SOLID WASTE MANAGEMENT ON INDIAN RESERVATIONS

U. S. Environmental Protection Agency
Region VIII
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CHAPTER I: INTRODUCTION

For years we, as a Nation, have neglected solid waste management, and it is obvious that our present solid waste storage, collection, and disposal practices are inadequate. A large portion of our solid waste is directly disposed of on land in an unsatisfactory manner. Open and burning dumps, which are all too common, contribute to water and air pollution and provide food, habitat, and breeding grounds for insects, birds, rodents, and other carriers of disease. This problem has been evident on American Indian reservations. The development of satisfactory disposal practices and plans for all aspects of solid waste management should be a requirement on all reservations. The development and implementation of such plans will, however, require the combined support of all Tribal members.

A. BACKGROUND

Since enactment of the Resource Conservation and Recovery Act (RCRA) of 1976, one of the major problem areas for solid waste management has been the many native American Indian Reservations.

The Resource Conservation and Recovery Act was enacted to assure that solid waste are managed, so as to prevent damage to public health and the environment. The objectives are:

- Regulation of hazardous wastes from the point of generation through disposal--from the cradle to the grave;

- Improvement of disposal practices for all other solid wastes to meet environmental and health standards; and

- Promotion of resource recovery and conservation as the preferred waste management approach.

Under RCRA, state governments are charged with the responsibility for the regulation of solid waste disposal sites within their respective boundaries.

Since state governments often do not have authority to regulate solid waste practices on Indian reservations, many reservations have not been given guidance for upgrading solid waste disposal practices.

B. INDIAN RESERVATIONS REGION VIII

The American Indian Reservations are distinct from the rest of the Nation's lands. Although the tribes are subject to Federal laws, they retain certain rights, including all resource management, established under "Trust Responsibility." It is EPA policy to promote comprehensive environmental management by both states and tribes consistent with overall aims and objectives of Federal statutes.

In Region VIII, there are 26 Indian Reservations totalling 18,915,490 acres with an approximate population of 100,000 residents. The reservations vary in size from the 2,180 acre Flandreau Reservation to the 2,778,710 acre Pine Ridge Reservation. A review of reservation solid waste disposal practices shows that a majority are not in compliance with state or federal regulations.

Some of the many factors that contribute to the problem of solid waste management on the reservations are:

- reservation boundaries that encompass one or more counties;
- reservation boundaries that overlap state boundaries;
- reservation boundaries that overlap several county boundaries;
- reservation boundaries that overlap several planning districts; and
- reservations that are divided by man-made or natural barriers;

These factors make it difficult, if not impossible, for the tribes to participate in state or regional district management plans that may have been developed to manage waste disposal. As a result, management of waste disposal on reservations has lagged behind that of most state and local governments.

Some of the conditions that are found on the reservations include:

1) numerous open dumps;
2) trenches throughout a reservation that lack evidence of application of cover material;
3) uncontrolled burning;
4) lack of supervision or control measures at dump sites resulting in haphazard disposal of waste and blowing debris;
5) dumps and open trenches that attract both domestic and wild animals and other vectors, potentially creating serious health hazards for reservation residents; and
6) unpleasant odors.

To correct these undesirable conditions and improve the management of the solid waste disposal system, each reservation must develop a complete solid waste disposal management program. The program should include:

ordinances governing the collection and disposal of solid wastes with penalties for improper disposal of waste;

a system for routine collection of solid wastes;

disposal of waste in a sanitary landfill; and

financing for solid waste collection and disposal.

By establishing measures to properly store, collect, and dispose of solid wastes on the reservation, health hazards associated with improper waste disposal can be controlled, land values maintained, air and water qualities protected, and the quality of life improved.

To assist the reservations in developing a solid waste management program, a packet has been developed. This packet, together with EPA document SW-281, "Sanitary Landfill, Design and Operation", plus other EPA documents pertaining to solid waste planning, should provide the information necessary to initiate a solid waste management program.

What's wrong with DUMPS?

DUMPS POLLUTE THE AIR CREATING HEALTH HAZARDS

CHAPTER II: WHY IMPROVE SOLID WASTE MANAGEMENT

A. BACKGROUND

Solid wastes, if not properly disposed of, cause pollution. In some cases, visual pollution can be considered a major part of the solid waste problem. Simply viewing garbage and junk is highly offensive to some people and, therefore, these would be visual pollutants. Ash piles and residue from construction projects are all less offensive, but are visual pollutants to some people.

The term "land pollution" is sometimes used in relation to solid waste. Very often, this term is associated with visual pollution and with aspects of biological or elemental environmental contamination.

Biological pollution, while the term is seldom used, has been the area of primary concern by agencies concerned with solid waste management. Generally, these agencies have recognized possible pathogenic (disease producing) materials in solid waste delivered to a disposal site. Unless the sites are carefully maintained it becomes possible for vectors (transporting agents) to carry diseases away from a disposal site.

These vectors may be any form of animal life that visits the site and either picks up or becomes infected with the disease agent. Vectors can be insects, humans, birds, or other animal life. The most common vectors are rats; however, domestic pets are far more likely to carry disease agents from a site and subsequently infect local residents.

Disease carriers also may be wind or water. Disease agents, such as fungi spores, typically are blown by wind from place to place. Bacteria and viruses typically have been associated with water as a carrier. Elemental pollution occurs when solid waste materials, both organic and inorganic, gradually breakdown into simpler compounds or basic elements. Some of these may be transported from a disposal site by means of wind; however, most are probably moved from site via water.

To avoid threats to human health and the environment, proper solid waste management practices must be put into effect. This document's purpose is to assist in this effort.

B. HEALTH HAZARDS ASSOCIATED WITH SOLID WASTE

Health hazards associated with solid waste begin inside homes, schools, hospitals, and other establishments at the point of waste generation. Solid waste consists of food wastes, oily rags, loose paper, aerosol containers, or explosive chemical containers, etc.

As a result of natural conditions, nontoxic wastes may become poisonous, sterile wastes may become capable of transmitting disease, nonexplosive wastes may cause explosions, and wastes which apparently have no injury-causing potential may in fact produce injury or even death. For example, within a matter of hours at a warm temperature, organic matter, such as food scraps, can become a potentially lethal source of toxic or disease-producing organisms. The organisms do not have to be originally present in the host material because the environment is normally well provided with spores and bacteria awaiting a favorable site on which to multiply. Flies, mosquitos, rodents, and other vermin actively transmit disease.

It has been estimated that 90 percent of the housefly population feeds on open trash and open trash containers. Rats also rely on readily available scraps of food such as those found in open dumps, overflowing trash containers, or containers with improperly fitting lids or no lids at all. Refuse containing organic wastes should be stored in closed containers with no spillage if at all possible.

Improper handling, storage, and disposal of organic wastes result in filth borne diseases such as dysentery, typhoid, cholera, plague, and hepatitis.

C. ENVIRONMENTAL CONCERNS

In addition to creating human health problems, uncontrolled refuse disposal also results in an unhealthy environment. Refuse is scattered by wind and water. Dense black smoke often spews forth from community dumps.

DUMPS POLLUTE THE WATER

RUN-OFF POLLUTES
STREAMS
LAKES
SWAMPS

RAIN AND
SURFACE WATER

↓

PERCOLATE
THROUGH WASTES
TO UNDERGROUND
WATER SOURCES

↓

SOMETIMES
CARRYING
HAZARDOUS
CONTAMINANTS

1. Air Pollution

When compared to the magnitude of emissions from autos and industry, the air pollution from burning may at first seem insignificant. However, the composition of refuse coupled with the common methods of burning results in very inefficient combustion. This combustion then produces smoke heavy in fly ash, particulates, toxic gases and odors - all of which present nuisances to nearby residents. In addition, the smoldering fires present a hazard due to flying sparks, frequent explosions (bottles, light bulbs, and aerosol cans) and dangers to children.

2. Water Pollution

Uncovered refuse contaminates surface waters with every rainfall event. This water borne refuse is particularly prevalent in many areas of the reservation where refuse is frequently dumped into "dry washes" along roadways. The most obvious effect of this refuse laden water is the scattering of refuse down the watershed. A more insidious problem is water contaminated with the suspended and dissolved, decaying organic material, commonly known as "leachate".

Pollution of groundwaters is also a potential problem that may be caused by inadequate disposal practices. This contamination is potentially very serious because the suspended organic nutrients cannot easily decompose underground without the presence of oxygen. Usually, the organic solids will eventually be filtered out; however, the chemical salts and possible pesticides dissolved in the leachate will never decompose nor can they be filtered out. This fact presents a serious problem because if ground water contamination does occur, it will take many years to dissipate even after the source is removed.

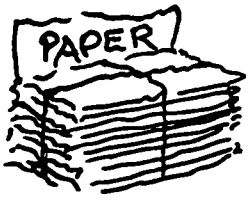
3. Aesthetics

Open dumps, indiscriminate dumping along roadways, and waste accumulating in alleyways and backyards are not only health hazards; they are also aesthetically degrading. Residents of reservations must be shown that proper waste disposal methods are necessary to improve health, water, and general living conditions.

'TEX' SAYS

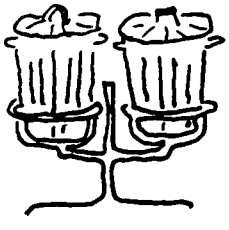
START IN THE HOME, MANAGEMENT STARTS WITH THE SEPARATION OF TRASH.

SOME THINGS CAN BE SEPARATED AND THEN MAY BE RECYCLED



STORAGE IS MADE SAFE and EFFICIENT WITH...

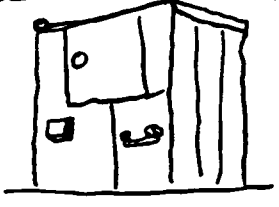
CANS



NO UNSIGHTLY MESSES

20-30 GALLON SIZE, easy to handle, Tight lids. Two secure handles, concrete base or steel frame

DUMPSTERS



NO RATS OR INSECTS

DETACHABLE CONTAINERS 4-20 cubic yard size for industrial and commercial use. ALSO FOR RURAL USE. Mechanically lifted and emptied

SACKS

paper or plastic

Used separately or as can liners ... light, inexpensive disposable -- no maintenance or cleaning.

CHAPTER III: SOLID WASTE COLLECTION

A. BACKGROUND

Solid waste collection is the process of picking up from many locations/ dwellings the wastes of a community and hauling them to a disposal site. The objectives of a collection system should be:

1) To protect the health and aesthetics of the living environment by hauling the waste away in a sanitary manner;

2) To provide a desired level of service, i.e., in terms of frequency of collection and points of collection; and,

3) To collect and dispose of the waste in a manner that is safe for employees, as well as the public.

B. HANDLING OF WASTES

Wastes come from residences, commercial establishments, institutions, municipal operations, industries, and farms. Some of these wastes may require special methods of handling and disposal. Solid waste program managers should know all the types of wastes that will be handled and make provisions for their disposal. Materials that cannot be safely handled and disposed of should not be accepted.

Residential, commercial and industrial wastes that are usually handled by a solid waste system are often highly compactable. These wastes contain a heterogeneous mixture of materials such as paper, cans, bottles, cardboard, and wooden boxes, plastics, lumber, metals, yard clippings, food wastes, and soil. Most of these materials can be compacted under relatively low pressures.

C. COLLECTION OF WASTES

There are many types of collection services that a community can provide to its residents. Door-to-door collection of wastes is the highest level of service a community can provide its citizens. It is also the most expensive.

On reservations where the population is small and rural in nature, distances between residences may preclude an individual door-to-door collection service.

A potentially economical solid waste collection alternative is the use of "greenboxes" (Figure 1: greenboxes). This type of collection provides a reliable and the least costly method of refuse collection that can be provided for reservation recipients. The "greenboxes" are placed at strategic or convenient locations on the reservation, and residents bring their waste to the locations.

The use of a greenbox collection system should be considered on reservations. Advantages of the use of green boxes include:

1) It is a cost effective means in terms of labor and equipment necessary to do the job. Costs per ton, depending on the size of the containers, are only one-fourth to one-half of the costs of door-to-door collection.

2) Management is simplified. Fewer trucks and workers are needed, thereby reducing management problems.

3) Injuries are reduced, since laborers do not lift waste containers.

4) Since wastes can be deposited at anytime, waste does not have to be held in or at the home or point of generation for extended periods of time. Potential health hazards are reduced or eliminated.

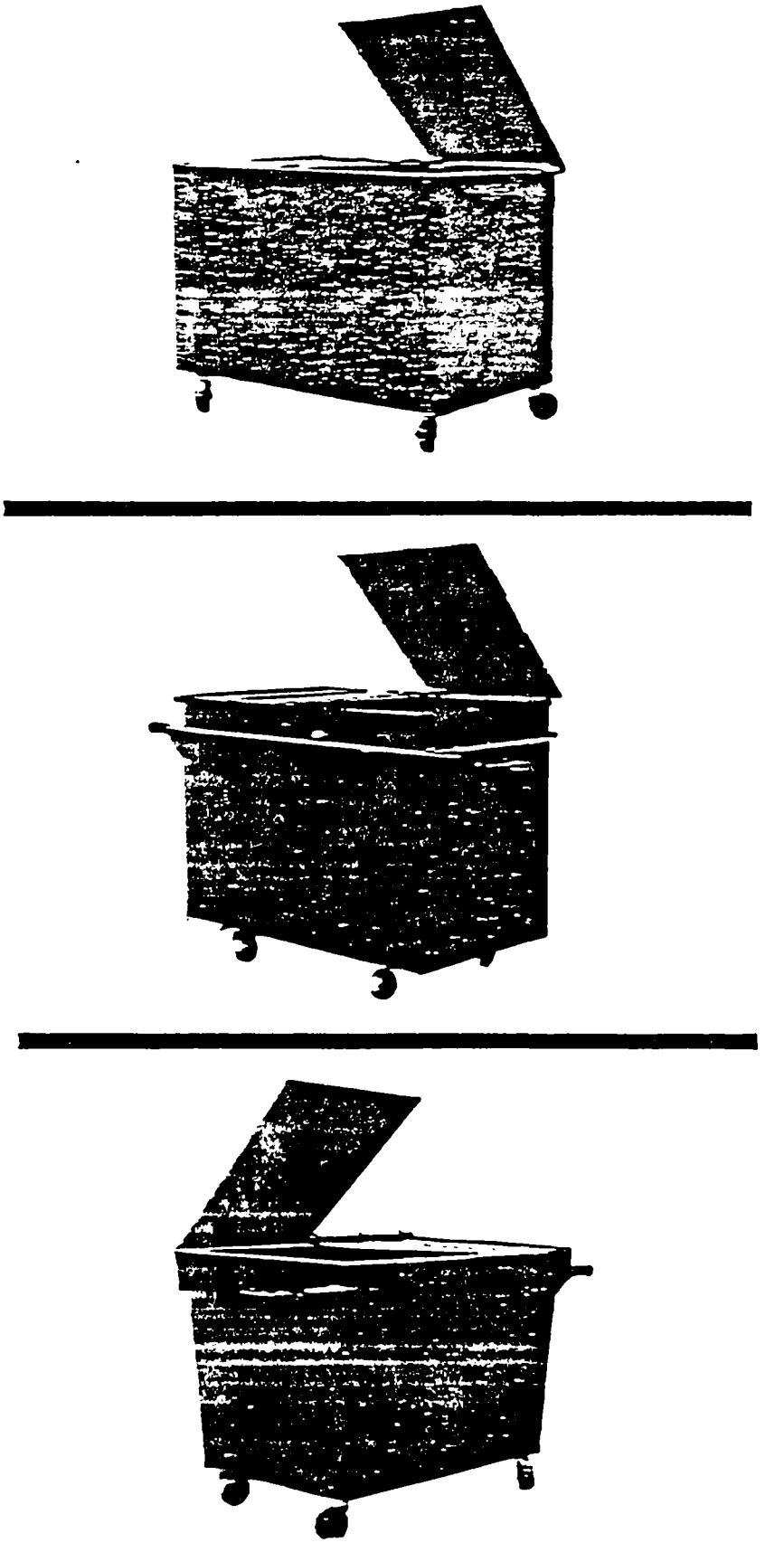
5) Containers properly utilized will prevent dogs from feeding on and/or scattering wastes.

6) Rodents, birds, and other pests are denied access to the waste.

7) Blowing trash and debris are minimized.

8) Moisture is prevented from entering the waste.

FIGURE 1. GREENBOXES



SOURCE: GEORGE SWANSON & SON, INC., ARVADA, COLORADO

"Greenboxes range from three to eight cubic yards in size and can be designed so that the waste in the container can be emptied into front loading, rear loading, or side loading vehicles.(See Figures 2, 3 and 4).

The items listed below should be prohibited from being disposed in green boxes:

1) Dead animals
2) Burning or smoldering materials
3) Stumps and tree limbs greater than four feet in length
4) Construction and demolition debris
5) White goods (washers, dryers, stoves, refrigerators, etc.)

Another type of containerized collection system is the "roll-off" container system. This system uses large open containers with a capacity of approximately 20 to 40 cubic yards. These containers are strategically located throughout the reservation. The containers are not emptied into a vehicle, but instead are replaced regularly by empty containers with the full containers being taken directly to the disposal site and emptied. This system utilizes a tilt-frame vehicle especially designed to handle the "roll-off" containers (see Figure 5). Unlike the green box system previously discussed, a special bulky waste pickup service throughout the reservation would not be required since the 40 cubic yard containers are large enough to handle most types of wastes.

When comparing the green box and roll-off systems, it would appear to be a trade-off. The green box system offers a higher number of drop locations compared to the roll-off system; however, the roll-off system offers the opportunity to dump large loads of various size materials, including "white goods", directly into the container where the green box system does not. The roll-off system would require preparation of the location site for the container, to the degree the tilt-frame vehicle could maneuver sufficiently to allow a straight pull on/pull off. Roll-off container locations should be fenced to prevent unlimited access.

There are several major advantages to bulk bin collection systems. The first is that a collection system is provided where usually none had existed before. Promiscuous dumping and use of community dumps are generally reduced.

The sites can be located close to the users, and population and waste-generation changes can be easily adapted to by changing the location of the containers.

As with any system, there are also disadvantages. On some models of the small containers, green box lids are too heavy or are difficult for children or adults to open. As a result, lids may be left open or wastes may be placed outside the container. With the larger roll-off type containers, lids are usually not provided or are left open at the container site, allowing rainwater and flies to enter and blowing litter to occur. At a minimum, the containers need to be covered for hauling to the disposal site. As with any unattended site, vandalism may occur and unsanitary conditions may develop unless the sites are properly maintained.

D. COLLECTION VEHICLES

When setting-up or modifying a collection system, decisions on type of equipment and size of the crews should not be made until the policies on level of service have been established (e.g., points of collection and type of storage containers). Many other factors, such as roundtrip time to the disposal site and the amount of waste at each stop, will also have an impact on the decisions concerning the selection of vehicle type and crew size.

There are many types of collection vehicles available, some of which are designed for specific jobs. All the collection methods described below use a compaction vehicle to reduce haul costs and prevent litter problems that often occur with open-top trucks.

1. Side Loaders

Most side loaders range in sizes between 13 and 32 cubic yards. Their main use is in collecting from residences and small commercial establishments, but they can also collect from bulk containers. Most manufacturers offer hopper loading on either side of the vehicle body, although for reasons of safety and convenience the right side is most often used.

Single-family residential curbside service can be most economically provided by a one man side-loading vehicle with right-hand drive, a low step-in

cab, and a separate power source for compaction. This system is best suited for areas with relatively few items per stop and some distance between stops rather than in areas with a high percentage of multiple-family buildings.

2. Rear Loaders

Rear loaders normally range in size from 16 to 25 cubic yards, and, like the side loaders, their main use is in collecting from residences and small commercial establishments, although they can also be used with bulk containers. These types of vehicles are more suited for high population density areas with more waste at each stop, very narrow streets, and alley collections. Rear loaders normally utilize three man crews (including the driver who also collects at many stops).

3. Front-End Loaders

The front-end loader has shown some merit in sparsely populated areas. These trucks, which range in size from four to forty-one cubic yards, collect from bulk containers usually varying in size from two to ten cubic yards.

The use of specialized or commercial vehicles under the appropriate conditions can substantially reduce collection costs. Some of these systems require a large initial capital investment, and others require extra citizen cooperation.

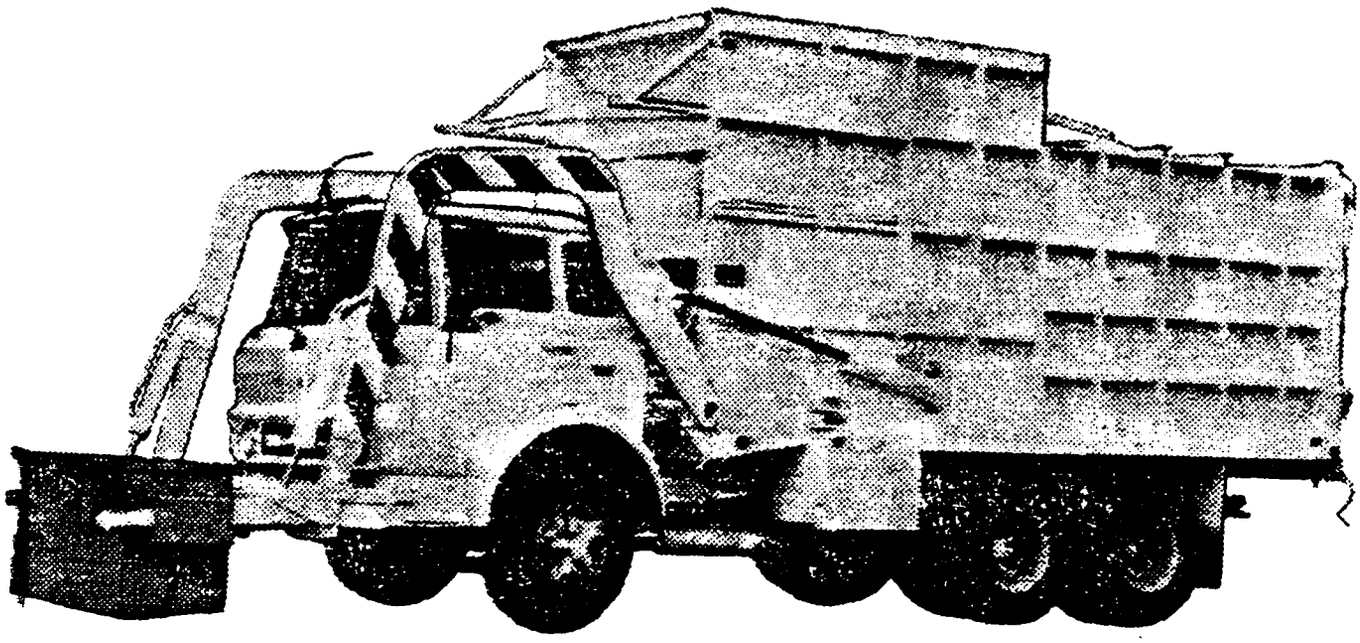
E. ROUTING/SCHEDULING

1. Routing

The term routing as applied to solid waste management is the assignment of collection routes. The objective is to optimize the use of collection vehicles and workers while providing consistent service. Information essential to routing includes haul times from the routes to the disposal site, crew size, vehicle capacity, and types and amounts of waste that will be generated in each area.

FIGURE 2

FRONT LOADER



FRONT LOADER

FIGURE 3

REAR LOADER

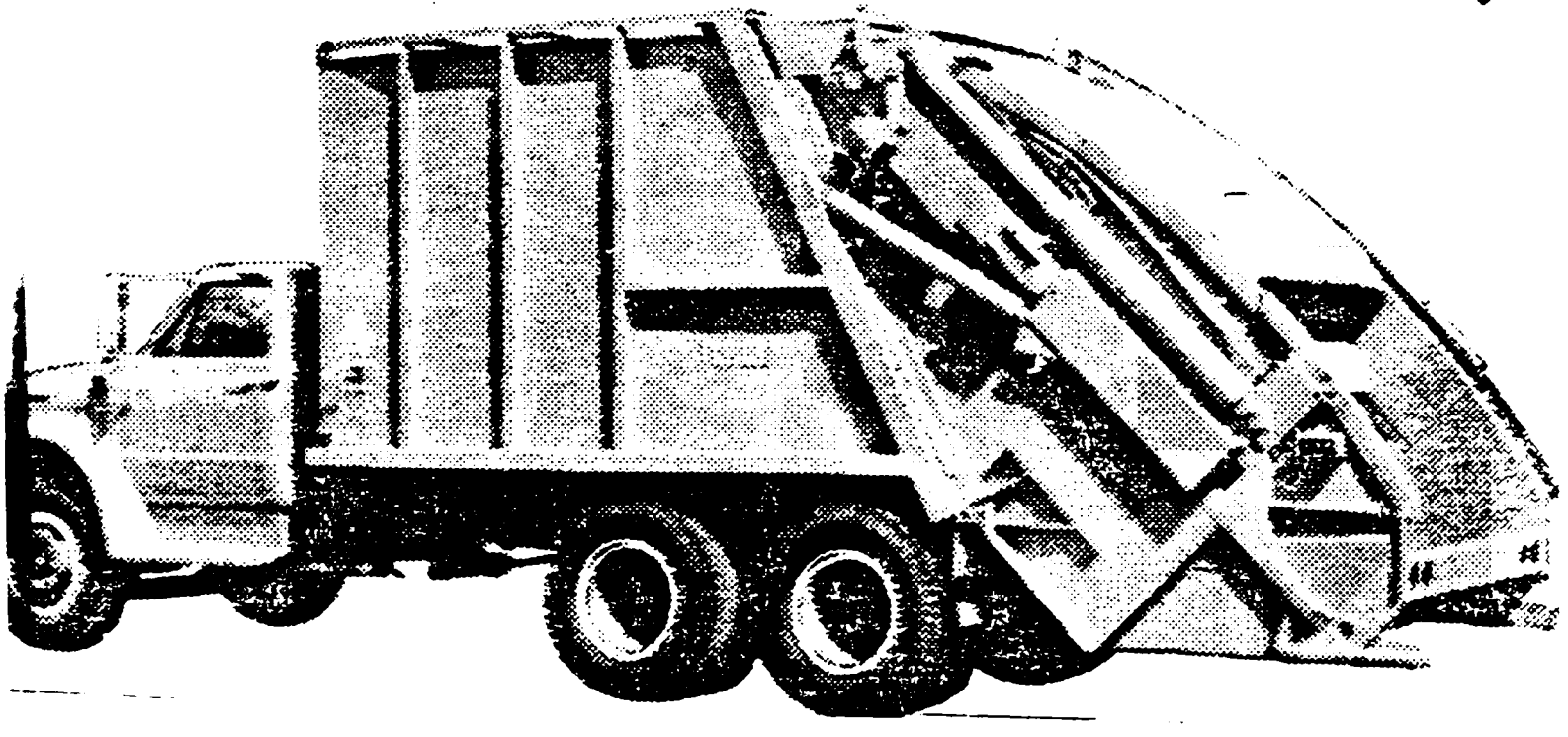


FIGURE 4

SIDE LOADER

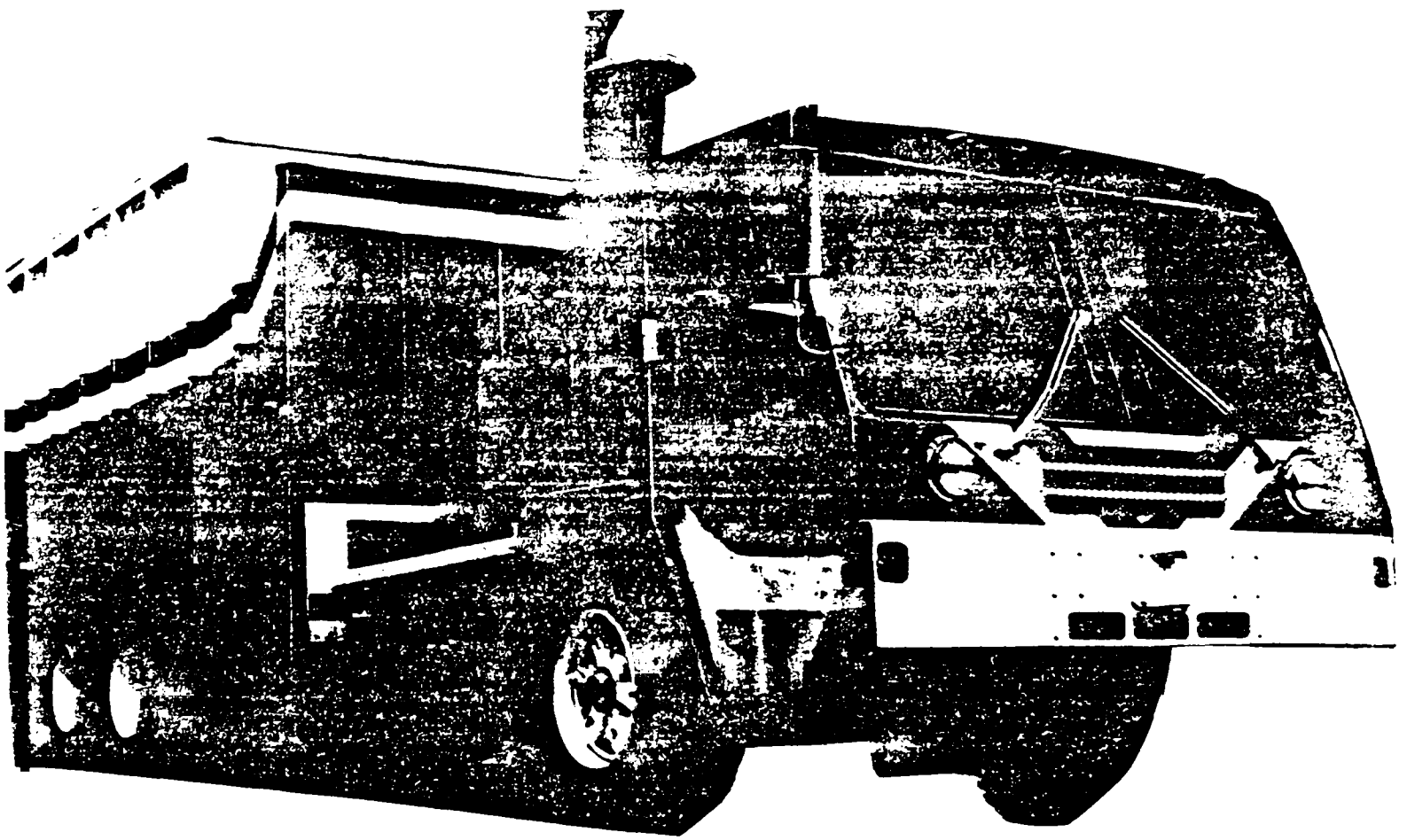
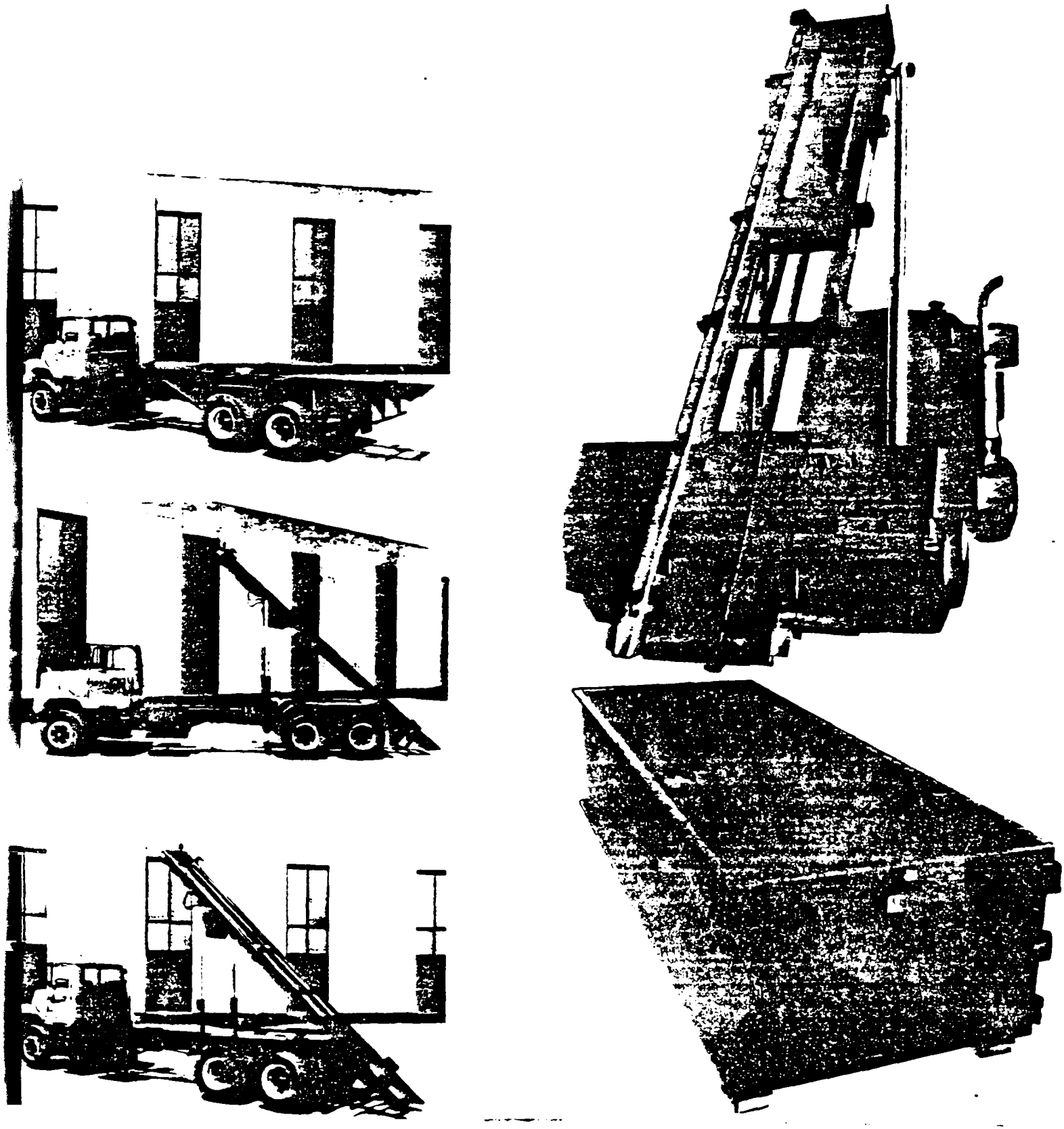


FIGURE 5

ROLL-ON/ROLL-OFF



The information needed for routing is generally available from different sources. Recording this information on reservation/community maps is a practical way to handle it. Population figures may be obtained from Indian Health Service (IHS), Bureau of Indian Affairs (BIA), and Housing and Urban Development (HUD) officials. The location of residents in rural areas may be obtained from U.S. postal authorities. Once the data is gathered, indicate the number and types of services (residential, commercial, etc.) on each side of the street or road-way. A determination should be made as to whether crews are to collect on one or on both sides of the street/road on a pass.

Routes should be designed to be as continuous as possible to minimize dead distances (areas wherein no pick-up is scheduled) and delay times. Once the initial route layout has been determined, the individual route should be retraced and alternate routings or modifications attempted wherever long dead distances exist.

Since the collection of solid waste will generally represent from 70 to 80 percent of a reservation's total waste management costs, collection routes must be carefully planned. Consideration should be given to the miles traveled, the total waste to be collected, and the capacity of the collection vehicle. In order to increase fuel efficiency, routes should be planned so as to reduce the distance that collection vehicle(s) travel with full loads as much as possible. When a loop or circular collection route is planned, waste from the more sparsely populated side of the route should be collected first and the return trip should be on the more densely populated side of the route. When the route is not a loop, and the collection vehicle goes out and returns on the same road, waste collection should begin at the far end of the route and the waste should be collected on the return trip. When practical, wastes should be collected on both sides of a street/road while the collection vehicles are moving downhill. The reasons are many and include: safety, ease, speed of collection, wear on vehicle, and to conserve gas and oil.

2. Scheduling

Waste collection routes must be scheduled so that service will be provided on a regular bases. To determine the schedule for solid waste pick-up, it is necessary that solid waste management officials know the types and amounts of

wastes being generated in each area. Commercial areas, hospitals, and schools may require more frequent pick-ups than would a household.

When developing a weekly route schedule, it is suggested that all residential routes be scheduled for collection Monday through Thursday. Friday mornings can then be utilized for preventative maintenance functions and collection from routes that may not have been complete Monday through Thursday.

Where possible, routes should be scheduled to collect wastes from hospitals, schools, restaurants, grocery stores, or any other facility that generates large quantities of food wastes on the afternoon route. This will prevent large build-ups of food wastes and help control dogs, rats, and other vermin, as well as flies and other insects.

F. OPERATIONS UNDER ABNORMAL CONDITIONS

There are conditions and factors such as weather, holidays, acts of nature, etc. that may have an effect on the solid waste disposal schedule. Personnel in solid waste management, particularly the manager, must be aware of these possibilities and be ready to take the necessary actions to maintain the solid waste collection and disposal service. Some of the problems that may require schedule adjustment include:

1. Holidays

If the holiday is on a weekend, there should be no scheduling adjustments necessary. If the holiday is an outside activity such as a rodeo, Pow-Wow, or any other activity where a large number of people will attend, the operations and maintenance manager should insure that an adequate number of containers are on hand to hold the waste generated. If the holiday is on a weekday, collection is slipped one day. (For example, if the holiday falls on a Wednesday, the pick-up date is slipped to Thursday.)

2. Christmas

The two weeks after Christmas is the high volume time in the winter season. All containers should be emptied prior to the Christmas holiday season.

Immediately after the holiday, routing should go back on schedule and larger loads of waste should be anticipated.

3. Adverse Weather Conditions

One of the solid waste manager's jobs is to keep a close watch on weather conditions. When these conditions present a hazard to collection personnel and equipment, all operations should be suspended until they can continue safely. When conditions are considered safe, collection should resume on the route that was suspended and continue until all routes are back on schedule.

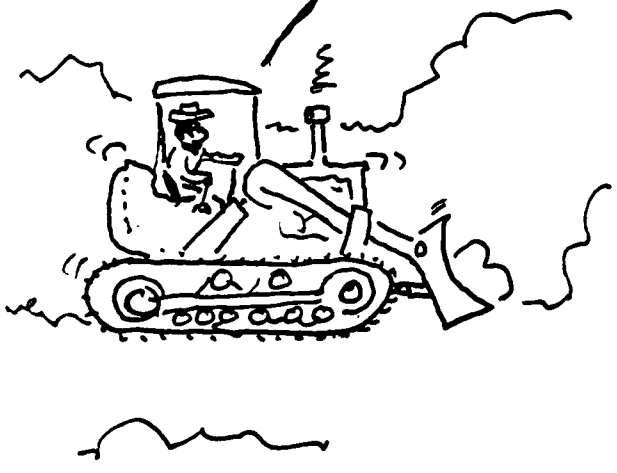
WHEN PLANNING A DISPOSAL SYSTEM CONSIDER...

1. hydrogeological conditions
2. topographical conditions
3. environment
4. total costs
5. hauling
6. property value
7. Future land use

ALTHOUGH SANITARY LANDFILL WILL BE NECESSARY WITH ANY SYSTEM, PRIOR PROCESSING MAY HAVE ADVANTAGES FOR YOUR COMMUNITY.

'TEX' SAYS

REMEMBER TOO, WHEN PLANNING A SANITARY LANDFILL ...



... precautions must be taken to ensure that proper

* planning
* design
* operation will be practiced to minimize damage to the environment.

CHAPTER IV: SANITARY LANDFILLING, SITE SELECTION, LOCATION, AND DESIGN

A. Background

Sanitary landfilling is an engineered method of disposing of solid wastes on land by spreading them in thin layers, compacting them to the smallest practical volume, and covering them with soil each working day in a manner that protects the environment. By definition, no burning of solid waste occurs at a sanitary landfill. A sanitary landfill is not only an acceptable and economic method of solid waste disposal; it allows for the maximum utilization of land designated for disposal purpose.

Thorough planning and the application of sound engineering principles to all stages of site selection, design, operation, and completed use will result in a successful and efficient sanitary landfill. To meet this objective, it is also essential to have an understanding of solid waste decomposition processes - how many variables may effect the decomposition rate, decomposition products, and how these factors may affect the environment. In essence, these relationships determine the physical stability of the fill and its potential to produce such environmental problems as uncontrolled gas generation and movement and water pollution. For detailed landfill information, EPA manual (SW-287), Sanitary Landfill Design and Operation, should be utilized.

B. Solid Waste Decomposition

A knowledge of solid waste decomposition processes is essential to proper sanitary landfill site selection and design.

Solid wastes deposited in a landfill degrade chemically and biologically to produce solid, liquid, and gaseous products. Organic and inorganic wastes are utilized by microorganisms through aerobic and anaeorobic decomposition. Liquid waste products of microbial degradation, such as organic acids, increase chemical activity within the fill. Food wastes degrade quite readily, while other materials, such as plastics, rubber, glass and some demolition wastes, are highly resistant to decomposition. Some factors that affect degradation are the heterogeneous character of the wastes, their physical, chemical, and biological properties, the availability of oxygen and moisture within the fill, and

temperature. It is not possible to predict accurately contaminant quantities and production rates due to the variety of factors including differences in waste composition and landfill conditions.

Biological activity within a landfill generally follows a set pattern. Solid wastes initially decompose aerobically, but as the oxygen supply is exhausted, facultative and anaerobic microorganisms predominate. Under anaerobic conditions methane gas is produced. Methane gas is odorless and colorless and is of concern since it may cause explosions. Temperatures rise to the high mesophilic-low thermophilic range (60° to 150°F) because of microbial activity. Characteristic products of aerobic decomposition of waste are carbon dioxide, water, and nitrate. Typical products of anaerobic decomposition of waste are methane, carbon dioxide, water, organic acids, nitrogen, ammonia, and sulfides of iron, manganese, and hydrogen.

C. Leachate

Groundwater or infiltrating surface water moving through solid waste can produce leachate, a solution containing dissolved and finely suspended solid matter and microbial waste products. Leachate may leave the fill at the ground surface, as a spring, or percolate through the soil and rocks that underlie the waste. Composition of leachate is important in determining its potential effects on the quality of nearby surface and groundwater. The most obvious means of controlling leachate production and movement is to prevent water from entering the fill to the greatest extent practicable. Moisture control measures should start at the point the waste is generated, such as utilizing green boxes with covers.

D. Surface Water

Surface water that infiltrates the cover soil and enters the underlying solid waste can increase the rate of waste decomposition and eventually cause leachate to emanate from the solid waste and create water pollution problems.

The permability of a soil is the measure of ease or difficulty with which water can pass through it. This is greatly affected by the texture, gradation, and structure of the soil and the degree to which it has been compacted.

Coarse-grained soils (gravels and sands) are usually much more permeable than fine-grained soils (silts and clays). However, small amounts of fine silts and clays in a coarse-grained soil may greatly decrease permeability, while cracks in fine grained soils may do the opposite.

The quantity of water that can infiltrate the soil cover of a landfill depends not only on the above mentioned physical characteristics but also on the residence time of the surface water. This can be minimized by: 1) diverting upland drainage; 2) grading and sloping the daily and final cover to allow for runoff; 3) decreasing the permeability of the cover material.

E. Groundwater

Groundwater is water that is contained within the zone of saturation of soil or rock - that is, all the pores in the containing earth materials are saturated. This zone is just beneath the land surface in many parts of the country and is on the surface at many springs, lakes, and marshes. In some areas, notably most of the arid west, the zone of saturation is deep in the ground.

The water table is the surface where water stands in wells at atmospheric pressure. In highly permeable formations, such as gravel, the water table is essentially the top of the zone of saturation. In many fine grained formations, however, capillary action causes water to rise above this zone, and the inexperienced observer might think this capillary fringe is part of the zone. Water within the zone of saturation is not static. It moves vertically and laterally at varying rates, depending on the permeability of the soil or rock formation in which it is located and the external hydraulic forces acting upon it. Because the conditions affecting groundwater occurrence are so complex, it is essential that the landfill site investigation include an evaluation by a qualified groundwater hydrologist. This is needed not only to locate the zone of saturation but also to determine the direction and rate of flow of groundwater and the quality of the aquifer.

Leachate from a landfill can contaminate groundwater. To determine if leachate will produce a subsurface pollution problem, it is essential that the

quality of the groundwater be established and that the aquifer's flow rate and direction be determined.

F. Decomposition Gas

Gas is produced naturally when solid wastes decompose. The quantity generated in a landfill and its composition depend on the types of solid waste that are decomposing. A waste with a large fraction of easily degradable organic material will produce more gas than one that consists largely of ash and construction debris. The rate of gas production is governed solely by the level at which microbial decomposition is occurring in the solid waste. When decomposition ceases, gas production also ends. Chapter VI, Sanitary Landfill Safety Considerations, contains information on the hazards of decomposition gas and measures that can be taken to reduce these hazards.

G. Climatology

Wind, rain, and temperature directly affect landfill design and operation. Windy sites need litter fences at the operating area and personnel to clean up at the end of each day. Such sites can be very dusty when soil dries, irritating workers and nearby residents. Frequent watering can serve as a dust control measure.

H. Site Selection

Landfills must be properly sited to minimize ground or surface water pollution, landfill gas hazards, and health hazards. Landfills should also be located where they can be conveniently utilized and where they will not cause land use conflicts.

A major consideration in selecting a landfill site is the hydrology of the area. It is recommended that waste be deposited at least 5 - 10 feet above the groundwater level to reduce the potential for groundwater contamination. Efforts also must be taken to locate a site where surface water will not flow onto the fill area and percolate through the soil cover to the deposited waste.

EX SIGNS

PROPERLY PLANNED SANITARY LANDFILLS CAN...

1. minimize obnoxious odors
2. Prevent uncontrolled, dangerous burning
3. Minimize scavenging by rats, dogs and other larger predators such as bears.
4. Prevent illegal dumping and disposal of dangerous chemicals.
5. With quick coverage and other proper practices, DUMPS can become SANITARY LANDFILLS.

In addition, landfills should not be located where there is a potential for floods to cut through soil cover and cause washouts of waste.

An important difference between a dump and a sanitary landfill is the use of soil cover at the latter. Landfill sites are best located in areas where there is an ample supply of suitable soil that can be used for cover. Sometimes soil can be hauled into a disposal site from another location. Proper cover material controls flies, discourages the entrance of rodents seeking food, and prevents scavenging birds from feeding on the waste. Cover material will also reduce the amount of moisture that comes in contact with the waste.

A landfill site needs to have all-weather access roads. If access is not provided, waste will be dumped along roadsides during periods of wet weather or snow. Due to the high cost of road construction and maintenance, attempts should be made to locate landfills near existing roads.

While it is desirable to have landfills near population centers to reduce the haul distance for waste, landfills should not be placed close to homes, schools, or businesses. In addition, high value agricultural land should not be taken for landfill use.

The plan for a sanitary landfill should prescribe how the site will be maintained to provide an orderly and sanitary operation. EPA officials should be consulted for technical advice prior to selecting a site for a landfill.

I. Sanitary Landfill Operation

The best designed disposal facility will be of little value unless it is constructed and operated as prescribed. This is especially true of a sanitary landfill because it is under construction up to the day the last particle of solid waste is disposed. Constructing the sanitary landfill on a daily basis in accordance with the design should be required in an operation plan.

An operations plan is esentially the specification for construction, and it should contain all items required to construct the sanitary landfill. It should

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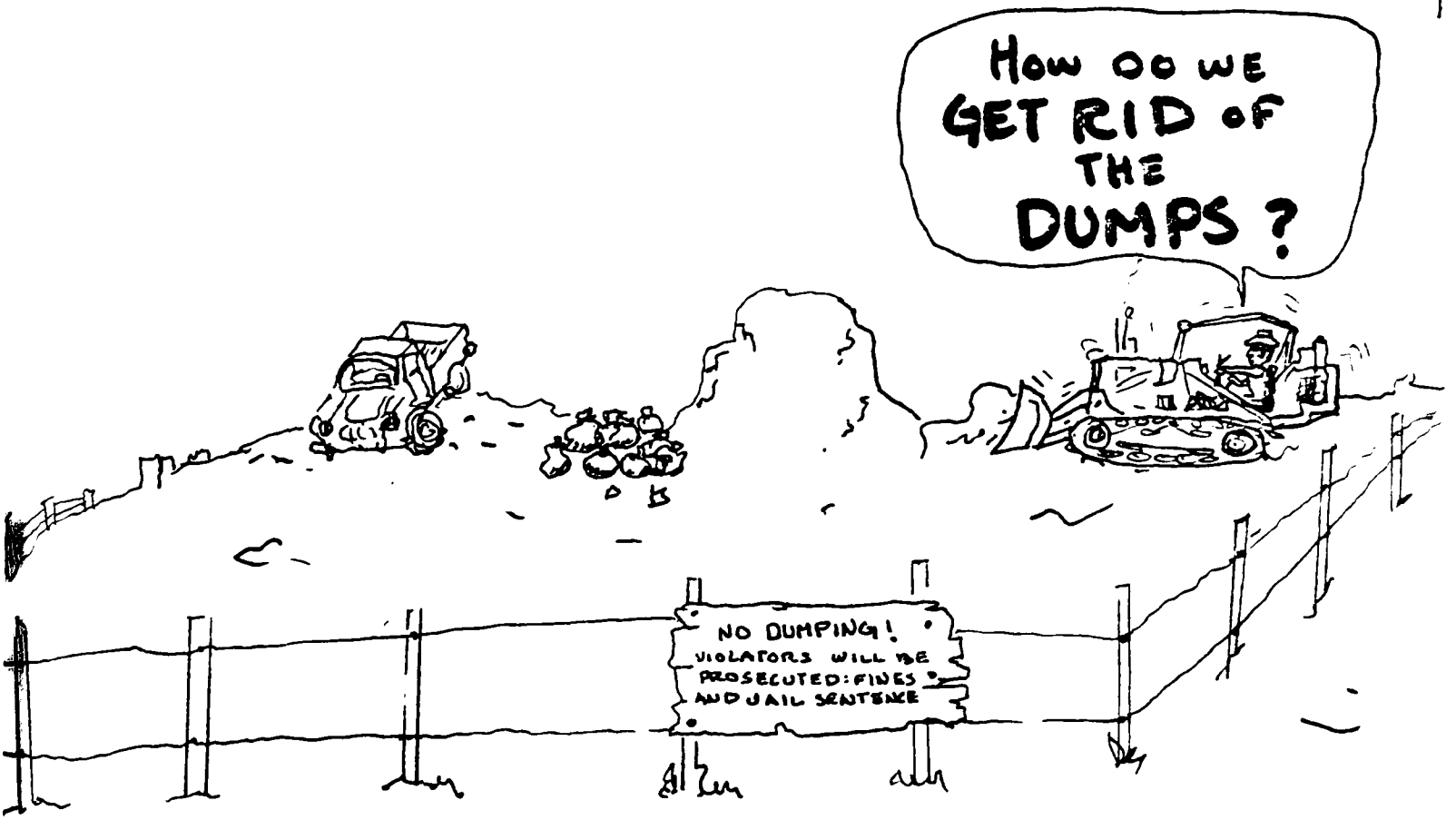


it's not easy!

YOU MUST ARRANGE ANOTHER FACILITY, PUBLICIZE THE CHANGES, CLOSE ALL ACCESS TO DUMPS and STOP ALL DUMPING.

PROSECUTE violators with fines and even jail.

describe: 1) hours of operation; 2) traffic flow and unloading procedures; 3) designation of specific disposal areas and methods of handling and compacting various solid wastes; 4) placement of cover material; 5) maintenance procedures; 6) adverse weather operations; 7) fire control; 8) litter control; and 9) salvaging operations, if permitted. Chapter VI, Sanitary Landfill Safety Considerations, contains safety requirements for landfill operations.

The hours of operation should be posted on a sign at the landfill entrance. The sign should also indicate what wastes are not accepted, fees charged (if any), and the names and telephone numbers of operating personnel. The sanitary landfill should be open only when operators are on duty. If it is anticipated that wastes will be brought to a disposal site after operating hours, a large container should be placed outside the site entrance.

Chapter VI, Sanitary Landfill Safety Considerations, contains traffic requirements.

J. Closing Open Dumps

Reservation solid waste management officials should develop a plan to eliminate dumps and to establish an acceptable substitute. The plan should provide for informing everyone about the need for closing the dump(s) and the procedures that will be followed. Consideration should be given to upgrading an existing dump site to a sanitray landfill.

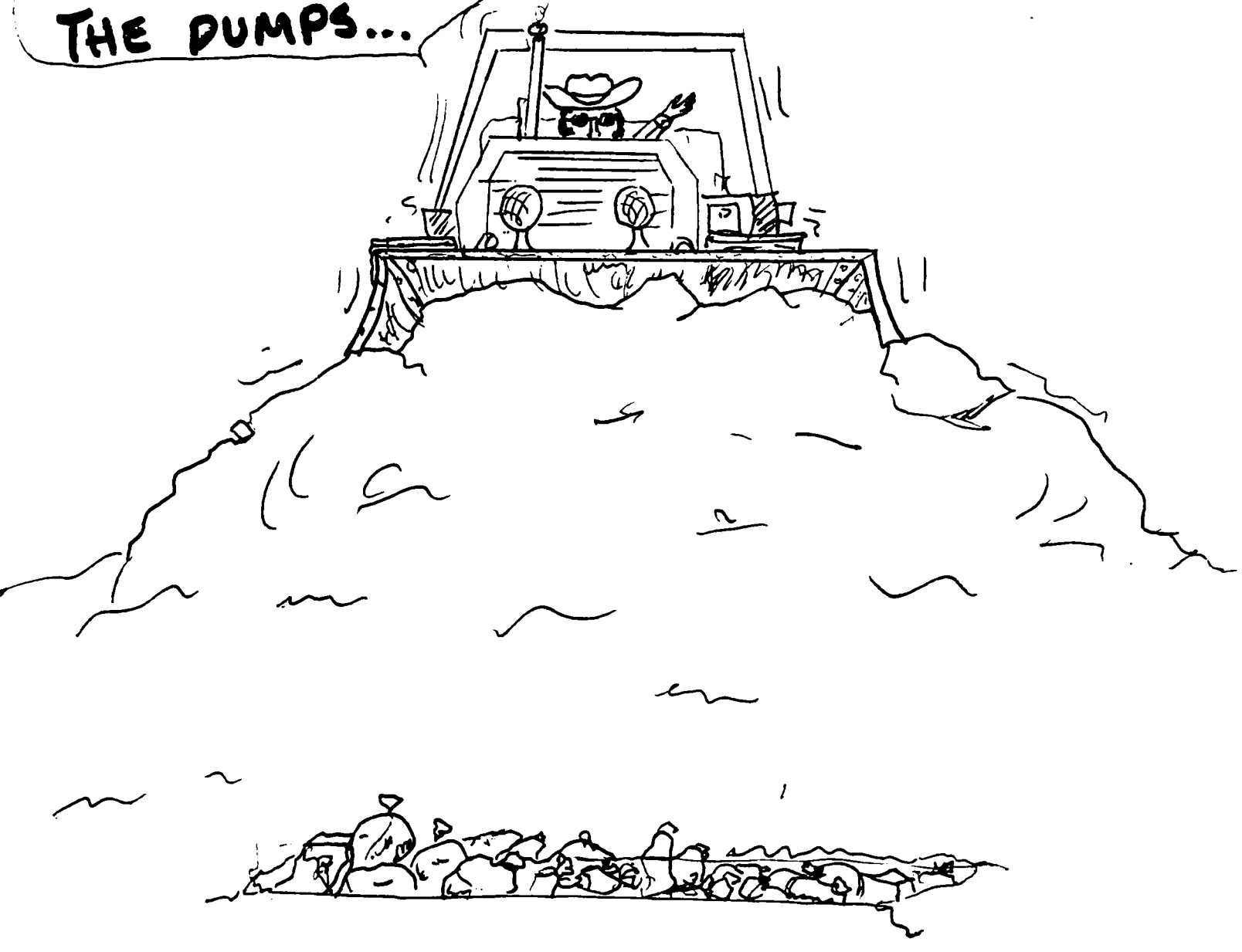
Residents and agencies must be kept informed of activities pertaining to the dump(s) closing. Their cooperation is critical to a satisfactory solid waste disposal program. They should, therefore, be informed:

- Why the dump is being closed
- How the job will be done
- What method of acceptable waste disposal will replace the dumps(s)

Keeping the residents and agencies informed should begin when the planning starts and continue with progress reports until the dump is closed and the new disposal method is operating successfully.

'TEX' SAYS

WHEN COVERING THE DUMPS...



CONSOLIDATE refuse. Then compact it, place it in trenches, cover it with soil to eliminate flies and rodents. Grade land so water can run off. Plant grass and trees to prevent erosion.

Open dumping should be stopped prior to commencement of closing operations. An alternative disposal site, with fixed and posted hours of operations, must be established for the former users of the dump.

Area Clean-Up

Prior to covering the dump a major cleanup effort of the entire disposal area should be made. All trash, litter and debris should be picked up and deposited in the trench. The area should be as free of trash as possible.

Covering the Dump

After the area has been throughly policed and all waste deposited in the trench, the dump surface should be graded, compacted, and covered with at least 2 feet of soil. A decision should be made as to whether a rat extermination program is required at the dump. Information on rat extermination methods can be obtained from the nearest county extension agent.

Cover material should be selected to limit the access of vectors, control moisture entering the fill, control the movement of gas from the decomposing waste, provide a pleasing appearance, control blowing paper, and support vegetation.

The depth of the cover material depends on the use planned for the closed dump and the soil type. Usually 2 feet of cover is sufficient and it should be graded to slopes of 2 percent or greater. Proper grading is important since it prevents excessive soil erosion and ponding of water. Standing water infiltrates into the deposited waste, resulting in groundwater pollution.

CHAPTER V: SPECIAL WASTES

Special wastes are those wastes that require special management procedures to ensure health and safety of personnel. Included in this category are:

A. Institutional Wastes

Solid wastes from schools, rest homes, and hospitals are usually handled in the same manner as residential and commercial wastes. Hospital wastes include such wastes as pathological and surgical waste and clinical and biological laboratory waste. Pathological wastes, such as tissues, should be incinerated at the hospital or transported to a hospital equipped with an incinerator. Ash may be landfilled. Bacteriological waste should be autoclaved or disinfected by other means, prior to disposal at the landfill.

B. Pesticide/Pesticide Containers

Pesticide and/or pesticide containers may end up in the waste stream. If they are empty, they can be treated as other solid waste. If the containers are full or partially full, consideration should be given to procedures designed to recover some useful value from excess pesticides and containers. Where large quantitites are involved, one of the first recommendations is that the material be used for the purpose originally intended, providing that the use is legal and label directions are followed. Another alternative is to return the material to the manufacturer for potential reuse or reprocessing.

Should none of these alternatives be applicable, the ultimate disposal method should be determined by the type of hazardous material involved. Organic pesticides in empty pesticide bags which do not contain mercury, lead, cadmium, arsenic, beryllium, selenium, or other toxic materials may be disposed of by incineration unless prohibited by label instructions. If incineration is not acceptable or available, disposal in specificlly designated areas of the landfill is suggested. Encapsulation prior to landfilling is recommended for certain materials such as those containing mercury, lead, cadmium, arsenic, beryllium, selenium, or other toxic materials and all inorganic compounds which may be highly mobile in the soil. Encapsulation of these will retard mobility

and contain them within a small area which can be permanently marked and recorded.

Among the disposal procedures not acceptable are water dumping and open-dumping. Open burning of small quantities of certain containers and open-field burial of single containers on farms and ranches by the pesticide user may be acceptable in some areas.

C. Dead Animals

Dead cats, dogs, and livestock sometimes end up in the solid waste stream. In general, small animals can be safely disposed of if taken directly to the fill site and placed along with other waste and immediately covered. Whenever possible, dead livestock should be disposed of through rendering plants or pet food companies. These types of businesses should be contacted to determine whether they will pick up the dead livestock. Dead livestock that cannot be disposed of through rendering plants or pet food companies should be disposed of by placing them in a special pit and covering them with two feet of compacted soil. Due to the severe winter conditions that prevail in this region, livestock losses can be severe. This is particularly true in late fall and early spring.

D. Water and Waste Water Treatment Plant Sludge

Dewatered sludges and dewatered digested sludges received from water and waste water treatment plants can be disposed of at a sanitary landfill. In most cases, they can be placed in the regular part of the fill, but they should be covered immediately. If their moisture content is relatively high, the sludges should be mixed with other wastes before being covered to prevent localized leaching. Raw sewage sludges and septic tank pumpings should not be disposed of at a sanitary landfill.

E. Bulky Wastes

Bulky wastes are those items whose large size precludes or complicates their handling by normal collection, processing, or disposal methods. Bulky wastes include abandoned and scrapped vehicles, demolition and construction

debris, large appliances, tree stumps, and timber. "White goods" (refrigerators, washers, dryers, etc.) should be collected on special dates. A biannual scheduled pickup (spring and fall) should be sufficient. These dates should be given the widest possible publicity to enable residents to ready their bulky waste for pickup. Residents should be warned to remove doors from all discarded large appliances to prevent the possibility of a small child becoming locked inside while playing. Demolition and construction debris should be hauled by the contractor directly from the building site to the fill area for disposal. Selected loads of demolition and construction debris such as broken concrete, asphalt, bricks, and plaster can be stockpiled and used to build or improve on-site roads.

F. Recovery of Scrap Metal from Vehicles and Other Bulky Items

A special area of the landfill should be designated for abandoned and scrapped vehicles. A special effort should be made to collect all abandoned and scrapped vehicles reservation wide, and deliver them to a specifically designated area of the landfill. Vehicles and white goods may be sold to junk car or scrap iron dealers. If the abandoned or scrap vehicles are to be disposed of at the local landfill, they should be crushed on solid ground to reduce the volume, then pushed onto the working face, near the bottom of the cell or into a separate disposal area.

Solid Waste Management
includes

STORAGE
COLLECTION
PROCESSING
RECOVERY OF RESOURCES
RECYCLING
and FINAL PROPER DISPOSAL
OF WASTES THAT CANNOT
BE REUSED IN ANY WAY

CHAPTER VI: SANITARY LANDFILL SAFETY CONSIDERATIONS

A. Background

The nature of operations at landfill sites is such that the risk of accident/injuries, fires and health hazards is significant. The reduction of accident/injuries on the job means savings in time, money and equipment, not to mention reducing suffering and disabililty to members of the work force. The development and enforcement of a continuing safety program will help reduce the accident/injury potential at the landfill operation, thereby reducing the overall cost of the operation. Areas of concern should include but are not limited to:

B. Individual Safety

Personnel working at landfill sites should be familiar with the nature and hazards of the operation they are performing. Proper safety clothing and equipment should be used at all times. Examples of safety equipment are: safety shoes, shatter-proof glasses, heavy work gloves, chemically resistant work clothes, and hard hats.

C. Fire

Burning of wastes is not permitted at a sanitary landfill, but fires occur occasionally when there is careless handling of open flames and smoldering waste materials. The use of daily cover should keep fire in a cell that is under construction from spreading laterally to other cells. All equipment operators should keep a fire extinguisher on the their machines at all times since it may be necessary to put out a small fire. If the fire is too large, waste in the burning area should be spread out so that water can be applied. This is an extremely hazardous chore, and water should be sprayed on those parts of the machine that come in contact with the hot wastes. A fire plan for the landfill should spell out fire-fighting procedures and sources of water. All landfill personnel should be thoroughly familiar with these procedures. In the event a collection truck arrives carrying burning wastes, it should not be allowed near the working face of the fill but be routed as quickly as possible to a safe area away from buildings, where its load can be dumped and the fire extinguished.

D. Traffic Control

Traffic flow on the landfill site can effect the efficiency of daily operations. Haphazard routing in the area can lead to indiscriminate dumping and cause accidents. Pylons, barricades, guardrails, and traffic signs can be used to direct traffic. All vehicles hauling waste to the landfill should be of a closed type or have the means to properly secure the load to prevent the blowing or falling off of waste matter en route to the landfill. This requirement should apply to private vehicles delivering waste to the landfill site.

E. First Aid

First aid kits should be installed on all landfill vehicles and in the landfill office. All landfill operating personnel should be familiar with first aid procedures.

F. Salvage and Scavenging

Scavenging, sorting through waste to recover salvageable items, must be strictly prohibited at the working face. Scavengers are too intent on searching to notice the approach of spreading and compacting equipment, and they risk being injured. Moreover, some of the items collected may be harmful, such as food waste, canned or otherwise, which may be contaminated.

G. Firearms Control

Landfill sites are usually in areas where population density is light, and often the areas surrounding or adjacent to the landfill are open country or farm land. These areas and the landfill site are likely to attract people interested in target shooting or small game hunting. Signs should be posted outside the landfill boundaries in all directions warning that hunting, target practice, or shooting of any type is not permitted within 300 feet of the landfill perimeter or on the landfill proper.

H. Bird/Aircraft Hazards

Birds attracted to landfill sites can be a nuisance, a health hazard, and a danger to low-flying aircraft. The primary method to reduce the problem is to make each working face as small as possible and to cover all wastes as soon as possible.

I. Decomposition Gas

Gas is produced naturally when solid wastes decompose. The quantity generated in a landfill and its composition depend on the types of solid wastes that are decomposing. Methane and carbon dioxide are the major constituents of landfill decomposition gas, but other gases are also present and some may impart a repugnant odor.

Landfill gas is important to consider when evaluating the effect a landfill may have on the environment, because methane can explode when present in air at concentrations between 5 and 15 percent. Since there is no oxygen present in a landfill when methane concentrations in it reach this critical level, there is no danger of the fill exploding. If, however, methane vents into the atmosphere (its specific gravity is less than that or air) it may accumulate in buildings or other enclosed spaces at dangerous levels close to a sanitary landfill.

The potential movement of gas is, therefore, an essential element to consider when selecting a site. It is particularly important if enclosed structures are built on or adjacent to the sanitary landfill or if it is to be located near existing industrial, commercial, and residential, areas. Periodic checks of buildings on or adjacent to the landfill should be made.

Landfill gas movement can be controlled if sound engineering principles are applied. Permeable vents and impermeable barriers are the two most widely used methodologies.

J. Communications

Telephone or radio communication should be provided so that landfill operating personnel will be able to report fires or injuries. The use of a radio that can be tied into the police network or the highway department should be satisfactory.

K. Fencing

Peripheral and litter fences are commonly needed at sanitary landfills. The type is used to control or limit access, keep out children, dogs, and other large animals, screen the landfill, and delineate the property line. Litter fences are used to control blowing paper in the immediate vicinity of the working face. As a general rule, trench operations require less litter fencing because the solid waste tends to be confirmed within the walls of the trench. At a very windy trench site, a 4 foot snow fence will usually suffice.

'TEX' SAYS

Think about the **BEST** ways to **MANAGE, STORE, COLLECT, RECYCLE,** and **DISPOSE** of solid Wastes.

Each Reservation must design a system to meet their local needs

When planing a COLLECTION SYSTEM consider

1. Types of storage containers.
2. Types of collection equipment.
3. Route and crew organization.
4. Manpower availability.
5. Types and amounts of solid waste to be collected.
6. Potential markets for separately collected materials.

CHAPTER VII: MANAGEMENT OF SOLID WASTE PROGRAMS

A. Background

The size of operations carried out in a solid waste disposal system and the area served will influence the mechanics of management. The purpose and goal of solid waste management should be to consolidate and coordinate all the resources necessary to dispose of solid wastes in the most sanitary and efficient manner possible.

Most effort in the management of solid waste has been directed toward densely populated areas where solid waste volumes are generated in thousands of tons per day, where the population density may be hundreds of people per city block, and where finding a location for a sanitary landfill is difficult. On Indian reservations, on the other hand, we are dealing with the management of solid waste in rural areas, and management considerations are significantly different: the population density may be three to four persons per square mile; waste is generated in hundreds of tons per year; and having the waste collected and deposited in a minimum of locations is a major problem.

Because of the ease of indiscriminate dumping of wastes in rural areas, the focus for solid waste management must be on waste control, starting at the generation point and continuing through collection and transportation to final disposal in a sanitary landfill. Wastes that are not collected and disposed of properly often find their way into the nearest gully, stream, or roadway.

To ensure proper solid waste management, the operations must be institutionalized as are other functions of tribal government. There is no one set method to set up a program for solid waste management and to incorporate it into the tribal government. However, certain functions of management must be addressed, and support of the tribal council is necessary.

One function is the regulation of solid waste management practices to ensure that public health and the environment are protected. Due to the importance of regulation, tribal governments should be directly involved and not depend upon regulation from outside the reservation. Ordinances should be enacted to prohibit individuals from activities such as indiscriminate dumping.

Organizations which provide environmental services must also be regulated. For example, criteria that landfills are operated and maintained in a manner which does not damage the environment should be included in ordinances.

Tribal utility departments are often set up to provide reservations with a water supply and to provide wastewater treatment. A tribal utilities department can also be set up to provide the public with solid waste collection and disposal service.

There are two basic functions which should be provided so that a tribal utilities department can be effective. These are overall department planning and direction and day-to-day management.

The final function relates to actual operations which include the collection truck drivers and the landfill operators.

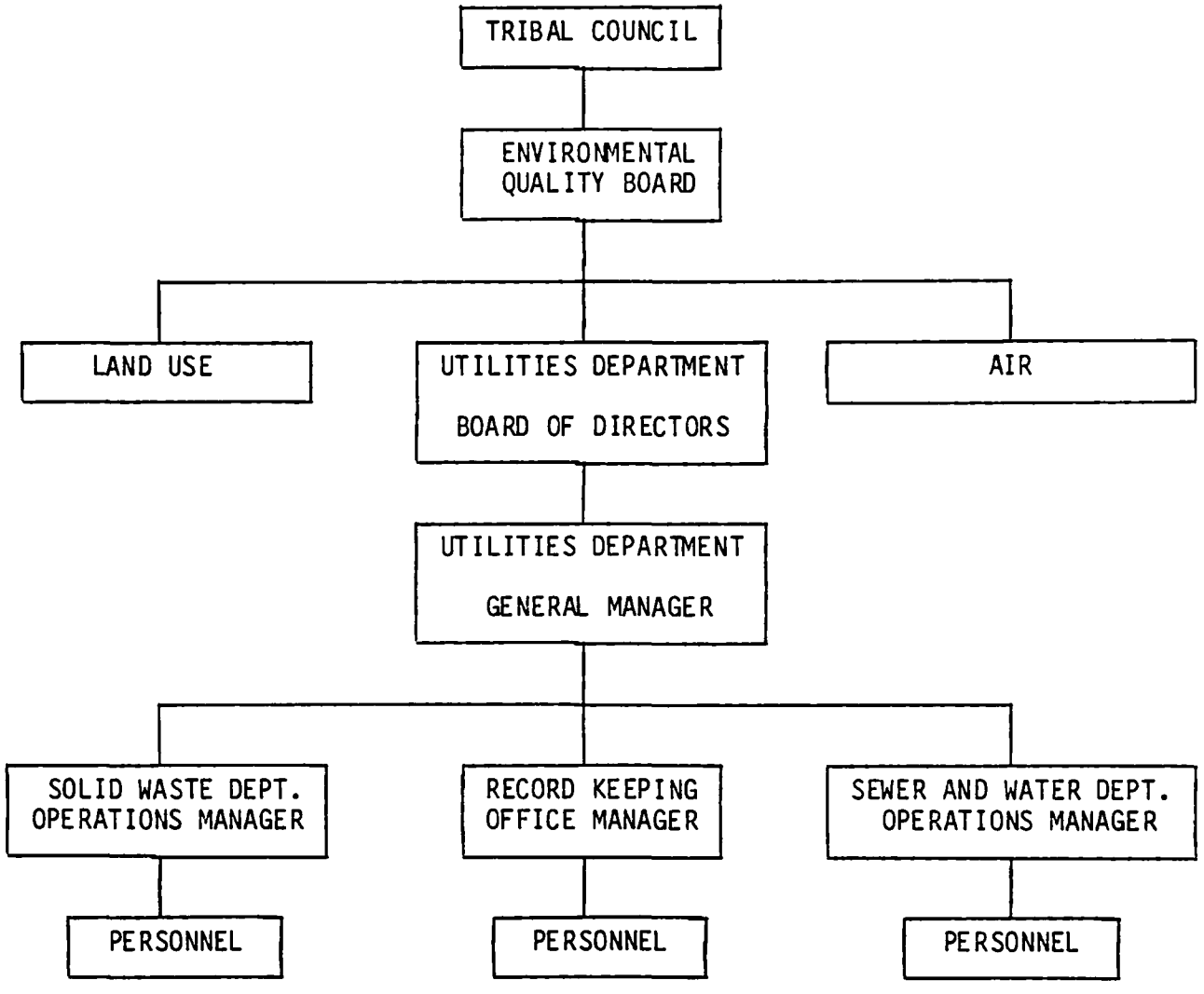
Figure 6 is an example of an organization which would provide all of the functions that are necessary for proper solid waste management. This is provided only as an example, and it is not expected that this exact organizational plan will be adopted. Some of the duties and responsibilities of the different sections of this organizational plan are discussed here to show how the necessary functions can be arranged.

B. Tribal Council

The tribal council has the responsibility to chart a course for the reservation to follow. The level of support and effort by the tribal council is the key factor in solid waste management on the reservation. The following actions are recommended for tribal councils:

1. Adopt an ordinance that regulates landfill site selection, design, and operation. The Environmental Protection Agency's criteria for solid waste disposal facilities and practices should be used in this ordinance.

FIGURE 6
TRIBAL ORGANIZATIONAL PLAN



2. Adopt ordinances that make it mandatory for all solid waste generators within the reservation boundary to use the solid waste management system adopted for the reservation.

3. Assist the Environmental Quality Board and utility service to secure adequate assistance and financing to carry out their duties.

4. Set up utillities service as a chartered tax exempt entity of the tribe. This is a common practice for states, counties and cities to be exempt from federal, state and local taxes.

5. Request technical assistance from other federal agencies responsible for health and sanitation considerations on reservations.

C. Environmental Qualilty Board

The Environmental Quality Board should be a standing board to oversee all aspects of the reservation's environmental quality including safe drinking water, wastewater treatment, noise, air pollution, and pesticide use. This board should consist of managers of other tribal programs that are concerned with health, safety, and welfare of the reservation and its inhabitants. The board membership should include: the tribal attorney, tribal police chief, health board chairman, and other program directors. Provision should be made for additional board members, appointed by the tribal council, who have the experience and abililty to contribute to its functioning.

The general duties of the Environmental Qualilty Board should be:

1) to evaluate the overall quality of the environment on the reservation;

2) to develop standards for reservation environmental quality;

3) to develop guidelines to achieve these standards and to comply with the needs of the reservation and with federal standards;

4) to incorporate standards and guidelines into ordinances that are presented to the tribal council for approval and adoption.

The Environmental Quality Board may develop specific responsibilities for different aspects of environmental concern. For solid waste management, these should be:

1) to meet two to four times a year unless special projects, such as drafting ordinances, require more frequent meetings;

2) to develop a reservation-wide solid waste ordinance;

3) to evaluate health or environmental problems which result from solid waste collection and disposal practices and make recommendations for necessary changes to the tribal council.

D. Tribal Utilities Department Board of Directors

This board oversees the activity of the tribal utilities department program. Its membership should include persons from both the public and private sectors who have experience in solid waste management. The duties of the board should be:

1) to evaluate the overall performance of the organization;

2) to develop standards and procedures for the organization;

3) to inform the general manager of any changes in operational standards or procedures that need to be carried out;

4) to meet with the environmental quality board to discuss problems and solutions concerning utility service operations.

E. Utilities Operation

The utilities operation may be divided into segments which cover operations which are performed; for example, sewer and water, solid waste, and office management. A general manager is responsible for the overall utilities operations and under this position are managers for each operation area. This requires skill in many areas, especially financial management and public

relations. The general manager need not be highly skilled at doing the physical work, but should have a working knowledge of each area of utilities operations. The duties of the general manager include:

1) to produce monthly income and cost records and present them in detail to the board of directors;

2) to meet with other program managers and district leaders to be informed of impending changes that might affect utilities operations;

3) to develop an on-going public relations program.

Within the utilities operation, there are various positions responsible for specific functions. The positions are:

1) Office Manager is responsible for the daily operations of the utilities organization including billing, procurement, and payment. The manager's duties include:

    1) accurate record keeping and evaluation

    2) personnel training and evaluation

    3) proper communication with personnel

    4) financial management

    5) public relations

2) Solid Waste Department Operations Manager serves both as the director of other solid waste department employees and as the landfill operator. Specifically, the day-to-day responsibilities of the solid waste manager include:

    1) landfill operator

    2) personnel training

3) personnel work scheduling

4) system record keeping

5) system evaluation

6) preventive maintenance scheduling

7) personnel records

As the landfill operator, the manager has ample time for these functions. He will see each route driver in the morning and possibly several times a day. Skills necessary for this position are many and are the key to the overall success of this operation. These skills include:

1) direction of working people

2) working knowledge of all equipment used

3) landfill management

4) routing and scheduling

5) mileage and volume records

6) operational safety and first-aid

7) customer relations

8) customer service requirements

9) solid waste management

3) Route Drivers: Each driver should be a qualilfied equipment operator with a good driving record. Basic skills required are:

1) truck driving

2) operational safety and first-aid

3) preventive maintenance

4) customer relations

4) Shop Mechanic: The mechanic should be familiar with all the equipment that is used for the solid waste operations. Basic skills of the mechanic should be:

1) diesel and gas engine maintenance

2) standard and automatic transmission

3) hydraulic systems

4) welding

5) painting

6) preventive maintenance

7) operational safety and first-aid

The personnel-system manager, the route drivers, and the mechanic should be cross-trained to carry out the duties of the other positions. Each one does not have to be highly skilled at the other positions, but the abililty to substitute in another position in case of illness, breakdown, or emergency is very important.

F. Public Awareness Programs

Public Awareness is one of the most important administrative functions in the solid waste management plan. Convincing reservation residents of the advantages of a viable solid waste collection and disposal system may be a tedious process but can be accomplished by explanation and education. The program must be continuous, beginning early in the long range planning stages and continuing

after operations begin. Public awareness programs should stress that proper waste management and disposal will reduce potential health and environmental hazards. The media available for public awareness purposes include radio, television, newspapers, signs on collection vehicles, and billing receipt ads. Extensive "stumping" and support by elected officials in support of a proposed solid waste disposal system is invaluable.

A key aspect of a public awareness program is the procedure for handling citizen complaints. Deficiencies in operating methods or employee courtesy should be investigated and acted on promptly. If this practice is followed, citizens and employees will become more conscientious.

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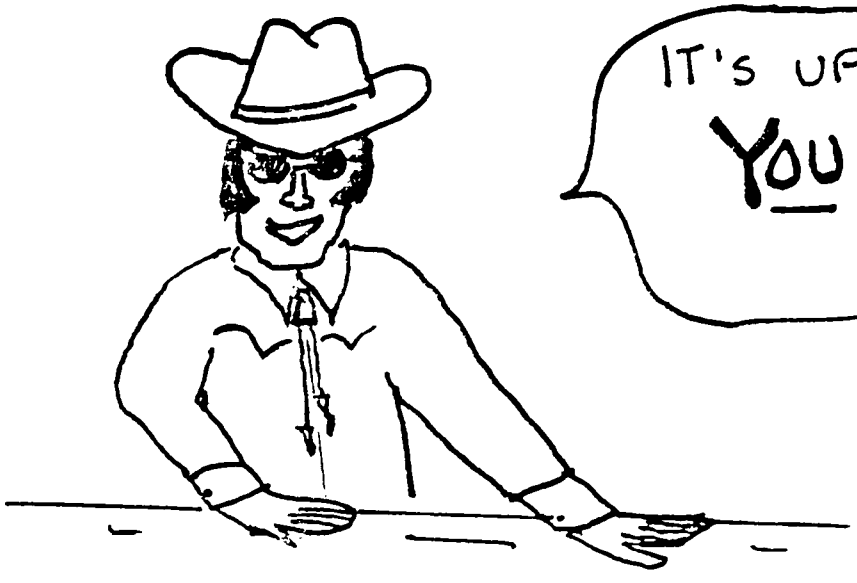

LET'S GET RID OF THE DUMPS!

Let's **DO** it...

let's <u>protect</u> and <u>improve</u> the <u>quality of our environment</u> by putting an end to open dumps

HOW?

1. by **FINDING OUT** what your local tribal council is doing about solid wastes -- how it disposes of garbage and trash. **KNOW THE FACTS.**

2. by **GETTING LOCAL** tribal officials, schools businesses, etc... **INTERESTED** in <u>doing</u> <u>something</u> about it. **GET PEOPLE INVOLVED!**

3. by **LETTING LOCAL TRIBAL OFFICIALS** know of your <u>concern</u> for... and <u>support</u> of their actions to manage solid waste.

APPENDIX A
DEFINITIONS

ABANDONED VEHICLE	A VEHICLE THAT APPLICABLE STATE LAWS DEEM TO HAVE BEEN ABANDONED.
AGRICULTURAL SOLID WASTE	THE SOLID WASTE THAT RESULTS FROM THE REARING AND SLAUGHTERING OF ANIMALS AND THE PROCESSING OF ANIMAL PRODUCTS AND ORCHARD AND FIELD CROPS.
AQUIFER	A GEOLOGIC FORMATION, GROUP OF FORMATIONS, OR PART OF A FORMATION THAT IS CAPABLE OF YIELDING USABLE QUANTITIES OF GROUND WATER TO WELLS OR SPRINGS.
BULKY WASTE	ITEMS WHOSE LARGE SIZE PRECLUDES OR COMPLICATES THEIR HANDLING BY NORMAL COLLECTION, PROCESSING, OR DISPOSAL METHODS.
CELL	THE DAILY VOLUME OF SOLID WASTES THAT ARE DEPOSITED AND ENCLOSED BY COVER MATERIAL IN A LANDFILL.
COLLECTION	THE ACT OF REMOVING SOLID WASTE FROM THE CENTRAL STORAGE POINT AT THE SOURCE OF GENERATION.
CONTAMINATION	THE DEGRADATION OF NATURALLY OCCURRING WATER, AIR OR SOIL QUALITY EITHER DIRECTLY OR INDIRECTLY AS A RESULT OF MAN'S ACTIVITIES.
COMMERCIAL SOLID WASTE	SOLID WASTE GENERATED BY STORES, OFFICES, AND OTHER ACTIVITIES THAT DO NOT ACTUALLY TURN OUT A PRODUCT.
DEAD ANIMALS	ANIMALS THAT HAVE DIED FROM ANY CAUSE EXCEPT THOSE SLAUGHTERED FOR HUMAN CONSUMPTION.

DISPOSAL	THE ORDERLY PROCESS OF DISCARDING USELESS OR UNWANTED MATERIAL.
DUMP	A LAND WHERE SOLID WASTE IS DISPOSED OF IN A MANNER THAT DOES NOT PROTECT THE ENVIRONMENT.
FLOODPLAIN	THE LOWLAND AND RELATIVELY FLAT AREAS ADJOINING INLAND AND COASTAL WATERS, INCLUDING FLOODPRONE AREAS OF OFFSHORE ISLANDS, WHICH ARE INUNDATED BY THE BASE FLOOD.
GENERATION	THE ACT OR PROCESS OF PRODUCING SOLID WASTE.
HAZARDOUS WASTE	THOSE WASTES SUCH AS TOXIC, RADIOACTIVE OR PATHOGENIC SUBSTANCES WHICH REQUIRE SPECIAL HANDLING TO AVOID ILLNESS OR INJURY TO PERSONS OR DAMAGE TO PROPERTY.
GROUND WATER	WATER BELOW THE LAND SURFACE IN THE ZONE OF SATURATION.
INCINERATION	THE CONTROLLED PROCESS BY WHICH SOLID, LIQUID, OR GASEOUS COMBUSTIBLE WASTE ARE BURNED AND CHANGED INTO GASES, AND THE RESIDUE PRODUCED CONTAINS LITTLE OR NO COMBUSTIBLE MATERIAL.
INCINERATOR	AN ENGINEERED APPARATUS USED TO BURN WASTE SUBSTANCES AND IN WHICH ALL THE FACTORS OF COMBUSTION-TEMPERATURE, RETENTION TIME, TURBULENCE, AND COMBUSTION AIR--CAN BE CONTROLLED.
INDUSTRIAL SOLID WASTE	SOLID WASTE THAT RESULTS FROM INDUSTRIAL PROCESSES AND MAUFACTURING.
INFECTIOUS WASTE	(1) EQUIPMENT, INSTRUMENTS, UTENSILS (OF A DISPOSAL NATURE), AND ANY SUBSTANCES THAT MAY HARBOR OR TRANSMIT PATHOGENIC ORGANISMS FROM THE ROOMS OF PATIENTS WHO ARE SUSPECTED TO HAVE OR HAVE BEEN DIAGNOSED AS HAVING A COMMUNICABLE DISEASE

(2) LABORATORY WASTES, SUCH AS TISSUES, SPECIMENS OF BLOOD ELEMENTS, EXCRETA, AND SECRETIONS OBTAINED FROM PATIENTS OR LABORATORY ANIMALS.

INSTITUTIONAL SOLID WASTE — SOLID WASTE ORIGINATING FROM EDUCATIONAL, HEALTH CARE, AND RESEARCH FACILITIES.

LANDFILL — A FACILITY FOR THE DISPOSAL OF SOLID WASTE INVOLVING THE PLACEMENT OF SOLID WASTE ON OR INTO THE LAND SURFACE, AND USUALLY INVOLVING COMPACTION AND COVERING OF THE DISPOSED SOLID WASTE, AND WHICH IS NOT A LANDSPREADING OR SURFACE IMPOUNDMENT FACILITY.

LEACHATE — LIQUID CONTAINING DISSOLVED OR SUSPENDED MATERIALS THAT EMERGES FROM SOLID WASTE.

MONITORING WELL — A WELL USED TO OBTAIN WATER SAMPLES FOR WATER QUALITY ANALYSIS OR TO MEASURE GROUND WATER LEVELS.

NATURAL RESOURCES — MATERIALS WHICH HAVE USEFUL PHYSICAL OR CHEMICAL PROPERTIES WHICH EXIST, UNUSED, IN NATURE.

NON-RESIDENTIAL SOLID WASTE — SOLID WASTE FROM AGRICULTURAL, COMMERCIAL, INDUSTRIAL, OR INSTITUTIONAL ACTIVITIES OR A BUILDING OR GROUP OF BUILDINGS CONSISTING OF FIVE OR MORE DWELLING UNITS.

OPEN BURNING — 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.

OPEN DUMP — A SITE FOR THE DISPOSAL OF SOLID WASTE WHICH DOES NOT COMPLY WITH THE "CRITERIA FOR CLASSIFICATION OF SOLID WASTE DISPOSAL FACILITIES".

PERMAFROST	PERMANENTLY FROZEN SUBSOIL.
PERIODIC APPLICATION OF COVER MATERIAL	THE APPLICATION OF SOIL OR OTHER SUITABLE MATERIAL OVER DISPOSED SOLID WASTE AT SUCH FREQUENCIES AND IN SUCH A MANNER AS TO CONTROL VECTORS AND INFILTRATION OF PRECIPITATION; REDUCE AND CONTAIN ODORS, FIRES, AND LITTER; AND TO ENHANCE THE FACILITY'S APPEARANCE AND FUTURE UTILIZATION.
POLLUTION	THE CONDITION CAUSED BY THE PRESENCE IN THE ENVIRONMENT OF SUBSTANCES OF SUCH CHARACTER AND IN SUCH QUANTITIES THAT THE QUALITY OF THE ENVIRONMENT IS IMPAIRED OR RENDERED OFFENSIVE TO LIFE.
POTENTIAL ZONE OF INFLUENCE	THAT AREA WITHIN A WATER RESOURCE WHICH COULD BE CONTAMINATED BY LEACHATE OR OTHER MATERIALS DERIVED FROM A LANDFILL DISPOSAL FACILITY.
PROCESSING	ANY METHOD, SYSTEM, OR OTHER TREATMENT DESIGNED TO CHANGE THE PHYSICAL FORM OR CHEMICAL CONTENT OF SOLID WASTE.
RECOVERED RESOURCES	MATERIALS WHICH STILL HAVE USEFUL PHYSICAL OR CHEMICAL PROPERTIES AFTER SERVING A SPECIFIC PURPOSE AND CAN, THEREFORE, BE REUSED OR RECYCLED FOR THE SAME OR OTHER PURPOSES.
RECOVERY	THE PROCESS OBTAINING MATERIAL OR ENERGY RESOURCES FROM SOLID WASTE; SYNONYMS: EXTRACTION, RECLAMATION, SALVAGE.
ENERGY RECOVERY	THE OBTAINING OF ENERGY AVAILABLE FROM THE HEAT GENERATED WHEN SOLID WASTE IS INCINERATED.
RECYCLING	THE PROCESS BY WHICH RECOVERY RESOURCES ARE TRANSFORMED INTO NEW PRODUCTS IN SUCH A MANNER THAT THE ORIGINAL PRODUCTS LOSE THEIR IDENTITY.

RENDERING	A PROCESS OF RECOVERING FATTY SUBSTANCES FROM ANIMAL PARTS BY HEAT TREATMENT, EXTRACTION, AND DISTILLATION.
RESIDENTIAL SOLID WASTE	ALL SOLID WASTE THAT NORMALLY ORIGINATES IN A RESIDENTIAL ENVIRONMENT. THIS DEFINITION IS APPLICABLE TO THE SOLID WASTE FROM A BUILDING OF FOUR OR LESS SEPARATE UNITS.
REPROCESSING	THE ACTION OF CHANGING CONDITION OF A SECONDARY MATERIAL.
REUSE	THE REINTRODUCTION OF A COMMODITY INTO AN ECONOMIC STREAM WITHOUT ANY CHANGE IN ITS PHYSICAL CHARACTERISTICS.
RUNOFF	THE PORTION OF PRECIPITATION THAT DRAINS FROM AN AREA AS SURFACE FLOW.
SALVAGING	THE CONTROLLED REMOVAL OF WASTE MATERIALS FOR UTILIZATION.
SANITARY LANDFILL	A SITE WHERE SOLID WASTE IS DISPOSED USING SANITARY LANDFILLING TECHNIQUES.
SANITARY LANDFILLING	AN ENGINEERED METHOD OF DISPOSING OF SOLID WASTE ON LAND IN A MANNER THAT PROTECTS THE ENVIRONMENT BY SPREADING THE WASTE IN THIN LAYERS, COMPACTING IT TO THE SMALLEST PRACTICAL VOLUME, AND COVERING IT WITH SOIL BY THE END OF EACH WORKING DAY.
SCAVENGING	THE UNCONTROLLED REMOVAL OF MATERIALS AT ANY POINT IN SOLID WASTE MANAGEMENT.
SCRAP	DISCARDED OR REJECTED MATERIAL OR PARTS OF MATERIAL THAT RESULT FROM MANUFACTURING OPERATIONS AND ARE SUITABLE FOR REPROCESSING OR RECYCLING.
(PROMPT) INDUSTRIAL SCRAP	SCRAP THAT IS GENERATED DURING THE MANUFACTURE OF A PRODUCT.

SECONDARY MATERIAL	A MATERIAL THAT IS UTILIZED IN PLACE OF A PRIMARY OR RAW MATERIAL IN MANUFACTURING A PRODUCT.
SEPARATION	THE SYSTEMATIC DIVISION OF SOLID WASTE INTO DESIGNATED COMPONENTS.
SLUDGE	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 EFFECTS.
SOLID WASTE	USELESS, UNWANTED, OR DISCARDED MATERIAL WITH INSUFFICIENT LIQUID CONTENT TO BE FREE FLOWING.
SOLID WASTE MANAGEMENT	THE PURPOSEFUL, SYSTEMATIC CONTROL OF THE GENERATION, STORAGE, COLLECTION, TRANSPORT, SEPARATION, PROCESSING, RECOVERY AND DISPOSAL OF SOLID WASTE.
STORAGE	THE INTERIM CONTAINMENT OF SOLID WASTE, IN AN APPROVED MANNER, AFTER GENERATION AND PRIOR TO ULTIMATE DISPOSAL.
TRANSPORT	THE MOVEMENT OF SOLID WASTE.
TRANSFER STATION	A SITE AT WHICH SOLID WASTE IS CONCENTRATED AFTER COLLECTION AND BEFORE PROCESSING OR DISPOSAL.
VECTOR	A CARRIER THAT IS CAPABLE OF TRANSMITTING PATHOGENS FROM ONE ORGANISM TO ANOTHER.
WATER TABLE	THE UPPER SURFACE OF THE ZONE OF SATURATION IN AN UNCONFINED AQUIFER AT WHICH THE PRESSURE IS EQUAL TO ATMOSPHERIC PRESSURE.
WETLANDS	THOSE AREAS THAT ARE INUNDATED OR SATURATED BY SURFACE OR GROUND WATER AT A FREQUENCY AND DURATION SUFFICIENT TO

SUPPORT A PREVALENCE OF VEGETATION TYPICALLY ADAPTED FOR LIFE IN SATURATED SOIL CONDITION. WETLANDS GENERALLY INCLUDE SWAMPS, MARSHES, BOGS, AND SIMILAR AREAS.

APPENDIX B

BULK DENSITY OF MIXED WASTES AND WASTE COMPONENT

1. RESIDENTIAL WASTE COMPONENTS	AVE. Wt. CU. FT.	AVE. WT. CU. YD.
GRASS AND TRIMMINGS	8#	218#
METAL CANS	6	160#
UNBROKEN GLASS AND BOTTLES	26	700
BROKEN GLASS	74	2,000
RAGS	7	196
PAPER AND CARDBOARD	7	183
PAPER	9	235
WET PAPER	10	277
RUBBER	17	450
TREE CUTTINGS	9	299
LOGS AND STUMPS	25	785
GREEN LOGS	20	537
LIMBS AND LEAVES	10	270
BRUSH	2	54
FURNITURE	3	80
MAJOR APPLIANCES	11	300
WOOD CRATES	7	182
BATTERY CASE AND MISC. AUTO PARTS	44	1,200
AUTO BODIES	8	216
TIRES AND RUBBER PRODUCTS	15	400
2. CONSTRUCTION DEMOLITION		
MIXED DEMOLITION NON-BURNABLE	89	2,400
MIXED DEMOLITION BURNABLE	22	600
MIXED CONSTRUCTION BURNABLE	16	430
BROKEN PAVEMENT, SIDEWALK	95	2,560

3. INDUSTRIAL WASTE	CU. FT.	CU. YD.
SAWDUST	18	485
BARK SLABS	25	675
WOOD TRIMMINGS	36	970
MIXED METALS	7	200
HEAVY METAL SCRAP	150	4,050
LIGHT METAL SCRAP	50	1,350
WIRE	20	540
DIRT, SAND, GRAVEL	90	2,430
CINDERS	56	1,514
OIL, TARS, ASPHALTS	60	1,620
TEXTILE WASTES	11	300
PLASTICS	2	50

4. AGRICULTURAL WASTE		
PEN SWEEPINGS	40	1,090
PAUNCH MANURE	64	1,730
OTHER MEAT-PACKING WASTES	46	1,730
DEAD ANIMALS	22	600
MIXED VEGETABLE WASTE	22	600
BEANS OR GRAIN WASTE	48	1,300
POTATO-PROCESSING WASTE	42	1,130
CHAFF	4	100
MIXED AGRICULTURAL	35	950

APPENDIX C
RECOMMENDED SOLID WASTE INFORMATIONAL MATERIAL

THE RESOURCE CONSERVATION AND RECOVERY ACT
PUBLIC LAW 94-580
- E.P.A.
1860 LINCOLN ST.
DENVER, CO.

MODEL TRIBAL ENVIRONMENTAL CODE
- NATIVE AMERICAN RIGHTS FUND
1506 BROADWAY
BOULDER, CO 80302
(303) 447-8760

SANITARY LANDFILL DESIGN AND OPERATION
- REPORT SW-287
E.P.A.
1860 LINCOLN ST.
DENVER, CO.

PROCEDURES MANUAL FOR GROUND WATER MONITORING AT SOLID WASTE DISPOSAL FACILITIES
- REPORT SW-611
E.P.A.
1860 LINCOLN ST.
DENVER, CO.

CLASSIFYING SOLID WASTE DISPOSAL FACILITIES GUIDANCE MANUAL
- REPORT SW-828
E.P.A.
1860 LINCOLN ST.
DENVER, CO.

APPENDIX D
PREVENTIVE MAINTENANCE SCHEDULE

COLLECTION VEHICLES:

DAILY
- CHECK ENGINE OIL.
- CHECK HYRDAULIC FLUID LEVEL.
- CHECK HYDRAULIC SYSTEM FOR LEAKS.
- EMPTY ALL AIR RESERVOIRS OF CONDENSATION AT THE END OF EACH DAY, AND MORE OFTEN IF REQUIRED.
- CHECK ALL LIGHTING.
- REMOVE WASTE FROM INSIDE OF COMPACTION BODY.
- CHECK TIRE AIR PRESSURE.
- FILL FUEL TANK.
- CHECK COOLANT LEVEL.

WEEKLY
- ALL ABOVE ITEMS.
- CHECK BRAKES AND ADJUST IF REQUIRED.
- CLEAN AIR FILTER, REPLACE IF REQUIRED.
- LUBRICATE ENTIRE CHASSIS AND COMPACTION BODY.
- PRESSURE WASH ENTIRE BODY AND CHASSIS, INSIDE OF COMPACTOR BODY, ENGINE COMPARTMENT, CHASSIS FRAME, CLEAN DRIVER'S COMPARTMENT.

BI-WEEKLY - ALL THE ABOVE.

- CHANGE ENGINE OIL AND FILTER.
- CHECK HYDRAULIC SYSTEM OPERATING PRESSURE.
- CHECK ALL DRIVE BELTS.
- CHECK FUEL HEATER OPERATION.
- CHECK BLOCK HEATERS.
- CHECK FUEL FILTERS.
- CHECK BODY AND FRAME FOR DAMAGE, LOOSE BOLTS, ALIGNMENT.

ANNUALLY - ALL THE ABOVE.

- CHANGE HYDRAULILC FLUID AND FILTER.
- CHECK WINDSHIELD FOR CRACKS/DAMAGE
- CHANGE AUTOMATIC TRANSMISSION FLUID AND FILTER (CHECK MANUFACTURER'S SPECIFICATIONS FOR FREQUENCY OF FLUID CHANGE).
- CHANGE FLUID IN REAR DRIVE AXLES.

ALL COLLECTION VEHICLES ARE NOT EQUIIPPED THE SAME AND ARE MANUFACTURED BY DIFFERENT COMPANIES. CHECK MANUFACTURER'S SPECIFICATIONS FOR PROPER MAINTENANCE INTERVALS.

LANDFILL EQUIPMENT:

DAILY
- CHECK ENGINE OIL.
- CHECK HYDRAULIC FLUID LEVEL.
- CHECK HYDRAULIC SYSTEM FOR LEAKS.
- REMOVE WASTE FROM RADIATOR AND TRACKS.
- CHECK COOLANT LEVEL.
- FILL FUEL TANK.

WEEKLY
- ALL ABOVE ITEMS.
- LUBRICATE ENTIRE UNIT.
- CHECK TRACK AND ROLLERS FOR PROPER CLEARANCE AND LUBRICATE.

MONTHLY
- ALL THE ABOVE ITEMS.
- CHANGE ENGINE OIL AND FILTER (CHECK MANUFACTURER'S SPECIFICATIONS).
- CHECK HYDRAULILC SYSTEM OPERATING PRESSURE.
- CHECK ALL DRIVE BELTS.
- CHECK FUEL FILTER.
- CHECK ENTIRE UNIT FOR WEAR, LOOSE BOLTS, AND ALIGNMENT.

ANNUALLY - ALL THE ABOVE ITEMS.

- CHANGE HYDRAULIC FLUID AND FILTERS.

- CHANGE FLUID IN GEAR BOXES. (CHECK MANUFACTURER'S SPECIFICATIONS).

- BUILD UP TRACKS AND BLADE WITH HARD SURFACE WELDING.

ALL LANDFILL EQUIPMENT IS NOT EQUIPPED THE SAME AND IS MANUFACUTRED BY DIFFERENT COMPANIES. CHECK MANUFACTURER'S SPECIFICATIONS FOR PROPER MAINTENANCE INTERVALS.