two years:

1. A study of the quantities and types of hazardous waste projected to be generated in the Tucson area must be completed. This could be done by PAG, the Tucson Department of Operations, and the County Wastewater Management Department in cooperation with the Tucson Fire Department which maintains lists of hazardous materials used by local businesses.
2. ADHS must implement the manifest system required by ACRR Article 18.

3. The local hazardous materials emergency response task force must be expanded, trained, and put into operations.
4. The public education programs for generators of hazardous waste must be initiated. These programs involve educating small generators (less than 1,000 kg per month) about safe disposal practices and informing large generators about the RCRA requirements and opportunities for recycling their hazardous waste.
5. A waste exchange and resource recovery information clearinghouse should be established and industrial participation and sponsorship should be encouraged.

HAZARDOUS WASTE

Management Agency/ Management Task	Planning				Operating				Monitoring			
	Los Reales Site	State Site	Emerg. Response	Other*	Los Reales Site	State Site	Emerg. Response	Other*	Los Reales Site	State Site	Emerg. Response	Other*
FEDERAL:												
EPA	**	**	**	X					**	**	**	**
STATE:												
ADHS	X	X	X	X				X	X	X	X	X
Department of Public Safety			X				X					
Division of Emergency Svcs.	X	X	X									
LOCAL												
PAG Staff	X		X	X				X				
County Wastewater Management			X	X			X	X				
County Health Department				X								
County Sheriff			X				X					
Emergency Services			X				X					
Tucson Dept. of Operations	X		X	X	X		X		X			
Tucson Fire Department	X		X				X					
Tucson Police Department	X		X				X					
Tucson Water Department	X		X				X					

*Other refers to treatment and recovery of hazardous waste, public information programs, and the general implementation of RC and State requirements regarding the proper handling and disposal of hazardous waste.

**If the State Program for hazardous waste control is not approved, EPA will be responsible for implementing a program in the State. This responsibility might be delegated to ADHS.

Hazardous Waste: Short-Term Management Tasks

Task	Agency	Date	Cost
Study of quantity and type of hazardous waste generated in area	PAG Tucson Operations Wastewater Management Tucson Fire Department	1981	
Implementation of manifest system	ADHS	1980	
Implementation of hazardous materials emergency response task force	County Sheriff State Highway Patrol Tucson Police Tucson Fire Department Emergency Services Dept. Operations Department Tucson Water	1980	$5,000
Public education programs	PAG	1981	$2,000
Waste exchange and resource recovery clearinghouse	PAG		$1,000

Hazardous Waste: Long-Term Management Tasks

The most important long-term task for the area's local jurisdictions is to encourage the timely development of a state-owned hazardous waste facility at Rainbow Valley. In addition, after the hazardous waste regulations have been in effect for some time, ADHS, the County Health Department, the Tucson Department of Operations and the County Wastewater Management Department should cooperate in evaluating whether those regulations adequately control hazardous waste in the area. If they are found to be inadequate, the local jurisdictions can pass more stringent regulations governing local hazardous waste management.

Resource Recovery: Management Tasks

Reducing and recycling the solid waste stream is a major goal of the PAG Areawide Solid Waste Management Plan. The initial step which must be taken is to have the local jurisdictions formally agree to cooperate in establishing an areawide resource recovery program when economically feasible. The designation of one coordinating agency to begin resource recovery planning should be an integral part of the above agreement. The designated agency would have the following responsibilities:

1. To maintain communication among the various local jurisdictions and the relevant agencies with respect to resource recovery options and developments.
2. To ensure that short-range programs and planning decisions take into consideration long-range resource recovery goals.
3. To investigate what sources of funds are available for resource recovery projects.
4. To initiate the study of legal impediments to resource recovery programs.

A public education program should be initiated concerning the advantages and potential of resource recovery. In addition, a program should be established to inform local businesses and industries about the availability of markets for their waste products and the availability of recovered energy and materials for their production processes. In this way, the byproducts of one firm might be used by another firm and the waste stream could be reduced.

Resource Recovery: Short-Term Management Tasks

Task	Agency	Date	Cost
Formal agreement to cooperate on resource recovery	PAG Regional Council	1981	-0-
Designation of overall coordinating agency	PAG Regional Council	1981	-0-
Public education	PAG	1981	

Resource Recovery: Long-Term Management Tasks

The most important long-term task involves keeping up to date on the economic and technological feasibility of resource recovery. To do so requires ongoing studies of the composition of the local solid waste stream, the local market potential for recycled materials and recovered energy, the current costs of landfilling, the advances in resource recovery technology, and the degree of citizen support that exists for resource recovery efforts. Periodically, this information must be evaluated and policy decisions made regarding when to proceed with areawide resource recovery and how the operating responsibility for resource recovery should be divided among the area's governments and between the public and private sectors. The agencies responsible for these tasks are as follows:

Task	Responsible Agency
Composition studies	To be designated by coordinating agency
Market studies	To be designated by coordinating agency
Landfilling cost studies	Tucson Department of Operations Pima County Wastewater Management Department
Technology file	Coordinating agency
Citizen survey	PAG
Policy decisions on when and how to proceed with areawide program	PAG Regional Council

RESOURCE RECOVERY

Management Agency/Management Task	Planning	Operating	Monitoring*
Federal:			
EPA	X		
DOE	X		
HUD	X		
COMMERCE	X		
State:			
ADHS	X		
Attorney General	X		
Local:			
PAG Staff	X	**	
County Wastewater Management	X		
Tucson Department of Operations	X	X	
Other Local Jurisdictions	X		

*The monitoring function will be project specific.

**PAG will conduct public information programs regarding the advantages and potential of resource recovery.

COLLECTION AND DISPOSAL

(Old Landfills, Illegal Dumping, Collection, Disposal)

Management Agency/ Management Task	Planning				Operating				Monitoring			
	Old Land-Fills	Illegal Dumping	Coll.	Disp.	Old Land-Fills	Illegal Dumping	Coll.	Disp.	Old Land-Fills	Illegal Dumping	Coll.	Disp.
FEDERAL:												
EPA		X	X	X								
BLM		X		X						X		
STATE:												
Attorney General	X	X							X	X		
ADHS	X	X	X	X					X	X	X	X
Land Department		X		X						X		
Department of Public Safety		X								X		
LOCAL:												
PAG Staff	X	X	X	X		*						
County Wastewater Management	X	X	X	X	X			X				
County Health Department	X	X	X							X	X	
County Sheriff										X	X	
Tucson Operations Department	X	X	X	X	X		X	X		X	X	X
Tucson Water	X			X					X			X
Tucson Police		X								X	X	
Other Local Jurisdictions	X	X	X	X			X			X		

*PAG will conduct a public education program to combat illegal dumping.

Collection and Disposal: Short-Term Management Tasks

The management tasks in this section are divided according to whether they relate to old landfills, illegal dumping, the collection system or the disposal system. In completing them, a major goal is to ensure that no degradation of the area's groundwater will occur as a result of local solid waste management practices.

Old Landfills

The survey of old landfill sites which ADHS has begun must be completed. The survey should ascertain the dimensions and distance from the water table of such sites and evaluate their condition. If any problems are found with respect to water quality, gas production or subsidence, remedial measures will be required. A general policy for determining who is responsible for taking such measures and for safely maintaining old landfills should be adopted so that case by case adjudication can be avoided.

Illegal Dumping

Illegal dumping is a serious problem in the area and may become much more serious as the hazardous waste disposal regulations are implemented. To combat the problem, information about illegal dumpers should be collected so that the situations which encourage illegal dumping can be understood. A study of other communities' efforts to eliminate illegal dumping should be made to find techniques which could be applied in this area. The Pima County Health Department and Wastewater Management should draft and promote legislation to give stronger anti-litter enforcement powers to local governments.

Finally, the Health Department and Wastewater Management should draft legislation to allow Pima County to franchise private solid waste haulers.

The County Health Department, the County Wastewater Management Department and the State Land Department will coordinate the studies of illegal dumping with ADHS, the State Attorney General's Office and other agencies.

The Pima Association of Governments will conduct a multifaceted public education program on the hazards of illegal dumping.

Finally, funds and facilities must be provided so that the existing wildcat dumps can be eliminated. The State Land Department and the Bureau of Land Management will organize this effort in cooperation with ADHS.

Collection

To reduce transportation costs, however, the Tucson Operations Department will put the area's first large-scale transfer station into operation within the next three years. The station will be designed and sited so that conversion for resource recovery at a later date will be feasible. Provision for public dumping at this transfer station may be made to reduce traffic at the landfills and discourage illegal dumping.

Disposal

Several tasks must be undertaken in the near future to meet EPA and ADHS disposal requirements. The washout prevention work at the Ina Road Landfill must be completed by the County Highway Department, and the precautions against methane generation at the Speedway Landfill must be implemented by the Tucson Operations Department. In addition, methane monitoring should be conducted on a regular basis at any landfill which has onsite structures or which is within 1200 feet of any development.

Leachate monitoring must be installed whenever and wherever conditions indicate that leachate could become a water quality problem.

There are litter problems at almost all the existing landfills. The Wastewater Management Department and the Tucson Operations Department must implement improved litter control systems.

To prevent the illegal disposal of hazardous waste in the area's regular landfills and to comply with EPA and ADHS standards, the access to areawide landfills must be strictly controlled. The landfills should not be open to the public unless an operator is on duty, and operators should oversee landfill operations to prevent inappropriate materials from being deposited. Both the landfill personnel and their supervisors should take part in ADHS training programs to help them recognize and properly deal with hazardous waste. If it is discovered that hazardous liquid waste is being taken to regular landfills, the possibility of requiring a laboratory certification for all liquid waste before it can be placed in regular landfills should be evaluated. Currently, hazardous wastes are not allowed at any of the landfills operated by the City of Tucson or Pima County. To prevent unwanted scavenging at County landfills, appropriate legislation must be sought to provide the management agencies with enforcement powers and the ability to impose and collect fees for the use of the landfills.

Finally, the county must study the use of disposal fees for its landfills both to help defray the costs of operating them and to deal with the differential in use of county landfills that may result from the imposition of disposal fees at city landfills.

The main short-term task which must be undertaken to plan for solid waste disposal in the future is development of a 20 year plan for landfill sites in the area. This should be a cooperative effort undertaken by the Pima County Wastewater Management Department and the Tucson Department of Operations.

OLD LANDFILLS

Task	Agency	Date	Cost
Survey of old landfill sites	ADHS	1980-82	$11,630

ILLEGAL DUMPING

Task	Agency	Date	Cost
Illegal dumping studies	County Health, State Lands Wastewater	1981-82	
Promotion of legislation for franchising private haulers	Wastewater Management , County Health	1982	-0-
Clean up of Wildcat Dumps	ADHS BLM State Land	1981-	
Public education on illegal dumping	PAG	1981-	
Enforcement of illegal dumping and load cover laws	Department of Public Safety County Sheriff Tucson Police	1980-	
Promotion of strong anti-litter laws	Wastewater Management, Pima County Health	1981-	

COLLECTION

Task	Agency	Date	Cost
Completion of first large-scale transfer station	Tucson Operations	1982-83	$1,400,000

DISPOSAL

Task	Agency	Date	Cost
Ina Road Landfill washout protection	County Highway Dept.	1980-81	$300,000
Speedway Landfill methane precautions	Tucson Operations	1981	$ 1,000
Methane monitoring at selected landfills	Wastewater Management Tucson Operations	1981-	$ 1,000 $ 1,000
Leachate monitoring at selected landfills	Wastewater Management Tucson Operations	1981-	$ 10,000 $ 30,000
Landfill and transfer station litter control	Wastewater Management Tucson Operations	1980-	$ 3,000 *
Landfill and transfer station access control	Wastewater Management Tucson Operations	1980-	$ 90,000 *

DISPOSAL (cont.)

Task	Agency	Date	Cost
Hazardous waste control training for landfill personnel and supervisors	Wastewater Management Tucson Operations ADHS	1980-	-0- -0- $ 5,000
County disposal fee study	Wastewater Management	1981-	-0-
Development of 20 year plan for potential landfill sites	Wastewater Management Tucson Operations	1981-82	-0- -0-
Promotion of legislation to modify prohibition against landfill sites within 1mile of a residential area	Wastewater Management	1981-	-0-

*Funds for these tasks have been included in the 1980 budget.
** Statewide figure.

Collection and Disposal: Long-Term Management Tasks

Old Landfills

With respect to old landfills, the primary long-term management task is to establish a system for regulating the development of such sites and the land adjacent to them to prevent the creation of environmental and health hazards. A study should be made to determine the most effective way of doing this.

Illegal Dumping

The main efforts to be made with respect to illegal dumping are to implement whatever effective prevention measures are discovered in the course of the short-term studies undertaken by the County Health Department and to continue the public education program initiated by PAG.

Collection

New large- and small-scale transfer stations will be added by the Tucson Department of Operations and the County Wastewater Management Department as necessary to ensure efficient and cost-effective service. If authorized by the State Legislature, the county may provide collection service to help alleviate the problems of illegal dumping.

Disposal

An areawide plan should be developed specifying where, when and how much landfill space will be required to meet the area's future disposal needs. Citizen participation will be an integral part of this planning process. The County Wastewater Management Department and the Tucson Department of Operations should then determine which agency will develop which site.

Collection and Disposal: Long-Term Management Tasks

Task	Agency
Study regulation of use of old landfill sites and adjacent property	ADHS
Public education program on hazards of illegal dumping	PAG
Addition of large- and small-scale transfer stations as needed	Wastewater Management Tucson Operations
Develop joint plan for providing area's future landfills	Wastewater Management Tucson Operations PAG

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CHAPTER FIVE: HAZARDOUS WASTE MANAGEMENT (FINAL DRAFT)

Introduction

During the last several years, there has been increasing awareness in the United States concerning the human and economic costs of improper management of hazardous wastes. Two dramatic examples are the Love Canal chemical dump in New York State and the asbestos tailings problem in Globe, Arizona. In both cases, there has been severe human hardship, and the costs of rectifying the situations are still mounting.

In an effort to prevent such problems in the future, all levels of government are taking an interest in developing programs for the safe management of hazardous wastes. In 1976, the U.S. Congress passed the Resource Conservation and Recovery Act (RCRA). Subtitle C of the act deals specifically with hazardous waste management, creating the legal basis for thorough regulation of those who generate, store, transport, treat or dispose of hazardous wastes.

This chapter explores the progress which has been made with respect to hazardous waste management in the Tucson metropolitan area. It outlines the relationships among the federal, state and local governments, the past and present local procedures for dealing with hazardous waste disposal, the present sources and quantities of hazardous waste generated in the area, and projections for the future. Management issues involving safe treatment and disposal, resource recovery, public education and contingency planning are discussed.

Federal and State Programs

The federal program seeks to establish "cradle to the grave" control over hazardous wastes through a complete manifest and permit system. Any person or company involved in hazardous waste management must prepare the required manifests and apply for the required permits for operation. The permits establish standards for those handling and disposing of hazardous wastes. The manifests accompany any hazardous waste from its point of generation to its final destination, whether this involves recovery, treatment or permanent disposal.

EPA is charged with defining and providing lists of hazardous wastes, establishing the operating standards, making inspections to ensure compliance, and enforcing the act in case of noncompliance. As of 1980, EPA is in the process of writing the necessary regulations. The lists of hazardous wastes have been prepared, preliminary standards of operation have been defined, and the manifest system has been developed. The effective date of these regulations is November 19, 1980 (Federal Register, May, 19, 1980, pp. 33053-33588).

RCRA provides that individual states may implement their own hazardous waste management programs in lieu of the federal program as long as those programs are equivalent to and consistent with the federal program and are adequately enforced (Sec. 3006). States may receive interim authorization for a period of twenty-four months to implement state hazardous waste programs which are "substantially equivalent" to the federal program. This amounts to a grace period during which the states can upgrade their programs to meet EPA standards.

On the basis of Title 9, Section 8, Article 18 of the Arizona Compendium

of Rules and Regulations, which was adopted on May 2, 1980 and revised on October 23, 1980, Arizona is now seeking interim authorization. Assuming that interim authorization is granted, the Arizona Department of Health Services will administer the hazardous waste regulations contained in Article 18. These are similar to those proposed by EPA. They include a definition of hazardous waste, establish a manifest system, outline the responsibilities of generators and transporters of hazardous waste, and set up performance standards for the storage, treatment and disposal of hazardous waste. The regulations allow a hazardous waste facility which is in existence at the time of the regulations' adoption to continue its activities as long as it applies for the appropriate permits within six months and complies with certain operating rules detailed in Article 18 (R9-8-1820.A.5.).

The EPA and state lists defining hazardous wastes are extremely complicated, including both chemical and generic names. They are roughly divided into four categories: Ignitable, corrosive, reactive, and toxic wastes. Tests to determine whether or not a particular waste product falls within the hazardous waste category are detailed. Both Article 18 and the federal regulations require the generators of solid waste to determine, on the basis of state and federal regulations, whether that waste is hazardous, and if so, whether it is being generated in quantities sufficient to be covered by the regulations. At present, the federal and state regulations apply to quantities in excess of 1000 kg per month for most substances (Federal Register, May 19, 1980, p.33120, Section 261.5; R9-8-1818.A.S.,as revised).

The state and federal regulations do not prevent local governments from establishing more stringent requirements or from including additional substances in the hazardous waste category.

Past Management Procedures

Government involvement in hazardous waste management in the Tucson area has been quite limited. There have been no local requirements governing the generation, transportation, treatment or storage of hazardous wastes more stringent than Section 15-5 of the Tucson Code which requires that explosives, poisons, acids, caustics and potentially infectious materials from health care facilities be separated from other refuse by being put in yellow containers to alert those who collect them to possible danger. Similar rules are in force in other jurisdictions of the area.

From 1977 through December 1980, the City of Tucson had been using a portion of the Los Reales Landfill for a hazardous waste disposal site, under the management of the Department of Operations. This site is leased from the State Land Department, and under the terms of the lease, was not supposed to accept certain kinds of sludges. In practice, however, the Department of Operations had waived this requirement. The site has not however, handled radioactive or explosive materials.

Persons in the city or county who wished to use the hazardous waste section of the Los Reales Landfill contacted either a city or county agency and were referred to the Environmental Services Section of the Department of Operations. They were asked to describe the type of waste material involved and then allowed or denied access to the facility depending on the properties of the waste. This was determined by the Arizona Department of Health Services. When access was granted, a time was set for delivery of the material to the site. The part of the site where it was deposited was controlled to assure compatibility with the substances already in place. An official of the Environmental Services Section supervised the disposal and recorded the generator, date, type, and quantity of the waste in a log. Copies of the log were forwarded monthly to the administrator of the Sanitation Division and the director of the Operations Department. In July 1980, the Mayor and

Council instituted a charge for the use of the hazardous waste disposal site. The fee which was $16/1,000 lbs. for solids and $16/750 gals. for liquids, was subject to annual review.

The City of Tucson, in mid 1980, had begun to develop plans for the upgrading of the Los Reales site to meet State and EPA requirements for interim status. In November of 1980 the State Land Department issued an order to cease and desist from accepting hazardous waste at the Los Reales facility. The order also required that the existing site be cleaned up. In December 1980, the site was closed down. Disposal of hazardous waste is now referred to and managed through the Arizona Department of Health Services.

At present, there is no system for monitoring leachate at the Los Reales hazardous waste site and the disposal pits are not lined. However, the Department of Operations plans to have monitoring wells in place at the site within the next nine months. This is important because the Tucson area depends on the underlying aquifier for drinking water. The aquifier flows from the southeast toward the northwest. Los Reales is located south of the city, and there are pumping stations in the vicinity. Monitoring to ensure that no hazardous fumes are escaping and no hazardous materials are being blown from the site is handled by careful disposal procedures and on-site inspections.

Since 1979, there has been a hazardous materials unit of the Tucson Fire Department which is prepared to respond to a hazardous waste emergency anywhere within the city or at Los Reales, should one occur. The Fire Department is also implementing the City of Tucson ordinance passed in May 1980 which requires that people holding business or occupational licenses must report what potentially hazardous substances they have on their premises. The Fire Department has divided such substances into categories corresponding to those used by the U.S. Department of Transportation and has set the minimum amounts which must be declared. A copy of the declaration form is included here.

City of Tucson
Business License — Information

Firm Name _____ License No. _____

Location _____ Business Phone _____

Owner _____ Home Phone _____

Zoning _____ Fire Dept. _____

Description of Business _____

I have read the DOT list of hazard classes listed below and know and understand that it is my duty to notify the City of possession of su stances and that failure to do so is a misdemeanor. I swear or affirm that the information given below is true and complete to the best of my knowle

☐ Do not have any of the listed hazardous substances.

Signature _____

Relationship to Business _____

Date _____

Check the box on the left if you intend to or do use, store, or otherwise have on hand at the place of business for which this license is issu substances which fall within any of the United States Department of Transportation hazard classes listed below, subject to limitations stated in the space provided below the substance involved by 1) trade name, and 2) if known, the generic name. Also, indicate the average quantity of each substance found at the place of business. If additional space is required, list on a separate sheet of paper and attach to this

☐ 1. Explosives Class A, B, C — Any amount. Exceptions: less than 3,000 rounds of small arms ammunition or primers; any amount of toy

Name of Substance _____ Average Monthly Quantity _____

☐ 2. Non-flammable Gas — Any liquefied system or more than 720 cu. ft. in compressed cylinders.

Name of Substance _____ Average Monthly Quantity _____

☐ 3. Flammable Gas — Any liquefied system or more than 480 cu. ft. in compressed cylinders.

Name of Substance _____ Average Monthly Quantity _____

☐ 4. Chlorine — More than 100 lbs. of granular or more than 720 cu. ft. in compressed cylinders.

Name of Substance _____ Average Monthly Quantity _____

☐ 5. Oxygen — Any liquefied system or more than 720 cu. ft. in compressed cylinders.

Name of Substance _____ Average Monthly Quantity _____

☐ 6. Poison Gas — Any amount.

Name of Substance _____ Average Monthly Quantity _____

☐ 7. Flammable Liquids — Any liquid with a flash point less than 100° F. in any amount greater than 25 gal. Exceptions: flammable liquid boat or vehicle fuel tanks in place.

Name of Substance _____ Average Monthly Quantity _____

☐ 8. Combustible Liquids — Any liquid with a flash point greater than 100° but less than 200° F.

Name of Substance _____ Average Monthly Quantity _____

☐ 9. Flammable Solids — Any amount. Exceptions: Charcoal.

Name of Substance _____ Average Monthly Quantity _____

☐ 10. Oxidizers — Any amount.

Name of Substance _____ Average Monthly Quantity _____

☐ 11. Organic Peroxide — Any amount.

Name of Substance _____ Average Monthly Quantity _____

☐ 12. Poisons — Class A, B and irritating materials — any amount.

Name of Substance _____ Average Monthly Quantity _____

☐ 13. Corrosives — Any quantity greater than 30 gal.

Name of Substance _____ Average Monthly Quantity _____

☐ 14. Radioactive Materials — Any amount. Exemptions: ARPA exempted source materials and exempted concentrations, items and quan

Name of Substance _____ Average Monthly Quantity _____

☐ 15. Etiologic Agents — Any amount.

Name of Substance _____ Average Monthly Quantity _____

☐ 16. Other Regulated Materials — A and B — Any amount. Class C — any solid in quantities greater than 10 lbs.

The Mayor and Council of the City of Tucson have requested the Pima Association of Governments to consider investigating how the transportation of hazardous materials is regulated in the area, with a view to determining whether a regional problem exists. The study, made by a broad-based committee comprised of representatives of relevant government agencies in the PAG area, concluded that transportation of hazardous materials is adequately regulated in Pima County.

At the state level, a Hazardous Waste Section has been established within the Bureau of Waste Control of the Arizona Department of Health Services to implement the state's hazardous waste control program and to coordinate state and local planning with EPA and RCRA requirements. ADHS is also conducting an Uncontrolled Hazards Program in conjunction with the State Attorney General's Office in an effort to deal with illegal dumping of hazardous waste. The State Division of Emergency Services has written a "Hazardous Materials Emergency/Spill Response Plan" (1980) to define the responsibilities and appropriate courses of action to be taken by relevant state agencies in case of a hazardous waste emergency anywhere in the state. Coordination of responsibility among the relevant state and local agencies is still being worked out.

Waste Quantities

The hazardous waste being generated in the Tucson area as of 1980 comes primarily from industrial sources. Large institutions such as the University of Arizona, Davis-Monthan Air Force Base and IBM have developed their own methods for dealing with such materials. Some are treated on site, and some are shipped out of state. The State Land Department has documented the existence of wildcat dumping of hazardous wastes in several areas adjacent to the metropolitan area. The Pima County Wastewater Management Department acknowledges that the dumping of hazardous waste into the sewer system is a serious problem. The department conservatively estimates that 1,000-1,500 lbs. of material, which should go into a hazardous waste site, is deposited in the sewers each month. These materials range from bottom solids from oil tanks to small amounts of such things as arsenic trioxide and phenol from laboratories. In the experience of the Roger Road Wastewater Treatment Facility, the treatment process is adversely impacted by inflow of waste containing any of the following constituents: (1) chromium; (2) petroleum distillates; (3) copper; (4) high fluctuations in B.O.D. loadings. Copper has been found to destroy the process of sludge digestion wherein it becomes concentrated. The remaining constituents all impact the biological treatment process and can, in the instance of high concentrations, totally arrest the treatment process. Control of the release of these materials is obviously of great concern to treatment plant operators. The Arizona Department of Health Services expected that illegal dumping of hazardous waste would become a much more serious problem when the federal hazardous waste regulations went into effect in November 1980.

No detailed study of the amounts and type of hazardous waste generated in the Tucson area has been made. However, according to the projections made on the basis of surveys done in 1974 and 1975 for the Arizona Department

Those who used the hazardous waste disposal facility at the Los Reales Landfill were largely service industries such as exterminating, pumping and paving companies, health related facilities, gasoline stations, and local governments. Although the amount of material disposed of at the Los Reales hazardous waste site was not necessarily representative of the quantities of hazardous waste being generated in the area, an examination of the types and quantities of material deposited at Los Reales would be helpful in planning for the future.

The following chart, based on the log maintained for the hazardous waste facility by the Department of Operations, presents a summary of the use of the Los Reales site from April 1979 to March 1980. It was prepared by the Technical Assistance Panel which studied the feasibility of upgrading the Los Reales hazardous waste site.

TABLE 1. SUMMARY OF HAZARDOUS WASTE RECEIVED AT THE LOS REALES LANDFILL SITE FROM APRIL, 1979 THROUGH MARCH, 1980[1]

Hospital and Laboratory Wastes	
Hospital Wastes:	
Expired blood	5,300 lbs.
Contaminated needles	55 cartons
Expired drugs	31 cartons
Chemicals:	
Solids-	
Potassium chloride	100 lbs.
Sodium chloride	50 lbs.
Stearyl alcohol	25 lbs.
Magnesium	10 lbs.
Copper sulfate	4 lbs.
Empty containers	69 ea.
Liquids-	
Cylene	60 gals.
Isopropyl alcohol	5 gals.
Sodium azide	2 oz.
Mercury	1 oz.
SUBTOTALS	5,800 lbs.
	65 gals.
Petroleum and Organic Wastes	
Liquids:	
Grease/oil/water	65,000 gals.
Fuel/water	55,000 gals.
Contaminated solvent	20,000 gals.
Petroleum sludge	10,000 gals.
Printing waste	10,000 gals.
Asphalt	10,000 gals.

[1]Based on Los Reales Landfill logs.

TABLE 1. (continued)

Waste coolant	5,000 gals.
Paint waste	5,000 gals.
Misc.	4,000 gals.
SUBTOTAL	184.000 gals.
Solids:	
Aminopyrinidine	200 lbs.
SUBTOTAL	200 lbs.
Inorganic Wastes	
Acids:	
Nitric	33 gals.
Hydrochloric	23 gals.
Sulfuric	12 gals.
Gold waste	12 gals.
Molybdenum waste	6 gals.
SUBTOTAL	86 gals.
Alkalines:	
Lime sludge	37,000 lbs.
Caustic water	300 gals.
SUBTOTAL	37,300 lbs.
Salts/Minerals:	
Mud/water	1,500 gals.
Calcium chloride	440 gals.
Chlorine	40 gals.
Copper sulfate	25 gals.
Barium chloride	10 gals.
Aluminum nitrate	5 gals.
Sodium sulfate	1,500 lbs.

TABLE 1.(continued)

Asbestoes	200 lbs.
Ferrous chloride	100 lbs.
SUBTOTALS	2,000 gals.
	1,900 lbs.

Pesticide Wastes

Liquids:	
Fenner liquid	65 gals.
Solids:	
Empty containers	300 lbs.
Surflace	90 lbs.
SUBTOTAL	390 lbs.

Projected Waste Quantities

Many factors will influence how much hazardous waste will require special management in the Tucson area during the next twenty years:

Population and industrial growth are obviously important. Thus far, most of the hazardous wastes deposited at Los Reales have been generated by service industries. The new industries which are expected to come to the area are largely electronic assembly businesses whose production processes do not ordinarily involve great quantities of hazardous waste. The new industries, however, will create new jobs, and there will be a commensurate increase in population and service industries, both of which will tend to increase the volume of hazardous wastes to be managed in the area.

Technological change can affect the amount of hazardous wastes in several ways. Depending on their nature, new production processes can either increase or diminish the volume. Advances in technical knowledge about how to treat and recover hazardous wastes can reduce the amount of waste which requires permanent disposal in a landfill or other facility.

Government regulation of hazardous waste may have a tremendous influence. The federal and state programs, if vigorously enforced, will increase the demand for treatment and disposal facilities. The costs of complying with the regulations will provide an impetus to private businesses to alter their production processes to generate less hazardous waste. At the present time, however, these programs exclude small generators (less than 1000 kg/mo.) from the regulations. Thus, if a study demonstrates that there are few large generators in the Tucson area, the impact of the federal and state programs and the demand for special treatment and

disposal facilities may be significantly less than in more industrialized communities unless more stringent local regulations are adopted.

State and local policy decisions will be very important. If the state goes ahead with its plans to develop a state-owned treatment and disposal site or if it encourages treatment and recovery of hazardous wastes rather than permanent disposal in a landfill, the demand for a local site will be minimized. If private industry is encouraged to enter the hazardous waste management business by building treatment, recovery and disposal facilities, there will be less demand for a public facility in the Tucson area.

Inflow from other areas. If any local agency decides to enter the hazardous waste disposal arena, one final factor to consider is the degree to which hazardous wastes will enter the Tucson area from other parts of Arizona or even from other states. According to the Arizona Department of Health Services, if management facilities are owned by the state or by private companies, it will be difficult to limit the inflow of hazardous wastes to the area. By federal law, a state facility is required to accept wastes from any other state in the country. Under the present regulations, private management companies could accept hazardous wastes regardless of where it was generated. As a result, large quantities of hazardous wastes could enter the Tucson area even though the quantities actually generated here might be relatively small. According to the Arizona Department of Health Services, a publicly owned facility, on the other hand, could determine who would have access to it. It should be noted, however, that this type of locally imposed access restriction has not been tested in court.

In summary, it is very difficult to make long-range predictions concerning the quantities of hazardous waste which will have to be managed in the Tucson metropolitan area before the above policy issues have been settled

and before the actual workings of the new state and federal programs are clearer. For the short term, it can be expected that there will be growth in the amount of hazardous waste which is generated and must be handled in the area. This growth will be commensurate with the growth of population and service industries. It may also be influenced by the fact that the only other interim hazardous waste disposal site in the state, the Hassayampa Landfill in Phoenix, was closed in late 1980. In the year between April 20, 1979, and March 31, 1980, the Hassayampa Landfill accepted approximately 1,790,000 gallons and 243 tons of hazardous waste from sixty generators in Maricopa County.[1] During the same period, only about 18 tons and 212,000 gallons were deposited in the Los Reales site from sixty different generators in Pima County.[2]

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1 Bureau of Waste Control, Arizona Department of Health Services, "The Hassayampa Landfill Hazardous Waste Disposal Site: Disposal Analysis (Through March 31, 1980), "Phoenix, 1980.

2 These figures are based on the log kept by the Department of Operations for the Los Reales Landfill.

Objectives

The following objectives have been established for the areawide hazardous waste management plan:

1. Encourage and aid the state in the opening of its own Class I disposal facility at Rainbow Valley.
2. Provide a safe and adequate means of disposing of hazardous wastes during the interim before a Class I disposal facility becomes operational in the state.
3. Promote the development of appropriate private and/or public treatment and recovery facilities.
4. Develop public information and education programs to encourage the safe handling of hazardous wastes and to inform hazardous waste generators of alternatives to land disposal.
5. Ensure that the regulation of hazardous waste addresses this area's hazardous waste problems.
6. Achieve an effective areawide capacity to respond to hazardous waste emergencies.
7. Ensure that the transportation of hazardous waste within the area is handled safely.

site's location, has been made and the site location is Rainbow Valley. Whether publicly or privately operated, state ownership will help ensure that the proper environmental precautions are taken at such a facility both during operation and after its closure. The area's governments should cooperate with this state effort. The question, then, is how long will it take before the Rainbow Valley facility is operational and what steps can be taken to ensure safe disposal practices in the interim time period?

Interim Use of the Los Reales Hazardous Waste Disposal Site. There would be at least a two- to three-year lag between the time the state decided to build a Class I facility and its compeltion. As a result, the City of Tucson could consider approaching the State Land Department with the possibility of re-opening the Los Reales hazardous waste disposal site to serve the Tucson metropolitan region in the interim.

At the city's request, a consultant was hired by the state through an EPA Region IX Technical Assistance Panel grant to provide engineering recommendations and operational guidelines for upgrading the Los Reales site. The consultant's report notes: "The major constraint limiting development at the Los Reales site is its location upgradient and over the water supply for the City of Tucson. Tucson obtains its entire water supply from groundwater resources" (SCS Engineers, Inc., "Recommendations of the Technical Assistance Panel for upgrading of Interim Hazardous Waste Disposal Site, Los Reales Sanitary Landfill, Tucson, Arizona," October 15, 1980, p. 2). In order to deal with this problem, the consultant recommended an engineering plan which includes the provision of lined disposal pits and ponds with a built-in "early-warning system" to detect any leakage. Provision is also included for groundwater monitoring wells upgradient and downgradient from the proposed site (pp. 13-14).

In considering whether the Los Reales site should be re-opened, studies to answer the following questions need to be made. Similar studies would

be necessary for any interim site planned for this area.

1. What steps will be taken to ensure that the site will not adversely affect the groundwater?
2. How much local demand will there be for the site during its lifetime?
3. What are the implications of not establishing an interim disposal site in the Tucson metropolitan area?
4. Are there any alternatives to the ground disposal of hazardous waste, i.e., temporary storage at a centralized site?
5. How long will the site be used? What assurances are there that this period will not be extended?
6. Can access to such a local site legally be limited to the Tucson metropolitan area? (The Department of Operations has asked ADHS for formal assurance that access to the site could be limited in in this way).
7. What would be the capital and operating costs of such a site and
8. What additional requirements would be imposed by the State Land Department to accept such a use of the State lands?

Before a final decision would be made relative to establishing a hazardous waste disposal site, the City of Tucson, in conjunction with ADHS would be required to hold public hearings and use other means to inform the area's citizens of the plans for the site. As of this writing, the two major constraints relative to the re-opening of the Los Reales facility are capital costs (which have more than doubled) and renegotiating the lease with the State Land Department, which translates into additional requirements, cost and the possibility of rejection.

Treatment and Recovery Facilities. To minimize the amount of hazardous waste which must be permanently deposited in landfills, the development of appropriate treatment and recovery facilities should be encouraged on a continuing basis. This could be coordinated through PAG. Information on

the existing technology and implementation of such efforts should be accumulated and distributed to the relevant generators of hazardous waste. A system should be set up to enable a generator of hazardous by-products to communicate with other industries which might be able to use those by-products, thus removing them from the waste stream.

Public Information Program for Large-Scale Generators and Handlers. The complexity of the regulations being written by the state and federal governments may make it difficult for generators of hazardous waste to determine whether their operations are regulated and, if so, what is necessary to achieve compliance. A program to explain and publicize the requirements will assist both the generators and the population as a whole, in addition to encouraging compliance.

Public Information Program for Small Generators and Households: A program to encourage the proper disposal of hazardous wastes by those not covered by state or federal regulations should be developed. The availability of adequate disposal or treatment facilities should be publicized. The fees for using such facilities might be adjusted for small generators and households. This type of program would be particularly important for the Tucson area if a study showed that there is a large number of small generators (under 1,000 kg/mo.) here.

Review of Local, State, and Federal Requirements. Federal, state and local regulation of hazardous wastes, including transportation of such wastes, should be reviewed periodically to ensure that it conforms to the needs of the area. When necessary, more stringent rules can be implemented locally.