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INTER-COUNTY DIFFERENCES IN COST OF COMPLIANCE
WITH MICHIGAN'S SOLID WASTE MANAGEMENT ACT

By

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INTRODUCTION

Background

Prior to 1970, solid wastes¹ from both industrial and residential sources were either burned or disposed of in dumps. Such practices were acceptable since the vastness of the United States supported the notion that land was an abundant resource to be used for the remnants of our production and consumption activities. This attitude encouraged haphazard, land intensive disposal techniques: the cost of land was low enough and the supply of land appeared great enough to justify disposal on land.

Until recently, there were few incentives to seek alternatives to this practice. In the last decade, solid waste management has become a serious problem to which state and local governments must devote substantial attention. Not only have the costs of land, labor, and energy increased, but the supply of land suitable for waste disposal has diminished.² The increasing volume of solid waste generated attributable to both population growth and the availability of convenient

¹ Excluding hazardous wastes.

² Environmental Quality, 1979.

disposable packaging for many consumer goods magnifies the disposal problem. In 1978, the average level of municipal waste generated per person was 3.85 pounds per day or 1,400 pounds per person annually.³ If Americans continue to improve their standard of living, this level is expected to rise. Changes in tastes and in the composition of the labor force also contribute to the increase in waste generation. Higher wages and the desire for more leisure have increased the demand for convenience goods. The influx of women into the labor force has also altered the preference for disposable goods. For example, one may choose a disposable plastic butter tub to avoid washing a butter dish, and disposable cigarette lighters and ballpoint pens have substituted for the traditional refillable, reusable version of these items. The list is endless. Hence, the problem of where to dispose of solid waste safely and conservatively has evolved as a primary concern to local governments. This issue became critical when it was recognized that leachate⁴ from existing disposal sites had the ability to contaminate surrounding water posing a threat to human, animal and plant life.

The threat stimulated a new environmental awareness and acted as a catalyst for the creation of stronger, more comprehensive regulations concerning solid waste management.

³ Environmental Quality, 1979.

⁴ Leachate is defined as a liquid that has emerged from the solid waste containing soluble or suspended materials removed from the waste.

The Resource Conservation and Recovery Act, 1976, established the goal of complete elimination of open dumps and the upgrading of other disposal methods to meet federal standards. It required that all states create a solid waste management plan to fulfill this goal. However, it has been predicted that the cost of solid waste disposal would nearly double in some areas due to the new regulations, or increasing from an average of \$5.39 per ton to about \$10.00 per ton (excluding collection costs).⁵

In an effort to conserve land and mitigate the increasing costs of solid waste disposal, local governments are seeking less costly alternatives to landfilling as a method of solid waste disposal. Waste processing and recycling techniques which were too costly in the past are now economically viable in some situations. For example, trash-to-energy facilities convert solid waste to energy by burning in electric utility boilers,⁶ thus reducing the cost of energy generation and also reducing the volume of waste which must be buried in the ground. However, the utility boilers must already exist since boilers constructed exclusively to burn refuse for energy would not produce a competitive energy source. Hence, such a technique is not feasible in all situations.

Heavier, non-combustible materials, such as glass and

⁵ Environmental Quality, 1979.

⁶ Environmental Quality, 1979.

metal, can be recovered and used again as productive inputs if there is a market which demands these items. Such markets are likely to occur in highly populated industrial regions where the supply of refuse is great and land for disposal purposes is scarce. Under these conditions, resource recovery is gaining acceptance as an economically viable alternative to landfilling. Not only does this technique reduce the amount of refuse to be buried, but also can provide revenues from the sale of the materials. Where markets are not available for recovered materials, the refuse is buried.

To reduce refuse volume and encourage recycling without reliance on private markets for recovered materials, legislation such as the Michigan "bottle bill" has proven effective in providing incentives to recover resources. This bill requires the consumer to pay a deposit for beverage containers to encourage return for reuse. Similarly, incentives to minimize packaging for consumer goods (e.g., cosmetics) and the return to reusable rather than disposable products can also contribute to a reduction in waste generation. However, encouraging such action would not be a function of state and local government solid waste planning, since implementation would be more appropriate at a national level.

State solid waste plans must offer flexibility so that local governments can choose a waste management system suited to their specific needs. As indicated above, the economic feasibility of a given system depends upon the characteristics

of a waste generation district.⁷ It is the purpose of this paper to examine the Michigan Solid Waste Management Act, Public Act 641 of 1978, which was developed to comply with the aforementioned Federally mandated requirement for state solid waste planning. The Act directly controls all aspects of solid waste management in order to protect natural environments from the deleterious effects of improper disposal practices. Specifically, the Act 1) regulates the construction and operation of landfills, processing plants, and transfer stations; 2) controls the licensing of waste hauling vehicles; and 3) certifies local health departments to act as the administering agency for Act 641. The Act places responsibility on local governments beginning at the county level to assure that solid waste management is conducted according to the guidelines of Act 641.

Compliance with Act 641 rules involves adjustments in current disposal practices which implies changes in the costs of disposal activities. Since waste disposal facilities differ from county to county, one could presume that costs of compliance will also differ between counties. This paper will evaluate the differential burdens between counties attributable to compliance with Act 641. The study will explain the constraints faced by a county in meeting Act 641 guidelines which will inhibit realization of the objectives

⁷ A jurisdiction or a collection of jurisdictions utilizing a single disposal facility.

of the new Act. In other words, Act 641 is designed to control solid waste management such that natural environments are protected, although fulfillment of this goal may be constrained for various reasons, where the severity of the constraint is expressed as the cost of compliance.

Concentrating on landfill regulations to illustrate the compliance burden of the entire Act, the objectives of this study are:

- To identify the variables which will differentiate counties according to costs of compliance with the landfill regulations;
- To evaluate how differences in compliance costs among counties will inhibit fulfillment of the goals of Act 641.

This information should be useful to policy makers when ascertaining the constraints to policy objectives and when attempting to correct imperfections in policy design.

Description of Public Act 641

The new Solid Waste Management Act was designed to correct the problem of land misuse due to improper disposal practices. The previous law, Public Act 87, did not provide adequate control over the construction and licensing of disposal facilities resulting in disposal practices that were environmentally damaging. The new Act requires a construction permit for all facilities and then certification that the facility has been developed according to approved plans. To

facilitate the certification process, Act 641 grants authority to local health departments to perform certification evaluation. The added costs of administration for this process is partially financed by application fees for the site and for the transfer station and facilities. These fees have increased substantially from those prescribed in previous legislation, and local governments are concerned since they are no longer exempt from the fee system. The inclusion of local governments was in response to private waste disposal interests who felt that municipalities had an unfair advantage over private enterprise. The measure was designed to merge the efforts of both private and public interests in order to solve the problem of waste disposal.

Site location and design are regulated for both new and existing facilities. Existing disposal sites must be upgraded to meet certain standards. All must have an approved hydrogeological monitoring system. This includes monitoring wells designed to assure that landfills do not contaminate the groundwater. A minimum of three wells is required.

The future use of the disposal site is regulated by a restrictive deed covenant. This assures that owners of land used as a disposal site cannot engage in filling, grading, excavating, drilling or mining for 15 years after completion of the landfill without authorization from the Department of Natural Resources. The covenant also provides a mechanism to inform subsequent owners that their land had been used as a landfill.

The covenant enhances control over the land in order to prevent damage to surface contours that could instigate a ground or surface water pollution problem. Building construction is also monitored since landfill gases, if ignited, will explode and destroy surrounding structures.

If problems do occur from failure to comply with waste management guidelines or improper facility termination, the surety bond requirements have been increased from a minimum of \$500 to \$4000 per acre. The increase takes into account the costly nature of land mismanagement and encourages compliance with the rules.

One of the major changes in the Act is the requirement of government responsibility in assuring that solid waste be removed from the site of generation to a licensed disposal site. In other words, a local government must assure that disposal facilities are available for its constituents. Local government is also responsible for developing a solid waste management plan beginning at the county level. However, the Act allows planning to be conducted by other levels of government if the county wishes to defer obligation.

The Issue in Perspective

Waste generation is a natural and expected outcome of productive activity. Waste is produced, much like any other commodity, although rather than considering waste as a 'good' where more is preferred to less, we would tend to consider waste as a 'bad' -- less is preferred to more.

However, it is also true that waste supply is an increasing function of production (consumption) and that if we prefer more consumption to less, we must accept the production of more waste. The point here is that waste disposal is a cost which in aggregate increases with the demand for productive activity; it is a cost which is assigned to both producers and consumers in the form of a trash removal fee. However, as a cost of production, one would expect that disposal fees are passed on to consumers in the prices they pay for goods. Hence, disposal fees in general are borne by consumers, either directly as residential disposal fees or indirectly through prices of goods and services.

When waste disposal is performed unsatisfactorily, an additional cost is imposed: the cost of pollution.⁸ The burden of this cost often escapes those who are responsible, since disposers interested in maintaining a competitive position will transfer the pollution cost to the public in general or to future generations. The issue here is not merely a problem of cost allocation, but rather a conflict in interests over the use of a natural resource -- namely, groundwater.

Waste disposal requires land as an input. To simplify the discussion, consider land as a container to hold waste.

⁸ The cost of pollution is understood to be the cost of repairing environmental damage, the health hazard imposed on humans, plus the value of natural resources destroyed from pollution.

This same land may also be a container for groundwater, although these two uses of land are mutually exclusive where proper disposal techniques are not utilized. In other words, we have a situation where the disposer has the right to utilize the land for disposal activities, and the public has the right to safe drinking water and uncontaminated soil. But where rights conflict, it is necessary to protect one of the interests (Samuels, 1974). Under Act 641, the right is assigned to the public, thereby prohibiting the waste disposer from interfering with the groundwater. Hence, the waste disposer is legally constrained from creating an externality; that is, from imposing pollution costs on others. One can argue, then, that a mechanism to protect a natural resource is property rights assignment, or as Demsetz points out, "a primary function of property rights is that of guiding incentives to achieve a greater internalization of externalities" (Furubotn and Pejovich, 1974).

This is precisely the purpose of Act 641: to alter the incentives in managing solid waste by regulating disposal practices where regulation is recognized as the functional equivalent of rights in protecting interests (Samuels, 1978). The Act standards directly control the behavior of waste disposers, thereby limiting their activities to those that are environmentally safe. However, regulation and the implicit reassignment of property rights necessarily impose a redistribution of costs.

Although the Act regulates all facets of solid waste

management, this study is confined to an examination of sanitary landfill regulation and the costs incurred by the county in conforming to these regulations. It is the hypothesis of this study that costs will not be distributed evenly between Michigan counties, but rather, will be a function of the degree to which a county can meet Act 641 standards, subject to certain constraints. Since a major objective of Act 641 is to regulate landfills, the author considered the analysis of this facet of the Act indicative of the economic ramifications of the entire Act. However, where regulatory changes in other waste management activities are particularly significant to this study, implications will be noted.

Part I describes the methodology used in this study, Part II describes the variables which contribute to cost differentials among counties, Part III examines the costs involved for a county to comply with Act 641 landfill regulations, Part IV discusses the current state of compliance for Michigan counties and the various constraints faced by county groups which contribute to high compliance costs, and Part V is a brief summary and conclusion.

PART I

METHODOLOGY

The county was chosen as the appropriate unit of analysis since Act 641 relegates authority to local governments (beginning at the county level) for developing the solid waste management plan, and assigns responsibility to the county for providing solid waste disposal facilities. Also, most counties contain a landfill(s) to be used by a group of smaller jurisdictions within that county.

An examination of the proposed rules⁹ for Act 641, governing sanitary landfills, suggests that compliance costs¹⁰ will be a function of the hydrogeological characteristics within the county and of existing landfills, as well as population size and volume of waste generated. In very simple terms, hydrogeological characteristics consist of soil type, slope, depth to water table and soil permeability. In order to comprehend the specific hydrogeological

⁹ The final rules had not been approved as of January, 1981.

¹⁰ Compliance costs are defined as the financial burden to the county due to required provision of disposal facilities. Where private interests provide disposal facilities, compliance cost is the unit increase to consumers. Where the county is responsible, the compliance burden is the drain on local resources.

characteristics of Michigan counties, soil survey maps were evaluated in terms of the above mentioned characteristics.

A summary of solid waste problems for each of the 83 counties in Michigan was obtained from the Department of Natural Resources revealing population, waste generation per day and landfill status. With this information, counties were divided into three groups according to population:

Group 1 - Population greater than 500,000

Group 2 - Population greater than 100,000 but less than 500,000

Group 3 - Population less than 100,000

Three case study counties were chosen from Group 2 to represent hydrogeological differences among populated regions in Michigan. Group 3 was divided according to degree of current compliance to represent cost burden differences among rural counties.

To gain a better understanding of the effects of the new rules on specific landfills within the case study counties, a survey of 17 disposal sites was conducted. Eleven responses were received providing data on landfill size, type, life expectancy, volume per day and soil type. Further information pertaining to landfills in the case study counties, as well as cost information for specific upgrading activities, was provided by the Department of Natural Resources. Cost data from one private landfill owner was also obtained.

Lack of specific data, and the unavailability of information on all county landfills, prohibits the calculation of

dollar values to measure a county's total compliance cost. Hence, this study attempts to analyze how compliance costs (in general) differ among counties and the economic implications of the non-uniform cost distribution.

PART II

VARIABLES WHICH CONTRIBUTE TO COST DIFFERENTIALS

In general, the compliance cost to a county depends upon the current level of compliance for existing landfills, the capacity of these facilities, and the costs of acquiring new facilities (if necessary). Since all counties have their own unique characteristics, degree of current compliance is expected to be different for each county. Therefore, compliance costs will be non-uniform.

Differences in Ability to Comply

The degree to which an existing landfill complies with Act 641 depends upon the construction and operation of the fill at present, compared to the prescribed construction and operation; or, in other words, the degree to which the groundwater is protected from leachate contamination. However, due to differences in hydrogeology, two landfills may be identical in construction and operation, yet exhibit very different degrees of compliance.

For some existing non-compliant sites, upgrading will consist of minor engineering modifications, such as construction of monitoring wells or alteration in top cover procedures. However, for other sites, compliance may be literally

impossible or so costly that it would not be economically feasible to perform the modification. For these sites, termination is inevitable.

Where existing sites must be terminated, the county is responsible for assuring that disposal facilities are available through either public or private provision. Constraints exist due to land availability and suitability, public acceptance of site location and to financial constraints. In some cases, counties must seek disposal facilities in neighboring counties. Where this is the solution, transfer stations must be constructed to collect and store the waste.

The variables which contribute to compliance cost differentials among counties can be categorized as follows:

- Characteristics of Existing Landfills: Size, Hydrogeology, Volume Per Day

The cost of upgrading an existing landfill will be an increasing function of size. The larger the landfill, the larger the monitoring system required. Hydrogeological characteristics will determine whether the landfill can meet Act 641 requirements after upgrading. The depth to the water table and soil composition are important factors in determining landfill suitability. Landfills located in permeable soils must utilize a liner to prevent exit of materials from the landfill. Landfills constructed on clay, a natural liner, avoid the cost of an artificial liner. Waste volume is important since the economies of scale characteristic of sanitary landfills will influence the

variable cost of upgrading the facility (see Appendix I).

Low volume operations may find upgrading costs too high, such that price increases to consumers will deteriorate their competitive position relative to larger landfill operations.

- Availability of Other Sites: Land Availability, Land Suitability, Public Acceptance

For counties which do not have landfill capacity to meet their needs, new facilities must be acquired. As mentioned above, a landfill located on impermeable soil will be less costly to build and maintain than a similar facility on permeable soil. However, favorable land may not be available due to zoning, proximity to residential property, or the refusal of property owners to sell. Public acceptance is also a constraint to acquisition of suitable land. Under these constraints, landfill construction may not occur under the most ideal and least costly conditions. Costs will be greater if: 1) the landfill is located on less suitable but available land, or 2) the landfill is located on suitable land which is at great distance from the point of waste generation. In the latter case, hauling costs would contribute to the higher cost.

- Information: Population Trends, Composition of Waste, Soil Composition and Geology

Decisions to upgrade or construct new facilities must consider future needs. For example, a county experiencing a decline in population may choose to upgrade an existing facility rather than constructing a new facility with twice

the life expectancy. Information concerning population growth trends would help the county comply in the least costly manner. Since industrial and residential wastes are not considered homogenous, knowledge of the composition of waste will be important in determining the type of landfill to construct. Also, data concerning soil composition and geology in a county is necessary for site location and upgrading activities. For some counties, the collection of this information will be an added compliance cost.

- Existence of Other Facilities: Resource Recovery, Joint-County Facilities

Counties may be able to minimize their overall compliance cost by implementing recycling programs or by cooperating with other counties to take advantage of scale economies in solid waste management. As indicated above, resource recovery (recycling) is feasible where waste generation is great and where markets are available to purchase recovered materials. In general, this system would reduce waste management costs in densely populated regions. Joint-county facilities have been successful in reducing costs for rural counties. Three such facilities are currently operating in Michigan, and all are expected to comply with Act 641 rules pending minor modifications.

PART III

OVERVIEW OF MICHIGAN'S SOLID WASTE PROBLEMS -- THE CONTRAST BETWEEN URBAN AND RURAL COUNTIES

Of the 83 counties in Michigan, 64 have either existing landfills which do not meet Act 641 standards or the life expectancy of a compliant landfill is less than two years. For many rural counties, open dumps are utilized instead of landfills since the unpleasant characteristics of the dumps exist at great distances from households. However, Act 641 prohibits open dumps, and, therefore, counties are required to provide an alternative facility for waste disposal.

Landfills in rural counties are generally owned and operated by the county, although hauling service to the site is typically private. Hauling costs are higher than in more densely populated counties, due to the great distances between homes, and, therefore, many rural dwellers find it more economical to do their own hauling. To take advantage of scale economies,¹¹ joint county sanitary landfills are

¹¹ The waste disposal industry displays economies of scale: the fixed cost of operating a landfill is high, and the greater the volume of waste collected, the lower the unit cost. This characteristic also applies to the hauling of waste to the landfill. For a truck that is loaded below capacity, the marginal cost of transporting an additional household's waste (along the same route) is very low.

becoming an attractive alternative to in-county landfills.

More densely populated counties may have several landfills -- both public and private, although the tremendous amounts of waste generated in these counties limits the life expectancy of the site. Acquisition of new sites is constrained due to the publics' apprehension to reside near a landfill. (Since the standards of Act 641 are designed to eliminate the possibility of groundwater contamination, the publics' apprehension may be relaxed somewhat, expanding the availability of possible sites. Whether this will actually occur will not be evident for some time.)

In many cases, a densely populated county may find it economically feasible to process or recycle certain types of waste, thus reducing the amount which must be buried. Again, these operations are subject to scale economies and require large volumes of waste to make processing feasible.

Compliance Cost Differences Among Counties¹²

All counties were grouped into three population categories to separate the rural from the urbanized counties. Group one consists of Oakland, Wayne and Macomb counties. The great industrialization and population density of these

¹² Since Act 641 rules have not been finalized as of January 1981, the Department of Natural Resources has licensed some non-compliant facilities, provided they do not pose threats to human health and have intentions of upgrading their facility.

three counties suggest specific and complex problems faced by highly urbanized areas. Since these counties represent extremes, no attempt was made to investigate their compliance cost situation. These counties transport their waste to other surrounding counties which confuses the identification of compliance costs on a county basis.

Group two includes 14 counties with significant urbanization, yet enough open land for in-county landfills. From this group, 3 case study counties were chosen to represent differing hydrogeological conditions in Michigan. The counties chosen were Ingham, Kalamazoo, and Muskegon.

Group three consists of 66 sparsely populated counties. Rather than selecting case study counties from this large group, counties were divided into 3 categories according to degree of current compliance. Cost differences to reach full compliance could then be discussed in terms of a representative county.

Case Study Counties

The criteria for selecting the case study counties from group two were similarities in population size and county area (to control for residential waste generation), but differences in hydrogeological conditions. The landfill situation was examined in each county to determine the ramifications of Act 641. Again, this analysis does not attempt to assign dollar values to measure a county's total compliance burden, but, rather, synthesizes the information gathered to

Compliance Problems in Counties With Population
Between 100,000 and 500,000

	Degree of Current Compliance			
	Number of Counties			
Compliance Constraints	High	Medium	Low	Total
no major problems	3	1	1	5
some problems	0	5	2	7
severe problems	0	0	2	2
Total	3	6	5	14

Compliance Problems in Counties With Population
Less Than 100,000

	Degree of Current Compliance			
	Number of Counties			
Compliance Constraints	High	Medium	Low	Total
no major constraints	15	4	4	23
some constraints	5	17	13	35
severe constraints	0	2	6	8
Total	20	23	23	66

Sources: Department of Natural Resources and the Soil Conservation Service.

make general comparative statements about compliance cost differentials.

Ingham County Population: 289,000 Area: 559 square miles

There are currently two landfills in Ingham county: one is utilized exclusively by a private hauling company and the other is open to the public. Both individuals and municipal haulers utilize this site. It is located on natural clay soil and covers approximately 90 acres and has a life expectancy of 10 years. Natural clay is the least permeable soil, and is considered a suitable liner. Top cover is also available on site which implies that no hauling of soil from other areas is required.

In order to comply with Act 641, the site required upgrading. But since the site is located on clay, modifications consisted of the construction of 11 monitoring wells. The tipping fee (charge) increased by 15% to cover the upgrading costs. The private facility has undergone the same modifications.

Ingham county is also serviced by a sanitary landfill in Clinton county. As these landfills reach capacity, new sites must be constructed. Hydrogeological conditions are favorable in this region, although constraints exist due to public opposition to landfill location. Clinton, Ingham and Eaton counties have discussed the possibility of a resource recovery facility to reduce the volume of waste and, hence, increase the life expectancy of existing sites.

Kalamazoo County Population: 222,000 Area: 562 square miles

Information on all waste disposal facilities in Kalamazoo county was obtained from the Kalamazoo Board of Commissioners. Three survey responses were received from landfill operators. Of the six public landfills in this county, two are still in operation, but require upgrading to meet Act 641 requirements. The other four were closed due to the Act. One in particular is a proven groundwater contamination source.

A fairly large landfill which services households only (no haulers) was closed due to inadequate cover and the ponding of leachate. The landfill is located on sandy clay, and therefore requires some type of liner -- either natural clay, which would be hauled in, or a PVC liner (plastic). Before closure, the landfill was open only on Saturdays, April to November. Due to limited operation, the revenues from this fill were relatively low compared to a fill that services haulers and is open daily.

The owner felt that Act 641 requirements were too stiff and refused to spend the money required for monitoring wells and the liner. Hence, the site was closed.

A rough approximation of compliance costs for this landfill are as follows:

3 monitoring wells	\$10,000
PVC liner with 2 feet of sand	17,800/acre
leachate collection system	1,000/acre
leachate treatment	500/year
	<u>\$29,300</u> for one acre,
	first year

This figure does not include normal operating costs, but

illustrates the initial capital outlay just to reopen the facility. For this particular fill, it is not economically feasible to upgrade unless volume could be increased.

Before closure, the fill collected 110 cubic yards per Saturday. Assuming the charge was \$1.50/cubic yard, this amounts to \$5,280 collected in revenues per operating year -- a sum which is not sufficient to cover the operating costs of a compliant site.

The largest licensed public facility in Kalamazoo county is publicly owned and operated. It is a natural clay site, although cover material must be hauled in. Three monitoring wells have been installed thus far. The present operating cost is \$25,000/year, most of which is the cost of top cover. The site could operate at current levels until 1990, although it is only licensed until 1982, at which time further modifications are required. However, an increase of 25% or more due to additional requirements will cause this facility to close. It has been suggested that privately operated facilities would be a feasible alternative to county owned facilities.

Most of Kalamazoo's waste is being transferred to landfills in surrounding counties. Site location in Kalamazoo is a major constraint due to hydrogeological conditions and public opposition. Considering the contamination problems of the past, it is unlikely that an in-county facility will be approved. A joint resource recovery system is being considered by Calhoun and Kalamazoo counties, although at

present, Kalamazoo county is faced with the costs of cleaning contaminated natural resources from terminated landfills and testing residential wells.

Muskegon County Population: 155,000 Area: 501 square miles

Muskegon county is serviced by two private and one county owned landfill. The capacity of these landfills is extensive -- well over 300 acres combined, although each has geological problems. All are located on sandy soil, and utilize special liners to prevent groundwater contamination.

In order to comply with Act 641, these sites must have a clearance of 12 feet from the top of the liner to the groundwater level, or 7 feet from the top of the liner to the depressed groundwater level. To depress the groundwater level, a trench is dug around the fill to interrupt the original water table. The groundwater beneath the landfill will then flow into this trench. This water is monitored for leachate contamination, and if found unpure, could be sprayed onto the fill where it would evaporate.

Lowering the water table in this manner is not terribly costly compared to terminating these landfills and constructing new ones. However, even with a lowered water table, the minimum vertical distance requirement may not be met. A variance¹³ could be submitted in this case, thus waiving the vertical isolation requirement (if approved). Upgrading of

¹³ A variance allows the waiver of certain rules under exceptional circumstances.

these sites is being delayed until the rules have been finalized.

It would be advantageous for Muskegon county to be able to use these sites since the capacity is so great: these three fills alone could satisfy the needs of Muskegon county for over 30 years. If the geological problems with these sites can be overcome, the cost increases required for a compliant facility would be much less than if the sites were terminated and new facilities constructed. In anticipation of future waste disposal needs, Muskegon, Ottawa and Kent counties are exploring the possibility of a tri-county resource recovery system.

No specific cost information was available for this county. Constraints are hydrogeological in nature and costs will depend upon the fate of the existing facilities (see Appendix I).

Summary of Case Study Counties

In Ingham county, disposal fees increased 15% due to Act 641 attributable to the required monitoring system. The landfills are already in compliance since capital was available to make the appropriate modifications. The fills are owned and operated by a large private construction company engaged in the waste disposal business. The site is "ideal" since no liner is necessary and top cover is available on site. In other words, this is a low cost, high volume operation which contributed to minimal compliance costs.

In Kalamazoo county, there is an indication that neither small private operations nor county operations are financially able to meet compliance costs. High groundwater levels and permeable soils require major engineering modifications for existing landfills. Presently, Kalamazoo county cannot meet its disposal needs. Poor performance in the past, resulting in groundwater contamination, mitigates the possibility of an in-county facility. A joint-county facility with transfer stations is one alternative, although county resources for public works have been utilized for contamination correction activities. There is an indication that the Kalamazoo county government would prefer a private company to provide waste disposal facilities, although public opposition to location may dissuade any investment by private parties.

The compliance costs for Kalamazoo county depends upon the particular disposal alternative chosen. Even if the county can finance the upgrading of its existing facility, another facility is necessary to meet the needs of the county. Alternatives are:

- New landfill, county owned
- New landfill, privately owned
- Joint county facility

Unlike Kalamazoo, Muskegon county has existing facilities with extensive capacity. However, compliance for these particular sites is limited due to unfavorable hydrogeological conditions. Engineering modifications would not totally correct the situation to meet requirements. Closure of these

facilities and construction of new landfills would be very costly. For this county, cost of compliance will depend on whether these sites will be granted an operating license without fully meeting the Act 641 requirements.

Compliance Cost Differences Among Rural Counties

Within group three, 16 counties have facilities which can meet Act 641 requirements with minor engineering modifications. These counties can provide for their disposal needs for at least 5 years; nine of the counties can provide landfill space beyond 5 years. Cost increases for these counties can be attributed to the required construction of monitoring wells -- few are required to reline their facility.

Conversely, 21 counties have no potential sanitary landfills. Nineteen of these counties utilize open dumps as the primary method of waste disposal. The few existing landfills in this group cannot meet Act 641 requirements, and, therefore, must be closed.

Costs to these counties are extensive and, in many cases, local funding is not available for preliminary assessment, not to mention the construction of new facilities. Moreover, counties with no existing landfill do not own the machinery necessary to operate a compliant disposal facility. Hence, landfill construction for this group would entail capital outlays not normally associated with construction of a new site.

The remaining 28 rural counties can be characterized as

having at least one licensed facility. Most will meet requirements after engineering modifications, although others are allowed to operate only temporarily and will not meet Act 641 standards. These latter sites will be closed.

Under existing conditions, these counties can provide for their disposal needs for a maximum of 2 years. Costs for these counties will include the provision of a new facility and the upgrading of existing facilities. The cost burden will depend on the type of facility provided. Some counties may engage in construction of a joint county facility, while others may operate transfer stations and haul the waste to surrounding counties.

Summary of Rural Counties

The 66 rural counties were divided into three groups: those with adequate facilities for at least 5 years (provided the landfills are upgraded to meet requirements), those with licensed facilities, but where new facilities are required within 2 years, and those where no licensed sites are present.

Site location for new facilities in these counties is not a major constraint. Although the group of 66 rural counties exhibit differences in hydrogeology, a favorable site (impermeable soil and/or a deep water table) can be located in each county.

For those counties with adequate facilities, compliance costs would be the cost of upgrading the landfill. This will

depend upon the size and hydrogeological characteristics of the facility. For the remaining counties, provision of a disposal facility is necessary in the very near future. The cost to a county which previously operated a landfill will be less than the cost to a county which relied upon open dumps, since the former presumably has the capital equipment required to operate a landfill.

PART IV

THE POLICY IMPLICATIONS OF DISPROPORTIONATE COMPLIANCE BURDENS

Before discussing the policy implications of Act 641, some comments are in order concerning the general economic ramifications of the new Act. The regulations will increase the costs of disposal activities, which will be reflected in higher residential trash collection fees and possibly in higher prices of consumer goods and services. For businesses which operate their own landfills, such as chemical or paper manufacturing firms, compliance will increase the costs of production which will be reflected as an increase in product price.

Faced with these disposal cost increases -- specifically with regards to landfills -- firms, counties, and individuals may seek substitutes or new technology to reduce their disposal costs. For example, some counties are employing processing systems to reduce the volume of waste generated. Recycling and resource recovery systems are also becoming more popular where restrictions on land availability exists due to hydrogeological characteristics or community opposition. In other words, consumers of waste disposal services will attempt to adjust to the regulation at a cost which varies from case to case. In particular, this study has

examined differences between counties which will affect the ability (and therefore cost) to adjust. As mentioned previously, the compliance burden (or cost of adjustment) for some counties is beyond the means of the county -- a situation which interrupts the goals of Act 641.

Although Act 641 was designed to achieve a statewide minimum level of environmental protection from solid waste disposal activities, the landfill standards imposed by the Act are not strictly uniform, but vary according to the characteristics of a particular county or landfill. As indicated above, some counties are able to comply with little or no difficulty, whereas others are financially unable to simply evaluate their waste disposal status.

The results of the compliance cost evaluation for county groups suggests the following differences among counties in terms of ability to comply:¹⁴

Urbanized counties are generally constrained in providing landfill space. Community acceptance seems to be a major problem, as well as acquiring a suitable location at a great enough distance from adjoining property. As populations grow, the rate at which landfills reach capacity increases. Currently, some urbanized counties must transfer their waste to surrounding counties since in-county facilities are not feasible.

¹⁴ Ability to comply refers to the financial and hydro-geological capacity of a county meet the responsibility of providing solid waste disposal facilities.

Alternatives to in-county landfills, as well as waste reduction systems, are economically feasible for most populated counties since waste volume is high. The study indicates that low volume landfills, both private and public, may be financially unable to comply. However, where there is a market for waste disposal services (i.e., high waste generation counties), counties may be able to attract private firms to supply their disposal needs.

The three case study counties illustrate various compliance constraints for populated counties. Cost burdens are likely to be disproportionate; that is, the cost increase for solid waste disposal per unit of waste, due to Act 641, will not be uniform across counties. However, one would expect non-uniform prices of other goods and services between counties (such as land or housing), reflecting differences in the value of resources. The fact that waste disposal fees are different among populated counties is not particularly relevant. A more interesting and policy relevant observation is that the populated counties have the resources to comply.

Conversely, some rural counties, subject to the same regulations and responsibilities as their populated counterparts, are stifled by financial constraints. To allocate their limited resources to solid waste management activities implies the reduction in services elsewhere. For these counties, waste is presently being disposed of illegally in open dumps or non-licensed landfills. In some cases, the open dumps may be converted to sanitary landfills if the proper

hydrogeological conditions are present at the site. Construction of a groundwater monitoring system and the daily placement of top cover would comprise the basic compliance costs. Without the financial capability, however, these potential sites will be terminated.

Attempts at attracting the private disposal industry to aid in solving solid waste disposal needs may be futile where county populations are extremely sparse. By including local governments in the licensing fee system, a municipality's competitive advantage in providing disposal services is reduced. However, for counties where private disposal services do not exist for economic reasons, the licensing fee further burdens the county budget while failing to alter the public/private relationship in providing solid waste facilities.

Apparently, the design of Act 641 did not recognize the disparities in ability to comply. Local governments are responsible for assuring that solid waste facilities are available for constituents, where responsibility implies a requisition cost: governments must arrange for disposal in some form. If local government budgets are severely limited, this responsibility cannot be met. This problem is especially acute for rural counties.

One method of adjustment practiced in rural counties where residents are financially unable to comply is to dispose of solid wastes on government owned land (see Appendix II). Although illegal, this action will (temporarily)

transfer costs back onto the State. It appears, therefore, that policy effectiveness is influenced by the apportionment of relative compliance costs, and that the efforts of Act 641 to correct solid waste disposal problems has actually created a similar waste disposal malady.

To realize the policy objectives of Act 641, some measure of ability to comply financially must be adopted. A House Bill has recently been introduced to provide financial aid to counties in adjusting to Act 641 guidelines. To receive aid, a county must submit an application containing an assessment of waste disposal needs and the proposed facilities to service those needs. Although this Bill recognizes the need for financial aid, it neglects the special problems of rural counties by requiring all counties to assume the cost of a preliminary investigation. Hence, a mechanism is necessary to enhance the compliance position of disadvantaged counties. One alternative is to provide a grant for the preliminary study, thereby allowing assessment for a construction and operating grant. Or, an appropriate State agency could conduct the preliminary study on behalf of the county.

PART V
SUMMARY AND CONCLUSIONS

Act 641 places certain requirements on the construction and operation of sanitary landfills in order to eliminate the possibility of groundwater contamination due to leachate. For some counties, compliance with these rules entails the construction of a monitoring system; for others, all existing facilities must be terminated and new facilities provided.

The compliance cost to a county will depend upon the status of the existing disposal facilities in terms of:

- Hydrogeological characteristics
- Size
- Life expectancy

Where a county can upgrade existing facilities, costs will be minimal compared to a county which must construct new facilities.

Counties are required to provide disposal facilities for their constituents. However, operating budgets for many counties do not allow for the large initial outlays required to provide licensed facilities. Where the demand for waste disposal services is great (densely populated counties), it is likely that the private disposal industry will invest in

upgraded facilities. Conversely, public operations are constrained since heavy outlays for waste disposal implies the reduction in services elsewhere.

In sparsely populated counties, the volume of solid waste is minimal. It would not be economically feasible for private disposal interests to locate there, since unit costs would be high, and individuals may not use the facility. Hence, the burden imposed by Act 641 for some rural counties is prohibitive: the resources are not available for these counties to evaluate their waste disposal situation nor provide the required disposal services.

Recognizing the costly nature of complying to Act 641, House Bill 5867 was introduced in June, 1980 to provide financing for recycling, resource recovery, solid waste processing and disposal facilities. However, the grant application to be submitted for consideration of aid requires "... background (information) on the alternatives considered and the economic feasibility of the facility proposed in relationship to the energy use or recovery of energy or marketability of any products resulting therefrom, and its flexibility and practicality to adapt to the specific area to be served." This implies that a county must perform a preliminary investigation of county needs and the alternative facilities to meet these needs. For some counties, this information is not readily available and the costs involved with attaining the information may exceed the means of certain rural counties.

The policy issue here is that a State Law, Act 641, designed to correct the problem of groundwater contamination, has created disproportionate cost burdens which are insurmountable for some counties. Responding to costs, there is evidence that individuals in counties with no licensed facilities will continue to dispose of their wastes illegally -- on State land. It appears, therefore, that in some regions of Michigan, Act 641 has created the problem it was designed to correct.

APPENDIX I

Table 1

SANITARY LANDFILL CAPITAL COSTS, CASE I

<u>Item</u>	<u>Capacity, Tons per Week</u>					
	350	700	1400	3500	7000	14000
Land	30	64	129	318	627	1258
Site Work	26	36	52	85	115	162
Buildings & Scales	62	71	80	89	137	155
Rolling Stock	105	105	230	370	410	410
Contingency	56	69	123	216	322	496
Total	279	345	614	1078	1611	2481

- NOTES: 1. All costs are in thousand dollars.
 2. Case I refers to landfills having favorable geological conditions.

Table 2

SANITARY LANDFILL ANNUAL COSTS, CASE I

<u>Item</u>	<u>Capacity, Tons per Week</u>					
	350	700	1400	3500	7000	14000
<u>Fixed (thousand dollars per year)</u>						
Amortization	28	35	63	110	164	253
Labor	120	120	140	160	200	200
Contingency	18	18	21	24	30	30
Total	166	173	224	294	394	483
<u>Variable (dollars per ton)</u>						
Roadways	0.20	0.17	0.15	0.14	0.13	0.13
Excavation	0.25	0.25	0.25	0.25	0.25	0.25
Rolling Stock O&M	1.54	0.77	0.93	0.50	0.30	0.15
Contingency	0.30	0.18	0.20	0.13	0.10	0.08
Total	2.29	1.37	1.53	1.02	0.78	0.61

- NOTE: 1. Case I refers to landfills having favorable geological conditions.

Source: Michigan Energy and Materials Recovery State Plan,
 Department of Natural Resources, 1978.

Table 3

SANITARY LANDFILL CAPITAL COSTS, CASE II

<u>Item</u>	<u>Capacity, Tons per Week</u>					
	350	700	1400	3500	7000	14000
Land	30	64	129	318	627	1258
Site Work	26	36	52	85	115	162
Buildings & Scales	62	71	80	89	137	155
Rolling Stock	105	105	230	370	410	410
Contingency	56	69	123	216	322	496
Total	<u>279</u>	<u>345</u>	<u>614</u>	<u>1078</u>	<u>1611</u>	<u>2481</u>

- NOTES: 1. All costs are in thousand dollars.
 2. Case II refers to landfills having unfavorable geological conditions.

Table 4

SANITARY LANDFILL ANNUAL COSTS, CASE II

<u>Item</u>	<u>Capacity, Tons per Week</u>					
	350	700	1400	3500	7000	14000
<u>Fixed (thousand dollars per year)</u>						
Amortization	28	35	63	110	164	253
Labor	120	120	140	160	200	200
Contingency	18	18	21	24	30	30
Total	<u>166</u>	<u>173</u>	<u>224</u>	<u>294</u>	<u>394</u>	<u>483</u>
<u>Variable (dollars per ton)</u>						
Roadways	0.20	0.17	0.15	0.14	0.13	0.13
Excavation	0.25	0.25	0.25	0.25	0.25	0.25
Leachate Collection	0.71	0.71	0.71	0.71	0.71	0.71
Rolling Stock O&M	1.54	0.77	0.93	0.50	0.30	0.15
Contingency	0.41	0.29	0.31	0.24	0.21	0.19
Total	<u>3.11</u>	<u>2.19</u>	<u>2.35</u>	<u>1.84</u>	<u>1.60</u>	<u>1.43</u>

- NOTE: 1. Case II refers to landfills having unfavorable geological conditions.

Source: Michigan Energy and Materials Recovery State Plan,
 Department of Natural Resources, 1978.

APPENDIX II

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF AGRICULTURAL ECONOMICS
AGRICULTURE HALL

EAST LANSING • MICHIGAN • 48824

October 2, 1980

Dear :

You are probably aware that the new Solid Waste Management Act 641, Public Act of 1978, has been created to overcome the inefficiencies of previous legislation in regulating the design and licensing of sanitary landfills. However, the new rules will also increase the costs of disposal operations to the landfill owner.

As a research requirement for my graduate degree in Agricultural Economics, I am currently investigating the implications of the new legislation in terms of the increased costs of compliance. In order to perform this study, I need specific information concerning the landfills in your county.

I am requesting the following information. I assure you the information will be confidential and used in general calculations for comparative purposes only. I hope to use the information to describe differences in cost increases among Michigan counties as implied in the Act.

I would appreciate any information which you could provide for me in order to facilitate my research. An envelope has been enclosed for your response. If you have any questions, please contact me at (517) 353-7895. Thank you for your cooperation.

Sincerely,

Julie Kaston
Research Assistant

Lawrence W. Libby
Associate Professor

Enclosure

County:

Type of Waste

Volume per day

Size of Operation
(acres)

Predominant Soil
Type

Life Expectancy
(years)

Hydrogeological
Characteristics
(circle one)

natural soil

compacted clay

synthetic liner

State may close northern landfills — and get garbage

By ERIC SHARP
Free Press Staff Writer

Local officials in Presque Isle County said Tuesday that many citizens will dump their garbage on state-owned land if the Department of Natural Resources closes down several landfills that don't meet pollution standards.

The warning will be relayed to DNR experts in Rogers City Wednesday at a meeting to discuss one of northern Michigan's most pressing problems — what to do with garbage in an area where people can't afford to build modern dumps.

Judy Burkhart, Allis Township clerk, said Allis and Krakow townships have received notices from the DNR ordering them to close their landfills Nov. 30 if they are not brought up to state standards.

"There's no way we can afford that," she said. "They want us to line the landfill with clay, compact and cover the material every night and do a lot of other things."

Burkhart said while many people in the area have their garbage picked up by a commercial hauler, about a third of the families haul their own trash to the dump and save \$6.50 a month. "People are calling and saying, 'Well, if the state wants to tell us what to do with our garbage, we'll just dump it on state land and let them take care of it.'"

NEIL WHITSITT, chairman of the Presque Isle County Commission, said that while the state wants to prevent local citizens from burying their own garbage in the county, it won't allow those same citizens to pass an ordinance banning the burial of nuclear wastes in Presque Isle, something the residents fear might happen if Michigan is chosen as a national nuclear waste repository.

Whitsitt angrily said trash from state-owned parks and other facilities has been hauled to county landfills for years, "even after they told us the landfills were illegal. Well, I figure we owe the state a lot of garbage, so I'd like to put up signs telling people to take theirs to the roadside parks."

DNR offices were closed Tuesday for the Veteran's Day holiday and depart-

ment spokesmen could not be reached for comment.

The southern third of Presque Isle County largely is state-owned forest crisscrossed by dirt tracks. There are hundreds of miles of lonely trails where illegal dumpers could drop their loads with no fear of being caught.

THE ALLIS LANDFILL takes trash from about 2,500 people in the township and city of Onaway. Another 7,000 people are dependent on a landfill near Rogers City, seat of this county on the northeastern tip of the Michigan mitten.

James Leidlein, city manager of Rogers City, said he doubts his community's landfill will be allowed to stay open much longer. "There's no way it can meet the standards," he said. "It would cost

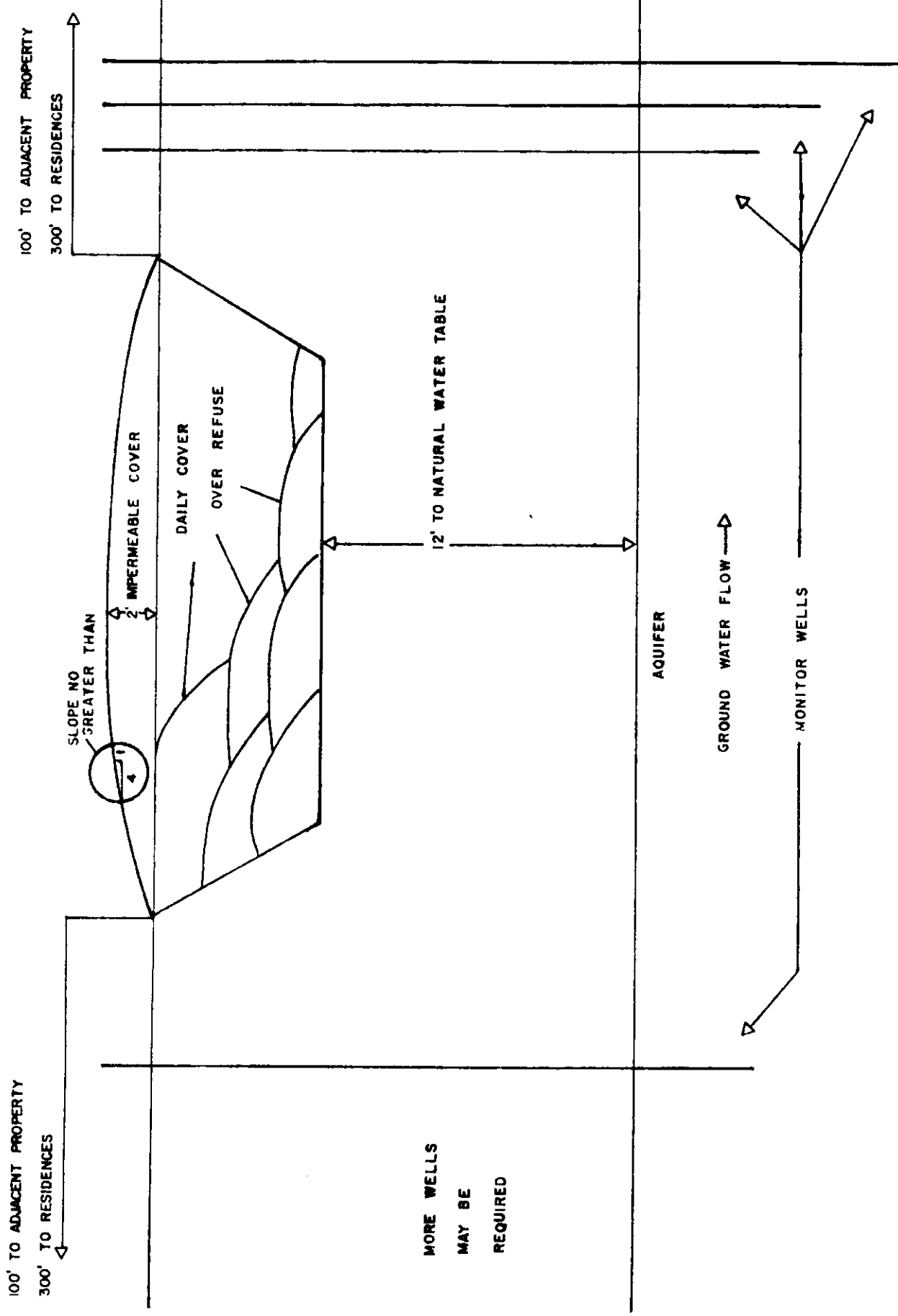
\$75,000 to \$100,000 just to do the studies to determine if it could qualify as a licensed landfill. We can't even afford the studies."

Roberta Leslie, Onaway City clerk, said the city will run an advertisement in the weekly Onaway Outlook for the next four weeks, explaining to citizens that the City Commission decided to close the landfill "under protest ... due to stan-

dards and requirements by the State of Michigan DNR that the city is financially unable to comply with."

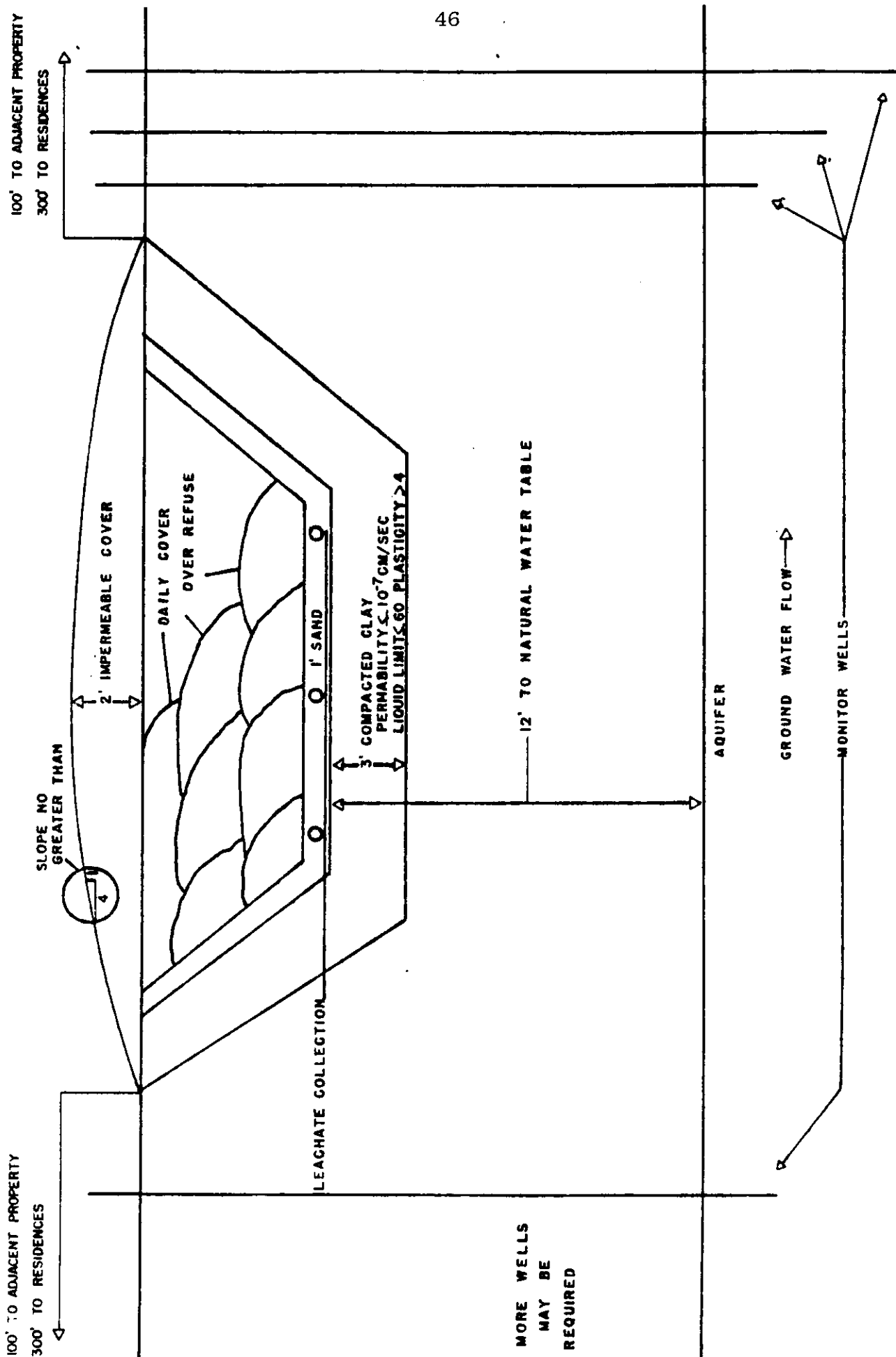
When the county landfills close, garbage from Presque Isle County will first be hauled to a transfer station at Cheboygan, 30 miles to the north, from where it will be trucked another 65 or 70 miles to state-approved landfills.

TYPE III LANDFILL



NOTE. DRAWING NOT TO SCALE, SIZE OF INDIVIDUAL LANDFILLS MAY VARY, COVER SLOPE MAY EXCEED LIMIT BY APPROVED DESIGN

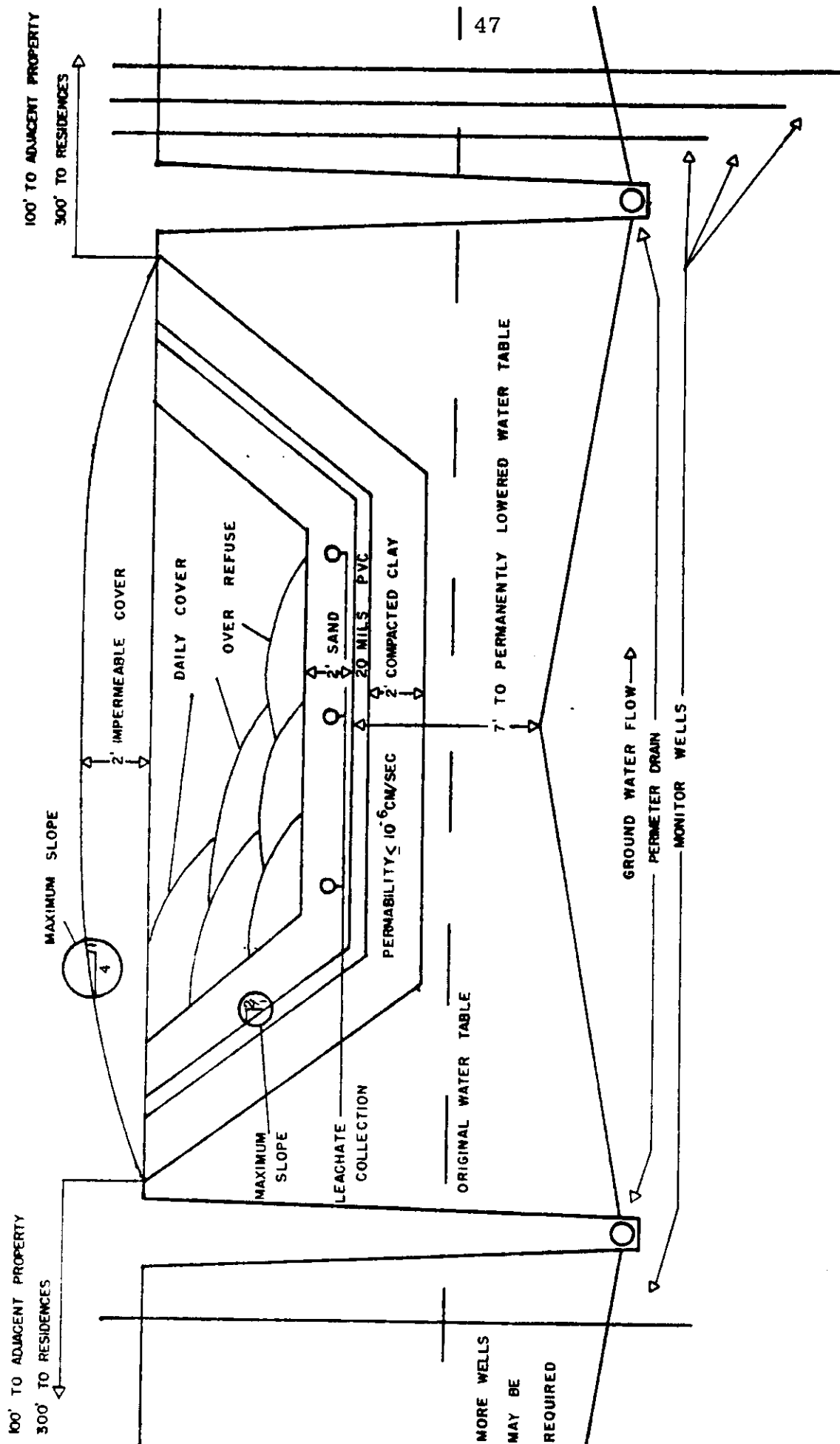
TYPE II LANDFILL - CLAY LINER



NOTE, DRAWING IS NOT TO SCALE, SIZE OF INDIVIDUAL LANDFILLS MAY VARY, COVER SLOPE MAY EXCEED LIMIT BY APPROVED DESIGN

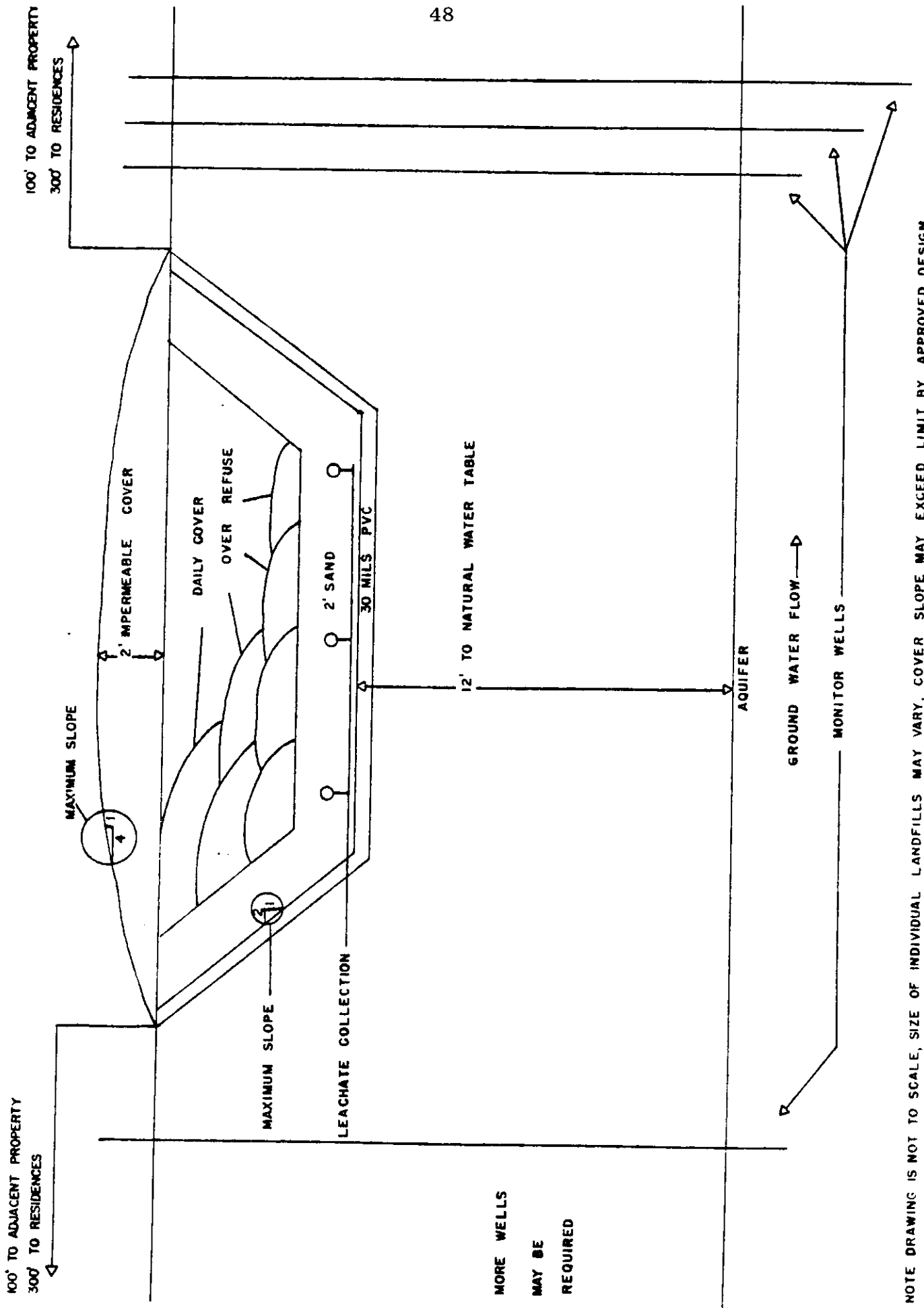
DRAWN BY JULIE MAFETTI

TYPE II LANDFILL 20 MILS PVC LINER WITH LOWERED WATER TABLE



NOTE: DRAWING IS NOT TO SCALE, SIZE OF INDIVIDUAL LANDFILLS MAY VARY, COVER SLOPE MAY EXCEED LIMIT BY APPROVED DESIGN

TYPE II LANDFILL — 30 MILS PVC LINER



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