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SMALL SCALE WASTE MANAGEMENT PROJECT

**The Cost of Holding Tanks For Domestic
Wastewater**

by

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PREFACE

Research is now in progress at the University of Wisconsin-Madison in response to the need for safe, economic and reliable alternative treatment and disposal systems for domestic liquid wastes in unsewered areas.

The Wisconsin Geological and Natural History Survey, University of Wisconsin-Extension has been working on the problem since 1969, with initial support from the Wisconsin Department of Natural Resources. The Upper Great Lakes Regional Commission made funding available to the University of Wisconsin-Extension since July, 1971 for test-demonstrations. Special research funds were appropriated by the State of Wisconsin in November, 1971 to the College of Agricultural and Life Sciences, University of Wisconsin-Madison, to develop solutions to the problem. The Small Scale Waste Management Project grew out of an integration of these activities.

An important element in considering alternative treatment and disposal systems for household liquid wastes is the cost of such systems to the homeowner. The purpose of this report is to analyze the costs of holding tanks for disposal of domestic wastewater. Much of the data used in this paper was taken from a survey of holding tank pumpers conducted by Duncan Harkin and John Zilber, University of Wisconsin-Extension.

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Geological and Natural History Survey

THE COST OF HOLDING TANKS FOR DOMESTIC WASTEWATER

by

Richard Barrows and Nicolaas Bouwes

Economic growth and increased population in Wisconsin have led to increasing demand for homesites in rural areas. This increasing demand may come from those seeking second-home sites for recreational purposes, from urbanites who wish to live in rural areas and commute to a job in a city, or from residents of rural villages who desire the amenities of open-country living.

Regardless of the reason for this increased demand for rural homesites, disposal systems for household wastewater must be provided in one of two ways: (1) on-site facilities such as septic tank systems or holding tanks; or (2) sewer systems such as those in urban areas. In order to provide public sewer service at a reasonable cost, housing density in an area must be quite high, or housing development must take place adjacent to existing urban areas. If neither of these conditions are met, the alternative of on-site wastewater disposal must be considered.

The fact that public sewers are not economically feasible does not automatically make on-site methods of disposal acceptable. The most widespread method of on-site disposal is the septic tank system. Unfortunately, almost half the state of Wisconsin is not well suited for such systems because of slowly permeable soils, or soils with high groundwater or shallow bedrock. Use of septic tank systems in these soils would threaten environmental quality and endanger public health. This is recognized by State health authorities and consequently where improper soil conditions exist, soil absorption systems are prohibited by State Health Code H62.20.

In areas that are unsuitable for septic tanks, there are two alternative on-site disposal methods--various on-site treatment systems, and the holding tank. The on-site treatment systems include nonwater carriage toilets, water recycle systems, treatment units employing anaerobic, aerobic, or physical-chemical processes, disinfection units, and modified soil absorption systems. These alternatives to septic tanks have been shown, on occasion, to produce higher quality effluents but have not been reliable because of various operational and maintenance requirements. For these reasons, more complex on-site treatment facilities (other than septic tank systems) are not presently recommended, and public health authorities discourage or prohibit their use.

If sewer systems, septic tank systems, and other on-site waste treatment systems are not possible, the only remaining disposal alternative is the holding tank. If an individual homeowner, businessman, or builder is considering installing a holding tank, he must carefully examine the costs of such a system. The costs of holding tank systems may be broken into two parts--initial capital costs of tank and installation, and operating or maintenance costs. These costs will be examined in more detail.

WHAT ARE THE INITIAL COSTS?

In order to install a holding tank, the homeowner must obtain a permit from the local zoning authority, similar to the permit required for septic tank systems. To obtain a permit the homeowner must show proof that the local governmental unit will inspect the tank for proper care and maintenance, and that he has met the State Plumbing Code with respect to holding tank size. The Code states that the tank must be able to store five-days waste at a generation rate of 100 gallons per person

per day. Thus, the tank must have a 500 gallon capacity for each person in the household so that for a family of four a minimum tank of 2,000 gallons capacity would be required.

Since minimum individual tank sizes are regulated by the State Plumbing Code, the costs for a specific household are more or less dictated. The individual can affect his investment cost by choosing a larger tank than required, or by his choice of a steel or concrete tank. Table 1 gives a rough indication of tank costs by various tank capacities and construction material. In addition to these costs, one must include the cost of an overflow warning device which ranges from \$25-\$35 installed.

Finally, the costs of installing the tank must be included. These installation costs will vary greatly according to ground conditions, and several estimates obtained ranged from \$500 to \$1,500. All of these costs will vary with the retail firm and the plumber involved, and the geologic and soil characteristics of the individual homesite.

Table 1. Cost of Holding Tanks for Various Capacities and Construction Materials* (excludes installation costs of \$500-\$1,500) (1973)

Tank Capacity (gallons)	Tank Cost (dollars)	
	Steel	Concrete
1,000	\$ 375	\$ 750
2,000	650	1,100
3,000	900	1,400
5,000	1,300	2,000
7,500		
8,000	2,000	
10,000	2,200	2,500

*These costs are approximations, and may vary in different areas of the state. By comparison, total cost of a septic tank system might range from \$700 to \$1,100 with very little maintenance cost.

A properly installed concrete holding tank may be expected to last 50 years or more, and a steel tank is normally under a 25-year warranty. Thus, when the investment cost is spread over this period the initial costs are quite low relative to the recurring maintenance costs.

WHAT ARE THE MAINTENANCE COSTS?

The major cost of a holding tank system is the cost of periodically pumping the tank. A private hauler (pumper) must be hired to collect the waste from the tank, and he must then dispose of the waste by spreading it on nearby fields, by discharging it into a sewer line, or by transporting it to a municipal treatment facility or lagoon.

The exact costs of collection of holding tank wastes for any household will vary according to several factors. Obviously, the amount of wastewater generated by the family will influence the costs of waste collection. A family which generates 500 gallons of wastewater per day must expect to pay more for holding tank servicing than a family which generates only 100 gallons per day. A second factor influencing costs is the location of the holding tank on the lot, and the ease with which the hauler can reach the tank outlet.

Third, the size of the household tank may influence the cost. If the hauler must make two trips to the home to pump the tank, instead of one, because the household tank capacity is greater than the capacity of the truck tank, the costs of pumping will increase. On the other hand, if the tank capacity is less than the truck capacity, the pumping costs may also increase. For example, if a hauler with a 2000 gallon truck capacity charges a fixed rate per trip to the home, a homeowner with a 2000 gallon tank will pay less per gallon than a homeowner with only a

1000 gallon holding tank.

Fourth, the cost of servicing a holding tank will depend on the number of tanks in the immediate area. For example, if a pumper with a 4,000 gallon tank on his truck can pump two 2,000 gallon household tanks which are located only a few feet apart, the costs per household may be less than if the holding tanks were located several miles apart. Fifth, the costs of servicing the household holding tank will depend on the size of the hauler's truck tank. The size of the truck tank determines how many household holding tanks can be serviced on a single trip from the disposal site.

Sixth, the servicing costs will depend on the distance which the hauler must travel to dispose of the wastewater. The distance between collection and disposal sites will influence costs because of the time required to travel between the home and the disposal site, and the costs of operating the pumping truck. These six major factors influencing the cost of collection of holding tank wastes mean that each homeowner may be faced with different service costs, depending on his specific situation. No single estimate of the cost of collecting and disposing of holding tank wastes can be stated.

Even though an exact cost cannot be given to cover all cases, it might be possible to state a range of costs based on the experience of homeowners who utilize holding tanks. However, there is no available data which report the costs of pumping holding tanks at various homesites. Nevertheless, it is possible to calculate some approximate costs to homeowners, based on the charges and experience of holding tank pumpers. A 1972 survey of holding tank pumpers indicated the following charges:

Table 2. Costs of Servicing Holding Tanks
in Selected Counties in Wisconsin
(1972)

County	Size of Truck Tank (gallons)	Disposal Site	Costs per Gallon (cents)
Kenosha	1200 and 3100	city treatment plant	0.8-1.5
Clark	1800	nearby field	1.0
Sheboygan	1500	nearby field	1.0
Door	1100	nearby field	1.0
Door	1500	nearby field	1.0
Fond du Lac	850	nearby field	1.0
Kenosha	3200	farm	1.0-1.7
Sheboygan	1500	nearby field	1.5
Kenosha	1500	nearby field	1.6-2.0
Winnebago	1200	nearby field	1.6-2.2
Winnebago	1300	nearby field	2.0
Sheboygan	1000	nearby field	2.5-3.0
Door	850	nearby field	12.0
Milwaukee	varied from 1500 to 6000	city sewers	depends on holding tank size: 1000-1500 gal. 2.0 3000-4000 gal. 1.0 5000-10,000 gal. 0.8

The servicing costs per gallon range from 0.8 cents to 12.0 cents. One operator has estimated that under the best conditions, he might be able to service tanks for 0.3 cents per gallon. With the exception of this extremely optimistic estimate, and the extremely high charge of 12 cents per gallon, most of the operators charge between 0.8 cents and 2.5 cents per gallon, and these charges are fairly similar for different counties. But the important question is: How much will holding tank servicing cost the individual homeowner? Assuming a waste generation rate of 50 gallons per day per person (a realistic assumption), the following annual costs per household may be estimated:

Table 3. Annual Cost of Servicing Holding Tank Per Household
(Based on generation rate of 50 gallons per day per person)*
(1972 prices)

Number of Persons in Household	Annual Cost if Service Charge is:	
	0.8¢ per gallon	2.5¢ per gallon
2	\$292	\$ 912
3	\$438	\$1368
4	\$584	\$1825
5	\$730	\$2281

* It is possible that with extremely rigid water-saving practices, the waste generation rate could be cut to 25 gallons per day per person. These practices would include elimination of home washing machines and garbage disposals, decreases in the number of toilet flushes per day, decreases in flush tank capacity, other low-flow water fixtures, and similar conservation efforts.

It is important to remember that these cost estimates are not based on a survey of homeowners, but on the charges of holding tank plumbers, and estimated waste generation rates. These cost estimates suggest that it may be quite expensive for the average family to consider a holding tank for a year-round residence. If the home is only occupied seasonally, it may be easier for the family to pay the servicing charge.

Most of the cost estimates given by haulers for servicing holding tanks are based on the availability of nearby farmland for wastewater disposal. Changes in disposal alternatives could greatly affect the cost of servicing holding tanks. The two major elements in disposal costs are: (1) the labor time required for the hauler to drive to the disposal site and pump the waste from his truck; and (2) the cost of operating the truck

from the home to the disposal site.¹ These disposal costs may be of critical importance to holding tank owners if state regulations are changed to require haulers to transport holding tank wastes to municipal treatment facilities or lagoons.² Any increase in the distance over which the wastes must be transported will increase the cost of holding tank servicing for the household. The increases in costs for a household would depend on how often the holding tank must be pumped, and how far the wastewater must be hauled.

A simple example may illustrate the range of these potential cost increases. In this example the initial pumping costs are assumed to be one cent per gallon, with no transportation cost since disposal is assumed to take place on nearby fields. Thus, for a 5,000 gallon tank the costs for pumping would be \$50.00, with no transportation necessary. If regulation changes required disposal at a municipal treatment facility the costs would increase. If, for example, the hauler were required to travel an extra 8 miles in order to dispose of the wastewater at a cost of \$.40 per mile, the increase in cost would be \$3.20 or approximately 7%. For a 1,000 gallon tank the initial costs would be \$10.00. If the hauler were required to travel 24 miles in disposing the wastewater, at a cost of \$.40 per mile, the cost increase would be \$9.60 or 96%. For other combinations of tank size between 1,000 and 5,000 gallons, and distances between 8 and 24 miles, the percentage increase in cost ranges between the extremes of 7% and 96%.

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1. The hourly cost of labor and truck operation have been estimated at \$12.00 in Door County, \$12.50 in other northeastern counties, \$10.00 in Clark County, and \$15.00 in Sheboygan County. Using \$12.00 as an average and an average truck speed of 30 m.p.h., the cost of hauling wastewater is approximately \$.40 per mile (based on 1972 prices).
 2. Many public health experts feel that disposal of holding tank wastes on open fields may present a health hazard, particularly when the soil is frozen or saturated and runoff is likely.

The potential increases in servicing costs due to changes in state regulations should be considered in making a decision on installation of a holding tank.

In summary, the landowner who wishes to build on land that is not suited for septic tank systems and is located far from municipal sewers is faced with a difficult problem. Complex on-site treatment facilities (including modified septic tank systems) are not recommended, or are prohibited by public health regulations. Holding tanks may be prohibitively expensive for a permanent residence. Under these conditions, an individual might consider postponing his building plans until such time as new technologies are developed for management of liquid wastes, or select an alternative homesite in an area in which septic tank systems function properly.