1976

Physical Inventory of the Lake Kampeska Area Watertown, South Dakota

Mark Wayne Thomas

PHYSICAL INVENTORY OF THE LAKE KAMPESKA AREA

WATERTOWN, SOUTH DAKOTA

BY

MARK WAYNE THOMAS

A research paper submitted
in partial fulfillment of the requirements for the
degree Master of Science, Major in
Sociology, South Dakota
State University
1976

208

PHYSICAL INVENTORY OF THE LAKE KAMPESKA AREA

WATERTOWN, SOUTH DAKOTA

This research paper is approved as a creditable and independent investigation by a candidate for the degree, Master of Science (with Minor in Planning), and is acceptable for meeting the research paper requirements for this degree. Acceptance of this research paper does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

Research Paper Advisor Date

Head, Rural Sociology Dept. Date

ACKNOWLEDGMENTS

At this time, I would like to direct several comments to those who made this project and program significant to me. I would first like to thank my parents, Marlys and Dar Thomas, for their enduring patience and support throughout the past several years. My fiance, Kathy Devitt, has offered much support to me and I am very thankful for her unselfish dedication. I would like to thank Julie Niemann, my typist, for her patience and good humor for enduring this, sometimes frustrating, experience. My thanks also goes to Lowell Richards, Roger Mack and the entire First Planning and Development District staff for being so helpful in helping me complete this project. Lastly, I would like to thank Dr. Robert Dimit, my advisor, and the rest of the Rural Sociology staff for making this graduate work an interesting experience.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF MAPS

LIST OF GRAPHS

INTRODUCTION

Background

In 1974, the city of Watertown annexed into its city limits Lake Kampeska, located four miles directly west of the city, and certain portions of land surrounding the lake. The lake perimeter land contained about 600 cottages and homes, several liquor establishments and several open areas of park and undeveloped land. The land area between the lake and the main section of the city was not annexed and remained in agricultural production.

A problem already identified around the lake included septic tanks polluting both the lake water and individual wells through the natural drainage seepage. Small two-acre residences were developing on the land in the agricultural district and were presenting problems with roads and traffic; and more problems loomed in the distance.

In the second week of January, 1976, correspondence between the chairman of the Watertown Planning Commission and the First Planning and Development District office in Watertown indicated a need by the city for assistance in determining the future of the Lake Kampeska area and Watertown.

Statement of the Purpose

In order for the future of the Lake Kampeska area to be an orderly and desirable one, an overall planning strategy had to be developed. The agreement between the First Planning District office and the Watertown Planning Commission was to have the District Planning staff conduct a miniature comprehensive plan of the lake area and

hold a series of meetings to present information to a special planning committee of the potentials and problems of the lake study area.

The general study area was to include the lake perimeter shoreline land and the land located between the lake and the main section of the city. The planning staff covered the lake's potentials and problems as extensively as possible and presented this information to the special committee.

Significance of the Study

In 1968, a comprehensive plan was formulated for the city of Watertown and has since become outdated and nonfunctional. The Lake Kampeska area, being newly annexed, had a void of collected, organized information; therefore, its planned future was uncertain. As a total planning effort by the Watertown Planning Commission, it was felt that the first step would be learning about the lake area, followed by updating of the material for the main section of Watertown, and finally to complete the process with a total updating of the city ordinances and codes to conform with a total, up-to-date, comprehensive plan.

Limitations

The lake area which was to be investigated had a few problems and drawbacks. Much of the information was opinions supplied by persons and officials in their particular field. There was very little information to be found about the lake in formalized texts or written reports for this inventory section of the plan.

As most citizen planning processes, time proved to be a limiting factor. Actual collection of data would take a certain length of

time to complete, but arranging meetings with a large number of persons were difficult to achieve. The collection time compounded with the difficulty of scheduling meetings put a proposed completion time of approximately six months.

Organization of the Study

It was felt by the Planning Commission members and the District Planning staff that a broad representative committee would be needed to ensure sufficient input into the planning process of the Lake Kampeska area. The committee would be composed of the regular Planning Commission members and the additional following membership: the city engineer, the city building inspector, the sanitation director, three members of the Codington County Planning Commission, a city alderman from the lake district, and the city attorney. Each member was selected by criteria of being a resident of the lake and/or occupying a position on those utilities and services that would be affected by the proposed plans. Two staff members, including me, were to collect, organize, and present the relevant data to this special planning body.

The planning process would follow three basic steps: inventory, goals and objectives formulation, and policy drafting to carry out those established goals and objectives.

The inventory step would include information about the past history of the area, the existing land use, the different roles of transportation available in the lake area, the present community facilities, the housing conditions and density, and the parks and recreation available to the area. In areas where applicable, there would be an

assessment of the future in the various inventory areas and a determination of necessary improvements and changes that would need to be made in order to accommodate future development.

Once the inventory stage was completed, a series of goals and more specific objectives for each of the subareas would be determined.

A general outline used as a guide for the first two phases of the comprehensive planning step is as follows:

Proposed Outline

I. HISTORY

- A. Origin
- B. Settlement

II. POPULATION

- A. Characteristics
- B. Projections

III. LAND USE

- A. Existing
  1. Factors Affecting Growth Patterns
  2. Geology and Soils
  3. Topography (flood plains)
  4. Land Use Analysis
     - a. Residential
     - b. Commercial
     - c. Industrial
     - d. Utilities and Municipal
     - e. Parks and Recreation
     - f. Agricultural and Vacant
- B. Land Use Plan (Goals and Objectives)
  1. Land Use Planning Proposals
     - a. Residential
     - b. Commercial
     - c. Industrial
     - d. Utilities and Municipal
     - e. Parks and Recreation
     - f. Agricultural and Open Space

Proposed Outline (Continued)

IV. TRANSPORTATION

A. Existing Network

B. Street Plan
Goals and Objectives

V. COMMUNITY FACILITIES AND SERVICES

A. Existing
1. Water and Sewer
2. Storm Drainage and Flood Control
3. Gas and Electricity
4. Refuse Collection and Disposal
5. Street Lighting and Snow Removal
6. Police and Fire Protection

B. Facilities and Services Plan
Goals and Objectives
1. Water and Sewer
2. Storm Drainage and Flood Control
3. Gas and Electricity
4. Refuse Collection and Disposal
5. Street Lighting and Snow Removal
6. Police and Fire Protection

VI. HOUSING

A. Existing Characteristics
1. Type
2. Condition
3. Density

B. Housing Plan
Goals and Objectives
1. Density
2. Needs

VII. PARKS AND RECREATION

A. Existing Parks and Facilities
1. Municipal
2. County
3. State Recreation Area
4. Lake Access Areas
5. Federal Areas
6. Golf Course

Proposed Outline (Continued)

7. Organizational Camps
8. Commercial Campgrounds

B. Recreation Plan
Goals and Objectives

VIII. CAPITAL IMPROVEMENTS PLAN

A. Fiscal Analysis

B. Plans
1. Streets and Lighting
2. Storm Drainage
3. Public Buildings
4. Sewer and Water
5. Parks and Recreation

After the inventory stage of the Lake Kampeska area has been covered, the next step would be to update information of the outdated Watertown Comprehensive Plan. The general philosophy of the planning organization was to bring the Lake Kampeska information together with updated Watertown information and pull the total planning effort together with recommendations such as new city ordinances, changes in subdivision regulations (both city and county), changes in zoning ordinances and forward these recommendations to the appropriate legislative body. This last step of updating the Watertown Comprehensive Plan and revising ordinances was estimated to take an additional year to complete.

At the time of the writing of this paper, the planning body had just received the information of the inventory portion of the plan. The next series of meetings were to be devoted to goal and objective formulation for the desired future of Lake Kampeska.

LAKE KAMPESKA INVENTORY

History

Lake Kampeska, located in south central Codington County, South Dakota, lies in a depression formed in front of the Wisconsin ice sheet that passed through the area approximately 10,000 to 12,000 years ago. (Parker, 1945:35-42). Details of the origin are in part conjectural; but it is evident that a large mass of ice, probably a tongue from the main glacier, lay in a depression while sand and gravel were washed over and around it, probably covering it almost completely. The fact that the lake is enclosed on all sides, except the northeast, by clay banks bears out this idea.

The gravels perched on clay banks high above the lake can be traced along the shore for nearly a mile between the area known previously as the City Light Plant and the area of the City Park. From the City Park, they can be seen as a scarp extending directly eastward for about another mile. From the lake and this scarp, the gravels slope to the southeast for about a mile, merging with the general level of the gravel flats of the Big Sioux River Valley near Watertown.

During or shortly after the high gravels were deposited, torrents flowing down the Big Sioux River Valley and the Punished Woman's Lake channels washed gravel and sand in front of the ice tongue, forming that part of the channel which is now occupied by the "Outlet" of Lake Kampeska and the Big Sioux River. This gravel fill at the northeastern edge of the lake is about 16 to 18 feet in depth. (See Map I.)

The final retreat of the main ice sheet left the Kampeska ice block isolated and in "cold storage," since it was covered with glacial debris. The withdrawal of the main ice front also removed the possibility of further debris being added to the channels; and when the Kampeska ice block melted, a depression was left which was filled with spring water flowing from the gravels. Thus, Lake Kampeska, as we know it today, was formed.

Lake Kampeska lies at the junction of three water channels down which torrents from the melting glaciers escaped to the Missouri River, carrying with them enormous quantities of debris. The debris eventually settled in the bottoms of the channels and choked them with sands and gravels, thus forming a large reservoir for the ground water which supplies Lake Kampeska. One channel enters the lake from the northwest. It follows the position of the ancient ice front a mile east of Medicine Lake to Lake Kampeska. A second channel follows the present Big Sioux River; its gravel fill can be followed for more than ten miles north of Lake Kampeska. The third channel enters the junction from the east and roughly follows the course of Gravel Creek. The three channels furnish the entire supply of water for Lake Kampeska.

The amount of water added to the lake by rain and runoff over the slopes around the lake is negligible, especially in years of dry weather. During rainy seasons, when the gravels are well saturated with water, much water flows through the stream channels of the Big Sioux River and Gravel Creek, and enters the lake through the channel known as the "Outlet." During the seasons when these channels are dry,

however, the lake is fed entirely by underflow through the gravels. In fact, during the dry periods of the 1930's, the bottom of the "Outlet" was five to eight feet above the lake's water level. The water flowing through the gravels enters as springs at the northwestern end of the lake where the gravels are 16 to 18 feet deep. It is seen, therefore, that the supply of water in the lake depends largely on the supply of water in the gravels of the three channels which feed it. (Rothrock, 1933:6-9).

Historical Background

The name of the large and beautiful lake was probably derived from the Sioux word Kampeska meaning "bright and shining" and "like a shell or glass." Locally, in the early days, the lake was referred to as the "lake of the shining shell" because of the many freshwater mussel shells found on the shore of the lake. However, the lake may have been named after a Sisseton Sioux who signed an agreement with the Sisseton and Wahpeton Sioux and the United States government in 1872.

In the early days of the railroad construction, many towns were established for land claims to federal land. The city of Kampeska was one such city, and was formed in 1873. However, the federal land extended only as far as the Big Sioux River several miles east of the lake. Consequently, Kampeska was abandoned several years later when the present town of Watertown was formed and the citizens moved the county seat from Kampeska to Watertown.

Over the years, Lake Kampeska has provided the area residents with opportunities for fishing, boating, picnicking, and other forms of

entertainment. The good years of picnicking under the trees with family, going to the skating rink, or maybe taking in a dance at the ballroom were enjoyed by many Watertown and area people. Before the luxury of electric refrigerators came to the area, ice was taken from the lake each winter and stored for use during the hot summer months. So for many generations, the lake has served the area with entertainment, recreation, and even some of the necessities. (Rothrock, 1933: 6-9).

One of the lake's biggest attributes is its fishing quality. The lake is managed as a warm-water fishery by the South Dakota Department of Game, Fish and Parks. Warm-water means that the kinds of fish that survive year-round in Lake Kampeska are those that tolerate summer water temperatures of 70 degrees or higher. The Department's reference to permanent lake, with respect to its fishery, means primarily that it does not have a history of winter-killing.

Lake Kampeska has favorable maximum depth of 14 to 15 feet and a good average depth of 10 feet. These physical characteristics along with its large size and across-lake maximum length of more than 4.5 miles are beneficial features of fish survival. The midwinter ice may reach a thickness of two to three feet on the lake and this still leaves an average of seven to eight feet of water, with deeper water areas of 12 to 13 feet.

Many things about a lake, both physical and biological, affect its ability to produce and sustain fish. A lake of satisfactory water depth must maintain its level. Lake Kampeska on a yearly average is

not over four-tenths feet high or two feet low. Lake Kampeska, consequently, has maintained quite good fish populations over the years and appears to stay consistent with past fishing activity and providing some of the best sports recreation in the area. (Wicks and Fox, 1975:8).

A brief chronological history of events of the Lake Kampeska area is as follows:

1679 - Daniel G. Duluth may have visited the northeastern South Dakota.

1759 - About this date, the Teton Sioux arrived in the Big Sioux and James Valleys from Minnesota.

1840 - The first recorded visit by white men, two French missionaries.

1861 - The Dakota Territory was formed including parts of North and South Dakota.

1872 - Lake Kampeska Homestead Colony was organized, in anticipation of the railroad ending construction to Lake Kampeska and obtaining federal land grants. The colony folded due to lack of leadership, grasshoppers and prairie fires.

1873 - The first railroad ended at Lake Kampeska and Kampeska City was formed by the outlet of the lake by the railroad company.

1875 - Watertown was founded in late 1875 and plotted in 1876.

1878 - Kampeska was all but abandoned when it was discovered that the federal land grant boundary ended at the Sioux River; the citizens soon voted to move the county seat to Watertown and most of the settlers of Kampeska followed. (Parker, 1933:35-42).

1974 - Lake Kampeska annexed into the city limits of Watertown.

1974-75 - A modern sewer and water system was completed around the lake.

Population

The population in a certain geographic area has particular characteristics which help to explain not only existing housing conditions, income, etc., but also help forecast or predict future population changes through the analysis of past population trends.

The primary areas of population analysis can be broken down into three subareas: population characteristics, population change, and population projection.

The first area of analysis would be the characteristics of the population of Lake Township which encompasses our study area. The figures indicate a large majority of residents earning less than $10,000 annually (1970 figures). This indicates a moderate income group located in and near the study area, but a fairly large number of low income persons also occupying the same area. (U. S. Department of Commerce, Lake Township, 1970:19-21).

An analysis of the age of the head of each household in Lake Township reveals a slightly higher percentage of household heads under 35 than in either Watertown or Codington County. There is also a lower percentage of household heads over the age of 65 in Lake Township than in Watertown or Codington County. (U. S. Department of Commerce, Lake Township, 1970:4, and U. S. Department of Commerce, Watertown, 1970:14).

Another characteristic area deals with the indicators of the quality of housing in Lake Township. Lake Township has nearly three times the population of houses lacking one or more plumbing facilities when compared to Watertown. (U. S. Department of Commerce, Lake Town-

ship, 1970:12). The township also has over three times the population of homes without flush toilets than Watertown. (U. S. Department of Commerce, 1970:18).

The overall number of substandard homes may be low for Lake Township, but it is still a quite high percentage of homes.

The 1970 census indicates that approximately 65 percent of the Lake Township population is located around Lake Kampeska. (Wey, 1970). Taking this information into account with the previous data, it can be deduced there are a fair amount of homes in the lake area of substandard condition.

A look at population changes from 1960-1970 indicates a drop in population in the State, District I, Codington County, and Watertown proper; however, there was a substantial increase in Lake Township and also in our study area, Lake Kampeska. (U. S. Department of Commerce, 1970:43-12, 43-14, 43-18, 43-7).

The third area of population analysis is population projection. The population project tables indicate various growth rates from the State down through Lake Kampeska. (Wagner, 1975:5-16). With updated Watertown population information for 1975, it indicates population growth to be between the medium and high growth levels. (South Dakota Department of Health, 1976). With this in mind, the Lake Kampeska population can be expected to increase between 35 and 202 in population in the next 15 years.

Straight line projections of Lake Township and Lake Kampeska also indicate similar conclusions by using 1960 and 1970 census data.

TABLE I. INCOME OF LAKE TOWNSHIP AND WATERTOWN RESIDENTS, 1970 CENSUS

Income	Lake Township	Per Cent	Watertown	Per Cent
Less than $2,000	14	4.0%	706	16.0%
$2,000 - $2,999	26	8.0%	322	7.0%
$3,000 - $4,999	30	9.0%	666	15.0%
$5,000 - $6,999	44	14.0%	591	14.0%
$7,000 - $9,999	80	25.0%	858	20.0%
$10,000 - $14,000	81	26.0%	832	19.0%
$15,000 - $24,000	33	10.0%	284	7.0%
$25,000 and over	9	3.0%	107	2.0%
Total	317	99.0%	4,366	100.0%

Source: U.S. Department of Commerce, Bureau of Census, Number of Inhabitants - South Dakota, U.S. Census of Population: 1970, Final Report PC(1)-A43, 1971.

TABLE II. AGE OF THE HEAD OF HOUSEHOLD FOR LAKE TOWNSHIP, WATERTOWN, AND CODINGTON COUNTY, 1970

Age	Lake Township	Per Cent	Watertown	Per Cent	Codington County	Per Cent
Under 25	3	3.0%	314	7.0%	379	6.0%
25 - 34	73	24.0%	680	16.0%	927	15.0%
35 - 44	17	17.0%	669	15.0%	923	15.0%
45 - 64	115	38.0%	1,483	34.0%	2,187	36.0%
Over 65	57	19.0%	1,240	28.0%	1,651	27.0%
Total	317	101.0%	4,386	100.0%	6,067	99.0%

Source: U.S. Department of Commerce, Bureau of Census, Fourth Count Data, Minor Civil Divisions, U.S. Census of Population: 1970.

TABLE III. INDICATORS OF QUALITY OF HOUSING FOR LAKE TOWNSHIP AND WATERTOWN, 1970

Total Occupied and Vacant	Lake Township	Per Cent	Watertown	Per Cent
All plumbing	412	84.0%	4,303	94.0%
Lacking one or more plumbing facilities	77	16.0%	282	6.0%
Total	489	100.0%	4,585	100.0%

Source: U.S. Department of Commerce, Bureau of Census, Fourth Count Data, Minor Civil Divisions, U.S. Census of Population; 1970.

TABLE IV. INDICATORS OF QUALITY OF HOUSING FOR LAKE TOWNSHIP AND WATERTOWN, 1970

Total Occupied and Vacant	Lake Township	Per Cent	Watertown	Per Cent
Flush toilet	424	87.0%	4,389	96.0%
No flush toilet	65	13.0%	199	4.0%
Total	489	100.0%	4.597	100.0%

Source: U.S. Department of Commerce, Bureau of Census, Fourth Count Data, Minor Civil Divisions, U.S. Census of Population: 1970.

TABLE V. POPULATION CHANGES FOR SELECTED AREAS IN SOUTH DAKOTA 1960 - 1970

Selected Areas	Year		Per Cent
	1960	1970	
South Dakota[a]	680,514	666,357	- 2.1%
District I[a]	105,597	98,213	- 7.4%
Codington County[a]	20,220	19,140	- 5.3%
Watertown[a]	14,077	13,388	- 4.9%
Lake Township[a]	821	1,016	+23.6%
Lake Kampeska[b]	634	659	+ 3.9%

[a] Source: U.S. Department of Commerce, Bureau of Census, Number of Inhabitants - South Dakota. U.S. Census of Population: 1970, Final Report PC(1)-A43, 1971.

[b] U.S. Department of Commerce, Bureau of Census, Information Supplied By Special Request by Kenneth Wey, Watertown Public Opinion, 1960 and 1970.

TABLE VI. POPULATION PROJECTIONS FOR
SOUTH DAKOTA AND DISTRICT I
1980, 1985, AND 1990

Area	1970	Model	1980	1985	1990
			Year		
South Dakota	666,257	Low	633,610	616,502	607,871
		Medium	679,582	697,251	724,444
		High	726,886	779,948	843,124
District I	98,213	Low	87,311	82,683	79,459
		Medium	96,838	99,065	103,721
		High	106,168	115,299	127,751

Source: Robert T. Wagner, Eugene T. Butler, Jr., and Karen A. McComish, Population Projection Models for South Dakota: 1980, 1985, and 1990. Brookings: Agricultural Experiment Station, South Dakota State University, Bulletin 631, May, 1975.

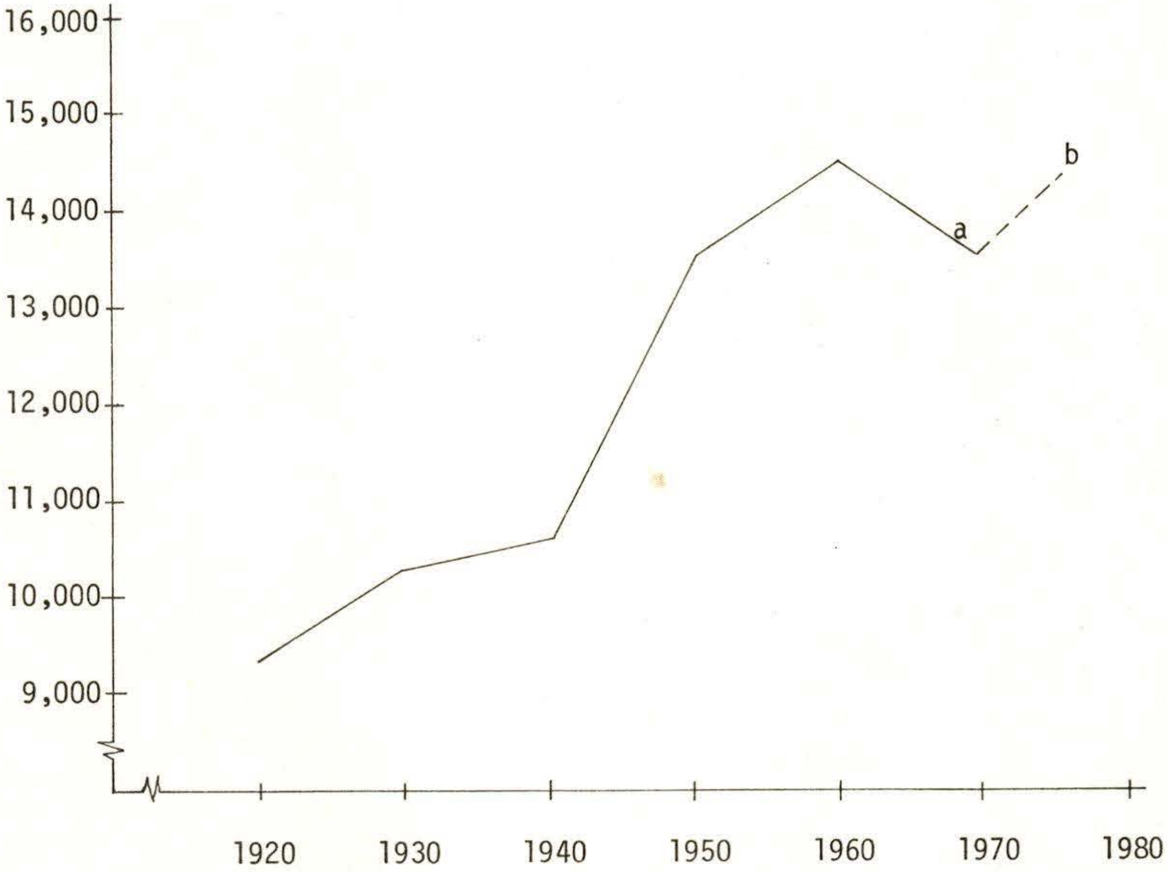
TABLE VII. POPULATION PROJECTIONS FOR CODINGTON COUNTY, WATERTOWN, LAKE TOWNSHIP AND LAKE KAMPESKA, 1980, 1985, AND 1990

Area	Year				
	1970	Model	1980	1985	1990
Codington County	19,140	Low	17,015	16,096	15,468
		Medium	18,872	20,570	21,599
		High	20,671	22,532	25,010
Watertown	13,388	Low	11,902	11,259	10,820
		Medium	13,201	13,456	14,138
		High	14,459	15,760	17,494
Lake Township	1,016	Low	903	854	821
		Medium	1,001	1,022	1,073
		High	1,097	1,196	1,327
Lake Kampeska	650	Low	586	554	533
		Medium	650	663	696
		High	712	776	861

Source: Computed by the First Planning and Development staff, February, 1976.

GRAPH I. POPULATION CHANGE FOR

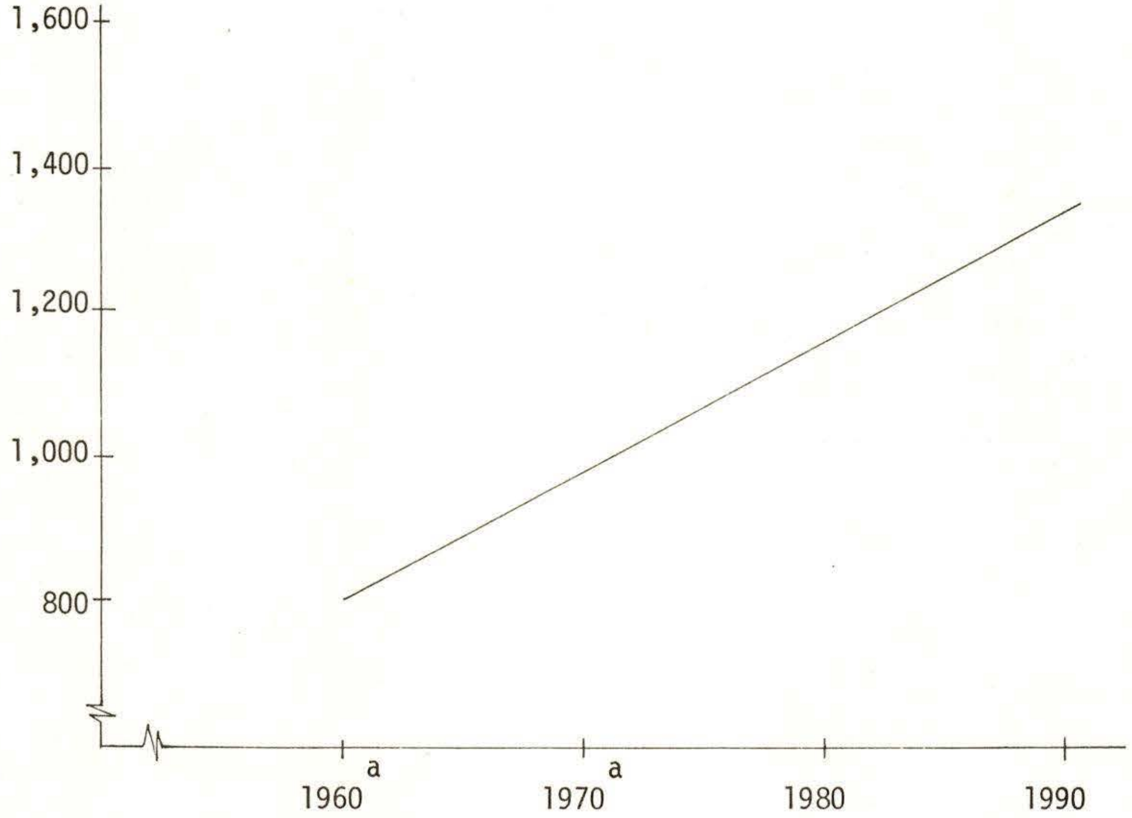
WATERTOWN, 1920 - 1970



Source: [a] Banner, 1975.

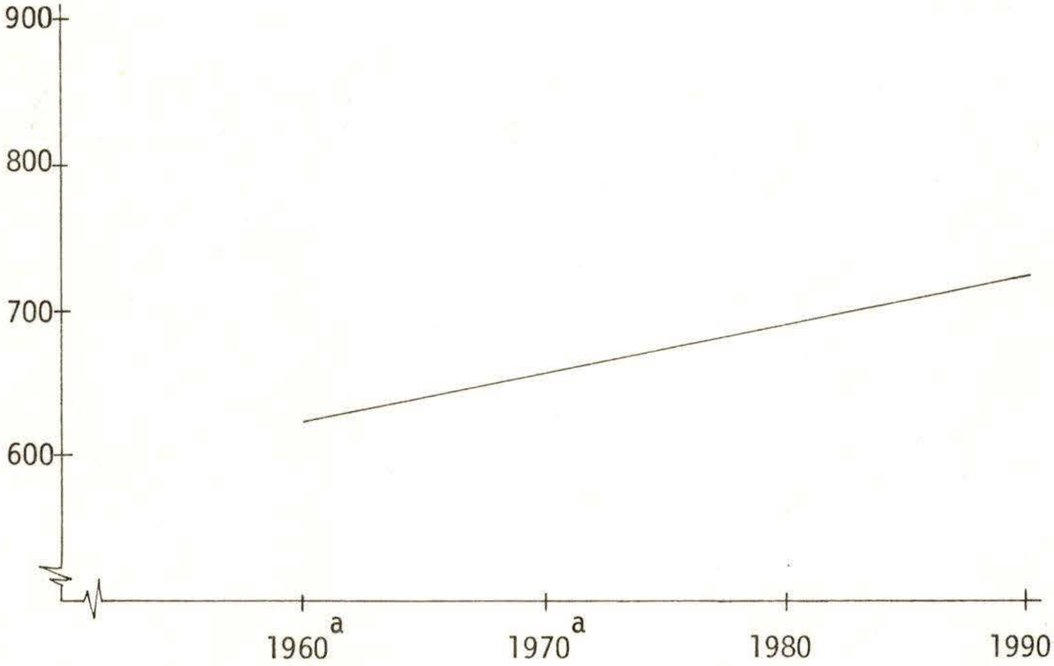
[b] South Dakota Department of Health, Public Health Statistics, 1976.

GRAPH II. LAKE TOWNSHIP
POPULATION PROJECTIONS



[a] Source: U.S. Department of Commerce, Bureau of Census, Number of Inhabitants - South Dakota. U.S. Census of Population: 1970, Final Report PC(1)-Z43, 1971.

GRAPH III. LAKE KAMPESKA
POPULATION PROJECTIONS



[a] Source: U.S. Department of Commerce, Bureau of Census, Information Supplied By Special Request by Denneth Wey, Watertown Public Opinion, 1960 and 1970.

Land Use

It is generally agreed that a comprehensive development plan should focus on the physical development of an area. Whether looking at long range or short range developmental ideas, all land use planning must begin by looking at what currently exists on the land. Important areas of study for existing land use include geology and soils, topography, and a land use analysis. These three areas will encompass all major aspects of the present use of the land.

Factors Affecting Growth Patterns

There are various reasons for growth to occur or not occur around fringe areas of an expanding city such as Watertown. Some of the more important factors affecting the Lake Kampeska area are the following:

Factors for More Growth

- new sewer and water available for lake residents
- available green lots for development
- better winter road maintenance
- nice, appealing area to live
- Watertown residents cannot maintain a nice cottage at the lake and a home in town, so this may influence permanent moves to the lake
- increasing land values

Factors for Less Growth

- shoreline land and property are now in city limits, meaning higher taxes which may influence persons to stay away from the lake
- lake distance from the main part of Watertown may discourage commuting

- lake water quality deteriorating
- Watertown residents cannot maintain a cottage and a home, due to taxes, etc., which may influence permanent moves into town.

Geology and Soils

The Lake Kampeska area was created by the glacial action of the Wisconsin glacier as mentioned earlier in the history section. The glacier deposited boulder clay along the entire length of the lake and was later covered in areas with sand and gravel by the action of runoff water from the melting glacier. Along the more concentrated drainage patterns of the Big Sioux River and Gravel Creek were deposited the alluvium or soil that was transported by years of water action and flooding in the watershed areas. (Rothrock, 1933:6-9).

The Codington County Soils Table, "Interpretations of Engineering Properties of Soils" is an index to suitability of soils for selected land uses. Suitability is indicated in degrees of hazards or limitations - Slight, Moderate or Severe - and one or more of the limiting soil characteristics or qualities are cited. A severe limitation does not mean that the soil is excluded from a specific land use. Soils having severe limitations require more inputs to overcome limitations for some land uses. (U. S. Department of Agriculture, 1933:6).

In selecting a site for a particular use, the soil limitation rating given a named kind of soil, while important, is only one of the criteria a user considers. Location, land values, aesthetic values, etc., are examples of other criteria. In some circumstances, soil limitations can be modified or removed so that the soil can be used

safely for the intended use. For this reason, some kinds of soil rated as severe can be used for the intended use. This is especially important where good sites are scarce. (U. S. Department of Agriculture, 1973:6).

The Codington County Soils Table contains selected information useful to those who plan to use soil material in construction of local roads and streets, foundations, excavations, sanitary landfills, sewage lagoons, and sewage disposal systems. Detrimental or undesirable features are emphasized. The ratings and other interpretations in this table are based on estimated engineering properties of the soils, on available test data, and on field experience. The information is reasonably reliable to depths of about 5 feet. The following defines the items for which interpretations have been expressed. (U. S. Department of Agriculture, 1973:6).

Soil association and percent composition of major soils (Column 1) contains the soil association symbols used for the general soil map and the percent composition of the major soils of each soil association. The items in columns 2 through 8 are soil evaluations for the degree and kind of limitation for seven engineering uses. An estimated percentage of degree of each limitation is given by selected uses for the association. Three degrees of suitability are used: Slight, Moderate, and Severe. The kind of limitation that contributes to the suitability is given following the degree of limitation. Soil evaluations are given only for the major two or three soils of each soil association. (U. S. Department of Agriculture, 1973:7-9).

Septic tank absorption fields (Column 2) are the soil absorption systems for sewage disposal. It is a subsurface tile system laid in such a way the effluent from a septic tank is distributed uniformly into the natural soil. Features affecting the rate and uniformity of distribution are permeability of soil, depth of bedrock, flooding, seasonal and annual ground water level and soil slopes. (U. S. Department of Agriculture, 1973:7-9).

Sewage lagoons (Column 3) are shallow basins or lakes used to hold sewage for the time required for bacterial decomposition. Requirements for lagoons are twofold; as a vessel for the impounded area and as soil material for the dam or dikes. Soil features affecting are permeability, location of water table, susceptibility of flooding and soil slope. (1973:7-9).

Shallow excavations (Column 4) are those that require soil removal to a depth of 6 feet or less. Such uses include underground utility lines (pipelines, sewers, cables), cemeteries, sanitary landfills, basements and open ditches. Additional criteria must be considered for specific uses such as pipelines or cemeteries. Ratings are based upon the workability of soil material, slopes, susceptibility to sloughing or sliding, water (free water-high water table or flooding), stones and sand or gravel. (1973:7-9).

Dwellings with basements (Column 5) refers to foundations for single family dwellings and other buildings with similar foundation requirements. While the main emphasis is on evaluation for foundations, other features affecting these sites are also considered. These include

slope gradients, flooding and seasonal wetness, and depth to bedrock and gravel. The properties affecting foundation include shear strength, bearing capacity, shrink-swell, plasticity and density. Excluded from the rating are considerations of soil corrosion, suitability for septic tank absorption fields and landscaping. (1973:7-9).

Sanitary landfill-trench type (Column 6) is a trench type landfill with the excavated soil material to serve as blanket and cover. Excavations for trench type landfill is often 15 feet or more deep. There is often a need for geological investigation when trenches are this deep. Routine soil investigations are normally confined to less than 5 or 6 feet. The ratings included here involve only those characteristics of the soil to about 5 feet. Soil qualities and characteristics used are depth to water table, soil drainage, flooding, permeability, soil slope, textures, and depth to sand and gravel. (1973:7-9).

Sanitary landfill-area type (Column 7) is a type of sanitary landfill where refuse is placed on the surface of the soil in successive layers. The daily and final cover material generally must be imported. A final cover of soil material at least 2 feet thick is placed over the fill when it is completed. Soil properties to consider are flooding, depth to water tables, permeability and soil slope. Consideration is also given to the probability of contamination of water supplies. (1973:7-9).

Local roads and streets (Column 8) refers to improved roads and streets having some kind of all-weather surfacing and are expected to

carry automobile traffic all year. Excluded are highways designed for heavy traffic. The roads and streets are build mostly from soil materials at hand and cuts and fills are usually less than 6 feet. Ratings are made on qualities and features that affect the stability and load supporting capacity, the workability, and include site factors such as wetness, flooding, slopes, depth to bedrock, and relief as it affects cut and fill. (1973:7-9).

The map and soil engineering property tables organize the information by geographic area and soil type. A glossary of terms can be found on Appendix A. (1973:18-21).

Topography

The topography of an area has particular implications for site development; the topography itself sometimes determines a plan. The gradient of paths, the flow of utilities, the use of areas, the disposition of buildings, and the visual aspect are all affected by it. (Lynch, 1962:14).

The form of an area is critical to how it may be used. Ground slope is one of the more important aspects of the topography, since land use and service maintenance are dependent on it. This relationship will vary according to the pattern of activity, but the following is a general classification worth remembering. Slopes under 4 percent seem flat and are usable for all kinds of intense activity. Slopes between 4 and 10 percent appear as easy grades, suitable for informal movement and activity. Slopes over 10 percent seem steep and can be actively used only for hill sports or free play. Gradients over 10 percent increase the expense of erecting buildings on them as a more complicated form and foundation and more difficult utility connections are required. Slope also has a bearing on drainage, erosion, and maintenance. Slopes under 1 percent do not drain well unless they are paved and carefully finished. Slopes over 50 or 60 percent cannot be protected from erosion in a humid climate except by terracing or other conservation methods. The steeper the land and the more impervious its soil, the more the rain will run off its surface instead of seeping into the ground. This means a liability to erosion and the flooding of the surface channels. (Lynch, 1962:48). (For further information

of soil slope and characteristics, consult Soil Survey of Codington County, South Dakota, Soil Conservation Service, 1966.)

Another critical aspect of ground form is the way in which it limits circulation by means of roads and gravity-powered utilities, such as sewers. Here, concern is not only with local slopes but with the way in which the total system of slopes allows continuous lines of suitable grade to be connected.

The ability to make such judgements comes with experience and depends on the analysis of many other site factors, as well as a knowledge of development purposes and possibilities. (Lynch, 1962:48).

For the topography of the Lake Kampeska area, refer to the City Planning Commission's copy of the final report.

The topography of the Lake Kampeska area shows several areas as being flood prone. The lake is considered full at 1720 feet above sea level and land areas north of South Dakota highway 20 near the outlet are almost all designated as flood prone. The high water mark around the lake shorelines also has been indicated as flood prone. There are several low areas south of the lake and also on the west part of the lake near Camp Watymca. These areas are indicated as flood prone and are presently marsh or swamp areas.

The flood prone areas have been so designated, from hydrology studies, previous flood records and topography, as areas having flood waters or high water at various flood stage periods. Conditions of water runoff, septic tank drainage and soil stability are areas that must be observed if potential development seeks to locate in such areas.

There will be a study conducted in the next several years by the federal government that will indicate those areas where no structures or development should be allowed.

Land Use Analysis

The amount and arrangement of land uses exert a major influence upon the convenience and desirability of developing rural and urban land. The variety of land uses observable on the landscape are a result of many influences, both human and natural.

It is generally agreed that a comprehensive development plan should focus on the physical development of an area. It follows then, that one of the more important sections of a plan is that section dealing with land use. An examination of land uses requires an understanding of the physical setting in which the land use activities have developed and are continuing to develop. In order to understand the effect of the physical setting upon the city of Watertown, it is necessary to understand the existing patterns of land use around the planning area of Lake Kampeska, and investigate potential limiting factors that could influence future development.

Residential

The predominant uses of land in our study area are the residential and agricultural. There are close to 600 residents located around the perimeter of the lake as well as scattered two-acre plots for single family dwellings located on predominately agricultural land.

Past residential use of the lake area was the summer cottage type of housing usually located on small lots of 50 foot width. With the increased interest in the lake, and due to the various positive growth factors listed previously in this section, numbers of seasonal cottages have been either converted to year-round homes or torn down

and replaced by more modern homes. There are still several areas that are predominately seasonal, but most areas appear to be in transitional stages of improvement. There are approximately 215 seasonal homes out of a possible 575 dwellings located around the lake perimeter.

In the past several years, there have been residential homes built in agricultural areas, predominately along good county highways. (See Map 2). There have also been platted several subdivisions again showing an increased interest for development in the study area.

Commercial

The commercial use of land around the lake area is somewhat small with four areas being directly adjacent to the lake and occupying fairly small land areas; and two other commercial enterprises, the Lake Kampeska Nursery and Casino Speedway, occupying land to the east of the lake. The small, scattered commercial uses are predominately small neighborhood grocery stores, bars, and quick food drive-in. Two isolated areas of commercial activity are found around the lake; one directly north of the lake on South Dakota Highway 20 and the other directly south of the lake on U. S. Highway 212.

Parks and Recreation

The city of Watertown maintains two parks and a municipal golf course near the lake. Jackson Park occupies about 31 acres and City Park occupies 33 acres. The municipal golf course is located across the perimeter road along the eastern edge of the lake and occupies about 160 acres. (Michelsen, 1976). The state park, Sandy Shores, occupies approximately 8 acres on the southern tip of the lake.

(Wicks, A., 1976). The Memorial Park-Watymca complex is located on the west edge of the lake and is composed of approximately 102 acres. (Wicks, 1975:4). The Watertown Country Club occupies approximately 150 acres of land located just south of the lake. (Edison, 1976). There are close to a dozen public access areas to the lake, most often being located at section line intersections with the lake shore. Some of these access areas have been developed with boat ramps and parking areas, and others are relatively undeveloped.

Industrial

The only land being used for industrial purposes is found along the U. S. Highway 212 adjacent to the railroad tracks on the southwest part of Watertown. A mobile home construction plant and elevator occupy those two areas.

Utilities and Municipal

The city of Watertown has several public facilities located in the lake area. The municipal water pumping station is located on the eastern part of the lake and occupies approximately 150 feet of lake shore frontage for the purposes of pumping and trenching water. Two 20,000 gallon elevated storage tanks are located at the lake with one on the north end and the other at the south end. Several electrical substations are also located near the lake area.

The municipal airport separates the main area of Watertown from the annexed lake. The airport land occupies a substantial amount of land and presents some obstacles with road and street access to and from the lake.

Open Space

Agricultural land and open areas occupy large amounts of the study area. There is little privately owned open space directly adjacent to the lake with residential or park use occupying most of the shoreline area. Agricultural land has been converted to residential use in some areas, with scattered strip development taking place along several county highways between the lake and the main section of town.

Land Use

The following are definitions of the six land use categories used in the Lake Kampeska survey.

Residential land use is primarily occupied by single family dwellings. Included under this classification are mobile homes and mobile home parks.

Commercial land use is land primarily devoted to small retail businesses serving the needs of the local and surrounding rural-farm and residential population.

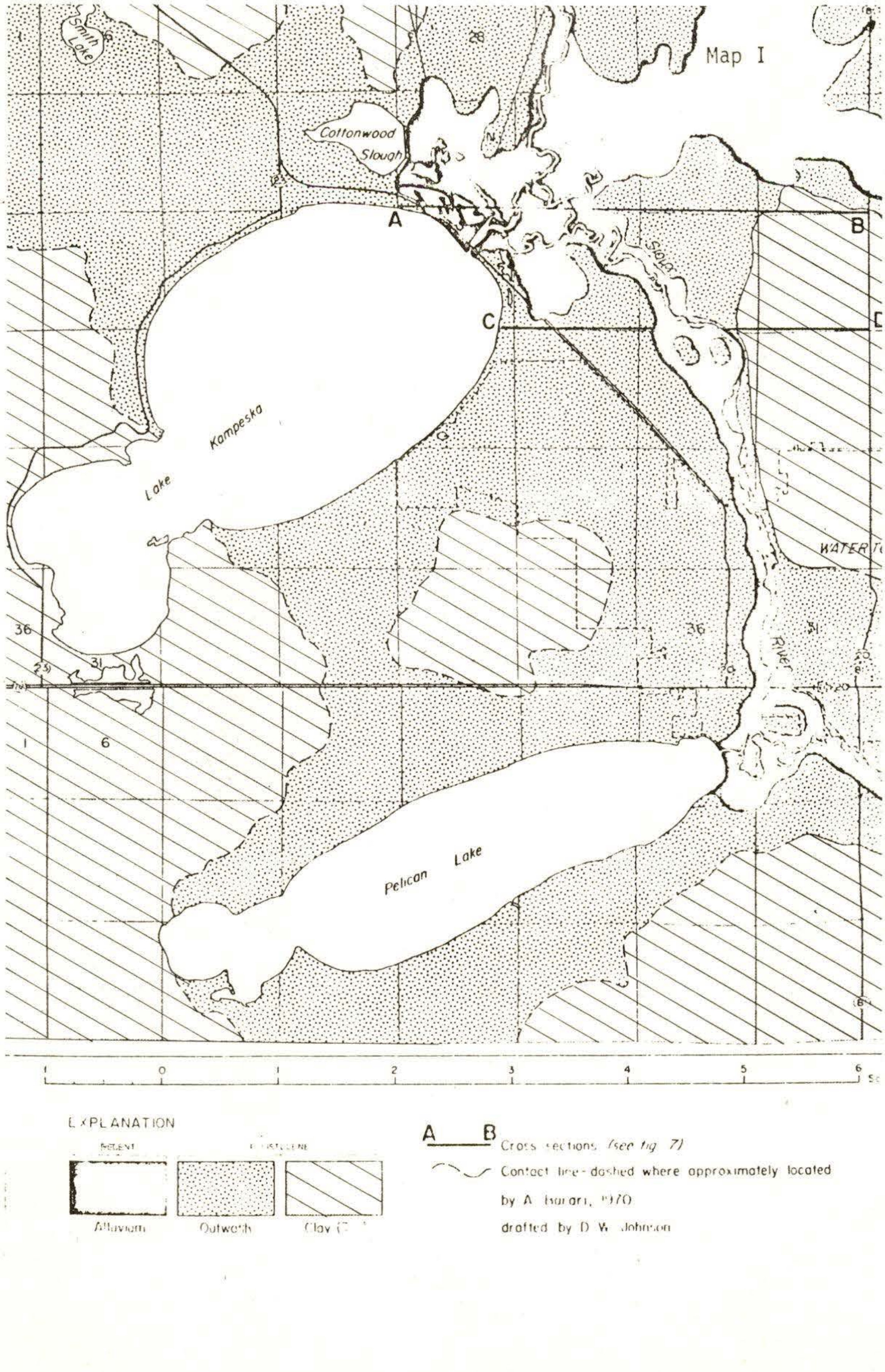
Parks and Recreation land use takes in those areas of city, county and state park jurisdiction. They also included golf courses, country clubs, and other recreational land areas.

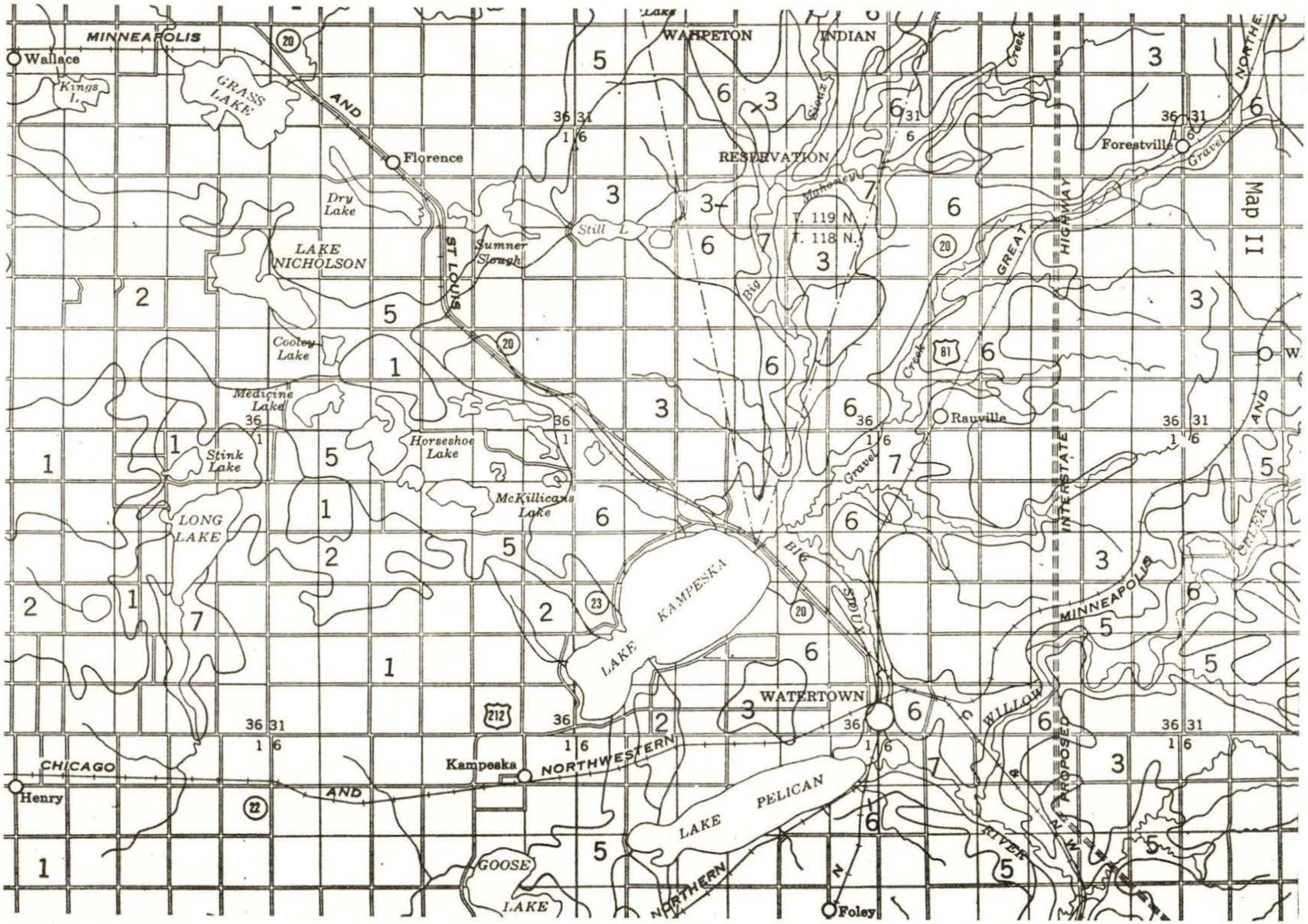
Industrial land is usually found on, or immediately adjacent to, railroad right-of-ways and good highways. Industrial land use is primarily of the grain elevator-feed mill type for which rail transportation is a necessity.

Utilities and Municipal land uses consist of land occupied by

watertowers, electrical transformer substations, natural gas pipeline stations, telephone offices and waterwell houses.

Agricultural and Open Space classifications are vacant areas not used for anything other than agricultural production or left open and undeveloped.


Map I
Smith Lake
Cottonwood Slough
A
B
C
D
Lake Kampeska
Sioux
River
WATER
Pelican Lake
1 0 1 2 3 4 5 6
EXPLANATION
Alluvium
Outwash
A B Cross sections (see fig. 7)
Contact line-dashed where approximately located
by A. Harari, 1970
drafted by D. W. Johnson



Wallace
MINNEAPOLIS
AND
ST LOUIS
Kings L.
GRASS LAKE
Florence
Dry Lake
LAKE NICHOLSON
Sumner Slough
Still L
WAHPETON
INDIAN
RESERVATION
T. 119 N.
T. 118 N.
Big Sioux
Mahoney
Creek
GREAT
INTERSTATE HIGHWAY
Forestville
Gravel
Map II
Cooley Lake
Medicine Lake
Stink Lake
LONG LAKE
Horseshoe Lake
McKillicans Lake
Rauville
LAKE KAMPESKA
BIG SIOUX
WATERTOWN
Kampeska
CHICAGO
AND
NORTHWESTERN
Henry
LAKE PELICAN
GOOSE LAKE
NORTHERN
Foley
WILLOW
RIVER
PROPOSED
MINNEAPOLIS
CREEK

TABLE VIII. ENGINEERING PROPERTIES OF SOILS

Soil association and percent composition of major soils (Col. 1)	Degree and kind of limitation for -- Septic tank absorption fields (Col. 2)	Sewage lagoons (Col. 3)	Shallow excavations (Col. 4)	Dwellings with basements (Col. 5)	Sanitary land fill (trench type) (Col. 6)	Sanitary land fill (area type) (Col. 7)	Local roads and streets (Col. 8)
1 PN-WG Poinsett-Waubay association	Slight - 10% Moderate - 70% Severe - 20%	Slight - 10% Moderate - 70% Severe - 20%	Slight - 65% Moderate - 25% Severe - 10%	Slight - 10% Moderate - 75% Severe - 15%	Slight - 55% Moderate - 35% Severe - 10%	Slight - 65% Moderate - 20% Severe - 15%	Slight - 5% Moderate - 10% Severe - 85%
Poinsett-55%	Moderate-moderate permeability	Moderate:moderate permeability	Slight	Moderate:moderate shrink-swell potential	Slight or moderate:silt loam or silty clay loam textures	Slight	Severe:AASHO Group Index more Than 8
Waubay-20%	Moderate;moderate permeability; severe in areas subject to run-in water	Moderate;moderate permeability	Moderate;moderately well drained; some areas subject to run-in water	Moderate or severe; moderate shrink-swell potential; severe if subject to run-in water	Slight or moderate; moderately well drained	Slight; severe where subject to run-in water	Severe;AASHO Group Index more than 8; plasticity index more than 15
Buse and other soils-25%							
SH-WF Sinai-Wentworth association	Slight - 5% Moderate - 25% Severe - 70%	Slight - 25% Moderate - 60% Severe - 15%	Slight - 30% Moderate - 40% Severe - 30%	Slight - 10% Moderate - 45% Severe - 45%	Slight - 10% Moderate - 60% Severe - 30%	Slight - 80% Moderate - 10% Severe - 10%	Slight - 5% Moderate - 50% Severe - 45%
Sinai-25%	Severe:slow permeability	Slight:moderate if slope is over 2 percent	Severe:silty clay and silty clay loam textures	Severe or moderate;moderate or high shrink-swell potential	Severe;silty clay and silty clay loam textures	Slight	Severe;moderate or high shrink-swell potential
Wentworth-25%	Moderate:moderate permeability	Moderate if slopes are less than 7 percent; severe if slopes are more than 7 percent	Slight	Moderate or severe; moderate or high shrink-swell potential	Moderate: silty clay loam textures	Slight	Moderate or severe; moderate or high shrink-swell potential
Egan-20%	Severe: moderately slow permeability in substratum	Moderate if less than 7 percent slopes; severe if slopes are over 7 percent	Moderate:clay loam substratum	Moderate or severe:moderate or high shrink-swell potential	Moderate:silty clay loam and clay loam textures	Slight	Moderate or severe;moderate or high shrink-swell potential
Viborg and other soils-30%							

TABLE VIII. (CONTINUED).

Soil association and percent composition of major soils (Col. 1)	Degree and kind of limitation for — Septic tank absorption fields (Col. 2)	Sewage lagoons (Col. 3)	Shallow excavations (Col. 4)	Dwellings with basements (Col. 5)	Sanitary land fill (trench type) (Col. 6)	Sanitary land fill (area type) (Col. 7)	Local roads and streets (Col. 8)
Forman-42%	Severe:moderately slow permeability in substratum	Slight if less than 2 percent slopes;moderate if 2 to 7 percent slopes; severe if more than 7 percent slopes	Slight or moderate;loam and clay loam textures; moderate if 8 to 15 percent slopes	Moderate or severe; moderate or high shrink-swell potential	Moderate;loam and clay loam textures;severe if slopes exceed 25 percent	Slight if less than 8 percent slopes;moderate if 8 to 15 percent slopes, severe if slopes exceed 15 percent	Moderate or severe;moderate or high shrink-swell potential; severe if slopes exceed 15 percent
Buse-28%	Severe;moderately slow permeability in substratum	Severe:slopes are more than 7 percent	Moderate if slopes are 8 to 15 percent; severe if slopes exceed 15 percent	Moderate:moderate shrink-swell potential;severe if slopes exceed 15 percent	Moderate if 15 to 25 percent slopes; severe if slopes exceed 25 percent	Moderate if less than 15 percent slopes; severe if slopes exceed 15 percent	Moderate;moderate shrink-swell potential; severe if slopes exceed 15 percent
Aastad and other soils-30%							
2 PN-BY Poinsett-Buse association	Slight - 10% Moderate - 60% Severe - 30%	Slight - 10% Moderate - 65% Severe - 25%	Slight - 45% Moderate - 35% Severe - 20%	Slight - 10% Moderate - 60% Severe - 30%	Slight - 45% Moderate - 35% Severe - 20%	Slight - 50% Moderate - 30% Severe - 20%	Slight - 5% Moderate - 15% Severe - 80%
Poinsett-45%	Moderate-moderate permeability	Moderate;moderate permeability	Slight	Moderate;moderate shrink-swell potential	Slight or moderate;silt loam or silty clay loam textures	Slight	Severe:AASHO Group Index more than 8
Buse-20%	Severe:moderately slow permeability in substratum	Severe;slopes are more than 7 percent	Moderate if slopes are 8 to 15 percent; severe if slopes exceed 15 percent	Moderate;moderate shrink-swell potential; severe if slopes exceed 15 percent	Moderate if 15 to 25 percent slopes Severe if slopes exceed 25 percent	Moderate if less than 15 percent slopes;severe if slopes exceed 15 percent	Moderate:moderate shrink-swell potential; severe if slopes exceed 15 percent
Waubay-15%	Moderate;moderate permeability; severe in areas subject to run-in water	Moderate;moderate permeability	Moderate;moderately well-drained;some areas subject to run-in water	Moderate or severe;moderate shrink-swell potential;severe if subject to run-in water	Slight or moderate;moderately well drained	Slight;severe where subject to run-in water	Severe;AASHO Group Index more than 8; plasticity index more than 15
Parnell and other soils-20%							

TABLE VIII. (CONTINUED).

Soil association and percent composition of major soils (Col. 1)	Degree and kind of limitation for -- Septic tank absorption fields (Col. 2)	Sewage lagoons (Col. 3)	Shallow excavations (Col. 4)	Dwellings with basements (Col. 5)	Sanitary land fill (trench type) (Col. 6)	Sanitary land fill (area type) (Col. 7)	Local roads and streets (Col. 8)
3 KN-BW-VS Kranzburg-Brookings-Vienna association	Slight - 10% Moderate - 10% Severe - 80%	Slight - 30% Moderate - 55% Severe - 15%	Slight - 20% Moderate - 65% Severe - 15%	Slight - 10% Moderate - 65% Severe - 25%	Slight - 15% Moderate - 55% Severe - 30%	Slight - 55% Moderate - 25% Severe - 20%	Slight - 10% Moderate - 15% Severe - 75%
Kranzburg-40%	Severe:moderately slow permeability in substratum (20 to 40 inches)	Slight if less than 2 percent slopes;moderate if 2 to 7 percent slopes;severe where slopes exceed 7 percent	Moderate:clay loam textures at 20 to 40 inches	Moderate or severe;moderate or high shrink-swell potential	Moderate:silty clay loam and clay loam textures	Slight if slopes are less than 8 percent;moderate if slopes are 8 to 15 percent	Severe:AASHO Group Index more than 8; plasticity Index more than 15
Brookings-20%	Severe:moderately slow permeability in substratum;some areas subject to occasional flooding	Slight;moderately slow permeability in substratum;severe where flooding of dikes is a hazard	Moderate or severe;moderately well drained; severe in areas subject to occasional flooding	Moderate;moderate shrink-swell potential;severe in swales that receive run-in water	Severe in swales that receive run-in water;moderate on upland flats; silty clay loam textures	Severe in areas subject to occasional flooding; slight on upland flats	moderate on upland flats; severe in areas subject to run-in water
Vienna-15%	Severe:moderately slow permeability in substratum	Slight if less than 2 percent slopes; moderate if 2 to 7 percent slopes; severe if slopes exceed 7 percent	Slight where slopes are less than 8 percent; moderate if slopes are 8 to 15 percent	Moderate;moderate shrink-swell potential	Slight or moderate; dominantly loam or clay loam textures	Slight if slopes are less than 8 percent	Severe;AASHO Group Index more than 8; Plasticity Index more than 15
Lismore and other soils-25%							
SJ-NL Singsaas-Oak Lake association	Slight - 10% Moderate - 10% Severe - 80%	Slight - 30% Moderate - 55% Severe - 15%	Slight - 50% Moderate - 35% Severe - 15%	Slight - 10% Moderate - 75% Severe - 15%	Slight - 40% Moderate - 45% Severe - 15%	Slight - 55% Moderate - 30% Severe - 15%	Slight - 5% Moderate - 10% Severe - 85%
Singsaas-60%	Severe;moderately slow permeability in substratum	Slight if less than 2 percent slopes;moderate if 2 to 7 percent slopes; severe if slopes exceed 7 percent	Slight where slopes are less than 8 percent; moderate if slopes are 8 to 15 percent	Moderate;moderate shrink-swell potential	Slight or moderate;dominantly loam and clay loam textures	Slight if slopes are less than 8 percent	Severe;AASHO Group Index more than 8

TABLE VIII. (CONTINUED).

	Degree and kind of limitation for —						
Soil association and percent composition of major soils (Col. 1)	Septic tank absorption fields (Col. 2)	Sewage lagoons (Col. 3)	Shallow excavations (Col. 4)	Dwellings with basements (Col. 5)	Sanitary land fill (trench type) (Col. 6)	Sanitary land fill (area type) (Col. 7)	Local roads and streets (Col. 8)
Oak Lake-20%	Severe:moderately slow permeability in substratum; some areas subject to run-in water	Slight:moderately slow permeability in substratum; severe where flooding of dikes is a hazard	Moderate or severe:severe in areas subject to run-in water	Moderate:moderate shrink-swell potential; severe in swales that receive run-in water	Severe in swales that receive run-in water;moderate on upland flats;loam and clay loam textures	Severe in areas that receive run-in water;slight on upland flats	Moderate on upland flats;severe in areas subject to run-in water
Parnell and other soils-20%							
4 VS-LP Vienna-Lismore association	Slight - 10% Moderate - 10% Severe - 80%	Slight - 30% Moderate - 55% Severe - 15%	Slight - 50% Moderate - 40% Severe - 10%	Slight - 10% Moderate - 75% Severe - 15%	Slight - 40% Moderate - 50% Severe - 10%	Slight - 55% Moderate - 30% Severe - 15%	Slight - 5% Moderate - 10% Severe - 85%
Vienna-65%	Severe:moderately slow permeability in substratum	Slight if less than 2 percent slopes; moderate if 2 to 7 percent slopes;severe if slopes exceed 7 percent	Slight where slopes are less than 8 percent; moderate if slopes are 8 to 15 percent	Moderate:moderate shrink-swell potential	Slight or moderate dominately loam or clay loam textures	Slight if slopes are less than 8 percent	Severe:AASHO Group Index more than 8; plasticity Index more than 15
Lismore-15%	Severe:moderately slow permeability in substratum	Slight	Moderate:moderately well drained	Moderate:moderate shrink-swell potential;severe in areas that receive run-in water from adjacent slopes	Moderate:moderately well drained;silty clay loam and clay loam textures	Slight or moderate;some areas receive run-in water from adjacent slopes	Severe:AASHO Group Index more than 8; plasticity index more than 15
Kranzburg and other soils-20%							
5 FU-BY Forman-Buse association	Slight - 5% Moderate - 10% Severe - 85%	Slight - 15% Moderate - 25% Severe - 60%	Slight - 20% Moderate - 50% Severe - 30%	Slight - 5% Moderate - 50% Severe - 45%	Slight - 10% Moderate - 60% Severe - 30%	Slight - 25% Moderate - 40% Severe - 35%	Slight - 5% Moderate - 45% Severe - 50%

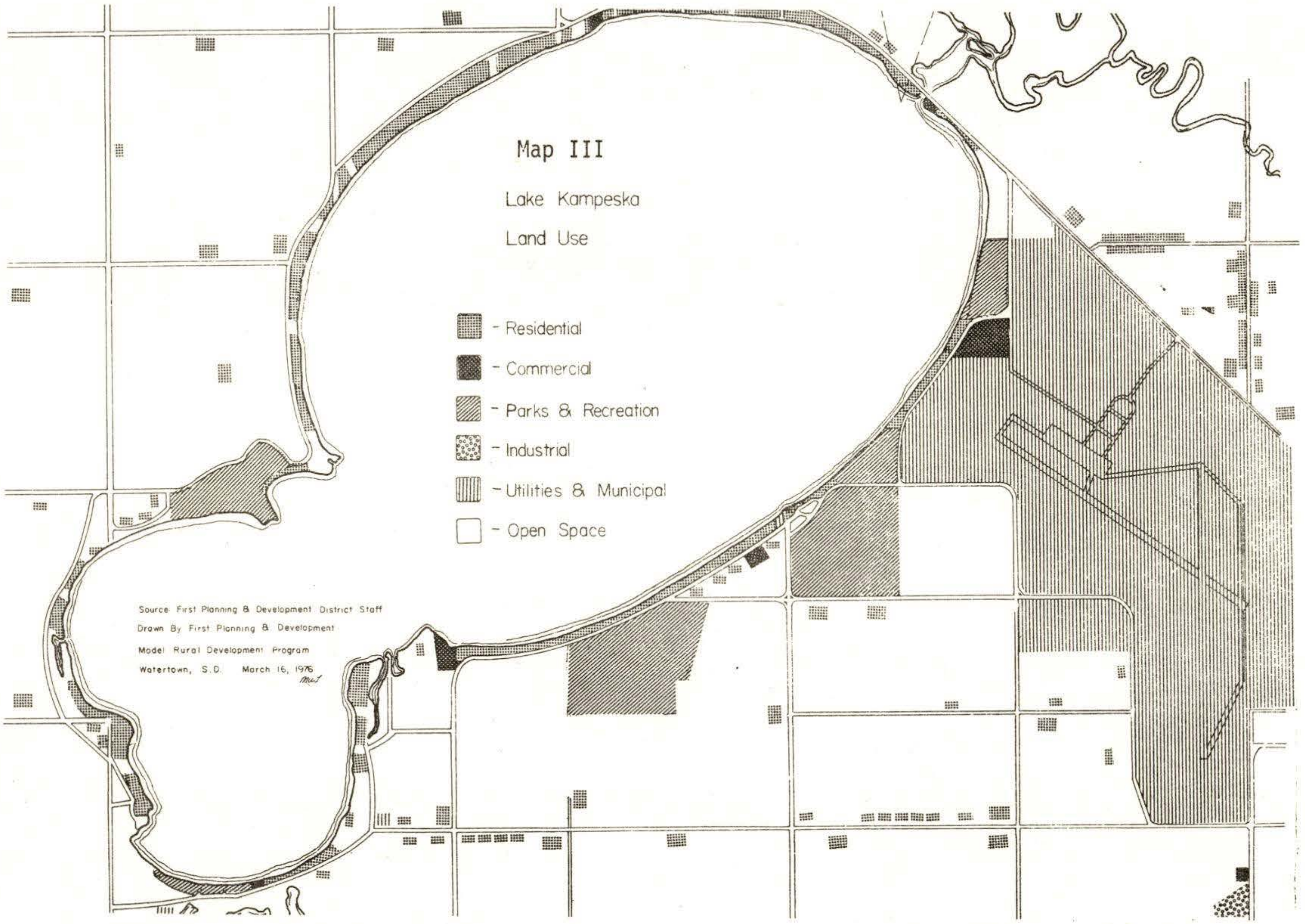
TABLE VIII. (CONTINUED).

Soil association and percent composition of major soils (Col. 1)	Degree and kind of limitation for -- Septic tank absorption fields (Col. 2)	Sewage lagoons (Col. 3)	Shallow excavations (Col. 4)	Dwellings with basements (Col. 5)	Sanitary land fill (trench type) (Col. 6)	Sanitary land fill (area type) (Col. 7)	Local roads and streets (Col. 8)
FJ-EG Flandreau-Egeland association	Slight - 55% Moderate - 10% Severe - 35%	Slight - 10% Moderate - 10% Severe - 80%	Slight - 70% Moderate - 20% Severe - 10%	Slight - 20% Moderate - 70% Severe - 10%	Slight - 5% Moderate - 15% Severe - 80%	Slight - 5% Moderate - 15% Severe - 80%	Slight - 20% Moderate - 70% Severe - 10%
Flandreau-55%	Slight if less than 8 percent slopes;moderate if slopes over 8 percent	Severe;rapid permeability in substratum	Slight if less than 8 percent slopes; moderate if slopes 8 to 15 percent	Moderate; low to moderate shrink-swell potential; well drained; 1 to 15 percent slopes	Severe;moderately rapid and rapid permeability in substratum	Severe;moderately rapid and rapid permeability in substratum	Moderate;ML or CL Unified Soil Group in upper part;SM or SC in lower part
Egeland-25%	Slight;severe if glacial till within 40 to 60 inches	Severe-moderately rapid permeability	Slight	Slight if less than 8 percent slopes;moderate if 8 to 15 percent slopes	Severe;moderately rapid permeability	Severe;moderately rapid permeability	Slight if less than 8 percent slopes;moderate if 8 to 15 percent slopes
Kranzburg and Other soils-20%							
6 FS-ES Fordville-Estelline association	Slight - 70% Moderate - 15% Severe - 15%	Slight - 5% Moderate - 5% Severe - 90%	Slight - 5% Moderate - 10% Severe - 85%	Slight - 70% Moderate - 20% Severe - 10%	Slight - 5% Moderate - 15% Severe - 80%	Slight - 5% Moderate - 15% Severe - 80%	Slight - 50% Moderate - 20% Severe - 30%
Fordville-45%	Slight;possible pollution of ground water supplies	Severe;rapid permeability in substratum	Severe;sand and gravel substratum (20 to 40 inches)	Slight	Severe;rapid permeability in substratum	Severe;rapid permeability in substratum	Slight
Estelline-30%	Slight;possible pollution of ground water supplies	Severe;rapid permeability in substratum	Severe;sand and gravel substratum (24 to 40 inches)	Slight	Severe;rapid permeability in substratum	Severe;rapid permeability in substratum	Severe;AASHO Group Index more than 8 in upper part of soil
Renshaw and other soils-25%							
RL-FS Renshaw-Fordville association	Slight - 70% Moderate - 15% Severe - 15%	Slight - 5% Moderate - 5% Severe - 90%	Slight - 5% Moderate - 10% Severe - 85%	Slight - 70% Moderate - 20% Severe - 10%	Slight - 5% Moderate - 10% Severe - 85%	Slight - 5% Moderate - 15% Severe - 80%	Slight - 80% Moderate - 10% Severe - 10%

TABLE VIII. (CONTINUED).

Soil association and percent composition of major soils (Col. 1)	Septic tank absorption fields (Col. 2)	Sewage lagoons (Col. 3)	Shallow excavations (Col. 4)	Dwellings with basements (Col. 5)	Sanitary land fill (trench type) (Col. 6)	Sanitary land fill (area type) (Col. 7)	Local roads and streets (Col. 8)
	Degree and kind of limitation for --						
Renshaw-60%	Slight:possible pollution of ground water supplies	Severe:rapid permeability in substratum	Severe:sand and gravel substratum (10 to 20 inches)	Slight if less than 8 percent slopes;moderate if 8 to 15 percent slopes	Severe:rapid permeability in substratum	Severe:rapid permeability in substratum	Slight if less than 8 percent slopes;moderate if 8 to 15 percent slopes
Fordville-20%	Slight:possible pollution of ground water supplies	Severe;rapid permeability in substratum	Severe;sand and gravel substratum (20 to 40 inches)	Slight	Severe;rapid permeability in substratum	Severe;rapid permeability in substratum	Slight
Divide and other soils-20%							
7 LD Lamoure association	Slight - 5% Moderate - 5% Severe - 90%	Slight - 0% Moderate - 5% Severe - 95%	Slight - 5% Moderate - 5% Severe - 90%	Slight - 0% Moderate - 5% Severe - 95%	Slight - 0% Moderate - 5% Severe - 95%	Slight - 0% Moderate - 5% Severe - 95%	Slight - 0% Moderate - 5% Severe - 95%
Lamoure-65%	Severe;frequent flooding;water table at 2 to 5 feet	Severe;moderately rapid permeability in substratum;water table at 2 to 5 feet	Severe;poorly drained;water table at 2 to 5 feet	Severe;poorly drained;frequent flooding	Severe;poorly drained;frequent flooding	Severe;poorly drained; frequent flooding	Severe;poorly drained;frequent flooding,high potential frost action
Volga-Rauville and other soils-35%							

1/ Interpretations based on "Guide for Interpreting Engineering Uses of Soils" United States Department of Agriculture, Soil Conservation Service, 1971, 87 pages, illus.
For use with General Soil Map for Broad Planning Purposes.


Map III
Lake Kampeska
Land Use
- Residential
- Commercial
- Parks & Recreation
- Industrial
- Utilities & Municipal
- Open Space
Source: First Planning & Development District Staff
Drawn By First Planning & Development
Model Rural Development Program
Watertown, S.D. March 16, 1976

Transportation

Direct access from the lake to the main section of Watertown is supplied by U. S. Highway 212, South Dakota Highway 20 and Codington County road 14. South Dakota Highway 20 runs north of the lake; U. S. Highway 212 runs south of the lake; and South Dakota Highways 23 runs along the west of the lake connecting South Dakota Highway 20 and U. S. Highway 212. Several stretches of county and township roads intermixed with several city streets provide access to lake area residences.

Due to the recent annexation of the lake area, the responsibilities for various functions of transportation maintenance have been spread among several providers. The South Dakota Department of Highways provides snow removal, weed control, maintenance and all other needs for the South Dakota Highway 23, U. S. Highway 212 and South Dakota Highway 20. The other road areas are split in the duties of road upkeep. The County Highway Department has agreed to remove snow from Stony Point to the exit at South Dakota Highway 20 for a period of five years, but the city will maintain for repair, weed control, etc. The snow removal is taken care of by contractual services with county road crews with the city paying an hourly fee for the completion of these snow removal services. The city also has roads in the lake area as indicated on the following page, but the same agreement holds true for these street areas as for the southern perimeter road. All other roads not designated as city streets are county roads or highways and township roads maintained either by the county or township.

The traffic that follows County road 14 enters the city on 4th Avenue of the city street system. The 4th Avenue is beginning to deteriorate from use, and the bridge spanning the Big Sioux River is to be replaced this summer.

Administrative Systems of Highways

The following classification is used for the purpose of clarifying the duties and power of the various governmental state agencies charged with the administration of the highways in South Dakota.

1. State trunk system - the highways designated by statute to be controlled and supervised by the State Highway Commission;
2. County highway system - the highways designated by the board of county commissioners in organized counties that have been approved by the state highway commission;
3. Township highways - the secondary highways in organized townships that are administered by a board of township supervisors;
4. County secondary highways - the rural local highways in unorganized counties and in the unorganized townships of organized counties, excluding the approved county highway system, that are under the supervision of the board of county commissioners of a county highway board.

Various Highway Systems

1. Federal-aid Primary System is a limited connected system of principal roads with urban connections which qualify for

improvement with funds from the Federal Highway Trust Fund. In Codington County, there are 88 miles of Federal-aid Primary highways which qualify under the Federal-aid systems: U. S. 81, 30 miles; U. S. 212, 31 miles; S. D. 20, 27 miles (Watertown, NE to county line).

2. County Highway System

   a. Organization - The county commissioners are authorized by state statutes to employ a county highway superintendent and to create a county highway department.

   b. Funding - The County Road and Bridge Fund was created to simplify the accounting and safekeeping of highway and bridge funds useable for the county highway and bridge construction, maintenance and repair.

   c. Establishing County System - The county commissioners establish a county highway system. The maximum road mileage in the system cannot be greater than twenty-five percent (25%) of the total public road mileage of the county, except in the county where the county system has been completed. Then the county system may be changed to include thirty-five percent (35%) including the portions within incorporated cities and towns. Codington County has 283.3 miles of road in the county highway system.

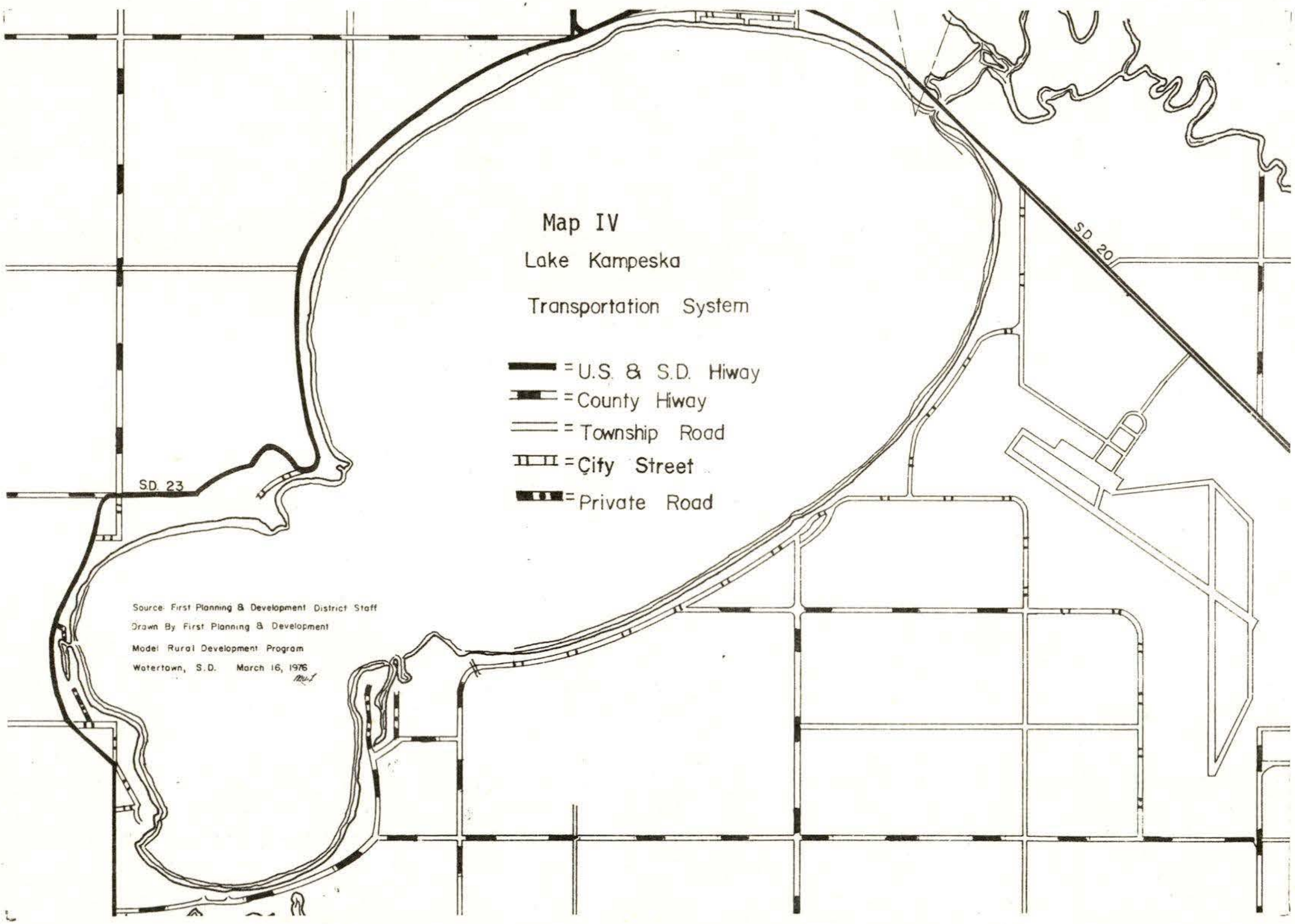
   The county system roads are usually spaced approximately six miles apart and essentially grid the county

providing an adequate feeder road network to the State Trunk System. (Each county makes a priority list of yearly road construction and maintenance.)

3. Township and Highway System - The township supervisors are responsible for all township roads; their construction, repair, and maintenance unless, by petition to and approval by the county commissioners, the township requests the county to take responsibility for designated roads commonly called county-aid roads.

   a. Funding - There is voted and levied each year in each civil township a highway tax for construction and repair of township roads.

   b. System - In Codington County, there are 921 miles of township roads. Of the total public roads, these township roads represent seventy-three percent (73%) of the total. (Model Rural Development, 1973:VIII-2 - VIII-6).


Map IV
Lake Kampeska
Transportation System
= U.S. & S.D. Hiway
= County Hiway
= Township Road
= City Street
= Private Road
SD 20
SD 23
Source: First Planning & Development District Staff
Drawn By First Planning & Development
Model Rural Development Program
Watertown, S.D. March 16, 1976

Community Services and Facilities

Water - Present

Several years ago, the city of Watertown expanded its water supply by digging a series of wells north of the Lake Kampeska area. Even with the expansion of the well field, Lake Kampeska has remained the primary source of water supply for the city of Watertown. Pumping records maintained by the city show that over the last ten years, approximately sixty-three percent (63%) of the municipal water supply has come from Lake Kampeska.

The water utilities division has a pumping capacity of 3,000,000 gallons per day with 1,700,000 gallons per day available from the lake and the remaining capacity coming from the various municipal wells. At the present time, Watertown has a total of about 5,000,000 gallons of treated water storage capacity. This figure includes the 200,000 gallons of storage that serves the city's Lake Kampeska distribution system. (Banner, 1973:3-15).

In 1973, construction was started on a third city water distribution system. This system consists of an eight-inch water line around Lake Kampeska. Water is provided from the Lake Kampeska treatment facilities, and distribution pressure provided from two 100,000 gallon elevated storage tanks. (1975:6-2). (See Map VI, p. 65.)

Policy followed by the utilities company shows that before a water tap is made, the customer must obtain a permit from the utilities and pay the fees required for the service. The permit fee shall include the water main assessment, the cost of tapping the water main,

the costs of the water service meter and the installation of the meter. The owner, who must reside within the city limits, shall be responsible for installation of the service line from the water main to the meter location and prepare plumbing to receive the meter. (1975:11-11).

Water - Future

Information supplied by the J. T. Banner consulting firm indicates that the existing water supply production plus storage is adequate to meet the peak day requirement until beyond year 2000. However, if a full fire demand should be required during a critical peak day period, a significant shortage could develop requiring a curtailment of service until storage supply is recovered. Table XI indicates the various water needs of the city from year 1975 to the year 2010. (Banner, 1975:3-17).

The graphic comparison shown on Table XII indicates that the existing facilities will not meet the estimated peak week demand without utilizing storage water or the utilization of emergency wells. The facilities with the utilization of storage water appears adequate to meet the peak week condition until about 1981. However, if a full fire demand should be needed at or near the end of the peak week, the City could experience a critical shortage of full supply without use of emergency wells. (1975:3-14).

Short period, hour or daily peaks, generally can be met by adequate storage if sufficient recovery time is available after the critical use period. This requires adequate water production facilities to provide quick recovery. The report by Banner shows the expansion of

the number of wells and also increases in the storage capacity of the city by construction of several new supply tanks. According to this report, the city will have to make capital improvements in the water supply within the next 15 years to meet the expected city demands. (1975:3-18).

Best areas for expansion according to municipal utilities officials, would be to keep the location of future development near existing lines. This would be primarily adjacent to the lake where the perimeter water line would allow short expansion of the line and keep installation costs low.

Another area of desired expansion would be along the county road going south from the lake treatment plant down to U. S. 212. This line would service the southern part of Watertown, and residential expansion could take place along its length. (Valard, 1976).

Sewer - Present

The Watertown sewage treatment plant has a capacity of approximately 4,250,000 gallons per day. The average daily sewage load is near 2,000,000 gallons per day.

The city installed sewage lines at the same time as water lines in 1973 and 1974 after the Lake Kampeska sanitary district was formed. (See Map V, p. 65.) The funding came from revenue bonds, and the residents' monthly service charge reduces the bond debt and pays a rental for treatment to the city. The entire cost of sewer installation was assessed to the property owners with the exception of the approximately 27 lift stations which were paid for by the city.

The revenue bonds have a 30-year retirement period. (Lebert, 1976).

Since the installation of sewer is the most expensive type of municipal service, it is important that special attention be given to the service areas of the sewer system.

The Conifer Nursery Road presents different types of problems than the lake area. Water quality is deteriorating due to high water table cutting down the effectiveness of individual septic tank systems.

A sewer line would need to be run a distance from the north-western end of the city in order to reach those homes. There are approximately 35 homes and small farms in that area, and it would need to be annexed into the city before city sewer and water services could benefit them. There is also a large cost factor that must be looked at when thinking of installing sewer to these isolated homes.

Sewer - Future

With the capacity of the treatment plant sufficient to handle the development in the near future, special attention should be directed to installation and future service areas.

The areas adjacent to the sewer lines would be most economical for installation of new lines. Any residences or commercial businesses located a distance from the lines becomes very costly for those persons because the entire cost for sewer installation is assessed to those service recipients. Also, areas of varying topography are more costly for installation than level areas due to the necessity of expensive lift stations to transport sewage uphill.

Final emphasis should be given to those soils areas occupied by

hard boulder clay. (Refer to Map I.) Those areas present installation problems due to hardness of the material and the quantity of rock material encountered. (Lebert, 1976).

Storm Drainage

Storm sewer drainage around Lake Kampeska follows natural channels and enter the lake at various points. There are no specific plans for additional storm sewage control at this time, but with added residential development, the need may arise to give it more attention. (1976).

Flood Control

The residents living in the designated flood prone areas are being informed and advised by city officials to pursue flood insurance. (1976). There are no flood retarding structures such as dikes, canals, or etc., being planned at this time. The flood prone areas are primarily small (under 40 acres) parcels of land that experience standing and running water in times of spring runoff and high water table periods. The federal government is studying flood prone areas, and will later designate those areas where no development should occur. (Ferber, 1976).

Gas - Present

The Watertown Municipal Utilities has a natural gas line around Lake Kampeska and several other lines located within our study area. (Refer to Map VII, p. 66.) The line varies from 6 to 2 inches in diameter depending on the relative distance from the distribution center located in the southern part of the city. (Stoudt, 1976).

TABLE IX
WATER REQUIREMENTS TO MEET PEAK DAY AND FIRE DEMAND
CITY OF WATERTOWN

Water Supply Source	Year	Peak Day Demand M.G.D.	10-hour Fire Demand M.G.D.	Peak Day Plus Fire M.G.D.	Water* Production From Plants M.G.D.	Total Storage Required M.G.D.	Existing** Storage Available M.G..	Additional Water Supply Required For full Supply M.G.
Lake Kampeska	1975	4.53	2.29	6.82	2.73	4.09	3.50	0.59
Supply and Wells	1980	4.79	2.35	7.14	2.73	4.41	3.50	0.91
No. 1,2,3,9, & 10	1985	5.05	2.41	7.46	2.73	4.73	3.50	1.23
(All Existing)	1990	5.31	2.47	7.78	2.73	5.05	3.50	1.55
Lake Kampeska	1975	4.53	2.29	6.82	3.55	3.26	3.50	0.00
Supply and Wells	1980	4.79	2.35	7.14	3.55	3.59	3.50	0.09
No. 1,2,3,9 & 10 plus	1985	5.05	2.41	7.46	3.55	3.91	3.50	0.41
New 800 G.P.M. Supply	1990	5.31	2.47	7.78	3.55	4.23	3.50	0.73
Lake Kampeska	1975	4.53	2.29	6.82	4.78	2.04	3.50	0.00
Supply and Wells	1980	4.79	2.35	7.14	4.78	2.36	3.50	0.00
No. 1,2,3,9 & 10 plus	1985	5.05	2.41	7.46	4.78	2.68	3.50	0.00
New 1940 G.P.M. Supply	1990	5.31	2.47	7.78	4.78	3.00	3.50	0.00
and 2.0 M.G.D.	1995	5.57	2.52	8.09	4.78	3.31	3.50	0.00
Addition to treatment	2000	5.82	2.58	8.40	4.78	3.62	3.50	0.12
Facilities	2005	6.08	2.63	8.71	4.78	3.93	3.50	0.43
	2010	6.34	2.68	9.02	4.78	4.24	3.50	0.74

*Assumed 71% efficiency for preventative maintenance, backwash, blow down sludge and emergency breakdowns.

**Assumed 30% of storage remaining to maintain pressures, proper distribution and second emergency.

SOURCE: (Banner, 1975:3-17).

TABLE X

PROJECTED WATER REQUIREMENTS
CITY OF WATERTOWN, SOUTH DAKOTA

(1) Year	(2) Estimated Population	(3) Average Annual MGD	(4) Peak Month MGD	(5) Peak Week MGD	(6) Peak Day MGD	(7) Fire Requirement M.G.
1975	15,110	2.12	3.32	3.78	4.53	2.29
1980	15,970	2.24	3.51	3.99	4.79	2.35
1985	16,830	2.36	3.70	4.21	5.05	2.41
1990	17,690	2.48	3.89	4.42	5.31	2.47
1995	18,550	2.60	4.08	4.64	5.57	2.52
2000	19,410	2.72	4.27	4.85	5.82	2.58
2005	20,270	2.84	4.46	5.07	6.08	2.63
2010	21,130	2.96	4.65	5.28	6.34	2.68

Column (3) = Column (2) x 140 ÷ 1,000,000
Column (4) = Column (2) x 200 ÷ 1,000,000
Column (5) = Column (2) x 250 ÷ 1,000,000
Column (6) = Column (2) x 300 ÷ 1,000,000
Column (7) = 10 hour supply for rate $G = 1020 \sqrt{P} \; (1-.01\sqrt{P})$
where G = Gallons per minute and
P = Populations in thousands

MGD = Million gallons per day

M.G. = Million gallons

SOURCE: Banner, 1975:3-14.

TABLE XI

TOTAL WATER PRODUCED
WATERTOWN, SOUTH DAKOTA

Year: 1973
Estimated Population: 13,900 (Does not include Lake Kampeska Population)

Month	Average Daily Use 1000 Gal.	Peak Day Use 1000 Gal.	Average Per Capita Use G.P.C.P.D.	Peak Day Per Capita Use G.P.C.P.D.
January	1470.4		106	
February	1353.2		97	
March	1367.3		98	
April	1483.5		107	
May	1824.7		131	
June	2650.9		191	
July	3068.9	4147.0	221	298
August	2888.0		208	
September	1904.0		137	
October	1588.3		114	
November	1423.1		102	
December	1344.5		97	
Year	1863.9	4147.0	134	298

SOURCE: Banner, 1975:3-12.

The municipal gas is supplied to areas in and out of the city limits. The installation of lines is paid for by the utilities and the customer is assessed only a monthly gas charge.

Gas - Future

The municipal officials feel they can handle another 300 customers, but gas quantities are somewhat uncertain for anything but the near future. The requests for services anywhere but directly adjacent to present lines are not being filled due to expense of installation and the relative uncertainty of future gas quantities for any more than the present service load. (1976).

Electricity - Present

The municipal electrical system includes the area from the proposed Interstate 29 to the west edge of Lake Kampeska and roughly just south of the city limits and just south of the city limits area. The lines servicing the lake perimeter were purchased from Northwestern Public Service and are now maintained by Watertown utilities. Municipal utilities officials said that lines installed in our study were installed with the capacity to handle anticipated heavier loads. (Refer to Map VIII, p. 67.)

Electricity - Future

With the basic understanding that electrical demands double every 10 years, the Municipal Utilities Electrical office has planned well ahead to meet such demand. Lines in the study area appear adequate to handle future loads from development. With the electrical service area covering more than just Watertown, and with the planning that has

been done to handle future development, there appears to be little problem with this municipal service. (1976).

Refuse Collection - Present

Present municipal garbage policy indicates that only residences within the city limits qualify for collection of solid waste. Commercial and industrial businesses within the city must contract with private companies to have their solid waste removed.

Since the Lake Kampeska area was annexed into the city limits, a new truck and staff of three men were added to handle the additional work load. (Meyer, 1976).

Refuse Collection - Future

At this time, solid waste collection poses no problem. When additional customers are annexed into the city, the work load is accommodated by the existing staff until the work load becomes excessive and more equipment and staff are added. The collection charge from residents appears to cover necessary equipment and staff. (1976).

Street Lighting - Present

Street lighting around the lake is sporadic and in many areas, non-existent. Private yard lights supplement municipal lights, but both fire and police officials feel lighting is very inadequate. (Hoy).

Street Lighting - Future

The municipal utilities officials, at present, do not have a formal street lighting plan, but a long range lighting improvements program is being investigated. (Stoudt).

Snow Removal - Present

Snow removal of all township, county and city streets in the study area is taken care of by the county highway department. All services are provided through a contractual agreement with the city and township boards for the removal of snow. The U. S. Highway 212 and South Dakota Highways 20 and 23 are maintained for snow removal by the state highway department.

The agreement for snow removal from city streets in the study area by county crews is for a five-year period starting in 1975. If this proves to be too much of a burden to county staff, a new arrangement may have to be worked out. (Risvedt, 1976).

Snow Removal - Future

If conditions of increased development and increased demand for snow removal occurs, there may be a need to increase staff and equipment for this service. (1976).

Police Protection - Present

The city of Watertown has a police force of 24 total staff. The staff currently patrols the main area of the city and has one staff car located at the airport. The police officer at the airport also patrols the lake perimeter road where the city limits have jurisdiction. Problems of the lake area cited by the police chief include the need for street markings and more accurate home addressing; the need for better street lighting; and also the need for area residents to report accident and vandalism activities. (Strain, 1976).

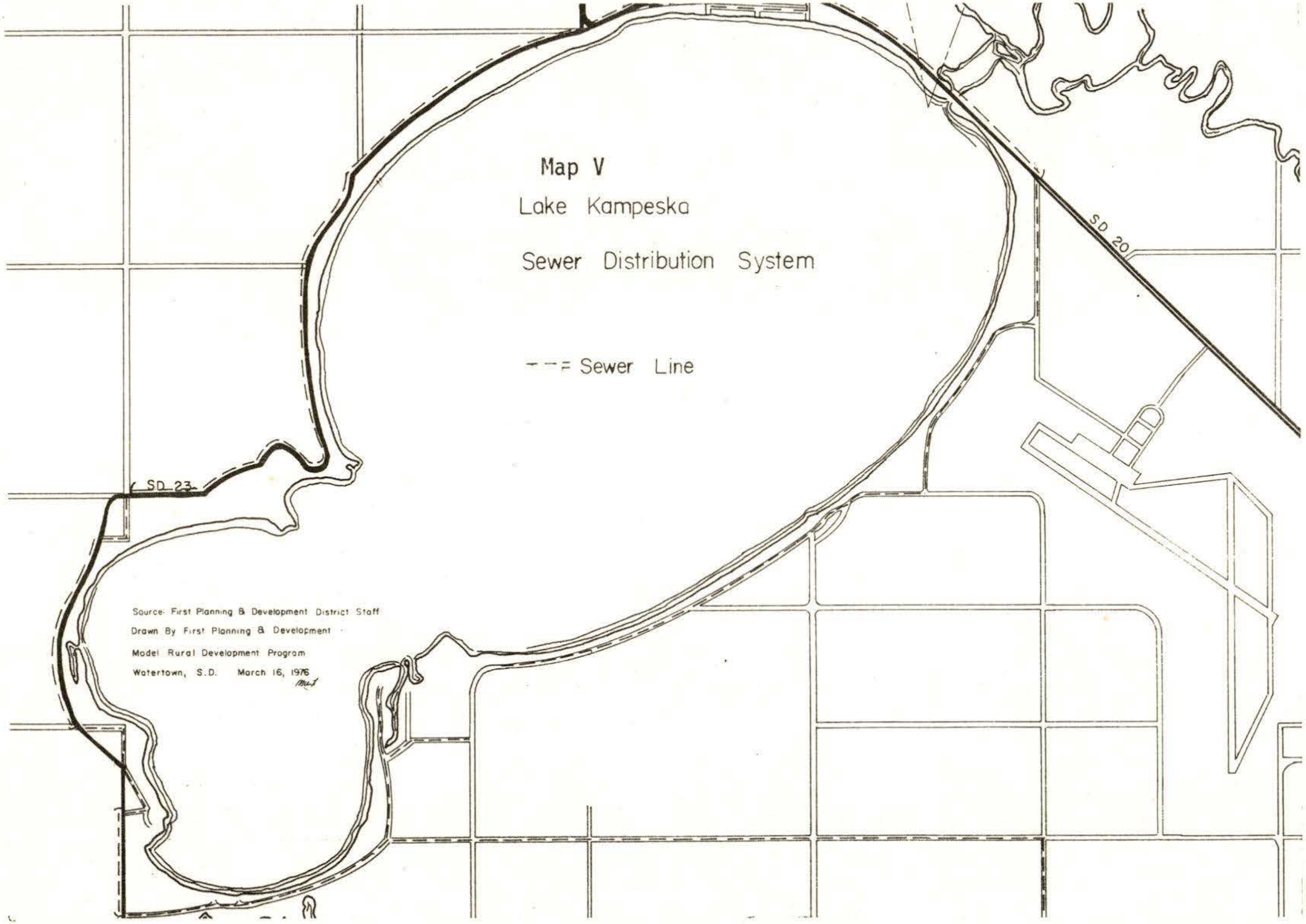
Fire Protection - Present

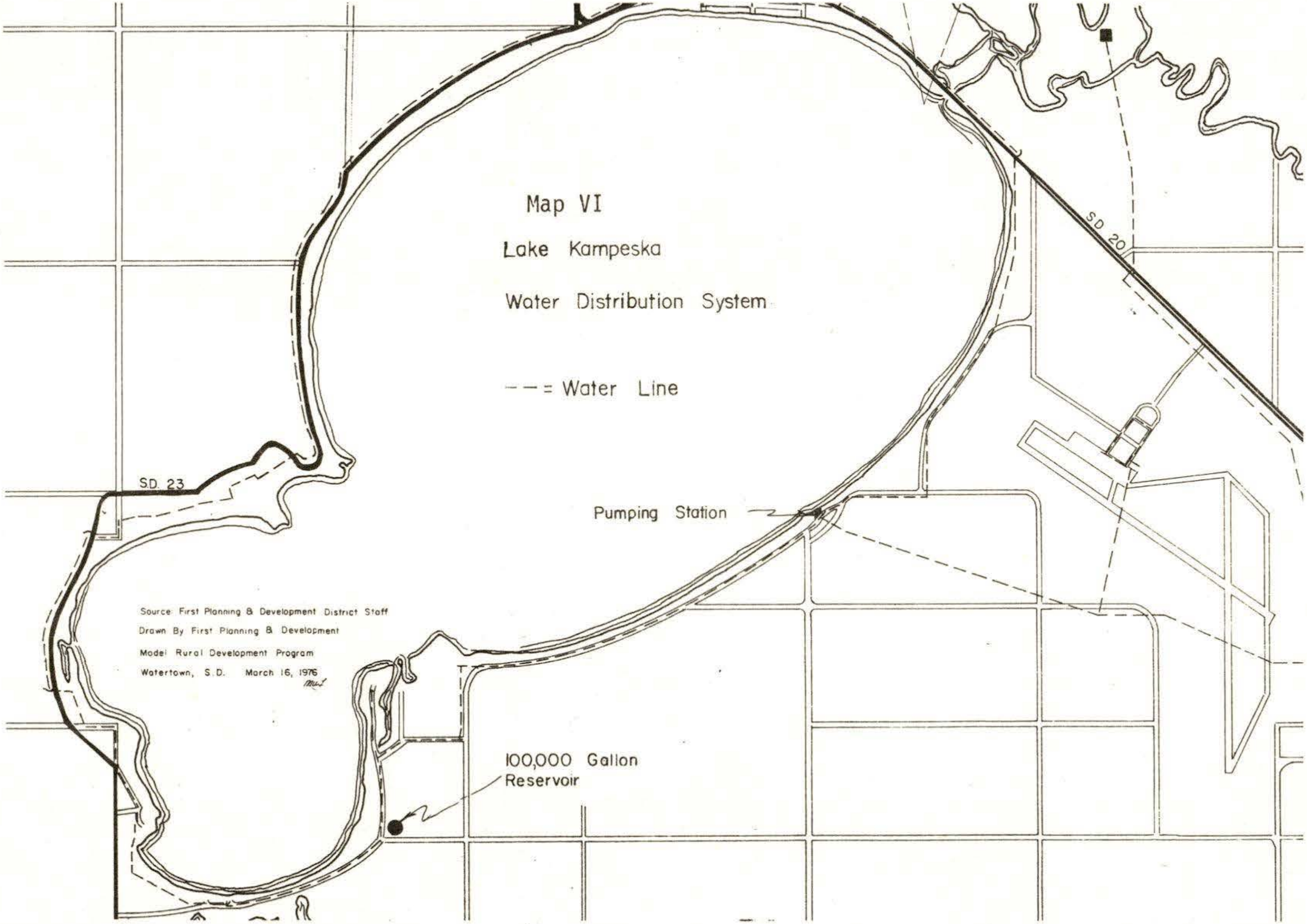
The Watertown Fire Department currently has a staff of 26, with six men on duty per shift at the main station and two men on duty per shift located at the airport. The fire chief feels a new ambulance is needed immediately due to the use demanded by covering a service area of approximately 325 square miles. Fire protection at the lake poses several problems, the most important being distance requiring time to reach the lake in case of an emergency. A crash truck and a 30 year old fire truck are located at the airport, but other main equipment and staff are located in downtown Watertown, necessitating several minutes to travel from the city limits to the lake area.

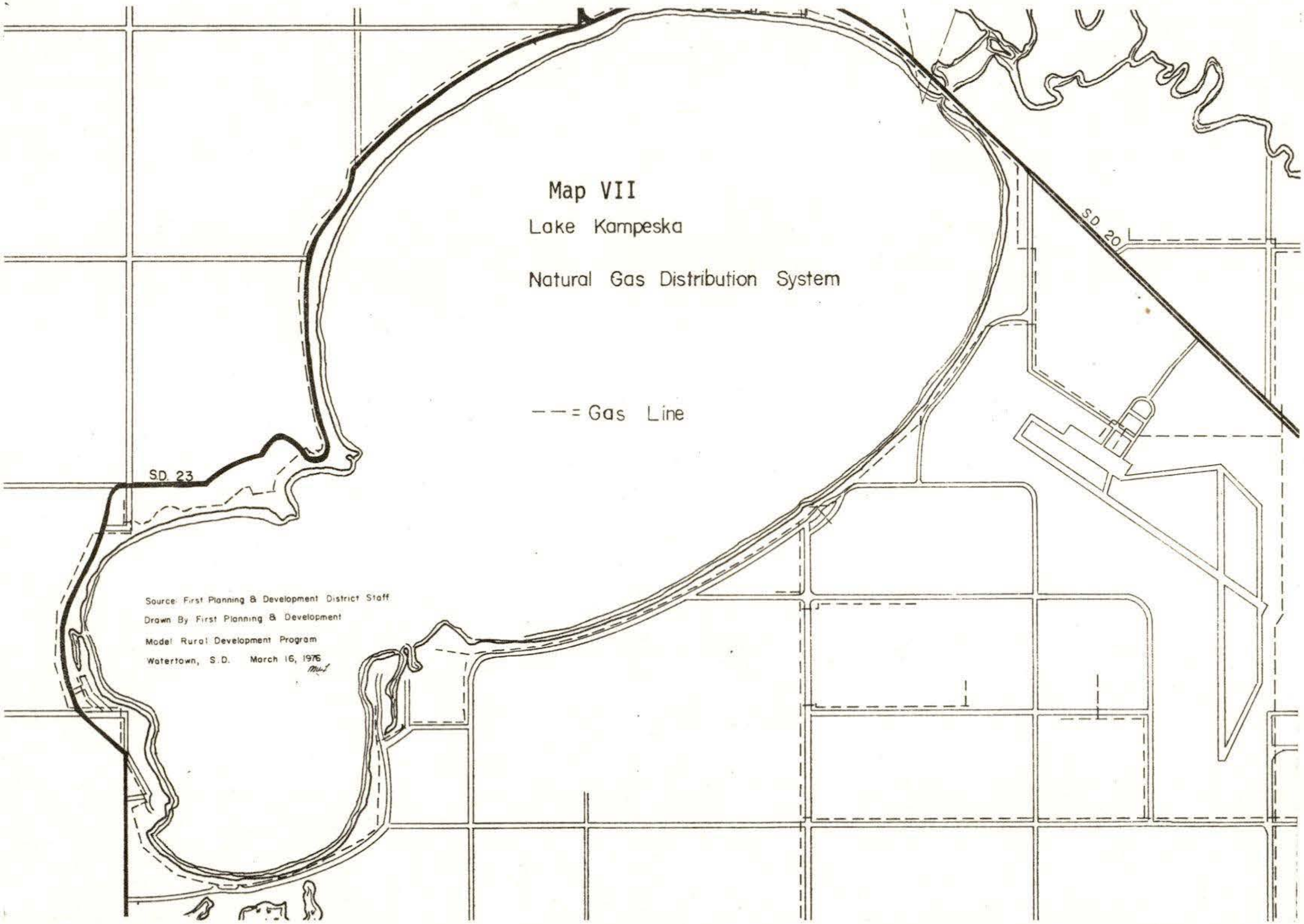
Water pressure and hydrant placement appear adequate, but winter snowfall poses problems of locating hydrants under plowed snowbanks. (Hoy, 1976).

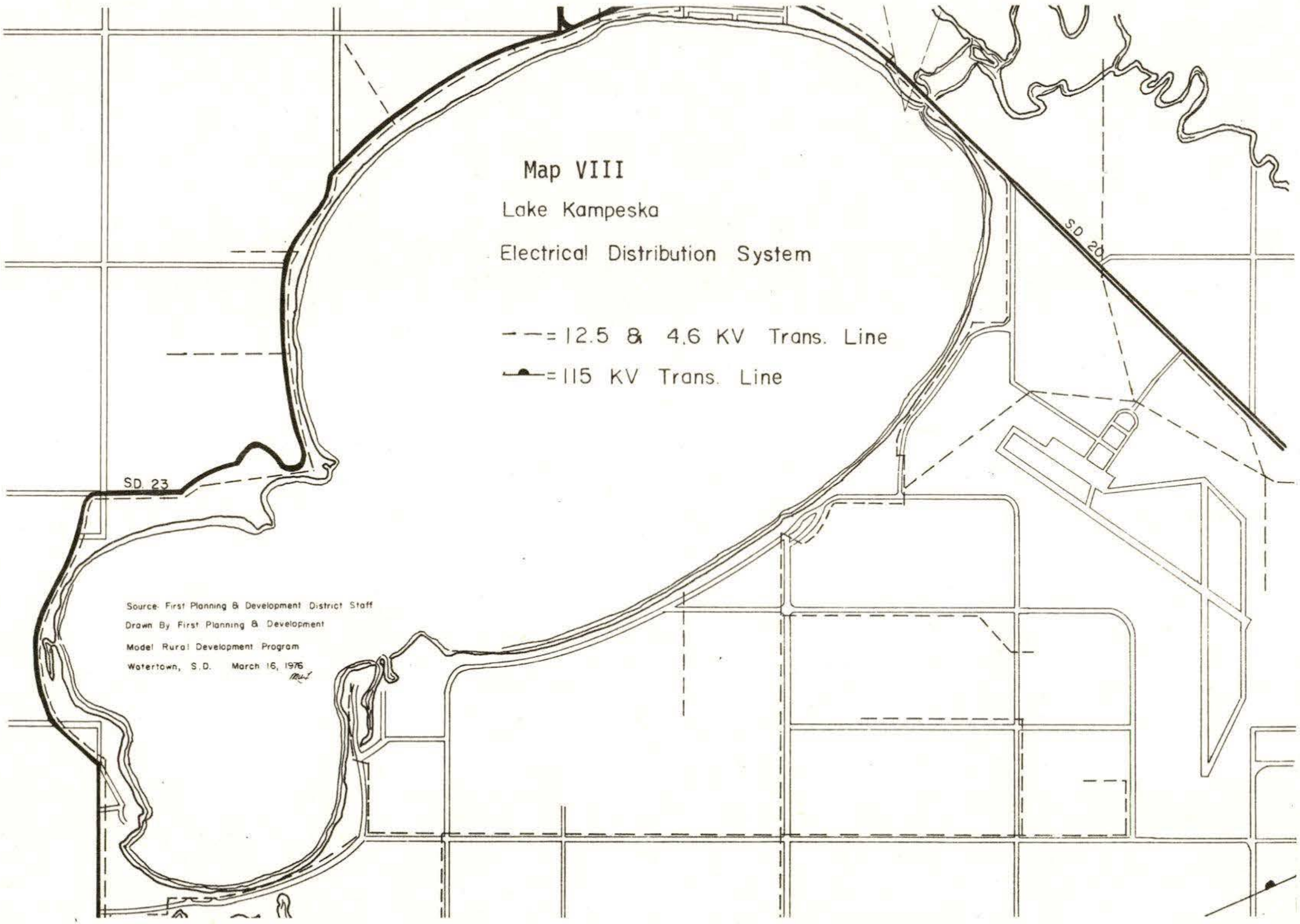
Fire Protection - Future

If additional building and development occur at the lake area, the fire chief indicates that more staff and equipment will be needed. To adequately serve the population in that area, construction of a substation near the airport may prove necessary to provide quick service. (1976).


Map V
Lake Kampeska
Sewer Distribution System
- - = Sewer Line
SD 20
SD 23
Source: First Planning & Development District Staff
Drawn By First Planning & Development
Model Rural Development Program
Watertown, S.D. March 16, 1976


Map VI
Lake Kampeska
Water Distribution System
— — = Water Line
SD 20
SD 23
Pumping Station
Source: First Planning & Development District Staff
Drawn By First Planning & Development
Model Rural Development Program
Watertown, S.D. March 16, 1976
100,000 Gallon
Reservoir


Map VII
Lake Kampeska
Natural Gas Distribution System
--- = Gas Line
SD 20
SD 23
Source: First Planning & Development District Staff
Drawn By First Planning & Development
Model Rural Development Program
Watertown, S.D. March 16, 1976



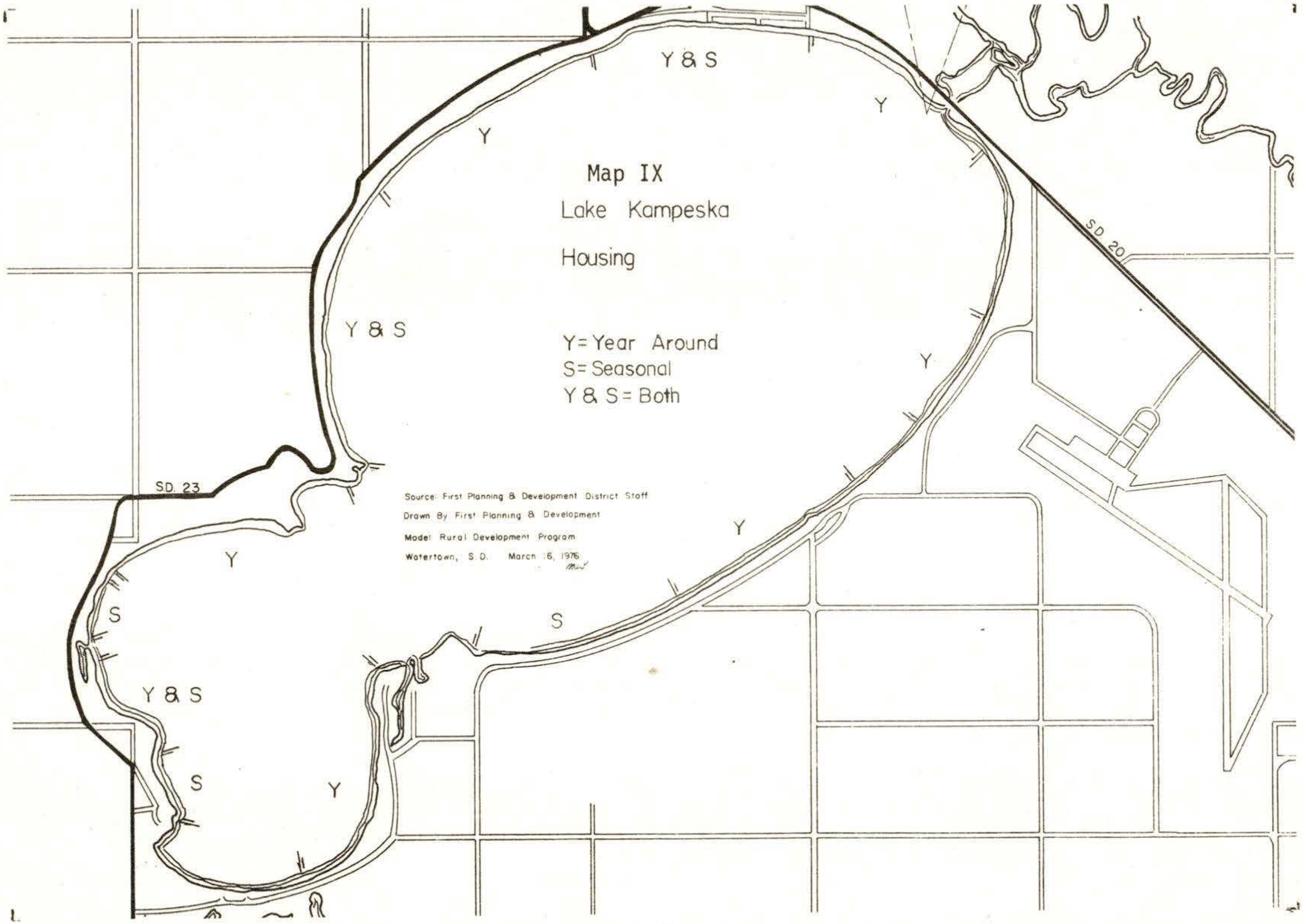
Map VIII
Lake Kampeska
Electrical Distribution System
= 12.5 & 4.6 KV Trans. Line
= 115 KV Trans. Line
SD 20
SD 23
Source: First Planning & Development District Staff
Drawn By First Planning & Development
Model Rural Development Program
Watertown, S.D. March 16, 1976

Housing

The predominate land use of the Lake Kampeska perimeter is residential housing. Increased interest in the lake, not only for recreation purposes, but for residential home location, has placed a demand on the available land for development of housing.

The historical pattern of residential land use was the summer cottage but in recent years has shifted to year-round homes. This effect is creating transitional areas from older structures to newer structures. The overall condition of homes, cottages and businesses appears to be good. The mandatory connection to municipal sewer has helped tremendously to improve conditions of cabins. With the increasing interest in the lake, it becomes increasing apparent that homes and cabins are being improved and receiving adequate maintenance.

The seasonal cottages were primarily located on small lots of 50 foot width or less, and this created some very high density areas. An average city block contains approximately 10 homes, while the same land area on the lake perimeter has 20 to 25 seasonal cottages. The location of these areas of transition, or seasonal homes or year-round homes, are indicated on Map IX, page 69.


Map IX
Lake Kampeska
Housing
Y = Year Around
S = Seasonal
Y & S = Both
Source: First Planning & Development District Staff
Drawn By: First Planning & Development
Model Rural Development Program
Watertown, S.D. March 16, 1976
SD 23
SD 20
Y & S
Y
Y
Y & S
Y
Y
Y
S
S
Y & S
S
Y

Parks and Recreation

There are large amounts of recreational and park lands located within our study area. The various types of parks and recreation areas are as follows:

1. Municipal - The city owns and maintains two municipal parks and a municipal golf course. City Park, located just south of S.D. 20 on South Lake Drive, has approximately 32 acres and was recently improved with bath houses, comfort stations and areas for 38 campers.

   Jackson Park, located farther south along South Lake Drive, is relatively open with some wet areas and is undeveloped. An access road through the land area permits park users to use the boat ramp or dock. The future of the park depends on the overall demand on all park areas around the lake. Due to adequate state, county and municipal park areas scattered around the lake, Jackson Park has remained undeveloped, but if demand arises, the city park and recreation director feels that the city will look at developing and improving the park to meet demand. (Michelsen, 1976).

2. County - The Memorial Park-Watymca complex is composed of approximately 32 acres in Memorial Park and 70 acres in Watymca for a total of about 102 acres. There are picnic grounds, nature trails, boat ramp, campground and comfort stations in the park complex. The county recently completed a large tree planting and landscaping project and expanded the camping facilities at the park. (Wicks, 1975:3).

3. State - The Sandy Shores State Park is located on the south end of

the lake. It occupies approximately 8 acres and has camping pads, bath houses and picnic shelters. Some extensive blacktop work is being planned for the parking and drive areas. (Wicks, 1976).

4. Lake Access Areas - There are approximately a dozen access areas located around the lake. Most of those areas are at points of intersection where section lines meet the lake shore. The Game, Fish and Parks maintain those access areas around the lake. (1976).
5. Federal Areas - There are no federal areas located within our study area.
6. Golf Course - The Watertown Municipal Golf Course is located on the east end of the lake and occupies approximately 150 acres. The course has a clubhouse, equipment building, and cart storage building. The Watertown Country Club is also located on the east edge of the lake and occupies approximately 160 acres and has a clubhouse, cart storage building and equipment buildings on the grounds. (Michelsen and Edison, 1976).
7. Organizational Camps - The Memorial-Watymca camp is used by various organizations, but is not maintained by an individual organization for its own use.
8. Commercial Campgrounds - The only commercial campground is located at Stony Point and has a capacity of approximately 12 campers on an overnight basis.

Conclusions

Through the planning process described in earlier portions of this report, the Watertown Planning Commission, together with the added citizen advisory group, should be able to accurately evaluate their present situation in regards to Lake Kampeska. The information supplied by the First Planning and Development staff, together with the citizen input in the planning process, should pilot the city in the direction the citizens so desire.

Planning the future of a community the size of Watertown is a long, tedious process which may take years to accomplish and put into operation. However, the length of time and patience necessary to complete such a plan is indicative of the interest and involvement many South Dakotans are beginning to realize is necessary in order that their communities may solve present and future problems.

APPENDICES

APPENDIX A

Glossary of Terms

Bearing Capacity - The load supporting strength of a soil.

Bedrock - The solid rock underlying soils that has not been weathered.

Clay - As a soil separate, the mineral soil particles less than 0.002 mm. in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clayey - Containing large amounts of clay or having properties similar to those of clay.

Clay Loam - Solid material that contains 27 to 40 percent clay and 20 to 45 percent sand.

Coarse Texture - The texture exhibited by sand, loamy sands, and sandy loams, except very fine sandy loams.

Deposits - Material left in a new position by a natural transporting agent such as wind, water, ice or gravity or by the activity of man.

Drainage - The removal of water by natural or artificial means.

Drainage Class - The rate of removal or extent of removal of water from the soil. Eight drainage classes are recognized:

Very poorly drained or ponded - water is removed so slowly that the soil remains water logged or covered with water throughout most of the year.

Poorly drainage - water is removed so slowly that the soil remains wet throughout most of the year.

Somewhat poorly drained - water is removed slowly so that the soil is wet through certain times of the year.

Moderately well drained - water is removed at a rate that the soil is moist for significant periods of time.

Well drained - water is removed at a rate that most operations are not hampered by moisture.

Somewhat excessively drained - water is removed at a rapid rate so that a moisture deficit somewhat larger than normal exists.

Excessively drained - water is removed from the soils at a very rapid rate so that a large moisture deficit exists.

Fine Texture - Consisting of or containing large quantities of the fine fractions, particularly of silt and clay. (Includes silty clay and clay textural classes.)

Fine Sandy Loam - Soil material that contains either 20 percent clay or less, and the percentage of silt plus twice the percentage of clay exceeds 30 and 52 percent sand. The sand fraction consists of 30 percent or more fine sand and less than 30 percent very fine sand or between 15 and 30 percent very coarse, coarse, and medium sand.

Frost Heave - The formation of ice crystals in voids of the soil that expand the volume of the soil.

Glacial Drift - Rock debris that has been transported by glaciers, and deposited, either directly from the ice or from the meltwater. The debris may or may not be heterogeneous.

Glacial Till - Unstratified glacial drift deposited directly by the ice and consisting of clay, sand, gravel and boulders intermingled in any proportion.

Glacial Outwash - The material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice.

Gravel - Rounded or partially rounded rock fragments 2 mm. to 3 inches in size.

Internal Drainage - The downward movement of water through the soil.

Interpretations, Soil - The science and art of explaining the meaning of significance of basic soils information for various land uses.

Liquid Limit and Plastic Index - Liquid limit and plastic index relate to soil moisture and provide important clues to soil behavior. If water is added to a dry soil containing at least some clay or silt, the soil will become plastic. The moisture content at which the soil just becomes plastic is the plastic limit. This limit is needed to compute the plasticity index. If more water is added, the soil will become fluids. The moisture content at which the soil changes from a plastic to a fluid state is the liquid limit. The differences between the liquid limit and the plastic limit is the plasticity index - the range over which the soil is plastic.

Loam - Soil material with 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

Loamy Sand - Soil material that contains at the upper limit 85 to 90 percent sand, and the percentage of silt plus 1.5 times the percentage of clay is not less than 15; at the lower limit it contains not less than 70 to 85 percent sand, and the percentage of silt plus twice the percentage of clay does not exceed 30.

Loamy Texture - Intermediate in texture and properties between fine-textured and coarse textured soils. Includes very fine sand loam, silt loam, and loam textures.

Parent Material - The unconsolidated and more or less chemically weathered mineral or organic matter from which the soil is developed by pedogenic processes.

Permeability - The ease with which gases, liquids or plant roots penetrate or move through a bulk mass of soil or a layer of soil.

Permeability classes

Very slow	- less than .06 inches per hour
Slow	- .06 to .2 inches per hour
Moderately slow	- .2 to .6 inches per hour
Moderate	- .6 to 2 inches per hour
Moderately rapid	- 2 to 6 inches per hour
Rapid	- 6 to 20 inches per hour
Very rapid	- More than 20 inches per hour

Piping - The formation of subterranean voids or tunnels in soil material.

Plastic Index - (See definition for Liquid Limit and Plastic Index).

Plastic Limit - The minimum moisture percentage by weight soil at which a small sample of soil material can be deformed without rupture.

Profile, Soil - A vertical section of the soil through all its horizons and extending into the parent material.

Sand - A soil particle between 0.05 and 2.0 mm in diameter.

Sandy Soil - Soil containing a large amount of sand. Includes sand except loamy, very fine sand.

Sandy Loam - Soil material that contains either 20 percent clay or less and the percentage of silt plus twice the amount of clay exceeds 30 and 52 percent or more sand; or less than 7 percent clay, less than 50 percent silt, and between 43 and 52 percent sand.

Silt - A soil separate consisting of particles between 0.05 and 0.002 mm in equivalent diameter.

Silt Loam - Soil material that contains 50 percent or more silt and 12 to 27 percent clay or 50 to 80 percent silt and less than 12 percent clay.

Silty Clay Loam - Soil material that contains 27 to 40 percent clay and less than 20 percent sand.

Silty Clay - A soil texture that contains 40 percent or more clay and 40 percent or more silt.

Slope - The rise and fall of the land surface measured in percent.

Shapes of slope:

Concave - slopes that are dish shaped.
Convex - slopes that are rounded in shape.

Stability - The ability of a soil to resist slippage or sliding.

Subsoil - That part of the soil below the surface soil and above the substratum.

Substratum, Substrata, Underlying Materials - That part of the soil below the subsoil, commonly the parent material.

Surface Soil, Surface Layer - That portion of the soil that overlies the subsoil layers. Generally includes that portion with highest amount of organic matter and the most weathered part of the soil. Sometimes used interchangeable with topsoil.

Terrace (geological) - An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains and are seldom subject to overflow.

Water Table - The highest part of the soil or underlying rock material that is wholly saturated with water. In some places, an upper or perched, water table may be separated from a lower one by a dry zone.

BIBLIOGRAPHY

BIBLIOGRAPHY

Banner, J.T. and Associates
"Watertown Municipal Utilities - Future Water Needs." Unpublished report, Brookings, South Dakota, 1975.

Edison, Dave
Watertown Country Club Manager. Personal interview by author February 10, 1976.

Ferber, Dan
First Planning and Development District Regional Planner. Personal interview by author February 2, 1976.

Hoy, Jack
Watertown Fire Chief. Personal interview by author March 9, 1976.

Lebert, Howard
Watertown Assistant City Engineer. Personal interviews by author February 16 and 23, 1976.

Lynch, Kevin
1962 Site Planning. Cambridge, Mass.: M.I.T. Press.

Meyer, Bill
Watertown Municipal Solid Waste Collection. Personal interview by author February 12, 1976.

Michelsen, Ken
Watertown Park and Recreation Director. Personal interview by author February 5, 1976.

Model Rural Development
"Codington County Comprehensive Plan." First Planning and Development District, unpublished report, 1973.

Parker, Donald
undated "History of Our County and State - Codington County." Brookings, South Dakota. History Department, South Dakota State University.

Risvedt, Howard
Codington County Highway Superintendent. Personal interview by author February 17, 1976.

Rothrock, E.P.
"Geology of Lake Kampeska." Unpublished State Geologist Report, 1933.

South Dakota Department of Health
Public Health Statistics advance report to the county population estimates to be published in Current Population Reports, Series P-26 April 1976, U.S. Bureau of Census.

Stoudt, Jim
Watertown Municipal Utilities - Gas. Personal interview by author February 19, 1976.

Strain, Lloyd
Watertown Police Chief. Personal interview by author March 11, 1976.

Swanson, Pete
Watertown Municipal Utilities - Electricity. Personal interview by author February 17, 1976.

U.S. Department of Agriculture
"Soil Interpretations for Broad Planning Purposes Based on General Map." Soil Conservation Service unpublished paper, March 1973.

U.S. Department of Commerce
1971 "Number of Inhabitants - South Dakota." Bureau of Census, U.S. Census of Population: 1970, Final Report PC(1)-A43.

U.S. Department of Commerce
"Fourth Count Data: Minor Civil Divisions." Bureau of Census, U.S. Census of Population: 1970.

Valard, Arnie
Watertown Municipal Utilities - Water. Personal interview by author March 11, 1976.

Wagner, Robert T., Eugene T. Butler, Jr., and Karen A. McComish
Population Projection Models for South Dakota: 1980, 1985, and 1990. Unpublished under-graduate project. Brookings: Agricultural Experiment Station, South Dakota State University, Bulletin 631, May 1975.

Wicks, Dave
Conservation Officer for Game, Fish and Parks Department, South Dakota. Personal interview by author March 3, 1976.

Wicks, Ruegen and Donald Fox
1975 "Watymca Outdoor Classroom." Codington Conservation District, Soil Conservation Service.