WASTEWATER TREATMENT FACILITIES PLAN SUMMARY REPORT

LAKE VIEW TOWNSHIP

AUGUST, 1981

rieke carroll muller associates inc

EPA Project No: C270841-01

RCM File No: 801024

August 7, 1981

Mr. Dale Hagen, Chairman
and Members of the
Lake View Township Board
P.O. Box 69
Detroit Lakes, MN 56501

In accordance with our contract for engineering services, we have completed the investigations and studies of the water pollution control problems in Lake View Township. Our findings and recommendations are presented in the enclosed report entitled "Wastewater Treatment Facilities Plan Summary Report, Lake View Township, Becker County, Minnesota".

This report reviews the present and projected wastewater treatment needs in the planning area, the present treatment systems, applicable design criteria and regulatory agency requirements as well as alternatives for upgrading wastewater treatment for the Township. The alternatives are evaluated in terms of economic, environmental and technical aspects.

After your careful consideration and review of this report, we would welcome the opportunity to meet with you to discuss its contents in greater detail.

Respectfully submitted,

RIEKE CARROLL MULLER ASSOCIATES, INC.

David O. Husby, P.E., Manager
Municipal Engineering Department

Donn W. LaVoie, Project Manager

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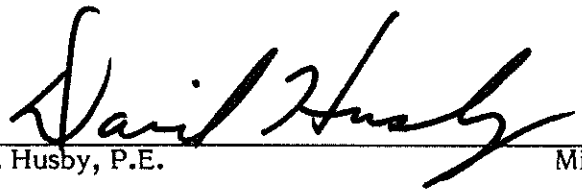
WASTEWATER TREATMENT FACILITIES PLAN SUMMARY REPORT

LAKE VIEW TOWNSHIP

BECKER COUNTY, MINNESOTA

AUGUST 1981

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.



David O. Husby, P.E. Minnesota Reg. No. 6280

RIEKE CARROLL MULLER ASSOCIATES INC.

WASTEWATER TREATMENT FACILITIES PLAN SUMMARY REPORT

LAKE VIEW TOWNSHIP

BECKER COUNTY, MINNESOTA

AUGUST, 1981

CONSULTING ENGINEERS

RIEKE CARROLL MULLER ASSOCIATES, INC.

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ABBREVIATIONS

AM	ante meridiem (12 midnight to 12 noon)
avg	average
BOD	5-day Biochemical Oxygen Demand
cu yd	cubic yard
EPA	Environmental Protection Agency
ft	feet
fps	feet per second
gal	gallon
gpd	gallon per day
gpm	gallon per minute
hp	horsepower
hr	hour
I/I	infiltration/inflow
in.	inch
kwh	kilowatt hour
lb	pound
lin	lineal
LF	lineal feet
max	maximum
mgd	million gallons per day
mg/l	milligrams per liter
MPCA	Minnesota Pollution Control Agency
mi	mile
min	minute or minimum
no.	number
NPDES	National Pollutant Discharge Elimination System
PM	post meridiem (12 noon to 12 midnight)
psi	pounds per square inch
sq ft	square feet
SSES	Sewer System Evaluation Survey
TSS	total suspended solids
yr	year

missing abb. MPN NTU

Summary, Conclusions, Recommendations

I. SUMMARY, CONCLUSIONS, RECOMMENDATIONS

A. Summary

In accordance with the provisions of the agreement between Lake View Township, Minnesota and Rieke Carroll Muller Associates, Inc., a wastewater treatment facilities plan report has been prepared evaluating the feasibility of providing improved wastewater treatment for Lake View Township. The findings of the evaluation are presented herein. The enclosed information reviews water quality requirements, present conditions, design criteria, feasible alternatives and estimated costs for improving wastewater treatment, the existing and future environment and the environmental effects of feasible alternatives.

B. Conclusions

As a result of the study, the following conclusions were made:

1. The majority of the existing individual on-site sewage treatment systems within the study area are not capable of providing adequate wastewater treatment.

2. According to current MPCA policy for lake area projects, new wastewater treatment facilities should be designed based on a 20-year design life and designed for existing conditions with no allowance for future growth.

3. The existing estimated summertime population within the service area is 3,550. Existing summertime wastewater flows are estimated to be 366,000 gallons per day.

4. There are no major commercial or industrial wastewater contributors within the planning area.

5. After an analysis of three wastewater collection and treatment systems, a cost-effective alternative with the least potential local cost for Lake View Township, is to construct cluster systems with individual septic tanks and community drainfields.

6. Based upon June 1981 prices, the construction and annual operating and maintenance costs of eleven cluster systems are estimated at $9,620,000 and $92,400 per year, respectively.

7. The local annual cost for this alternative based upon June 1981 prices is estimated at $193,000 per year. This represents a cost per household of approximately $14.00 per month based on 1,037 residential dwellings and 91 commercial units.

8. The environmental assessment for implementing this alternative indicates the cluster systems can be constructed with a minimum of adverse environmental impact. The overall environmental impact is beneficial because of improved groundwater and surface water quality.

C. Recommendations

Based upon the information presented herein, the following recommendations are submitted:

1. The alternative considered most desirable for Lake View Township should be selected and endorsed in writing by the Township Board to the Minnesota Pollution Control Agency and the U.S. Environmental Protection Agency.

2. The facilities plan should be submitted to the Minnesota Pollution Control Agency and the U.S. Environmental Protection Agency for approval.

3. Lake View Township should request to be put on the Minnesota Pollution Control Agency's Fiscal Year 1982 Municipal Project List.

4. A Step 2 grant application (for plans and specifications) should be completed and submitted to the Minnesota Pollution Control Agency.

Introduction

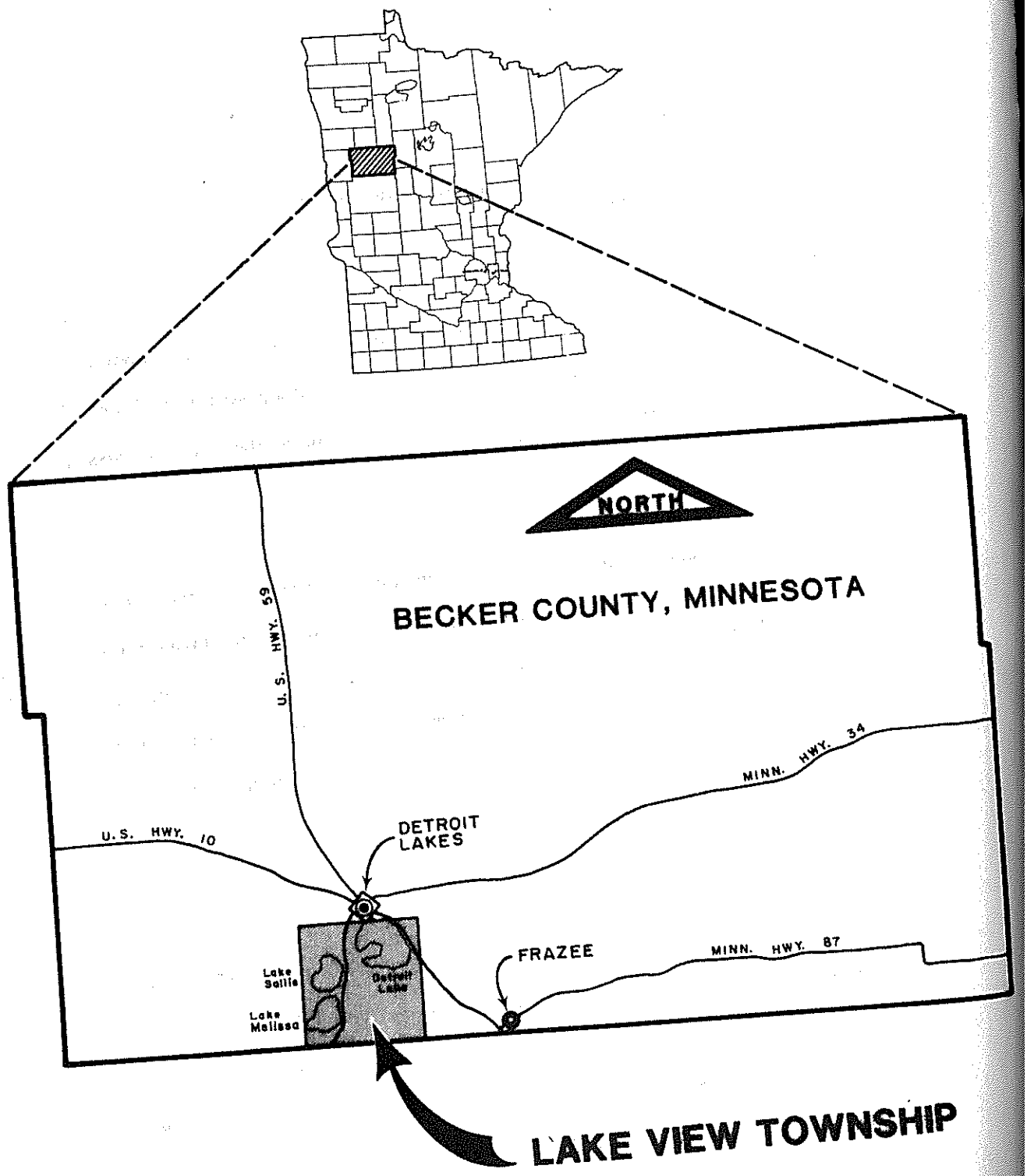

Figure 1. Location Map

Most of the residences around the lakeshore were constructed in the late 1800's and early 1900's. The septic systems installed during this time were subject to little or no regulations. This is evident from the fact that many of the septic systems lie within the groundwater table which causes them to back up, resulting in untreated wastewater breaking out onto the surface. In addition, many of the original systems (mostly cesspools or 2-tank systems) are still being used today.

In the early 1970's, it was recognized that the wastewater treatment systems serving residents on the shores of area lakes were potential sources of surface and groundwater pollution. Residents of the area lakes recognized the need to protect their water resources.

As a means of implementing a program to improve wastewater treatment, the Township Board retained the firm of Rieke Carroll Muller Associates, Inc. (RCM), to conduct a study and prepare a planning report. The report titled Wastewater Collection & Treatment System for Lake View Township, Becker County, Minnesota was completed in September 1973 and studied improved wastewater treatment for five area lakes. In the summer of 1974, several informational meetings were held and in September, a public hearing was conducted. The general tone of that meeting was one of opposition mainly because of the high cost. As a result, the Township Board felt further action should not be taken without some financial assistance from outside the Township.

In 1975, grant funds became available to Lake View Township from the U.S. Environmental Protection Agency (EPA) and the Minnesota Pollution

Control Agency (MPCA). The Township Board applied for and received the State and Federal grants. By accepting the grant funds, the Township was required to prepare another engineering report which reviewed wastewater treatment alternatives in accordance with new state and federal regulations.

In August 1978, an engineering report titled Water Pollution Control Facilities Report, Lake View Township, Minnesota was completed which evaluated several wastewater collection and treatment alternatives. A public hearing was conducted in October and the report submitted to the MPCA in December for their review. The planning area included three lakes (Detroit, Sallie and Melissa) and recommended a centralized stabilization pond and spray irrigation facility.

About the same time the 1978 engineering report was submitted to MPCA, the state adopted a new policy for evaluating the need for improved wastewater treatment in unsewered areas. In November 1978, MPCA promulgated "Guidelines for Determining Wastewater Treatment Problems in Unsewered Areas". The MPCA published a document titled "Site Specific Needs Determination and Alternative Planning for Unsewered Areas" to provide clarification of the requirements and suggest procedures to use for the demonstration of need. Under this new policy, specific documentation of need for each lot is required.

As a result of MPCA's newly adopted policy, all engineering reports that were not yet approved by MPCA and EPA (including Lake View Township's), were subject to the State's new requirements and had to be revised. In

June 1980 the Township Board received additional grant money from EPA and MPCA to conduct the new study. This report contains the results of that study and re-evaluates wastewater treatment alternatives based on the results. It is intended that this report will complete the wastewater treatment facilities plan for Lake View Township.

B. Purpose and Scope

The purpose of this report is to summarize the results of work efforts intended to complete the wastewater treatment facilities plan for Lake View Township. This facilities plan was prepared to assist the citizens of Lake View Township and their elected officials in establishing a direction for future wastewater management efforts.

The scope of this report is to provide an evaluation of the need for improved wastewater treatment on a site-specific basis and evaluate three wastewater treatment alternatives. MPCA's guideline titled "Site Specific Needs Determination and Alternative Planning for Unsewered Areas" was used throughout the study and is presented in Appendix A.

C. Planning Area

The service area (planning area) evaluated within this study is shown in Figure 2. Curfman Lake (Deadshot Bay), portions of the south shore of

LAKE VIEW TOWNSHIP

Becker County, Minnesota

TOWNSHIP 138 NORTH RANGE 41 WEST

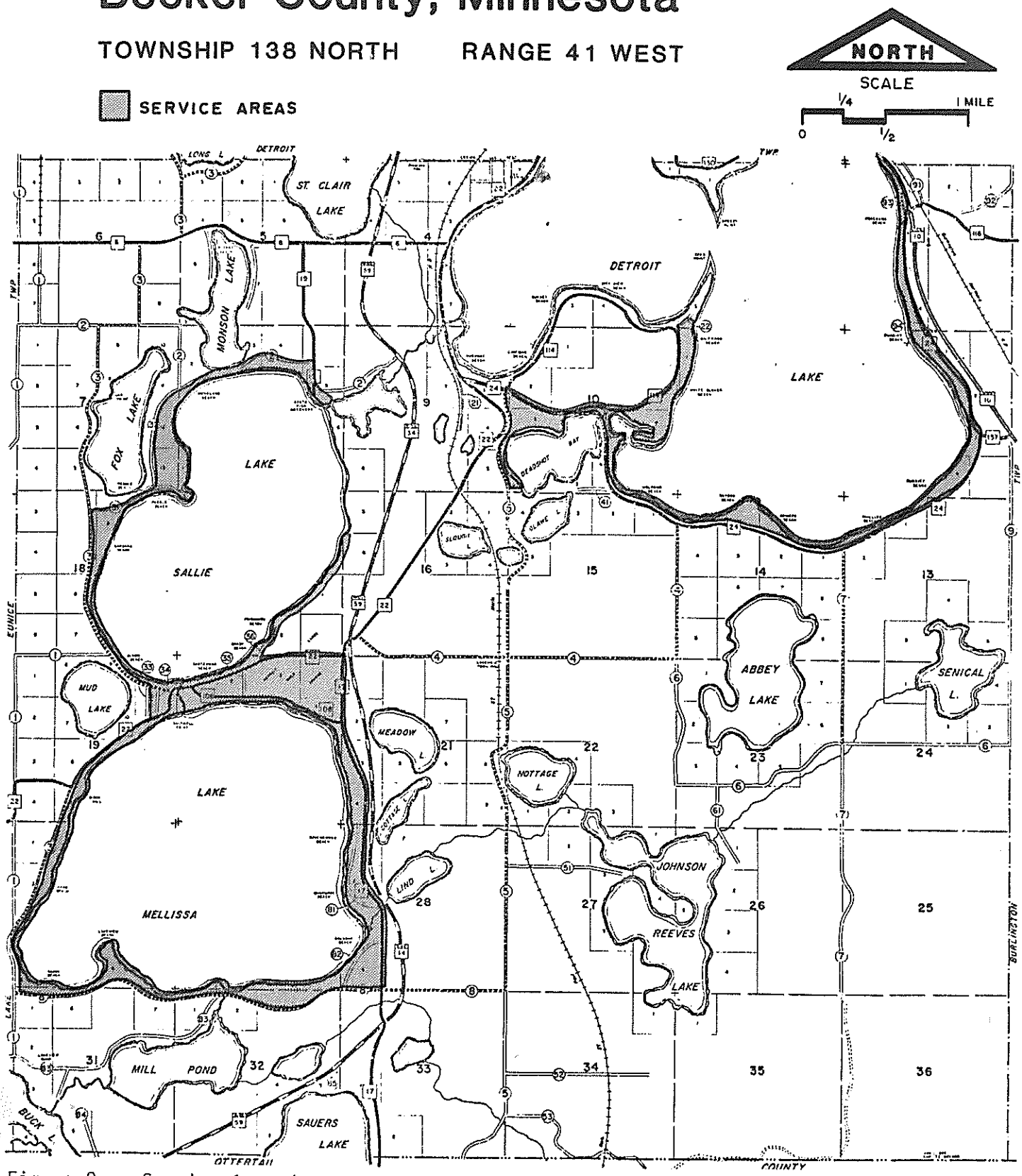

Figure 2. Service Area (planning area) Map

Lake Melissa, and the north and west shores of Lake Sallie were not included in the August 1978 report, but are included in the analyses summarized by this report. The residents on Curfman Lake and the south shore of Lake Melissa have asked to be included in the study area. The north and west portions of Lake Sallie were included in the planning area at MPCA's request. The MPCA has approved the revised planning area described above.

Description of Existing Environment

III. DESCRIPTION OF THE EXISTING ENVIRONMENT

A. Physical Characteristics

1. Topography

The relief within the planning area ranges from steep to moderately rolling. Several swamps, low marsh areas and bogs are located within the Township. Substantial areas of glacial outwash sediments which are found in the Lake View Township area were deposited during the time of glacial recession by the melting waters of the glacier.

2. Geology

Little information is available about the underlying bedrock formation due to the extreme (greater than 400 feet) depth of the glacial overburden. The bedrock is assumed to be Precambrian crystalline rock, more than 500 million years old.

3. Faults, Caves and Mines

Because the geology of the area consists mainly of glacial till and outwash deposits, no known faults or caves exist in the Lake View Township area. There is no mining activity in the area.

4. Soils

The soil structure in Lake View Township is a result of vegetational and climatic influences on the materials deposited in the area by the succession of glaciers. The soils in the Lake View Township area consist of sandy loams to gravelly sandy loams over the north and west three-quarters of

the planning area. The southeastern quarter of the Township is a moraine till or a clay silt loam, somewhat sandy with occasional gravel and boulders.

5. Hydrological Elements

a. General A large portion of the planning area is surface water. Lake View Township lies within the Ottertail River watershed and the Pelican River, which is a major tributary to the Ottertail River, flows through the planning area.

The direction of the surface water flow within the planning area is generally from northeast to southwest. The Pelican River flows between Detroit Lake and Lake Sallie, down through Lake Melissa and out of the area. The other lakes and streams are considered local tributaries to the Pelican River.

b. Surface Water The quality of the surface water in Lake View Township is below natural levels. This degradation has resulted from different sources. First, the City of Detroit Lakes wastewater treatment plant has been discharging various levels of treated wastewater for many years. Previous studies have shown the treatment plant discharges into St. Clair Lake have contributed to the excessive algae growth in this lake and lakes downstream, particularly Lake Sallie. At one time, a major lawsuit had been brought against the City of Detroit Lakes by an organization of Lake Sallie property owners. The results of this suit did not indicate that the City of Detroit Lakes wastewater treatment plant was the only source

of pollution. Agricultural runoff and private disposal systems were noted as additional pollution contributors.

c. Flood stages and frequencies According to Flood Hazard Boundary Maps for the Lake View Township area, there are no flood plain restrictions within the planning area that limit potential sites for new wastewater treatment facilities.

d. Groundwater Within the planning area, groundwater levels are generally high. In many areas around the four lakes, individual on-site wastewater treatment systems are located very near or within the groundwater table. In these areas, instances of well contamination are high. In some cases, it has been reported that wells have been relocated because of contamination by nearby septic systems.

B. Climatic Elements

The climate of the planning area generally includes warm summer days, cool summer nights, and cold snowy winters. Mean temperatures vary from $6^{o}F$ in January to $71^{o}F$ in July, with extremes from $100^{o}F$ above to $35^{o}F$ below zero. Total annual precipitation averages 23.6 inches, most of which falls as spring and summer rains. Monthly precipitation varies from a maximum of 12.2 inches in June to a minimum of just a trace in February. The prevailing winds are from the northwest during winter months and the southwest during warm summer months.

C. Vegetation and Wildlife

Prior to settlement, the land surrounding Lake View Township was mainly open prairie with a few scattered areas of brush prairie, aspen, and oak hardwood forests. Agricultural practices have vastly reduced the open prairie which was the breeding ground for many species of rodents, reptiles, and birds. Today, only remnants of these prairie lands remain. Most of these are protected by the Minnesota Department of Natural Resources (DNR). Farming practices dominate the landscape with a few wooded lots of aspen, small oaks and birch interspersed among the fields of corn, flax and sunflowers.

Agricultural activities have greatly influenced wildlife in the area. A variety of insects, crustaceans, rodents and some larger mammals such as white-tailed deer, inhabit the farmland and woodlots. Ruffed-neck grouse and other birds are abundant.

D. Historical, Archaeological and Cultural Elements

According to the document entitled "Natural and Historic Areas of Minnesota", published by the Minnesota Department of Natural Resources, Bureau of Planning, St. Paul, Minnesota, September 30, 1971, nothing of historical, archaeological or cultural interest has been found within the Lake View Township area. The Minnesota Historical Society has been contacted to review this area during previous studies (See Appendix O). As per their request, an archaeological survey will be performed on each proposed site.

E. Air Quality

The air quality in the Lake View Township area is generally good. There are no known air pollution problems in the vicinity.

F. Land Use

A large portion of Lake View Township is covered by lakes and as a result is primarily a water oriented recreational area. Detroit Lake, Lake Sallie and Lake Melissa are the three major lakes of size and depth used for swimming, boating and fishing. Rural land of the area supports some limited farming where the topography is suitable.

Existing Wastewater Treatment Systems and Project Area Information

IV. EXISTING WASTEWATER TREATMENT SYSTEMS AND PROJECT AREA INFORMATION

A. Present Treatment Systems

Most of the wastewater treatment around the area lakes is provided by individual on-site treatment systems. The majority of the residences around the lakes were originally seasonal cottages constructed in the early 1900's. During this time, wastewater was typically discharged into either buried 55-gallon drums with the bottoms cut out or into cesspools. Most of these original systems are still in use today along with some additional two-tank cesspool installations.

In May of 1971, Becker County adopted an ordinance which regulated the type of new individual systems installed. According to local officials, prior to 1971, the county had no regulation over the type of systems that could be constructed. As a result, many substandard systems (not up to present code) were installed. Septic tanks were undersized and often followed by a cesspool or seepage pit instead of a drainfield. Because of the many low-lying lakeshore lots, most of these systems were constructed in or close to the water table.

There is one community wastewater treatment system on east shore of Lake Melissa which serves a cluster of approximately 30 homes. The cluster system is located on Ravenswood Beach. The community septic tank and drainfield were constructed in 1977 and according to area

residents and local officials, the system appears to be working fine. To date, no problems have been reported.

B. Determination of Need for Improved Wastewater Treatment

As part of the facility planning process at Lake View Township, efforts to obtain information regarding each lot, residence and the existing wastewater treatment system were made. The information collected was compiled to help determine the condition of existing systems and develop a data base for selecting feasible alternative treatment methods for substandard systems. MPCA's document titled "Site Specific Needs Determination and Alternative Planning for Unsewered Areas" was used as a guideline for evaluating and planning. A copy of this document is presented in Appendix A.

Several types of information were used in the evaluation of each unsewered residence. Most of the information was either based on, or obtained from the following sources:

1. Questionnaire Survey
2. Septic Leachate Survey
3. Age of Present System
4. High Groundwater
5. Small Lot Size--Setback Requirements
6. Soil Types

As discussed in MPCA's Site Specific Needs Determination document, the information collected is classified as either direct or inferred evidence of a malfunctioning or illegal system. The criteria used for classifying information as direct or inferred are tabulated in Table 1. The information obtained was used to categorize each individual system on the basis of an "obvious problem" or "no action needed". Systems were classified as an obvious problem on the basis of direct or inferred evidence of a malfunctioning or illegal system. Due to the nature of direct evidence, a system or lot was placed in the obvious problem category if one or more types of direct evidence was found. However, a reasonable combination, or a verification, of inferred evidence was necessary to classify an individual system as an obvious problem by inferred evidence. Where no direct or inferred evidence of a malfunctioning or illegal system was found, the lot was categorized as "no action needed".

In the following section of this report, some of the criteria used for determining direct and inferred evidence of malfunctioning or illegal systems will be discussed. A summary of the information collected and treatment needs will also be presented.

Table 1. Criteria for site-specific needs determination[1]

Direct Evidence of Malfunctioning or Illegal System

1. Surface failure--sewage seeping from ground
2. Sewage backup into residence
3. Direct sewage flow into surface water
4. Septic leachate plume
5. Water well contamination
6. No system in place for dwelling

Inferred Evidence of Malfunctioning or Illegal System

1. High groundwater table (within four feet of drainfield bottom)
2. No suitable area for conventional system or mound on the site--Small lot
3. Well separation distance--100 feet from well less than 50 ft deep, 50 feet from deeper wells
4. Lake setback less than 50 ft (Detroit, Sallie and Melissa)
5. Lake setback less than 75 ft (Curfman Lake--Dead Shot Bay)
6. Other setbacks, lateral, right-of-way, house, property lines, trees and buildings
7. Rapid permeability of soil--less than 0.1 min/in. percolation rate or from 0.1-5 min/in.[2]
8. Use of holding tanks
9. Age of system
10. Sub-standard system--cesspools, septic tank inadequate size (less than 1,000 gal), drainfield inadequate size, drainfield too deep.

1. Source: "Site Specific Needs Determination and Alternative Planning for Unsewered Areas," MPCA
2. Soil is unsuitable for a standard system if percolation rate is less than 0.1 min/in. and for a percolation rate from 0.1 to 5 min/in. alternative sewage treatment systems should be considered (i.e. trench liner)

Site Specific Evaluation of Need for Improved Wastewater Treatment

V. SITE SPECIFIC EVALUATIONS OF NEED FOR IMPROVED WASTEWATER TREATMENT

A. General

A variety of information was collected and used in evaluating the unsewered areas around Detroit Lake, Curfman Lake, Lake Sallie, and Lake Melissa. The information obtained and a discussion of the findings will be presented in this section of the report. Most of the data obtained is indexed in the Appendix by the owner's name and residence identification numbers. A Lake Directory is located in Appendix B which lists each lakeshore owner and their corresponding residence identification number.

B. Questionnaire Survey

Questionnaire surveys were mailed to lake area residents in August of 1980. The mailing addresses were taken from tax roles which were obtained from county records. The questionnaire surveys were also available at the public meeting held in the City of Detroit Lakes during June of 1981. Residents who did not respond to the survey before, were encouraged to do so at the public meeting. The questionnaire asked for information such as the age, type, size, and location of the septic tank system, any problems with the system (such as surface failure or sewage back-up into residence), and the location and depth of wells.

Response to the questionnaire survey varied from 27 to 43 percent as indicated in the summary below:

Lake	Percent Response
Detroit & Curfman	43%
Sallie	27%
Melissa	36%

A copy of the questionnaire survey and a summary of the responses received can be found in Appendix C. (For a listing of residents responding to the questionnaire, refer to Appendix G).

C. Septic Snooper Survey

In September 1980, a septic leachate (snooper) survey was performed by K-V Associates on Detroit Lake, Curfman Lake, Lake Sallie and Lake Melissa. The septic snooper device used during the survey is designed to identify failing septic systems by wastewater "plumes" that move with the groundwater into the lake (see Figure 3). A "plume" is broadly defined as any emergent pocket of water different from the surrounding background lake water. The septic snooper unit shown in Figure 4, consists of a subsurface probe, a water intake system, an analyzer control unit, and a graphic recorder. Mounted in a boat, the system draws water from near the lakeshore bottom through the instrument which detects and profiles any emerging domestic wastewater-type plumes.

Mineral flow from adequate systems or failing systems is not determined it is the raw sewage that is need to register in the snooper

Health and pollution design needs are confusingly combined and separated constantly.

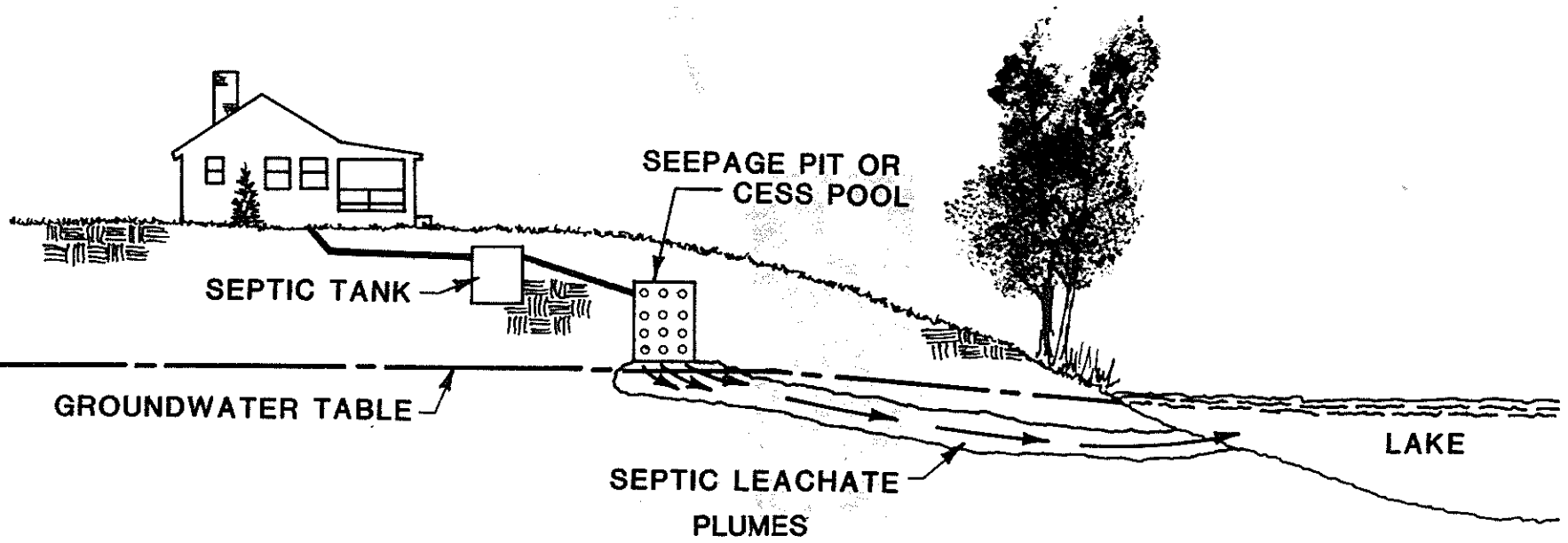

Figure 3. Plumes of poorly treated wastewater moving with groundwater flow into nearby lake.

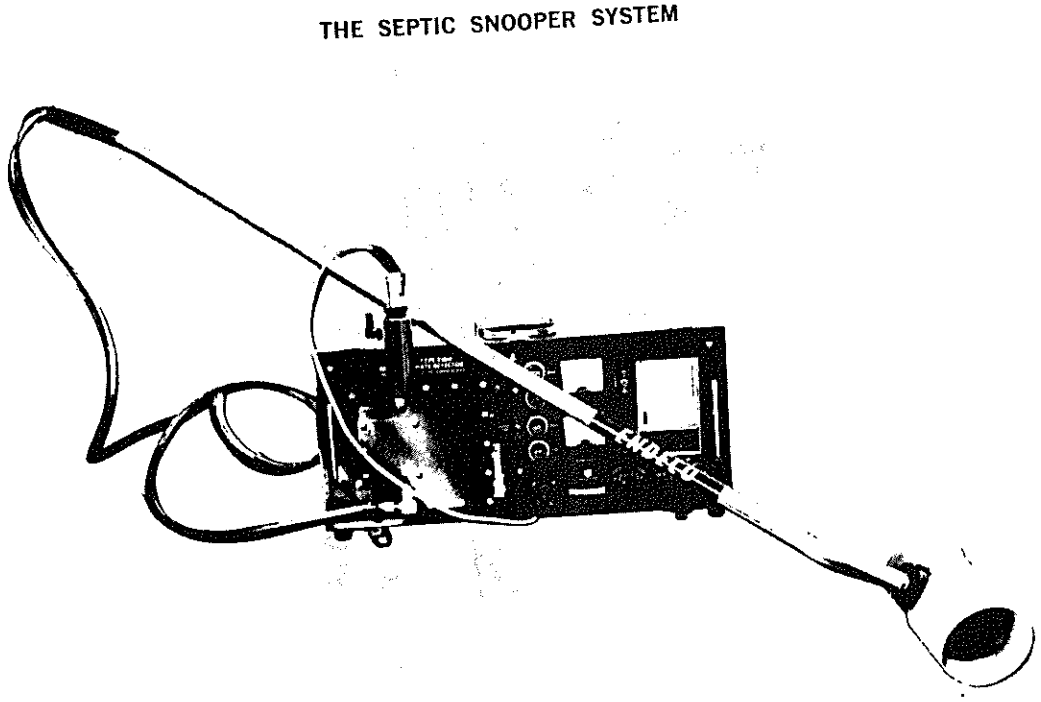

Figure 4. The septic leachate detector system (septic snooper)

As part of the survey, groundwater direction and flow rates were obtained around the lakes. Infiltration and exfiltration patterns around various shorelines were determined. Random well samples from occupied homes, particularly in low-lying areas or regions where lake water was expected to be moving away from the lake, were also taken to note any variability in drinking water quality.

Several septic leachate survey reports and supporting data prepared by K-V Associates are presented in Appendix D. Summary maps schematically indicating the location and strength of wastewater plumes found along the shoreline are located near the end of Appendix D. (The residence identification numbers shown on the maps correspond to the numbers listed in the Lake Directory found in Appendix B). Based on groundwater flow patterns in the areas where plumes were detected, a projection back to the shoreline was made to determine a probable "zone of contribution".

In many cases, the specific source of the plume could not be determined. A discharge into the lake recorded at a particular lot does not necessarily mean that the septic system on that lot is the source of the discharge. The source of the plume could lie anywhere within the "zone of contribution". The flow of groundwater, its direction, the rate of flow and the location of septic systems in the vicinity of the discharge are all important in determining the probable source. The septic snooper report recommended a more detailed study of areas where probable sources of discharges were noted.

It is beyond the scope of this report to conduct a more detailed study of groundwater flow patterns and plume identification. The information obtained from the septic snooper survey will be used to identify areas of need and will be considered a component part of the information used to evaluate specific need. For a discussion of the results of the septic snooper survey, the reader should refer to K-V Associate's September 1980 report and March 4, 1981 letter which supplements the September report.

D. Age of Septic Systems

As previously discussed (Section IV A), Becker County adopted an ordinance in May of 1971 which regulated the installation of individual septic tank systems (See Appendix E). Prior to 1971, no regulatons were in effect and many substandard systems were installed.

A list of lakeshore residences that have installed on-site systems after 1971 was obtained from Becker County Zoning officials and is presented in Appendix F. For the purposes of this study, septic tank systems installed after May of 1971 were considered to be in compliance with the exception of a few isolated cases. Systems constructed prior to May 1971 were categorized as substandard and in need of upgrading or replacement.

E. Holding Tanks

Although holding tanks can sometimes be a cost-effective alternative, for purposes of the site-specific needs determination, a residence with a holding tank was considered to have a need for improved wastewater

treatment facilities. Residences with holding tanks were identified from county records and from questionnaire survey responses.

F. Depth to Groundwater

If the groundwater table is too close to the bottom of the drainfield, a saturated flow will result causing improper treatment of wastewater. According to the Becker County ordinance governing septic tank installations, a minimum of four feet of unsaturated soil below the drainfield is required.

Water table elevations were estimated around the lakes using a hand level and taking transit sitings from the lake level. The water table and lake level were assumed to be at the same elevation. Personnel from the Becker County Zoning Department performed the transit sitings. Lakeshore lots where the groundwater table would not meet a four foot separation distance were recorded and are presented in Appendix G.

G. Lot Sizes

Isolation distances with respect to water wells, buildings, property lines, lakeshore, trees and other objects can be correlated with lot size. As part of the scope of work for this project (outlined by the MPCA), each lakeshore lot was to be categorized into one of the following groups:

1. Area less than 5,000 sq ft
2. Area between 5,000 and 10,000 sq ft
3. Area between 10,000 and 20,000 sq ft.
4. Area greater than 20,000 sq ft.

This lot size information has been collected and is presented in Appendix G. In many cases (where a community water system is not installed), the MPCA has assumed lots with an area greater than 10,000 square feet have sufficient area to meet the required isolation distances. With respect to the lakeshore lots around Detroit Lake, Curfman Lake, Lake Sallie and Lake Melissa however, this assumption should not be used.

Typical lakeshore lots in these areas are 50 to 100 feet wide with depths averaging between 200 and 250 feet. In most cases, although the lots are between 10,000 and 20,000 square feet, many are very heavily wooded and occupied by driveways, garages, storage sheds, gardens, patios, boats, wood piles, and an occasional guest cabin or other buildings. On many of the lots, very little open space is available. During a field inspection of the lakeshore area, it was evident that many lots between 10,000 and 20,000 square feet do not have adequate space to construct an individual sewage treatment system on-site. It became apparent that another method was needed for determining if the required isolation and setback distances were being met or could be met (in the case of new construction).

As an alternative to using a fixed area for evaluating lot sizes with respect to the required isolation and setback distances, each lot was evaluated on a case-by-case basis. A field inspection of each lot was conducted to make a

preliminary determination of the feasibility of constructing an individual system on the lot and meeting MPCA's setback requirements outlined in 6MCAR 4.8040 (WPC-40). Figures 5 and 6 show typical minimum lot sizes required to meet the well separation distances for two different house locations. Many of the lots in this area are less than these minimum lot sizes. The minimum distances certain items are to be located from the septic tank and drainfield are listed in Table 2. If information about the well depth on a particular lot was not available, the well was assumed to be less than 50 feet deep. Based on responses from the questionnaire surveys and information from local officials, the majority of wells within the planning area are less than 50 feet deep.

The majority of lots were judged to be too small or did not have adequate space available to construct an individual on-site sewage treatment system. This situation is largely a result of the separation distance required for shallow wells (100 ft) and the lack of actual useable space available on each lot for an on-site system.

H. Soils

Soils information including detailed soil survey maps and soil interpretation sheets for the shoreland areas around Detroit Lake, Curfman Lake, Lake Sallie, and Lake Melissa are presented in Appendix H. Subsurface soils in the planning area have been identified according to texture and differentiated into the following groups:

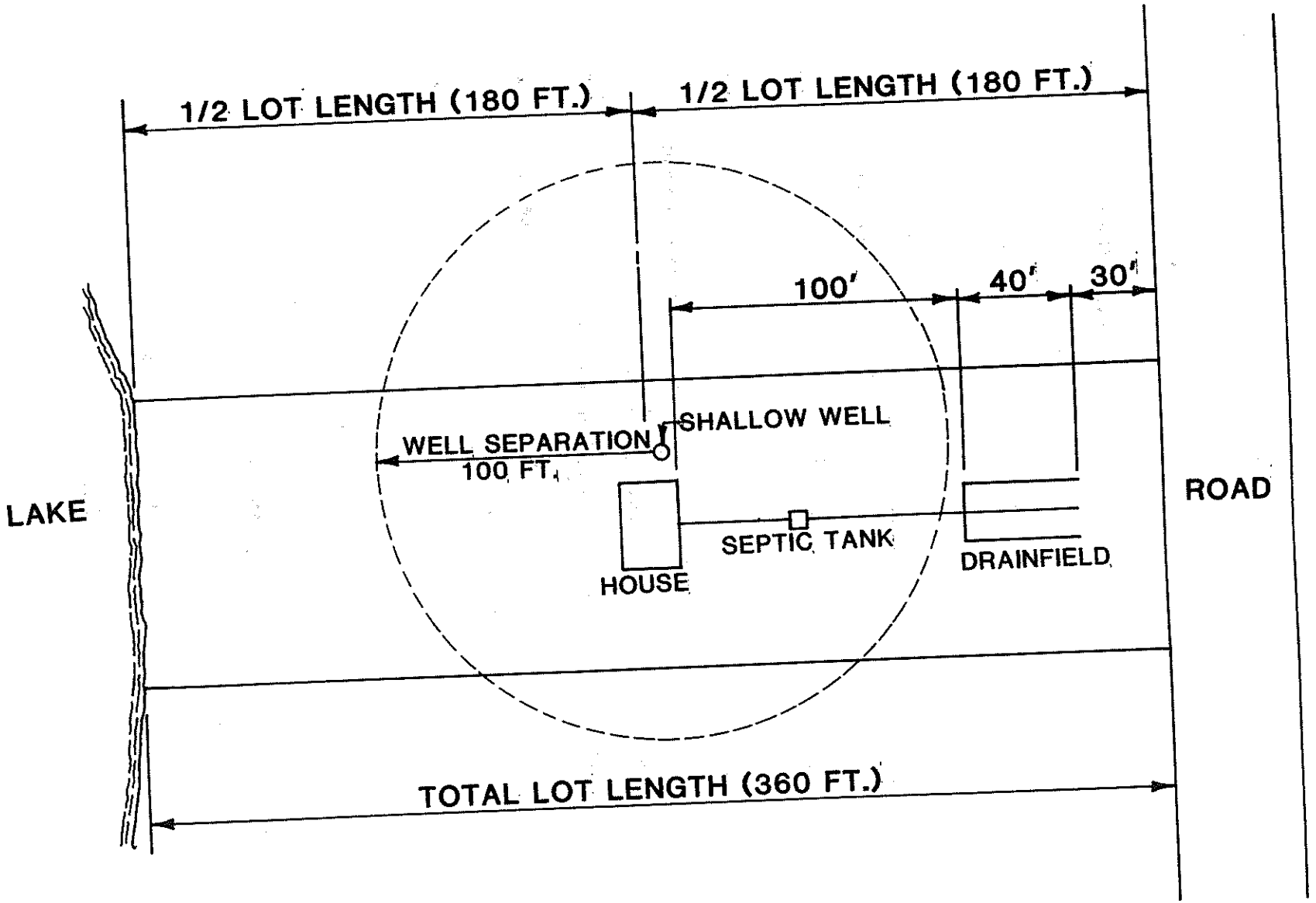

Figure 5. Typical minimum lot size required to meet separation distance for shallow well with house located in center of lot.

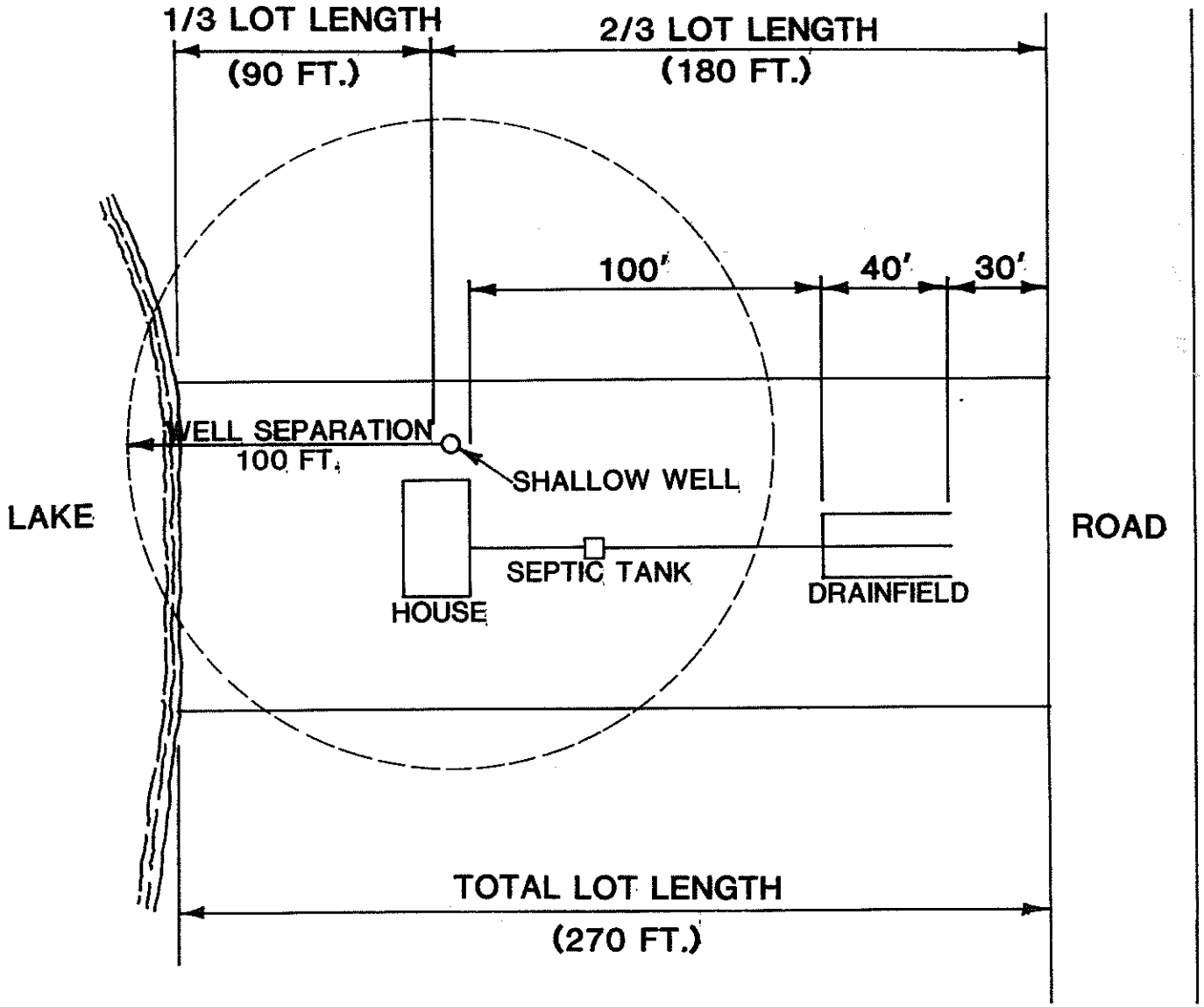

Figure 6. Typical minimum lot size required to meet separation distance for shallow well with house off-set from center of lot.

Table 2. Minimum separation distances for septic tank/drainfield systems*

Item	Minimum Distance, Feet
SEPTIC TANK	
Any source of domestic water supply	50
Buildings	10
Property lines	10
Buried water pipe under pressure	10
DRAINFIELD	
Water supply well less than 50 feet deep	100
Water supply well greater than 50 feet deep	50
General development lakes (Detroit, Sallie & Melissa)	50
Recreational lake (Curfman Lake)	75
Buildings	20
Large trees	10
Property lines or buried water pipe under pressure	10

*Based on MPCA requirements for design and construction of on-site wastewater treatment systems, 6MCAR 4.8040 (WPC-40)

1. Sand and Gravel - This group is the most extensive soil in the area. It is located on shorelands around all four lakes and consists of Arvilla, Maddock, Marquette, Osakis, Sioux, and Sverdrup soils. The percolation rate of this group is generally faster than ten minutes per inch.

2. Loam - Nebish soils make up this group which is found only along the eastern shore of Detroit Lake. Percolation rates range from 30 to 100 minutes per inch.

3. Marsh - These small areas are widely scattered on shorelands of all four lakes. The group cannot be classified as to percolation rate due to a highly variable texture.

Soil borings were done in 1978 around the lake areas and at the proposed stabilization pond site. Percolation tests were done at 14 sites, and the percolation rates ranged from 1.0 to 2.5 minutes per inch. The results of the soil borings and percolation tests are also presented in Appendix H. No percolation tests were done on the east side of Detroit Lake, but based on the soils information, it is assumed that the percolation rates may be slower than those shown in the other areas.

I. Other Areas of Consideration

1. MPCA Design Criteria

Drainfield systems are normally sized according to the texture and percolation rate of the soil. In large drainfield systems however, the more

limiting factor is the capacity of the soil to move the wastewater laterally away from the drainfield area. Drainfields treating over 1,000 gallons per day which are designed based on MPCA Regulation 6MCAR 4.8040 (WPC-40) apparently develop wastewater mounding problems below the drainfield. This situation can cause reduced treatment (by decreasing the depth of the aerated soil zone), or possibly cause a hydraulic failure.

In December 1980, the Minnesota Pollution Control Agency came out with a revised policy concerning the design of large drainfields (treating over 1,000 gallons per day). The new policy indicated that large drainfields shall be sized with twice the bottom bed area required in MPCA Regulation 6MCAR 4.8040 (WPC 40). A copy of MPCA Regulation 6MCAR 4.8040 (WPC-40) and the new policy concerning large drainfield design is presented in Appendix I. This revision will be considered when the alternatives are being evaluated later in this report.

2. Design of Existing Cluster System

An existing major cluster system has been identified on Lake Melissa. It serves approximately 30 homes in the Ravenswood Beach area on the east side of the lake. Based on available information, this report will assume that the drainfield area for this system is substandard based on the recently revised MPCA criteria mentioned above. This system is assumed to require upgrading, and a more detailed analysis will be conducted during the Step 2 phase of this project.

3. Shoreham Area

The Shoreham area, located between Lakes Sallie and Melissa, has been identified as an area with severe site problems. It is an area with small lots and very high groundwater. The results of the septic snooper study suggested this area has a high degree of groundwater contamination. After discussions with the MPCA it was agreed that this area should be included in the total project area, and its sewage treatment needs should be analyzed.

J. Summary of Site Specific Needs Evaluation

As shown in Appendix B, the original area for planning and study in Lake View Township included all of the area around Lakes Melissa and Sallie and a majority of the lakeshore area around Detroit Lake. Based on the site specific needs evaluation it was determined that sections of this planning area do not need any centralized or cluster treatment systems (see Figure 12). The residences in these sections would be best served, where required, by on-site system upgrading or new system construction.

The results of the lot-by-lot categorization of the unsewered lots around Detroit Lake, Curfman Lake, Lake Sallie, and Lake Melissa are presented on plat maps in Appendix J. Based on the site specific needs evaluation, no action is needed on 126 of the 1,046 residences within the study area. The remaining 920 residences contain malfunctioning or illegal sewage treatment systems as determined by direct and/or inferred evidence.

Design Conditions

VI. DESIGN CONDITIONS

A. Effluent Limitations

Most residences in the study area currently treat their wastewater with individual on-site systems with no approved discharges to area lakes. Minnesota Pollution Control Agency (MPCA) regulations require that any wastewater discharged to a lake must be treated to remove most of its phosphorus content. The reason why phosphorus removal is required is to limit the rate of eutrophication of lakes, i.e. the growth of biological organisms such as algae and aquatic plants, which tend to "age" a lake by slowly filling it with dead biological matter, covering it with algal blooms, and depleting the oxygen supply required by fish. Limiting the phosphorus available to biological organisms limits their rate of growth, thus delaying the eutrophication process.

The effluent discharge standards which typically apply to lakes in this area are as follows for both continuous and controlled (180-day storage) discharge:

Parameter	Allowable Concentration
Biochemical Oxygen Demand	25 mg/l
Total Suspended Solids	30 mg/l
Fecal Coliform	200 MPN/100 ml
Total Phosphorus	1 mg/l
pH Range	6.5-8.5
Turbidity	25 NTU

These standards were used in the preliminary development and evaluation of different alternatives for wastewater treatment in this area. However, based on the three alternatives selected by the MPCA for study in this report, no surface water discharge points are being considered.

B. Planning Period and Population Estimates

Based upon a general review of the current wastewater treatment situation in Lake View Township, it is possible to design a wastewater treatment facility to comply with requirements for the existing flows and loads. Since it is not economicalily feasible to frequently make changes in a treatment facility capacity, design criteria are typically projected 20 years into the future by making a judgement of treatment needs at that time. However, MPCA's current policy for lake area projects requires that no allowance for future growth be considered in the design conditions. Therefore, only the existing residences within the planning area will be served by the proposed treatment facilities. The existing summertime population in the project area is estimated at 3,550, assuming three persons per residence. Based on the above mentioned MPCA requirements, the design year population is assumed to be approximately the same as the existing population.

C. Projected Future Land Use and Development Trends

No major changes in land use practices are foreseen during the 20-year planning period. Therefore the need for improved wastewater treatment

facilities is based upon the current development in the area. It is not expected that improved wastewater treatment in Lake View Township will be responsible for a change in land use or growth patterns.

D. Flow Projections

The design flow rates for the proposed centralized treatment system and/or cluster treatment system areas for Lake View Township are summarized in Table 3. The design flow rates for each of the areas will be the same regardless of the alternative selected. Individual on-site upgrading or new on-site system construction will be designed on an individual basis. As explained earlier, domestic and commercial wastewater contributions were based on existing flows.

It is important to emphasize that this data is based upon the most accurate information available to date. The design criteria presented in Table 3 will be used to analyze the various alternatives considered feasible for improved wastewater treatment. Even though these criteria may be subject to minor changes prior to final design, the evaluation of the alternatives in this report should not be significantly affected.

Table 3. Estimated wastewater flow rates* for Areas 1 through 11 (see Figure 12), Lake View Township Facility Plan, August 1981

Area	Description		Flow Rate, GPD
1	97 Residential Dwellings @ 300 gpd	=	29,100
	Castaway Motel & Resort, 85 people @ 50 gpd	=	4,300
	Supper Club, 100 seats @ 10 gal/seat	=	1,000
	Allowance for I/I	=	1,400
	TOTAL		35,800
2	56 Residential Dwellings @ 300 gpd	=	16,800
	Allowance for I/I	=	800
	TOTAL		17,600
3	81 Residential Dwellings @ 300 gpd	=	24,300
	Allowance for I/I	=	2,900
	TOTAL		27,200
4	47 Residential Dwellings @ 300 gpd	=	14,100
	Allowance for I/I	=	2,400
	TOTAL		16,500
5	34 Residential Dwellings @ 300 gpd	=	10,200
	Allowance for I/I	=	1,000
	TOTAL		11,200
6	30 Residential Dwellings @ 300 gpd	=	9,000
	Long Bridge Resort, 45 people @ 50 gpd	=	2,300
	Baywood Resort, 36 people @ 50 gpd	=	1,800
	Allowance for I/I	=	700
	TOTAL		13,800
7	30 Residential Dwellings @ 300 gpd	=	9,000
	Allowance for I/I	=	--
	TOTAL		9,000
8	51 Residential Dwellings @ 300 gpd	=	15,300
	Allowance for I/I	=	1,400
	TOTAL		16,700
9	195 Residential Dwellings @ 300 gpd	=	58,500
	Fairhaven Resort, 15 people @ 50 gpd	=	800
	Village Resort	=	4,000
	Country Club	=	900
	Hilmer's Resort, 100 people @ 50 gpd	=	5,000
	Hilmer's Campground, 72 people @ 25 gpd	=	1,800
	Allowance for I/I	=	6,400
	TOTAL		77,000

Table 3. Estimated wastewater flow rates* for Areas 1 through 11 (see Figure 12), Lake View Township Facility Plan, August 1981 (continued)

Area	Description		Flow Rate, GPD
10	98 Residential Dwellings, @ 300 gpd	=	29,400
	Camp Melissa, 30 people @ 50 gpd	=	1,500
	Allowance for I/I	=	2,100
	TOTAL		33,000
11	327 Residential Dwellings @ 300 gpd	=	98,100
	Fern Beach Resort, 24 people @ 50 gpd	=	1,200
	Allowance for I/I	=	8,600
	TOTAL		107,900

* Based on existing dwellings and summertime flow rates. No allowance for future growth has been included.

Wastewater Treatment Alternatives

VII. WASTEWATER TREATMENT ALTERNATIVES

Several alternatives are available for providing improved wastewater treatment around the area lakes. During meetings with the Minnesota Pollution Control Agency and representative from the Township Board, it was decided that three alternatives should be considered for further analysis.

1. On-site and Cluster Treatment Systems
2. Central Stabilization Ponds with Spray Irrigation
3. Joint Treatment with the City of Detroit Lakes

Appropriate collection system technology was selected for each of the three alternatives using site specific field data collected during site investigations and cost considerations.

A. On-Site and Cluster Treatment Systems

(Alternative 1)

This alternative utilizes septic tank/drainfield system technology for those lots having inadequate existing on-site systems. The alternative includes a combination at the following three different systems for those lots needing system upgrading:

1. Standard on-site treatment system
2. Non-standard on-site treatment system (pump to mound or drainfield)
3. Off-site cluster treatment system (individual on-site septic tanks with a community drainfield)

1. Standard On-site Treatment System

This method of treatment basically includes septic tank/soil absorption units. The septic tanks are designed to allow raw wastewater to flow through the tank at a rate slow enough to allow settleable and floatable solids to be removed. The non-decomposed solids remain as the bottom sludge layer and are removed periodically by pumping. The liquid portion of the septic tank contents is discharged to a drainfield which provides further treatment by biological activity and filtration through the soil. A typical septic tank/drainfield configuration is illustrated in Figure 7.

State and local regulations limit the type of soil and the environment in which a drainfield can be built. These limitations were reflected in Table 1 under "Inferred Evidence of a Malfunctioning or Illegal System". Limiting factors on several lots around area lakes include high groundwater table, rapid permeability of soil, and small lot sizes. On-site treatment is viable where lot limitations and cost would not preclude it.

Minnesota Pollution Control Agency regulation 6MCAR 4.8040 (WPC 40), states that on-site drainfields should not be located in soils with a

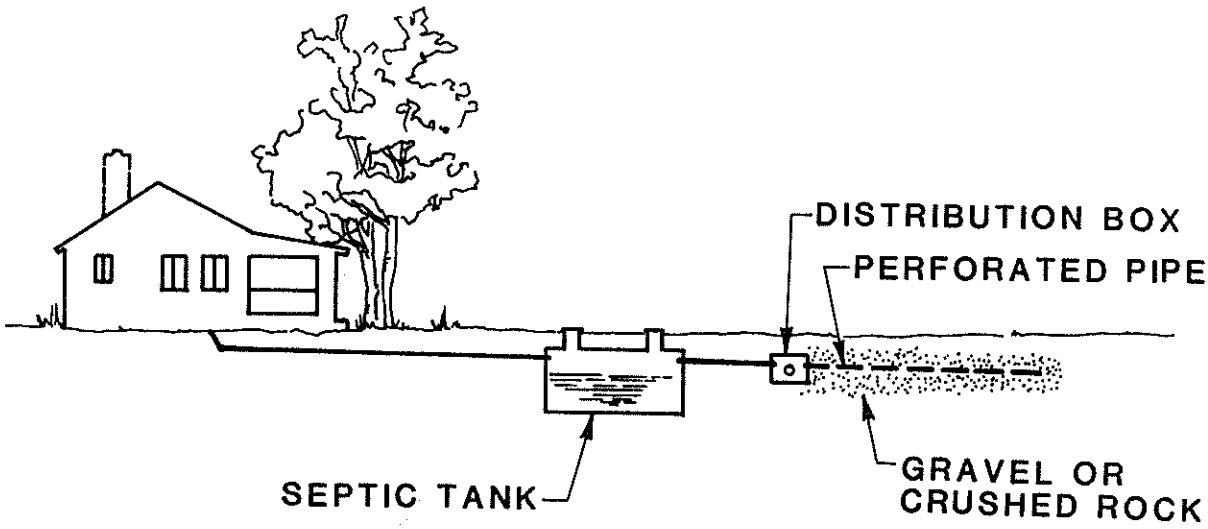

Figure 7. Standard on-site system for level lot

percolation rate faster than 0.1 minutes per inch and that alternative sewage treatment systems should be considered for soils with percolation rates in the range of 0.1 to 5 minutes per inch. On-site drainfields can be modified for use in the 0.1 to 5 min/in. soils by lining the drainfield trenches or beds with a more impermeable soil. The trench liner improves treatment by acting as a filter and a medium for biological growth. The soils around the area lakes have percolation rates within the range of 0.1 to 5 min/in. In these soils, any drainfield trenches or beds would need to be lined with a more impermeable soil.

2. Non-standard On-site Treatment System

In areas where high groundwater exists, conventional on-site septic tank/drainfield systems cannot function properly because the depth of unsaturated soil is not enough to allow proper treatment. A non-standard on-site system may be constructed on these lots by pumping the septic tank effluent to a mounded drainfield or a standard drainfield located at higher elevations on the lot. The effluent pump would be located in a separate wet well, downstream from the septic tank. A mounded drainfield would be constructed by building the drainfield in a mound of permeable fill material. A mounded drainfield would be appropriate only where lot sizes and pertinent separation distances are adequate. For some lots that can have an effluent pump with a drainfield located at a higher elevation but have soils with a permeability between 0.1 and 5 min/in., a trench liner may be required. Typical non-standard on-site systems are illustrated in Figures 8 and 9.

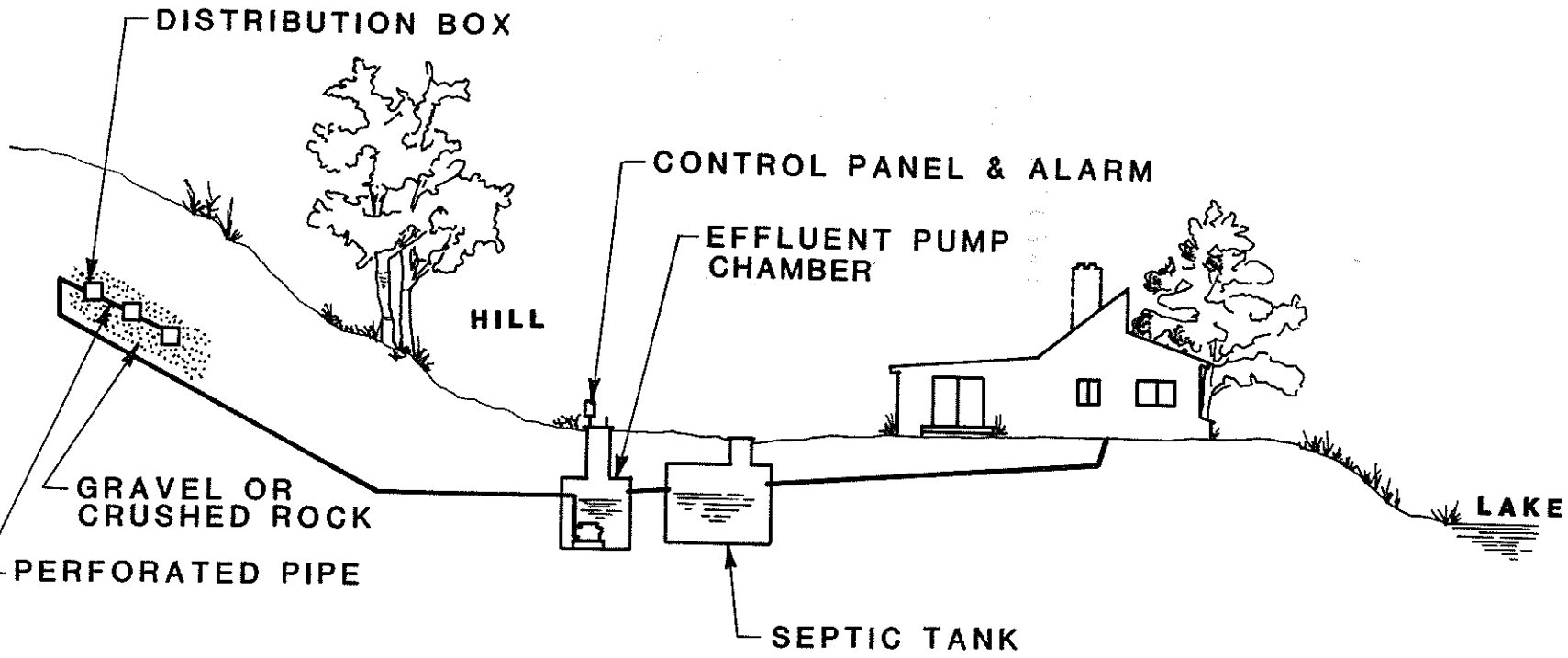

Figure 8. Non-standard on-site system - drainfield at higher elevation

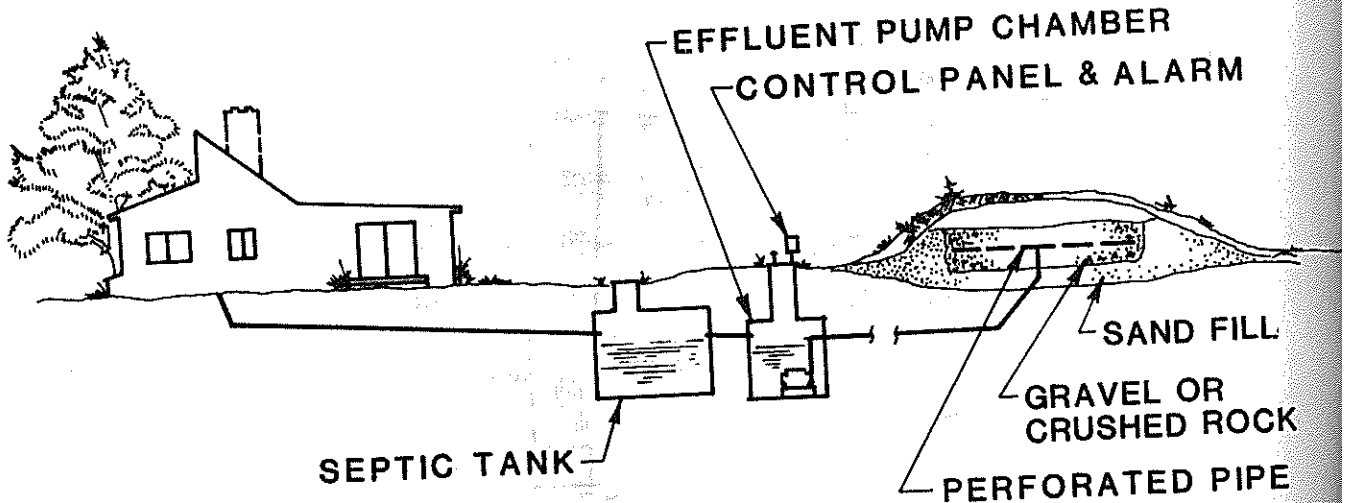

Figure 9. Non-standard on-site system - mounded drainfield

3. Off-site Cluster Treatment System

In areas where standard or non-standard on-site treatment systems are not feasible due to site specific constraints or cost considerations, off-site cluster treatment is a viable treatment alternative. Using this method, wastewater treatment is obtained by treating and disposing of the effluent from a number of individual on-site septic tanks with a community dosing chamber and drainfield located off-site. An example of this type of cluster system is shown in Figure 10.

A septic tank effluent pump, shared by two residences, is used on any low lot, or any lot not served by a gravity sewer. Small diameter gravity sewers and/or forcemains are used to convey the effluent to the community dosing chamber and drainfield (see Figures 11a and 11b). The dosing chamber pumps four 10-minute doses per day to the drainfield which gives the drainfield adequate time to treat and dispose of the effluent.

Other off-site cluster treatment system technologies were studied along with the above mentioned system, but were found to be less cost effective for this project area. One cluster system which was studied and found more costly used grinder pumps for each pair of lots, small diameter sewers, and a community septic tank and drainfield.

4. Selection of Appropriate Treatment System

The appropriate treatment system for each "obvious problem" lot was decided based on site data considerations and cost effectiveness. Because of the close proximity of many lots requiring treatment, it was found that

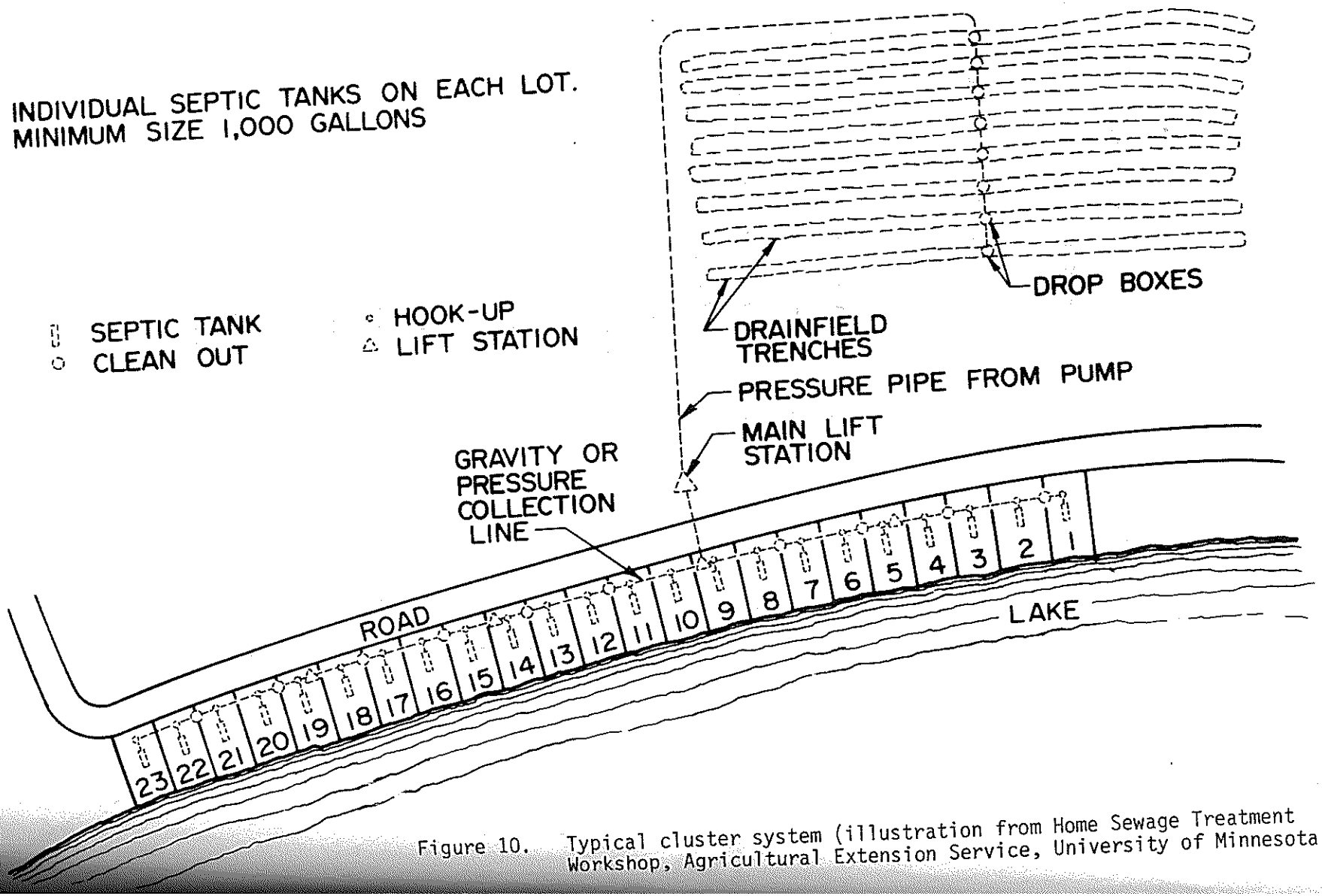

Figure 10. Typical cluster system (illustration from Home Sewage Treatment Workshop, Agricultural Extension Service, University of Minnesota)

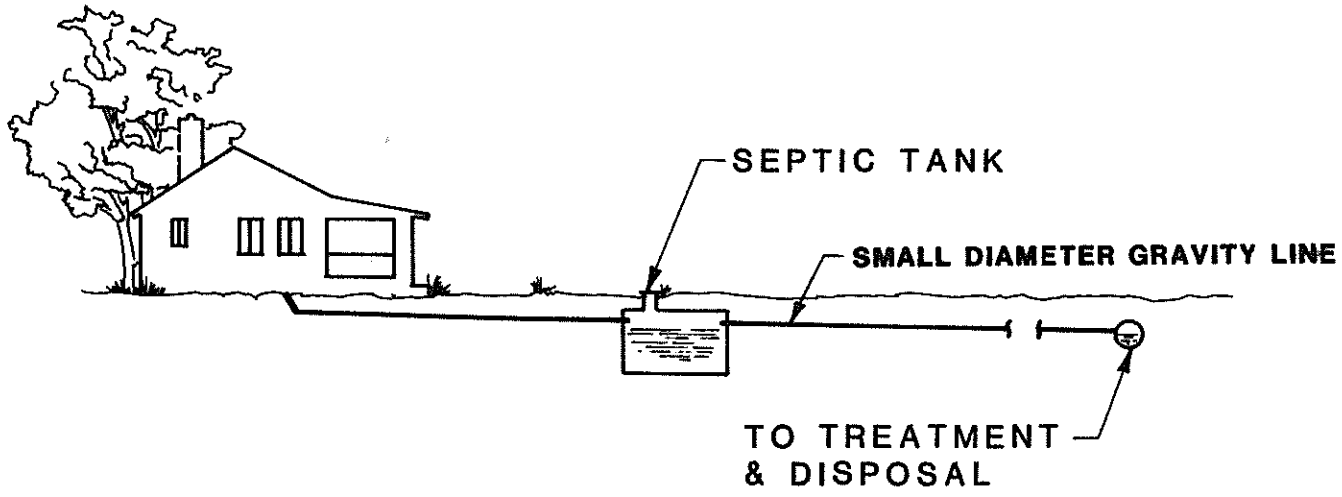

Figure 11a Septic tank small diameter gravity system

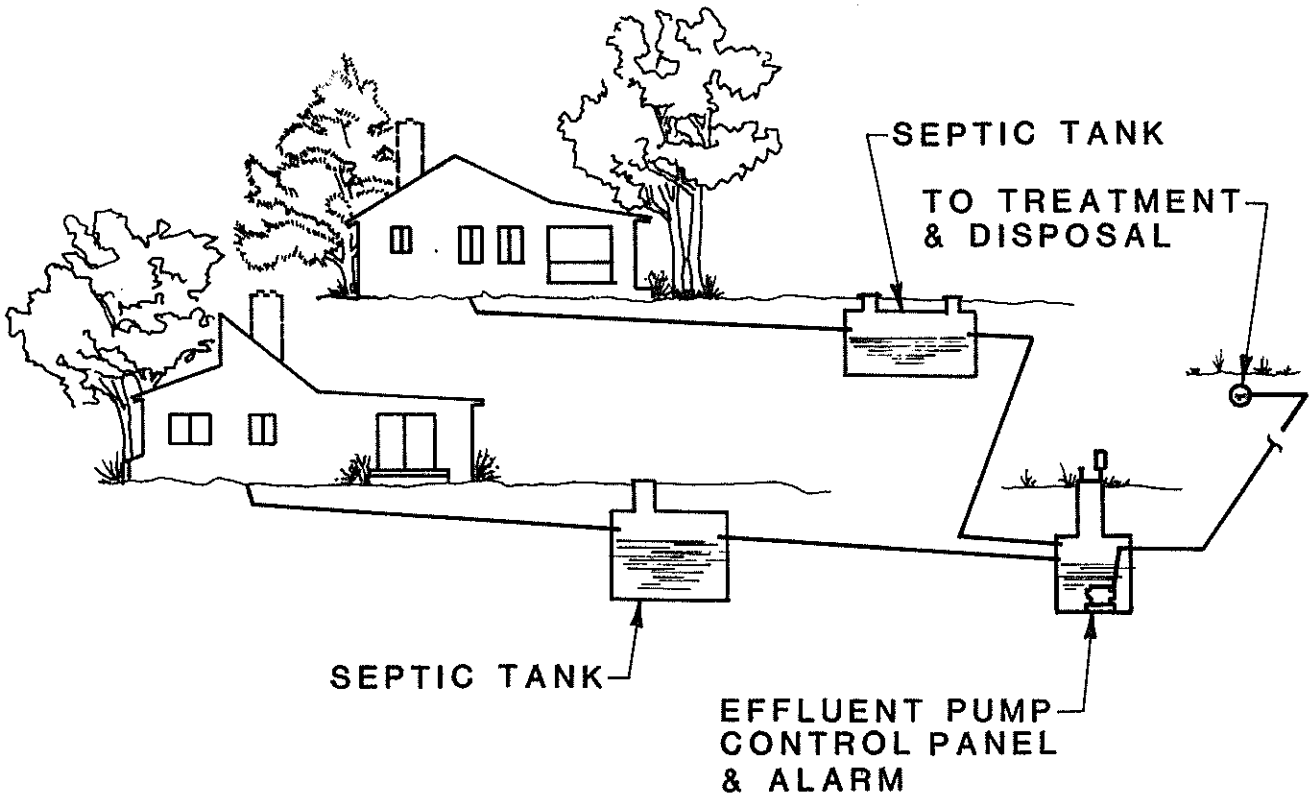

Figure 11b Septic tank effluent pump (STEP) system

it was less costly to treat these lot groupings with an off-site cluster treatment system rather than individual on-site systems. Off-site cluster systems were also designated for lots where on-site systems (standard or non-standard) were precluded by site constraints. Where individual on-site systems were the most feasible, the action option was either to upgrade the existing systems or construct new on-site systems (either standard or non-standard as required).

The lots designated for off-site cluster treatment systems occured in groups at various locations around the lakes. A soil survey was conducted at several locations to determine suitability for community drainfield construction in the area, and provide data for drainfield design (see Appendix H). The proposed layout for Alternative 1 is presented in Figure 12.

B. Central Stabilization Ponds with Spray Irrigation (Alternative 2)

This alternative consists of a conventional collection system conveying wastewater to a central treatment facility, and serving most of the project area. The central treatment facility consists of stabilization ponds with spray irrigation. For areas 7 and 8 on Lake Sallie, it was determined that it was more cost effective to serve these areas with cluster treatment systems as described under Alternative 1, than to extend the collection

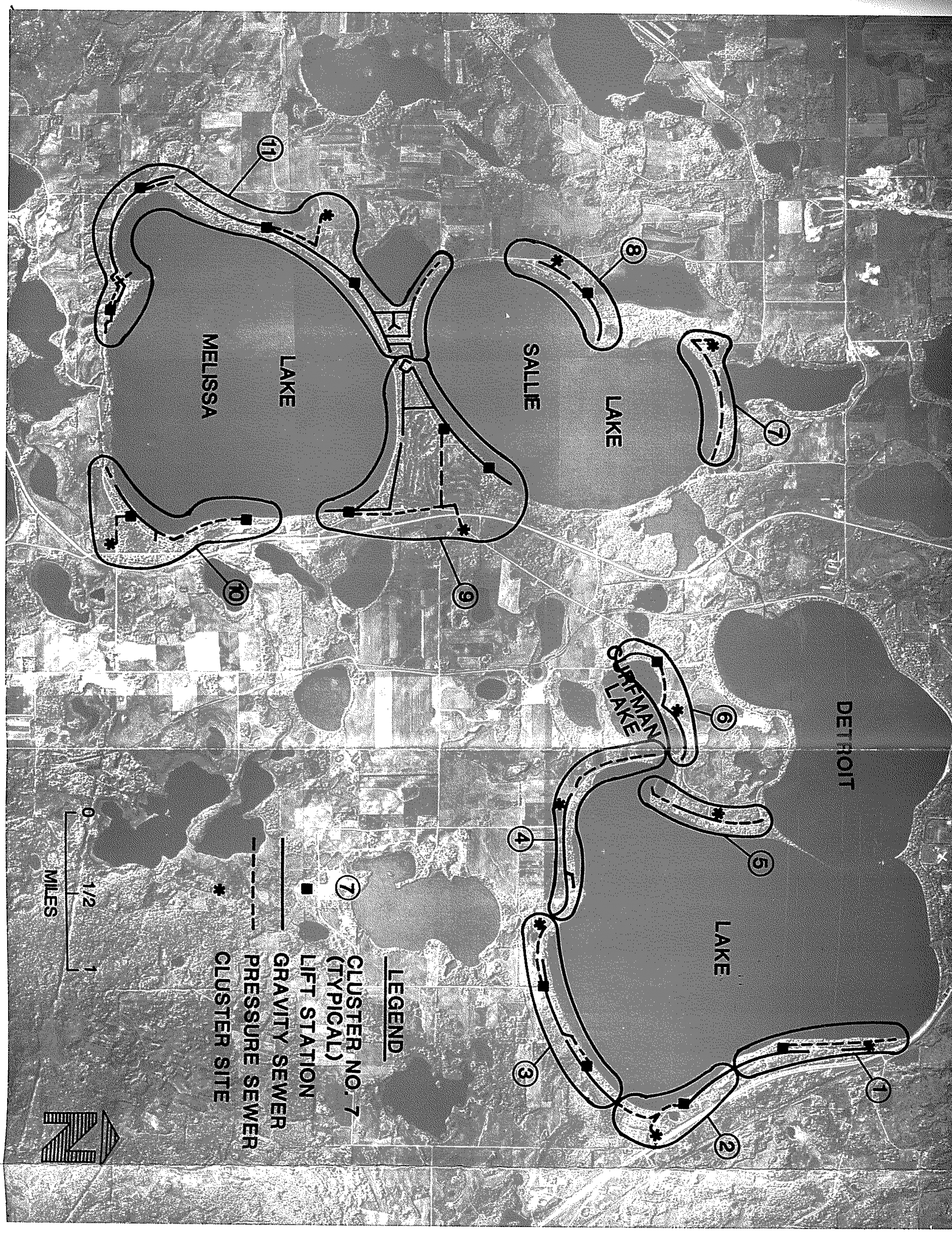

FIGURE 12

ON-SITE and CLUSTER TREATMENT SYSTEMS

(ALTERNATIVE 1)

system. Other scattered lots that require treatment outside the central collection system limits will either have their existing on-site systems upgraded or new on-site systems will be constructed (standard or non-standard as required). These systems are described more fully under Alternative 1. The proposed layout for Alternative 2 is presented in Figure 13.

Spray irrigation is a process that combines wastewater treatment with crop irrigation. Nutrients in the wastewater are recycled into crop production. This is the most common of the various land application techniques available as well as being the most favorable technique from the standpoint of maximizing benefits and eliminating discharges to navigable waters. Some of the MPCA guidelines relating to site selection, where land application of wastewater is to be practiced, are as follows:

- Potential sites shall be at least one mile from any municipal water supply and one-fourth of a mile from any private domestic water supply.

- The disposal site shall be one-fourth of a mile from any human habitation or area which is likely to be developed within the proposed use period of the project.

- The site shall be one-fourth of a mile from state parks, recreation areas, and lakes or rivers.

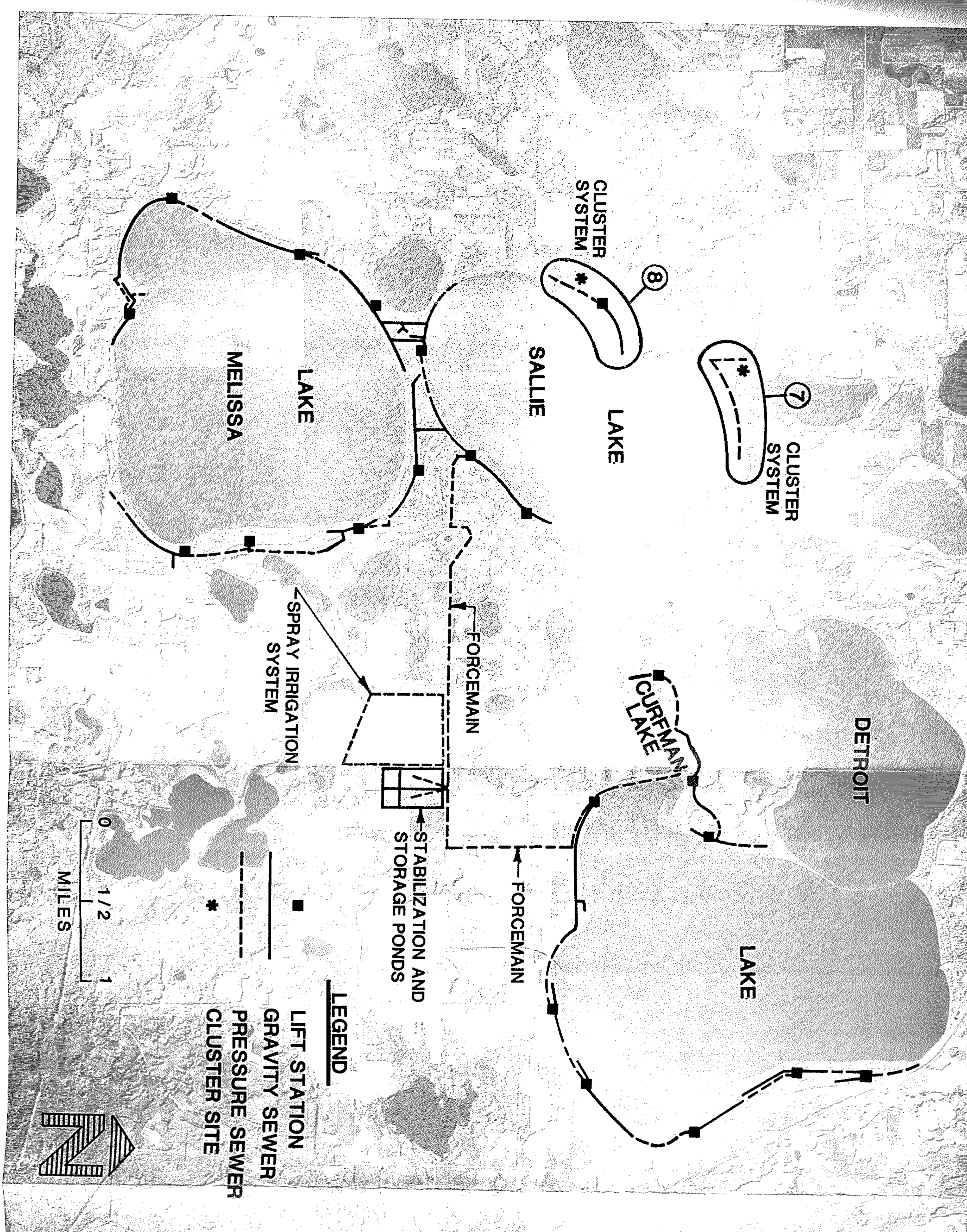

FIGURE 13

CENTRAL STABILIZATION PONDS with SPRAY IRRIGATION

(ALTERNATIVE 2)

... The site shall be of sufficient elevation to permit a 10 foot separation between the surface of the irrigation field and the maximum height of the groundwater table.

The MPCA also has specific regulations concerning spray irrigation of wastewater. The rate of application of wastewater should not exceed two inches per week, and a storage facility capable of holding at least 210 days of wastewater flow should be provided. The large storage facility is necessary since cold weather (wintertime) surface land application is undesirable in Minnesota. The application design period should be limited to approximately 18 weeks per year, which regulates the application rate to a maximum of 3 feet per year. Approximately one acre of land is requried under these conditions for each million gallons of wastewater per year.

This alternative, utilizing stabilization ponds and spray irrigation, was sized based on the above mentioned MPCA guidelines and regulations with the exception of the storage facility. Since the land application period is shorter in northern Minnesota, a longer wintertime storage facility is needed, therefore a 240-day storage facility was used. Based on the estimated wastewater volume, approximately 55 acres would be necessary for construction of the stabilization pond system and about 143 acres of additional land would be required for spray irrigation. It is noted that an application rate of three feet of wastewater per year is quite high and would have to be confirmed or modified by further studies if this is the selected alternative.

C. Joint Treatment with the City of Detroit Lakes (Alternative 3)

Treatment of Township wastewater by the existing facility serving the City of Detroit Lakes is an alternative to the previously discussed plans for separate treatment. City officials have indicated that the City of Detroit Lakes will accept wastewater from outside the current City limits only by annexing the new service area into the City. The only area the City is presently interested in annexing is around Lake Detroit. Since the City will not accept wastewater from around Lake Sallie and Lake Melissa for treatment at the Detroit Lakes facility, only wastewater from around Lake Detroit (and Curfman Lake) was considered in this alternative.

Treatment of wastewater from the Lake Sallie and Lake Melissa areas would be provided by cluster treatment systems as described under Alternative 1. Other scattered lots that require treatment will have either their existing on-site system upgraded or a new on-site system constructed (standard or non-standard as required). These systems are described more fully under Alternative 1. The proposed layout for Alternative 3 is shown in Figure 14.

Treating wastewater from around Detroit Lake at the City's existing treatment facility would use a substantial amount of any "additional capacity" which had been built into the facility. It is not within the scope

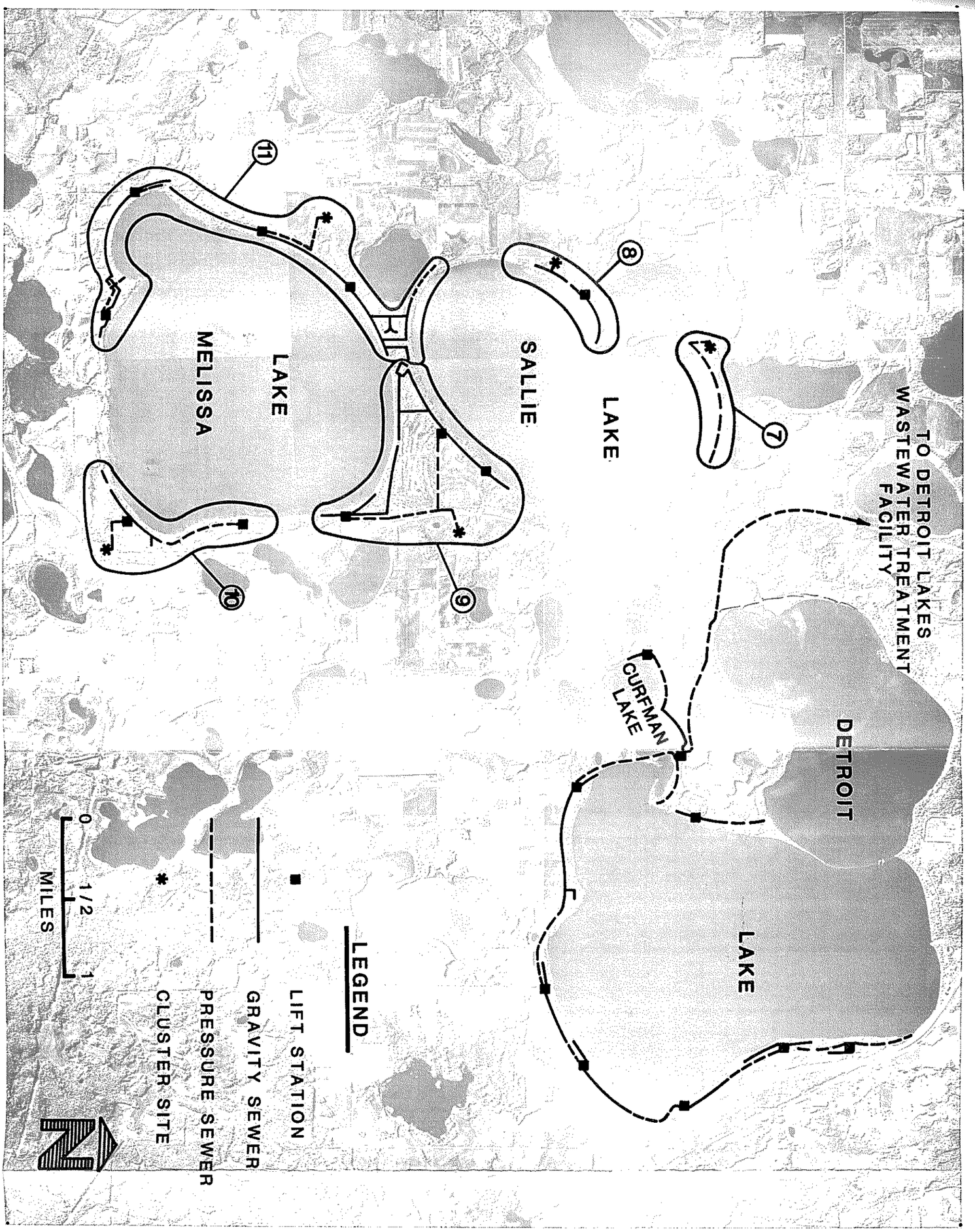

FIGURE 14

JOINT TREATMENT with the CITY of DETROIT LAKES

(ALTERNATIVE 3)

of this report to investigate the extent or cost of any modifications that may be required to the City plant to serve the Detroit Lake area.

Evaluation of Alternatives

VIII. EVALUATION OF ALTERNATIVES

Many factors must be carefully considered in making the final selection of a wastewater treatment alternative for Lake View Township. Financial, environmental and technical considerations plus implementation, reliability and expansion capability for each alternative should be weighed in the final decision-making process.

A. Cost Considerations

1. General

The estimated total cost for improved wastewater treatment will include both construction costs, and operation and maintenance costs. In determining the cost-effectiveness of the three alternatives, costs will be presented in terms of equivalent annual costs. Salvage values will also be considered in accordance with EPA regulations.

2. Estimated Construction Costs

Preliminary construction cost estimates presented herein are based on June 1981 construction costs. The Engineering News Record Construction Cost Index at the time the estimates were prepared was 3510. Various material and equipment manufacturers and suppliers were consulted for information affecting cost estimates. Published and unpublished data on costs for similar kinds of construction were also utilized.

In the past, it has not been uncommon for the construction costs to increase as much as one percent per month, and such increases will probably continue in the future. The estimated costs presented do not take inflation into account. The reader is cautioned to keep this in mind in reviewing the costs within this report. These costs are only approximate in nature and are presented as a general tool for decision makers in Lake View Township. More refined estimates will be made during the completion of plans and specifications. The estimated costs for the three alternatives are presented in Tables 4 through 6.

3. Estimated Salvage Values

Salvage values are calculated by depreciating a given item over its useful life on a straight line basis, and then determining the undepreciated amount at the end of the 20-year planning period. Estimated salvage values also appear in Tables 4 through 6. Useful life assumptions utilized for determining salvage value as outlined by EPA are:

- Land - permanent
- Piping - 50 years
- Concrete and earthen structures - 30 to 50 years
- Process equipment - 15 to 20 years
- Auxiliary equipment - 10 to 15 years

Land costs were appreciated in value at a rate of 3 percent per year to determine a salvage value in accordance with EPA cost analysis guidelines.

Table 4. Summary of construction cost estimates for wastewater collection and cluster treatment systems (Alternative 1), Lake View Township, Minnesota

Item	Construction Cost	Salvage
Cluster 1	$ 693,000	$ 122,000
Cluster 2	344,000	80,000
Cluster 3	635,000	135,000
Cluster 4	374,000	104,000
Cluster 5	271,000	59,000
Cluster 6	335,000	65,000
Cluster 7	230,000	47,000
Cluster 8	353,000	80,000
Cluster 9	1,358,000	326,000
Cluster 10	604,000	132,000
Cluster 11	1,981,000	466,000
Electrical and Portable Standby Power	53,000	--
Telemetry	120,000	10,000
Office, Storage and Maintenance Building	70,000	23,000
Maintenance Vehicles and Equipment	25,000	--
SUBTOTAL	$ 7,446,000	$ 1,649,000
Construction Contingencies (5%)	372,000	--
Engineering, Legal and Administrative (15%)	1,173,000	--
Land (66 acres @ $2,000/acre)	132,000	238,000
Interest During Construction	497,000	--
TOTAL ESTIMATED CONSTRUCTION COST	$ 9,620,000	$ 1,887,000

June 1981

Table 5. Summary of construction cost estimates for wastewater collection and central ponds and spray irrigation facility (Alternative 2), Lake View Township, Minnesota

Item	Construction Cost	Salvage
Collection and Conveyance System	$ 4,339,000	$ 1,384,000
Raw Wastewater Pumping	248,000	123,000
Cluster Treatment Systems (Areas 7 & 8)	583,000	127,000
Wastewater Treatment and Storage Ponds	1,259,000	755,000
Spray Irrigation System	215,000	35,000
Electrical and Portable Standby Power	60,000	--
Telemetry	100,000	10,000
Office, Storage and Maintenance Building	70,000	23,000
Maintenance Vehicles and Equipment	25,000	--
SUBTOTAL	$ 6,899,000	$ 2,457,000
Construction Contingencies (5%)	345,000	--
Engineering, Legal and Administrative (15%)	1,087,000	--
Land (63 acres @ $2,000/acre)	126,000	228,000
Interest During Construction	461,000	--
TOTAL ESTIMATED CONSTRUCTION COST	$ 8,918,000	$ 2,685,000

June 1981

Table 6. Summary of construction cost estimates for wastewater collection and joint treatment with the City of Detroit Lakes for Lake Detroit; wastewater collection and cluster treatment systems for Lake Sallie and Lake Melissa (Alternative 3), Lake View Township, Minnesota

Item	Construction Cost	Salvage
Detroit Lake & Curfman Lake		
Collection and Conveyance System	$ 1,920,000	$ 566,000
Raw Wastewater Pumping	306,000	147,000
Lake Sallie & Lake Melissa		
Cluster Treatment Systems	4,526,000	1,051,000
Electrical and Portable Standby Power	53,000	--
Telemetry	100,000	10,000
Office, Storage and Maintenance Buidling	70,000	23,000
Maintenance Vehicle and Equipment	25,000	--
SUBTOTAL	$ 7,000,000	$ 1,797,000
Construction Contingencies (5%)	350,000	--
Engineering, Legal and Administrative (15%)	1,110,000	--
Land (38 acres @ $2,000/acre)	76,000	137,000
Interest During Construction	467,000	--
TOTAL ESTIMATED CONSTRUCTION COST	$ 8,993,000	$ 1,934,000

Land cost valued too high - most lands should be obtained for 500/acre or less land irrigated in the production of reeds canary grass should produce 8 tons/acre 8 tons x 40.00/ton = 320.00 income per year

June 1981

4. Estimated Operation and Maintenance Costs

A significant portion of the total annual cost of wastewater treatment is the day-to-day operation and maintenance (O & M) expenses. These costs, presented in Table 7, vary from $63,800 for Alternative 2 to $92,400 for Alternative 1. In accordance with EPA cost-effective analysis guidelines, these costs represent an average cost over the 20-year design period not considering the effects of inflation. Inflation may cause the operation and maintenance costs to be significantly greater than those used in the cost-effective analysis. However, it is assumed that the relative ranking of alternatives will not be affected by changes in the general level of prices because all prices will tend to change by approximately the same percentage.

The following categories of costs have been considered in estimating the total operation and maintenance costs: labor, power, parts and supplies, truck mileage, lab services, contract sludge hauling, and replacement cost.

The following unit costs were used in estimating operation and maintenance expenses:

Labor costs (including overhead)	- $18,000/yr., full-time
	- $8,000/6 mo., part-time
Power costs	- $0.065/kilowatt hour

Table 7. Estimated annual operation and maintenance costs for proposed wastewater treatment alternatives for Lake View Township, Minnesota

ITEM	ALT 1 [(a)]	ALT 2 [(b)]	ALT 3 [(c)]
Labor	$ 36,000	$ 26,000	$ 36,000
Power	6,900	6,300	6,700
Parts/Supplies	5,000	3,000	4,000
Truck Mileage	6,000	4,000	5,000
Lab Services	2,500	1,500	2,000
Contract Sludge Hauling	11,000	1,000	7,000
Replacement Cost[(d)]	25,000	22,000	23,000
Total Annual O & M Costs, $/yr	$ 92,400	$ 63,800	$ 83,700 [(e)]

(a) Wastewater collection and cluster treatment systems

(b) Wastewater collection and central pond and spray irrigation facility

(c) Wastewater collection and joint treatment with the City of Detroit Lake for Lake Detroit; wastewater collection and cluster treatment systems for Lake Sallie and Lake Melissa.

(d) Estimated equivalent annual replacement cost based on a 20-year amortization @ 7.375% interest.

(e) Does not include the base monthly sewer charge for the area around Detroit Lake proposed to be served by the existing City treatment plant (presently $12.00/household/month).

↓
Sewer cost based on the amount of water used.

June, 1981

5. Estimated Total Equivalent Annual Cost

All costs have been converted to an equivalent annual cost for the 20-year planning period and are summarized in Table 8. The interest rate used for the cost-effective analysis was 7.375% as prescribed by the EPA. This results in a capital recovery factor of 0.0972 and a present worth factor for the 20-year period of 0.2410. By adding the estimated equivalent annual operation and maintenance costs to the estimated equivalent annual construction costs, and subtracting the estimated equivalent annual salvage value, the total estimated equivalent annual cost for each alternative is determined.

According to Table 8, Alternative 2 appears to be the most cost-effective. However, it is the current policy of the MPCA to consider all alternatives as being equally cost effective if their total equivalent annual costs are within 15% of each other. This policy is based on the fact that these costs are estimates only, and the actual costs could vary by as much as 15%. Both Alternatives 1 and 3 are within 13% of Alternative 2. Therefore, the Township does have the option of considering all three alternatives as being equally cost effective.

B. Environmental Considerations

1. Description of the Future Environment Without the Project

The description of the existing environment, presented in Section III, is relevant to the future environment with the exception of the following categories:

Table 8. Estimated total equivalent annual cost for proposed wastewater treatment alternatives for Lake View Township, Minnesota

	ITEM	ALT 1 [a]	ALT 2 [b]	ALT 3 [c]
1.	Total Estimated Construction Cost, $	$9,620,000	$8,918,000	$8,993,000
2.	Estimated Salvage Value at 20 years, $	1,887,000	2,685,000	1,934,000
3.	Estimated Equivalent Annual Construction Cost, $/yr [d]	935,000	867,000	874,000
4.	Estimated Equivalent Annual Salvage, $/yr [d]	44,000	63,000	45,000
5.	Estimated Annual O & M Cost, $/yr	92,000	64,000	84,000
6.	Estimated Total Equivalent Annual Cost, $/yr (Line 3 - Line 4 + Line 5)	$ 983,000	$ 868,000	$ 913,000 [e]

(a) Wastewater collection and cluster treatment systems

(b) Wastewater collection and central pond and spray irrigation facility

(c) Wastewater collection and joint treatment with the City of Detroit Lake for Lake Detroit; wastewater collection and cluster treatment systems for Lake Sallie and Lake Melissa.

(d) Based on 20-year amortization @ 7.375% interest. (e)Does not include the base monthly sewer charge for the area around Detroit Lake proposed to be served by the existing City treatment plant (presently $12.00/household/month).

(e) Does not include the base monthly sewer charge for the area around Detroit Lake proposed to be served by the existing City treatment plant (presently $12.00/household/month).

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... Hydrological Elements

... Land Use

The future environment without the project relative to the above categories is discussed as follows:

Hydrological elements Attempting to predict the future environment in the Lake View Township area without any improvement to the existing wastewater treatment systems is difficult at best. As previously discussed, due to the inadequate on-site wastewater treatment systems serving the residents of Lake View Township, proper treatment is not being provided. As a result, the untreated wastewater percolates through the soil and enters the groundwater and surface water. This situation has created a ground and surface water contamination problem within the Township.

Since ground and surface water contamination already exist, it seems unrealistic to believe that it will dissipate if wastewater treatment improvements are not made. It is more likely that this contamination will continue and increase in intensity if improvements are not implemented.

Land use Land use plans and controls could possibly be affected if action is not taken to improve wastewater treatment in Lake View Township. The possibility of continued degradation of the groundwater and surface water quality in the immediate and adjacent areas is less than desirable for prospective new residents.

2. Primary Impacts of Alternatives

Primary impacts are those impacts that can be attributed directly to the proposed action.

a. Alterations to land forms, streams and natural drainage patterns Construction of any of the three alternatives would result in minor environmental changes at the proposed treatment facility sites. The proposed sites are relatively flat and are currently either vacant or used for agricultural purposes. The construction of earthen berms for a stabilization pond, or the construction of community drainfields should not significantly alter the natural drainage pattern of the area.

b. Erosion losses Erosion losses would be expected during construction of any of the alternatives until final ground cover has been established. Control measures to be implemented to minimize these losses would be as follows:

- Scarify only those portions of the site to be used for construction.
- Utilize proper construction techniques to minimize erosion during construction (proper compaction and wetting to minimize wind erosion losses).
- Seed all areas disturbed during construction as soon as possible.

c. Vegetation and trees Some of the proposed sites are used for agricultural purposes and some are wooded areas. Alternatives 1 and 2 would require the largest amounts of land, approximately 66 and 63 acres respectively, while Alternative 3 would require 38 acres.

d. Clearing Herbicides, defoliants, blasting or burning will not be used to clear the construction sites unless proper permits are obtained from local, county and state agencies. It is not anticipated that any of these practices will be necessary.

e. Final disposal method for soil, vegetation and construction wastes The proposed wastewater treatment facilities will be designed to minimize the disposal of excessive earth material. Any excessive quantities of earth will be disposed of on-site. Final grading of the site will be accomplished according to final plans and specifications. Directions for disposing of excess construction materials or wastes will be specified within the construction documents and will be subject to the wishes of the owner.

f. Relocation of residents No relocation of residents or existing structures will be required for any of the proposed alternatives.

g. Bypassing wastewater during construction There will be no need to bypass raw wastewater during construction of any of the proposed alternatives. Operation of the existing individual treatment systems will be maintained throughout the construction period.

h. Present water quality A favorable environmental impact is foreseen as a result of implementing any of the proposed alternatives. Construction of any of the three alternatives would eliminate the current wastewater treatment problem. Inadequately treated wastewater would no longer percolate into the groundwater and cause contamination of area water supplies. but mineralized effluent would.

i. Project's physical relation to area flood plains The proposed project sites are not located within a flood plain.

j. Odor problems If the wastewater stabilization pond with spray irrigation alternative is implemented, odors could be noticeable for approximately 2 to 10 days during the spring, but can be controlled by chemical addition.

Odors may also be noticeable with the community drainfield alternatives. In these alternatives, septic tank effluent would flow to the treatment facility site. Under these conditions, it has been found that wastewater remains septic during transit and could result in strong odors and corrosion problems.

k. Noise levels Construction noise will be noticeable only within the immediate vicinity of the project for the duration of the construction period. The construction period is estimated to be approximately two years for each alternative. Noise would be generated by dozers, graders, back hoes, and earth movers. Due to the location of the proposed central treatment facility site, construction and operation noises will have minimal

effect on the area residents. Noise levels from construction of the collection system and cluster systems would have a greater effect in the more densely populated areas in the Township.

l. Incineration Incineration would not be a part of any of the proposed alternatives.

m. Disposal method for grit, screenings and sludge The wastewater treatment pond with spray irrigation alternative being considered would be designed for the accumulation of sludge in the bottom of the treatment cells that should not have to be removed during the 20-year design life.

With the community drainfield alternatives, a private contractor would be hired to remove and landspread the septic tank septage on a regular basis. The contractor would be required to supply evidence of compliance with all permits and regulations for the disposal of septage, as established by the MPCA.

n. Wetlands and habitats of endangered species No wetlands nor the habitats of any endangered species will be disturbed by construction of any alternative.

3. Secondary Impacts of Alternatives

Secondary impacts are defined as indirect or induced changes as a result of an alternative.

a. Beneficial uses of land eliminated In accordance with previous discussions, some of the potential site areas considered herein are currently or have in recent years been used to grow agricultural crops. The other proposed sites are either wooded areas or vacant fields. The decrease in agricultural productivity by construction of any of the proposed wastewater treatment alternatives is not expected to be significant.

b. Changes in land use and population density As previously discussed, Lake View Township is located in a mixed agricultural, industrial, and recreational area, and improved water pollution control in the Township is not expected to alter the community growth pattern or area land use practices. None of the proposed alternatives are expected to trigger undesirable growth in the population of the area.

c. Effect of project on historic, archaeological, recreational and natural preserve sites As previously discussed, the Minnesota Historical Society has been contacted to determine if any historical/archaeological/cultural sites or elements are present in this area. (See Appendix O). As per their request, an archaeological survey will be performed on each proposed site. A survey of the final treatment areas will be required to determine if any historical/archaeological/cultural sites or elements are present. This survey will be done prior to beginning the Step 2 phase of the project.

C. Other Considerations

1. Implementation

Implementation refers to the effort required to construct the treatment facility and put it into operation. The implementation of each alternative is dependent upon institutional, financial and operation and maintenance factors.

a. Institutional Lake View Township has the legal authority and financial capability to construct and operate any of the proposed alternatives. The Township must approve any alternative before it can be implemented. Additional agencies in the approval process include the Minnesota Pollution Control Agency and the U.S. Environmental Protection Agency, as well as the State and Regional Planning agencies.

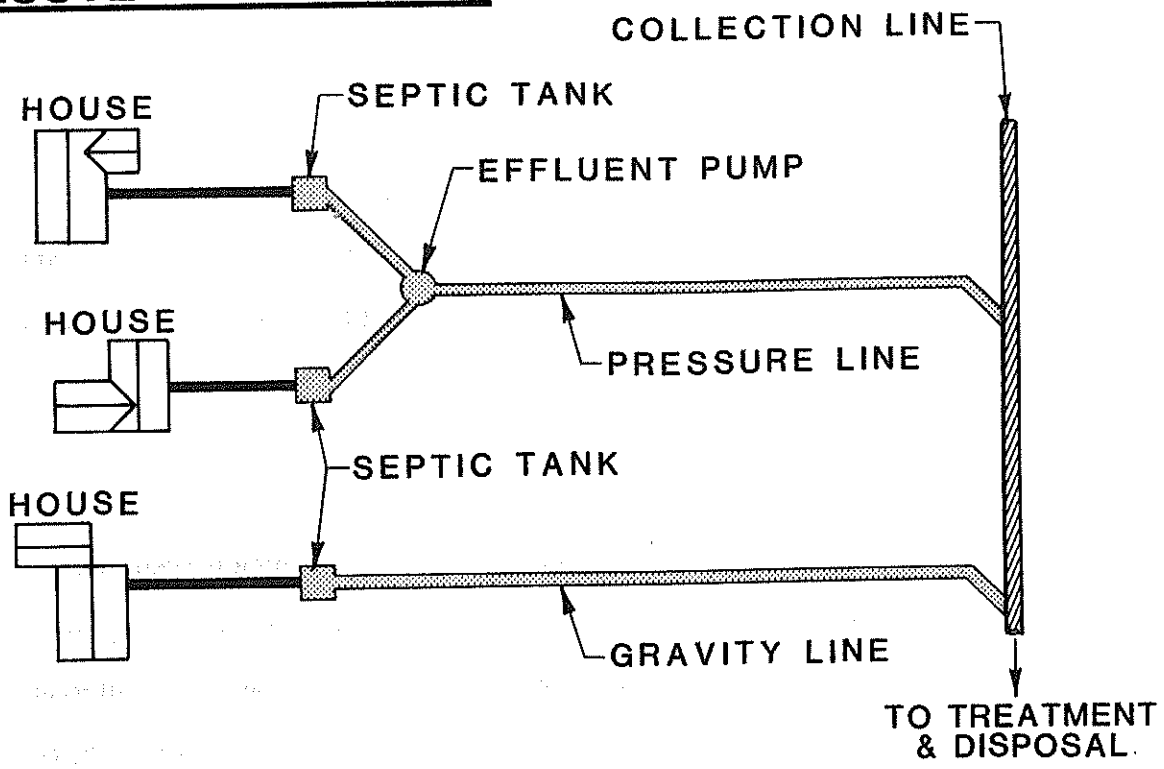
b. Financial Lake View Township is participating in the construction grants program which presently provides for a 75 percent Federal grant and a 15 percent State grant (90% total) for eligible portions of the wastewater treatment facility improvement costs. For innovative/alternative (I/A) treatment technologies the program may provide for an 85 percent Federal grant and a 9 percent State grant (94% total) on certain eligible I/A component costs. Prior to receiving 94 percent funding for the I/A portions of the system, the treatment facility must be certified by the EPA as either innovative or alternative, and set aside grant funds for I/A projects must be available. All three of the proposed alternatives should be classified as I/A systems with varying portions eligible for 94% I/A funding.

It is anticipated that the principal source of funding for the proposed project would be from state and federal grants. Due to the ever changing political situation, it is anticipated that the current 90 percent funding of the non-I/A system portions will be reduced. For this reason local costs were figured assuming 94 percent funding of eligible I/A system portions, and then either 90, 50, or 0 percent funding of the remaining non-I/A eligible portions.

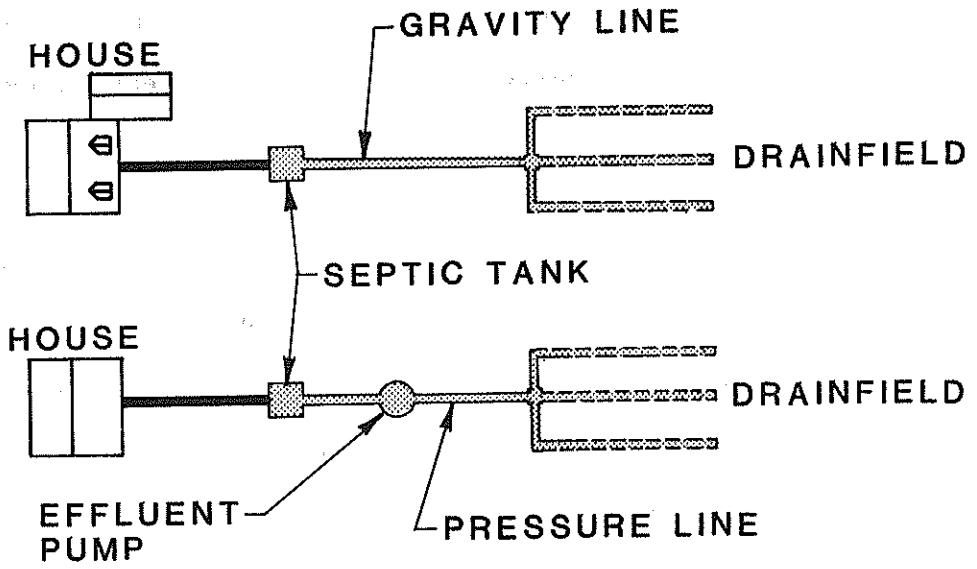
Lake View Township would be responsible for the remaining percentages of the grant-eligible construction costs plus all non-grant-eligible costs. Non-grant-eligible costs include any conventional gravity services, interest during construction, and annual operation and maintenance costs. Figure 15 shows a more detailed breakdown of those components of on-site systems and services considered grant-eligible. Land costs for all three alternatives are grant-eligible because they are I/A components of the treatment systems.

The effect of grant assistance for each of the alternatives and the resultant local costs to the Township are shown in Tables 9, 10, and 11. These tables represent three different scenarios using different funding percentages for non-I/A grant-eligible costs. Based on comments from the MPCA, it is assumed that the 50 percent funding scenario is the most probable. All grant-eligible portions of Alternative 1 would be considered I/A technology, whereas approximately 50% of Alternative 2 and 75% of Alternative 3 would be considered I/A.

CLUSTER TREATMENT



INDIVIDUAL ON-SITE TREATMENT



LEGEND

ELIGIBLE FOR 94 PERCENT EPA/MPCA GRANT

LOCAL COST (100 PERCENT)

Figure 15. Breakdown of grant-eligible and non-grant-eligible components for cluster and individual on-site systems.

Table 9. Estimated local costs for proposed wastewater treatment alternatives for Lake View Township, Minnesota, assuming 90% funding of non-I/A eligible costs (a)

	ITEM	ALT 1 (b)	ALT 2 (c)	ALT 3 (d)
1.	Total Estimated Construction Costs, $	$9,620,000	$8,918,000	$8,993,000
2.	Non-Grant Eligible Construction Costs, $	497,000	1,251,000	744,000
	Grant-Eligible Construction Costs:			
3.	-I/A Technology, $	9,123,000	3,866,000	6,276,000
4.	-Conventional Technology, $	0	3,801,000	1,973,000
	State and Federal Grant:			
5.	-@ 94% of Line 3, $	8,576,000	3,634,000	5,899,000
6.	-@ 90% of Line 4, $	0	3,421,000	1,776,000
7.	Local Share of Construction Costs, $ (Line 1 - (Lines 5 + 6))	1,044,000	1,863,000	1,318,000
8.	Local Annualized Construction Costs, $/yr (e)	101,000	181,000	128,000
9.	Annual O & M Costs, $/yr (e)	92,000	64,000	84,000
10.	Total Local Annual Costs, $/yr. (Line 8 + Line 9)	193,000	245,000	212,000
11.	Estimated Monthly Costs per Household, $/Household/Month (f)	$ 14.00	$ 18.00	$ 16.00 (g)

(a) Based on ENR construction index of 3510, salvage values not considered
(b) Wastewater collection and cluster treatment systems
(c) Wastewater collection and central pond and spray irrigation facility
(d) Wastewater collection and joint treatment with the City of Detroit Lake for Lake Detroit; wastewater collection and cluster treatment systems for Lake Sallie and Lake Melissa.
(e) Based on 20-year amortization at 7.375% interest rate
(f) Based on 1037 houses, and 91 commercial units @ 300 gpd/unit
(g) Doesn't include the base monthly sewer charge for the area around Lake Detroit proposed to be served by the existing treatment plant (presently $12.00/household/month).

June 1981

Table 10. Estimated local costs for proposed wastewater treatment alternatives for Lake View Township, Minnesota, assuming 50% funding of non-I/A eligible costs [a]

	ITEM	ALT 1 [b]	ALT 2 [c]	ALT 3 [d]
1.	Total Estimated Construction Costs, $	$9,620,000	$8,918,000	$8,993,000
2.	Non-Grant Eligible Construction Costs, $	497,000	1,251,000	744,000
	Grant-Eligible Construction Costs:			
3.	-I/A Technology, $	9,123,000	3,866,000	6,276,000
4.	-Conventional Technology, $	0	3,801,000	1,973,000
	State and Federal Grant:			
5.	-@ 94% of Line 3, $	8,576,000	3,634,000	5,899,000
6.	-@ 50% of Line 4, $	0	1,901,000	987,000
7.	Local Share of Construction Costs, $ (Line 1 - (Lines 5 + 6))	1,044,000	3,383,000	2,107,000
8.	Local Annualized Construction Costs, $/yr [e]	101,000	329,000	205,000
9.	Annual O & M Costs, $/yr [e]	92,000	64,000	84,000
10.	Total Local Annual Costs, $/yr. (Line 8 + Line 9)	193,000	393,000	289,000
11.	Estimated Monthly Costs per Household, $/Household/Month [f]	$ 14.00	$ 29.00	$ 21.00 [g]

(a) Based on ENR construction index of 3510, salvage values not considered
(b) Wastewater collection and cluster treatment systems
(c) Wastewater collection and central pond and spray irrigation facility
(d) Wastewater collection and joint treatment with the City of Detroit Lake for Lake Detroit; wastewater collection and cluster treatment systems for Lake Sallie and Lake Melissa.
(e) Based on 20-year amortization at 7.375% interest rate
(f) Based on 1037 houses, and 91 commercial units @ 300 gpd/unit
(g) Doesn't include the base monthly sewer charge for the area around Lake Detroit proposed to be served by the existing treatment plant (presently $12.00/household/month).

June 1981

Table 11. Estimated local costs for proposed wastewater treatment alternatives for Lake View Township, Minnesota, assuming 0% funding of non-I/A eligible costs [a]

	ITEM	ALT 1 [b]	ALT 2 [c]	ALT 3 [d]
1.	Total Estimated Construction Costs, $	$9,620,000	$8,918,000	$8,993,000
2.	Non-Grant Eligible Construction Costs, $	497,000	1,251,000	744,000
	Grant-Eligible Construction Costs:			
3.	-I/A Technology, $	9,123,000	3,866,000	6,276,000
4.	-Conventional Technology, $	0	3,801,000	1,973,000
	State and Federal Grant:			
5.	-@ 94% of Line 3, $	8,576,000	3,634,000	5,899,000
6.	-@ 0% of Line 4, $	0	0	0
7.	Local Share of Construction Costs, $ (Line 1 - (Lines 5 + 6))	1,044,000	5,284,000	3,094,000
8.	Local Annualized Construction Costs, $/yr [e]	101,000	514,000	301,000
9.	Annual O & M Costs, $/yr [e]	92,000	64,000	84,000
10.	Total Local Annual Costs, $/yr. (Line 8 + Line 9)	193,000	578,000	385,000
11.	Estimated Monthly Costs per Household, $/Household/Month [f]	$ 14.00	$ 43.00	$ 28.00 [g]

(a) Based on ENR construction index of 3510, salvage values not considered
(b) Wastewater collection and cluster treatment systems
(c) Wastewater collection and central pond and spray irrigation facility
(d) Wastewater collection and joint treatment with the City of Detroit Lake for Lake Detroit; wastewater collection and cluster treatment systems for Lake Sallie and Lake Melissa.
(e) Based on 20-year amortization at 7.375% interest rate
(f) Based on 1037 houses, and 91 commercial units @ 300 gpd/unit
(g) Doesn't include the base monthly sewer charge for the area around Lake Detroit proposed to be served by the existing treatment plant (presently $12.00/household/month).

June 1981

As shown in the tables, the local share of costs range from approximately $14 to $43 per month per residence. The local costs of Alternative 3, for the area around Lake Detroit, only represent the increase in sewer costs over the existing base billing rate since this area is proposed to use the existing Detroit Lake treatment plant. Since Alternative 1 utilizes 100% I/A technology, its local share of costs is the lowest for all three funding scenarios.

2. Reliability

The reliability of operation for each alternative should be considered. Following is a discussion of the major components of the three alternatives.

a. Stabilization pond facility with spray irrigation (Alternative 2) The stabilization pond facility has little mechanical equipment and is fairly easy to operate resulting in high reliability.

b. Septic tanks (Alternatives 1, 2 and 3) The reliability of a septic tank is related to how well it is maintained. Septic tanks require regular septage removal and the consequence of not pumping the system is solids washout, resulting in clogging of the drainfield. As part of this project, the Township is required to institute a maintenance and management program which would include regular inspection and pumping of each septic tank. This program would greatly increase the reliability of the septic tanks.

c. Community drainfield (Alternatives 1, 2, and 3) The reliability of a drainfield system is largely dependent on the quality of the effluent

received from the septic tanks. If the septic tanks are not maintained properly, solids can carry over into the drainfield and cause clogging. With proper design, construction, and operation, soil absorption systems can be reliable.

The community systems proposed in Alternatives 1, 2 and 3 require pumping of septic tank effluent to the drainfield. Because of the corrosive nature of the septic tank effluent, the dosing chamber pumps will require routine maintenance to avoid breakdowns and system failures.

d. Conventional collection systems (Alternatives 2, 3) Conventional collection systems (gravity sewers and forcemains) are considered a very reliable method of transporting wastewater. With the large pipe diameter, blockages are minimized. Regular inspection and cleaning of the collection system is required. Leaky joints can also be minimized by proper construction and design. In addition, conventional sewers have been used successfully for many years with many improvements in their design, construction, and operation, which has increased the overall system reliability.

e. Small diameter collection system (Alternative 1, 2, and 3) The reliability of small diameter collection systems is similar to conventional systems with a few exceptions. In small diameter systems, blockages are more likely to occur because of possible large solids that enter the system. In addition, odor and corrosion problems may result in the lift stations and treatment facilities because of the septic nature of the effluent.

3. Expansion Capability

The expansion capability of a wastewater treatment facility refers to the ability of a treatment plant's hydraulic capacity and treatment capability to be increased or modified by additions to the facility. For any of the alternatives, space and the capability of future expansion is available.

4. Primary Energy Requirements

The estimated energy required for each alternative must be considered in the Facility Plan. Energy requirements for the three alternatives have been computed in terms of kilowatt hours per year (kwh/yr) and are summarized as follows:

Alternative 1	-	106,000 kwh/yr
Alternative 2	-	97,000 kwh/yr
Alternative 3	-	103,000 kwh/yr

Based on the estimated energy requirements for the three alternatives, it appears that energy usage is essentially equal for all three alternatives.

D. Evaluation Summary

In the previous sections each of the alternatives were considered in terms of monetary, environmental and other considerations. The ranking of alternatives according to monetary costs is relatively straightforward because of the quantitative nature of the evaluation. The monetary evaluation indicates that all three alternatives can be considered equally

cost effective since their total estimated equivalent annual costs are within 13% of each other.

Ranking the alternatives according to environmental and other considerations is more subjective than the monetary evaluation. In this section of the report, an effort to identify the important considerations in selecting an alternative for wastewater treatment in Lake View Township will be made.

A brief review of the environmental concerns shows that improved wastewater treatment is necessary in Lake View Township. All of the alternatives within this report seem to be environmentally sound. None of the alternatives would have significant primary or secondary adverse effects on plant or animal communities, endangered or locally threatened species, air quality, community growth patterns, land use trends, or wetland areas. Also, none of the alternatives would require the relocation of residents. Some temporary disturbances to the environment would occur during construction of any of the alternatives.

In terms of implementation, Alternative 1 would be most desirable to implement from a local cost viewpoint. Because of the possibility of reduced funding for conventional portions of the treatment systems, the local costs for Alternatives 2 and 3 could well be prohibitive.

Concerning reliability, all three alternatives are judged to be equally reliable treatment systems. Should future expansion of the facility be required, any of the alternatives could be expanded.

In addition to all the factors previously evaluated, public input was also considered in the decision-making process. During a public meeting in Lake View Township in June 1981, residents of the Township generally supported improving their existing wastewater treatment systems. Because of the variability of future funding, it is assumed the residents would support the alternative with the least potential local cost.

As a result of all the above considerations, Alternative 1 appears to be cost-effective, has the least potential local cost, and represents an environmentally sound and implementable alternative for wastewater treatment in Lake View Township. Therefore, the construction of cluster systems for all areas is the recommended alternative.

Plan Selection and Implementation

IX. PLAN SELECTION AND IMPLEMENTATION

A. Public Participation

The proposed wastewater treatment plan is designed for the benefit of the residents within the service area. To adequately assess the needs and desires of the residents, public comments must be received. In Lake View Township the residents and other people potentially affected by the project have been kept informed from the beginning of the project. A public participation program was established within the first few weeks of the facilities planning process to organize contacts with Township representatives and residents.

The first contact with the residents was through a questionnaire survey in August 1980, which was distributed to all of the lakeshore residences and landowners. A copy of the questionnaire, along with a summary of the responses, is included in Appendix C. The residents in this area were also kept informed on the status of this project in the early stages and during the needs assessment study through local newspaper articles and television and radio reports.

The second formal contact with residents of Lake View Township was at a public meeting in June 1981. Prior to the meeting, notices were printed in the paper and posted around the area to inform residents of the public meeting. At the meeting, the project and planning process was explained. The problems with existing systems, potential alternative solutions to the

problems, and rough cost estimates were presented. A discussion of the alternatives followed to answer questions from the public.

The final stage in the public participation program was the formal public hearing in August 1981. At this meeting the results of the facilities plan were presented and public comments solicited. A notice of this meeting was published in the local newspaper and mailed to lakeshore residents prior to the hearing. The public hearing summary and comments, in addition to other public participation material, are included in Appendix M.

B. Description of Recommended Alternative

In the previous sections each alternative was considered in terms of monetary, environmental, and other concerns. Based on these factors, construction of cluster systems with individual septic tanks and community drainfields (Alternative 1) is the alternative recommended to be selected by the Township for implementation.

The proposed facilities consist of six separate cluster systems on Lake Detroit and a total of five separate cluster systems on Lakes Sallie and Melissa. Existing substandard systems outside the cluster areas are proposed to be upgraded as required. The cluster systems will be designed to treat only the wastewater from existing residences within their respective area limits. Each cluster will consist of individual on-site septic tanks, shared septic tank effluent pumps where required for low lots, small diameter gravity sewers and/or forcemains, and final treatment at a community dosing chamber and drainfield. Table 12 shows the approximate

quantities for each component of the proposed treatment facilities. The proposed action for each lot within the service area is presented in Appendix K. The residence numbers shown in Appendix K correspond to the numbers in the Lake Directory in Appendix B.

1. On-Site Septic Tanks and Effluent Pumps

A concrete precast septic tank is recommended for every lot without an approved existing tank. These septic tanks will be constructed and installed to meet all County and State standards.

An effluent pump, shared by two residences, is proposed on any low lot or any lot not served by a gravity sewer. The septic tanks and effluent pumps will be owned and maintained by the Township.

2. Small Diameter Gravity Sewers and Forcemains

Small diameter pipes will be designed to convey the septic tank effluent to the community drainfields. Special effort will be taken to minimize corrosion and to control potential odor problems.

3. Lift Stations

The proposed lift stations will be equipped with two pumps, each sized to handle the maximum capacity at the required design head. Influent flow metering will be installed along with ventilation equipment, and electrical and telemetry equipment and controls. Standby power will also be provided for operation during power outages.

Table 12. Summary of quantity estimates for the proposed wastewater collection and cluster treatment systems (Alternative 1), Lake View Township, Minnesota

Area	New[(a)(b)] On-site Septic Tanks	Shared[(a)] Effluent Pumps	Small Diameter Gravity Sewer (lin. ft)	Small Diameter Forcemain (lin. ft)	Lift Stations	Community Drainfield with Dosing Chamber
Cluster 1	87	32	2,900	3,900	1	1
Cluster 2	50	7	2,100	2,500	1	1
Cluster 3	73	8	5,000	4,000	2	1
Cluster 4	42	3	5,800	2,300	1	1
Cluster 5	31	11	2,200	2,800	0	1
Cluster 6	19	4	2,200	1,600	2	1
Cluster 7	27	15	0	4,900	0	1
Cluster 8	46	8	3,200	1,400	1	1
Cluster 9	176	0	14,000	7,500	3	1
Cluster 10	88	9	3,700	3,500	1	1
Cluster 11	294	23	20,100	7,700	4	1
Total Estimated Quantities	933	120	61,200	42,100	16	11

(a) Doesn't include on-site septic tanks and effluent pumps for commercial establishments. These will be designed on an individual basis.

(b) Assumes 10% of the existing septic tanks will be reused.

4. Community Drainfields and Dosing Chambers

The proposed community drainfields and dosing chambers will be designed and sized for only the existing residences and commercial establishments, with an additional allowance for infiltration and inflow (I/I). The dosing chambers will be cast-in-place concrete structures which collect and store the septic tank effluent prior to distribution to the drainfield. The dosing chambers will be equipped with two pumps, each sized to handle the maximum design capacity. The pumps and chambers will be designed to provide four 10-minute doses per day to the drainfields.

The community drainfield will be designed to meet all local and State standards. The drainfield provides the final treatment and disposal of the septic tank effluent, and will filter out all disease-causing bacteria and fine solids contained in the effluent. The drainfield area will be seeded and mowed regularly by the Township. Wastewater sampling will be done quarterly by the Township, with the testing and analysis done by an independent laboratory.

C. Environmental Effects of Recommended Alternative

As a result of analyzing the wastewater treatment needs of Lake View Township, and evaluating several alternatives to meet these needs, it has been recommended that the alternative to construct cluster systems be implemented. Environmental impacts of the recommended alternative are summarized below.

1. Unavoidable Adverse Impacts and Steps to Minimize These Impacts

The unavoidable adverse impacts have been alluded to in previous sections of this environmental assessment. These include the noise and landscape disruption during construction of the proposed facilities and potential odor problems during operation.

Noise and landscape disruption will be minimal due to the location of the proposed sites and with proper construction techniques. Because of the location of the sites, and with proper design and maintenance, odor problems will be minimized.

2. Irreversible and Irretrievable Commitments of Resources

Some resources would be irretrievably committed during the proposed project. The concrete associated with the treatment process structures and the energy required for construction and operation are the major irretrievable uses of resources. The land required would be recoverable if so desired at some future date.

3. Relationship Between Local Short-Term Uses of Environment and Maintenance and Enhancement of Long-Term Productivity

Since the proposed project will provide for the proper treatment of wastewater in the project areas, it is anticipated that the water quality of Detroit Lake, Curfman Lake, Lake Sallie, and Lake Melissa will be protected to the long-term benefit of area residents and all downstream aquatic biota and water users. The removal of sources of groundwater contamination from the area should be of long term benefit to area residents and others using the same aquifer.

Improving wastewater treatment in Lake View Township is not expected to alter the community growth pattern or area land use practices. It is also felt that upgrading wastewater treatment will not trigger an undesirable growth in the population of Lake View Township and vicinity. Agriculture will continue to be major industry of the area and the net productivity of the area should not be altered.

D. Recreation and Open Space Opportunities

As part of the facility planning process, EPA requires the possibility of incorporating recreation and open space opportunities as part of the proposed improvements be investigated. Some examples include construction of bike paths over sewer lines and passive parks in drainfield areas. It would be possible to construct a bike path over the sewer lines, and this will be further investigated during the Step 2 phase. The possibility of incorporating some park or recreational facilities in the drainfield areas will also be considered further during Step 2.

E. Arrangements for Implementation

1. Institutional Responsibility

Lake View Township has the legal authority and financial capability to construct and operate the proposed facilities. A resolution of intent to construct and operate the proposed facilities will be submitted with the Step 2 grant application.

Lake View Township will have to obtain title or a long-term lease to the land to be used for the cluster systems. In addition, easements for construction, inspection, operation and maintenance of the on-site systems will have to be obtained. Appendix L describes a recommended management organization for on-site/cluster systems. The recommended management organization would provide for Lake View Township to own, construct, inspect, operate and maintain all on-site/cluster systems around Detroit Lake, Curfman Lake, Lake Sallie and Lake Melissa.

2. Financial Responsibility

The effects of grant assistance for Alternative 1 and the local costs to the Township were shown in Tables 9, 10 and 11. As shown, the estimated typical cost per household for the recommended alternative is $14.00 per month.

The local construction costs will likely be financed by revenue bonds and repaid by means of user charges and property taxes. It is possible that a part of the local costs may be financed through other agencies. Loan and grant funds may be available from sources such as the Farmers Home Administration or the Upper Great Lakes Regional Development Commission. If additional funds are available, the local portion of the construction costs presented in this report may be reduced. The availability of additional funding assistance should be investigated by the Township during Step 2.

A user charge system will be developed as a part of subsequent steps of the EPA Construction Grants program. The operation and maintenance costs

would also be covered by the user charge system. The Township will have to periodically review their user charge system and adjust it to reflect the actual costs of operation and maintenance.

3. Operation and Maintenance

A plan of operation must be prepared to provide for staffing, management, training, sampling, and analysis for effective operation and maintenance of the facilities. The plan of operation will be prepared concurrently with the preparation of the engineering drawings and specifications and be submitted with those plans and specifications. A State-certified operator will be required to operate and maintain the facilities. A management organization plan for on-site and cluster systems was developed and is shown in Appendix L.