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Costs and Returns of Solid Waste Disposal in Sanitary Landfills

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FS 614

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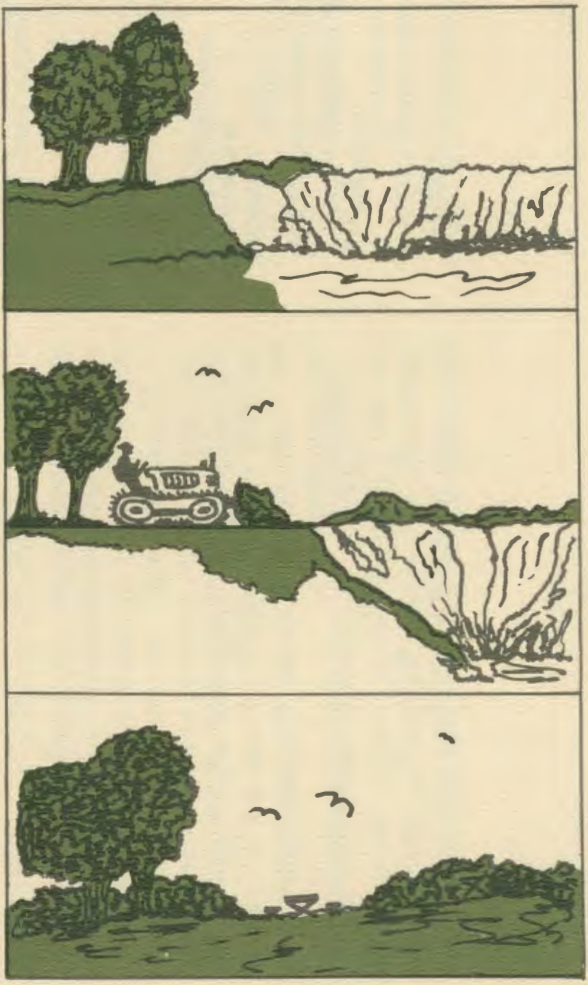

COOPERATIVE EXTENSION SERVICE
SOUTH DAKOTA STATE UNIVERSITY
U. S. DEPARTMENT OF AGRICULTURE

Costs and Returns
of Solid Waste Disposal in Sanitary Landfills

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Most units of government feel that the disposal of solid wastes should be wholly or at least partially a self financing public service. The alternative is for local government to absorb all costs, with revenues collected through taxation.

Assuming that government wants to make the service self financing, what charge per ton of waste handled must be made to cover depreciation on needed equipment, pay operating costs and retire the cost of land used?

Land costs may be in the form of yearly lease charges, land purchased for landfill use that will be sold when the site is full, or land purchased that will be retained for uses such as public parks, maintenance facilities for government equipment, or for some other public use.

This publication contains a method for computing what service charges must be made to retire all disposal capital and operating costs. **Collection costs are not included in this publication.**

A format is provided, showing an example. But since no two situations will be the same, blank spaces have been provided for units of government to insert figures that apply to their situations. The objective is to come up with a **charge per ton** of waste handled that will retire all costs during the life of the site. Knowing this, units of government can then decide if they wish to use this charge per ton and make the service entirely self financing or if they wish to lower the charge per ton and pay part of the costs out of tax revenues.

The example used is the same as the one used in FS 613 where acreage requirements were computed. Table 1 summarizes the **example situation** and provides space for **your situation.**

The example assumes that the land will be purchased by the unit of government and retained for future public use.

Table 1	Example Situation	Your Situation
Population to be served	30,000	
Estimated yield per person per day	4.25 Lbs	Lbs
Yearly yield	23,269 T	T
Acreage needed	30 A	A
Design life of the site	10 Yrs	Yrs

Equipment Costs

Assume for purposes of the example, purchase of a $50,000 compactor to be used at the landfill site 100 percent of the time. A $27,000, 1¾ yard wheel-type loader already owned is allocated to the landfill 20 percent of the time. An 11 yard, $48,000, self loading elevating grader, already owned, is allocated to the landfill 10 percent of its time for stockpiling cover material. Table 2 summarizes equipment needs and annual depreciation charges.

Land and Associated Costs

The example further assumes that land costs $250 per acre for the 30 acres needed, or $7,500. Fencing would amount to $440. Gates, locks and incidentals are assumed at $300, and an operators' shelter with sanitary facilities at $2,400.

Site preparation costs vary from almost zero to a significant figure. If the site is an unobstructed natural depression near an all weather road, costs will be very low. If a tree filled gully a long distance from an all weather road is to be used, costs will be significant. The example arbitrarily assumes $1,000 for this cost.

Table 2
Yearly Equipment Depreciation

	Example Equipment	Your Equipment
Compactor	$50,000.00	$
Wheel-type loader $27,000x$20%	5,400.00	$
Elevating grader $48,000x10%	4,800.00	$
		$
		$
Total equipment value	$60,200	$
Assuming a 10 year life for the example ~~with a 20% reclaim~~ value, yearly depreciation = $\frac{60,200 \times 80\%}{10 \text{ years}}$ =	$ 4,816.00	
Assuming a ____ year life for **your** equipment with a ____% reclaim value, yearly depreciation = $\$\frac{\quad \times \quad \%}{\quad \text{years}}$ =		$

Table 3
Yearly Land and Associated Costs

	Example Costs	Your Costs
Land	$ 7,500.00	$
Site preparation	1,000.00	$
Fencing	440.00	$
Incidentals	300.00	$
Shelter	2,400.00	$
Example Total	$11,640.00	
Your Total		$

yearly land charge = $\frac{\text{total land charge}}{\text{design life}} = \frac{\$11,640}{10 \text{ years}} =$

$1,164.00

your yearly land charge = $\frac{\text{your total land charge}}{\text{your design life}} =$

$\$\frac{\quad}{\quad \text{years}} =$ $

Annual Operating Costs

Principle operating costs are labor, fuel and repairs for equipment. Some billing and bookkeeping cost will be involved, but since they become a part of other bookkeeping needs of the governing unit they are not significant in themselves. A record should be kept for future reference of tonnage or volume handled.

Table 4 gives operating costs as assumed for the example with space for computing your costs.

The cost of a scale is omitted, since many governing boards feel that tonnages can be estimated reasonably well. Some consider adding a scale after some of the immediate costs have been retired.

The basic costs shown in tables 2, 3 and 4 can be inserted in computation table No. 5.

Table 4
Operating Costs

	Example Costs	Your Costs
Personnel—2 men including insurance, social security etc.)	$15,000.00	$
Fuel and lubrication	2,300.00	$
Repairs	5,250.00	$
Insurance	650.00	$
Annual operating costs for example	$23,200.00	
Annual operating costs for **your** operation		$

Table 5
Computation Table

Cost Factors	Example Summary	Your Summary
1. Yearly equipment depreciation (Table 2)	$ 4,816.00	$
2. Yearly land and associated cost		
Using Assumption No. 1 (table 3)[1]	1,164.00	$
Using Assumption No. 2[2]		$
Using Assumption No. 3[3]		$
3. Yearly interest on investment and/or reserve fund[4]		$
4. Annual operating cost (table 4)	$23,200.00	$
Example total annual costs	$29,180.00	
Your total annual costs		$
Income Factors		
Anticipated annual waste yield from the example (table 1)	23,269 T	
Anticipated annual waste from **your** facility (table 1)		$

Charges Needed

Per Ton charges needed to retire all costs = $\frac{\text{total annual costs}}{\text{total annual T}} = \frac{\$29,180}{23,269\ \text{T}} = \$1.254$

Your per T. charges needed to retire all costs

$\frac{\text{your total annual costs}}{\text{your total annual T}} = \frac{\$\_\_\_\_\_}{\text{Tons}} = \$\_\_\_\_\_$

[1]Assumption is that land will be purchased and retained for public use. Usually it is desirable to charge off the land cost to waste disposal, since future use will likely not be revenue producing.

[2]Assumption is that land will be sold after site is complete. Therefore it should be safe to assume a land charge of zero, but an annual charge covering fencing, incidentals and structures should be included.

[3]Assumption is that the land is leased, and the land charge equals the yearly rent paid plus an annual charge for fencing, incidentals and structures.

[4]If the governing body must incur an indebtedness to meet all or a part of the costs involved, obviously the service charge should retire the interest paid on the amount of the debt. Even though an indebtedness is not incurred, some units of government use this technique to built a reserve fund so that money is available for new equipment and land when it must be purchased at a future date (10 years in the case of the example). This technique is common practice in business but is relatively new in government. It is called Capital Improvements Budgeting.

To Buy or Not To Buy Land

The decision to purchase land to keep for public use, to purchase land to sell after the site is full, or to lease land will be influenced by many things such as need for more public use land, availability of land, land costs and perhaps others.

To give some idea of the dollar difference between the alternatives, the example used here has been refigured and is shown in table 6.

Table 6
Buying or Not Buying Land

	Per Ton Charge to break even
Assumption No. 1 (as used in the example) where land is to be retained for public use	$1.254
Assumption No. 2—where land is to be sold after site is completed	$1.222
Assumption No. 3—where land is leased—(a figure of $20.00 per acre per year is used here)	$1.248

Since dollar differences are so small, units of government should be more concerned with their need for public use land than with choosing the least costly alternative.

Determining a Rate Schedule

Computations so far are all in terms of tons. If a scale is purchased the rate schedule is no problem since everything is weighed. If there is no scale, tons must be converted to compacted cubic yards.

Compactor trucks are rated according to the cubic yards they can compact, so this is a simple conversion. The rule of thumb used in conversion is that one cubic yard of compacted wastes will weigh from 800 to 1000 pounds with the 800 pound figure occurring more frequently.

Going back to the example used where the per ton rate was determined to be $1.25, and using 850 pounds per cubic yard for conversion, the break-even rate would be ($1.25 x 850/2000) or $.53 per cubic

yard. This would establish a rate of $6.36 per load for a 12 cubic yard compactor.

In the case of non-compacted loads delivered to the site the rate schedule becomes something of an educated guess.

Most units of government establish a rate schedule for non-compacted wastes based on the size of the conveyance used for delivery. One sanitary landfill's rate schedule for such conveyances is shown below.

1. Small trailers with a rack (about 2 yards)—$.75 per load
2. Large trailers with rack or small pickup w/o rack (about 3 yds)—$1.00 per load
3. Large pickup with rack (about 5 yds)—1.25 per load
4. Small trucks (5 to 9 yds)—$2.00 per load
5. Large trucks (10 to 12 yds)—$2.75 per load

Obviously this rate schedule is a rather arbitrary one established in the hope that, for example, pickup loads of old tires that are heavy and difficult to compact will average out with loads of paper cartons that are light and compact easily.

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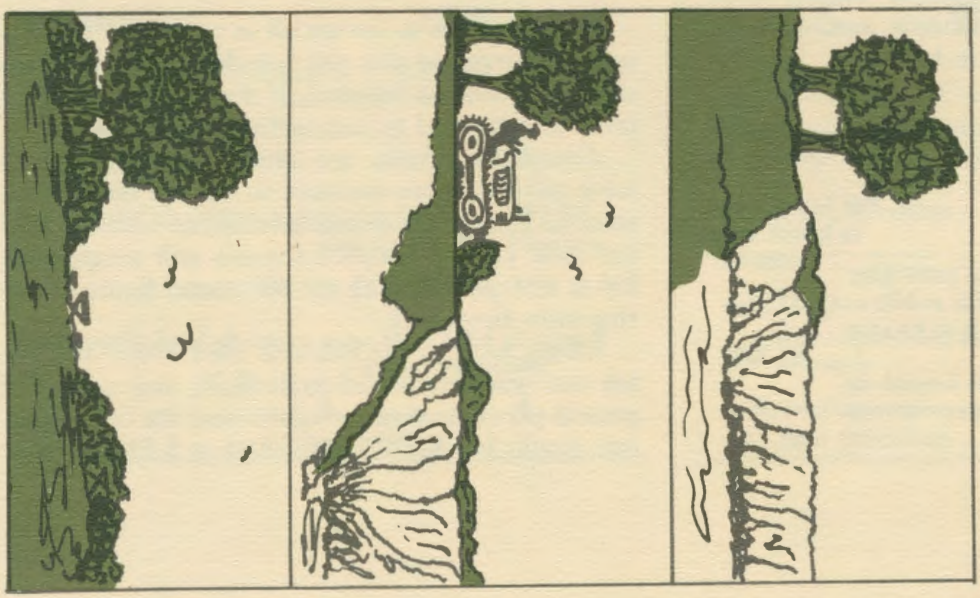

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