A

# SOLID WASTE MANAGEMENT STUDY

FOR

THE POTTAWATOMIE-RILEY COUNTIES

MANHATTAN REGIONAL PLANNING COMMISSION

by

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B. A., Kansas State Teachers College, 1969

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A NON-THESIS REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF REGIONAL AND COMMUNITY PLANNING

Department of Regional and Community Planning

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1973

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# TABLE OF CONTENTS


| | | Page |
|---|---|---|
| Acknowledgements | | ii |
| Table of Contents | | iii |
| List of Maps | | v |
| List of Illustrations | | vii |
| List of Tables | | viii |
| List of Graphs | | x |
| CHAPTER I | Introduction | 1 |
| | The Problem | 1 |
| | A Regional Solution | 9 |
| | Study Outline | 16 |
| CHAPTER II | Existing Conditions | 17 |
| | Community Solid Waste Practice Survey | 17 |
| | Community Disposal Sites Survey | 25 |
| | Analysis of Industries in Regard to Affect on Solid Waste Management | 31 |
| | Residential and Commercial Impact on Solid Waste Management | 42 |
| | Land Use and Zoning | 46 |
| | Summary | 69 |
| CHAPTER III | Solid Wastes Generation Projections | 70 |
| | Population | 70 |
| | Solid Waste Generation Projection | 70 |
| | The Center of Solid Waste Generation | 77 |
| | Summary | 81 |
| CHAPTER IV | Future Regional Solid Waste Management System Alternatives | 82 |
| | Storage of Solid Waste | 82 |
| | Collection System Alternatives | 84 |
| | Refuse Disposal Alternatives | 94 |
| | Summary | 109 |

| | | Page |
|---|---|---|
| CHAPTER V | The Solid Waste Management System ..... | 112 |
| | Introduction ..... | 112 |
| | Solid Waste Management Administration ..... | 112 |
| | Regional Solid Waste Management Financing ..... | 119 |
| | Summary ..... | 141 |
| CHAPTER VI | Summary and Recommendations ..... | 142 |
| | Summary ..... | 142 |
| | Recommendations ..... | 144 |
| APPENDIX A | ..... | 146 |
| APPENDIX B | ..... | 152 |
| APPENDIX C | ..... | 161 |
| APPENDIX D | ..... | 178 |
| APPENDIX E | ..... | 191 |
| APPENDIX F | ..... | 195 |
| APPENDIX G | ..... | 197 |
| APPENDIX H | ..... | 198 |
| Footnotes | ..... | 206 |
| Bibliography | ..... | 209 |

# LIST OF MAPS


| Map No. | Title | Page |
|---|---|---|
| 1 | The Pottawatomie-Riley Counties, Manhattan Region | 10 |
| 2 | Regional Land Use Map | 49 |
| 3 | Belvue | 54 |
| 4 | Emmett | 55 |
| 5 | Havensville | 56 |
| 6 | Louisville | 57 |
| 7 | Olsburg | 58 |
| 8 | Onaga | 59 |
| 9 | St. George | 60 |
| 10 | St. Mary's | 61 |
| 11 | Wamego | 62 |
| 12 | Westmoreland | 63 |
| 13 | Wheaton | 64 |
| 14 | Leonardville | 65 |
| 15 | Ogden | 66 |
| 16 | Riley | 67 |
| 17 | Randolph | 68 |
| 18 | Centroid of Solid Waste Generation for the Total Planning Region | 80 |
| 19 | Demand for Collection Service in the Planning Region | 92 |
| 20 | Area of Proposed Sanitary Landfill Site | 102 |
| 21 | Manhattan, Kansas Collection Route | 116 |

LIST OF MAPS (Continued)


| Map No. | Title | Page |
|---|---|---|
| 22 | Proposed Rural Communities Collection Routes | 117 |
| 23 | Proposed Green Box Collection Route | 118 |

# LIST OF ILLUSTRATIONS


| Figure No. | Title | Page |
|---|---|---|
| 1 | Regional Planning - Decision Making Hierarchy | 11 |
| 2 | Total Regional Waste Management and Pollution Control System | 12 |
| 3 | The Planning Process | 13 |
| 4 | A Regional Solid Waste Decision Making Hierarchy | 15 |
| 5 | Centroid | 78 |
| 6 | Storage Containers | 83 |
| 7 | Solid Waste System in Chilton County, Alabama | 88 |
| 8 | Rural Collection Truck | 89 |
| 9 | Transfer Station | 94 |
| 10 | City Dump | 95 |
| 11 | Area Method | 97 |
| 12 | Trench Method | 98 |
| 13 | Ramp Method | 99 |
| 14 | Basic Incinerator Design | 104 |
| 15 | Pottawatomie-Riley Counties, Manhattan Regional Solid Waste Management Organizational Chart | 114 |

# LIST OF TABLES


| Table No. | Title | Page |
|---|---|---|
| 1 | Community and County Solid Waste Practice Reports | 18 |
| 2 | Solid Waste Disposal Practices (1968) | 26 |
| 3 | Manufacturing Establishments | 33 |
| 4 | Type of Industries | 36 |
| 5 | Industrial Salvage | 38 |
| 6 | Residential and Commercial Solid Wastes in 1970 | 45 |
| 7 | Classification of Refuse Materials | 47 |
| 8 | Regional Land Use Patterns | 46 |
| 9 | Land Use Statistics | 50 |
| 10 | Manhattan Land Use Projections | 52 |
| 11 | Existing Land Use in Acres | 53 |
| 12 | Existing Land Use in Unincorporated Areas | 69 |
| 13 | Population Projections | 71 |
| 14 | Total Solid Waste Projection for Total Planning Region in Tons Per Year (High Projection) | 75 |
| 15 | Total Solid Waste Projection for Entire Planning Region in Tons Per Year (Probable Projection) | 76 |
| 16 | Solid Waste Generation - Total Planning Area (Tons Per Year) | 77 |
| 17 | Comparison of Residential Collection Services | 87 |
| 18 | Analysis of Collection Administrative Services | 86 |

LIST OF TABLES (Continued)


| Table No. | Title | Page |
|---|---|---|
| 19 | Average Equipment Requirements | 100 |
| 20 | Projected Landfill Site Requirements | 101 |
| 21 | 1968 Status of U.S. Composting Operations | 107 |
| 22 | Alternative Disposal Facilities Cost Statistics | 108 |
| 23 | Financial Conditions - 1970 | 120 |
| 24 | Summary of Alternative Requirements of Financing Capital Requirements | 125 |
| 25 | Equipment and Site Acquisition -- Costs Projection | 129 |
| 26 | Long-Term General Obligation Bond Schedule | 132 |
| 27 | Short-Term General Obligation Bond Schedule | 134 |
| 28 | Variable Costs | 135 |
| 29 | Labor Costs | 136 |
| 30 | Labor Cost | 137 |
| 31 | Projection of Community Property Tax Support for a Solid Waste Agency | 138 |
| 32 | Total Operating Expenses -- Projection for a Regional Solid Waste Management Agency | 140 |

# LIST OF GRAPHS


| Graph No. | Title | Page |
|---|---|---|
| 1 | Number of Employees in Industries | 34 |
| 2 | Industrial Questionnaire Analysis, Composition of Solid Waste for the Total Planning Region | 37 |
| 3 | Employment in Light Industry | 40 |
| 4 | Employment in Printing Industry | 41 |
| 5 | Employment in Intermediate Industry | 43 |
| 6 | Employment in Bulk Industry | 44 |
| 7 | Total Solid Waste Generated Projection for Total Planning Region | 72 |
| 8 | Solid Waste Generated Projection: Non-Farm, Farm, and Tuttle Creek Reservoir Population | 73 |
| 9 | Solid Waste Equipment and Site Acquisition Schedule | 127 |

# CHAPTER I

# INTRODUCTION

## The Problem

Solid waste can be defined as decomposable and non-decomposable materials which are useless or discarded. These materials result from normal community activities, except body waste, and include garbage, rubbish, ashes, and street cleanings.

An indication of the dimension of the solid waste problem is stated below:

"Of all living things, modern man is undoubtedly the greatest generator of wastes. Each year affluent Americans throw away over 20 billion pounds of paper, over a billion pounds of plastics, over 48 billion cans, 28 billion bottles, and close to eight (8) million junked autos. In 1920, 2.7 pounds per capita of solid waste were collected per day. Today, this figure has grown to 5.5 pounds and, by 1980, an estimated monumental eight (8) pounds of solid wastes will be collected for each person daily. Today, about ten (10) million pounds of solid wastes are collected daily in Kansas, approximately one ton per Kansan per year. The total amount collected, however, represents only about 60 per cent of the amount actually produced in Kansas." [1]

The problems of storage, collection, and disposal of solid wastes have been with us a long time, but only in the last few years have communities become cognizant of the magnitude of the solid waste problem. "The Manhattan Mercury," a local newspaper, and such nationally-known magazines as Fortune and Newsweek have published articles concerning the problems of solid waste management. The entire nation has become aware of the situation through such publicity.

One rational perspective toward the solid waste situation is: One can easily understand that approximately the same amount of material should leave the community as is imported into it. Extensive and costly transportation systems have been constructed so that goods may enter a region. Little regard was paid as to how the goods, once they were discarded by people, were collected and disposed of. "Until now, nature has covered for such a casual attitude toward waste-handling through the natural destruction process; however, man's technology is rapidly exhausting nature's generosity. Aluminum cans, non-returnable bottles, and a growing number of plastic items do not deteriorate appreciably."[2]

## Solid Waste Legislation

Little attention was directed in Kansas towards controlling and administering a sanitary refuse collection and disposal system prior to the end of World War II. Perhaps the lack of attention was due, in part, to the abundance of land and the absence of major urban concentration. Farmers usually let the hogs and chickens eat the garbage, and the trash was burned. Noncombustible items, such as bottles and cans, were usually dumped in a ravine behind the house. Most city dwellers had to arrange directly with a private hauler for collection of refuse.

### 1947 - Initial State Action

State legislation enacted in 1947 permitted communities to provide refuse collection and disposal as a function of municipal government. A large portion of the household refuse consisted of garbage which was generally fed to hogs. Trash was burned at open dumps. This type of disposal facility was very economical. However, there were a number of sanitary problems associated with the method.

1952 - State Action on Hog Feeding

A 1951 Kansas State Department of Health survey of 106 communities in Kansas indicated that 82.7 per cent of them fed raw garbage to hogs. Many times, the feeding of raw garbage to hogs and then the human consumption of undercooked pork resulted in trichinosis in humans. Outbreaks of vesicular exanthema, a swine disease, occurred during the early Fifties in Kansas. The State Department of Health promoted legislation which was enacted in 1952 to prohibit feeding of uncooked garbage to hogs.

This legislation had a significant effect on municipal refuse practices. No longer could communities feed garbage to hogs. The collection of garbage and trash was combined, and disposal was made at the dump. Unfortunately, the large amount of garbage at the city dumps attracted rats, flies, and dogs.

1965 - Federal Action

The federal government was aware of the serious problems that had developed in the field of solid waste management. Mr. Richard D. Vaughan, Director of the Bureau of Solid Waste Management, stated that, "Primary responsibility for solid waste collection, processing, and disposal has traditionally, and quite properly, rested with local levels of government, with state agencies heavily involved in regulatory activity. The federal interest and activities, authorized by the Federal Solid Waste Disposal Act of 1965 (PL 89-272) are designed to assist state and local government and others involved in solid waste management by providing financial assistance through research and training, and through encouraging proper planning for state and local waste management programs." [3] See Appendix C for the complete "Federal Solid Waste Disposal Act."

1967 - County Enabling Legislation

State enabling legislation was adopted in 1967 which permitted counties to acquire, equip, and operate solid waste disposal facilities. A State Health

Department Solid Waste Survey of 1968-69 revealed the following:

"(1) No counties had implemented the 1967 law authorizing them to provide disposal sites;

(2) Of 537 community solid waste disposal sites operating in Kansas, only two (2) met the minimum standards;

(3) Almost 92 per cent of the disposal sites were located in agricultural areas;

(4) Some 60 per cent of the disposal sites never covered the solid waste material;

(5) The practice of burning refuse was carried on at 93 per cent of the sites, and the burning was controlled in very few cases;

(6) Backyard burning of refuse was permitted and practiced in 88 per cent of Kansas communities;

(7) No qualitative and few quantitative collection records were available from 98 per cent of the communities; and

(8) Scavenging was practiced at 85 per cent of the disposal sites." [4]

The 1968-69 survey pointed out that Kansas communities were still using the antiquated solid waste disposal method, i.e., the open dump. Open dumps pollute the air; they are potential sources of water pollution, and they defile the landscape.

Recent State Legislation

Two significant laws have recently been enacted by the Kansas State Legislature which have a direct effect on present solid waste management practices in the state. The result of the implementation of the solid waste laws will be that many communities and counties must change their past, outmoded solid waste disposal methods.

The first of these recent laws to have an impact on Kansas communities was the implementation of K.S.A. 1969 Supp. 65-3006 to 65-3020, "The Air Quality Conservation Act." Mr. Charles Linn and Mr. Ivan F. Shull, two

Kansas State Department of Health officials responsible for administering the solid waste program for the state of Kansas, stated: "The adoption of the air quality standards authorized under this act will undoubtedly restrict open burning of solid wastes with the ultimate objective of prohibiting all burning of solid wastes except in approved facilities." [5] This will stop the burning of solid wastes which has been the method employed by many communities in the past.

The second significant law was enacted with the passage of House Bill 1141, Chapter 264, Session 1970, the "Kansas Solid Waste Management Act," signed into law by Governor Docking on March 16, 1970. (See Appendix B.) Linn and Shull again indicated, "There are three basic objectives written into HB 1141 in the form of legislation authorization. They are: first, to establish a cooperative state and local system of planning; second, to utilize, whenever feasible or desirable, the capabilities of private enterprise as well as public agencies in solid waste management; and finally, to set up a permit system for solid waste processing and disposal systems." [6]

Each county is directed to develop and adopt a solid waste plan. When discussing HB 1141 with state health officials, they encourage communities and several counties to colsolidate into one planning region. In this way, the capital cost of a solid waste management system would be supported by a larger area and there would be better utilization of disposal and collection facilities in planning for a larger unit.

The act authorized the Kansas Department of Health to assist counties, cities, and multi-county regions by administering grants up to 50 per cent of the cost of preparing the solid waste management plans. This portion of the law has not been funded to date. However, recommendations will be sent by the State Solid Waste Advisory Council to the legislature and, hopefully, will be

funded in the future.

Listed below are important dates to remember. The Kansas Solid Waste Management Act has set forth several dates for compliance. These are:

1. State Solid Waste Advisory Council appointed - July 1, 1970.
2. County Solid Waste Management Planning Commission appointed - January 1, 1971.
3. State Solid Waste Advisory Council submits to the Board of Health a recommendation concerning rules, regulations, and standards necessary for implementation of the Act, July 1, 1971. The rules, regulations, and standards were approved and are in affect at this time.
4. The latest date for submission of each county's Solid Waste Management Plan is June 30, 1974.
5. Permits are required for all solid waste disposal sites on June 30, 1976.

The dates indicate the time constraints involved in the development of a Solid Waste Management Plan.

The statutes related to solid waste are not clear as they pertain to the question of joint planning. Adequate legal authority exists for joint planning under K.S.A. 12-716 through K.S.A. 12-721 provided that a regional planning commission is established as outlined in K.S.A. 12-718. The Inter-local Cooperation Act, K.S.A. 12-2901 through K.S.A. 12-2907, is the companion statute which allows governmental bodies to cooperate in performing jointly any function that they are empowered to do separately.

K.S.A. 65-3405(g) of the Solid Waste Management Act states that, "the department may, in appropriate cases, recommend the submission of joint plans." [7] In most cases, joint planning has a great deal to offer as it relates to solid waste management operations. The Kansas State Department of Health has chosen to encourage counties to use this approach by inserting Section 28-29-15, "Joint Planning," into the regulations.

Solid Waste Regulations

The State Board of Health adopted the administrative guidelines in July of 1971 which established minimum standards for the storage, collection, transportation, utilization, and the final disposal of solid waste by any person, industry, city, or county. These regulations are significant factors in the implementation of "The Solid Waste Management Act, 1970." A synopsis of the regulations is given below:

Part One. - The first section defines the terms relating to solid waste and establishes the site permit process. All disposal sites operating in the state as of June 30, 1974, must register their site(s) or facilities with the Department of Health before January 1, 1975. Within ten days upon receipt of the site registration form, the Kansas State Department of Health will set a time which is mutually acceptable to both parties for evaluation of the site and will furnish the owner or operator a report of their evaluations. Within sixty days after receiving the report, the owner or operator must submit a work plan for bringing the site into compliance with state regulations and the locally adopted plan for solid waste management.

Part Two. - This section establishes the design standards for the collection, transportation, and storage of solid wastes.

Part Three. - An official solid waste management plan shall be prepared and adopted by each county and city which elects to prepare and adopt its own plan. The plan shall be submitted in the manner described in K.S.A. 1970 Supp. 65-3405 and the guidelines established by the State Solid Waste Advisory Council. All solid waste plans must be submitted to the State Department of Health before June 30, 1974.

The regulation section (28-29-14), "Submission of Joint Plans," explains how the counties may utilize a regional approach. The following quotation

from the Regulations illustrates such an approach: "Two or more counties or a single county and one or more cities within an adjacent county or counties may submit jointly an official solid waste management plan which may be prepared by one city or county or an authority designated to prepare and submit such plan on behalf of all participating counties and cities, provided that such joint official solid waste management plan is adopted by each county and city sponsoring the joint plan and certification of such adoption as provided for in Regulation 28-29-12 accompanies the official plan submitted to the Department for approval. (Authorized by K.S.A. 1970 Supp. 65-3405: Effective January 1, 1972.)" [8]

Another Kansas law pertaining to solid waste, House Bill 1612 (K.S.A. 19-2676), was passed by the 1971 legislature. It grants to counties the right to franchise the operations of the solid waste management system within their boundaries and also prescribes the procedure for granting the franchise. This state law provides the Regional Planning Commission another alternative at the time of implementation of the Solid Waste Management Plan.

National Recovery Act of 1970

Again the federal government felt the need to promote innovative solid waste programs, and in October of 1970, President Nixon signed into law the National Recovery Act of 1970 which "authorizes the Secretary to make grants pursuant to this section to any state, municipal, or interstate or intermunicipal agency for the demonstration of resource recovery systems or for the construction of new or improved solid waste disposal facilities."[9] This law could allow the Regional Planning Commission to utilize federal funds if it determines an innovative technique for collection and disposal.

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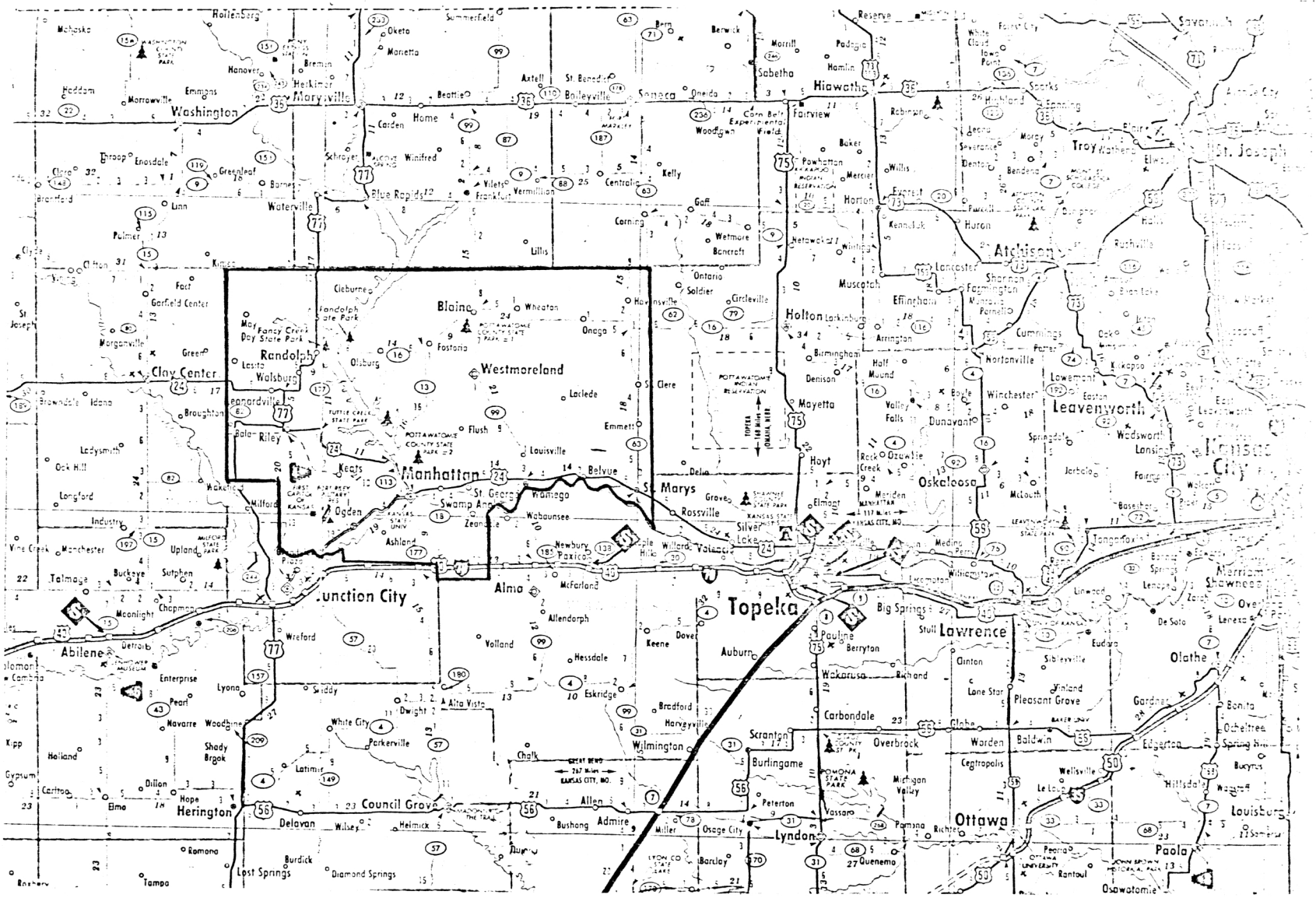



Map 1.-- The Pottawatomie-Riley Counties, Manhattan Region

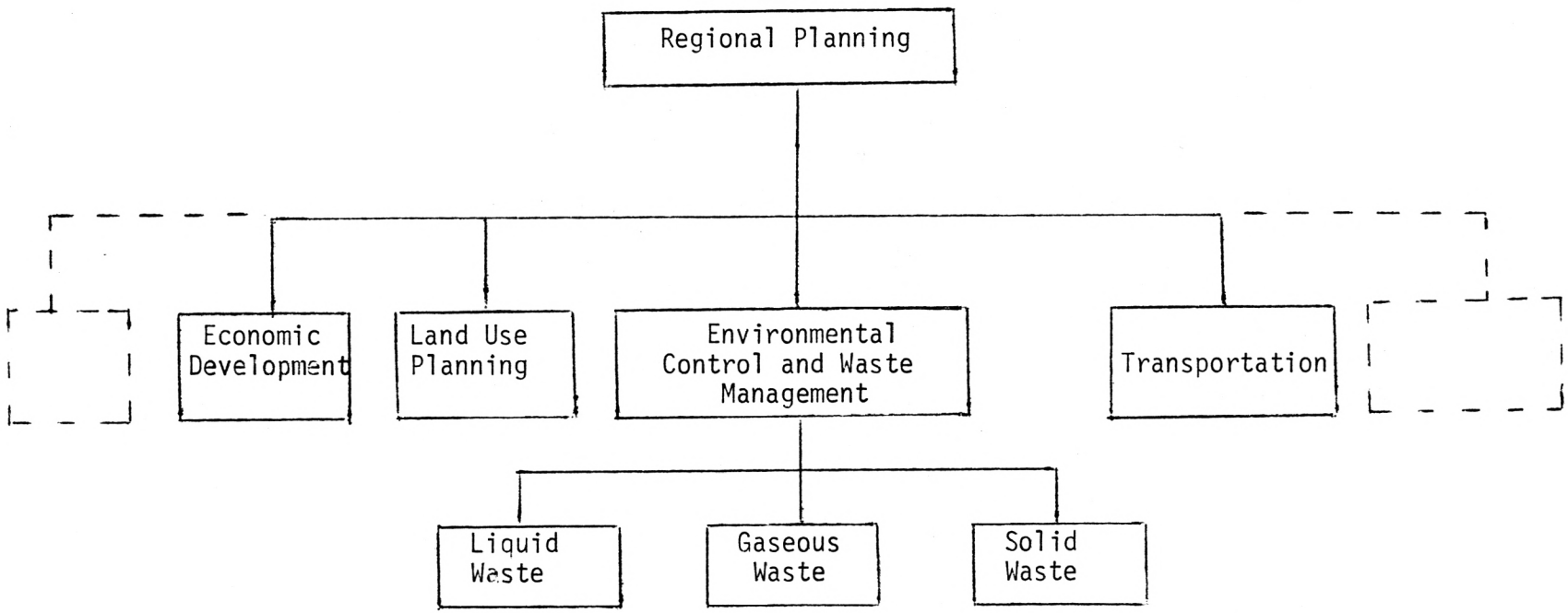



Fig. 1.-- Regional Planning - Decision Making Hierarchy

Source: Norman Morse and Edwin W. Roth, Systems Analysis of Regional Solid Waste Handling, (SW-15C), HEW, Bureau of Solid Waste Management, Washington, D.C.: U.S. Government Printing Office, 1970.

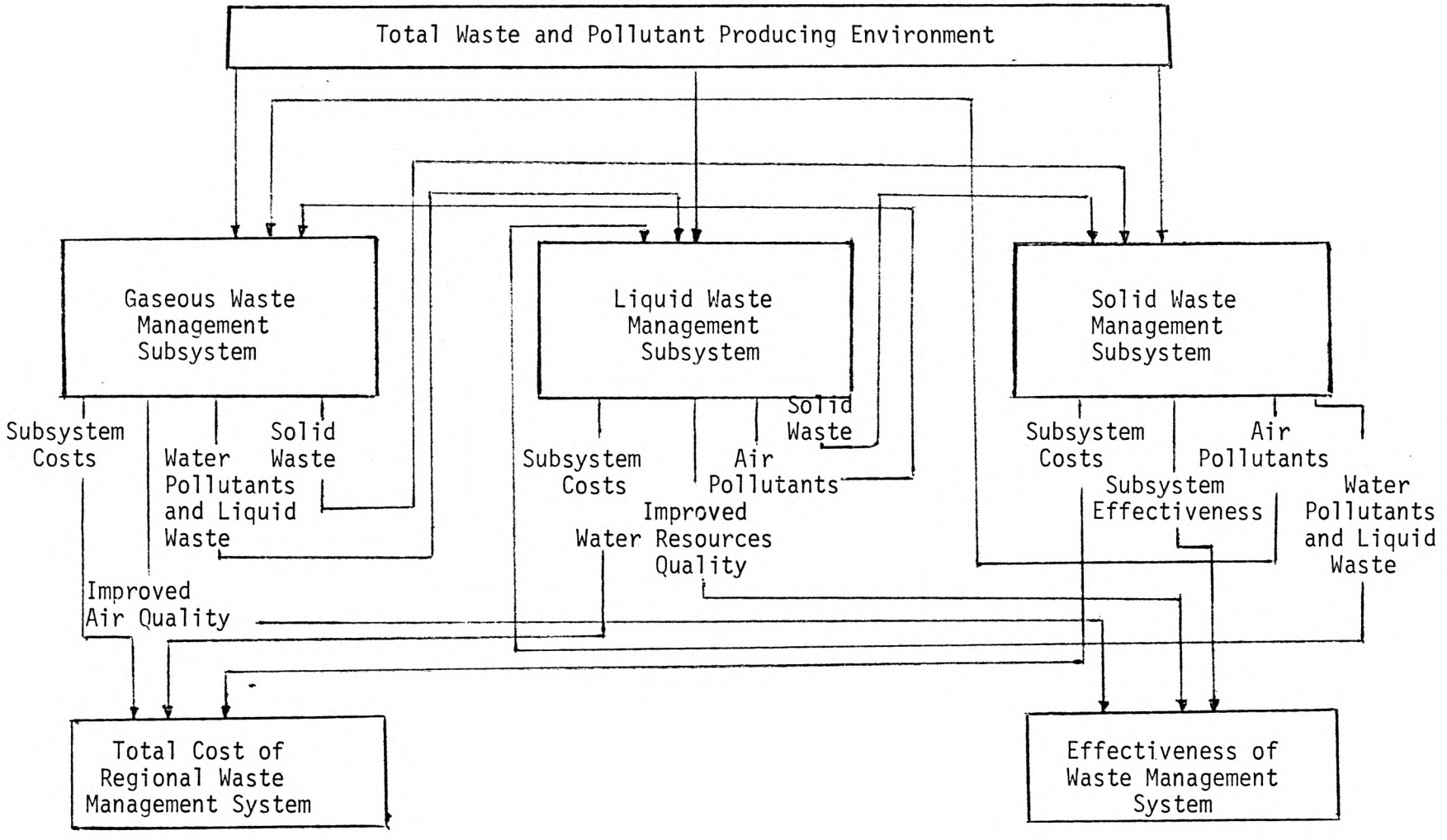



Fig. 2-- Total Regional Waste Management & Pollution Control System

Source: Norman Morse and Edwin W. Roth, Systems Analysis of Regional Solid Waste Handling, (SW-15C),HEW, Bureau of Solid Waste Management, Washington,D.C.: U.S. Government Printing Office, 1970.

solid waste management may have far-reaching ramifications upon the other two subsystems, that is, in the effectiveness of Waste Management System and the cost of Regional Waste Management System. Several objectives of this study are illustrated in the chart. They include:

1. Elimination of or minimizing air and water pollutants because of inadequate solid waste management.

2. Determining the feasibility of several alternative solid waste management systems while maintaining an equilibrium between subsystem effectiveness and subsystem cost.

The main thrust of the study will be on the solid waste management subsystem.

The Planning Process

Planning is a rational procedure that requires a logical sequence of investigation, analysis, and decision-making which formulates and establishes the planning policies of the region. Planning can prevent problems from arising and cause beneficial development to take place within the region. Planning has one major purpose -- it provides a frame of reference for decision-makers, public and private, to relate and coordinate their actions. Below is a diagram which seeks to illustrate the planning process.

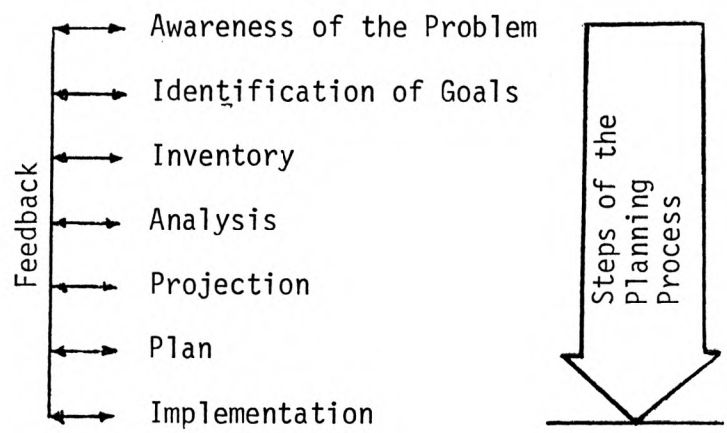



Fig. 3.--The Planning Process

The planning process is a continuous and dynamic cycle which often means the planner returns from one step in the planning process to another prior step in order to accommodate change. Planning should include many review procedures to insure that developments take place when needed. Utilizing the method in Figure 3, a rational decision based on a logical thought process will provide a framework for decision-makers to adopt the best policies concerning solid waste management.

In requiring a systematic approach toward achieving objectives, planning for solid waste management on the regional level is similar to planning for any activity. The solid waste plan should be formalized by the political subdivisions involved and should be updated to accommodate changing conditions. The plan should be a technical document as well as a policy statement containing objectives for solving the solid waste management problems. This can be done by indicating the direction that implementation should follow.

The need for policy-makers to take part in the planning aspect of solid waste management is urgent. Both the Pottawatomie County and Riley County Solid Waste Committees were selected in January, 1971. The State Solid Waste Advisory Council, a 15-member group appointed by the Kansas Board of Health, recently has formulated and adopted the criteria and the standards which must be met when planning.

In most cases where the Kansas State Department of Health has recommended joint planning, the Department has also recommended that the participating agencies form a regional planning commission to perform the planning work and involve the solid waste planning committees as advisory bodies to the planning commission. This would seem proper since the specific duties of the county solid waste planning committee are not enumerated in the Solid Waste Management Act.

The Pottawatomie-Riley Counties - Manhattan Regional Planning Commission may accept the responsibility of formulating a solid waste plan for the region. The Solid Waste Planning Committees could function as special committees of the Planning Commission as illustrated below:

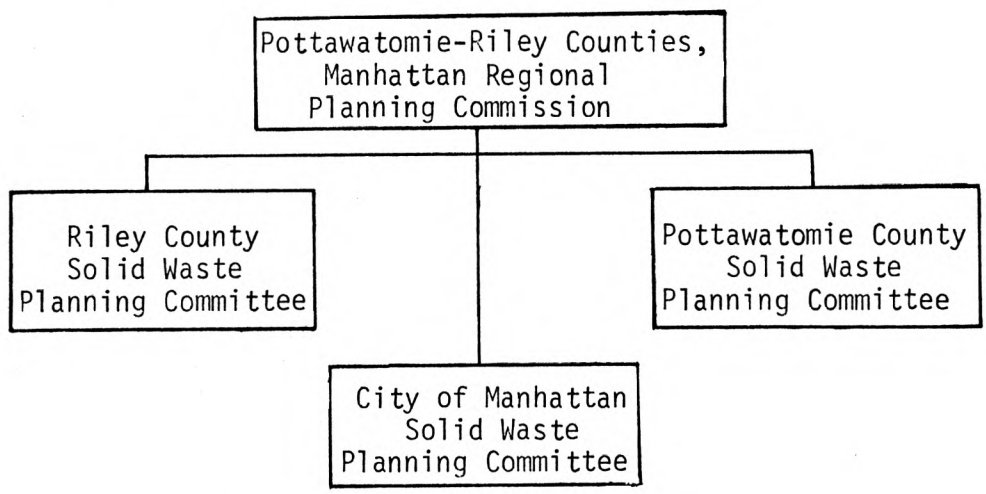



Fig. 4.-- A Regional Solid Waste Decision Making Hierarchy

There is a logical reason why a regional approach should be used. When a feasibility analysis is completed for a typical small community, the results usually suggest that the town is too small to employ even a minimum amount of solid waste management equipment. A part-time truck, a part-time employee, and a part-time landfill are all that will be needed to operate the system adequately. An economic analysis of the cost of part-time service usually results in costs that are too high to be economically feasible for providing the necessary service. A single agency responsible for solid waste management in the two counties could provide a more efficient means of serving rural residents and small communities.

The following statements are a brief explanation of sequence of activities in the study: Chapter I, "Introduction," addresses itself to defining the problem of solid waste management and the identification of the objective of determining the feasibility of solid waste management on a regional scale.

Chapter II, "Existing Conditions," is concerned with an inventory and analysis of existing conditions in the Pottawatomie-Riley Counties - Manhattan Regional Planning Area.

Chapter III, "Solid Waste Generation Projections," will project the quantitative amounts of solid waste that will be generated in the region until 1990.

Chapter IV, "Alternatives in a Future Regional Solid Waste Management System," will be concerned with an evaluation of different solid waste management subsystems and determining which combination may best suit the needs of the region.

Chapter V, "The Solid Waste Management System," defines the administrative divisions and the financing plan necessary to implement a regional solid waste management plan.

Chapter VI, "Recommendations," is a synopsis of significant points in regard to establishing a regional solid waste agency.

# CHAPTER II

# EXISTING CONDITIONS

The present storage, collection, and disposal practices of communities within the planning area were analyzed to determine the level of service which people in the communities are receiving. The existing information ascertained by the Kansas State Department of Health and data collection by means of a questionnaire survey in regard to industrial solid waste practices in the region were the parameters of information that were surveyed.

## Community Solid Waste Practice Survey

The State Department of Health, in cooperation with the Department of Health, Education and Welfare, made a survey of Community Solid Waste Practice in 1968. (See Appendix E for the questionnaire form used.) Table 1 illustrates the significant statistics synthesized from the reports on communities in Pottawatomie and Riley Counties. The analysis of the questionnaires was divided into the following divisions: (1) general information; (2) storage characteristics; (3) collection statistics; (4) disposal information; and (5) fiscal budget information.

## General Characteristics

A significant percentage of the population of the planning area is clustered in Manhattan with the remainder of the planning area population being fairly evenly distributed. No community in the two counties has included solid waste management as part of their comprehensive planning.

TABLE 1

Community and County Solid Waste Practice Reports

| | Pottawatomie County - 1 | | | Riley County - 2 | | | Manhattan - 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1-Estimated Population | 12,126 | | | 10,199 | | | 26,584 | | | GENERAL |
| 2-Total area of community - square miles | 850 | | | 597 | | | 8 sq. | | | |
| 3-Planning agencies which include solid waste as part of their comprehensive planning. | None | | | Local | | | Local | | | |
| 4-Legislative-administrative regulations governing on-site storage. | | | | | | | | | | STORAGE |
| Garbage regulations? | No | | | No | | | Yes | | | |
| Enforced? | - | | | - | | | Yes | | | |
| Other refuse regulations? | No | | | No | | | Yes | | | |
| Enforced? | - | | | - | | | Yes | | | |
| 5-Supervision for work performance of private collectors provided primarily by | None | | | None | | | None | | | COLLECTION |
| 6-Collection work performed - by volume (percent) | Public Agency | Private Collector | Individual | Public Agency | Private Collector | Individual | Public Agency | Private Collector | Individual | |
| Source: | | | | | | | | | | |
| Household | 25 | 25 | 50 | - | NA | - | - | 100 | - | |
| Commercial | 10 | 20 | 70 | - | NA | - | - | 100 | - | |
| Industrial | - | - | - | - | NA | - | - | 100 | - | |
| Institutional | 30 | 30 | 40 | - | NA | - | - | 100 | - | |
| Dead animals | 40 | 50 | 10 | - | NA | - | - | 100 | - | |
| Abandoned vehicles | 100 | - | - | - | NA | - | - | 100 | - | |

Source of information: Kansas Department of Health 1968 Survey of Community Solid Waste Practices.

1. Communities in Pottawatomie jurisdiction which were considered in the reports are Belvue, Emmett, Havensville, Louisville, Olsburg, Onaga, St. Marys, Wamego, Westmoreland and Wheaton.
2. Leonardville, Ogden and Riley were communities that were considered in the jurisdiction of Riley County.
3. Editors note: due to erroneous oversight the 1968 questionnaire was misplaced. New questionnaire required. This questionnaire was administered again in the summer of 1971 for this solid waste study.

TABLE 1 - Cont.

Community and County Solid Waste Practice Reports

COLLECTION

| | Pottawatomie County | | | Riley County | | | Manhattan | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 per week | 2 per week | Other | 1 per week | 2 per week | Other | 1 per week | 2 per week | Other |
| 7-Household refuse collection frequency | | | | | | | x | | |
| Type of refuse collected separately | | | | | | | | | |
| Garbage | | x | | - | NA | - | x | | |
| Rubbish | x | | | - | NA | - | x | | |
| Yard refuse | | | x | - | NA | - | x | | |
| Ashes | | | x | - | NA | - | x | | |
| Combustibles | | | x | - | NA | - | x | | |
| Non-combustibles | | | x | - | NA | - | x | | |
| Bulky Items | | | x | - | NA | - | x | | |

| 8-Average manpower (man-year) and equipment used for collecting community solid waste | | Source of waste | | Source of waste | | Source of waste | |
|---|---|---|---|---|---|---|---|
| | | Household Commercial Industrial | Industrial | Household Commercial Industrial | Industrial | Household Commercial Industrial | Industrial |
| PUBLIC | Collectors & drivers (man years) | 6 | 0 | - | - | - | - |
| | Compactor trucks (no.) | - | 0 | | | - | - |
| | Other vehicles (no.) | 4 | 0 | | | - | - |
| PRIVATE | Number of firms | 5 | 0 | | | - | - |
| | Collectors & drivers (man years) | 7 | 0 | | | - | - |
| | Compactor trucks (no.) | 0 | 0 | | | - | - |
| | Other vehicles (no.) | 5 | | | | - | - |

TABLE 1 - Cont.

Community and County Solid Waste Practice Reports

| | Pottawatomie County | Riley County | Manhattan | |
|---|---|---|---|---|
| 9-Amounts of solid wastes collected annually - estimated (tons) | | | | COLLECTION |
| CLASSIFICATION: | | | | |
| Refuse (combined household and commercial) | 35,177 | 5,098 | - | |
| Refuse (industrial) | | | | |
| Refuse (agricultural) | 30 | - | - | |
| Refuse (institutional) | | - | - | |
| Demolition and constructional refuse | 50 | | | |
| Tree and landscaping refuse | 1,000 | - | - | |
| 10-Agency primarily responsible for recommendation for location and development of new disposal sites | None | None | Operational Authority | DISPOSAL |
| 11-Agency primarily responsible for regulation of disposal facility operations | None | None | Operational Authority | |
| 12-Is backyard buring of household refuse practiced? | Yes | Yes | No | |
| 13-Is on-site open burning of commercial, institutional, industrial and/or agricultural waste practiced? | Yes | Yes | No | |

TABLE 1 - Cont.

Community and County Solid Waste Practice Reports

| | Pottawatomie County | Riley County | Manhattan | |
|---|---|---|---|---|
| 14-Number of disposal sites serving the community | 9 | | 1 | |
| 15-Number of promiscuous dumps within community boundaries known to be active | Information not Available | - | Information not Available | |
| 16-Estimated number of household garbage grinders installed | 630 | - | - | DISPOSAL |
| 17-Estimated number of garbage grinders in commercial and institutional establishments | 13 | - | - | |
| 18-Estimated number of on-site incinerators serving apartment houses, commercial and institutional establishments | 7 | - | - | |

TABLE 1 - Cont.

Community and County Solid Waste Practice Reports

| | Pottawatomie County | Riley County | Manhattan | BUDGET AND FISCAL |
|---|---|---|---|---|
| 19-Community Funds budgeted for collection of solid waste for calendar or fiscal year 1967 | | | | |
| A. Excluding capital expenditures | $5,180 | - | 0 | |
| B. Capital expenditures only | 0 | - | 0 | |
| 20-Community Funds budgeted for disposal of solid wastes for calendar or fiscal year 1967 | | | | |
| A. Excluding capital expenditures | 0 | - | $33,174 * | |
| B. Capital expenditures only | 0 | - | $10,200 * | |

*Fiscal year 1971

## Storage

Only the City of Manhattan has adopted and is enforcing regulations governing on-site storage of refuse. The other communities, as of this date, have not adopted ordinances with regard to storage of solid waste.

A group of engineering students at Kansas State University, in their report entitled Solid Waste Management System for Manhattan, Kansas, in May, 1970, said, "We found the 55 gallon drum used as a container for burning to be a very strong trend in residences. Also, a majority of the locations surveyed were clean (no scattering), but lacked watertight covers. The on-site storage of manufacturers and retailers was entirely adequate, excepting grocery stores and restaurants. There was some scattering and a general lack of adequate solid waste facilities at those places."[10] It is assumed that the conditions describing storage of solid waste in Manhattan would reflect conditions in other communities.

## Collection

Statistical information was sketchy in the collection section because most of the communities do not have public collection, but rely on private collection. Again, the civil engineering students at Kansas State University in Solid Waste Management System for Manhattan, Kansas, stated, "Private enterprise is the type of system that Manhattan is in right now. There are several inherent disadvantages to this system. One is that the city has no real absolute control over the haulers. Also, due to the large number of haulers and the relationship to their customers, there is gross inefficiency in their scattered pick-up."[11] It is assumed this is true not only in Manhattan, but in the rest of the communities within the planning area, with the exception of the City of Wamego which has a publicly-owned collection system.

## Disposal

Manhattan was the only community which has delegated to an agency the responsibility for regulation of disposal facility operations. Disposal practices will be analyzed separately later in this chapter.

The use of food waste grinders, a volume reduction method which, in addition to residential use, is utilized in restaurants, hotels, and other food-processing establishments, lowers the moisture content of the solid wastes and eliminates most on-site garbage storage. The disadvantage to the system is that it cannot accommodate all food waste, i.e., bones, fibrous vegetables, etc. Also, it means a greater capacity in the sewage treatment plant or rural septic tank system must be provided.

## Budget and Fiscal Information

Manhattan had $33,174 of its community funds budgeted for disposal of solid waste for Fiscal Year 1971 with a capital expenditure of $10,200. Riley County and Pottawatomie County did not allocate any funds for a disposal facility during Fiscal Year 1967. The City of Wamego allocated $5,180 for the collection of solid waste for calendar year 1967. No other local government agency in the region spent funds on the collection of solid waste.

## Summary

Eleven of the sixteen communities included in this study have a solid waste disposal site. All of the disposal sites are classified as "open dump" within the two-county area. Some of the communities have set higher standards for their disposal sites than others, but none approach the necessary standards to be classified as a sanitary landfill. These "dumps" are visual eye-sores, a source of nuisance conditions, fire hazards, air pollution and a potential health hazard.

## Community Disposal Sites Survey

The eleven disposal sites were inventoried by the Kansas State Department of Health in April of 1968, and their findings are illustrated in Table 2. The chart gives a descriptive analysis of all existing disposal sites in the planning area. (See Appendix F for the form used by K.S.D.H. in 1968.)

Only three of the communities had one full-time employee at the disposal site and only two of the sites had any equipment at all. In the past, the communities had little financial expense involved in operating their disposal facilities because of the below normal standards which resulted in unsatisfactory conditions. In order for communities and counties to meet the new state health standards, the communities must make the necessary investment in maintaining a properly-managed solid waste program.

### Environmental Problems

Several of the sites had pollution problems. The Ogden disposal site had a problem with leeching and surface drainage because of its location on a flood plain. Also, St. Marys, Wamego, and Olsburg experienced leeching problems.

Nine (9) of the disposal sites in the planning area had controlled burning taking place. With the passage of the "Air Quality Conservation Act," the burning practice will be significantly curtailed. The burning practice is a cheap bulk reduction, but it creates serious environmental problems because of gaseous pollutants escaping into the atmosphere. Now communities will need bigger land disposal sites because they will not be able to reduce the solid waste bulk as much.

It was found in the two counties that random dumping occurred around communities and subdivisions that did not maintain a centralized disposal site.

TABLE 2

SOLID WASTE DISPOSAL PRACTICES (1968)

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Distance from center of city (in miles) | Site owned by public agency | Year site place in operation | Anticipated life remaining (years) | Total area (acres) | Area to be used for land disposal (acres) | General character of the site | Zoning | Land Use | Is a use of completed site planned? | Will public agency control completed site? |
| RILEY COUNTY | | | | | | | | | | | |
| Manhattan | 3 | Y | - | - | - | - | M | N | A | N | N |
| Ogden | 1 | N | 48 | 4 | 5 | 3 | M | N | A | - | Y |
| Leonardville | 1 | Y | - | 3 | 1 | 1 | L | N | A | N | Y |
| Riley | | | | | | | | | | | |
| POTTAWATOMIE COUNTY | | | | | | | | | | | |
| Belvue | 1.0 | N | 1946 | 30 | 2 | 1 | M | N | A | N | - |
| Emmett | 0.5 | N | 1965 | 1 | 1 | 1 | L | N | A | Y | N |
| Havensville | 1.0 | N | 1948 | 15 | 1 | 1 | G | N | A | N | N |
| Louisville | 0.5 | Y | 1963 | 7 | 1 | 1 | G | N | A | N | - |
| Olsburg | 0.5 | Y | 1964 | 9 | 4 | 1 | M | N | A | N | Y |
| Onega | 1.0 | Y | 1956 | 10 | 6 | 4 | L | P | A | Y | Y |
| St. Mary's | 0.5 | Y | 1903 | 7 | 5 | 3 | M | N | A | N | Y |
| Wamego | 1.5 | Y | 1939 | 7 | 4 | 3 | M | N | A | N | N |

Source: Kansas Department of Health, Community Solid Waste Practices, Land Disposal Site Investigation Reports, Kansas Department of Health, 1968.

TABLE 2--Continued

| | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|
| | Frequency of cover | Is spread and compaction of refuse handled in approximately two-foot layers or less? | Number of days site could not operate because of weather conditions | Appearance (unsightly) | Is blowing paper controlled? | Is blowing paper considered a nuisance? | Routine burning | Are there surface drainage problems? | Are there leeching problems? |
| RILEY COUNTY | | | | | | | | | |
| Manhattan | N | N | 0 | Y | N | N | N | N | - |
| Ogden | M | - | 0 | U | N | N | U | Y | Y |
| Leonardville | A | N | 0 | U | N | Y | U | N | N |
| Riley | | | | | | | | | |
| POTTAWATOMIE COUNTY | | | | | | | | | |
| Belvue | N | N | 10 | Y | N | N | U | N | N |
| Emmett | 0 | - | 10 | N | N | N | N | N | N |
| Havensville | N | N | 0 | Y | N | N | N | N | N |
| Louisville | 6M | N | - | Y | N | N | U | N | N |
| Olsburg | N | N | 0 | Y | N | N | U | N | Y |
| Onega | 0 | N | 7 | N | N | N | U | N | N |
| St. Mary's | N | N | 3 | Y | N | N | U | N | Y |
| Wamego | N | N | 0 | Y | N | N | U | N | Y |

TABLE 2--Continued

| | 21 | | 22 | | 23 | 24 | 25 | 26 | 27 | | | 28 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rodent control | | Fly control | | Is lowest part of fill in water table? | Number of times fire control equipment was required at site in past year | Is salvaging permitted? | Is salvaging practiced? | Estimated number of loads deposited daily | | | Estimated tons of solid waste received annually |
| | Needed | Provided | Needed | Provided | | | | | | Private Vehicles | Other Vehicles | |
| RILEY COUNTY | | | | | | | | | | | | |
| Manhattan | N | Y | Y | Y | Y | 0 | N | Y | - | - | - | 11920 |
| Ogden | Y | Y | N | N | N | 0 | N | Y | - | 3 | 10 | 848 |
| Leonardville | N | N | N | Y | N | 0 | Y | Y | - | - | 10 | 194 |
| Riley | | | | | | | | | | | | |
| POTTAWATOMIE COUNTY | | | | | | | | | | | | |
| Belvue | N | N | N | N | N | 0 | Y | Y | 0 | 0 | 6 | 95 |
| Emmett | N | N | N | N | N | 0 | Y | Y | 0 | 0 | 3 | 87 |
| Havensville | N | N | N | N | N | 0 | Y | Y | 0 | 0 | 10 | 83 |
| Louisville | N | N | N | N | N | 0 | Y | Y | 0 | 0 | 3 | 95 |
| Olsburg | N | N | N | N | N | 0 | Y | Y | 0 | 0 | 10 | 77 |
| Onega | N | N | N | N | N | 0 | Y | Y | 0 | 1 | 7 | 488 |
| St. Mary's | Y | Y | Y | Y | Y | 1 | Y | Y | 0 | 1 | 50 | 877 |
| Wamego | N | N | N | N | N | 1 | Y | Y | 2 | 0 | - | 1386 |

TABLE 2--Continued

| | 29 | 30 | 31 | 32 | | 33 | 34 | 35 |
|---|---|---|---|---|---|---|---|---|
| | Equipment available at site | What items does the community exclude from the site? | Total number of employees on site (F.T.E.) | Hours daily operated | | Number of days operated per week | Annual operating cost | Is this a sanitary landfill? |
| | | | | Begin | End | | | |
| RILEY COUNTY | | | | | | | | |
| Manhattan | D | N | 1 | 07 | 17 | 7 | $13,000 | N |
| Ogden | T | J.A. | 1 | 08 | 17 | 3 | $ 1,000 | N |
| Leonardville | N | J.A. | 0 | 0 | 24 | 7 | $ 100 | N |
| Riley | | | | | | | | |
| POTTAWATOMIE COUNTY | | | | | | | | |
| Belvue | N | N | 0 | 0 | 24 | 7 | $ 140 | N |
| Emmett | N | N | 0 | 0 | 24 | 7 | $ 125 | N |
| Havensville | N | J.A.<br>D.A. | 0 | 0 | 24 | 7 | $ 75 | N |
| Louisville | N | J.A. | 0 | 0 | 24 | 7 | $ 100 | N |
| Olsburg | N | N | 0 | 0 | 24 | 7 | $ 40 | N |
| Onega | N | D.A.<br>J.A. | 1 | 13<br>17 | | 4 | $ 2,000 | N |
| St. Mary's | N | D.A.<br>J.A. | 0 | 0 | 24 | 7 | $ 2,000 | N |
| Wamego | N | N | 0 | 0 | 24 | 7 | $ 700 | N |

TABLE 2--Continued

Source: Community Solid Waste Practices
Land Disposal Site Investigation Reports
Kansas Department of Health, 1968.

N - no
Y - yes

7. General character of the site
   Q - quarry or borrow pit
   G - gully
   L - level area
   H - hillside
   M - marsh or flood plain
   S - strip pit or mine
   O - other

8. Adjacent zoning
   N - none
   P - public land

9. Adjacent land use
   A - agriculture

12. Frequency of cover
   N - none
   D - daily
   W - weekly
   M - monthly
   6M - every 6 months
   A - annually
   O - other

18. General character of operation - routine burning
   N - none
   U - uncontrolled
   P - planned and limited

29. Equipment available
   D - dragline or shovel-type excavator
   S - self-propelled scraper
   T - tractors, bulldozers or high lift loaders
   N - none

30. Items excluded from the site
   N - none
   D.A. - dead animals
   J.A. - junked automobiles

The random dumping usually occurred on one side of town with one main site and several smaller ones. There are, however, several subdivisions on the west side of Tuttle Creek that have hired a private hauler. This solid waste is usually disposed of at controlled sites.

### Summary

Solid waste management is an emerging profession. At the present time, therefore, analysts are faced with the lack of detailed records kept by municipalities on the amounts of solid waste disposed. Also, the cost of the disposal operations have been inadequately maintained in the two-county area. In the future, more accurate records should be maintained to determine the actual costs to the community for services.

## Analysis of Industries in Regard to Affect on Solid Waste Management

A survey of industries in the entire planning area was required because: (1) the industries possess unique characteristics which would make solid waste standards for a metropolitan area irrelevant in the study of a rural region; and (2) there was a general lack of adequate information regarding industries in the planning region at the community, county, and state level.

The Directory of Kansas Manufacturers and Production (1970) listed 68 industries which were studied through the use of a carefully designed questionnaire (See Appendix G). The questionnaire addressed itself to the pertinent information needed and was received by all industries listed in the Directory that were located in the planning region. The only exceptions were the radio stations, which were deleted from the list of recipients because they do not produce a material product. A remarkable ninety-two percent of the industries cooperated by returning the completed questionnaire. Those

industries which did not return their questionnaires were small isolated industries. However, they were included in the estimate of waste generated by using general wastes per year* (weight) times the number of industries which did not respond. The second cause of industries not returning their questionnaires was that they had terminated their operations.

## Employment

Industrial employment is one factor that will determine the amount of solid waste generated. In 1964, there were 66 manufacturing establishments in the planning region as reported by the Kansas Department of Economic Development. From the questionnaire survey of this study, it was found that there had been a decrease by five in the number of manufacturers since 1964. The distribution of manufacturing establishments by categories of number of employees has remained relatively constant for the planning region with a majority employing less than 25 (F.T.E.) employees with an average of 20 employees. An important increase in manufacturing employment did take place with the establishment of McCall Pattern Company east of Manhattan. The plant employs approximately 400 people, and will expand its work force substantially by the end of 1971. The growth in manufacturing employment was 34 percent between 1950 and 1966 and should continue into the 1970's. (See Table 3.)

Graph 1 is a graphical presentation of the data gathered from the questionnaire relating to number of employees in industry, and is more finely graduated than the table on Page 33. From the graph, one can observe that a majority of industries employ less than ten (10) workers. The Histogram is then fairly constant until after the 70-74 (employees per industry column), and there is not another industry until 400 employees.

*This weight is expressed in tons/year and was the average derived from the analysis of the returned questionnaire.

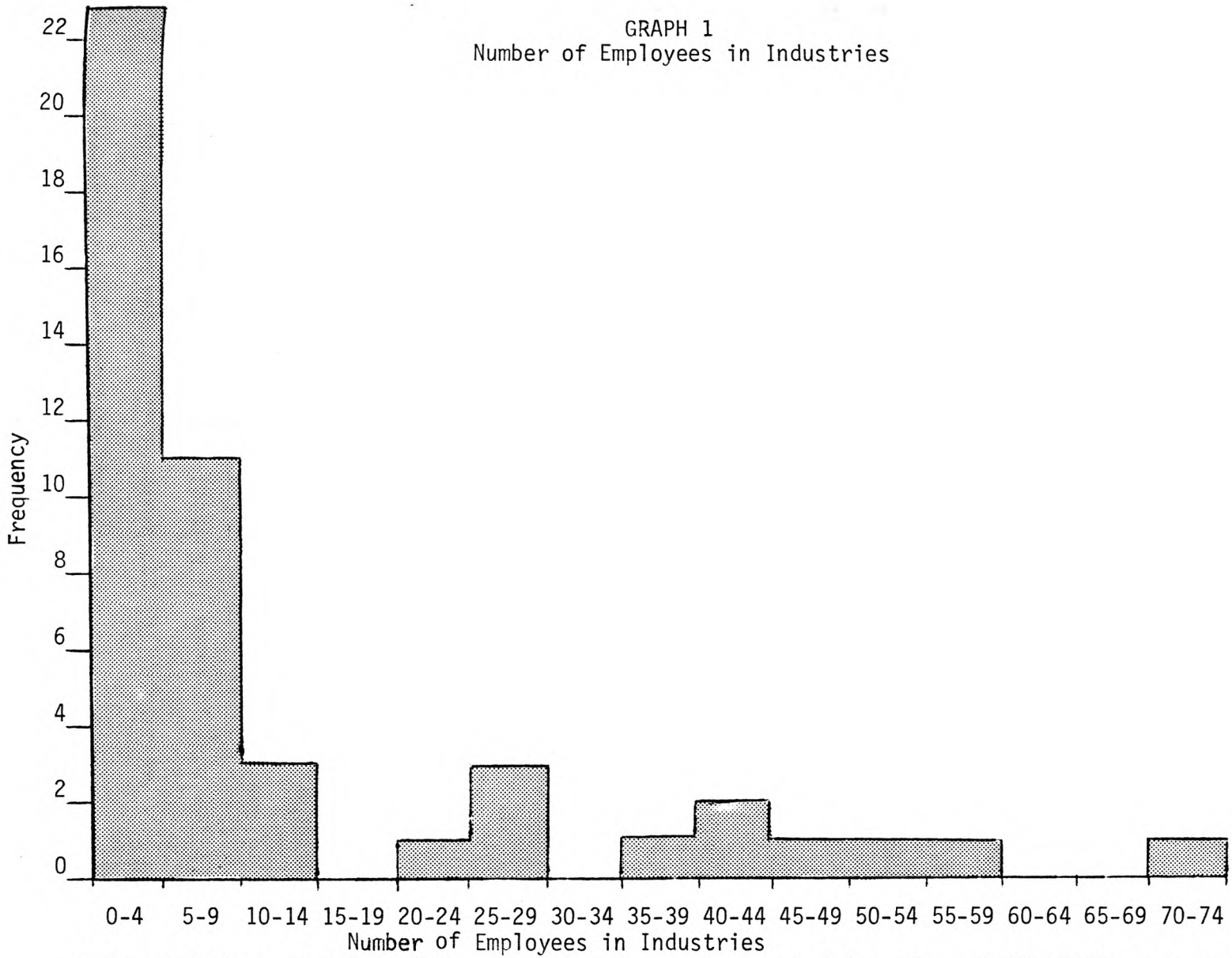
TABLE 3

MANUFACTURING ESTABLISHMENTS

| | Less than 25 Employees | | 25-99 Employees | | 100 or more | | Total | |
|---|---|---|---|---|---|---|---|---|
| | 1964-65 | 1970-71 | 1964-65 | 1970-71 | 1964-65 | 1970-71 | 1964-65 | 1970-71 |
| POTTAWATOMIE COUNTY | 16 | 14 | 1 | 3 | 0 | 0 | 17 | 17 |
| RILEY COUNTY | 42 | 44 | 7 | 5 | 0 | 1 | 49 | 50 |
| TOTAL PLANNING REGION | 58 | 58 | 8 | 8 | 0 | 1 | 66 | 67 |

Source: Kansas Department of Economic Development.

GRAPH 1
Number of Employees in Industries




* One industry was deleted because its employment accounted for almost half of the industrial employment in the two counties. It was analyzed separately.

Employment will be a significant factor in analyzing and predicting the generation rates for various industries.

## Generation Rates

It was found that most manufacturers generated from 0-249 pounds per week of solid wastes. The average solid waste generation rate per industry in the planning region was 447 pounds/week (.233 tons/week).* Collectively, all industries in the planning area will produce 638 tons per year at the present time. This total is low when compared to other areas, but reflects the secondary role played by industries in the economy of the region; although this role has expanded somewhat in the last ten years.

## Types of Manufacturing

The types of products produced by the manufacturing sector result in fluctuation of the amount of solid waste generated. The industries were divided into four classifications to reflect the region's economic production activity. The following are four classifications of industry:

1. Light Industry. This is a specific branch of production which usually produces a compact product. The industry usually is compatible with surrounding land uses. The planning region's light industry employment ranges from one to over four hundred people.
2. Printing Industry. This is a branch of production that makes and issues matter for reading by means of type and the printing press. There were eight (8) industries involved with printing in the region.

*Source: Derived from analysis of the study's questionnaires.

3. Intermediate Industry. This is a branch of production which produces a large cumbersome product or has certain nuisances associated with production of the item.
4. Bulk Industry. This is a branch of production that processes large volumes of raw products with large amounts of waste. Much of this waste is salvageable.

The following table indicates the distribution of industries in the planning area among the four classifications.

TABLE 4

TYPE OF INDUSTRIES

| Type of Industry | Number of Industries in Sample | Percent of Total |
|---|---|---|
| 1. Light Industry | 33 | 68% |
| 2. Printing | 8 | 16% |
| 3. Intermediate Industry | 5 | 10% |
| 4. Bulk Processing | 3 | 6% |
| TOTALS | 49 | 100% |

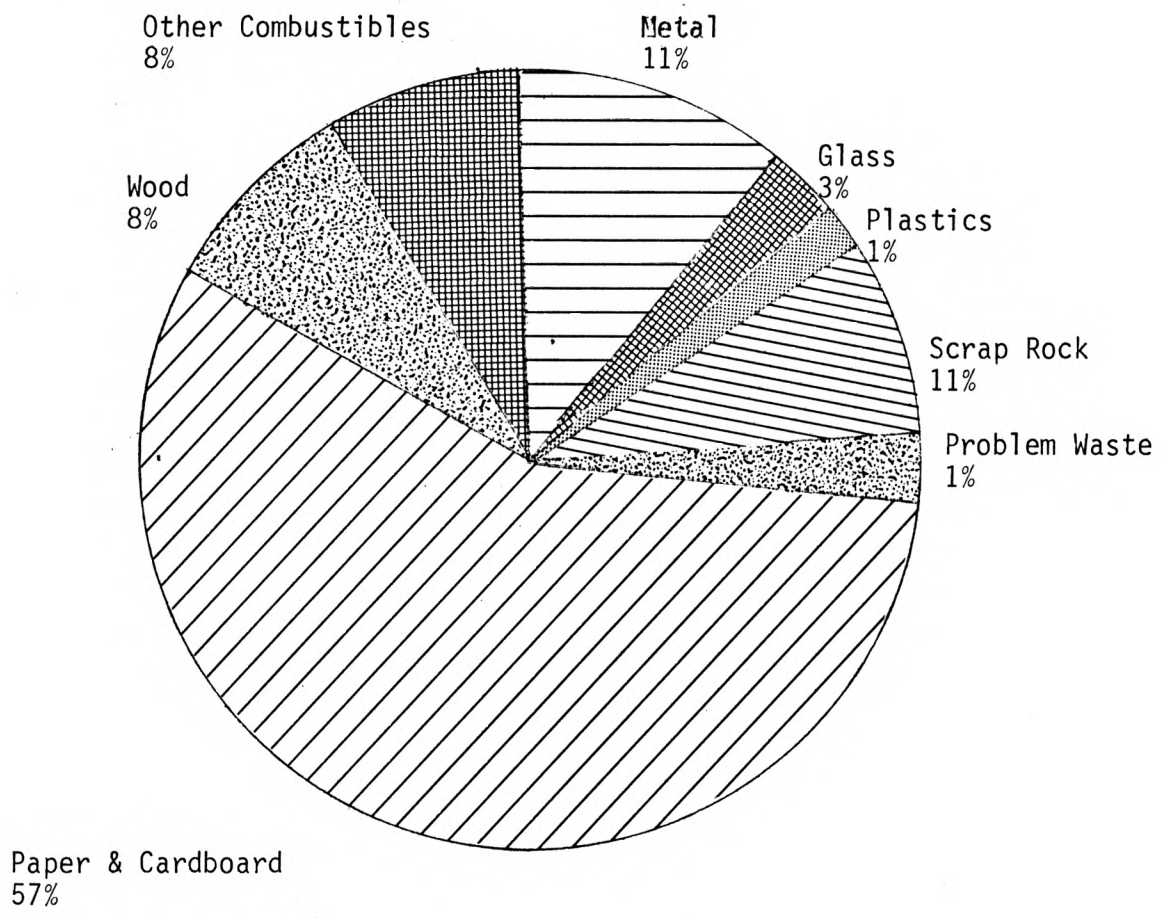
Source: Industrial Solid Waste Questionnaire.

The type of industry will be a factor in the model which will be formulated to predict the amount of solid wastes.

## Composition of Solid Wastes

The impact of light industry and printing can be illustrated using a pie graph, Graph 2, which indicates that 57.25 per cent of the solid wastes

GRAPH 2
Industrial Questionnaire Analysis, Composition of Solid Waste
for the Total Planning Region



generated is paper and cardboard. The percentage is derived by summing all the major types of composition and calculating the mean. This method reflects each individual industry response and does not allow one type of industry to outweigh the rest.

## Industrial Salvage

What appears to be no longer a useable product for one industry may be another industry's raw material. In the planning area, a number of industries are recycling solid waste. Some of the recycling involves the following industries: swine feeding of dairy processing by-products; paper being saved by printing companies for re-use; and, stone companies utilizing most of their waste as fill. (See Table 5.)

TABLE 5

INDUSTRIAL SALVAGE

| | ONE | TWO | THREE |
|---|---|---|---|
| Type of Industry | Total Number of Industries | Number of industries that have some or all solid waste salvaged | Percent of the total number of industries who now salvage |
| Light Industry | 33 | 8 | 21% |
| Printing | 8 | 2 | 22% |
| Intermediate Industry | 5 | 2 | 40% |
| Bulk Processing | 3 | 3 | 100% |
| TOTALS | 49 | 15 | 30% |

Source: Industrial Solid Waste Questionnaire.

Column Two (2) of Table 5 represents the number of industries that have some or all solid waste salvaged. This amount was not included in the calculation of the solid waste generation rate because these wastes are not deposited in the community disposal site. It is interesting to note that more light industries have some recycling of their solid waste. However, if one studies Column Three (3), one can see that the intermediate and bulk industries have a larger percent of their types of industries reusing or selling their solid wastes. The bulk industries had more amounts of salvageable solid wastes than did other types of industries.

## Analysis of Questionnaire Survey

The purpose of the first analysis of the industries was to ascertain a correlative or causal relationship between different factors to develop a method of predicting the amount of solid waste that would be produced by an individual industry. Employment, as related to the amount of solid wastes generated by industries in the planning region, was the first factor to be analyzed. The analysis revealed widely-diversified results which indicated that there were other factors which needed to be considered.

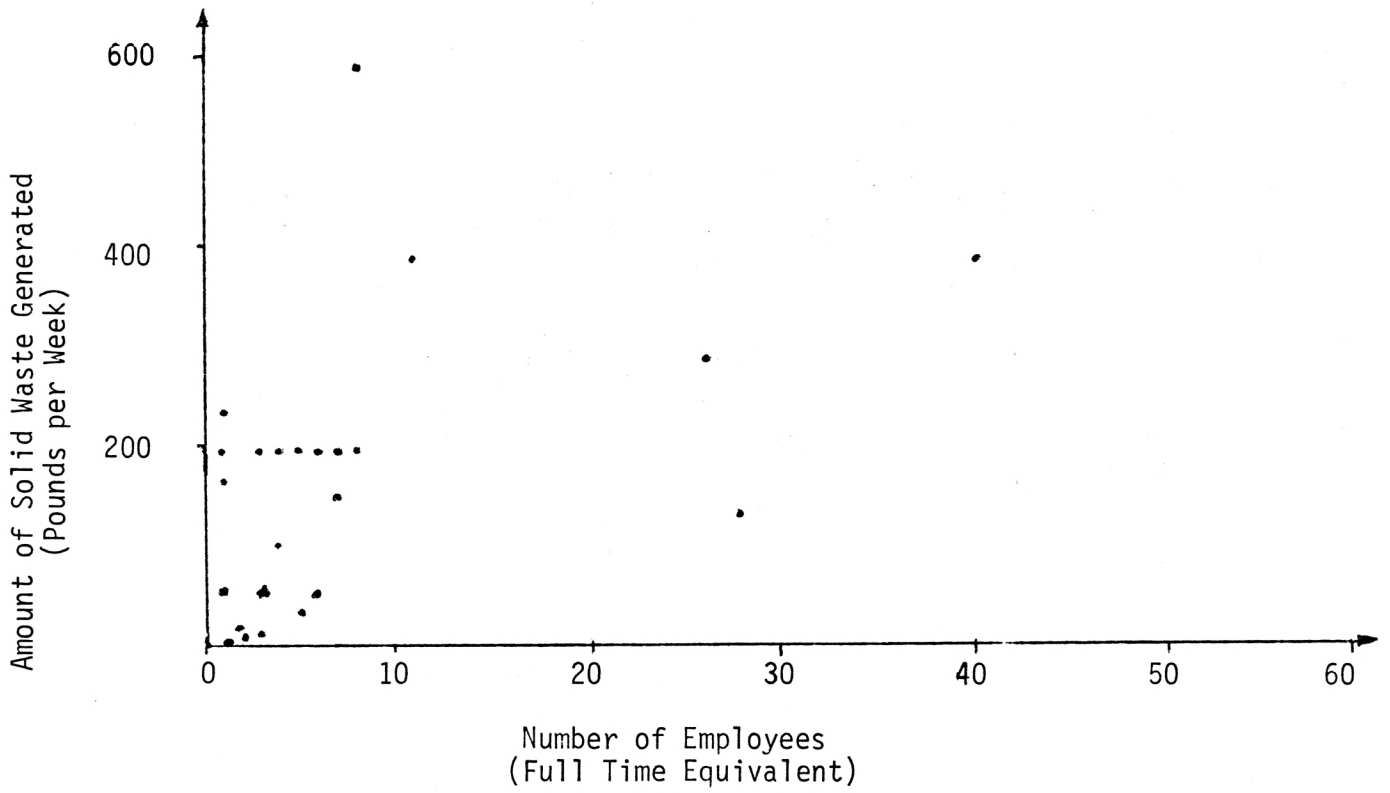
### Light Industries

The next factor that was added to the two existing factors was type of industry. In Graph 3, light industries solid wastes values are plotted against the number of employees in the industry. Although the points are scattered, a relationship developed and the scattering has taken a definite form.

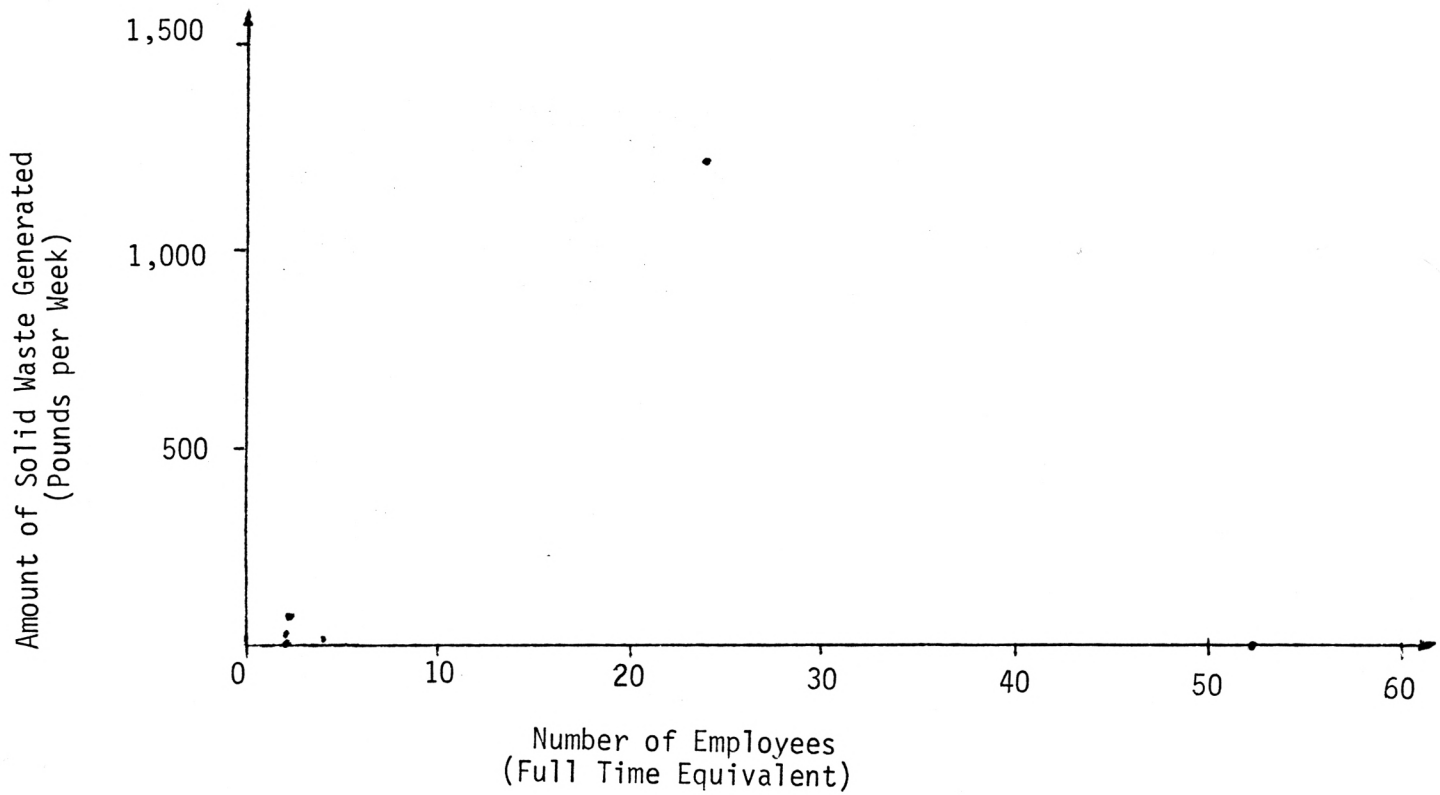
### Printing Industries

Most of the printing plants are small operations with very little solid waste produced (Graph 4). One industry has 25 employees and produces 1,200 pounds per week of solid waste which seems to be a high curvilinear distribution

GRAPH 3
Employment in Light Industry



GRAPH 4
Employment in Printing Industry



of points. Another printing plant has over fifty employees with no solid waste because the paper is sold for recycling. Once a printing plant reaches a certain size, it seems that they consider salvaging wasted paper.

### Intermediate Industries

Graph 5 illustrates the relationship between employment and amounts of solid wastes generated for intermediate industries. The results were so widely-diversified that they defied a graphical analysis. All but one of the intermediate industries produce less than approximately 2,300 pounds/week of solid waste.

### Bulk Industries

Bulk industries do not produce solid waste because most of their residue is salvaged or disposed of on their own site. (See Graph 6.) Therefore, their residue is not the responsibility of the community disposal facility. Some of their waste could be used as cover or fill for a sanitary landfill in the future.

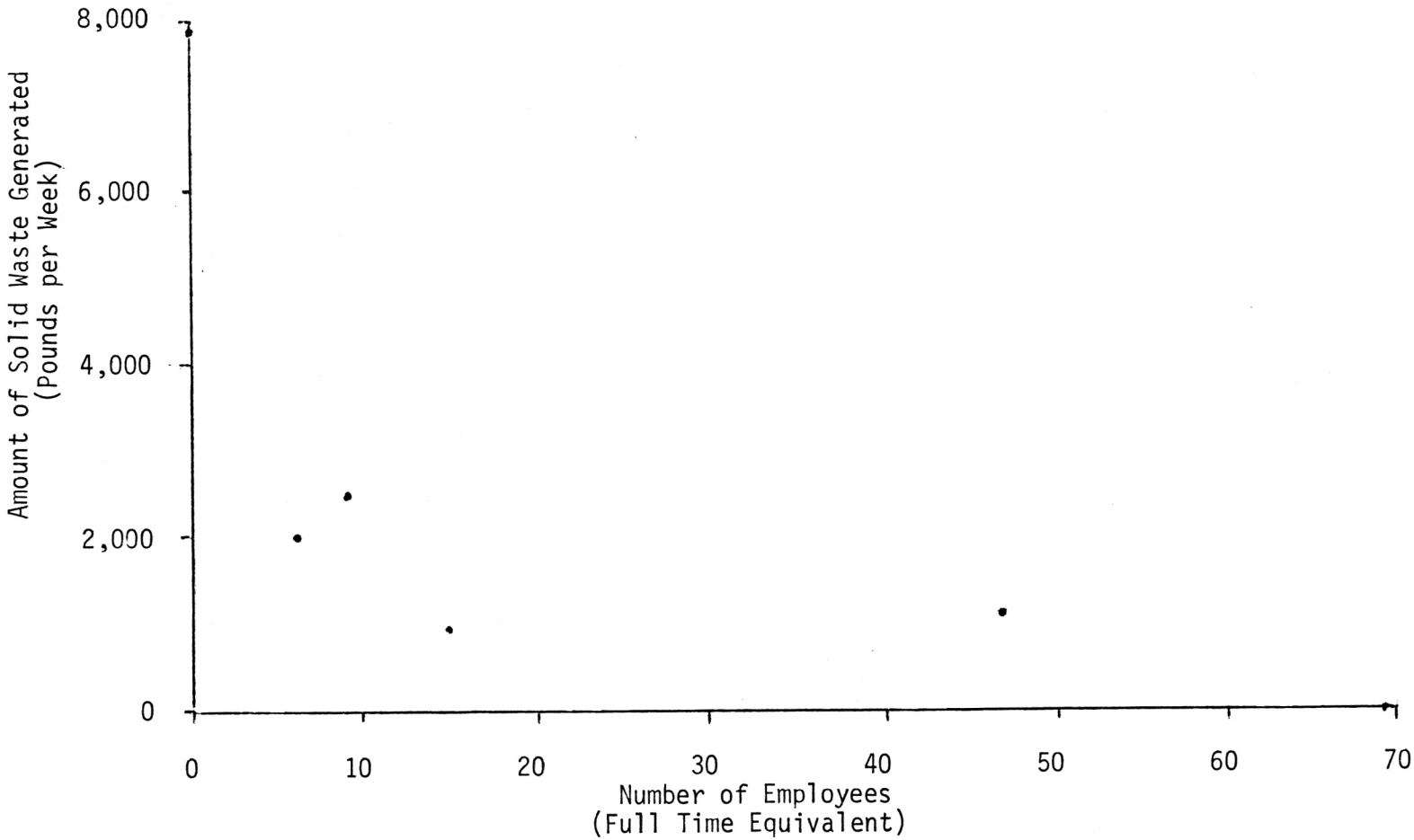
### Summary

Future projections of industrial wastes are given in Chapter III using the information developed through analysis of the questionnaire results. This questionnaire has produced meaningful statistics which made possible the prediction of amounts of industrial wastes to be generated in the future.

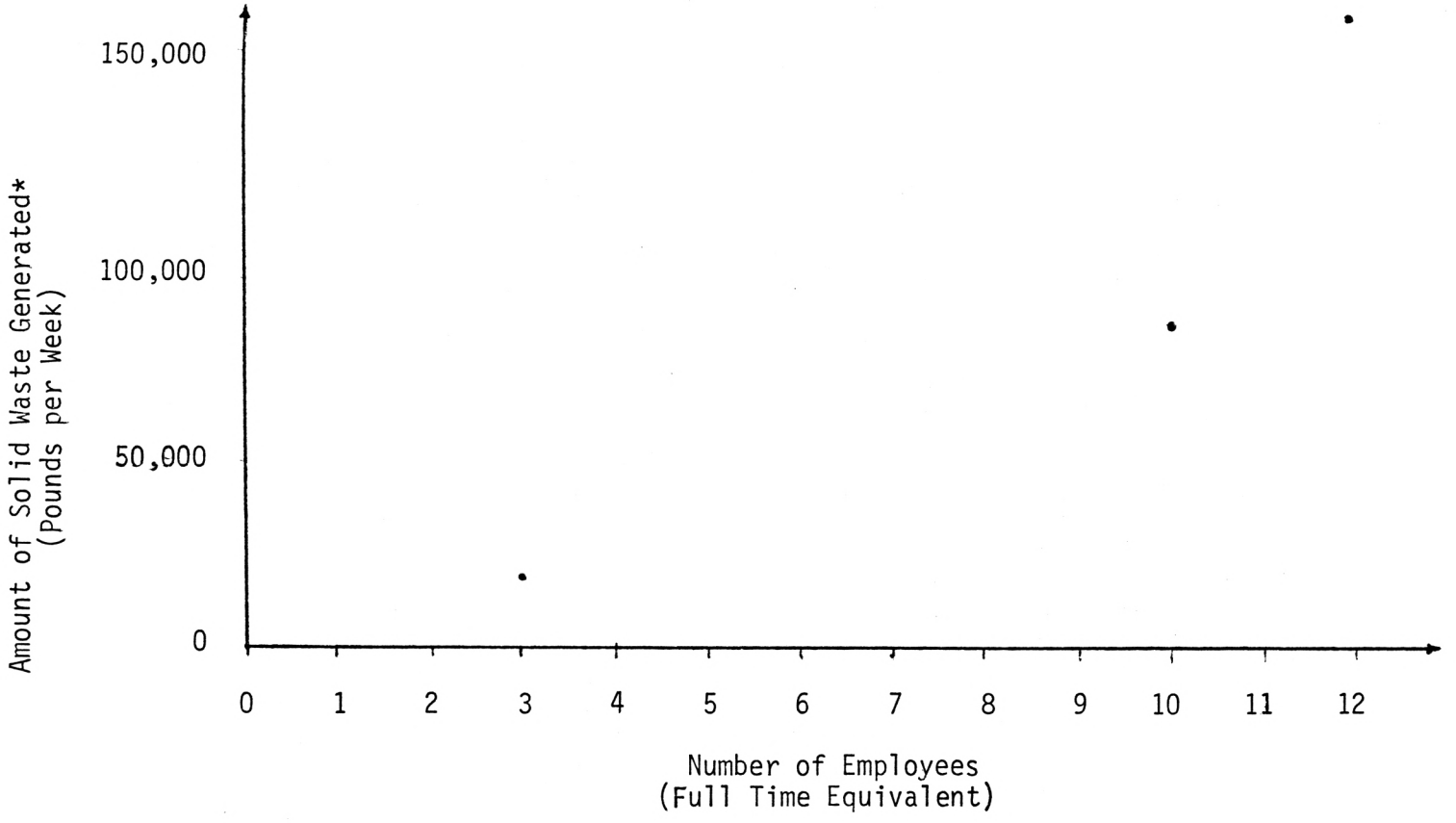
## Residential and Commercial Impact on Solid Waste Management

Commercial and residential solid wastes were combined because of their interdependence and their mutual dependence on population as a significant factor. The 1970 estimates of commercial and residential solid wastes generation utilized the U.S. Census of Population Advanced Reports.

GRAPH 5
Employment in Intermediate Industry



GRAPH 6
Employment in Bulk Industry




* All solid waste generated by bulk industry was salvaged.

The following two factors were used for predicting amounts of residential and commercial solid wastes:

1. The national average of 4.05 pounds per day per capita. [12]
2. A computed average of 3.07 pounds per day per capita.*

Listed in Table 6 are estimated amounts of solid waste generation from residential units and commercial establishments in the planning area.

TABLE 6

RESIDENTIAL AND COMMERCIAL SOLID WASTES IN 1970

| | Using National Average | Using Computed Average |
|---|---|---|
| Total Planning Area | 50,722 Tons | 38,384 Tons |
| Total Nonfarm | 46,565 | 35,238 |
| Tuttle Creek Reservoir | 481 | 364 |
| Total Farm | 4,157 | 3,145 |

*The computed average was derived by using the apportionment method which was used to determine the ratio between the national daily average of solid waste generation as compared to the national daily average for residential and commercial solid waste average and assumed the proportion ratio would remain the same for the Kansas total solid waste generation of 4.05 pounds per day per capita. (See formula below.)

$$\frac{X}{\text{Total Kansas Average Solid Waste Generation Per Day}} = \frac{\text{U.S. Commercial \& Residential Average Solid Waste Generation/Day}}{\text{Total U.S. Average Solid Waste Generation Per Day}}$$

X = Estimated Kansas commercial and residential average solid waste generation/day.

## Land Use and Zoning

The composition of refuse differs with changes in land use. Table 7 is a classification of refuse material. However, for this study, we excluded the solid wastes from farms and sewage treatment plants. The table illustrates the typical solid wastes that must be handled in the typical community solid waste management system.

### Land Use and Zoning in Respect to Disposal Sites

The land adjacent to all the disposal sites was in agricultural use. This use would be least affected by a solid waste disposal site being located in the area.

The zoning of the adjacent land is significant in regulating the type of use that may develop in the proximity of a disposal site. Only the community of Onega has the land adjacent to their disposal site zoned public. Onega was the only community in the planning area that had an ultimate use for their disposal site which will be part of the future community airport.

### Current Regional Land Use

Table 8 illustrates the extent to which land is currently being utilized in the region.

TABLE 8

REGIONAL LAND USE PATTERNS

| Utilization | Number of Acres | Percent of Total Land |
|---|---|---|
| Agriculture | 760,932 | 80.7% |
| Fort Riley | 81,620 | 8.6% |
| Tuttle Creek Reservoir | 15,700 | 1.7% |
| Urban | 6,770 | 0.7% |
| Recreation | 3,264 | 0.3% |
| Other | 75,074 | 8.0% |
| TOTAL | 943,360 | 100.0% |

Source: U.S. Census of Agriculture.

TABLE 7

Classification of Refuse Materials

| | | | | |
|---|---|---|---|---|
| REFUSE (Solid Waste) | Garbage | Wastes from the preparation, cooking, and serving of food<br>Market refuse, waste from the handling, storage and sale of produce and meats | | From: households, institutions, and commercial concerns such as: hotels, stores, restaurants, markets, etc. |
| | Rubbish | Combustible (primarily organic) | Paper, cardboard, cartons<br>Wood, boxes, excelsior<br>Plastics<br>Rags, cloth, bedding<br>Leather, rubber<br>Grass, leaves, yard trimmings | |
| | | Noncombustible (primarily inorganic) | Metals, tin cans, metal foils<br>Dirt<br>Stones, bricks, ceramics, crockery<br>Glass, bottles<br>Other mineral refuse | |
| | Ashes | Residue from fires used for cooking and for heating buildings, cinders | | |
| | Bulky Wastes | Large auto parts, tires<br>Stoves, refrigerators, other large appliances<br>Furniture, large crates<br>Trees, branches, palm fronds, stumps, flotage | | From: streets, sidewalks, alleys, vacant lots |
| | Street Refuse | Street sweepings, dirt<br>Leaves<br>Catch basin dirt<br>Contents of litter receptacles | | |
| | Dead Animals | Small animals: cats, dogs, poultry, etc.<br>Large animals: horses, cows, etc. | | |
| | Abandoned Vehicles | Automobiles, trucks | | |
| | Constr. & Demo. Wastes | Lumber, roofing and sheathing scraps<br>Rubble, broken concrete, plaster, etc.<br>Conduit, pipe, wire, insulation, etc. | | |
| | Industr. refuse | Solid wastes resulting from industrial processes and manufacturing operations such as: Food-processing wastes, boiler house cinders, wood, plastic, and metal scraps and shavings, etc. | | From: factories, power plants, etc. |
| | Special Wastes | Hazardous wastes: pathological wastes, explosives, radioactive materials<br>Security wastes: confidential documents, negotiable papers, etc. | | Households, hospitals, institutions, stores, industry, etc. |

Source: APWA, 1970 Municipal Refuse Disposal, 3rd Edition

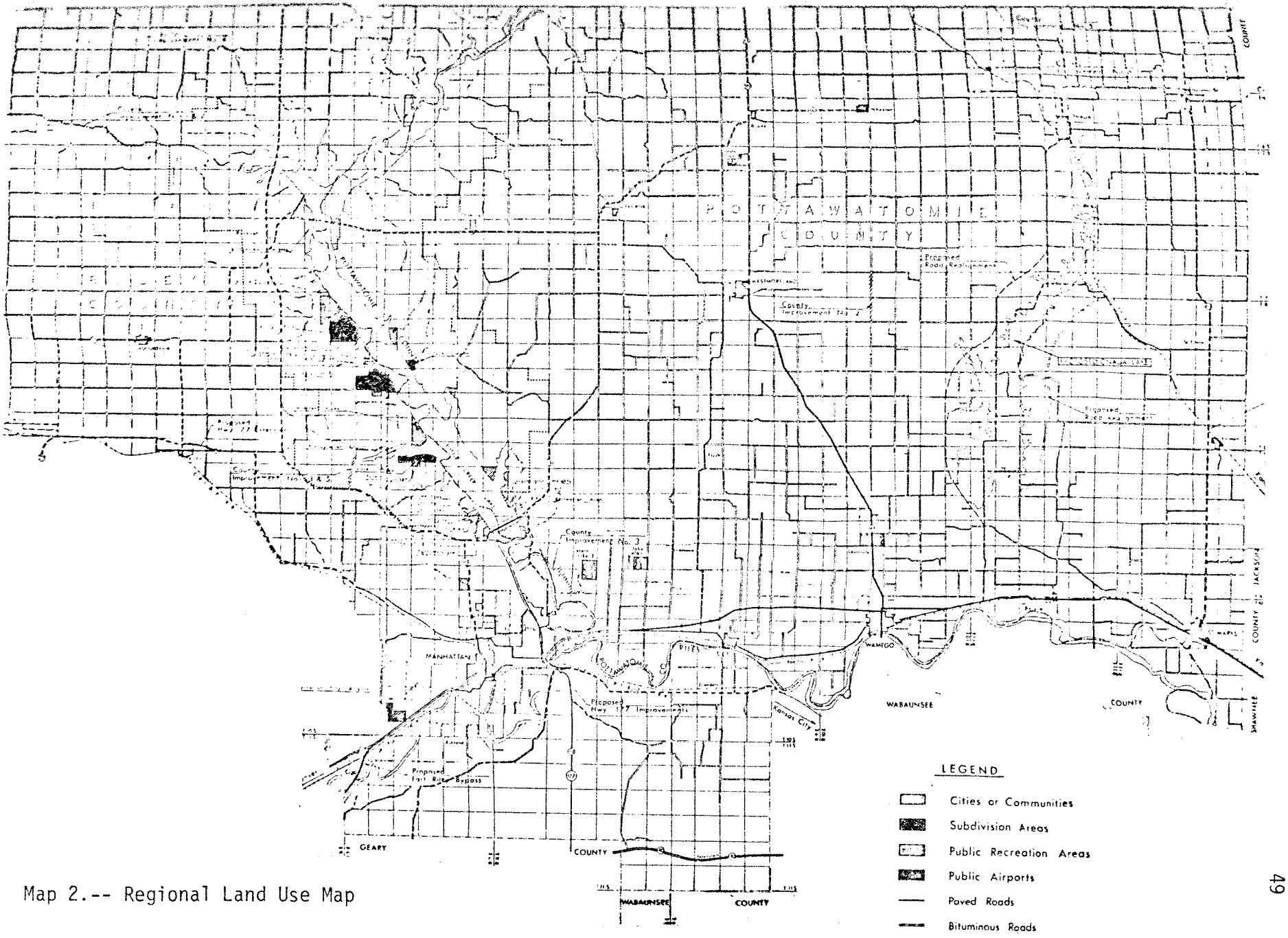
Agriculture is the most significant use of land, occupying 760,932 acres or 80.7 percent of the total land area in the planning area. The use occupying the second largest amount of land is Fort Riley, which owns 81,620 acres in Riley County. Tuttle Creek Reservoir is the third largest use of land. At the conservation area, its conservation pool covers 15,700 acres. A total of 3,264 acres is utilized around Tuttle Creek Reservoir and the two state lakes in Pottawatomie County. Urban land use occupies 6,770 acres or .7% of the total land area. The remaining land is utilized by non-urban housing and scattered commercial and industrial uses (particularly between Wamego and Manhattan adjacent to U.S. 24) and public uses such as roads, airports, and other uses.

## Future Land Use

Map 2 is a regional Future Land Use Map of the planning area showing the spatial distribution of the major uses. The Water and Sewer Plan stated that, "Manhattan is expected to record the greatest amount of growth in the region. Other than Manhattan, it is anticipated that the cities of Ogden and Wamego will be the primary growth centers. St. Mary's will also experience above average growth although not of the magnitude of Ogden and Wamego.

Most of the future growth in the planning area will occur in established municipalities. A small amount of residential growth probably will occur around residential developments near Tuttle Creek Reservoir and Lake Elbo.

As the economy of many of the municipalities of the region is founded on providing commercial services to their inhabitants and surrounding rural areas, it is expected that commercial growth will be found in all of the communities that are expected to increase in population. Also, some highway-oriented commercial growth is expected to occur along U.S. Route 24




Map 2.-- Regional Land Use Map

between Manhattan and Wamego and along Kansas Route 18 between Manhattan and Ogden. Industrial growth is expected to occur in and around growth centers in Manhattan, Wamego, and St. Mary's. Industrial growth in other municipalities is expected to be quite limited.

A proposed federal project may vastly increase land devoted to public land use in the planning area. Onega Lake, a proposed multi-purpose reservoir which will maintain a water surface of 5,320 acres if constructed, currently is being planned for Pottawatomie County by the U.S. Army Corps of Engineers. It is not currently known if this project will be constructed." [13]

Table 9 below seeks to present the information on where this change will take place, excluding Manhattan.

TABLE 9

LAND USE STATISTICS

| Existing Developed Urban* Land Use | | | Projected Regional Land Use Requirements | |
|---|---|---|---|---|
| Type of Use | Number of Acres | Per Cent of Total Land | Additional Number of Acres-1990 | Per Cent of Additional Total Land |
| Residential | 1,468.5 | 73.4% | 315.6 | 53.6% |
| Commercial | 171.0 | 8.5% | 41.5 | 7.0% |
| Industrial | 97.0 | 4.8% | 39.8 | 6.8% |
| Public and Semi-Public | 267.6 | 13.3% | 191.5 | 32.6% |
| TOTAL | 2,004.1 | 100.0% | 588.4 | 100.0% |

Source: Pottawatomie-Riley Counties-Manhattan Regional Planning Commission, Water & Sewer Plan.

*Urban refers to all incorporated municipalities.

From Table 9, one can conclude that a smaller proportion of land will

be required for residential and commercial purposes, while a larger proportion will be required for industrial and public purposes. The large increase in public land that was projected was due to inadequate existing park acreages.

The City of Manhattan, because of its size, was considered separately from the rest of the region's communities. The figures in Table 10 indicate Manhattan Land Use Projections until the year 1985.

Future land use growth areas are graphically illustrated on Maps 3 - 17 of those communities which are projected to sustain population increases in the next 20 years. In the instances that communities are not expected to experience growth, they were deleted from the study. Table 11 quantifies the graphical presentation in form of "Existing Land Use in Acres."

The Water & Sewer Plan indicated that, "In many communities past development has left tracts of land vacant. It is recommended that these vacant areas be developed prior to utilizing new areas of development. In most instances, this fill-in process is more economical than a leap frog pattern of development. In the event this fill-in process was not expected to be sufficient to satisfy future growth requirements of a land use category, new growth areas were recommended as shown on the land use maps. In all instances, it is recommended that communities promote compact and orderly development rather than scattered, low density type of development." [14]

Unincorporated Communities

Areas with a population of 25 or more persons outside the incorporated cities considered in this study (excluding Fort Riley) are: Blaine, Duluth, Fostoria, Keats, Lake Elbo, and Tuttle Creek Reservoir. Table 12 states their existing land use.

TABLE 10

MANHATTAN LAND USE PROJECTIONS

| Land Use | Acres-1967 | Additional Acres-1985 | Acres-1985 |
|---|---|---|---|
| Residential | | | |
| Single-Family | 1,030.4 | 1,200 | 2,230.4 |
| Multi-Family (includes dorms, rooming houses, sororities and fraternities) | 188.5 | 180 | 368.5 |
| Mobile Homes | 17.5 | 13 | 30.5 |
| Totals | 1,236.4 | 1,393 | 2,629.4 |
| Commercial | | | |
| Shopping Goods (Mainly Core Area) | 30.5 | 15 | 45.5 |
| Convenience | 49.5 | 16 | 65.5 |
| Service and Offices | 66.5 | 40 | 106.5 |
| Totals | 146.5 | 71 | 217.5 |
| Industrial | | | |
| Light | 38.8 | 86 | 124.8 |
| Heavy | 112.3 | 170 | 282.3 |
| Utilities | 12.5 | 11 | 23.5 |
| Totals | 163.6 | 267 | 430.6 |
| Public & Semi-Public | 581.4 | 589 | 1,170.4 |
| Public Rights-of-Way | 851.8 | 745 | 1,596.8 |
| Total Developed Area | 2,979.7 | 3,065 | 6,044.7 |

Source: Oblinger-Smith, Manhattan Land Use Plan.

TABLE 11

EXISTING LAND USE IN ACRES

| Communities | Belvue | Emmett | Havensville | Louisville | Olsburg | Onaga | St. George | St. Mary's |
|---|---|---|---|---|---|---|---|---|
| RESIDENTIAL | 33.9 | 32.1 | 44.5 | 67.1 | 47.4 | 148.8 | 45.8 | 227 |
| COMMERCIAL | 7.0 | 5.4 | 7.9 | 2.2 | 8.5 | 16.2 | 1.8 | 18.9 |
| INDUSTRIAL | 0.6 | 11.4 | 0.0 | 0.0 | 0.7 | 11.3 | 8.4 | 7.2 |
| PUBLIC & SEMI-PUBLIC | 5.2 | 17.6 | 11.2 | 6.8 | 3.9 | 17.4 | 12.1 | 18.3 |
| VACANT | 21.7 | 20.8 | 23.8 | 222.5 | 28.2 | 172.6 | 119.1 | 53.0 |
| Totals | 68.3 | 87.3 | 87.4 | 298.6 | 88.7 | 366.3 | 187.2 | 324.4 |

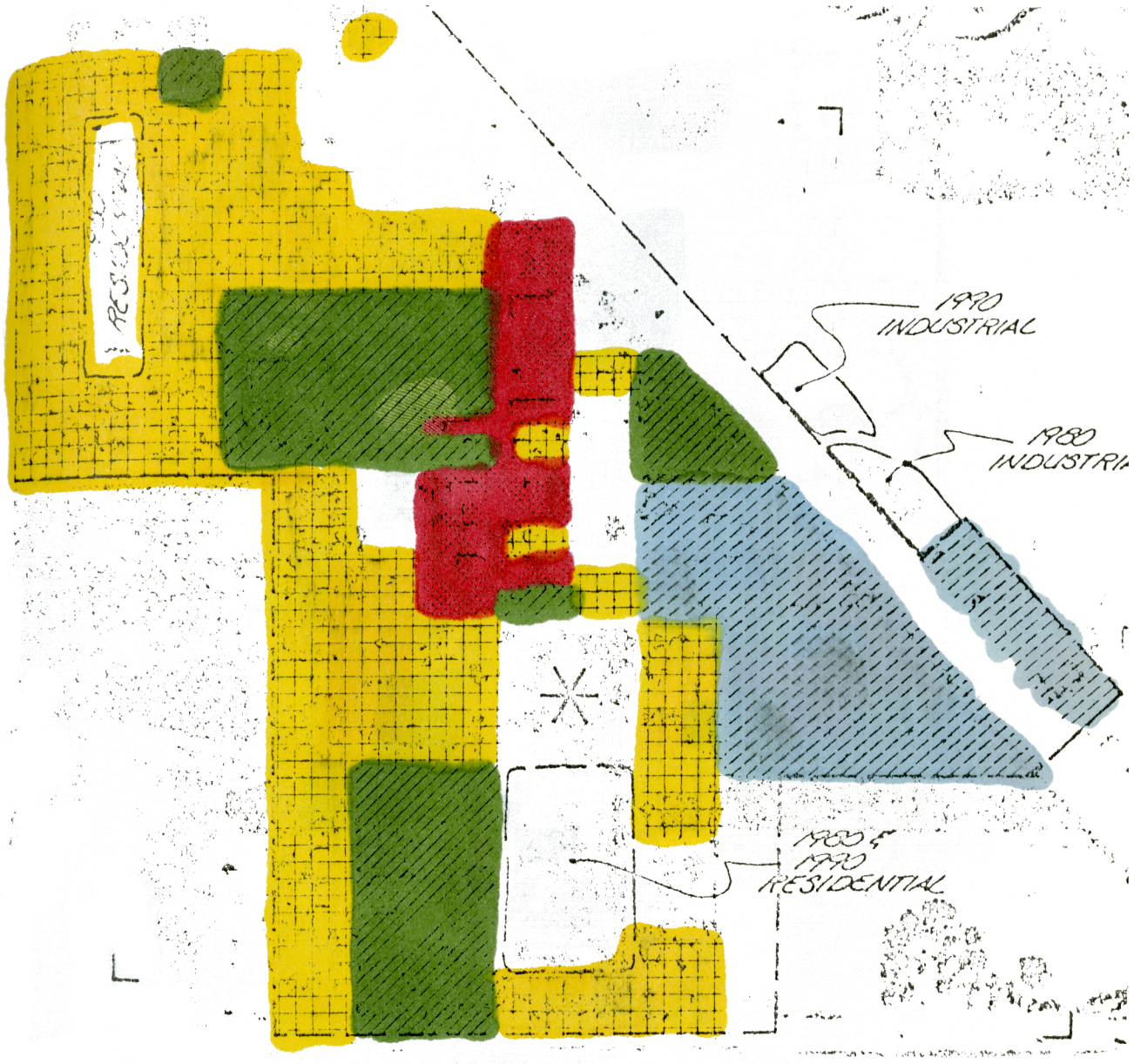
EXISTING LAND USE IN ACRES

| Communities | Wamego | Westmoreland | Wheaton | Leonardville | Ogden | Randolph | Riley |
|---|---|---|---|---|---|---|---|
| RESIDENTIAL | 272.3 | 103.8 | 47.4 | 92.5 | 142.7 | 26.9 | 136.4 |
| COMMERCIAL | 41.7 | 16.8 | 2.9 | 7.4 | 17.9 | 8.5 | 7.9 |
| INDUSTRIAL | 43.0 | 7.0 | 0.0 | 3.7 | 0.0 | 0.0 | 3.7 |
| PUBLIC & SEMI-PUBLIC | 89.9 | 19.3 | 7.9 | 16.1 | 14.6 | 8.7 | 18.6 |
| VACANT | 88.3 | 61.7 | 39.2 | 25.7 | 141.0 | 33.6 | 30.4 |
| Totals | 535.2 | 208.6 | 97.4 | 145.4 | 316.2 | 77.7 | 197.0 |




Map 3.-- Belvue

Source· Pottawatomie-Riley Counties Water and Sewer Plan.




Map 4.-- Emmett
Source: Pottawatomie-Riley Counties Water and Sewer Plan.



LAND USE

Residential

Commercial

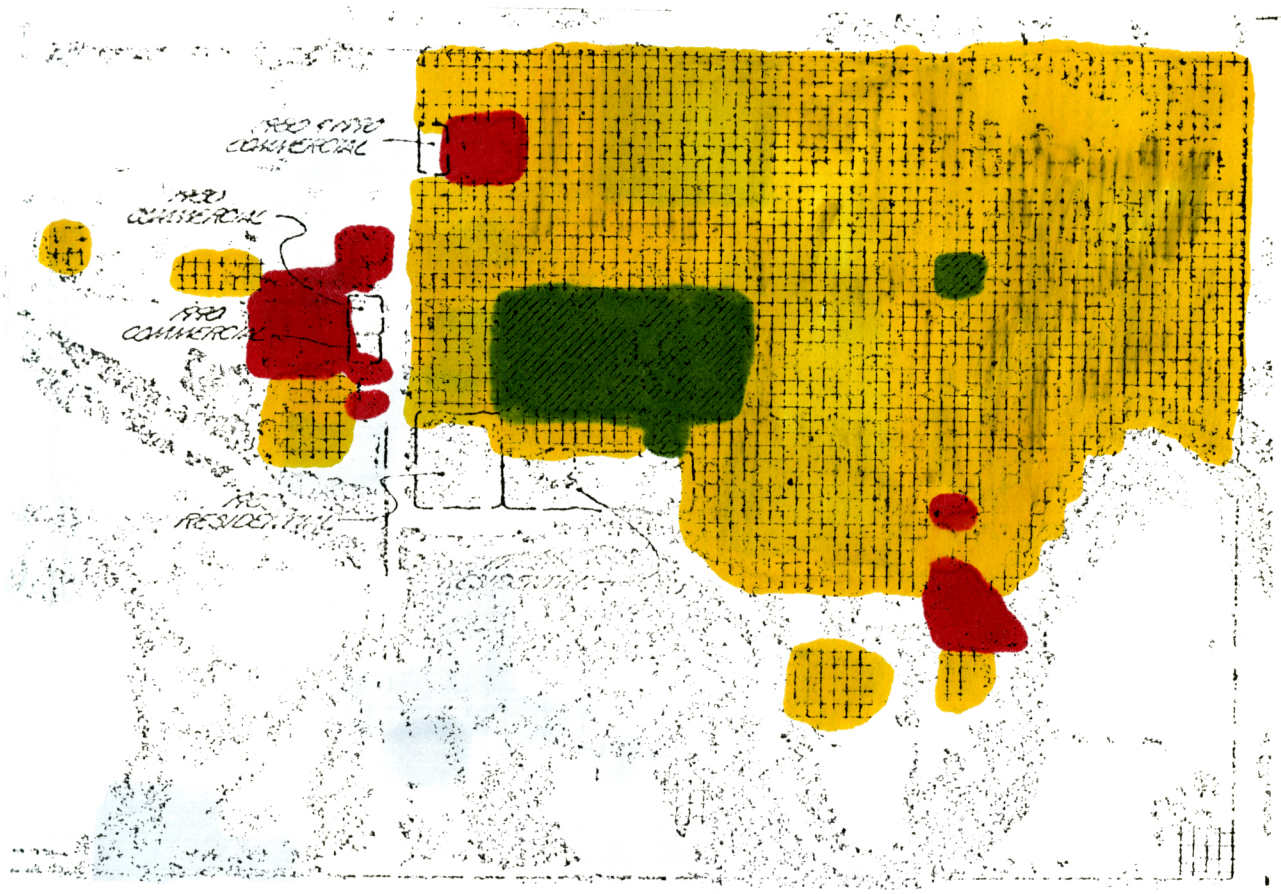
Public & Quasi Public

400 200 0 200 400

SCALE IN FEET

N

Map 5.-- Havensville
Source: Pottawatomie-Riley Counties Water and Sewer Plan.



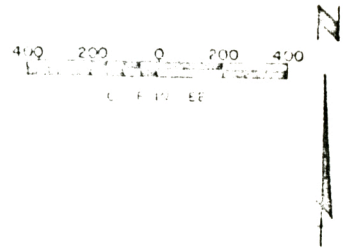
LAND USE

Residential

Commercial

Industrial

Public & Quasi Public




Map 6.-- Louisville
Source· Pottawatomie-Riley Counties Water and Sewer Plan.



LAND USE

Residential

Commercial

Industrial

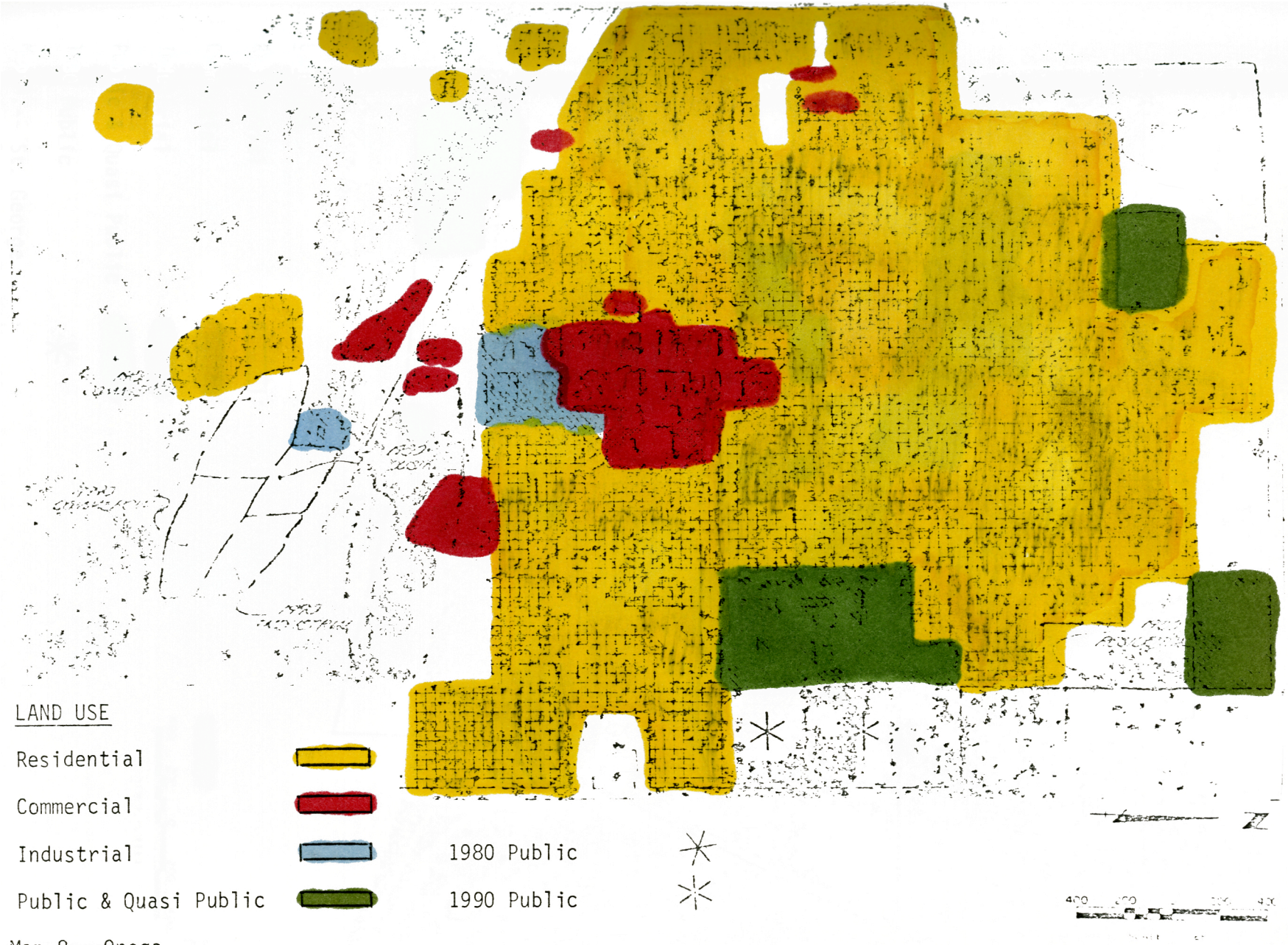
Public & Quasi Public

1980 Public

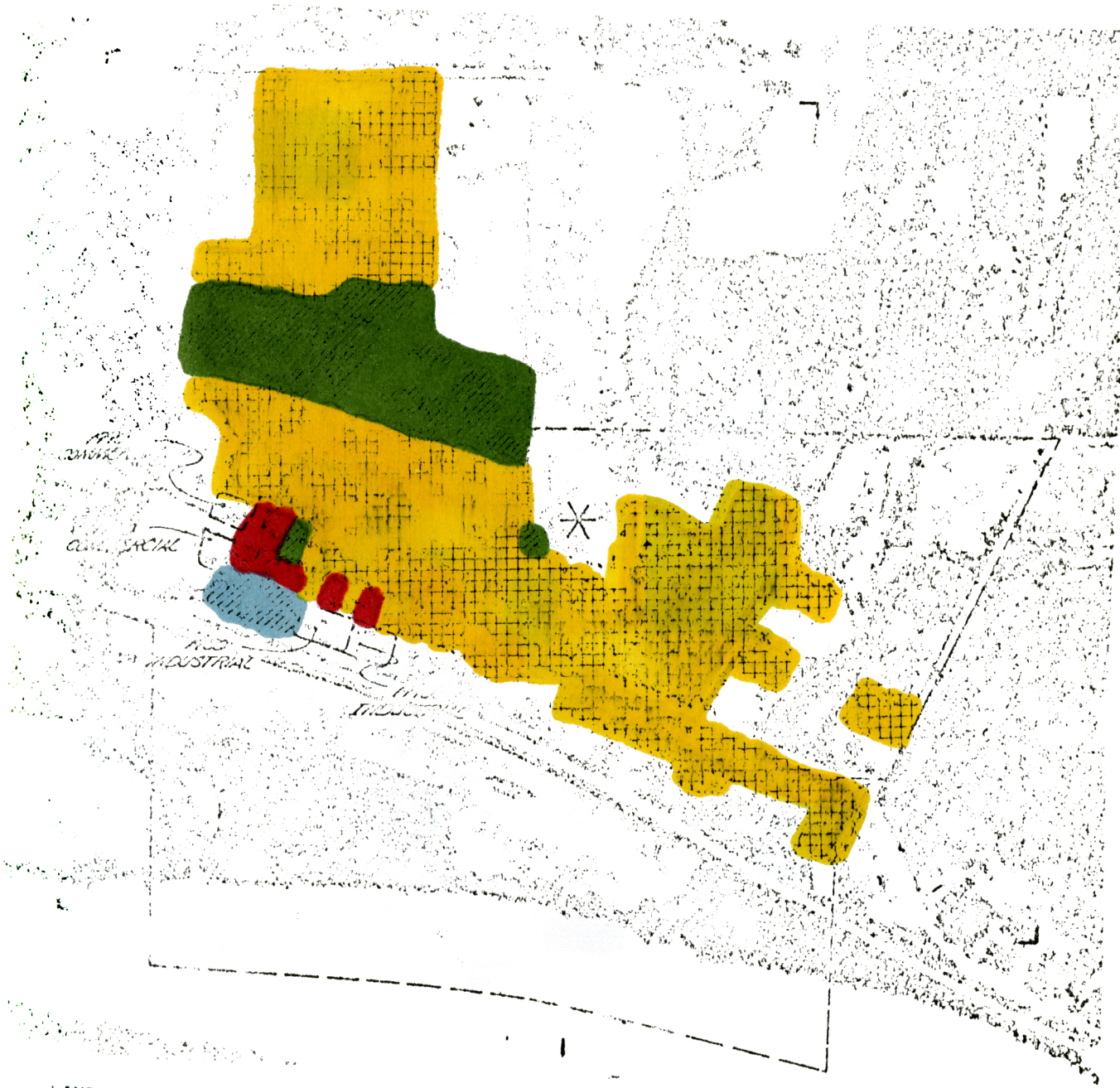
N

200 400

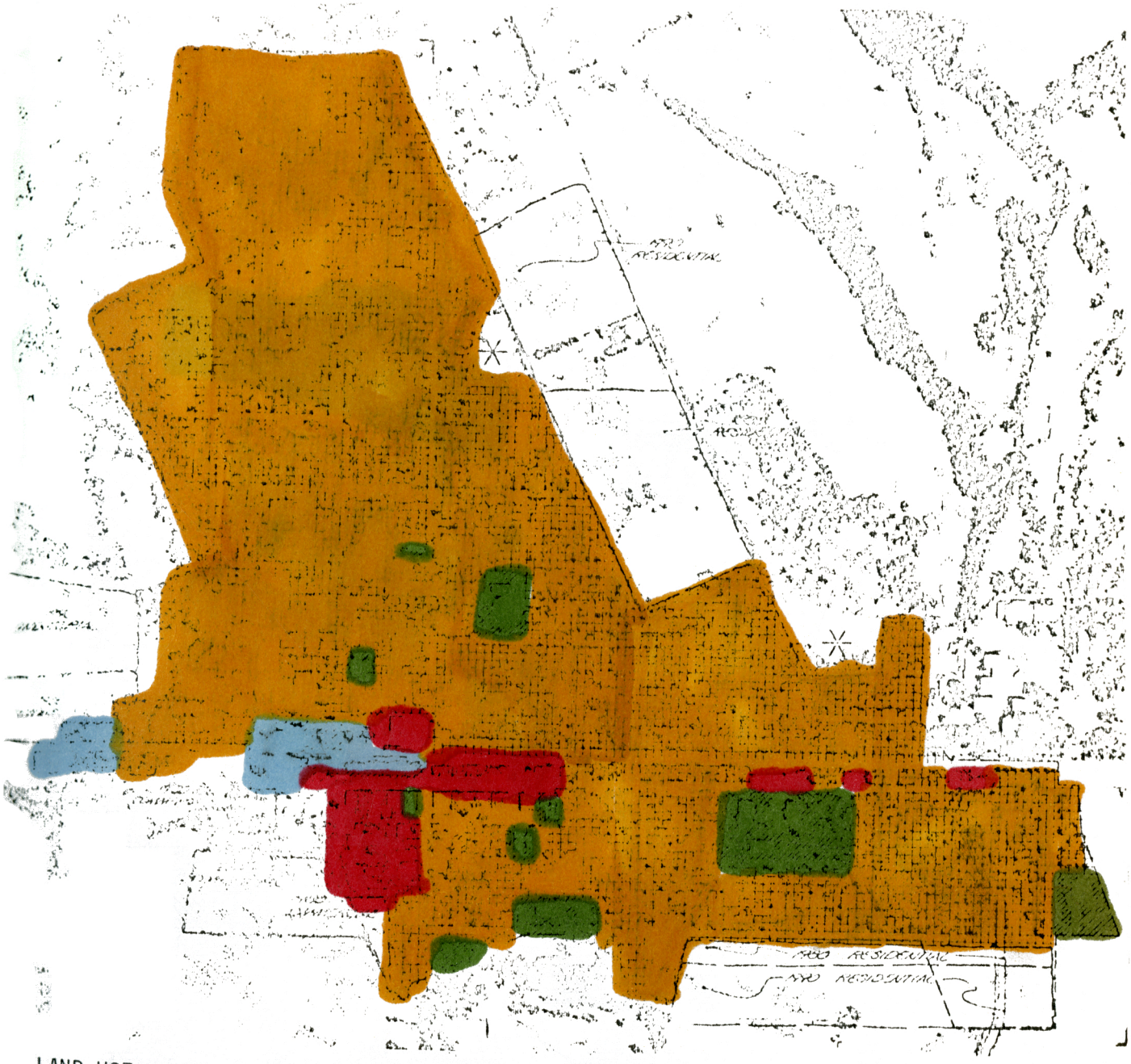
Map 7.-- Olsburg
Source Pottawatomie-Riley Counties Water and Sewer Plan.




Map 8.--Onaga
Source: Pottawatomie-Riley Counties Water and Sewer Plan.




Map 9.-- St. George
Source Pottawatomie-Riley Counties Water and Sewer Plan.



LAND USE

Residential

Commerical

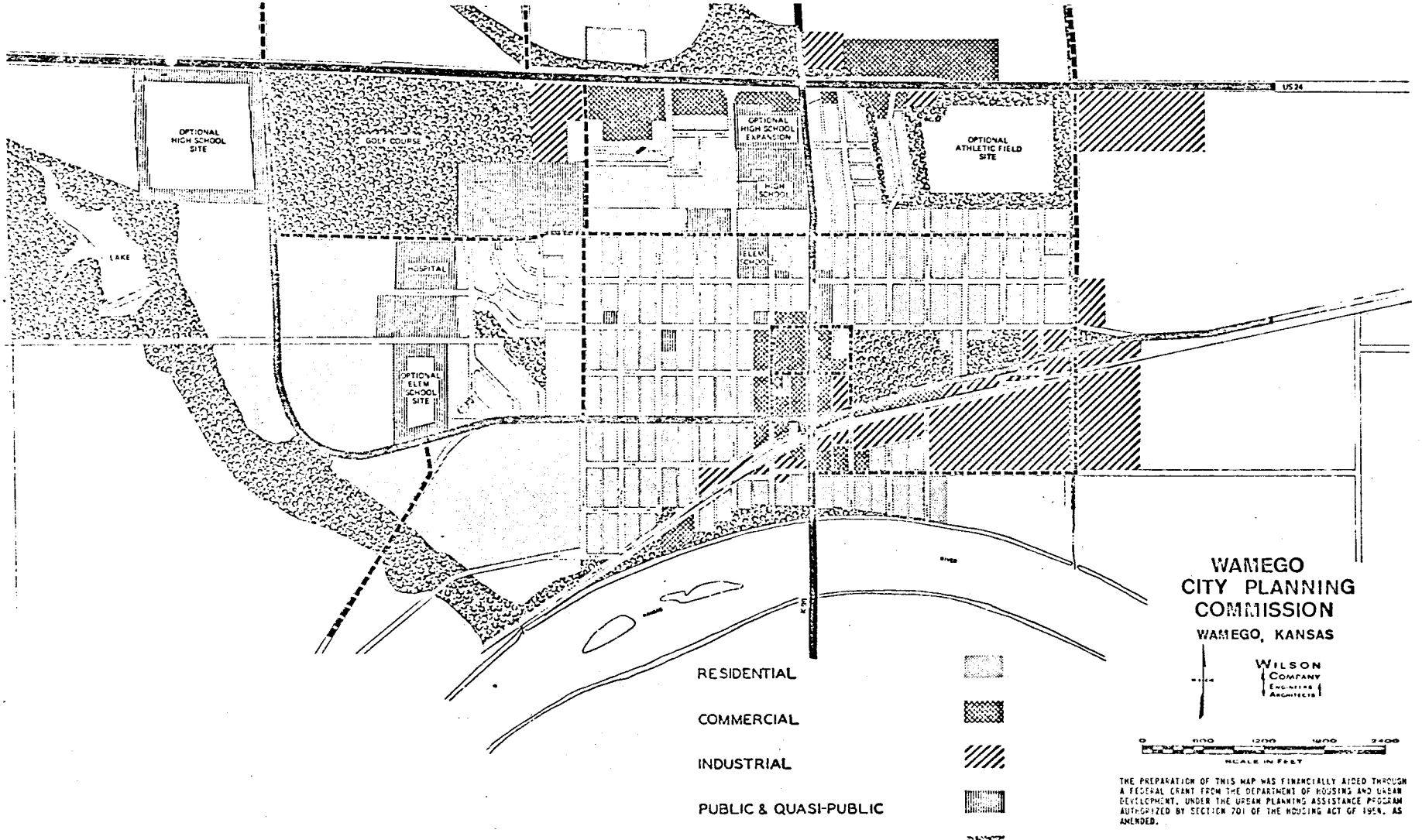
Industrial

Public & Quasi Public

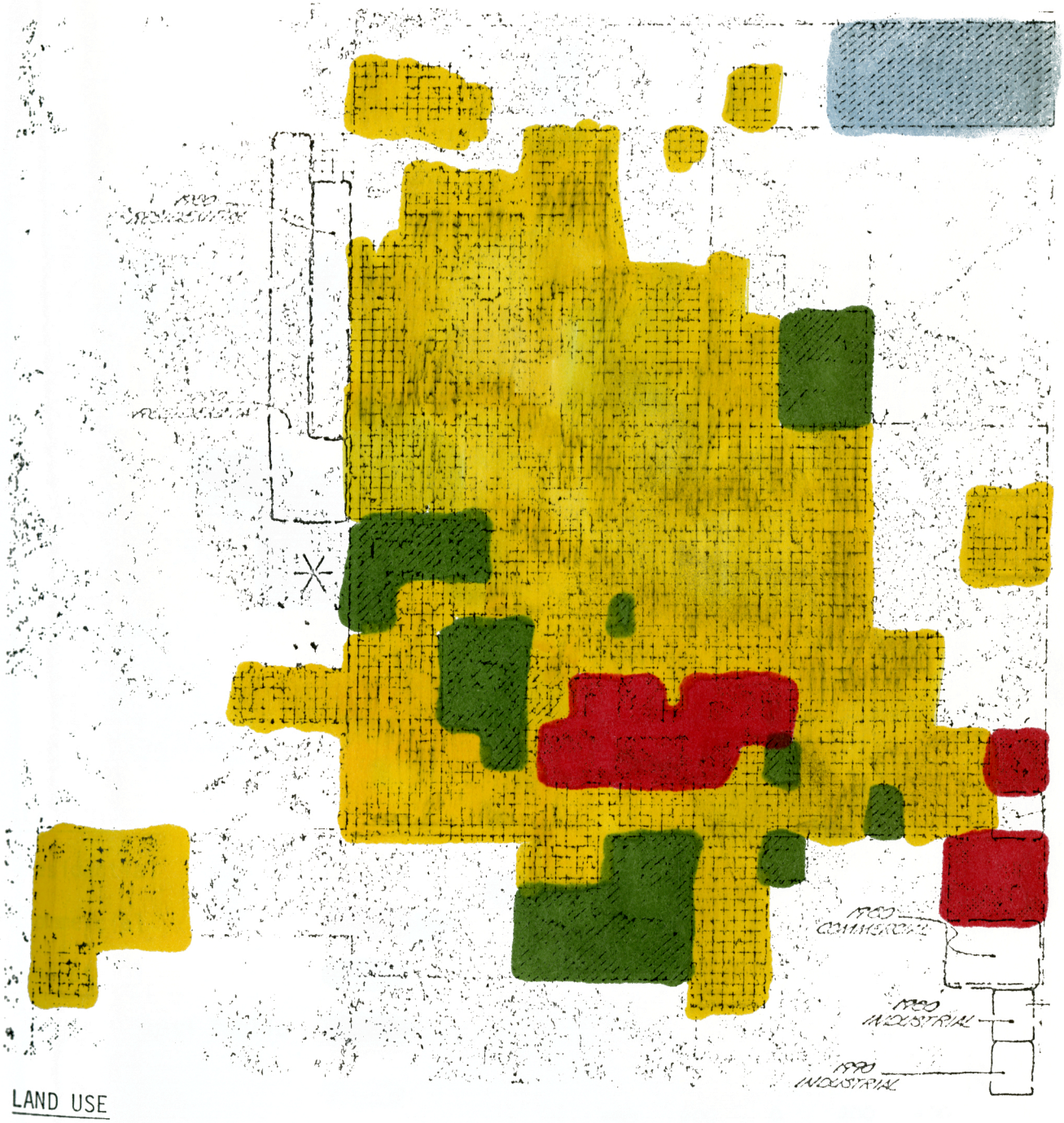
1980 Public

1990 Public

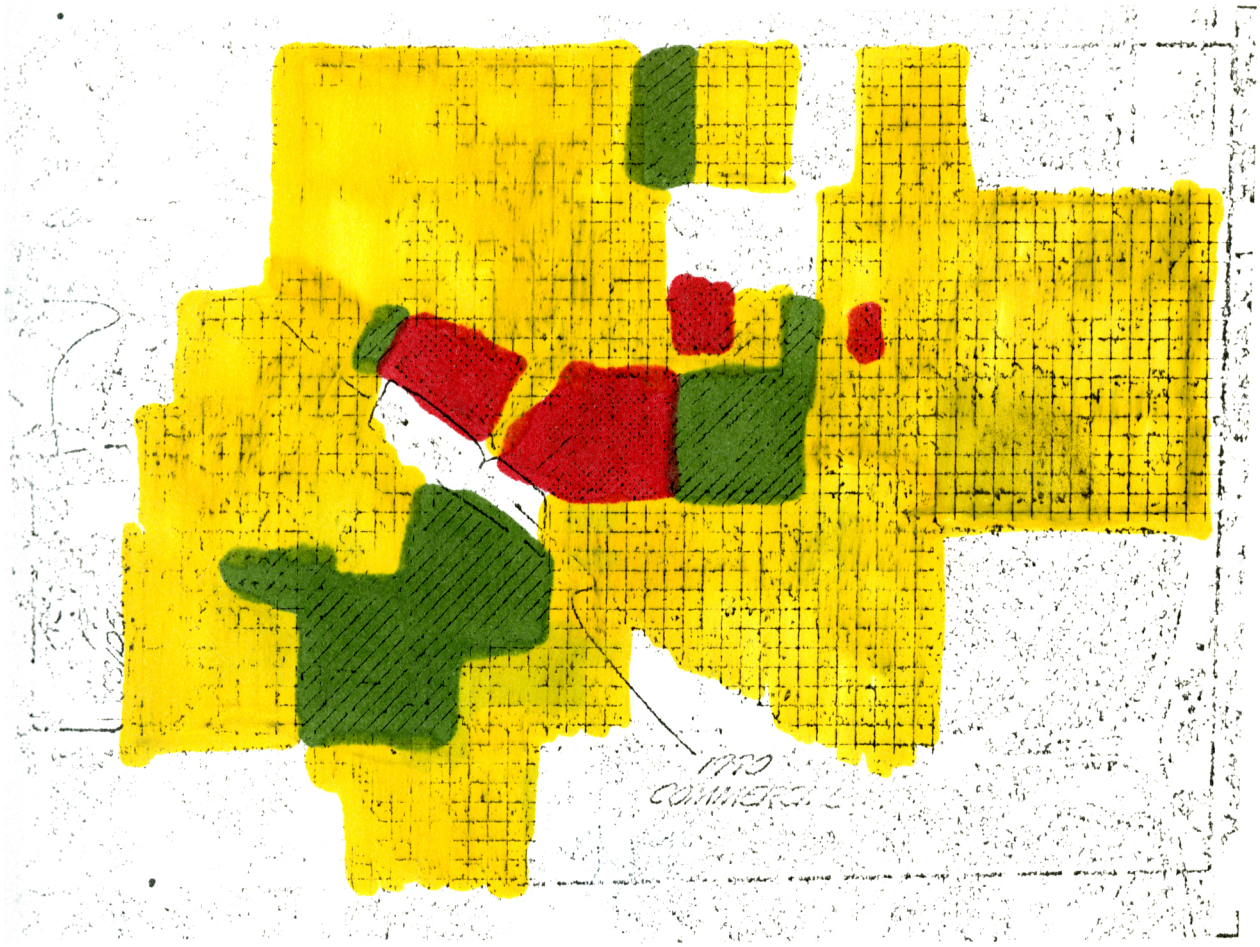
Map 10.-- St. Marys
Source· Pottawatomie-Riley Counties Water and Sewer Plan.




Map 11.-- Wamego
Source: Wamego Comprehensive City Plan.




Map 12.-- Westmoreland
Source· Pottawatomie-Riley Counties Water and Sewer Plan.



Land Use

Residential

Commercial

Industrial

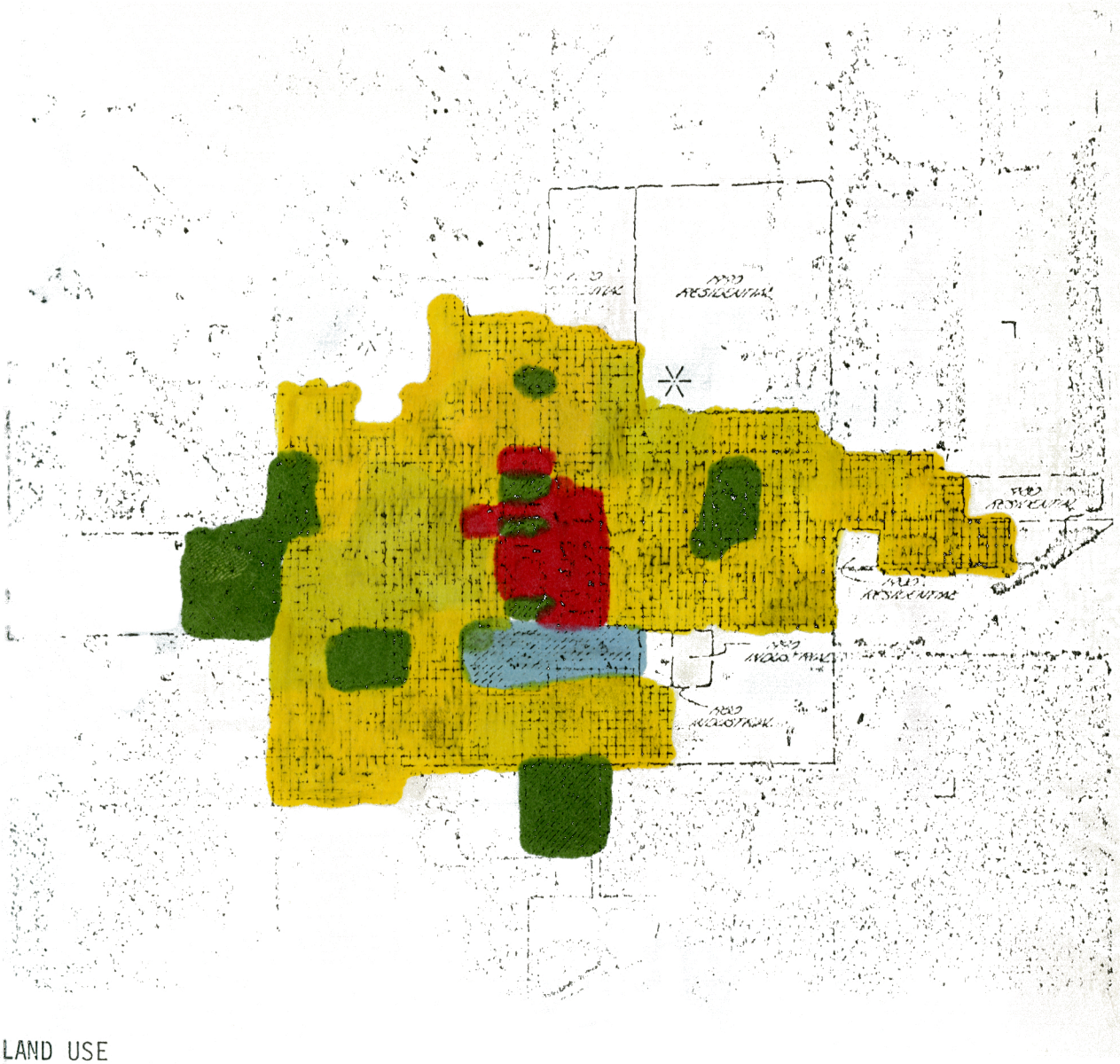
Public & Quasi Public

400 200 0 200 400

SCALE IN FEET

N

Map 13.-- Wheaton
Source Pottawatomie-Riley Counties Water and Sewer Plan.



LAND USE

Residential

Commercial

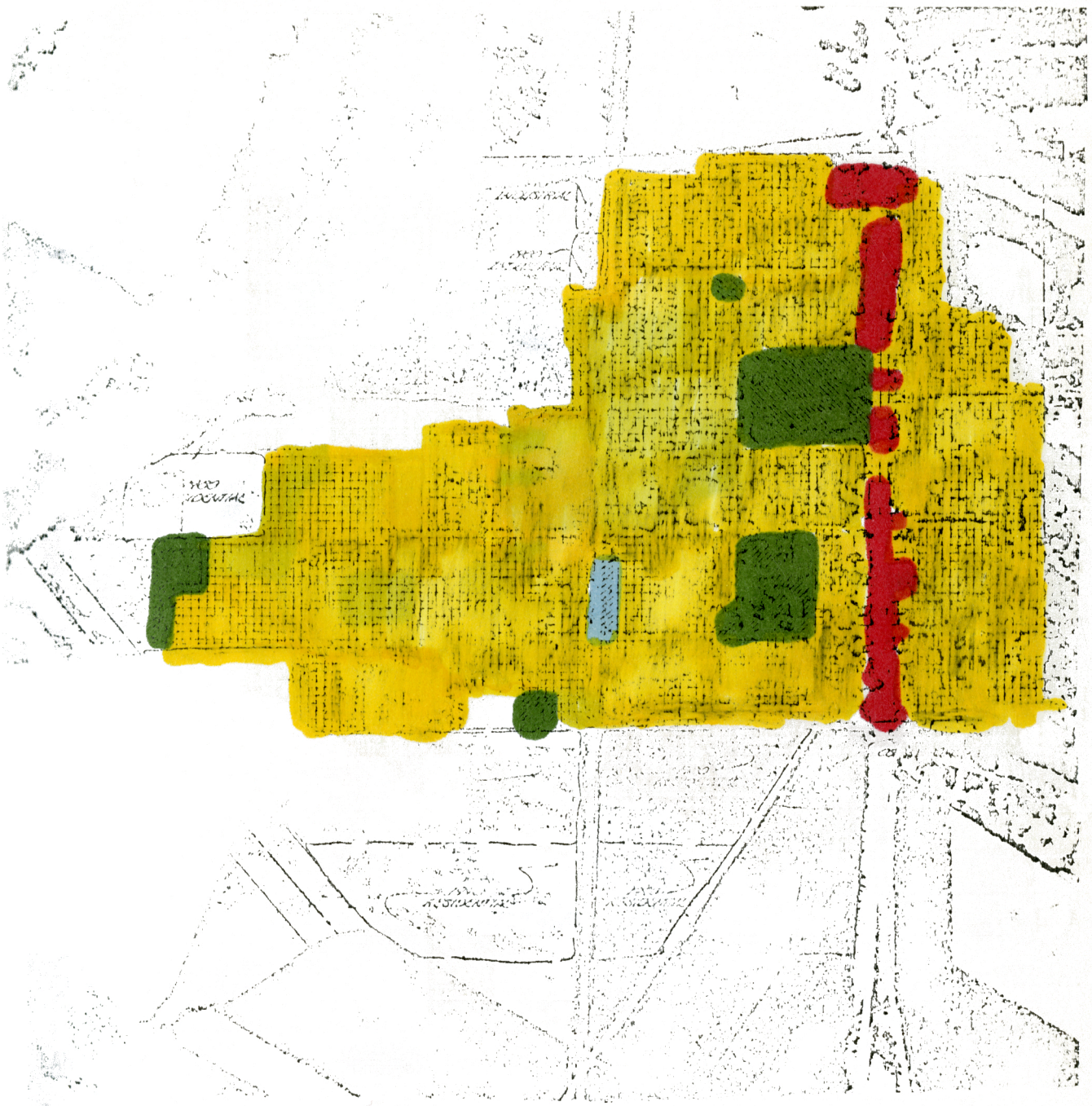
Industrial

Public & Quasi Public

1980 Public

1990 Public

Map 14.-- Leonardville
Source Pottawatomie-Riley Counties Water and Sewer Plan.



LAND USE

Residential

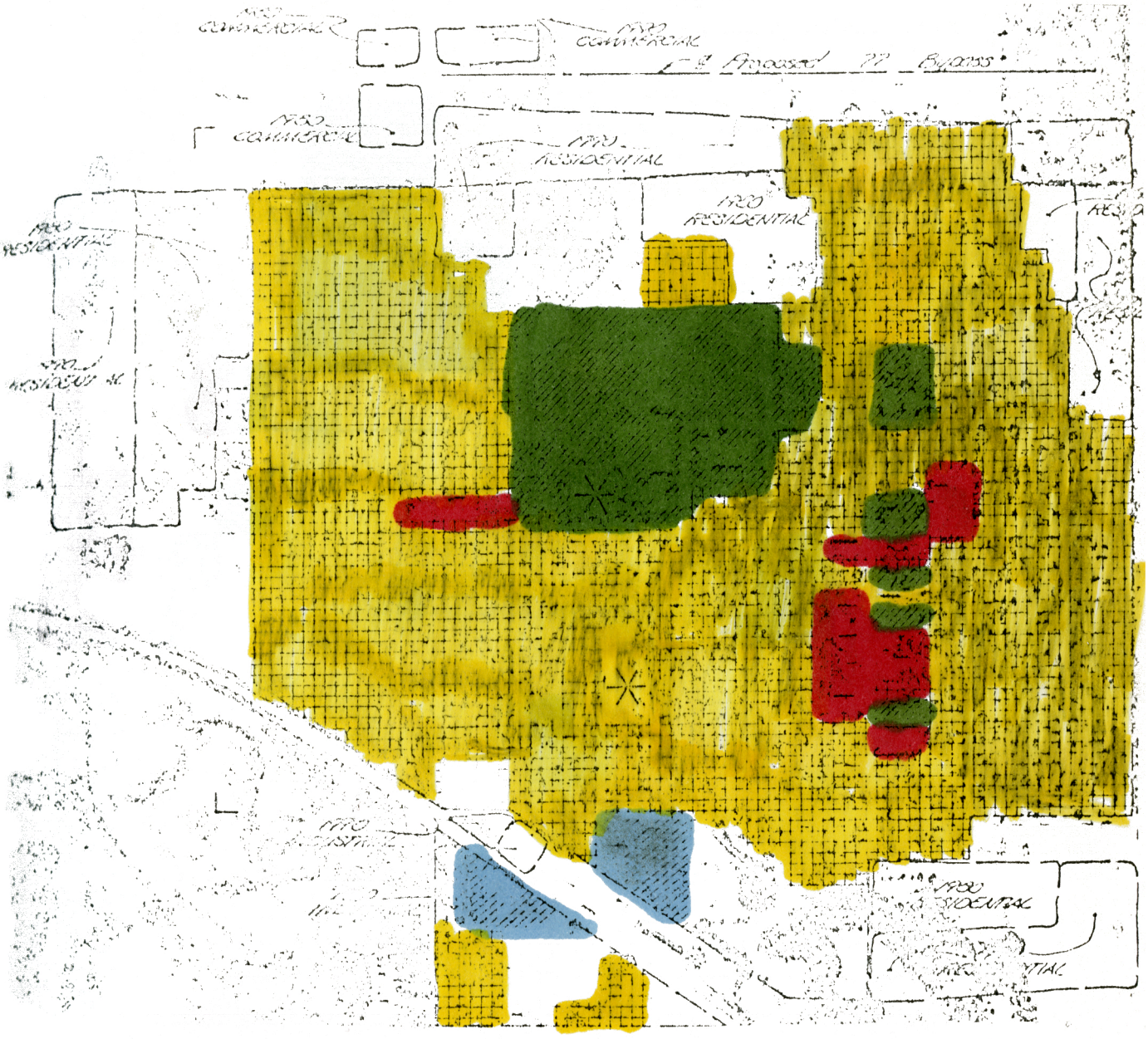
Commercial

Industrial

Public & Quasi Public

1980 Public

Map 15.-- Ogden
Source· Pottawatomie-Riley Counties Water and Sewer Plan.


PROPOSED K-18 BYPASS
1990 COMMERCIAL
1990 RESIDENTIAL
1990 RESIDENTIAL
1990 RESIDENTIAL
1990 RESIDENTIAL
1990 RESIDENTIAL
1990 COMMERCIAL
1990 RESIDENTIAL
1990 RESIDENTIAL
1990 RESIDENTIAL
1990 RESIDENTIAL
1990 RESIDENT




LAND USE

Residential

Commercial

Industrial

Public & Quasi Public

1980 Public

400 200 0 200 400

SCALE IN FEET

N

Map 17.-- Randolph
Source Pottawatomie-Riley Counties Water and Sewer Plan.

TABLE 12

EXISTING LAND USE IN UNINCORPORATED AREAS

| | Residential Acres | Commercial Acres | Industrial Acres | Public Acres | Total Developed Acres |
|---|---|---|---|---|---|
| BLAINE | 17.3 | 2.4 | - | 3.0 | 22.7 |
| DULUTH | 14.0 | 0.9 | - | 4.0 | 18.9 |
| FOSTORIA | 17.4 | 2.0 | - | 3.9 | 23.3 |
| KEATS | 20.3 | 1.6 | - | 7.1 | 29.0 |
| LAKE ELBO | 68.3 | - | - | 1.5 | 69.8 |
| Totals | 137.3 | 6.9 | - | 19.5 | 163.7 |

The small communities of Blaine, Fostoria, and Keats formerly provided the basic retail and commercial needs of the rural areas surrounding the communities. This function no longer is required because of the decline in rural population and the ready access now available to larger nearby towns.

Lake Elbo is a residential area that has developed around a small lake near Manhattan in Pottawatomie County.

## Summary

The second chapter has been a systematic attempt to describe the existing solid waste management systems in the planning area and the communities which must be served. There is much that communities will have to do in order to improve their solid waste management so that the systems can serve the people satisfactorily. Chapter III will be concerned with predicting the amounts of solid waste the region will be handling in the future.

# CHAPTER III

# SOLID WASTES GENERATION PROJECTIONS

## Population

Table 13, "Population Projections," indicates a 32.5 percent increase in the total population within the planning region from 1970 to 1990. "The farm population is projected to decrease 38.0 percent from 1970 to 1990, and non-farm population os projected to increase 38.8 percent within that time period." [15] The major growth centers will be Manhattan, Ogden, Wamego, and St. Mary's. The projected population could be achieved early or late, depending on changes in the economy, fertility ratio, and annexation policies, etc., which were assumed not to change significantly in the next twenty years.

## Solid Waste Generation Projection

The annual average amount of solid waste generated per person was assumed to remain constant over the planning period. The Kansas solid waste generation rate of 4.04 pounds per capita per day represents the amount of waste that was handled by the average solid waste management system in Kansas. The desirable degree of solid waste management service will be computed using the national average of 5.3 pounds per capita per day. [16]

Graph 7 indicates the projection of total solid wastes generated for the total planning region in tons per year. One can visually perceive that there will be a significant increase in the amount of solid waste collected and disposed of within the planning area in the next twenty years.

Graph 8 analyzes the origin of the solid wastes. As indicated by the graph, most growth will take place in the urban areas, therefore, these areas will require more service.

TABLE 13

POPULATION PROJECTIONS

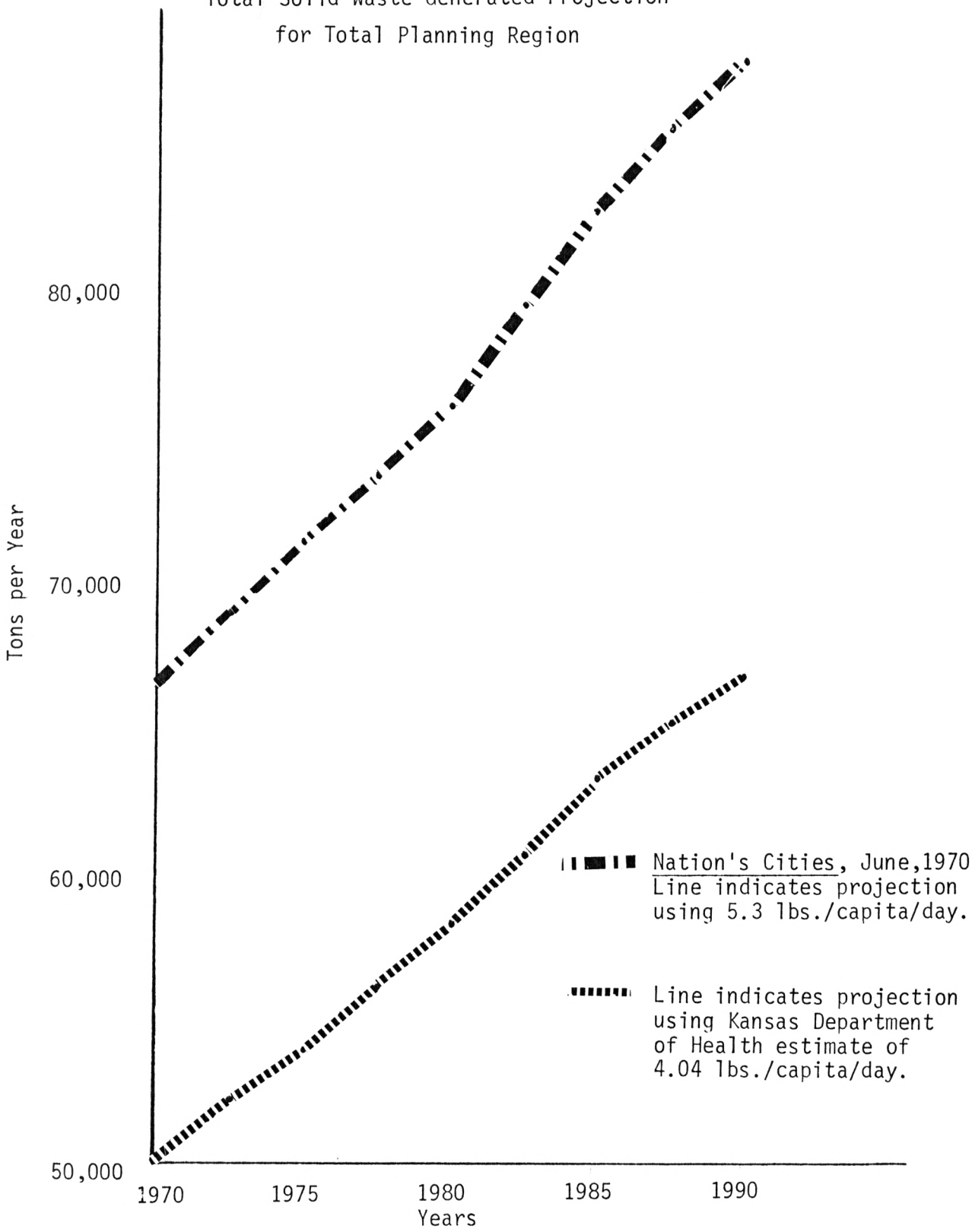
| | 1970 [1] | 1975 | 1980 | 1985 | 1990 |
|---|---|---|---|---|---|
| POTTAWATOMIE CO. | 11,755 | 11,800 | 11,850 | 11,920 | 12,000 |
| Total Non-farm | 8,438 | 8,750 | 9,220 | 9,580 | 9,920 |
| Belvue | 161 | 160 | 160 | 160 | 160 |
| Emmett | 156 | 160 | 170 | 175 | 185 |
| Havensville | 163 | 160 | 155 | 155 | 150 |
| Louisville | 204 | 210 | 210 | 220 | 220 |
| Olsburg | 151 | 160 | 160 | 170 | 175 |
| Onaga | 761 | 780 | 800 | 820 | 850 |
| St. George | 241 | 250 | 250 | 250 | 260 |
| St. Mary's | 1,434 | 1,510 | 1,600 | 1,690 | 1,780 |
| Wamego | 2,507 | 2,650 | 2,790 | 2,930 | 3,080 |
| Westmoreland | 485 | 490 | 510 | 520 | 550 |
| Wheaton | 106 | 110 | 110 | 120 | 120 |
| Other Non-farm [2] | 2,069 | 2,210 | 2,295 | 2,370 | 2,390 |
| Total Farm | 3,317 | 2,950 | 2,630 | 2,340 | 2,080 |
| RILEY CO. | 56,788 | 62,000 | 67,400 | 74,100 | 78,790 |
| Total Non-farm | 54,488 | 60,000 | 65,620 | 72,520 | 77,390 |
| Leonardville | 412 | 480 | 520 | 570 | 620 |
| Ogden | 2,311 | 2,450 | 2,600 | 2,800 | 3,000 |
| Randolph | 106 | 120 | 150 | 170 | 200 |
| Riley | 668 | 710 | 770 | 830 | 890 |
| Manhattan | 27,575 | 34,100 | 37,100 | 40,800 | 43,300 |
| Other Non-farm [2] | 23,416 | 22,140 | 24,480 | 27,350 | 29,380 |
| Total Farm | 2,300 | 2,000 | 1,780 | 1,580 | 1,400 |
| Total Planning Region | 68,543 | 73,800 | 79,250 | 86,020 | 90,790 |
| Total Non-farm [2] | 62,926 | 68,850 | 74,840 | 82,100 | 87,310 |
| Tuttle Creek Reservoir [3] | 650 | 725 | 800 | 875 | 950 |
| Total Farm | 5,617 | 4,950 | 4,410 | 3,920 | 3,480 |

[1] U.S. Bureau of the Census.

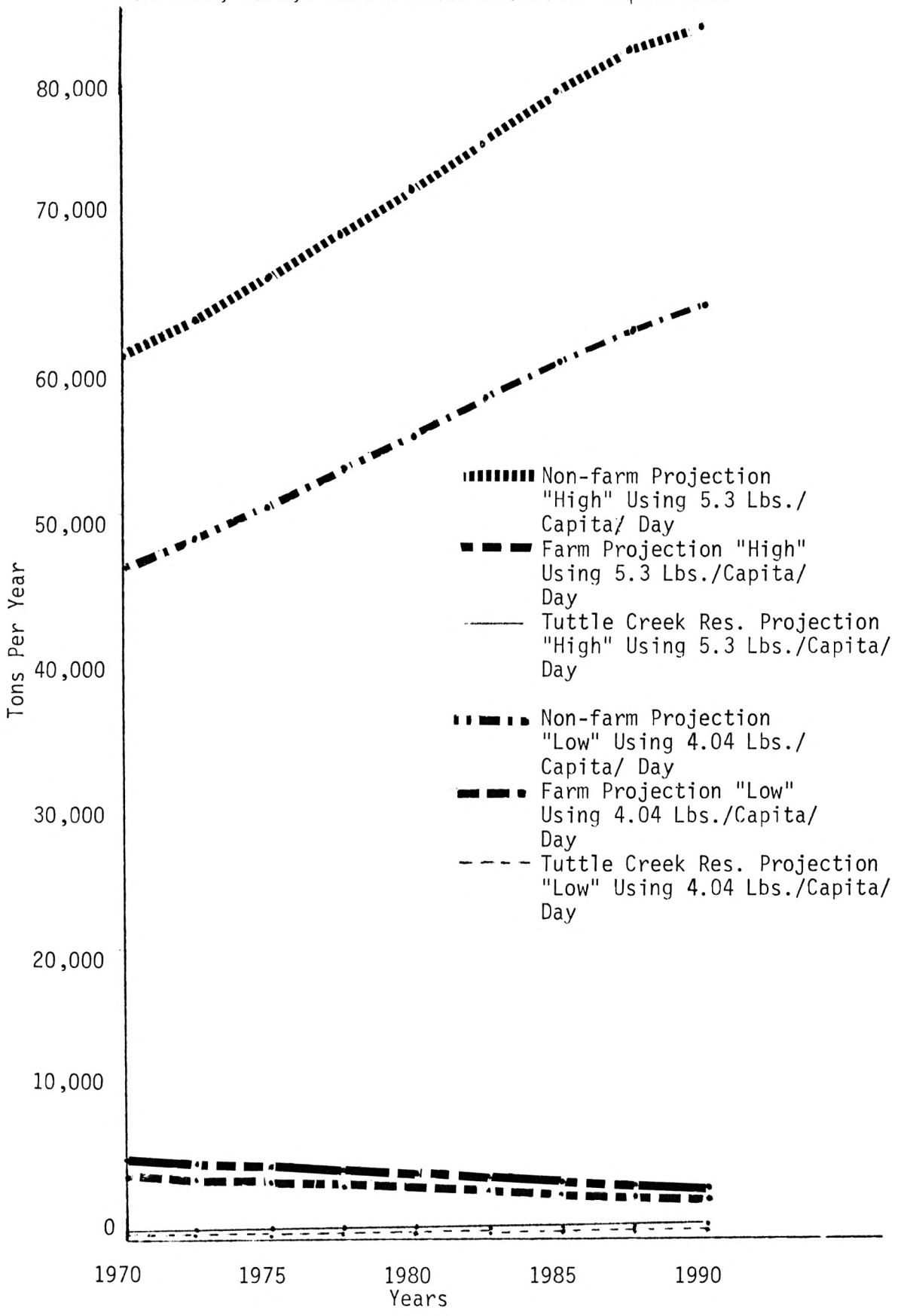
[2] Includes persons residing in communities not included in this study, persons living in unincorporated urbanized areas, and persons residing at Fort Riley.

[3] Present population estimated on the basis of 224 housing units located around the Reservoir at the time of the building conditions survey and 2.9 persons per housing unit reported by the U.S. Bureau of the Census for the total planning region in 1970.

GRAPH 7
Total Solid Waste Generated Projection
for Total Planning Region



Graph 8
Solid Waste Generated Projection:
Non-farm, Farm,& Tuttle Creek Reservoir Population



The rural farm areas will not need as much service if the present out-migration of population continues. Also, the Tuttle Creek Reservoir area demand for service is expected to continue with slight growth over the next twenty years.

Table 14 illustrates the total waste projected for the total planning area, using the national average of 5.3 pounds per capita per day. This indicates the distribution of solid waste generation projections for the next twenty years, and gives the necessary information needed in deriving the amounts of services that will be required in the future.

Table 15 is similar except that the projection was calculated using 4.04 pounds per capita per day. [17]

The demand for greater collection and disposal of more types of solid waste should increase in the future so that the national generation factor would be more reliable for the future predictions and will be a basis for all future prediction in the study, when needed.

There is a variation between the amounts of solid waste estimated by the study to be generated when compared with the disposal reports of the Kansas Board of Health in their 1968 inventory of community disposal sites. This variation was greater than what was caused by the natural increase in population. Most of the variation can be attributed to the practice of burning combustible refuse material in backyard burners, at the dump site, and scattered dumping which took place in smaller communities.

Most of the solid waste will be generated by commercial and residential uses over the next twenty years, as indicated by Table 16.

TABLE 14

TOTAL SOLID WASTE PROJECTION FOR TOTAL PLANNING REGION
IN TONS PER YEAR* (HIGH PROJECTION)

| | 1970 | 1975 | 1980 | 1985 | 1990 |
|---|---|---|---|---|---|
| Total Planning Region | 66,298 | 71,187 | 75,604 | 82,975 | 87,576 |
| Total Non-Farm [2] | 60,698 | 66,413 | 72,191 | 79,194 | 84,219 |
| Tuttle Creek [3] | 627 | 699 | 772 | 842 | 916 |
| Total Farm | 5,418 | 4,775 | 4,252 | 3,781 | 3,357 |
| POTTAWATOMIE CO. | 11,339 | 11,387 | 11,435 | 11,502 | 11,580 |
| Total Non-farm | 8,136 | 8,540 | 8,897 | 9,245 | 9,573 |
| Belvue | 155 | 154 | 154 | 154 | 154 |
| Emmett | 150 | 154 | 164 | 168 | 179 |
| Havensville | 157 | 154 | 149 | 149 | 148 |
| Louisville | 196 | 203 | 203 | 212 | 212 |
| Olsburg | 146 | 154 | 154 | 164 | 169 |
| Onaga | 734 | 753 | 780 | 791 | 820 |
| St. George | 232 | 241 | 241 | 241 | 251 |
| St. Mary's | 1,384 | 1,457 | 1,544 | 1,631 | 1,718 |
| Wamego | 2,419 | 2,557 | 2,692 | 2,827 | 2,972 |
| Westmoreland | 468 | 472 | 492 | 502 | 531 |
| Wheaton | 102 | 106 | 106 | 116 | 116 |
| Other Non-farm [2] | 1,997 | 2,132 | 2,214 | 2,287 | 2,306 |
| Total Farm | 3,200 | 2,847 | 2,538 | 2,258 | 2,007 |
| RILEY CO. | 54,800 | 59,830 | 65,041 | 71,506 | 76,032 |
| Total Non-farm | 52,581 | 57,900 | 63,323 | 69,981 | 74,681 |
| Leonardville | 398 | 463 | 501 | 550 | 598 |
| Ogden | 2,230 | 2,364 | 2,509 | 2,702 | 2,895 |
| Randolph | 102 | 116 | 145 | 164 | 193 |
| Riley | 645 | 685 | 743 | 801 | 859 |
| Manhattan | 26,609 | 32,907 | 35,802 | 39,372 | 41,785 |
| Other Non-farm [2] | 22,596 | 21,365 | 23,623 | 26,393 | 28,352 |
| Total Farm | 2,220 | 1,930 | 1,718 | 1,525 | 1,525 |

*These projections were calculated using 5.3 pounds per capita per day solid waste generation rate, Nation's Cities, June, 1970.

TABLE 15

TOTAL SOLID WASTE PROJECTION FOR ENTIRE PLANNING REGION
IN TONS PER YEAR* (PROBABLE PROJECTION)

| | 1970 | 1975 | 1980 | 1985 | 1990 |
|---|---|---|---|---|---|
| Total Planning Region | 50,398 | 53,859 | 58,271 | 63,291 | 66,756 |
| Total Non-farm [2] | 46,268 | 50,624 | 55,028 | 60,366 | 54,197 |
| Tuttle Creek [3] | 478 | 533 | 588 | 643 | 699 |
| Total Farm | 4,130 | 3,640 | 3,242 | 2,882 | 2,559 |
| POTTAWATOMIE CO. | 8,663 | 8,697 | 8,734 | 8,785 | 8,844 |
| Total Non-farm | 6,219 | 6,522 | 6,798 | 7,060 | 7,311 |
| Belvue | 119 | 118 | 118 | 118 | 118 |
| Emmett | 115 | 118 | 125 | 129 | 136 |
| Havensville | 120 | 118 | 114 | 114 | 111 |
| Louisville | 150 | 154 | 155 | 162 | 162 |
| Olsburg | 111 | 118 | 118 | 125 | 129 |
| Onaga | 561 | 574 | 590 | 604 | 627 |
| St. George | 178 | 184 | 184 | 184 | 192 |
| St. Mary's | 1,057 | 1,113 | 1,179 | 1,246 | 1,312 |
| Wamego | 1,848 | 1,953 | 2,056 | 2,159 | 2,270 |
| Westmoreland | 357 | 361 | 376 | 383 | 405 |
| Wheaton | 78 | 81 | 81 | 88 | 88 |
| Other Non-farm [2] | 1,524 | 1,629 | 1,691 | 1,747 | 1,761 |
| Total Farm | 2,444 | 2,174 | 1,938 | 1,725 | 1,533 |
| RILEY CO. | 41,852 | 45,694 | 49,674 | 54,612 | 58,068 |
| Total Non-farm | 40,158 | 44,220 | 48,362 | 53,447 | 57,036 |
| Leonardville | 304 | 354 | 383 | 420 | 457 |
| Ogden | 2,445 | 1,806 | 1,916 | 2,064 | 2,211 |
| Randolph | 78 | 88 | 111 | 125 | 147 |
| Riley | 492 | 523 | 567 | 612 | 656 |
| Manhattan | 20,322 | 25,132 | 27,343 | 30,070 | 31,912 |
| Other Non-farm [2] | 17,257 | 16,317 | 18,041 | 20,157 | 21,653 |
| Total Farm | 1,694 | 1,474 | 1,312 | 1,165 | 1,032 |

*These projections were calculated using 4.04 pounds per capita per day solid waste generation rate, Kansas State Board of Health, 1971.

TABLE 16

SOLID WASTE GENERATION - TOTAL PLANNING AREA
(TONS PER YEAR)

| Using National Average .74 | 1970 | 1975 | 1980 | 1985 | 1990 |
|---|---|---|---|---|---|
| Residential and Commercial | 50,722 | 54,612 | 58,645 | 63,655 | 67,185 |
| Industrial | 690 | 740 | 786 | 863 | 910 |
| Other | 14,866 | 15,835 | 16,173 | 18,457 | 19,481 |
| Total | 66,298 | 71,187 | 75,604 | 82,975 | 87,576 |

| Using State Computed Average .56 | 1970 | 1975 | 1980 | 1985 | 1990 |
|---|---|---|---|---|---|
| Residential and Commercial | 38,384 | 41,328 | 44,380 | 48,171 | 50,842 |
| Industrial | 690 | 738 | 798 | 867 | 914 |
| Other | 11,324 | 11,793 | 13,093 | 14,253 | 15,000 |
| Total | 50,398 | 53,859 | 58,271 | 63,291 | 66,756 |

## The Center of Solid Waste Generation

The calculation of the centroid of population distribution within the planning region is a significant determinant in the selection of an area worthy of consideration as a solid waste disposal site. The location of a disposal facility in the approximate centroid of population for the planning area would result in

1. The most economical transportation cost for the solid waste collection system.
2. More efficient utilization of disposal equipment (one central disposal site in lieu of several smaller, scattered sites).

The centroid of population was calculated for 1970 and then for 1990 using the mathematical logic shown here.

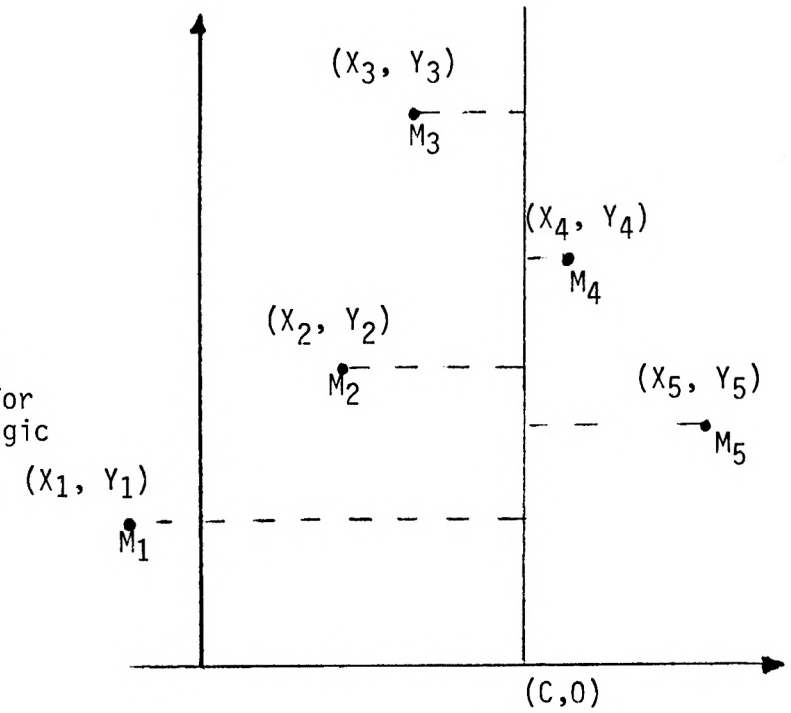



Fig. 5--Centroid

Now particles of masses, $M_1$, $M_2$ ....., $M_n$, i.e., magnitude of the population for the different communities, were found to be located at points $(X_1, Y_1)$, $(X_2, Y_2)$ ...., $(X_n, Y_n)$ in a plane considered as lying horizontal. Then the number L was selected and we let L be a line through point (c,o) perpendicular to the X axis. By definition, the numbers $(X_1\text{-}C)\ M_1$, $(X_2\text{-}C)\ M_2$ ...., $(X_n\text{-}C)\ M_n$ are the first moments relative to L of the individual masses.

$$M_L = (X_1\text{-}C)\ M_1 + (X_2\text{-}C)\ M_2 + .... + (X_n\text{-}C)\ M_n =$$

$$\sum_{K=1}^{n} X_k \quad M_k \quad - \quad C \quad \sum_{K=1}^{n} \quad M_k$$

is the first moment relative to L of the system, and the solution

$$\bar{X} = \frac{\left( \sum_{K=1}^{n} X_k \; M_k \right)}{\sum_{K=1}^{n} M_k}$$

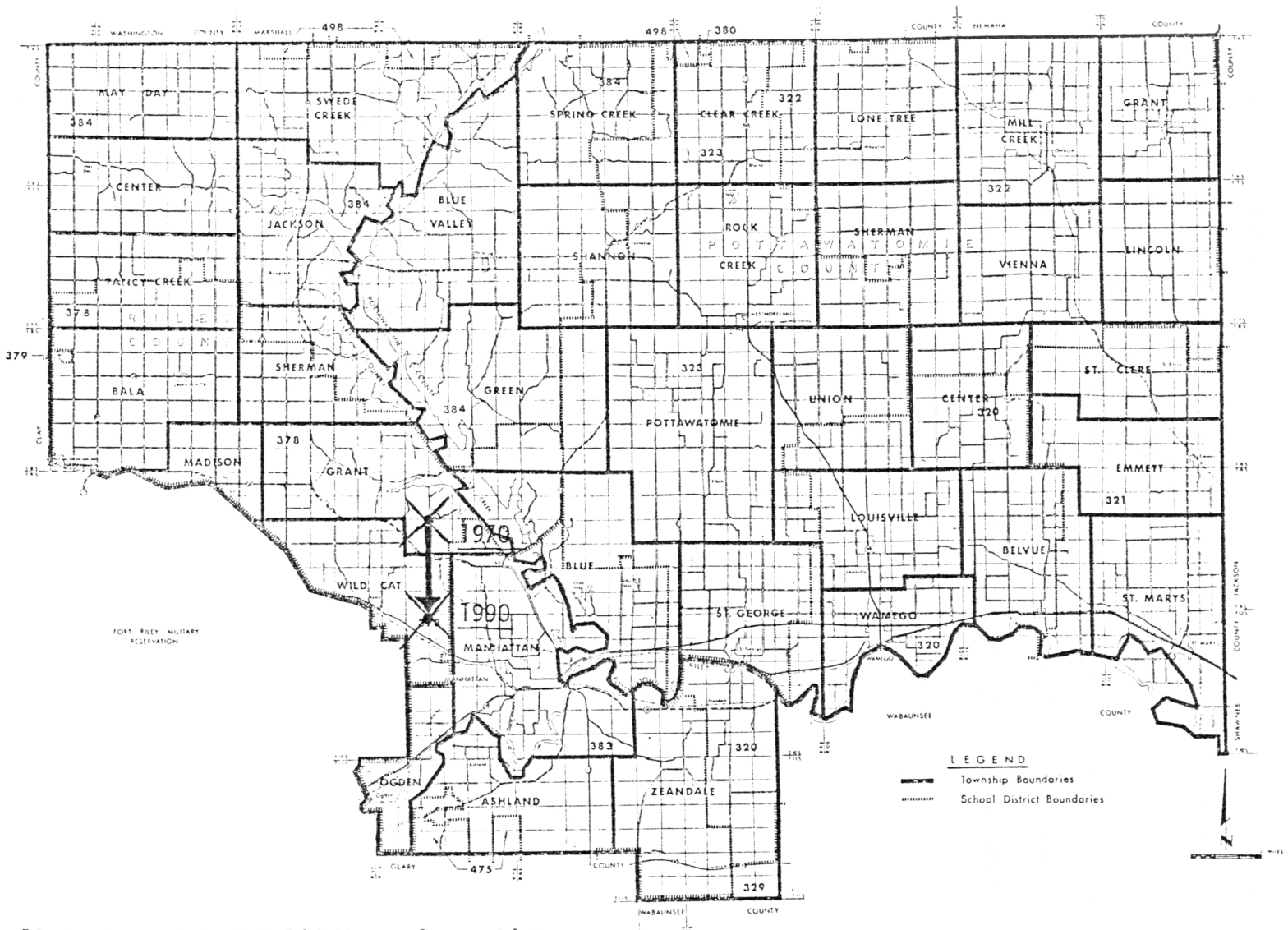
of the equation $M_L = 0$ for C is called the abscissa of the centroid of the system. In the same way, the first moments relative to the line perpendicular to the Y-axis are defined, and the point $(\bar{X}, \bar{Y})$ where

$$\bar{Y} = \frac{\left( \sum_{K=1}^{n} Y_k \; M_k \right)}{\sum_{K=1}^{n} M_k}$$

is called the centroid, or center of mass of the system.

This same mathematical logic was applied in deriving the centroid of population. The populations of the different communities were known. A rectangle coordinate system was then superimposed over a map of the region. The unique rectangle coordinate for each town and rural population were then inserted into the preceeding formulas along with the numeric population of each town.

The present centroid of all waste generated was computed in this study to be northwest of Manhattan. This centroid will move to near the Tuttle Creek Dam by 1990. This center should play a significant factor in the selection of a solid waste disposal site. Map 18 illustrates graphically the movement of the solid waste generation center in the twenty-year planning period Other factors also will be considered in the final selection of a disposal site.




Map 18.-- Centroid of Solid Waste Generation
for the Total Planning Region

## Summary

The purpose of Chapter III is to define the amounts of solid waste which must be accommodated by the solid waste management system in the future, and to distribute the solid waste projection over the planning area geographically. It was postulated that the amount of solid waste generated would be in direct proportion to the size of population. The derivation completed in this chapter will provide the framework upon which a solid waste management plan can be formulated.

# CHAPTER IV

## FUTURE REGIONAL SOLID WASTE MANAGEMENT SYSTEM ALTERNATIVES

This chapter discusses the operation of the storage, collection, and disposal systems. It is designed to assist the elected officials and solid waste management advisory committees in the selection of alternative solid waste management systems.

"The goal of a solid waste management system is to maintain a healthful and aesthetically pleasing environment by providing for the regulation and operation of the best and most efficient system the community can afford." [18]

## Storage of Solid Waste

### Urban Areas

All residential units, business establishments, and industrial plants must meet the following standards in storage of solid waste so that:

"(1) It does not attract rats, flies, mosquitoes, or other vectors,

(2) It does not provide shelter or a breeding place for vectors,

(3) It does not create a health or safety hazard,

(4) It is not unsightly, and,

(5) The production of offensive odors is minimized." [19]

The planning area communities may provide the storage container or they may let the individual owner be responsible for the storage of solid waste.

The Kansas State Health regulations also specify the following: "(1) The container must be rigid, durable, rust-resistant, nonabsorbent, watertight, and rodent-proof, or (2) rigid containers equipped with disposable liners made of reinforced Kraft paper or polyethylene or other type of material

designed for the storage of garbage; or (3) another alternative is just using Kraft paper or polyethylene storage bags for the storage of garbage. There must be some type of apparatus to support and seal the bag." [20]

It is recommended that both counties require the use of the reinforced Kraft paper disposal bags or polyethylene for storage of garbage by providing them to customers at a charge of $1.75 per month or by ordinance requiring usage of the bags.

The use of such bags reduces the possibility of back injuries and hernias among the collection service staff. The City Manager of Junction City, Kansas, reported that after initiation of the paper bag system, insurance rates for refuse collectors dropped from $16,000 annually to $7,200. [21] Even in rural collection, the inhabitants should bring their garbage to the convenient collection terminals in these bags because of the health factor.

*The plastic bags shown at curbside are used for residential collection in Mount Prospect, Ill. In Rockbridge County (Lexington), Va., sturdy, raised metal cans are used for residental storage.*



Fig. 6--Storage Containers
Illustration reproduced by permission of Michael K. Gemmel, Director of Contract Research, National Association of Counties, Solid Waste Management.

### Rural Areas

The rural areas of the planning area cannot economically maintain a house-to-house collection and transport system because of the sparsely-settled regions and communities.

Our proposal calls for a rural collection system utilizing four (4) cubic yard bulk storage containers placed at roadside or intersection locations so that most residents would have to bring wastes no further than four miles to a container. Each householder would be required to bring all his refuse and other solid waste to the nearest container which is emptied twice a week. The containers may be serviced twice weekly by a large compactor truck capable of hoisting and emptying the containers in place. The collected refuse then goes to a transfer station or a disposal facility. The rural solid waste management systems will be developed fully in the next section. The system is an adaptation of a model solid waste collection and disposal system for rural areas which has proven successful in Chilton County, Alabama.

## Collection System Alternatives

### Urban

The Regional Planning Commission has several choices in regard to a collection system in the urban residential areas.

The collection system is affected by the method of storage, pickup point requirement, kind of waste, kind of equipment, labor available, and cost. The service provided influences the crew size per truck, as does truck capacity and travel time. [22]

When the standard storage containers are utilized as mentioned in the previous section, there are five (5) major methods of collective service: curb service; alley service; set out, set back service; set out service; and

backyard carry service. Following is a brief explanation of each method of collection:

Curb Service

The homeowner places his refuse in containers at the front curb of his property on the scheduled collection day. The refuse collecting crew deposits the solid waste in their vehicle and replaces the container at the curb. The homeowner has the responsibility of returning the emptied container to its normal place.

Alley Service

The solid wastes are stored in containers on the homeowner's property near the alley. The collection crew empties the containers and returns them to their proper place. Many new residential developments lack alleys which would eliminate this method from consideration.

Set Out, Set Back Service

The "set out" men go to homes and take the full trash cans from the yard to the curbline; other men stay with the truck to empty cans; "set back" men return the empty cans to the owner's yard.

Set Out Service

The collector brings the waste container from the yard to the curb and empties it. The homeowner is then responsible for carrying the container back to his storage area.

Backyard Carry Service

The collector carries a tote bin or burlap cloth to the yard, empties the container into the bin or carry cloth, and carries the solid wastes to the collection vehicle.

## Collection System Evaluation

These five basic methods are in wide use throughout the United States with certain modifications. The following Table 17 compares the basic methods of residential collection services.

Either the set out service or the backyard carry service collection methods could provide the community with acceptable service at medium cost. The frequency of collection should be twice weekly in the Manhattan area so that odors and pests associated with solid waste would be kept minimal.

The Regional Planning Commission has four (4) major alternatives from which to select the most suitable administrative method. These are county controlled, franchise systems, private enterprise collection system, and community controlled.

TABLE 18

ANALYSIS OF COLLECTION ADMINISTRATIVE SYSTEMS

| Administrative Body | Initial cost to the public | Over-all Cost | Service | Efficiency |
|---|---|---|---|---|
| County | High | Low | Good | Good |
| Private enterprise | Low | High | Fair | Poor |
| Franchise | Low | Medium | Good | Good |
| Community | High | Low | Good | Good |

This study recommends that the communities or counties take the responsibility for administering the residential collection system in the two-county area.

TABLE 17

COMPARISON OF RESIDENTIAL COLLECTION SERVICES

| Considerations | TYPE OF SERVICE | | | | |
|---|---|---|---|---|---|
| | Curb Service | Alley Service | Set-out Set-back Service | Set-out Service | Backyard Carry Service |
| Requires homeowner cooperation: | | | | | |
| a) to carry empty cans | Yes | Optional | No | Yes | No |
| b) to carry full cans | Yes | Optional | No | No | No |
| Requires scheduled service for homeowner cooperation | Yes | No | No | Yes | No |
| Poor aesthetically: | | | | | |
| a) spillage and litter problem | High | High | Low | High | Low |
| b) cans visible | Yes | No | No | Yes | No |
| Attractive to scavengers | Yes | Highest | No | No | No |
| Prone to upsets | Yes | Yes | No | Yes | No |
| Average crew size required for efficiency* | 1-3 Men | 1-3 Men | 3-7 Men | 1-5 Men | 3-5 Men |
| Crew Time* | Low | Low | Great | Medium | Medium |
| Collector injury rate due to lifting and carrying | Low | Low | High | Medium | High |
| Trespassing complaints | Low | Low | High | High | High |
| Special considerations | | Requires alleys and vehicles that can maneuver in them; less prone to block traffic; high vehicle and can depreciation rate | | | Requires wheeled caddy to roll filled barrels or the use of burlap carry cloth or hand carry bin; works best with driveway |
| Evaluation based on service to homeowners; cost due to crew size and time requirements | Fair Service, Low Cost | Fair service, low cost | Good service, high cost | Fair service, medium cost | Good service, medium cost |

*Presumes use of standard compactor vehicle.

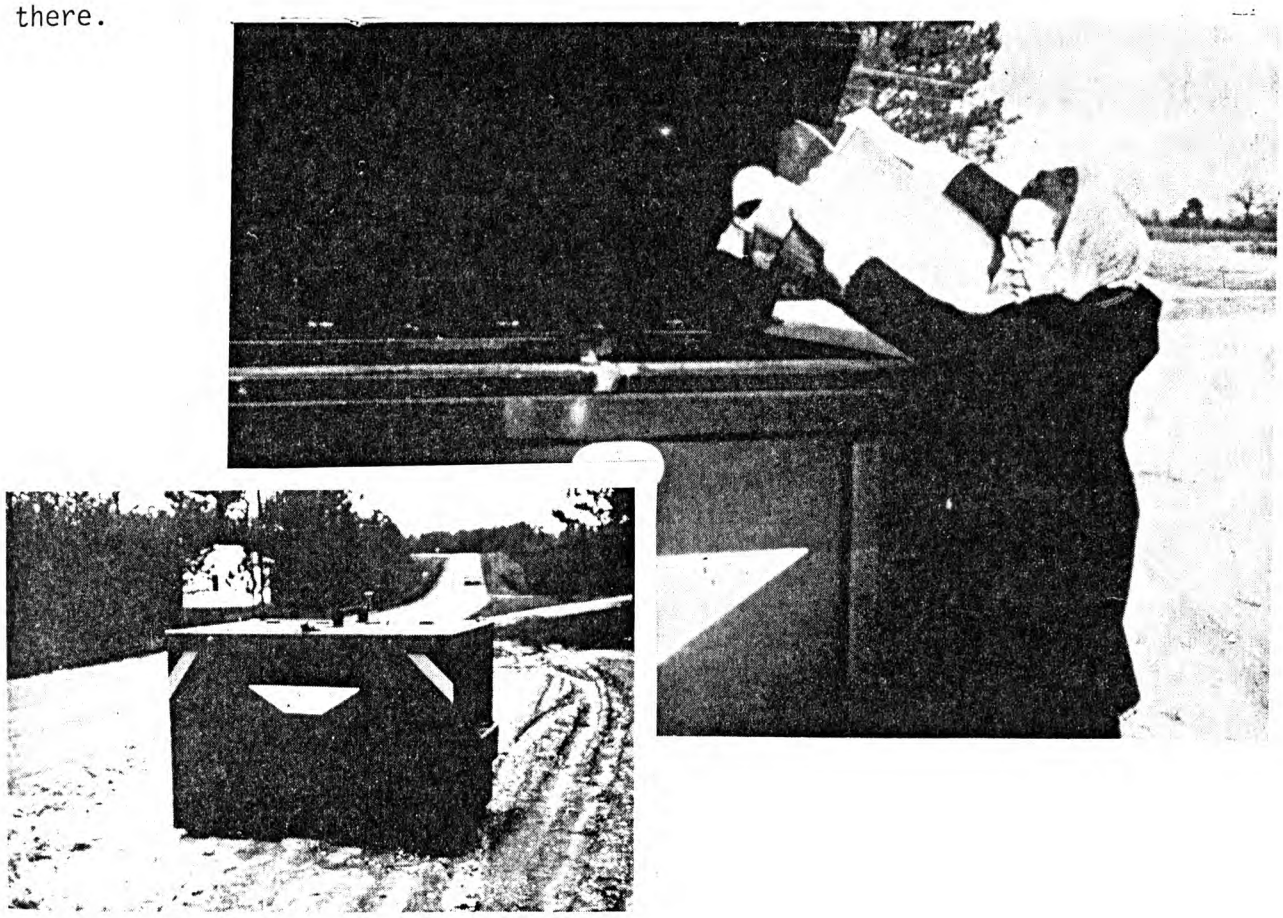
Source: National Association of Counties' Research Foundation, Solid Waste Management.

Industries, commercial as well as public institutions, could utilize the collection system or contract to private haulers. In the smaller communities, the collection systems that were selected in the previous paragraph could accommodate commercial and industrial solid wastes.

## Rural Collection System

### Chilton County, Alabama, Collection System

"Clean and Green," the slogan for Chilton County, Alabama's system for collection and disposal of solid waste, has become a descriptive term for the verdant way in which solid waste management principles have been demonstrated there.



Four-cubic-yard container at temporary location (later to be paved) shows identification and reflective striping.

Fig. 7--Solid Waste System in Chilton County, Alabama
Illustrations reproduced by permission of Michael A. Oberman (Ed.) Waste Age; Sept.-Oct., 1970.



Fig. 8--Rural Collection Truck
Illustration reproduced by permission of Michael A. Oberman (Ed.) Waste Age; Sept.-Oct., 1970.

"No less than 15 county-wide solid waste disposal systems, similar to or patterned after the Chilton County project began June 1, 1968. Inception of the new county-wide systems was stimulated through visits to the Chilton County demonstration by public health and public works representatives and by elected officials. To date, about 800 visitors from 24 states have made on-site inspections of the project, which has proven to be an outstanding demonstration of effective planning, operation, and management." [23]

Early in 1968, the Chilton County Board of Revenue and Control discussed with HEW Regional Solid Waste's program staff the possibility of funding a county-wide solid waste management project under the demonstration project

provisions of the Solid Waste Disposal Act of 1965. Included in their final application was a central sanitary landfill, a bulk collection system, and provision for making the project accessible to other areas in the Southeast and the Nation as a model "showcase" operation. The project was funded for three years with the budget broken down as follows: $189,600 from the Bureau of Solid Waste Management, and $106,685 from local source. After the third year, the project became self-supporting.

The local health department, et. al., determined that "the communities would continue their twice-weekly collection of solid waste but would close their dumps, eliminate refuse burning, and bring the waste free of charge to the central sanitary landfill. In the rural areas, bulk containers, each capable of receiving four (4) cubic yards of wastes, were to be placed at roadside or intersection locations so that most residents would have to bring wastes no more than three (3) miles to a container. The containers were to be serviced twice weekly by a large compactor truck capable of hoisting and emptying the containers in place, taking collected refuse to the central landfill." [24]

There are now 92 solid waste storage containers placed throughout the county. Most of them are located in paved roadside areas and are served every second day by the collection truck. The collection truck travels a 112-mile route on each of two routes, serving one route daily. On the average, a truckload equals the contents of approximately 25 containers. The storage container lids open from the top. The green metal containers are marked prominently and are striped with reflective tape. As of this date, there has been no significant vandalism of the containers.

The collection system has functioned well. No major breakdown of equipment has occurred, and the collection vehicle has been able to make its rounds

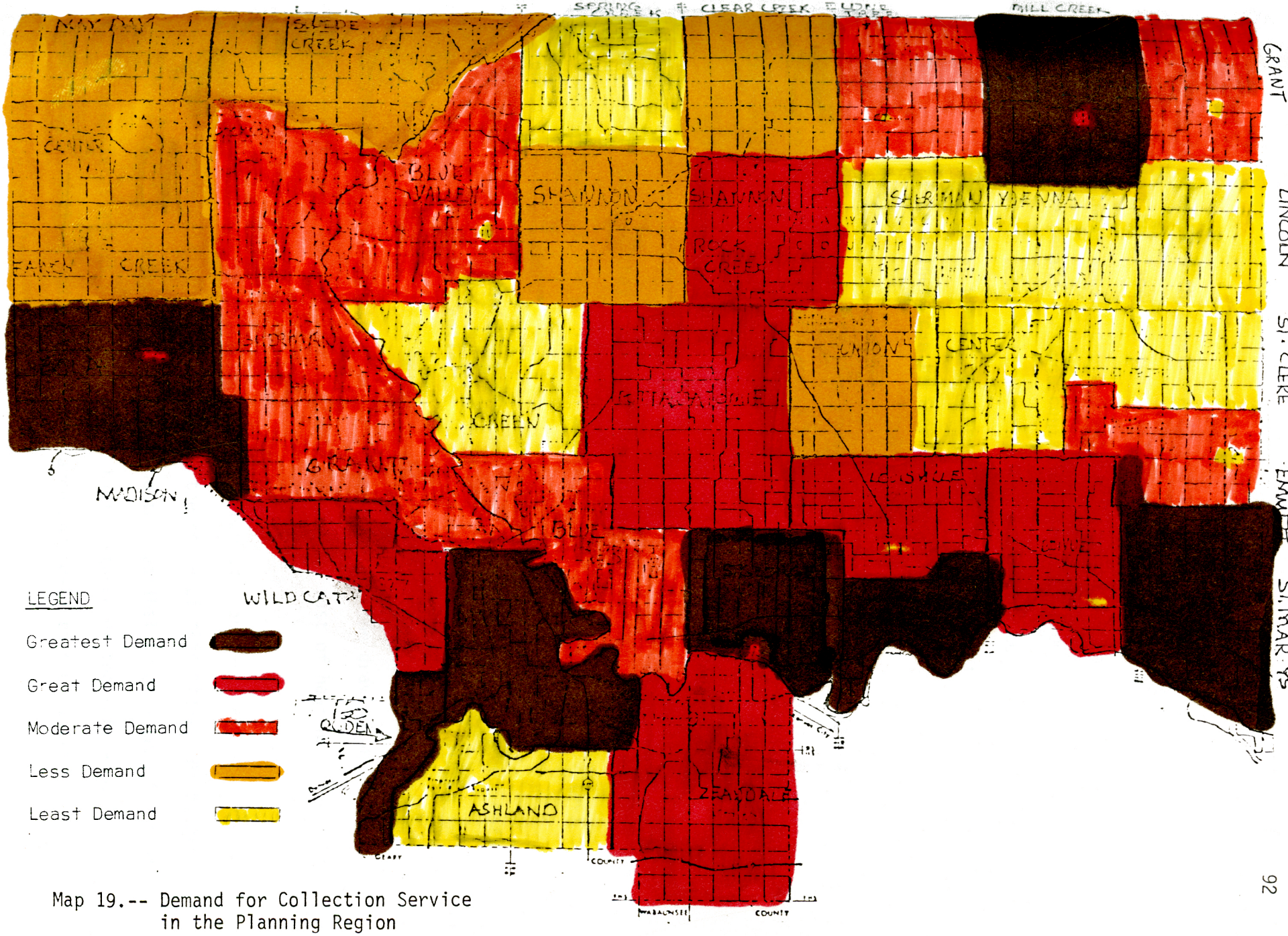
on schedule. Containers can be hoisted and emptied in less than two (2) minutes. The green box collection system demonstrated in Chilton County is the system used as a model by many rural counties.

Rural Collection System Evaluation

As previously mentioned in the first portion of this chapter, the solid waste planning is not only for the urban communities, but for the entire region. Persons living in the rural areas of the planning region deserve to have an adequate method of disposing of their solid wastes. One obvious obstacle is a small population scattered over a large area. For example, Spring Creek township and St. Clare township in Pottawatomie County have less than one hundred inhabitants. The level of service to rural areas cannot be as high as urban areas because of transportation costs.

Solid waste storage containers would be provided within four miles of most rural residents. The storage containers would be a four cubic yard size and would be emptied twice weekly into a 30-yard compactor truck.

One of the first considerations in developing a rural collection system is the demand for solid waste collection service in the planning region. Map 19 illustrates visually where the demand is by rural inhabitants for collection services. This was accomplished by arraying the populations of the political subdivisions within the planning area and dividing the arrayed populations into five (5) categories: (1) greatest demand; (2) great demand; (3) moderate demand; (4) less demand; and (5) least demand. The wide black lines designate four (4) mile intervals on the map. Certain distinct spatial patterns become readily apparent. The southern portion of the planning region is more densely populated than the northern townships and communities.




Map 19.-- Demand for Collection Service in the Planning Region

It is estimated that between 70 and 100 four-cubic yard solid waste containers should be placed in the rural areas along the collection routes. For the present, these would be placed at regular intervals and can later be moved to wherever the demand for such containers develops. Once the solid waste container location becomes fixed, the area around the container can be paved. A situation may arise where there needs to be several containers at one location. The number of containers can be increased once people accept the convenience of such a service.

Some preliminary collection routes have been designated on the transparent map. These routes can be modified in the future to reflect the changes in the rural spatial demands. The collection routes in Riley County and Pottawatomie County could terminate at the disposal site. The study did not include a collection system for Fort Riley Military Reservation and the Kansas State University because they have their own collection systems. However, they could be accommodated in the collection system at the time the regional agency is formed.

A solid waste transfer station may need to be established in St. Mary's and Wamego. All wastes collected in Pottawatomie County may be placed in the transfer station. This method would utilize large trucks to transport the refuse to the proposed Riley County disposal site. The drawing on the next page illustrates how transfer stations reduce the cost of hauling solid waste over long distances.

The determination of the economics of having transfer stations would involve a more detailed analysis beyond the scope of this study. Also, other factors could be important in determining the feasibility of a transfer station. The transfer stations would reduce the haul distance of the refuse collection vehicles as well as reduce travel distance and costs to the public works maintenance vehicles.

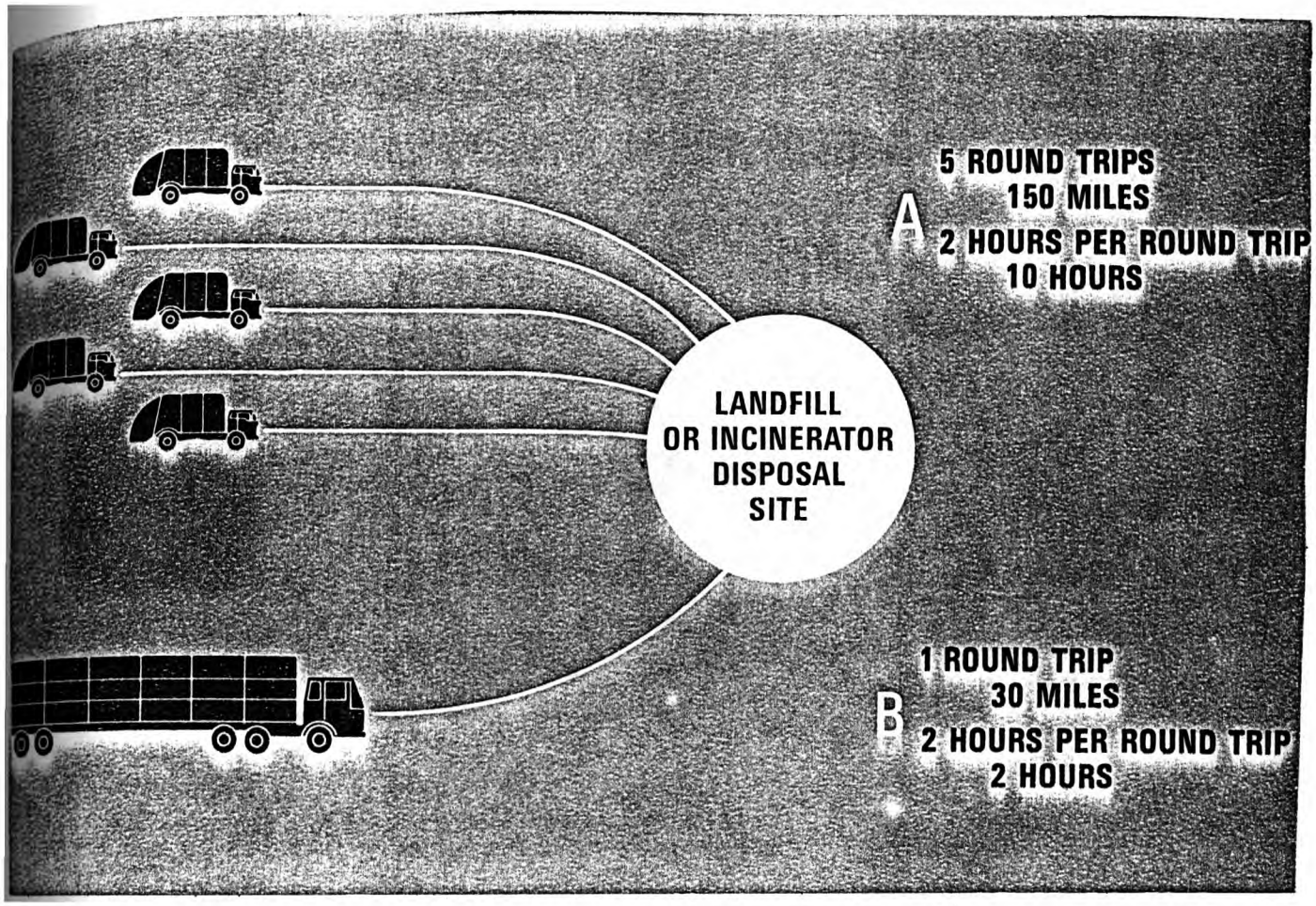



Fig. 9--Transfer Station
Illustration reproduced by permission of R. W. Wilson, Elgin Leach Corp., "Transfer System" brochure.

## Refuse Disposal Alternatives

The following factors must be considered in the selection of the most feasible method of refuse disposal:

1. Evaluation of contemporary methods of solid waste disposal;
2. Cost of implementation;
3. Government law and state health regulations;
4. Availability of suitable land;
5. Public acceptance; and,
6. Time restraint.

All of the factors appeared to have about equal significance in determining the most feasible disposal system.



*This dump, operated by a Michigan city, is not only an eyesore and a health hazard, but also situated on a flood plain, thereby creating pollution.*

Fig. 10--City Dump Illustration reproduced by permission of Michael Gemmel, Director of Contract Research, National Association of Counties, Solid Waste Management.

Open Dump

"The Bureau of Solid Waste Management uses the word dump to describe any site where solid wastes are left uncovered for a period of more than one day. Although it is a hazardous and unsatisfactory operation, it is the most widely-used practice. A dump also is an accumulation of wastes from one or more sources at a central disposal site under little or no management."

The open dump is the cheapest method of refuse disposal. "However, the problems associated with a dump include rodent and insect infestation, poor community relations, excessive demand on health and fire department time, stench, air and water pollution, and land value depreciation." In Kansas, this has been the method most often used in the past. The local governmental

officials are cognizant of the previously-mentioned points and have indicated their willingness to implement a disposal system that does not pollute the surrounding area.

Cleaning up an Old Dump

Many of the smaller communities in the planning area will be unable to maintain a solid waste disposal facility because of the cost. The following steps should be taken in closing a present dump:

"1. Thoroughly extinguish all fires,

2. Exterminate all rats and other vectors,

3. Compact all solid wastes and, if practical, consolidate them into a limited area,

4. Cover the dump with compacted earth." [25]

The Kansas State Department of Health already has held workshops in part of the state on the closing of city dumps and will provide assistance to communities.

## Sanitary Landfill

The sanitary landfill has been defined as "a method of disposing of refuse on land without creating nuisances or hazards to public health or safety, by utilizing the principles of engineering to confine the refuse to the smallest practical area, to reduce it to the smallest practical volume and to cover it with a layer of earth at the conclusion of each day's operation." [26]

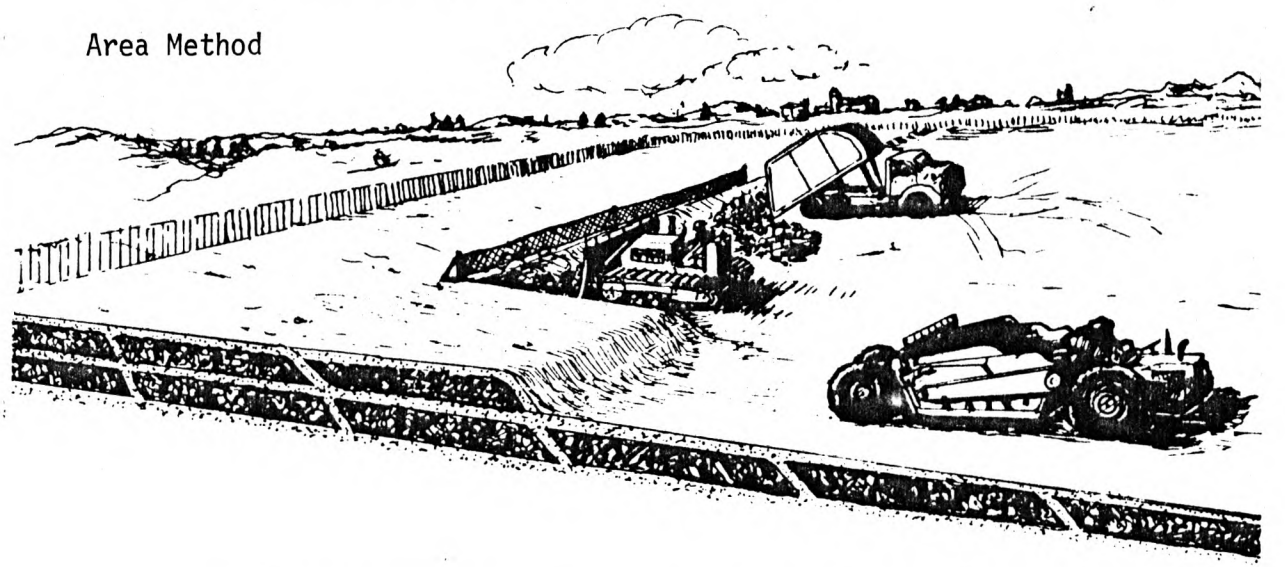
When correctly operated, the sanitary landfill will meet State Board of Health requirements and will give the community an economically acceptable facility.

Methods

Three (3) general methods or a combination of methods have been developed over the years in disposing of solid waste in sanitary landfills. The three methods are:

1. The area method;
2. The trench method; and
3. The ramp method.

Area Method



THE AREA METHOD. The area method, the bulldozer is spreading and compacting a load of solid wastes. The scraper (foreground) is used to haul the cover material at the end of the day's operations. Note the portable fences that catch any blowing debris; these are used with any landfill method, whenever necessary.

Fig. 11--Area Method
Courtesy of the Bureau of Solid Waste Management.

The area method is best suited for flat areas, or gently sloping land. The refuse is deposited in horizontal layers and covered at regular intervals with an earth cover material.

Trench Method

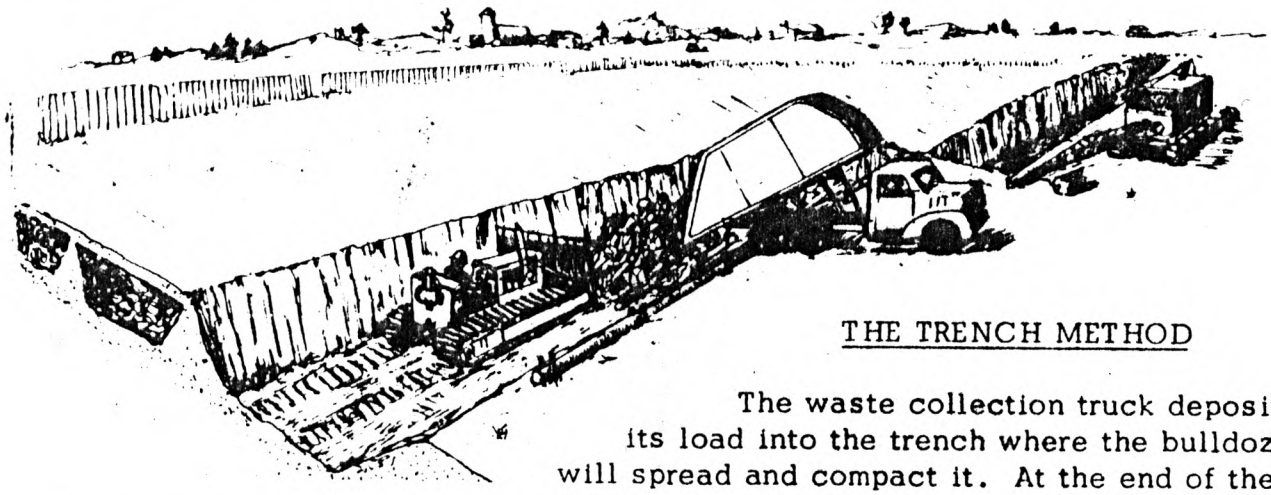



Fig. 12--Trench Method
Courtesy of the Bureau of Solid Waste Management.

The trench method means that solid wastes are placed in horizontal layers the width of the trench. The refuse is then compacted and earth cover is placed on the top and working portion of the trench. The advantage of this method is that the earth removed in excavating can be utilized as cover. A disadvantage is that the method requires more than one piece of equipment.

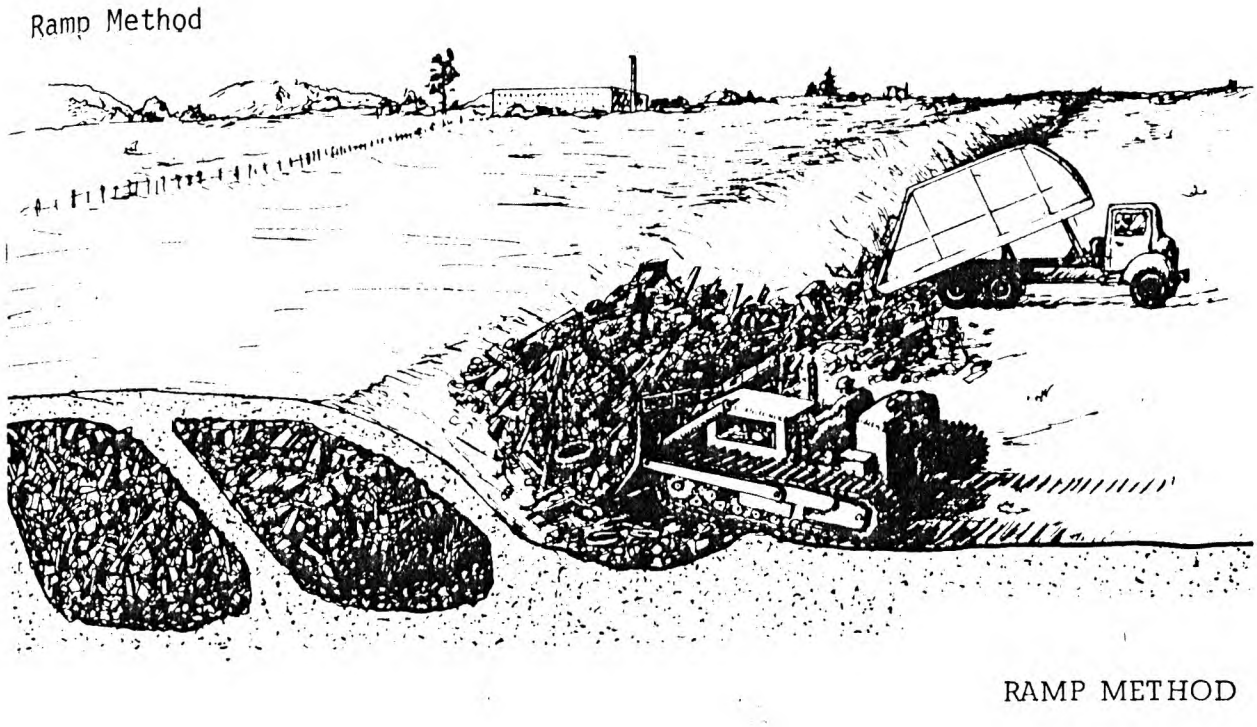



Fig. 13--Ramp Method
Courtesy of the Bureau of Solid Waste Management.

In the ramp method, the solid waste is deposited at the side of an existing slope. The bulldozer spreads the refuse into thin layers two feet thick on the slope and then compacts the wastes. The cover material usually is obtained just ahead of the working face and is spread on the refuse and compacted. The ramp method advantage is in the utilization of only one piece of equipment which would make it applicable for smaller communities.

Site Selection

The process of site selection involves the consideration of the following factors: topography; population; accessibility; hauling distance; collection cost time in motion; pollution potential; cover material; proximity of residential development; citizen reaction; and ultimate usage. The site should be chosen to meet the needs for at least a ten-year period. Sites worthy of consideration include gullies, ravines, eroded areas, and flat land.

The following table illustrates the equipment needs for a sanitary landfill facility, depending on the population of the area served. It is apparent that many of the smaller communities will be unable to afford to operate a site that requires an investment in heavy equipment plus a skilled operator because they lack the tax base to support such a system.

TABLE 19

AVERAGE EQUIPMENT REQUIREMENTS

| Population | Daily Tonnage | Equipment No. | Equipment Type | Size in lbs. | Accessory |
|---|---|---|---|---|---|
| 0 to 15,000 | 0 to 40 | 1 | Tractor, crawler or rubber-tired | 10,000 to 30,000 | Dozer blade<br>Front-end loader (1 to 2 yd)<br>Trash blade |
| 15,000 to 50,000 | 40 to 130 | 1 | Tractor, crawler or rubber-tired | 30,000 to 60,000 | Dozer blade<br>Front-end loader (2 to 4 yd)<br>Bullclam<br>Trash blade |
| | | * | Scraper<br>Dragline<br>Water truck | | |
| 50,000 to 100,000 | 130 to 260 | 1 to 2 | Tractor, crawler or rubber-tired | 30,000 or more | Dozer blade<br>Front-end loader (2 to 5 yd)<br>Bullclam<br>Trash blade |
| | | * | Scraper<br>Dragline<br>Water truck | | |
| 100,000 or more | 260 or more | 2 or more | Tractor, crawler or rubber-tired | 45,000 or more | Dozer blade<br>Front-end loader<br>Bullclam<br>Trash blade |
| | | * | Scraper<br>Dragline<br>Steel wheel compactor<br>Road grader<br>Water truck | | |

Source: State of Iowa, Sanitary Landfill. A publication of the Planning Division, Iowa Development Commission, Des Moines: Planning Division, October, 1969.

The amount of land required for a landfill may be determined by applying this formula:

> With refuse compacted to seven (7) feet (one cell only), it generally is estimated that approximately one acre of land is required per year for each 10,000 of population served.

Utilizing an area to a depth of 21 feet would produce the following results:

TABLE 20

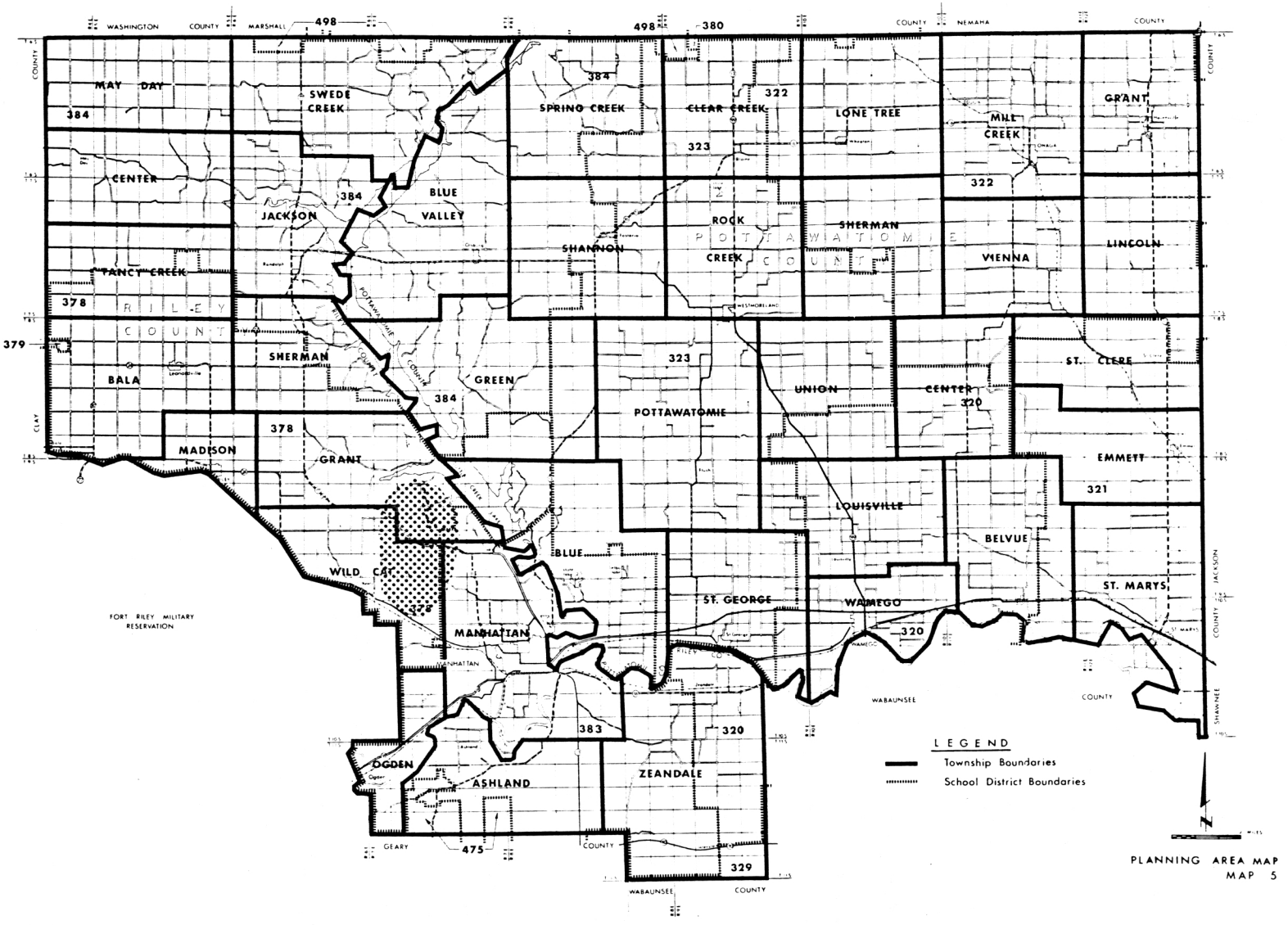
PROJECTED LANDFILL SITE REQUIREMENTS

| | Acres per year | Total Acres |
|---|---|---|
| Serving the entire planning area | 2.5 | 1970-1990 - 50 |
| City of Manhattan | 1.1 | 1970-1990 - 22.5 |

No sites are being recommended at this time, but a general area for the disposal facility has been suggested. The site should not be more than twelve miles from the major areas of generation in order to minimize hauling costs. Map 20 illustrates the area where the sanitary landfill should be located by calculating the center of the population for the planning area.

Summary

An evaluation of the pros and cons of a sanitary landfill is as follows:




Map 20.-- Area of Proposed
Sanitary Landfill Site

| ADVANTAGES | DISADVANTAGES |
|---|---|
| "1. Where land is available, the sanitary landfill is usually the most economical method of acceptable waste disposal. | 1. In highly-populated areas, suitable land may not be available within economical hauling distance. |
| 2. The initial investment is low compared to that of other disposal methods. | 2. People often confuse sanitary landfills with dumps. Location of sanitary landfills in residential areas can result in extreme public opposition. |
| 3. A sanitary landfill is a complete or final disposal method, compared to incineration and composting where items such as residue and unusable materials require further disposal. | 3. A completed landfill will settle and require periodic maintenance. |
| 4. A sanitary landfill can be put into operation within a short period of time. | 4. Special design and construction must be utilized for buildings constructed on completed landfill because of the settlement factor. |
| 5. A sanitary landfill can receive most types of solid waste. | 5. Without proper planning, methane, and explosive gas, and the other gasses produced from the decomposition of the wastes may become a hazard or nuisance factor and interfere with the use of the completed landfill. |
| 6. A sanitary landfill is flexible: increased quantities of solid wastes can be disposed of with little additional personnel and equipment. | 6. Potential for ground-water pollution exists if the landfill is not properly planned, designed, and operated." [27] |
| 7. Submarginal land may be reclaimed for uses such as parking lots, playgrounds, golf courses, and airports. | |

## Incineration

The incineration process is defined as a method of burning solid waste to carbon dioxide, other gasses, and ashes. The incinerator is generally rated on the number of tons it has the capacity to burn in a 24-hour period or in tons per hour.

### The Plant

The basic parts of an incinerator plant include the building, scales, storage pit, bucket and crane, charging hopper furnace, residue conveyor,

air pollution controls, stacks, and quench water controls.

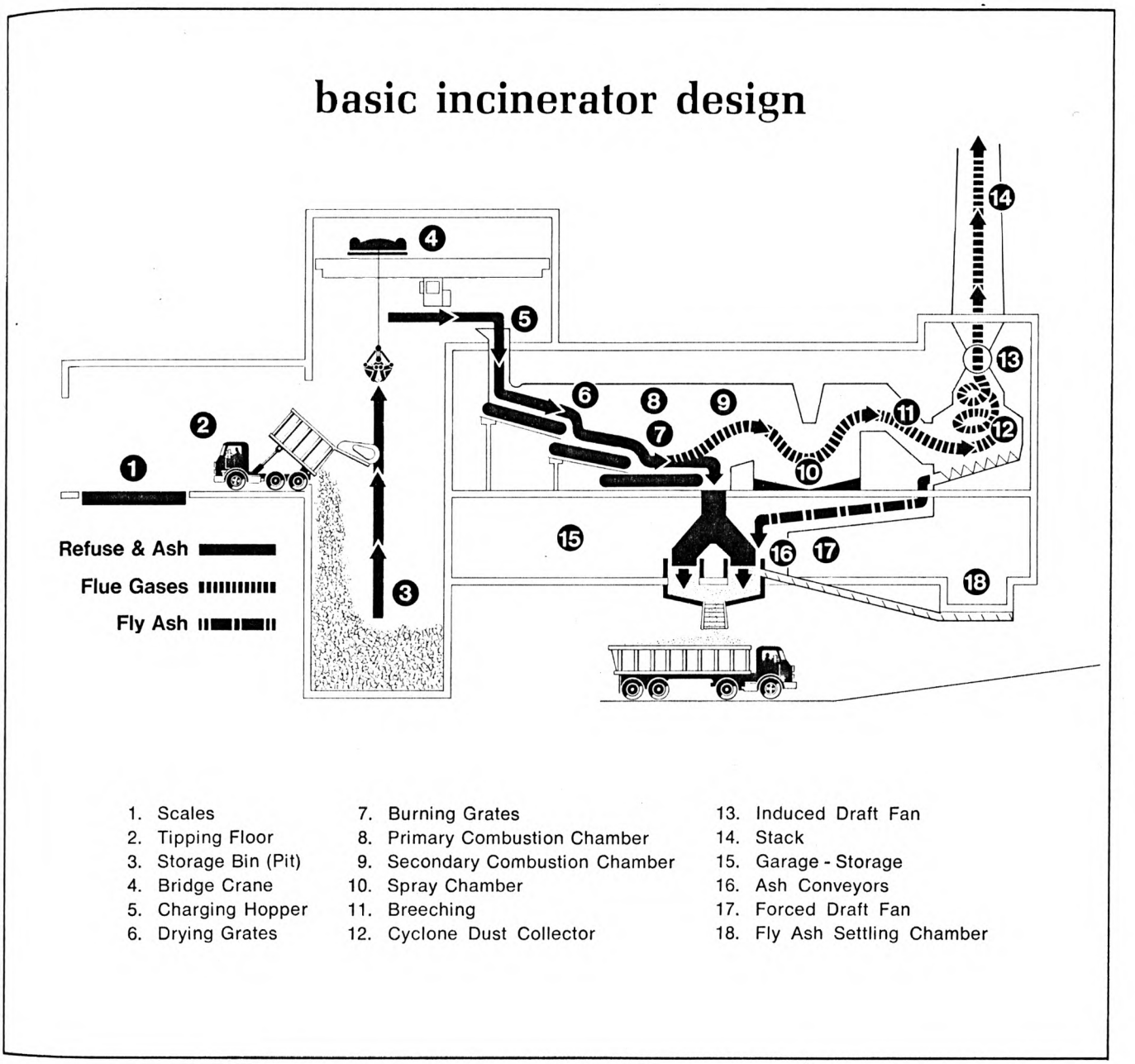



Fig. 14--Basic Incinerator Design
Illustration reproduced by permission of Michael Gemmel, Director of Contract Research, National Association of Counties, Solid Waste Management.

The incinerator must operate on a 24-hour basis or until all wastes are burned for that day. Solid waste collection usually does not take place after the daylight hours; therefore, a large storage area must be provided in

order for the plant to operate on a 24-hour basis. Solid wastes can be added to the charging hopper when needed, and the truck can be emptied conveniently. The incineration method can handle about 80 per cent of the typical urban solid wastes. A properly operated incinerator plant will reduce mixed refuse 70 per cent by weight. The residue, along with solid wastes that could not be handled by the system, must be buried in a sanitary landfill. With this system, much less land is required for the sanitary landfill than the previous method.

An incinerator plant is an extremely complex engineering operation and usually requires the retention of a consulting engineer.

"The design should be prepared by one engineering consultant so that all the component parts will be coordinated. The design consultant should be retained from the initial drawing of the plans to the completion of the plant. This means that the consultant should be responsible for seeing that the plant can be and is operated for a continuous period of six months or more at design capacity by plant personnel, trained by equipment manufacturers." [28]

Summary

The following are advantages and disadvantages of the incineration process:

| ADVANTAGES | DISADVANTAGES |
|---|---|
| "1. Land requirements for the plant are small. | 1. The plant is expensive to construct and operate. |
| 2. Operation is not dependent upon weather conditions. | 2. Improper operation or inadequate equipment produces air and land pollution. |
| 3. It can be located in urban industrial areas, reducing haul distance. | 3. Highly-skilled personnel are essential. |
| 4. It provides volume reduction. | 4. Continuing maintenance is a necessity. |
| 5. It reduces landfill requirements for solid wastes disposal. | 5. Disposal of residue must be provided." [29] |
| 6. It produces a stable, odor-free residue. | |

## Composting

"Composting is a method of handling and processing solid wastes to produce, as the end product, a humus-like material which may be used as a soil conditioner. The process requires separation of noncombustible materials which must be disposed of by other means. Technically, composting is a biological degradation of organic matter under controlled conditions of aeration, temperature, and moisture." [30]

Developing a market for the compost is not achieved easily. Most people think of compost as a fertilizer, but actually it is a soil conditioner to make the soil more manageable. Also, people are under the misconception that there is a ready market for compost while in reality, the plants usually have to give the compost away. The rate of failure of compost plants in the United States indicates its lack of acceptance as demonstrated in Table 21.

Listed below are several observations concerning the utilization of a composting method in a solid waste management program.

| ADVANTAGES | DISADVANTAGES |
|---|---|
| 1. Compost can be used as a soil conditioner. | 1. There are presently few outlets for the compost and the salvaged materials. |
| 2. Composting is a recycling method. | 2. All wastes will not compost. |
| 3. Composting is a volume reduction method. | 3. A sanitary landfill is still needed to dispose of those materials which are not salvaged and will not compost. |

## Recycling

Much research is currently taking place in the United States concerning alternative methods of reusing a community's solid wastes. While many of the experimental methods are promising, it will take time to make these methods economically feasible.

TABLE 21

1968 STATUS OF U.S. COMPOSTING OPERATIONS

| Location | Company | Process | Capacity Tons/ Day | Status |
|---|---|---|---|---|
| Altoona, Pa. | Altoona FAM, Inc. Fairfield Engr. Co. | Fairfield-Hardy | 45 | Operating |
| Boulder, Colo. | Rich Land Co. | Windrow | 100 | Closed |
| Elmire, N.Y. | National Organic Corp. | Windrow | 100 | Construction stopped |
| Gainesville, Fla. | Gainesville Metropolitan Conversion Corp. | Metro | 200 | Operating for research |
| Houston, Tex. | Biochemical Sales, Inc. | Snell | 300 | Closed |
| Houston, Tex. | Metropolitan Waste Conversion Corp. | Metro | 300 | Operating |
| Houston, Tex. | National Organic Corp. | Windrow | 300 | Construction delayed |
| Johnson City, Tex. | PHS-TVA Cooperative Program | Windrow | 50 | Operating for research purposes |
| Largo, Fla. | Peninsular Organics, Inc. | Metro | 50 | Closed |
| Mobile, Ala. | City of Mobile | Briquetting | 300 | Operating (with windrows) |
| Norman, Okla. | International Disposal Corp. | Naturizer | 35 | Closed |
| Phoenix, Ariz. | Arizona Biochemical Company | Dano | 300 | Closed |
| Sacramento, Calif. | Dano of America, Inc. | Dano | 40 | Closed |
| St. Petersburg Fla. | International Disposal Corp. | Naturizer | 105 | Closed |
| San Fernando, Calif. | International Disposal Corp. | Naturizer | 70 | Closed |
| Springfield, Mass. | Springfield Organic Fertilizer Co. | Frazer-Eweson | 20 | Closed |
| Williamston, Mich. | City of Williamston | Riker | 4 | Closed |
| Wilmington, Ohio | Good Riddance, Inc. | Windrow | 20 | Closed |

Courtesy of the National Association of Counties.

"Although recycling usable materials should be a national long-range goal, it is unwise to base an entire solid waste management system on recycling wastes unless a guaranteed market is developed in advance. The payment for the recycled goods must be at least sufficient to meet the additional costs of extra manpower for sorting materials and extra time for transporting the material to the user, and for sanitary landfilling the remaining solid wastes." [31]

It is anticipated that some of the experimental solid wastes disposal techniques will become a reality in the future. There is much that can be accomplished by the local government that does not involve technological innovation and which would go a long way in creating a better solid waste management system (i.e., a commitment by communities in setting the disposing of solid wastes as a priority and backing the commitment with a well-funded program).

## Summary

The cost of the disposal operation to the community is significant in arriving at a decision. Table 22 illustrates the cost to the region in implementing the different systems.

TABLE 22

ALTERNATIVE DISPOSAL FACILITIES
COST STATISTICS

Cost Projections Using the Sanitary Landfill Disposal Method

| Total Planning Area | 1970 | 1975 | 1980 | 1985 | 1990 |
|---|---|---|---|---|---|
| | $132,600 | $142,400 | $151,200 | $166,000 | $175,200 |

*

Cost Projections Using the Incineration Method of Disposing of Solid Wastes

| Total Planning Area | 1970 | 1975 | 1980 | 1985 | 1990 |
|---|---|---|---|---|---|
| | $445,600 | $479,700 | $515,100 | $559,100 | $590,100 |

TABLE 22-Continued

Cost Projections Using the Composting Method of Disposing of Solid Wastes

| Total Planning Area | 1970 | 1975 | 1980 | 1985 | 1990 |
|---|---|---|---|---|---|
| | $222,300 | $239,900 | $257,600 | $279,600 | $295,100 |

*Using the value of the dollar at the present time without adjusting for future changes in the value of the dollar.

A properly-operating sanitary landfill operation in 1970 would have cost the region approximately $132,600 while an incineration operation would have cost $445,600 to maintain. The composting method would have cost $222,300 to operate for that fiscal year. The sanitary landfill can be operated at about $2.00 per ton cost.

## Summary

This study recommends that the planning region implement a sanitary landfill disposal facility that can serve the needs of the area. A more detailed study may be needed in Manhattan concerning the feasibility of having people separate newspapers from the rest of the refuse with the papers then being collected and sold to a recycling firm. The paper collecting system is in operation in several communities on the east coast. One sanitary landfill could serve the region more economically than could a separate facility in every community.

Students of the Department of Civil Engineering at Kansas State University have developed an excellent outline of the proper procedures for developing a new landfill. The following narrative is their outline:

"1. Run preliminary survey for sanitary landfill sites. (See Appendix H).

2. Survey the site. A topographical map of the site should be

made, and boundaries should be established.

3. Set up a screen. This could be composed of live vegetation, an artificial screen such as a fence, or a combination of both. The purpose of such a screen is to obscure public view and to prevent blowing of paper beyond the landfill. Such a screen also would prevent blowing of final cover material.

4. Set up a timetable. This includes laying out of the landfill area and deciding which areas should be first filled. A consistent and systematic method of filling the landfill should be set up before the first load is brought in.

5. Employee facilities should be brought in. These include running water, telephone, sheds for the machinery, and an all-weather record keeping shack. Also First Aid facilities should be made available.

6. Weighing facilities are needed. These are necessary to keep track of the loads brought in. All hauling trucks could be required to have the weight of the truck written on the side of it to facilitate easier record keeping. These records should be kept so that the life of the landfill can be more easily measured and so that city output of refuse can be known. It would give the city a means of knowing whether city refuse output was increasing or not.

7. A facility for private hauling of refuse should be provided. Perhaps large loads brought by private industries could be allowed in for a fee. However, a large truck at a lower elevation should be provided for the majority of private haulers, eliminating unwanted traffic through the landfill.

8. Directional signs should be provided to insure whatever separation of materials is necessary and also to guide refuse haulers to the appropriate dumping place.

9. Adequate equipment should be provided. This should include backup equipment in case of breakdowns. This equipment should be large enough to take care of bulky items such as refrigerators and old car bodies. These items need to be smashed flat before being deposited in the landfill.

10. A bookkeeping system should be set up. 'Records should be kept of the incoming material: the weights, the type, and the origin. Any deviation from the plan of operation should also be recorded. Topographical surveys of the landfill should be made regularly to determine the rate of space utilization. Good cost-accounting records should be maintained, including inital cost of the land and equipment, the operating cost of labor, equipment, equipment maintenance, etc.'

11. Finally, a good landfill requires supervision by an engineer. Only then will most of the every day problems which beset a landfill be properly taken care of." [32]

If the above solid waste disposal facility criteria were followed, the region would have one of the best administered solid waste management systems in the Midwest.

# CHAPTER V

# THE SOLID WASTE MANAGEMENT SYSTEM

## Introduction

The preceding chapter was concerned with evaluating the different subsystems to determine objectively which subsystem, collectively, would be most appropriate for the Pottawatomie-Riley Counties regional planning area. A synopsis of those conclusions, with some additions, follows:

1. One sanitary landfill should be established to be utilized for a twenty-year period.

2. A green box collection system, similar to the one in Chilton County, Alabama, should be implemented.

3. Residential collection should be the responsibility of the management system. Industry and commercial establishments would contract with private haulers since their solid waste collection needs are difficult to serve with standard compactor trucks.

4. The most efficient use of time and money would be in establishing one central agency with the responsibility of solid waste management.

5. Curb service method of collection would be the most economical method of gathering solid wastes.

In the succeeding narrative, we will be developing the management and financial structure necessary to support the statements enumerated above.

## Solid Waste Management Administration

The Institute of Solid Wastes of the American Public Works Association stated in Municipal Refuse Disposal, "Management involves planning, organizing, directing, and controlling the various parts of an undertaking so that all components function correctly and cooperatively. Sound management of refuse disposal activities is essential to achieve an efficient, sanitary, reliable

operation that is acceptable to the community." [33]

An ad hoc committee on solid waste management of the National Academy of Engineering Sciences in Policies for Solid Waste Management noted, "Much of the problem of solid waste management derives from the continued reluctance of those concerned to come to grips with it and apply existing technology, systems and organizational know-how to its solution -- above all, to pay for these services." [34] In the case of a regional planning commission, the statement certainly would be true because the proposed system utilizes existing knowledge and materials to provide a highly-efficient service at a reasonable cost.

## Organization

Organization for refuse disposal in general should be governed by the broad principles that have proved successful in both public and private undertakings. Some of those basic principles are:

1. Lines of authority and responsibility should be clear and definite so that each employee can readily understand his place in the operation, to whom he is accountable, the units or employees under his supervision, and his relationships with other units and employees.

2. Authority and responsibility should flow directly between higher units and those immediately subordinate.

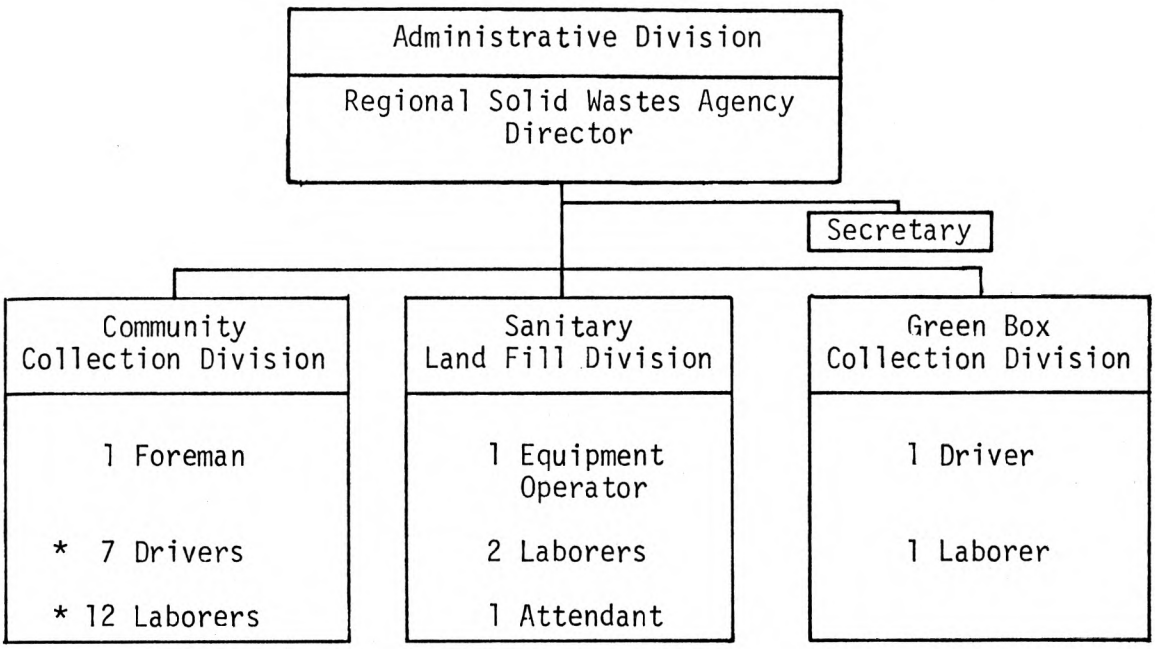
3. Each unit and employee should be given authority commensurate with assigned responsibility.

4. Responsibility should be distributed to units and employees to avoid overlapping, duplication, and dual accountability.

5. Division of responsibility among organizational units according to area, purpose, time, or process should be on the basis of comprehensive consideration of the basic functions of the whole operation.

6. The number of subordinates reporting to a superior should not be greater than he can supervise competently. [35]

Figure 15, the Pottawatomie-Riley Counties, Manhattan Regional Solid Waste Organizational Chart, attempts to utilize the previously outlined management in the allocation of responsibilities for the personnel.




* There may be initially:

Two - two-man collection crews - 16 yard compactor trucks
Five - three-man collection crews - 25 yard compactor trucks

Fig. 15.--Pottawatomie-Riley Counties, Manhattan Regional Solid Waste Management Organizational Chart.

The four divisions of staff responsibilities are described below: Administrative Division; Communities Collection Division; Sanitary Land Fill Division; and the Green Box Collection Division.

Administrative Division

The Administrative Division's primary responsibility is for the supervision and guidance of the Regional Solid Waste Agency. However, this division would, in addition, coordinate closely with county and community officials to insure that cooperation is maintained at the highest efficiency possible. The Division would be directly responsible to political decision-makers.

Communities Collection Division

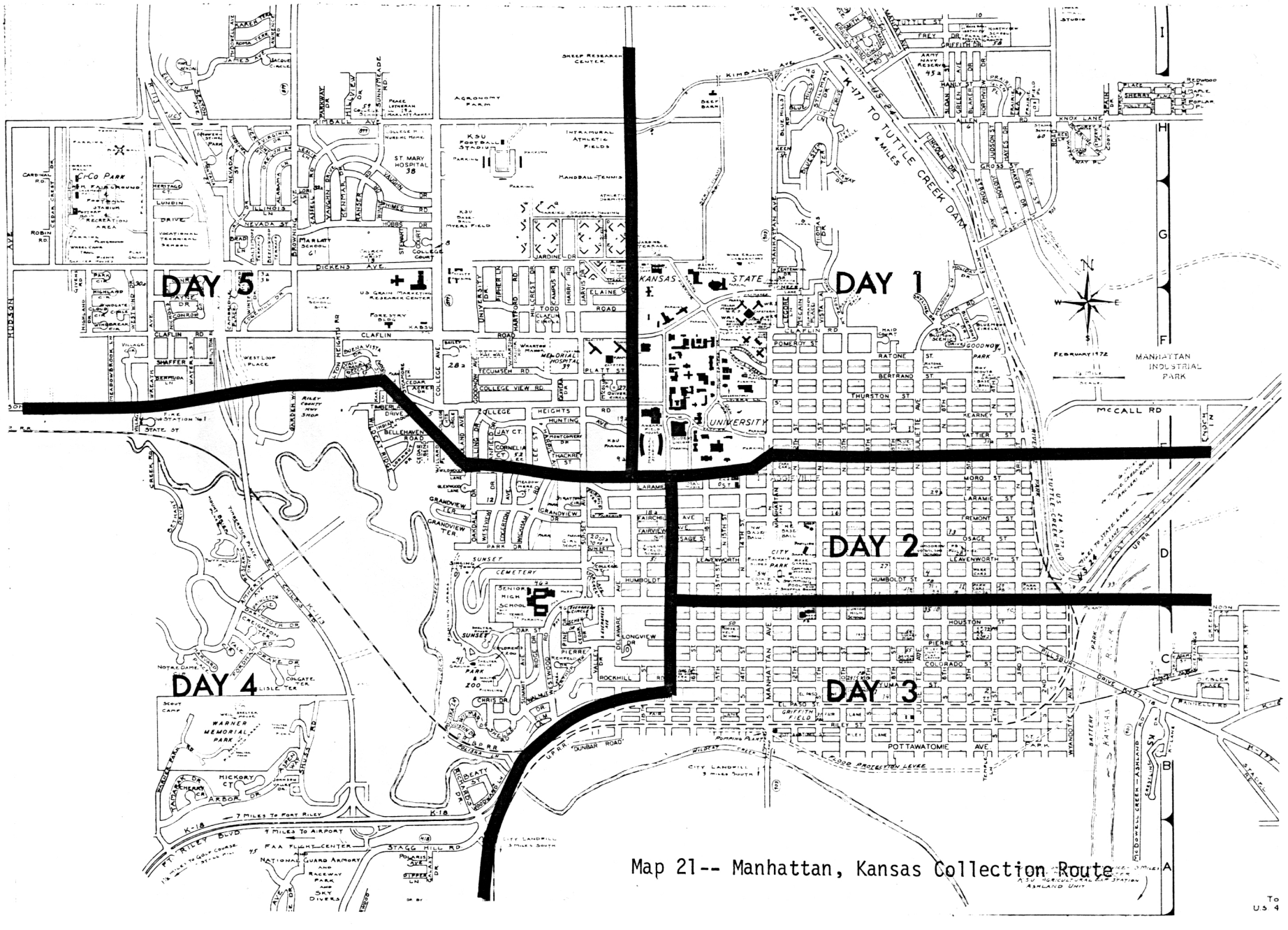
The Communities Collection Division would be in charge of gathering refuse from residential dwellings for the City of Manhattan and the other communities in the planning area. Industries and commercial establishments will have their refuse collected by private contractors. The Division will also be responsible for maintaining the truck and keeping it in a sanitary condition.

The foreman will be in charge of bringing about the most efficient use of the trucks and laborers. He will be responsible directly to the Regional Solid Waste Agency Director.

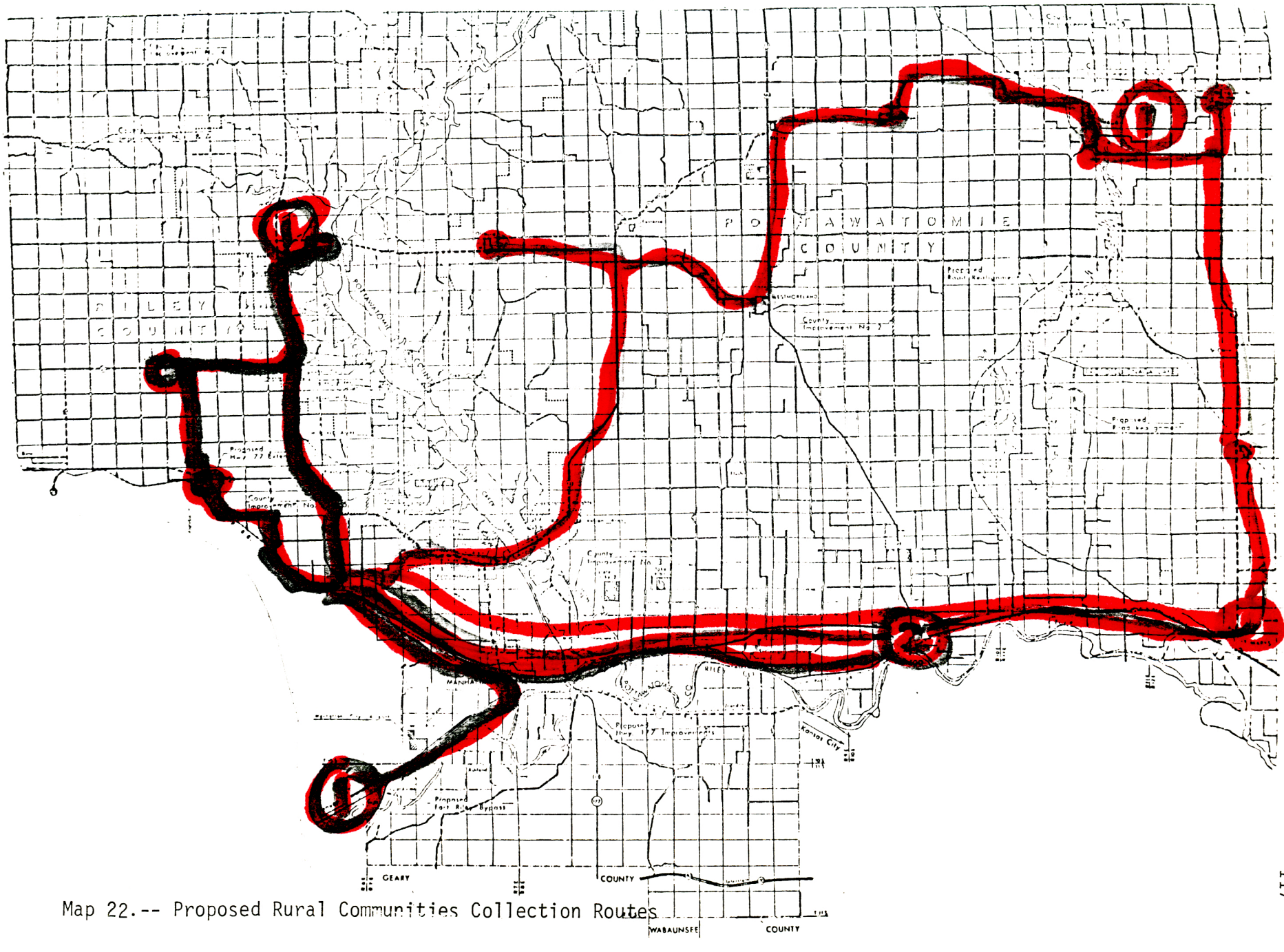
Illustrated in Maps 21, 22, and 23, are tenative collection routes that seem to serve the most households in the planning area with a reasonable level of service at an economical price. These routes can be modified in the future to reflect the changes in the regional demand for service. The collection routes would most likely terminate at the disposal facility.

Sanitary Land Fill Division

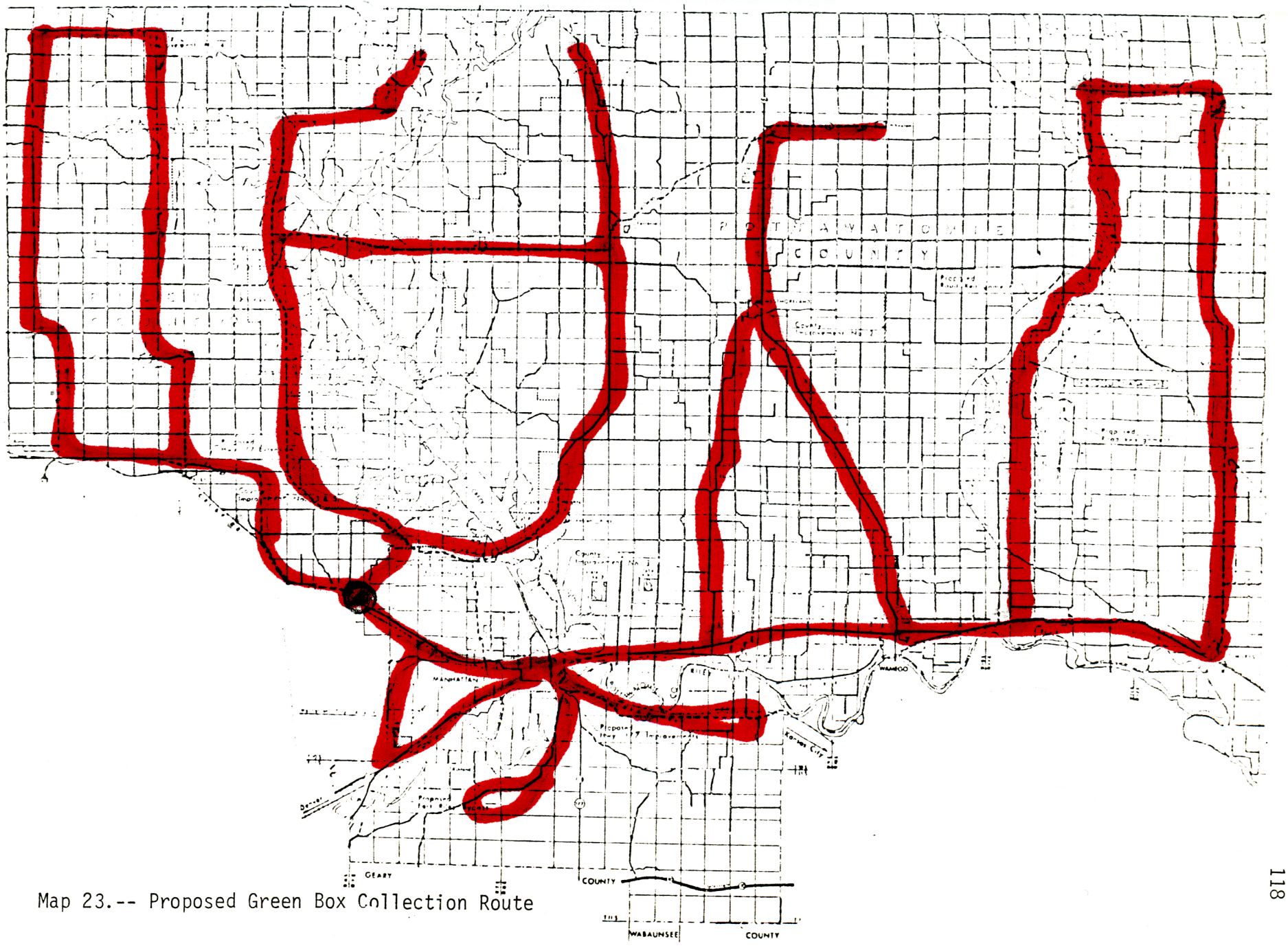
The Sanitary Land Fill Division would be accountable for the disposal of the solid wastes in the required manner at the disposal site. The Director would be in charge of administering this division; the equipment operator in driving the bulldozer; the laborers in collecting windblown trash and helping direct collection to the proper area; and the attendant would be in charge of collecting fees from private haulers, keeping records, and directing disposal trucks to the desired area in the disposal site for unloading. The private collectors would be charged a fee based upon volume of occupied refuse, this fee to be collected by the attendant.




Map 21-- Manhattan, Kansas Collection Route




Map 22.-- Proposed Rural Communities Collection Routes




Map 23.-- Proposed Green Box Collection Route

Green Box Collection Division

The Green Box Collection Division would have the responsibility of collecting solid wastes from the 100 initial four cubic yard containers located on scattered rural sites throughout the regional area. The Division should also be accountable for maintaining the containers in a sanitary condition and for cleaning up around the rural waste collection receptacles.

After determining the organizational structure necessary to provide an acceptable service to residents within the planning region, the next step is to plan the financing.

## Regional Solid Waste Management Financing

The solid waste problem reflects years of financial neglect. The open dumps throughout the planning region are evidence of the unwillingness or inability of local governments to finance a properly operated solid waste management system. The responsibility for an area-wide program rests with the local governments, and the actual operation can be cooperatively administered by local governments, private operators, or both.

Eventually, the customer has to pay for the service, whether directly or through taxes. The cost of the service depends upon the following factors: "(1) type of service to be provided -- collection and/or disposal; (2) level of collection service -- once or twice a week, and street or backyard pickup; (3) type of customer to be served -- agriculture, residential, commercial, industrial; and (4) method of processing and disposal -- land fill or incineration." [36] These factors were studied in Chapter IV, and recommendations were made concerning an adequate level of service.

The financial conditions of the communities and counties in the planning area are presented in Table 23. A glance at the chart will reveal that some

TABLE 23

FINANCIAL CONDITIONS - 1970
PART 1 COMMUNITIES

Tax Levy in Mills

| | Population | Assessed Tangible Valuation | General Obligation Debt and Other Bonded Debt[1] | Total Indebtedness | Debt Service (Bond & interest) | Total City Tax Rate | Total Tax Rate For All Purposes | General Obligation Debt Limit (15% Assessed Valuation) | General Obligation Debt Margin | Assessed Valuation per Capita |
|---|---|---|---|---|---|---|---|---|---|---|
| ottawatomie Co. | | | | | | | | | | |
| Belvue | | | | | | | | | | |
| 1966 | 160 | $155,505 | - | $ 39,000 | 15.95 | 24.17 | 89.62 | $ 23,326 | $ 23,326 | $ 972 |
| 1970 | 161 | 175,611 | (Report Not Received) | | 12.66 | 20.52 | 83.99 | 26,342 | NA | 1,091 |
| Emmett | | | | | | | | | | |
| 1966 | 183 | $134,505 | - | $ 18,000 | 11.37 | 22.39 | 75.73 | $ 20,176 | $ 20,176 | $ 735 |
| 1970 | 156 | 147,038 | - | 104,000 | 19.53 | 28.04 | 87.40 | 22,056 | 22,056 | 943 |
| Havensville | | | | | | | | | | |
| 1966 | 169 | $116,621 | - | - | - | 10.11 | 66.57 | $ 17,493 | $ 17,493 | $ 690 |
| 1970 | 163 | 151,443 | (Report Not Received) | | - | 9.21 | 76.00 | 22,716 | 22,716 | 929 |
| Louisville | | | | | | | | | | |
| 1966 | 216 | $ 78,636 | - | - | - | 5.99 | 73.08 | $ 11,795 | $ 11,795 | $ 364 |
| 1970 | 204 | $105,120 | - | - | - | 6.32 | 68.64 | 15,768 | 15,768 | 515 |
| Olsburg | | | | | | | | | | |
| 1966 | 155 | $124,784 | (Report Not Received) | | 11.46 | 21.07 | 88.58 | $ 18,718 | NA | $ 805 |
| 1970 | 151 | 168,249 | (Report Not Received) | | 4.27 | 6.05 | 65.12 | 25,237 | NA | $1,114 |
| Onaga | | | | | | | | | | |
| 1966 | 879 | $747,718 | - | $ 86,000 | 13.02 | 25.76 | 93.96 | $112,158 | $112,158 | $ 851 |
| 1970 | 761 | 975,695 | $ 83,000 | 83,000 | 18.70 | 29.51 | 100.80 | 146,354 | 63,354 | 1,282 |
| St. George | | | | | | | | | | |
| 1966 | 236 | $148,315 | (Report Not Received) | | - | 3.38 | 74.58 | $ 22,247 | NA | $ 628 |
| 1970 | 241 | 163,282 | $ 26,000 | $ 26,000 | 16.91 | 19.88 | 92.26 | 24,492 | $ -1,508 | 678 |

TABLE 23--Continued

| | Population | Assessed Tangible Valuation | General Obligation Debt and Other Bonded Debt[1] | Total Indebtedness | Debt Service (Bond & interest) | Total City Tax Rate | Total Tax Rate For All Purposes | General Obligation Debt Limit (15% Assessed Valuation) | General Obligation Debt Margin | Assessed Valuation per Capita |
|---|---|---|---|---|---|---|---|---|---|---|
| St. Mary's | | | | | | | | | | |
| 1966 | 1,526 | $1,355,309 | $ 82,000 | $ 99,000 | 11.02 | 19.32 | 70.40 | $203,296 | $121,296 | $ 888 |
| 1970 | 1,434 | 1,795,908 | 48,000 | 306,000 | 14.25 | 24.65 | 82.71 | 269,386 | 221,386 | 1,252 |
| Wamego | | | | | | | | | | |
| 1966 | 2,544 | $2,617,821 | $100,498 | $928,588 | 5.07 | 23.00 | 93.96 | $392,673 | $292,175 | $1,029 |
| 1970 | 2,507 | 3,275,279 | 435,813 | 1,204,619 | 6.55 | 24.33 | 90.09 | 491,292 | 55,479 | 1,306 |
| Westmoreland | | | | | | | | | | |
| 1966 | 483 | $ 400,420 | - | $108,000 | 12.43 | 22.54 | 96.07 | $ 60,063 | $ 60,063 | $ 829 |
| 1970 | 485 | 511,868 | (Report Not Received) | | 12.65 | 21.89 | 96.38 | 76,780 | NA | 1,055 |
| Wheaton | | | | | | | | | | |
| 1966 | 121 | $ 103,917 | - | - | - | 8.28 | 75.72 | $ 15,588 | $ 15,588 | $ 859 |
| 1970 | 106 | 134,193 | $ 5,000 | $ 5,000 | 10.09 | 19.43 | 88.99 | 20,129 | 15,129 | 1,266 |
| iley Co. | | | | | | | | | | |
| Leonardville | | | | | | | | | | |
| 1966 | 415 | $ 493,620 | $ 83,000 | $339,000 | 17.80 | 28.65 | 87.90 | $ 74,043 | $ -8,957 | $1,189 |
| 1970 | 412 | $ 615,660 | 59,000 | 66.400 | 14.50 | 27.70 | 90.56 | 92,349 | 33,349 | 1,494 |
| Manhattan-1970 | | 44,074,588 | 4,682,500 | 11,666,790 | 36 | 30.71 | 102.68 | No limit on 1st class city | - | $1,695 |
| Ogden | | | | | | | | | | |
| 1966 | 1,040 | $ 844,331 | $ 39,550 | $112,550 | 11.48 | 23.10 | 77.88 | $126,650 | $ 87,100 | $ 812 |
| 1970 | 2,311 | 991,436 | 36,000 | 91,000 | 11.50 | 24.55 | 87.66 | 148,715 | 112,715 | 429 |
| Randolph | | | | | | | | | | |
| 1966 | 95 | $ 94,811 | - | - | - | 9.56 | 66.87 | $ 14,222 | $ 14,222 | $ 998 |
| 1970 | 106 | $ 132,183 | - | - | - | 5.49 | 61.02 | 19,827 | 19,827 | 1,247 |
| Riley | | | | | | | | | | |
| 1966 | 622 | $ 781,444 | $152,000 | $159,545 | 4.48 | 14.63 | 76.62 | $117,217 | $-34,783 | $1,256 |
| 1970 | 668 | 908,589 | - | 172,500 | 5.28 | 18.44 | 82.44 | 136,288 | 136,288 | 1,360 |

TABLE 23--Continued

PART II COUNTIES

Tax Levy in Mills

| | Population | Assessed Tangible Valuation | Total Bonded Indebtedness | Bond and Interest | County School Foundation | Total County Tax Rate | Assessed Valuation per Capita |
|---|---|---|---|---|---|---|---|
| ottawatomie County - 1966 | 12,082 | $27,747,348 | - | - | 9.35 | 28.00 | $2,297 |
| - 1970 | 11,755 | 35,382,178 | - | - | 9.23 | 26.85 | 3,010 |
| iley County - 1966 | 33,276 | $57,327,401 | $120,000 | .58 | 7.98 | 26.08 | $1,723 |
| - 1970 | 56,788 | 67,264,903 | 896,000 | .03 | 8.98 | 25.17 | 1,184 |

Does not include special assessments or revenue bonds.

ource: Pottawatomie-Riley Counties Water and Sewer Plan. Oblinger-Smith Corporation and Swab & Eaton Consulting Engineers, June, 1971.

communities, i.e., Emmett, Havensville, Riley, and Louisville, are not utilizing their general obligation bonding potential which will create large fluctuations in their mill levies from year to year. St. Mary's and St. George are at their community legally allowed general obligation debt ceiling and, therefore, cannot use G.O. Bonds for an additional capital improvement in their city. The city of Manhattan is the only city of the first class and, legally, has no general obligation debt ceiling.

## Capital Improvement Budgeting

Local government should establish a capital improvement program which schedules the funding of all major solid waste facilities over a period of five (5) to ten (10) years. A capital improvement budget unites planning and implementation. A capital improvement program brings order by arranging specific projects in order of priority, estimated project costs, and suggested financing methods. It enables local governments to plan ahead for major capital outlays. Listed below are items for which typical capital funds are used:

1. Bond service - interest on repayment of debt;
2. Acquisition of sanitary landfill sites;
3. Incineration plants;
4. Collection equipment;
5. Transfer station; and
6. Disposal site equipment.

## Revenue Sources

The Regional Planning Commission will need to obtain reciprocal agreements among local governments and the counties to commit themselves, legally, to financing the solid waste management program on a regional basis. The main

sources of funds to develop such a system would be (1) the general fund (including fee and service charge revenues), (2) bond issue, and (3) grants-in-aid. The first two sources should be counted on primarily and supplemented by the third. The annual operating expenses should be met by the general fund, service charges, or grants-in-aid. Table 24 presents the alternative methods of financing capital requirements. The study recommends that long-term debt financing should be used, because a pay-as-you-go policy places too great an initial burden on current resources. The long-term debt financing should be used only for major capital investment.

In a solid waste management program for the proposed Pottawatomie-Riley Counties, Manhattan Regional Solid Waste Agency, it would be necessary to utilize several types of financing because of the differing economic life span of solid waste equipment. Some equipment has a short life span, and it would be more appropriate to acquire new equipment rather than pay the increasing maintenance costs. The site acquisition cost and building structure costs, on the other hand, could logically be spread over a number of years because their economic life is quite long.

## Equipment and Land Acquisition

Graph 9, Solid Waste Equipment and Site Acquisition Schedule, is an attempt to project large items of cost needs covering the next ten (10) years. These projections should be reviewed annually in the light of changes in the need for solid waste service. With the information contained in Graph 9 and Figure 15, it is possible to compute a valid prediction of the cost of operating a regional solid waste agency.

Equipment and Site Acquisition Costs Projection, Table 25, indicates the expenses of acquiring major pieces of equipment, buildings, and land that will

TABLE 24

SUMMARY OF ALTERNATIVE REQUIREMENTS OF FINANCING CAPITAL REQUIREMENTS

| Item | Pay-As-You-Go | Leasing | Subsidies/Grants | Borrowed Funds |
|---|---|---|---|---|
| 1. Explanation | 1. Yearly appropriations to finance requirements-either by accumulating funds in advance or meeting obligations as they occur. | 1. Straight rental with no intent to purchase or own (actually a form of pay-as-you-go). | 1. State or federal aid available for acquisition and construction of facilities, or from equipment acquisition. | 1. Long-term debt financing -analogous to mortgage financing. Several methods available. |
| 2. Advantages | 2a. Generally, the least expensive.<br>b. Accumulated funds provide maximum flexibility to meet unanticipated needs.<br>c. More certain than subsidies or bond issue requiring vote. | 2a. Requires no capital investment.<br>b. Provides high degree of flexibility in meeting unexpected or changing conditions such as location or amount of space required; and amount or type of equipment. | 2a. Lower the property tax burden or reduce service charges.<br>b. Represent the return of local taxpayers' money.<br>c. Can reduce total costs by permitting earlier construction/acquisition or by reducing amount of borrowed funds used. | 2. These are general advantages applicable to all methods.<br>a. Reduce immediate financing requirements.<br>b. Permit construction of critical facilities or acquisition of equipment without delay.<br>c. May provide some saving through earlier construction/acquisition--such as avoiding inflationary construction costs or rental costs.<br>d. We can expect to repay with "cheaper dollars" if inflation continues. |

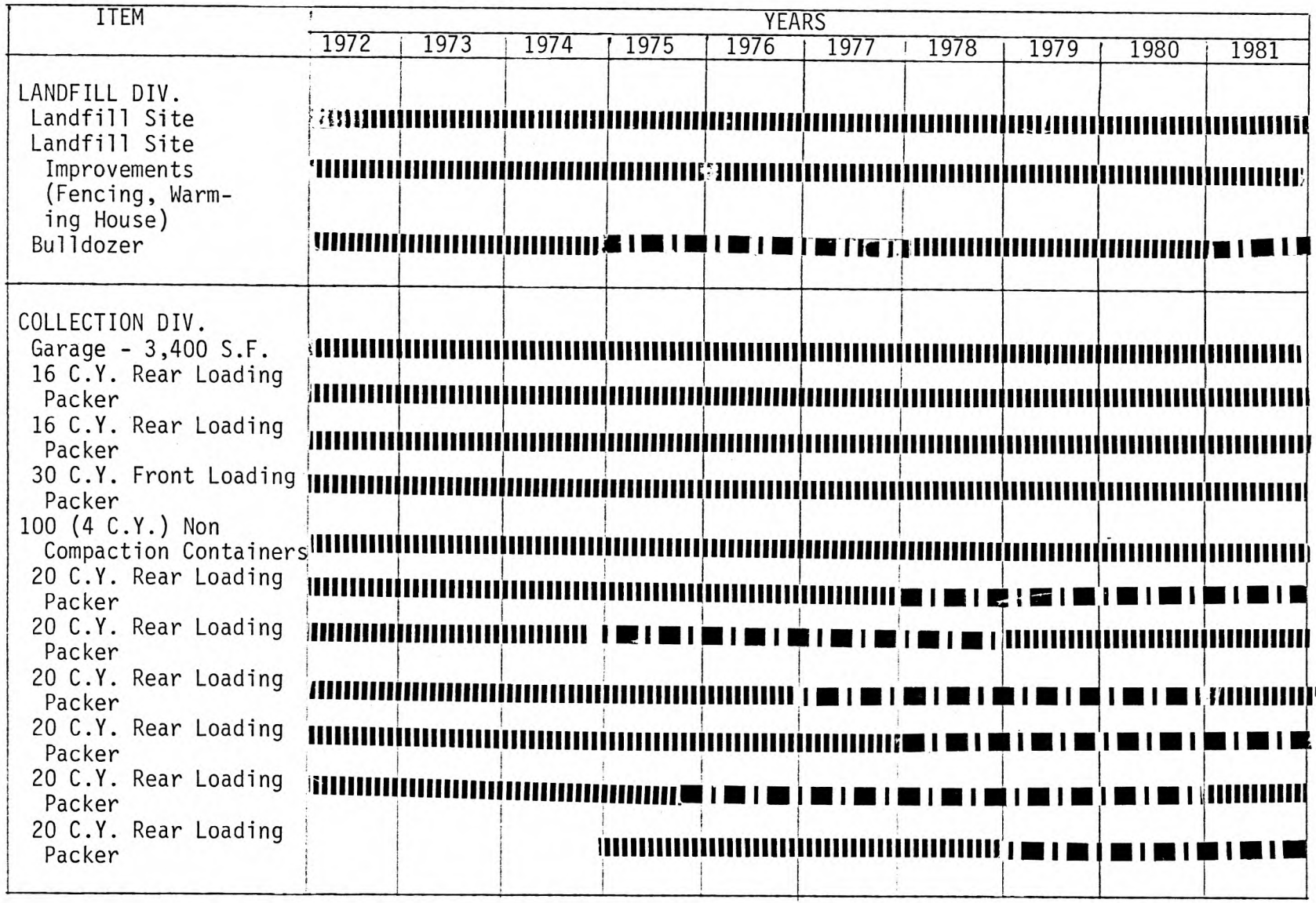
TABLE 24--Continued

| Item | Pay-As-You-Go | Leasing | Subsidies/Grants | Borrowed Funds |
|---|---|---|---|---|
| 3. Disadvantages | 3a. Exclusive use usually results in significant tax rate increase.<br>b. Relieves future citizens from responsibility of paying for facilities/equipment from which they will benefit. | 3a. Most expensive if used over extended period.<br>b. Does not produce any equity in facility/equipment.<br>c. Leased facilities sometime create operating problems because of location or layout: Leased equipment may not meet specifications we would use for purchase of new equipment. | 3a. Regulations generally accompany the money.<br>b. Some costs involved in preparing the processing applications.<br>c. Uncertainty of receipt due to change in rules or cutback of funds. | 3a. Interest costs are major drawback, can vary from 30% to 50% of principal depending on: 1) Repayment period; 2) Schedule of principal retirement; and 3) Interest rate.<br>b. Limits (practical and legal) to amount of borrowing that can be used. |
| 4. Proposed Guidelines | 4. As a general statement, pay-as-you-go is the best method of financing and should be used as extensively as possible with consideration given to: a) our total budgetary requirements and financial resources; b) our total construction needs; c) the benefit of the facilities/equipment to future residents; and d) the availability of subsidies.<br>Pay-as-you-go should be used whenever possible for minor needs or for additions, improvements, and modifications to existing structures/equipment. | 4. Whenever needs are well defined, short-term renting generally should be considered only as a temporary solution while plans and/or financing arrangements can be developed for permanent facilities/equipment.<br>Three- to five-year leases should be considered whenever major uncertainties exist concerning the need for space--either in terms of scope, timing, or location. | 4. The availability of subsidies should not be used as the justification for constructing a facility/acquiring equipment. However, an attempt should be made to obtain subsidies on approved projects to reduce the local property tax burden/service charges.<br>Any financing plan which anticipates subsidies should be flexible enough to allow for some under-collection. | 4. Long-term debt financing should be used if a) a pay-as-you-go policy places too great a burden on current sources; and b) borrowing does not create equally severe future financing problems.<br>The borrowing method should be evaluated in relation to the type of facility/equipment to be acquired. |

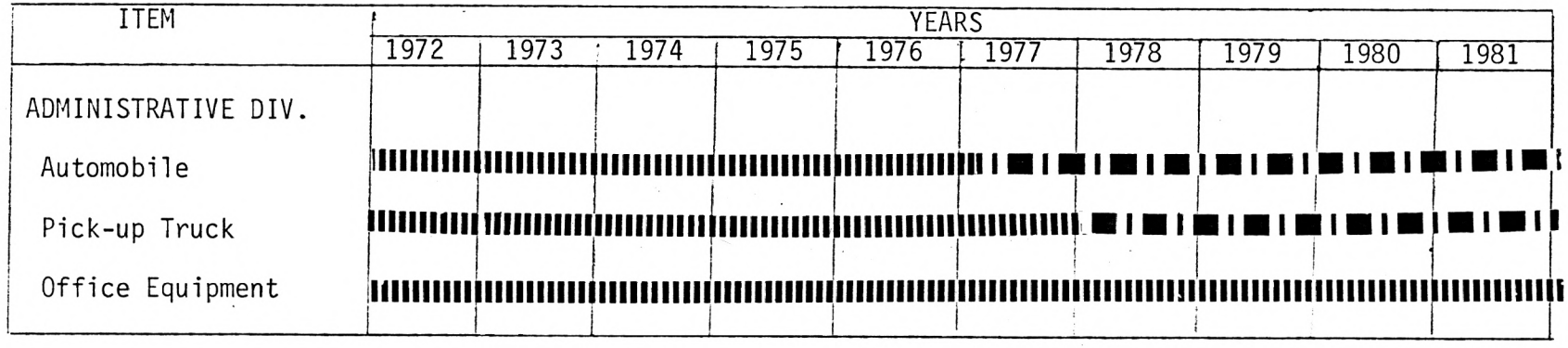
Source: Sacramento County, California, Office of the County Executive, March 6, 1968. "Refuse Collection Operation."

GRAPH 9

SOLID WASTE EQUIPMENT & SITE ACQUISITION SCHEDULE



GRAPH 9--Continued






Represents the life of equipment or the change in line represents the time when it would be most appropriate, economically, to acquire new equipment.

TABLE 25

EQUIPMENT AND SITE ACQUISITION -- COSTS PROJECTION

| | YEARS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
| LANDFILL DIV. COST | | | | | | | | | | |
| Landfill Site Acquisition | * 8,250 | | | | | | | | | |
| Landfill Site Improvements (fencing, warming house, office) | * 15,000 | | | | | | | | | |
| Bulldozer | * 24,000 | | | | | | | | | |
| Sub Total | | | | | | | | | | |
| COMMUNITY COLLECTION DIV. | | | | | | | | | | |
| Garage Site Cost | * 5,000 | | | | | | | | | |
| Garage Building Construction Costs - 3,000 S.F. | * 31,200 | | | | | | | | | |
| 16 C.Y. Rear Loader | *16,000 | | | | | | | | | |
| 16 C.Y. Rear Loader | *16,000 | | | | | | | | | |
| 30 C.Y. Front Loading Packer | * 1 29,000 | 2 | 3 | | | | | | | |
| 100 C.Y. Non-Compaction Container | * 24,500 | | | | | | | | | |
| 20 C.Y. Rear Loading Packer | * 1 18,600 | 2 | 3 | | | | 1 26,400 | 2 | 3 | |
| 20 C.Y. Rear Loading Packer | * 1 18,600 | 2 | 3 22,200 | 1 22,200 | 2 | 3 | | 1 28,000 | 2 | 3 |
| 20 C.Y. Rear Loading Packer | * 1 18,600 | 2 | 3 | 23,500 | 1 23,500 | 2 | 3 | | | 31,400 |
| 20 C.Y. Rear Loading Packer | * 1 18,600 | 2 | 3 | | | | 1 26,400 | 2 | 3 | 1 |

A 6 per cent increase was used in computations.

TABLE 25--Continued

| | YEARS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
| COMMUNITY COLLECTION DIV. (Continued) | | | | | | | | | | |
| 20 C.Y. Rear Loading Packer | * 1<br>18,600 | 2 | 3 | | 1<br>23,500 | 2 | 3 | | | 31,400 |
| 20 C.Y. Rear Loading Packer | * 1 | 2 | 3 | 1<br>22,200 | 2 | 3 | | 1<br>28,000 | 2 | 3 |
| Sub Total | | | | | | | | | | |
| ADMINISTRATIVE DIV. | | | | | | | | | | |
| Automobile | **<br>2,700 | | | | 3,266<br>200 Sal. | | | | | |
| ½ Ton Pick-up Truck | **<br>2,700 | | | | | 3,462<br>200 Sal. | | | | |
| Office Equipment | *<br>3,500 | | | | | | | | | |
| Sub Total | | | | | | | | | | |
| TOTAL | | | | | | | | | | |

Key: * G.O. Bonds
** Pay-As-You-Go

be needed for an efficiently-managed solid waste agency to germinate. The costs items have a symbol in the first column identifying which of the following means would be most effective in acquiring the item:

G.O. Bonds

Pay-As-You-Go

Leasing

The two most often-used means of financing items were general obligation bonds and pay-as-you-go. The solid waste agency pick-up truck and automobile were the equipment items acquired on a pay-as-you-go basis.

In computing the costs of items over the next ten (10) years, the annual rate of six per cent (6%) increase in costs per year was utilized.

G.O. Bond Schedule

Long Term

All items having a life expectancy of more than ten (10) years and which were relatively expensive items, were purchased in this manner. Table 26 addresses itself to scheduling of the debt service requirements for the one issuance of general obligation bonds totaling $119,450 that will be needed in 1972 to get the regional solid waste program underway initially. A ten (10) year bond retirement period and six per cent (6%) interest rate was used in computing the debt services requirement for the next ten (10) years.

Included in the G.O. Bonding proposal were such items as:

A. Landfill acquisition (55 acres) plus the construction of fencing and a warming house for the landfill attendants.

B. The acquisition of land in Manhattan for the construction of a 3,000 square foot garage for the compactor trucks of the agency.

C. The acquiring of 100 four (4) cubic yard non-compaction containers for the rural collection system.

TABLE 26

LONG TERM
GENERAL OBLIGATION BOND SCHEDULE

| | YEARS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
| Principle | * 119,450 | 119,450 | 107,505 | 95,560 | 83,615 | 71,670 | 59,725 | 47,780 | 35,835 | 23,890 |
| Principle Payment | - | 11,945 | 11,945 | 11,945 | 11,945 | 11,945 | 11,945 | 11,945 | 11,945 | 11,945 |
| Interest | - | 7,167 | 6,450 | 5,734 | 5,017 | 4,300 | 3,584 | 2,867 | 2,150 | 1,433 |
| Debt Service | - | 19,112 | 18,395 | 17,679 | 16,962 | 16,245 | 15,529 | 14,812 | 14,095 | 13,378 |

* 10-year bond retirement period at 6 per cent interest.

Short Term

All compactor collection trucks and the bulldozer should also be acquired under general obligation bonds so that the cost may be distributed over a three-year period. An interest rate of eight per cent (8%) was used in figuring yearly amortization rates. When one is studying Table 27, which is concerned with G.O. Bonds, it should be noted that the total costs do not fluctuate extremely from year to year but increase gradually after the first three years.

The Administrative Division's automobile and pick-up truck were the vehicles required on a pay-as-you-go basis because of their relatively low costs. The salvage value of the car and truck was figured as a revenue to the agency.

## Operational Cost Schedule

Variable Costs

Table 28 entitled, "Variable Costs," shows expenses that are dependent on the amount of equipment usage and amount of consumable items that will be expended when the regional solid waste agency begins their actual operations. Utilities, truck and car upkeep, and office material are some entries included under variable costs. Any change in the compactor truck collection routes would certainly affect the variable cost section.

Labor Costs

Labor costs projections for the solid waste agency's divisions are identified in Table 29. This is the largest single cost item in the solid waste financial plan.

Listed in Table 30 are salary schedules that were used for 1972. These salary rates will permit the agency to employ qualified and reliable individuals to fill the different positions which were described in the agency's organizational chart. Most of the employees will be paid on an hourly basis, with

TABLE 27

SHORT TERM
GENERAL OBLIGATION BOND SCHEDULE

| ITEM | YEARS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
| Landfill Division | | | | | | | | | | |
| Bulldozer | 24,000 | 25,440 | 26,970 | 28,580 | 30,300 | 32,120 | 34,050 | 36,090 | 38,260 | 40,555 |
| Collection Division | | | | | | | | | | |
| 30 C.Y. Front Loading Packer | 10,908 | 10,908 | 10,908 | | | | | | | |
| 20 C.Y. Rear Loading Packer | 6,996 | 6,996 | 6,996 | | | | 10,152 | 10,152 | 10,152 | |
| 20 C.Y. Rear Loading Packer | 6,996 | 6,996 | 6,996 | 8,268 | 8,268 | 8,268 | | 10,524 | 10,524 | 10,524 |
| 20 C.Y. Rear Loading Packer | 6,996 | 6,996 | 6,996 | | 9,024 | 9,024 | 9,024 | | | 11,652 |
| 20 C.Y. Rear Loading Packer | 6,996 | 6,996 | 6,996 | | | | 10,152 | 10,152 | 10,152 | |
| 20 C.Y. Rear Loading Packer | 6,996 | 6,996 | 6,996 | | 9,024 | 9,024 | 9,024 | | | 11,652 |
| 20 C.Y. Rear Loading Packer | - | - | - | 8,268 | 8,268 | 8,268 | | 10,524 | 10,524 | 10,524 |
| Administrative Division | | | | | | | | | | |
| | * | | | | * | | | | | |
| Automobile | 2,700 | | | | 3,266(-200 Sal.) | | | | | |
| ½ Ton Pick-up Truck | 2,700* | | | | | 3,462*(-200 Sal.) | | | | |
| TOTAL | 75,288 | 71,328 | 72,858 | 45,116 | 67,950 | 69,966 | 72,402 | 77,442 | 87,960 | 84,907 |
| Salvage Value Packers | | | | 27,400 | 24,800 | | 17,500 | 16,000 | | 25,700 |

* Pay-As-You-Go Equipment.

TABLE 28

VARIABLE COSTS

| | YEARS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
| Administrative Division | | | | | | | | | | |
| Public Education | 1,000 | 1,060 | 1,124 | 1,191 | 1,263 | 1,339 | 1,419 | 1,504 | 1,594 | 1,690 |
| Car operational expense -12,000 miles | 1,200 | 1,272 | 1,348 | 1,429 | 1,515 | 1,606 | 1,702 | 1,804 | 1,912 | 2,027 |
| Pick-up operational expense - 12,000 miles | 1,200 | 1,272 | 1,348 | 1,429 | 1,515 | 1,606 | 1,702 | 1,804 | 1,912 | 2,027 |
| Office Supplies | 1,500 | 1,590 | 1,685 | 1,786 | 1,893 | 2,007 | 2,127 | 2,255 | 2,390 | 2,533 |
| Per diem | 600 | 636 | 674 | 714 | 757 | 802 | 850 | 901 | 955 | 1,012 |
| Sub Total | 5,500 | 5,830 | 6,179 | 6,549 | 6,943 | 7,360 | 7,800 | 8,268 | 8,763 | 9,289 |
| Landfill Division | | | | | | | | | | |
| Bulldozer operational expense | 19,100 | 20,246 | 21,461 | 22,749 | 24,114 | 25,561 | 27,095 | 28,820 | 30,549 | 32,383 |
| Utilities | 600 | 636 | 674 | 714 | 757 | 802 | 850 | 901 | 955 | 1,012 |
| Sub Total | 19,700 | 20,882 | 22,135 | 23,463 | 24,871 | 26,363 | 27,945 | 29,721 | 31,504 | 33,395 |
| Collection Division | | | | | | | | | | |
| 16 C.Y. Compactor trucks operational expense | 9,360 | 9,922 | 10,517 | 11,148 | 11,816 | 12,525 | 13,277 | 14,074 | 14,918 | 15,813 |
| 20 C.Y. Compactor truck operational expense | 17,160 | 18,189 | 19,280 | 24,522 | 25,993 | 27,552 | 29,205 | 30,957 | 32,814 | 34,783 |
| 30 C.Y. Compactor truck operational expense - 18,000 miles | 9,900 | 10,494 | 11,124 | 11,791 | 12,498 | 13,248 | 14,043 | 14,886 | 15,779 | 16,747 |
| Garage utilities | 2,580 | 2,735 | 2,899 | 3,063 | 3,247 | 3,442 | 3,648 | 3,867 | 4,099 | 4,345 |
| Sub Total | 39,000 | 41,340 | 43,820 | 50,524 | 53,554 | 56,767 | 60,173 | 63,784 | 67,610 | 71,688 |
| TOTAL | 64,200 | 68,100 | 72,100 | 80,500 | 85,400 | 90,500 | 95,900 | 101,800 | 107,900 | 114,400 |

TABLE 29

LABOR COSTS

| | YEARS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
| Administrative Division | | | | | | | | | | |
| S. W. A. Director | 16,000 | 16,960 | 17,978 | 19,057 | 20,200 | 21,412 | 22,697 | 24,059 | 25,503 | 27,033 |
| Secretary | 6,000 | 6,360 | 6,742 | 7,147 | 7,576 | 8,031 | 8,513 | 9,024 | 9,565 | 10,139 |
| Sub Total | 22,000 | 23,320 | 24,720 | 26,204 | 27,776 | 29,443 | 31,210 | 33,083 | 35,068 | 37,172 |
| Landfill Division | | | | | | | | | | |
| Equipment Operator | 13,100 | 13,886 | 14,719 | 15,602 | 16,538 | 17,530 | 18,582 | 19,697 | 20,879 | 22,132 |
| 2 Laborers | 17,800 | 18,868 | 20,000 | 21,200 | 22,472 | 23,821 | 25,250 | 26,765 | 28,371 | 30,073 |
| 1 Attendant | 8,900 | 9,434 | 10,000 | 10,600 | 11,236 | 11,910 | 12,625 | 13,383 | 14,186 | 15,037 |
| Sub Total | 39,800 | 42,188 | 44,719 | 47,402 | 50,246 | 53,261 | 56,457 | 59,845 | 63,436 | 67,242 |
| Community and Green Box Collection Divisions | | | | | | | | | | |
| 1 Foreman | 10,000 | 10,600 | 11,236 | 11,910 * | 12,625 | 13,383 | 14,186 | 15,037 | 15,939 | 16,895 |
| 8 Drivers | 71,200 | 75,472 | 80,000 | 95,400 ** | 101,124 | 107,191 | 113,622 | 120,439 | 127,665 | 135,324 |
| 13 Laborers | 115,700 | 122,642 | 130,001 | 159,000 | 168,540 | 178,652 | 189,371 | 200,733 | 212,776 | 225,542 |
| Sub Total | 196,900 | 208,714 | 221,237 | 266,310 | 282,289 | 299,226 | 317,179 | 336,209 | 356,380 | 377,761 |
| TOTAL LABOR COST | 258,700 | 273,300 | 290,700 | 339,900 | 360,300 | 381,900 | 404,900 | 429,100 | 454,900 | 482,200 |

*One more collection vehicle driver will be needed in 1975.
**Two more collection laborers will be needed in 1975.

only the director, foreman, and the secretary receiving a salary income.

TABLE 30

LABOR COST

| Labor Cost | Annual Cost (each) |
|---|---|
| Solid Waste Agency Director | $16,000 |
| Secretary | 6,000 |
| Foreman | 10,000 |
| Drivers | 8,900 |
| Laborers | 8,900 |
| Equipment Operator | 13,100 |
| Attendant | 8,900 |

Revenue

It is recommended that a 4 mill property tax assessment be assessed to every community in the region so that the regional solid waste agency will be funded adequately. The millage may have to be adjusted higher or lower at the time the agency is formed to reflect changing economical conditions.

This amount will cover less than half of the actual operating expense of the solid waste agency in 1972. Each farm family would be assessed $30 per year in 1972 for the solid waste service, and this would bring in $54,200. Commercial haulers would be charged a usage fee based on the amount (volume in cubic yards) of solid waste deposited in the landfill. This income, plus any government grants, would have to amount to a total of $156,700 in order for the agency to operate at a balanced financial level.

Table 31 entitled, "Projection of Community Property Tax Support for a Solid Waste Agency," shows a tentative plan of distributing the costs of the program among the different communities in the two-county region. These amounts

TABLE 31

PROJECTION OF COMMUNITY PROPERTY TAX SUPPORT
FOR A SOLID WASTE AGENCY

| | YEARS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
| Belvue | 704 | 732 | 761 | 791 | 823 | 881 | 943 | 1,009 | 1,080 | 1,156 |
| Emmett | 588 | 612 | 637 | 663 | 690 | 738 | 790 | 845 | 904 | 967 |
| Havensville | 604 | 628 | 653 | 679 | 706 | 755 | 808 | 865 | 926 | 991 |
| Louisville | 420 | 437 | 455 | 473 | 492 | 526 | 563 | 602 | 644 | 689 |
| Olsburg | 672 | 699 | 727 | 756 | 786 | 841 | 900 | 963 | 1,030 | 1,102 |
| Onaga | 3,904 | 4,060 | 4,222 | 4,391 | 4,567 | 4,887 | 5,229 | 5,595 | 5,987 | 6,406 |
| St. George | 650 | 676 | 703 | 731 | 760 | 813 | 870 | 931 | 996 | 1,066 |
| St. Mary's | 7,180 | 7,467 | 7,766 | 8,077 | 8,400 | 8,988 | 9,617 | 10,290 | 11,010 | 11,781 |
| Wamego | 13,100 | 13,624 | 14,169 | 14,736 | 15,325 | 16,397 | 17,545 | 18,773 | 20,081 | 21,493 |
| Westmoreland | 2,044 | 2,126 | 2,211 | 2,299 | 2,391 | 2,558 | 2,737 | 2,929 | 3,134 | 3,353 |
| Wheaton | 536 | 557 | 579 | 602 | 626 | 670 | 717 | 767 | 821 | 879 |
| Leonardville | 2,464 | 2,563 | 2,666 | 2,773 | 2,884 | 3,086 | 3,302 | 3,533 | 3,673 | 3,930 |
| Manhattan | 176,296 | 183,348 | 190,682 | 198,309 | 206,241 | 220,678 | 236,125 | 252,653 | 270,239 | 289,154 |
| Ogden | 3,966 | 4,125 | 4,290 | 4,462 | 4,640 | 4,965 | 5,313 | 5,685 | 6,083 | 6,509 |
| Randolph | 528 | 549 | 571 | 594 | 618 | 661 | 707 | 757 | 810 | 867 |
| Riley | 3,632 | 3,777 | 3,928 | 4,085 | 4,248 | 4,545 | 4,863 | 5,203 | 5,567 | 5,957 |
| | 217,288 | 225,980 | 235,020 | 244,421 | 254,197 | 272,000 | 291,000 | 311,400 | 333,200 | 335,500 |

may change once communities and counties enter into a solid waste management agreement among themselves.

## Total Operating Budget Projection

Table 32 is an aggregation of all expense items that have been described in the previous charts and an aggregation of the several suggested sources of funding for the regional solid waste agency. This table gives a fairly accurate description of the expense of providing a regional solid waste service over the next ten (10) years.

The cost of living in the past has progressed at a six per cent (6%) annual increase, and it was assumed that this trend would continue over the next ten (10) years. This is one of the main reasons for an approximate $300,000 increase in the operating budget between Fiscal Year 1972 and Fiscal Year 1981.

Two expense items which previously have been omitted and deserve attention are: (1) escrowing funds for emergencies; and (2) insurance and license costs. A twenty thousand dollar ($20,000) fund is suggested to be escrowed in 1972 in order to provide adequate funds for unforeseen expenses incurred in the first year of operation. This fund would be used only to meet fiscal emergencies. In the financial plan, the escrowed funds would be depleted by the end of each fiscal year because of these emergencies.

The insurance and licenses were computed to be ten thousand dollars ($10,000) in Fiscal Year 1972. The worker compensation at $190 per employee makes up the major portion of this expense. The figure remains fairly constant in increase except for Fiscal Year 1975 when another three-man collection crew will be needed for Manhattan.

TABLE 32

TOTAL OPERATING EXPENSES -- PROJECTION
FOR A
REGIONAL SOLID WASTE MANAGEMENT AGENCY

| ITEM | YEARS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
| EXPENSE | | | | | | | | | | |
| Long Term G.O. Bonding Debt Service | - | 19,112 | 18,395 | 17,679 | 16,962 | 16,245 | 15,519 | 14,812 | 14,095 | 13,378 |
| Variable Costs | 64,200 | 68,100 | 72,100 | 80,500 ** | 85,400 | 90,500 | 95,900 | 101,800 | 107,900 | 114,400 |
| Labor Costs | 258,700 | 274,200 | 290,700 | 339,900 | 360,300 | 381,900 | 404,900 | 429,100 | 454,900 | 482,200 |
| Short Term G.O. Bonding Debt Service | 75,288 | 71,328 | 72,858 | 45,116 | 67,950 | 69,966 | 72,402 | 77,442 | 87,960 | 84,907 |
| Escrowed for Emergencies | 20,000 | 21,200 | 22,472 | 23,820 ** | 25,249 | 26,764 | 28,369 | 30,071 | 31,875 | 33,787 |
| Insurance & Licenses | 10,000 | 10,600 | 11,236 | 12,630 | 13,338 | 14,138 | 14,986 | 15,885 | 16,838 | 17,848 |
| Total Costs * | 428,200 | 464,500 | 487,800 | 519,600 | 569,200 | 599,500 | 632,100 | 669,100 | 713,600 | 747,500 |
| REVENUE | | | | | | | | | | |
| Community Property Tax * * | 217,300 | 226,000 | 235,000 | 244,400 | 254,200 | 272,000 | 291,000 | 311,400 | 333,200 | 335,500 |
| Farm Families Assessment | 54,300 | 55,900 | 57,700 | 59,400 | 61,600 | 63,864 | 66,100 | 68,300 | 70,600 | 72,800 |
| Landfill Usage Fees and Grants * | 156,700 | 182,600 | 195,100 | 188,400 | 228,600 | 263,600 | 257,500 | 273,400 | 309,800 | 313,500 |
| Salvage Equipment * | - | - | - | 27,400 | 24,800 | - | 17,500 | 16,000 | - | 25,700 |
| Total Revenue * | 428,200 | 464,500 | 487,800 | 519,600 | 569,200 | 599,500 | 632,100 | 669,100 | 713,600 | 747,500 |

* Numbers were rounded to the nearest 100.
** One additional collection vehicle with a three-man crew will be needed in 1975.

## Summary

The analysis has revealed that it is feasible for a solid waste management agency to provide its service for all the communities in Pottawatomie-Riley Counties, as well as to rural residents. The regional system would be a more efficient use of the taxpayers' dollars than if each community provided its own solid waste service.

The solid waste management plan which has been formulated will give the residents a knowledge that their refuse is being collected and disposed of in the most sanitary and most ecologically safe method possible.

# CHAPTER VI

# SUMMARY AND RECOMMENDATIONS

## Summary

The purpose of this study has been to analyze information pertinent to the present solid waste management situation for the Pottawatomie-Riley Counties, Manhattan Regional Planning Commission, and to determine the feasibility of developing a regional system of solid waste management.

### Storage

Local governmental units within the region have not addressed themselves to the problem of utilizing their police powers in the regulation of storage procedures for solid waste. Some of the reasons for this lack of action may include:

1. Their constituents did not exert sufficient pressure on the decision-makers. Therefore, no local action was taken in controlling the methods of solid waste storage.

2. Because the use of insecticides has been discouraged in recent years, thus the traditional open metal trash containers have become breeding areas for vectors. The utilization of Kraft paper bags and/or polythylene bags provides an economical and sanitary method of solid waste storage. Bag collection and curbside collection systems may result in savings of 30 per cent or more over conventional cans and carry-out service.

3. The U.S. Department of Health, Education, and Welfare has funded several demonstration solid waste management systems which have developed innovative solid waste storage methods in the last several years. The technological knowledge was not available for general use before this time.

The city of Manhattan was the only community found to be enforcing regulations concerning on-site storage of refuse. A model Solid Waste Storage Ordinance should be adopted and enforced by all local governmental units

within the region so as to provide a sanitary storage method.

The rural solid waste storage system, as proposed in the study, would eliminate the large disparity in the service between rural and urban areas. The rural solid waste storage system would consist of four (4) cubic yard storage containers placed along roadside locations at appropriate intervals, thereby providing most rural residents with a solid waste container located not more than four (4) miles from home.

## Collection

With the exception of Wamego, none of the local governmental units within the region has a public system of solid waste collection. Private haulers are often inefficient in their service because (1) the compactor truck cannot haul large loads of refuse; (2) the collection routes were characterized as being long with scattered customers; and (3) there were too many private haulers competing in the market place, thus resulting in a diseconomy.

The proposed regional solid waste management agency should accept the responsibility of providing collection service to rural and urban residents within the region. Industries and commercial establishments would continue to contract with private haulers.

A 30-cubic yard front yard or rear loader collection truck would be utilized in the collection of refuse from the four (4) cubic yard rural storage containers located at various intersections throughout the region. Frequency of collection would begin at a twice weekly rate until the proper frequency could be determined.

The collection of solid waste by a regional solid waste management agency is feasible economically. The unknown factor, that is, whether or not it is politically feasible to attempt to form such an agency, must be answered.

The region, in the past, has demonstrated the ability to plan as a single entity. The regional solid waste management agency must either provide a sufficient administrative authority or have the ability to relate to the individual household to the same degree as most local governments.

## Disposal

In April of 1968, eleven solid waste disposal facilities within the region were inventoried by the Kansas Department of Health, and all were classified as open dumps. The local governmental units have, in the past, devoted little of their budgets to the operation of open dumps, a substandard method of disposal, within the region.

The landfill disposal facility, when compared to other disposal methods, would result in the most advantageous cost benefit for the citizenry of the region. The study proposed one central sanitary landfill disposal facility to be located northwest of the city of Manhattan. The disposal facility would provide the proposed regional solid waste agency with twenty years of utility, and then the site would be utilized for a higher land use upon termination of the solid waste facility.

## Recommendations

Communities in Pottawatomie and Riley Counties have been unable to provide an adequate solid waste management system. In the future, most communities in the region will be unable to afford to provide the necessary solid waste service because of the limitations on local funding sources. The study which has been developed indicates that it is both feasible and advantageous for Pottawatomie County, Riley County, and the city of Manhattan to cooperate in the establishment of a regional solid waste agency.

The Pottawatomie and Riley, Manhattan Regional Planning Commission should assume the responsibility for the development of a regional solid waste management plan. The present county solid waste planning committees should be involved as an advisory body to the Regional Planning Commission.

This study, with some minor restructuring, could serve as an acceptable Solid Waste Management Plan to be submitted to the Kansas State Department of Health. A professional engineering and/or planning firm should be retained to advise and assist the Regional Planning Commission in the preparation of a regional solid waste management plan.

# APPENDIX A

# STANDARD UNITS AND GLOSSARY OF TERMS

## Standard Units of Measure

The units of measurement used in this report are defined as the following:

### Acreage Requirement for Sanitary Landfill

One acre filled to a depth of 7 feet (11,293 cubic yards), one cell, would handle the refuse for a population of 10,000 people for one year.

### Weight-Volume Conversion Factor

In the Solid Waste Study, the American Public Works Association ratio of 400 pounds of mixed refuse to the cubic yard, or 1 ton equals 5.0 cubic yards.

In reviewing other reports, they have used either cubic yards or tons in computations. Both of these units are satisfactory, but for this study, most computations will be in tons of refuse. Weight is the most reliable basis since it is a relative measure.

## Glossary of Terms

Abandoned Vehicles - Passenger automobiles, trucks, and trailers that are no longer useful and have been left on city streets and other public places.

Antinomycetes - A large group of microorganisms closely related to bacteria which are significant in the stabilization of solid waste (composting).

Ashes - Residue from the burning of combustibles (i.e., wood and coal).

Bacteria - Any of numerous widely-distributed unicellular microorganisms exhibiting both plant and animal characteristics. Some are capable of causing human, animal or plant diseases. Some are important in sewage or refuse stabilization.

BTU (British Thermal Unit) - The quantity of heat required to increase the temperature of one pound of water one degree of Fahrenheit.

Burner - A simple device for either municipal or on-site volume reduction of refuse by burning without the assistance of extra heating energy. This should not be confused with an incinerator, which, if properly designed and operated, can produce a satisfactory residue without serious air pollution problems.

Capacity (Incinerator) - The amount of solid wastes that can be burned to an inoffensive gas and a sterile residue containing little or no combustible material in a given time period. Usually expressed in pounds per hour or tons per 24 hours.

Carrying Container - A transfer container carried by the collector in backyard carry-out service. Usually of 30-50 gallon capacity and especially constructed of plastic or aluminum.

Cell - Compacted refuse completely enveloped by cover material.

Central Garbage Grinding - The grinding by mechanical means of garbage accumulated by delivery vehicles.

Combustible Solid Waste - Miscellaneous burnable material. In general, the organic component of rubbish.

Communicable Disease - An illness due to an infectious agent or its toxic product which is transmitted directly or indirectly to a well person from an infected person or animal, or through the agencies of an intermediate host, vector or inanimate environment.

Communicable Period - The time or times during which the etiologic agent may be transferred from an infected person or animal to man.

Compactor Collection Truck - Enclosed vehicle provided with special mechanical devices for loading the refuse into the main compartment of the body, for compressing the loaded materials and for distributing the refuse within the body.

Composting - A controlled microbial degradation of organic waste yielding a nuisance free product of potential value as a soil conditioner.

Construction and Demolition Wastes - Waste building materials and rubble resulting from construction, remodeling, repair and demolition operation on houses, commercial buildings, etc.

Containers, Storage (Reusable - Individual) - Receptacles that are water tight, have tight-fitting cover and can be easy to clean. All containers should be easy to empty and be equipped with suitable handles.

Containers, Storage (Paper or Plastic Sack - Disposable) - A paper or plastic sack storage is usually about 3½ feet high and with a capacity of 28 or 30 gallons. These may be free standing or affixed to a wall.

Contract Collection - City pays a contractor for doing collection work.

Dead Animals - Those that die naturally or from disease or are accidentally killed. Condemned animals or parts of animals from slaughter houses or similar places are not included in this term but are regarded as industrial refuse.

Definite Working Day Collection Method - A variation of the large route method. Definite routes are laid out and a crew assigned to each. Collection proceeds along a route for the length of time adopted for a working day. The next day, collection begins where the crew stopped the day before. This continues until the route is completely collected, whereupon the crew starts collection again at the beginning of the route without interruption.

Demolition Wastes - (See Construction Wastes)

Disinfection - The killing of pathogenic agents outside the body by chemical or physical means applied directly.

Dump - The consolidation of waste from one or more sources at a central disposal site which has little or no management. Some of the problems associated with open dumps are vector breeding, air and water pollution, unsightliness, and accident potential.

Fly Ash - All solids including ash, charred paper, cinder, soot, or other partially burned matter, residue in the production of combustion.

Fly Ash Collector - Equipment for removing fly ash from the products of combustion.

Fungi - Simple plants without photosynthetic pigment. Some fungi are involved in stabilization of solid waste (composting).

Garbage - Refuse from a kitchen, etc., consisting of unwanted or unusable pieces of meat, vegetables, etc.

Garbage Grinding - A method of uniformly reducing food waste or garbage and placing the reduced product in sewer system. The ground garbage should pass through the sewage treatment plant and will be disposed of as sewage sludge after treatment.

Hog Feeding - A process in which food waste or garbage portion of refuse is disposed of by feeding to hogs. State regulations throughout the U.S. require that the garbage be heated prior to feeding.

Incineration - The process of burning solid, semi-solid, or gaseous combustible waste to an inoffensive gas and a sterile residue containing little or no combustible material.

Incinerator - An arrangement of chambers and equipment designed for burning solid, semi-solid, or gaseous combustible waste to an inoffensive gas and a sterile residue containing little or no combustible material.

Incubation Period - The time period between the infection of a susceptible person or animal and the appearance of signs of symptoms of the disease.

Large Route Collection Method - A variation of the task system in which work is laid out for a normal week's activity for a single crew. The crew may work each day without a fixed stopping point or number of hours, but the route must be entirely completed within the working week.

Microorganisms - Generally, any living thing microscopic in size and including the bacteria, actinomycetes, etc. Some produce disease in man, animals or plants; some are involved in stabilization of solid wastes (composting) and sewage.

Municipal Collection - Collection by city employees; operation by city departments.

Non-Combustible Solid Waste - Miscellaneous refuse materials that are unburnable at ordinary incinerator temperatures (1300° F. to 2000° F.)

Offal - Intestine and discarded parts from the slaughter of animals.

On-Site Disposal - Includes all means of disposal or, more usually, volume reduction of refuse on premises before collection (i.e., garbage grinding, burning, etc. at homes and commercial establishments).

Private Collection - The collection of wastes in which citizens or firms, individually or in limited groups, pay collectors operating private agencies.

Putrescible - Capable of being decomposed by microorganisms with sufficient rapidity as to cause nuisances from odors, gases, etc. Kitchen wastes, offal, and dead animals are examples.

Rear Loader, Detachable Container - Detachable container system in which roll-out containers, typically 1 to 3 yard capacity, are hoisted at the rear of the collection vehicle and mechanically emptied. Container is left with the customer.

Refuse Shed - A region or area which, for reasons of contiguous population and/or other common features, includes refuse sources which may be considered collectively in general planning.

Rendering - A process of salvaging fats and oils, animal feed and other products from animal waste by cooking. Dead animals, fish, and waste from slaughter and butcher shops are commonly utilized.

Rubbish - Nonputrescible solid wastes, including ashes, consisting of both combustible and non-combustible wastes such as paper, cardboard, tin cans, yard clippings, wood, glass or litter of any kind.

Salvaging - The controlled removal of reusable materials.

Sanitary Landfill - A method of disposing of refuse on land without creating nuisances or hazards to public health or safety, by utilizing the principles of engineering to confine the refuse to the smallest practical area, to reduce it to the smallest practical volume, and to cover it with a layer of earth at the conclusion of each day's operation or at such more frequent intervals as may be necessary.

Scalvage and Reclamation - A refuse disposal process in which the refuse is separated mechanically or by hand into various categories such as ferrous and nonferrous metals, rags, cardboard, paper, glass, etc. The sorted refuse is then sold as waste or scrap.

Scavenging - The uncontrolled picking of materials.

Scooter - A small, usually single-passenger, 3-wheel vehicle with body of 1 cubic yard capacity, used in refuse collection, especially to negotiate long driveways and narrow alleys. Collected refuse is emptied into a collection truck.

Set-out, Set-back Method - Full refuse containers are carried by a special set-out crew from back doors or other places on the householders' premises to curbs or alleys a few minutes prior to the arrival of the collection vehicle. Refuse is loaded in the same manner as when it is placed at curbs or alleys by the householders, leaving empty containers at the curbs or alleys. A special set-back crew returns the empty cans to their regular locations within a short time after they are emptied.

Side Loader, Detachable Container - Detachable container system similar to rear loader except loaded at side of collection vehicle.

Single Load Collection Method - A variation of the task system in which areas or routes are laid out which under normal conditions each provides a full load of refuse. Each crew usually has two or more routes for a day's work. The crew quits for the day when the assigned number of routes are completed (See Task System).

Solid Wastes - Decomposable and non-decomposable materials which are useless or discarded resulting from normal community activities, except body wastes, including garbage, rubbish, ashes and street cleanings.

Street Refuse - Materials picked up by manual and mechanical sweeping of streets and sidewalks, litter from public litter receptacles and dirt removed from catch basins.

Task System (Daily Route Method) - A collection crew is assigned a weekly route, divided into daily routes. The crew is then responsible for refuse pick-up at all collection points on the assigned daily routes. Weather, refuse quantities, and other variables will cause the elapsed time for completion of each daily route to vary. The crew is allowed to go home after completion of the day's route, whether it takes less or more than the established work day to complete. (See also Large Route Collection Method, Group Task System, Single Load Collection Method, and Definite Working Day Method.)

Train System - A collection system consisting of a series of (usually three to five) wheeled containers of about 4 - 8 cubic yards capacity, open at the top or covered by tarp, and towed by a light truck. The containers are emptied into a compactor collection vehicle on the route or are towed directly to the disposal site.

Transfer Station - A supplemental transportation system used as an adjunct to route collection vehicles to reduce haul costs or add flexibility to the operation. A typical system has facilities in which route vehicles empty into a large hopper from which open semi-trailers of about 40 cubic yards capacity or railroad gondolas are filled. There may be some recompaction of refuse. Transfer stations may be fixed or mobile.

Vector (of Disease) - A living insect or other arthopod, or animal (not human) which transmits infectious diseases.

Vehicle (of Infection) - Water, food, milk or any substance or article serving as an intermediate means by which the pathogenic agent is transported from a reservoir and introduced into a susceptible host through ingestion, through inocculation or by deposit on the skin or mucous membrane.

# APPENDIX B

## HOUSE BILL NO. 1141

An Act relating to solid waste; providing for the planning and regulation of solid waste storage, collection, transportation, processing and disposal systems; requiring cities and counties to submit plans for solid waste management systems under their jurisdiction; authorizing planning grants to cities and counties; requiring permits for operating processing or disposal systems and fixing fees therefor; authorizing cities and counties to provide for the collection and disposal of solid waste; authorizing the state department of health to adopt rules, regulations, standards and procedures; creating an advisory council, regulating the storage, collection, transportation, processing and disposal of solid waste and providing for the administration and enforcement thereof; and declaring certain acts to be unlawful.

Be it enacted by the Legislature of the State of Kansas:

Section 1. It is hereby declared that protection of the health and welfare of the citizens of Kansas requires the safe and sanitary disposal of solid wastes. The legislature finds that the lack of adequate state regulations and control of solid waste and solid waste management systems has resulted in undesirable and inadequate solid waste management practices that are detrimental to the health of the citizens of the state; degrade the quality of the environment; and cause economic loss. For these reasons, it is the policy of the state to:

(a) Establish and maintain a cooperative state and local program of planning and technical and financial assistance for comprehensive solid waste management.

(b) Utilize the capabilities of private enterprise, as well as the services of public agencies, to accomplish the desired objectives of an effective solid waste management program.

(c) Require a permit for the operation of solid waste processing and disposal systems.

Section 2. The following words and phrases when used in this act shall, for the purpose of this act, have the meanings respectively ascribed to them in this section.

(a) "Solid waste" means garbage, refuse and other discarded materials, including, but not limited to, solid and liquid waste materials resulting from industrial, commercial, agricultural and domestic activities.

(b) "Solid waste management system" means the entire process of storage, collection, transportation, processing, and disposal of solid wastes by any person engaging in such process as a business, or any city, authority, county or any combination thereof.

(c) "Solid waste processing facility" means incinerator, compost plant, transfer station, or any other location where solid wastes are consolidated, temporarily stored or salvaged prior to being transported to a final disposal site.

(d) "Solid waste disposal area" means any area used for the disposal of refuse from more than one residential premise, or one or more commercial, industrial, manufacturing, or municipal operations.

(e) "Person" means individual, partnership, corporation, institution, political subdivision, or state agency.

(f) "Waters of the state" means all streams and springs, and all bodies of surface or groundwater, whether natural or artificial, within the boundaries of the state.

(g) "Department" means the Kansas State Department of Health.

(h) "Board" means the Kansas State Board of Health.

Section 3. An advisory council consisting of fifteen (15) members shall be appointed by the Board. The membership of this council shall include one representative from each of the following:

(a) Kansas Department of Economic Development
(b) Kansas State Board of Agriculture
(c) League of Kansas Municipalities
(d) Kansas County Commissioner's Association
(e) American Public Works Association, Kansas Chapter
(f) Kansas Public Health Association
(g) Kansas Engineering Society
(h) Kansas Section, Arkansas Valley Chapter of the American Institute of Planners
(i) Kansas University
(j) Kansas State University
(k) Wichita State University
(l) A representative from the privately-operated sector of refuse collection or disposal
(m) Two representatives of the general public

The chief engineer of the Board of Health shall be an ex officio member of the advisory council and, with voting privileges, shall serve as secretary.

Section 4.

(a) The advisory council shall, within twelve (12) months of the enactment of this act, submit to the Board for adoption a recommended set of rules, regulations, standards, and procedures as it deems necessary for the implementation of this act.

(b) The advisory council shall develop and submit to the Board for recommendation to the following session of the legislature an acceptable and equitable plan for financing solid waste systems. The plan shall provide for

the use of available resources from federal, state, and local units of government.

(c) The members of the council shall receive twenty-five dollars ($25) for each day or fraction of a day they serve and shall be reimbursed for their actual and necessary expenses incurred in the performance of their duties.

(d) The advisory council shall provide consultation and guidance to the department in conducting researches and investigation in the overall area of solid waste collection, handling, preparation, transportation, and disposal.

Section 5.

(a) On or before January 1, 1971, each county shall organize a solid waste management committee provided for in paragraph (b) of this section. On or before June 30, 1974, each county with a population in excess of thirty thousand (30,000) and each city located therein which elects pursuant to subsection (b) of this section to exclude such city from the county plan shall submit to the department a workable plan for the management of solid waste within such county or city. On or before June 30, 1974, each county with a population of from fifteen thousand (15,000) to thirty thousand (30,000) and each city located therein which elects pursuant to subsection (b) of this section to exclude such city from the county plan shall submit to the department a workable plan for the management of solid waste within such county or city. On or before June 30, 1974, each county with a population of less than fifteen thousand (15,000) and each city located therein which elects pursuant to subsection (b) of this section to exclude such city from the county plan shall submit to the department a workable plan for the management of solid waste in such county or city. The plan developed by each county or city shall be adopted by the governing body of such county or city and shall be amended from time to time as changing conditions occur by the filing of revisions to said plan with the department. Nothing in this act shall be construed to supersede or oust the jurisdiction of any local solid waste control program in operation on the effective date of this act: Provided, That within two (2) years from such date, any such program shall meet all the requirements of this act for a local solid waste control program. Any approval required shall be deemed granted unless action is taken to the contrary.

(b) There is hereby created in each county of this state a solid waste management committee which shall include one (1) member of the Board of County Commissioners, the County Engineer, the County Health Officer or his designated representative, the Director of Planning if one exists, one representative from each city and township served by the county solid waste management plan, two members who shall be selected from the public at large. City members of the solid waste management planning committee shall be selected by the mayors of the cities represented and the members of the public at large shall be selected by the Board of County Commissioners. The solid waste management plan submitted by each county shall provide for a solid waste management system plan to serve the residents of all townships and cities within the county or counties except for those cities which elect to be excluded from the county plan by resolution adopted by the city governing body thereof: Provided, That the county plan shall take reasonable cognizance of separately prepared plans developed by cities within such county.

(c) Every plan shall:

(1) Delineate areas within the jurisdiction of the political subdivision where waste management systems are in existence and areas where the solid waste management systems are planned to be available within a ten-year period.

(2) Reasonably conform to the rules, regulations, standards, and procedures adopted by the Board for implementation of this act.

(3) Provide for the orderly extension of solid waste management systems in a manner consistent with the needs and plans of the whole area, and in a manner which will not contribute to pollution of the waters or air of the state, nor constitute a public nuisance and shall otherwise provide for the safe and sanitary disposal of solid waste.

(4) Take into consideration existing comprehensive plans, population trend projections, engineering and economics so as to delineate with practicable precision those portions of the area which may reasonably be expected to be served by a solid waste management system within the next ten (10) years.

(5) Take into consideration existing acts and regulations affecting the development, use and protection of air, water or land resources.

(6) Establish a time schedule and revenue schedule for the development, construction and operation of the planned solid waste management systems, together with the estimated cost thereof.

(7) Include such other reasonable information as the department shall require.

(d) The plan shall be reviewed by appropriate official planning agencies within the area covered by the plan for consistency with programs of comprehensive planning for the area, and all such reviews shall be transmitted to the department with the proposed plan.

(e) The department is hereby authorized to approve or disapprove plans for solid waste management systems submitted in accordance with this act. In the event any plan is disapproved, the department shall furnish any and all reasons for such disapproval, and any city, county or political subdivision whose plan is disapproved may request a hearing before the Board in accordance with Section 12 of this act.

(f) The department is authorized to provide technical assistance to counties, municipalities and authorities in coordinating plans for solid waste management systems required by this act, including revisions of such plans.

(g) The department may, in appropriate cases, recommend the submission of joint plans.

(h) The Board may institute appropriate action under Section 14 to

compel submission of plans in accordance with this act and the rules, regulations, standards and procedures of the Board.

Section 6. After considering the recommendations of the advisory council, the Board is authorized and directed to:

(a) Adopt such rules, regulations, standards and procedures relative to solid waste management as shall be necessary to protect the public health, prevent public nuisances, and enable it to carry out the purposes and provisions of this act.

(b) Report to the legislature on further assistance needed to administer the solid waste management program.

(c) Administer the solid waste management program pursuant to provisions of this act.

(d) Cooperate with appropriate federal, state, interstate and local units of government and with appropriate private organizations in carrying out its duties under this act.

(e) Develop a statewide solid waste management plan.

(f) Provide technical assistance to cities, counties and other political subdivisions including the training of personnel.

(g) Initiate, conduct and support research, demonstration projects, and investigations and coordinate all state agency research programs with applicable federal programs pertaining to solid waste management systems.

(h) Establish policies for effective solid waste management systems.

(i) Authorize issuance of such permits and orders and conduct such inspections as may be necessary to implement the provisions of this act and the rules, regulations and standards adopted pursuant to the act.

(j) Conduct and contract for researches and investigations in the overall area of solid waste collection, handling, preparation, transportation and disposal including, but not limited to, new and novel procedures.

Section 7.

(a) After June 30, 1976, in all counties of the state, it shall be unlawful for any person to operate a solid waste processing facility or a solid waste disposal area of a solid waste management system without first obtaining a permit from the department.

(b) Every person desiring to obtain a permit to operate a solid waste processing or disposal facility or area shall make application for such a permit on forms provided for this purpose by the department and shall provide the department with such information as necessary to show that the facility or service will comply with the purpose of this act. Upon receipt of an application and payment of the fee, the department, with advice and counsel

from the local health authorities shall make an investigation of the solid waste processing facility or disposal area and determine whether it complies with the provisions of this act and any rules, regulations and standards adopted thereunder. When the investigation reveals that the facility or area does conform with the provisions of the act and the rules, regulations and standards adopted thereunder, the department shall approve the application and shall issue a permit for the operation of each solid waste processing or disposal facility or area set forth in the application. In the event that the facility or area fails to meet the rules, regulations and standards required by this act, the department shall issue a report to the applicant stating the corrections to be made and setting a reasonable time for compliance. The department may, at its option, issue temporary permits conditioned upon corrections of operational methods being completed and implemented.

(c) The annual fee for a solid waste processing or disposal permit shall be fifty dollars ($50): Provided, No refund shall be made in case of revocation. All fees shall be deposited in the general fund in the state treasury. A city, county, other political subdivision or state agency shall be exempt from payment of the fee but shall meet all other provisions of this act.

(d) Plans, designs and relevant data for the construction of solid waste processing facilities and disposal sites shall be prepared by a licensed professional engineer licensed to practice in Kansas and shall be submitted to the department for approval prior to the construction, alteration or operation of such facility or area.

(e) Permits granted by the department, as provided in this act, shall be revocable or subject to suspension whenever the department shall determine that the solid waste processing or disposal facility or area is, or has been conducted in violation of this act or the rules, regulations or standards adopted pursuant to the act, or is creating a public nuisance.

(f) In case any permit is denied, suspended or revoked, the person, city, county or other political subdivision or state agency may request a hearing before the Board in accordance with Section 12 of this act.

Section 8. All state institutions and agencies shall obtain a permit from the department under the provisions of Section 7 of this act and shall also comply with all other provisions of this act: Provided further, That such institutions and agencies may contract with any person, city, county, other political subdivision or state agency to carry out their responsibilities under the act.

Section 9. It shall be unlawful for any person, city, county, other political subdivisions or state agency to:

(a) Dump or deposit, or permit the dumping or depositing of any solid wastes onto the surface of the ground or into the waters of the state without having obtained a permit, as required by Section 7: Provided, That this provision shall not prohibit the use of solid wastes in normal farming operations or in the processing or manufacturing of other products in a manner that will not create a public nuisance or adversely affect the public health: Provided further, That this provision shall not prohibit individuals from dumping or

depositing solid wastes resulting from their own residential or agricultural activities onto the surface of land owned or leased by them when such wastes do not create a public nuisance or adversely affect the public health.

(b) Construct, alter or operate a solid waste processing or disposal facility or area of a solid waste management system without a permit or other approval from the department or in violation of the rules, regulations, standards or order of the department.

(c) Conduct any solid waste burning operations in violation of the provisions of K.S.A. 1969 Supp. 65-3001 to 65-3020, inclusive.

(d) Store, collect, transport, process or dispose of solid waste contrary to the rules, regulations, standards or orders of the department or in such a manner as to create a public nuisance.

(e) Refuse or hinder entry and inspection by an agent or employee of the department after such agent or employee identifies himself and gives notice of his purpose.

No person shall be held responsible for failure to secure a permit under the provisions of this section for the dumping or depositing of any solid waste on land owned or leased by him without his expressed or implied consent, permission or knowledge.

Section 10.

(a) Each city or county or combination of such cities and counties may provide for the collection, transportation, processing and disposal of solid wastes generated within its boundaries; and shall have the power to purchase all necessary equipment, acquire all necessary land, build any necessary buildings, incinerators, transfer stations, or other structures, lease or otherwise acquire the right to use land or equipment for the disposal of solid waste and to do all other things necessary for a proper effective solid waste management system.

(b) In carrying out its responsibilities, any such city or county may adopt ordinances, resolutions, regulations and standards for the storage, collection, transportation, processing and disposal of solid wastes which shall be in conformity with the rules, regulations, standards, and procedures adopted by the Board for the storage, collection, transportation, processing and disposal of solid wastes.

(c) Cities or counties may contract with any person, city, county, other political subdivision or state agency in this or other states to carry out their responsibilities for the collection, transportation, processing and disposal of solid wastes.

Section 11. If the department finds that the storage, collection, transportation, processing or disposal of solid waste from any source subject to the provisions of Section 9 is, or might reasonably be expected to cause pollution of the land, air or waters of the state or combination thereof, or is creating a public nuisance, the department may order the person, city, county,

other political subdivision or state agency to alter its storage, collection or transportation systems or provide such storage, collection or transportation systems as will prevent pollution and public nuisances. Such order shall specify the length of time, after receipt of the order, within which the facility or area shall be repaired, altered, constructed or reconstructed. Any party aggrieved by an order under this section shall have the right of appeal in accordance with the provisions of Section 12.

Section 12. Any person aggrieved by such order or disapproval may within ten (10) days of service of the order request a hearing on the order. Hearings shall be conducted by the Board, its executive secretary, or hearing officers appointed by the Board. Such hearing officers shall have the power and authority to conduct such hearings in the name of the Board at any time and place. A record of the proceedings of such hearings shall be taken and filed with the Board together with the findings of facts and conclusions made by the Board. On the basis of the evidence produced at the hearing, the Board shall make findings of fact and conclusions of law and shall give written notice of such findings and conclusions to the alleged violator. The order of the Board shall be final unless appealed to the courts within thirty (30) days after the order has been made. Any notice, order or instrument issued by or with the authority of the Board may be made by mailing a copy of the notice, order or other instrument by registered mail directly to the person affected at his last known post office address as shown by the files or records of the department. An appeal may be taken from any final order or final determination of the Board by any person adversely affected, to the district court of the county of residence of the appellant. Notice of appeal from any such final order or determination shall be served on the Board through its executive secretary. Failure to serve such notice of appeal within thirty (30) days shall operate as a waiver of the right of appeal. Notice of appeal shall refer to the action of the Board appealed from and shall specify the grounds for appeal. Copy of the original notice of appeal with proof of service on the executive secretary shall be filed by the appellant with the clerk of the court within ten (10) days of the service of the notice and thereupon the court shall have jurisdiction of the appeal. Service of a notice of appeal shall not operate as a stay of the Board order; however, the appellant has the right to apply to the Board for a stay, which the Board in its discretion may grant. Upon receipt by the executive secretary of the notice of appeal, he shall, within fifteen (15) days, file with the clerk of the district court a certified transcript of all files and proceedings relating to the order or decision appealed from. The review shall be conducted by the court without a jury and shall be de novo, except that in cases of alleged irregularities in procedure, testimony thereon may be taken in the court. The court may affirm the order or decision of the Board, or may reverse or modify said order. Appeals may be taken to the supreme court from the order or decision of the district court in the same manner as in other civil cases.

Section 13. The department may designate local health departments to act as its agent in carrying out the provisions of this act under such terms and conditions as it shall prescribe.

Section 14. The county attorney of every county is hereby authorized and directed to file appropriate actions for enforcement of this act upon request of the Board.

Section 15.

(a) The department is authorized to assist counties, municipalities and authorities by administering grants to pay up to fifty per cent (50%) of the costs of preparing official plans for solid waste management systems in accordance with the requirements of this act and the rules, regulations and standards adopted pursuant to this act, and for carrying out related studies, surveys, investigations, inquiries, research and analyses.

(b) All grants shall be made from funds appropriated for this purpose by the legislature.

Section 16. The provisions of this act are severable and if any provision or part thereof shall be held invalid or unconstitutional or inapplicable to any person or circumstances, such invalidity, unconstitutionality or inapplicability shall not affect or impair the remaining provisions of the act.

Section 17. This act shall take effect and be in force from and after its publication in the statute book.

# APPENDIX C

## CHAPTER 28 STATE BOARD OF HEALTH REGULATIONS

## ARTICLE 29 SOLID WASTE MANAGEMENT STANDARDS AND REGULATIONS

### Part 1 Administration Procedures

28-29-1. SCOPE AND CONTENT

These rules and regulations establish minimum standards for the storage, collection, transportation, processing, utilization and final disposal of solid wastes by any person, industry, city or county. Nothing in these regulations shall interfere with the right of cities or counties to enact ordinances or resolutions for control of solid waste management practices which are more stringent than the requirements of these regulations. (Authorized by K.S.A. 1970 Supp. 65-3406: Effective January 1, 1972).

28-29-2. VARIANCES

Upon receipt of a written request from the owner or operator of a solid waste management system for a variance from the requirements of these regulations, the Department shall consider the request and if it finds that exceptional circumstances make strict conformity with any provisions of the regulations an undue hardship, or would be unreasonable, impractical or not feasible, the Department may grant a variance from these regulations and stipulate such conditions and such time limitations as it may deem necessary to prevent and to control any air, land or water pollution, and comply with the intent of all applicable State and Federal Laws. (Authorized by K.S.A. 1970 Supp. 65-3406: Effective January 1, 1972).

28-29-3. DEFINITIONS

The following words and phrases, when applied to these regulations, shall have the following meanings:

"Agricultural waste" means solid waste resulting from the production of farm or agricultural products.

"Air pollution" means the presence in the outdoor atmosphere of one or more air contaminants in such quantities and duration as is, or tends significantly to be injurious to human health or welfare, animal or plant life, or property, or would unreasonably interfere with the enjoyment of life or property.

"Board" means the Kansas State Board of Health.

"Bulky waste" means large items of refuse including but not limited to appliances, furniture, tires, large auto parts, trees, branches and stumps.

"Commercial waste" means all solid waste emanating from establishments engaged in business. This category includes but is not limited to solid waste originating in stores, markets, office buildings, restaurants, shopping centers and theatres.

"Composting" means a controlled process of microbial degradation of organic material into a stable, nuisance free humus-like product.

"Construction and demolition waste" means waste building materials and rubble resulting from construction, remodeling, repair or demolition operations on houses, commercial buildings, other structures and pavements.

"Demolition landfill" means a landfill used exclusively for the disposal of demolition wastes.

"Dump" means a collection or consolidation of solid wastes from one or more sources at a central disposal site which has little or no management.

"Department" means the Kansas State Department of Health.

"Garbage" means the animal and vegetable waste resulting from the handling, processing, storage, packaging, preparation, sale, cooking and serving of meat, produce and other foods and shall include unclean containers.

"Ground water" means water in the ground that is in the zone of saturation.

"Hazardous wastes" are solid and liquid wastes which require special handling and disposal to protect and conserve the environment and shall include pesticides, acids, caustics, pathological wastes, radioactive materials, flammable or explosive materials, oils and solvents, and similar chemicals and materials, and shall include containers and materials that have been contaminated with hazardous wastes.

"Incineration" means the controlled process of burning solid, liquid and gaseous combustible wastes for the purpose of volume and weight reduction in facilities designed for such use.

"Incinerator" means any device or structure used for the destruction, or volume reduction of garbage, rubbish, or other liquid or solid waste materials by combustion pursuant to disposal of salvaging operations.

"Industrial waste" means all solid waste resulting from manufacturing and industrial processes and liquid waste resulting from manufacturing or industrial processes which are not suitable for discharge to a sanitary sewer or treatment in a community sewage treatment plant.

"Mixed refuse" means a mixture of solid wastes containing both putrescible and nonputrescible materials.

"Nuisance" means anything which (1) is injurious to health, or is offensive to the senses or any obstruction to the free use of property so as to interfere with the comfortable enjoyment of life or property, and (2) affects at the same time an entire community or neighborhood or any considerable number

of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal, and (3) occurs during or as a result of the handling or disposal of solid wastes.

"Official Adopted Solid Waste Management Plan" referred to herein as "Official Plan" and "Official Plan for Solid Waste Management" means a comprehensive plan for the provision of an adequate solid waste management system adopted by any authority, county, city, or any combination thereof possessing authority to provide such a system or having jurisdiction over the provision of such system, and submitted to and approved by the Department as provided in K.S.A. 1970 Supp. 65-3405.

"Person" means individual, partnership, corporation, institution, political subdivision or state agency.

"Processing of wastes" means any technology applied for the purpose of reducing the bulk of hazards of solid waste materials or any technology designed to convert part or all of the solid waste materials for reuse.

"Refuse" shall mean unwanted or discarded material resulting from commercial, industrial and agricultural operations and from normal community activities. Refuse includes in part the following: garbage; rubbish; ashes and other residue after burning; street refuse; dead animals; animal waste; abandoned vehicles; agricultural, commercial and industrial waste; construction and demolition waste, and sewage treatment residue; provided, however, that the term "refuse" does not include any uncontaminated earth, stone or minerals.

"Salvaging" means the controlled removal of reusable materials.

"Sanitary landfill operation" means a method of disposing of solid wastes on land without creating nuisances or hazards to the public health or safety by confining refuse to the smallest practical area, compacting it to the smallest practical volume by employing power equipment, and covering with a layer of compacted earth or other suitable cover material at the conclusion of each day's operation.

"Solid waste disposal area" also referred herein as "disposal area" or "disposal site," means any area used for the disposal of refuse from more than one residential premise, or one or more commerical, industrial, manufacturing, or municipal operations.

"Solid waste management system" means the entire process of storage, collection, transportation, processing, and disposal of solid wastes by any person engaging in such process as a business, or any city, authority, county or any combination thereof.

"Solid waste" means garbage, refuse and other discarded material including but not limited to solid and liquid waste materials resulting from industrial, commercial, agricultural and domestic activities.

"Solid waste processing facility" also referred herein as "processing facility" means incinerator, compost plant, transfer station or any other location where solid wastes are consolidated, temporarily stored or salvaged

prior to being transported to a final disposal site.

"Vector (of disease)" means an animal or insect which transmits infectious diseases from one person or animal to another by biting the skin or mucous membrane or by depositing infective material on the skin, on food, or on another object.

"Water pollution" means contamination, or other alteration of the physical, chemical or biological properties of any waters of the state as will or is likely to create a nuisance or render such waters harmful, detrimental, or injurious to public health, safety or welfare, or to the plant, animal, or aquatic life of the state, or to other legitimate beneficial uses.

"Waters of the state" means all streams and springs, and all bodies of surface or ground water, whether natural or artificial, within the boundaries of the state. (Authorized by K.S.A. 1970 Supp. 65-3406: Effective January 1, 1972).

28-29-4. ADOPTION OF GUIDELINES AND STANDARDS

The Department upon its own recommendation or the recommendation of the Board or the State Solid Waste Advisory Council, shall develop and from time to time revise design criteria and guidelines for planning, location, design, construction, and operation of all portions of a solid waste management system. These guidelines shall be within the intent of K.S.A. 1970 Supp. 65-3401 through K.S.A. 1970 Supp. 65-3417, and these guidelines shall govern the Department's review of solid waste management programs and operations within the State of Kansas. (Authorized by K.S.A. 1970 Supp. 65-3406: Effective January 1, 1972).

28-29-5. REGISTRATION, EVALUATION, IMPROVEMENT PLANS AND PERMITS

A. Sites Exempted from Registration

The following solid waste disposal sites or facilities are exempted from registration and shall not be required to have solid waste permits.

1. Private sites used solely by the owner or occupant of a single-family dwelling or farm for disposal of the solid wastes produced by the owner or occupant, provided the site is located on property owned or leased by the person producing the wastes.

2. Sites used for the spreading and disposal of animal manures, crop residue, or for processing of food wastes for use as fertilizer or as soil conditioner.

3. Sites used exclusively for disposal of mine tailings, spoils from gravel or quarry operations, that are regulated under the provisions of K.S.A. 49-401 - 423.

4. Facilities and sites used for retention of runoff and from feed lots and agricultural related waste waters that have valid permits from the Department; and temporary basic sediment ponds located on oil-field leases that are subject to surveillance by the Department under K.S.A. 65-171(d).

5. Sites and facilities licensed by the Livestock Sanitary Commissioner for collection, transfer, and disposal of dead animals.

Exemption from registration or obtaining a permit shall not be interpreted to permit any such sites or facilities to pollute the air, water or land or create a public nuisance or hazard to health.

Nothing in these regulations shall be interpreted to permit the disposal of domestic sewage in any manner other than that provided by K.S.A. 65-171(d) and regulations adopted thereunder.

B. Registration of Existing Nonexempted Sites or Facilities

The owners or operators of all existing nonexempted solid waste disposal sites or processing facilities operating in the state on June 30, 1974, shall register their site(s) or facilities with the Department before January 1, 1975.

C. Registration of New Nonexempted Sites or Facilities Placed in Operation After January 1, 1975

Owners or operators of all new nonexempted solid waste disposal sites or processing facilities placed in operation after January 1, 1975, shall make application for a permit for their site or facility with the Department at least 90 days prior to the date they wish to start operating the site or facility.

D. Registration and Permit Application Forms

The Department shall furnish registration and/or application forms, and the owner or operator of all sites or facilities shall use such forms in registering and/or applying for permits for their sites or facilities. All owners or operators of solid waste disposal sites or processing facilities required by law to have permits shall make application for such permit.

E. Site Evaluation and Appraisal

Within 10 days after receiving a site or facility registration form, the Department shall contact the owner or operator and set a mutually acceptable date for evaluation and appraisal of the site or facility as to its suitability to receive a permit, and its conformity with the approved solid waste plan for the area and state air, water and solid waste regulations.

The Department shall furnish the owner or operator of each registered site, a report of its appraisal of the site including an itemized listing of the corrective work that must be done to bring the site into conformity with the approved solid waste management plan.

F. Plan for Upgrading the Site or Facility

Within 60 days after receiving an appraisal report indicating deficiencies, the owner or operator of each registered site or facility shall submit to the Department a work plan for bringing the site or facility into

compliance with the state regulations and local adopted plan for solid waste management. The work plan shall contain (1) description of procedures that will be followed, (2) time schedule for starting each major item of work, and (3) data for final completion of all work included in the plan. Within 30 days after receipt of the proposed work plan, the Department shall notify the owner or operator whether the work plan is acceptable. After receipt of the notification of the acceptance of the work plan, the owner or operator shall begin and complete all work included in the plan within the time schedule set out on the work plan. Upon completion of the work, the owner or operator shall notify the Department that the work has been completed and a reappraisal of the site is desired.

If the Department finds that the site or facility is in conformity with state regulations and the local official adopted plan for solid waste management, the Department shall issue the owner or operator a permit. The permit number shall be placed in a prominent location near the entrance of the site or facility.

G. Permits

Owners or operators of all solid waste disposal sites or solid waste processing facilities operating in the state after July 1, 1976, shall possess a valid permit from the State Department of Health except those exempted in Section (A) of this regulation. Permits are nontransferrable.

H. Permit Fees

Owners or operators of solid waste disposal sites or processing facilities, other than public agencies, shall pay an annual permit fee (July 1 through June 30 or any portion thereof) of $50 for each permitted site or facility. All fees received by the Department shall be deposited in the general fund of the State Treasury.

I. Termination of Operation or Change of Proprietorship of a Solid Waste Disposal Site or Processing Facility

Prior to making any change in ownership or operating leases or contract responsibility for any solid waste disposal site or solid waste processing facility for which a permit has been issued under these regulations, the owner or operator shall notify the Department in writing of his intent to transfer title and/or operating responsibility of the disposal site or processing facility at least 30 days in advance of the date of transfer.

J. Reopening Closed Sites or Facilities

Any person proposing to reopen any facility or disposal site where operations have been terminated shall secure a new permit prior to accepting or receiving any solid wastes for processing and/or disposal.

K. Denial, Suspension, or Revocation of Permits

A permit may be denied, suspended, or revoked for any of the following reasons:

1. Incorrect and fallacious information is given in the application.

2. Improper functioning or operation of processing or disposal facilities that causes pollution or degradation of the environment, creates a public health hazard or public nuisance.

3. Violation of these rules and regulations and other restrictions set forth in the permit.

4. Failure to pay the permit fee required in K.S.A. 1970 Supp. 65-3407.

L. Hearings of Denial or Revocation of Permits

Any person aggrieved by the denial, revocation, or suspension of any permit required under the provision of K.S.A. 1970 Supp. 65-3407, may request a hearing under the provision of K.S.A. 1970 Supp. 65-3412. (Authorized by K.S.A. 65-3407: Effective January 1, 1972).

28-29-6. CLOSURE OF SITES

In order to prevent a disposal site from being a blight on the land, a hazard to health and safety, or a source of pollution to any water course, owners or operators of all registered or permitted solid waste disposal sites that are to be closed or discontinued after January 1, 1975, shall obtain approval of the method of closure from the Department at least 60 days prior to closure.

28-29-7. DISRUPTION AND EXCAVATION OF LANDFILLS OR DUMPS

No person may excavate, disrupt, or remove any deposited material from any active or discontinued sanitary landfill or dump without having received prior approval from the Department.

Requests for approval shall include an operational plan stating the area involved, lines and grades defining limits of excavation, estimated number of cubic yards of material to be excavated, locale where excavated material is to be deposited and estimated time for excavation procedures. (Authorized by K.S.A. 65-3406: Effective January 1, 1972).

## Part 2 Standards

28-29-7. STORAGE OF SOLID WASTES

A. General

The owner and/or occupant of any premise, business establishment, or industrial plant shall provide sanitary storage for all solid waste produced on his property which meet standards set forth in these regulations and the Official Solid Waste Management Plan for the area.

All solid waste shall be stored so that (1) it does not attract rats, flies, mosquitoes or other vectors; (2) it does not provide shelter or a breeding place for vectors; (3) it does not create a health or safety hazard; (4) it is not unsightly; and (5) the production of offensive odors is minimized.

Each premise shall be provided with a sufficient number of acceptable containers to accommodate all solid waste materials other than bulky wastes that accumulate on the premises between scheduled removals of these materials.

B. Specific Storage Standards

1. Garbage and Putrescible Wastes Shall be Stored In:

a. Rigid containers that are durable, rust resistant, nonabsorbent, water tight and rodent proof. The container shall be easily cleanable; fitted with close-fitting lids, fly-tight covers; and provided with suitable handles or bails to facilitate handling; or

b. Rigid containers equipped with disposable liners made of reinforced kraft paper or polyethylene or other similar material designed for storage of garbage; or

c. Nonrigid disposable bags constructed of reinforced kraft paper or polyethylene designed for storage of garbage. The bag shall be provided with a wall-hung or free-standing holder which supports and seals the bag; prevent insects, rodents and dogs from access to the contents; and prevent rain and snow from falling into the bag; or

d. Other types of containers meeting the general requirements of Section A of this regulation and acceptable to the collection agency.

2. Mixed Refuse

When garbage and putrescible wastes and nonputrescible refuse are stored together, the container shall meet the standards and requirements for garbage containers.

On premises where the quantity of refuse generated is large and where the use of individual storage containers is impractical, bulk containers may be used for on-premise-storage of refuse. The bulk container may be equipped with compaction equipment and shall be of such size, design, and capacity as to be compatible with the collection equipment. Containers shall be constructed of durable, corrosion-resistant metal or plastic material; be easily cleaned, and be equipped with tight-fitting lids or doors that can be easily closed and opened.

3. Toxic and Hazardous Wastes Shall Be Stored In:

a. A manner which will prevent spillage, leakage of liquids; and/or the concentration or generation of harmful or explosive vapors or offensive odors from the stored materials.

b. Containers shall be constructed of durable, corrosion-resistant, water-tight construction; provided with tight-fitting lids or covers; properly labeled, and kept in a safe location protected from tampering by unauthorized persons.

c. Other types of storage containers that have written approval of the Department for use at a specific location for a specified purpose.

All piping, valves and other appurtenances associated with the storage and transfer of toxic or hazardous wastes shall be constructed of corrosion-resistant materials and be maintained in a leak-proof condition.

4. Nonputrescible Bulky Wastes

These wastes shall be stored temporarily in any manner that does not create a health hazard, file hazard, rodent harborage, or permit any unsightly conditions to develop, and is in accordance with any locally-adopted regulations. (Authorized by K.S.A. 65-3406: Effective January 1, 1972).

28-29-8. STANDARDS FOR COLLECTION AND TRANSPORTATION OF SOLID WASTES

A. Frequency of Collection

Solid waste materials, excluding bulky wastes, shall be removed from the storage containers on residential premises and disposed of in accordance with these regulations at least once each week.

Garbage and putrescible materials shall be removed from commercial or industrial properties as often as necessary to prevent health and nuisance conditions but at least once a week.

Trash and other combustible materials, free of putrescible material, shall be removed from commercial and industrial properties as often as is necessary to prevent overfilling of the storage facilities or the creation of fire hazards.

Bulky wastes, free of putrescible wastes, shall be removed from properties at least once every six months.

Toxic and hazardous materials shall be removed from commercial and industrial properties as often as is necessary to prevent explosions or fire hazards. Whenever hazardous wastes in any quantity, which could be reasonably expected to be hazardous to public health or the environment, are to be transported off the premises to a disposal site, the producer of such wastes shall render them harmless, or shall issue a bill of lading to accompany each shipment of wastes; shall provide such information as is necessary to insure safe handling; and the producer shall make prior arrangement with the management of the disposal area, processing facility, or salvage company to permit the operation of the disposal area to be altered as is necessary for safe handling. Every producer of hazardous wastes shall provide labels for all containers as required in the official local solid waste management plan.

B. Collection Equipment

All vehicles and equipment used for collection and transportation of solid waste materials shall be designed, constructed, maintained and operated in a manner that will prevent the escape of any solid, semi-liquid, or liquid wastes from the vehicle or container onto the ground, street, or highway. (Authorized by K.S.A. 1970 Supp. 65-3406: Effective January 1, 1972).

28-29-9. STANDARDS FOR SOLID WASTE PROCESSING FACILITIES AND DISPOSAL AREAS

A. General

1. Scope

All solid waste disposal areas and solid waste processing facilities shall be located, designed, and operated in conformity with the following standards.

2. Acceptable Methods of Disposal

a. All nontoxic and nonhazardous solid wastes and residue from solid waste processing operations may be disposed of in registered sanitary landfills located on sites approved by the Department and operating under a valid permit.

b. Nonputrescible rubble and demolition waste materials such as brick, mortar, broken concrete and similar materials produced in connection with demolition of buildings and other structures may be disposed of at approved demolition landfills holding valid permits from the Department.

3. Acceptable Methods for Processing

Combustible solid wastes may be burned in incinerators that conform with the provisions of the Air Quality Control Act K.S.A. 1970 Supp. 65-3001 - 3020 and regulations adopted thereunder, and all local planning and zoning regulations and are approved by the Department.

Animal manures, sludges, and solid wastes with high organic content may be processed into compost at approved composting plants holding valid permits from the Department.

4. Planning and Design

Planning, design, and operation of any solid waste processing facility or disposal area of a solid waste management system, including but not limited to sanitary landfills, incinerators, compost plants, transfer stations, salvage yards and other solid waste operations shall conform with appropriate design and operation guidelines of the Department.

5. Location

Location of all solid waste disposal areas and solid waste processing facilities shall conform to applicable state laws, and county or city

zoning regulations and ordinances. All locations for solid waste disposal sites or processing facilities shall be reviewed by any local planning and zoning boards. Comments and recommendations based on such reviews shall be transmitted to the Department with the proposed plans. All locations for solid waste disposal areas and processing facilities shall be reviewed and approved by the Department before site development is started.

6. Access Roads

Access roads to the disposal site or processing facility shall be of all-weather construction, negotiable at all times by trucks and other vehicles. Load limits on bridges and access roads shall be sufficient to support all traffic loads which will be generated by use of the site or facility.

7. Reports Required

Operators of all solid waste disposal sites and processing facilities shall maintain suitable records of volumes or tonnage of solid wastes received, land area used, population served, area served, and any other information required by the conditions of the permit. All information shall be summarized and reported to the Department annually on forms furnished by the Department.

8. Air Quality

The operator of every solid waste disposal site and solid waste processing facility shall conform to all applicable provisions of K.S.A. 1969 Supp. 65-3001 to K.S.A. 1969 Supp. 65-3020; any regulation adopted thereunder, and any local regulations pertaining to air quality.

9. Communication

Communications shall be available to all solid waste processing or disposal sites.

10. Fire Protection

Arrangements shall be made for fire protection services when a fire protection district or other public fire protection service is available. When such a service is not available, practical alternate arrangements shall be provided at all sites.

11. Limited Access

Access to a solid waste disposal site or processing facility shall be limited to hours when an attendant or operating personnel are at the site. A gate or barrier and approved fencing shall be erected to block access to the solid waste disposal site or processing facility during hours when the site or facility is closed. Access by unauthorized vehicles or pedestrians shall be prohibited.

12. Hours of Operation

Hours of operation and other limitations shall be prominently

posted at the entrance of the disposal site or facility.

13. Salvage

Salvage or reclamation of materials shall be permitted only where facilities specifically designed for the purpose of salvaging or processing solid wastes are provided, and when the salvage materials are properly controlled to prevent interference with prompt sanitary disposal of solid wastes. All salvage operations shall be conducted in such a manner that will not create health hazards.

14. Safety

An operational safety program approved by the Department shall be provided for employees at solid waste processing and disposal sites.

15. Vector Control

Solid waste processing facilities and disposal sites shall be operated in a manner which will not permit the harborage or breeding of insects or rodents. Whenever supplemental vector control measures are necessary, these measures shall be promptly carried out.

B. Specific Standards for Solid Waste Disposal Areas

1. Demolition Landfills

Any person may establish and operate a private landfill for the disposal of "Construction Demolition Waste" originating from the operator's own demolition work, or a city or county may operate a landfill to receive construction and demolition waste from the public provided he shall have first applied for and received a permit from the Department designating his site a "Landfill for Construction and Demolition Wastes," and may do so as long as the permit shall remain in force and the site is operated in accordance with the provisions of these regulations and the specific requirements of the permit.

2. Sanitary Landfills

a. Design Plans and Engineering Reports

Sanitary landfills shall be designed and operated in accordance with this regulation and with the General Operating and Design Guidelines for Sanitary Landfills. All design plans and engineering reports required by these standards shall bear the signature and seal of an engineer licensed to practice in Kansas.

b. Land-Use Plan

All applications for a proposed sanitary landfill shall include an ultimate land-use plan for the site. The plan shall include intermediate stages, and shall identify the total and complete proposed land use upon completion of filling or termination of use of the site and shall be in accordance with any local land-use plans.

c. Reports and Maps Required

In addition to annual reports required under 28-29-9, the operator of the sanitary landfill shall maintain a map showing place of deposit of various materials within the state. Areas used for the disposal of hazardous wastes, rock, brick, stone, concrete and other similar materials, and unexcavated areas shall be clearly indicated by reference to the boundaries of the tract or other permanent markings. This map shall be filed with the register of deeds in the county where the landfill is located upon completion of the landfill or disposal area.

d. Fire Protection

No open burning of solid wastes shall be permitted at a sanitary landfill. In case of accidental fires at the site, the operator shall be responsible for initiating and continuing appropriate fire-fighting methods until all smoldering, smoking, and burning ceases. The operator of any landfill shall seek and obtain additional fire-fighting assistance if smoldering, smoking, or burning persists for longer than a twenty-four (24) hour period. The operator shall not permit the dumping of combustible materials within the immediate vicinity of any smoldering, smoking, or burning conditions; and shall not allow dumping activities to interfere with fire-fighting efforts. All disruption of finished grades, covered or compacted surfaces, shall be covered and regraded upon completion of fire-fighting activities.

e. Disposal of Sewage Solids, Liquids and other Hazardous Wastes Restricted

No materials of a hazardous nature, including but not limited to, sewage solids, oil sludge, dye concentrates, waste chemicals, pathological and biological wastes, radioactive materials or explosives, shall be disposed of in the sanitary landfill until the location, method of disposal, and site factors have been evaluated by the Department and the specific arrangements for handling the materials have been approved.

C. Specific Standards for Solid Waste Processing Facilities

1. Incinerators

All incinerators used for the combustion having a capacity greater than 200 pounds per hour and those used for the incineration of toxic or hazardous wastes must be designed and operated in conformity with the State Air Pollution Emission Control Regulations; with the Solid Waste Guidelines for the Design and Operation of Incinerators and any local air pollution control regulations. All incinerators will be evaluated on their own merits in accordance with accepted engineering practices. Emission control devices, disposal of incinerator residue and disposal of waste water must be approved by the Department. All plans, reports and specifications for incinerators must be prepared by and submitted by an engineer licensed to practice in Kansas.

2. Other Methods of Solid Waste Handling, Processing and Disposal

Before any site, facility or any method of solid waste handling, processing or disposal, not provided for in these regulations, is practiced

or placed into operation, complete plans, specifications, design data, land-use plan, and proposed operation procedures shall be submitted to the Department for review and permit issuance. All such information shall be prepared and submitted by a professional engineer licensed to practice in Kansas. (Authorized by K.S.A. 1970 Supp. 65-3406: Effective January 1, 1972).

28-29-12. ADOPTION OF THE PLAN

Upon completion, all county solid waste management plans shall be submitted to the county commissioners of each county affected by the plan for approval; and all city solid waste management plans shall be submitted to the governing body of the city for approval. Prior to approving any city or county solid waste management plan, the governing body of said city or county shall hold a public hearing on the plan. A notice of such public hearing, giving the place and time of the hearing shall be published at least once in the official newspaper of the county or city. The hearing shall be held not less than fifteen (15) days or more than thirty (30) days after publication of the notice.

At the conclusion of the public hearing, the board of county commissioners or the governing body of the city, in the case of a city plan, may revise or amend the plan prior to adopting it. The plan shall be adopted by enactment of an appropriate resolution by the board of county commissioners in the case of a county plan and by the city governing body in the case of a city plan. (Authorized by K.S.A. 1970 Supp. 65-3405: Effective January 1, 1972).

28-29-13. EXCLUSION FROM COUNTY SOLID WASTE MANAGEMENT PLAN

Any city which elects to exclude itself from the county solid waste management plan and submit its own plan shall file notice in writing of its intention to prepare and submit such solid waste management plan with the board of county commissioners not later than June 1, 1972. A copy of such notice of intent shall be filed with the Department not later than July 1, 1972. (Authorized by K.S.A. 1970 Supp. 65-3405: Effective January 1, 1972).

28-29-14. SUBMISSION OF JOINT PLANS

Two or more counties or a single county and one or more cities within an adjacent county or counties may submit jointly an official solid waste management plan which may be prepared by one city or county or an authority designated to prepare and submit such plan on behalf of all participating counties and cities, provided that such joint official solid waste management plan is adopted by each county and city sponsoring the joint plan and certification of such adoption as provided for in Regulation 28-29-12 accompanies the official plan submitted to the Department for approval. (Authorized by K.S.A. 1970 Supp. 65-3405: Effective January 1, 1972).

28-29-15. PLAN CONTENTS

The official adopted solid waste management plan shall include all information required by K.S.A. 1970 Supp. 65-3405 and shall plan for a solid waste management system which will:

1. Provide for the removal of solid waste for the on-premise storage facilities as provided by these regulations and the locally adopted solid waste management plan.

2. Provide an approved solid waste site or facility which will be open to receive solid waste at least one day per week.

3. Provide for the orderly and systematic elimination of nuisances and pollution sources associated with improper storage, collection, transportation, processing and disposal of solid wastes.

The plan shall include such text, maps and analysis as will adequately describe the following:

1. Development of a comprehensive solid waste storage, collection, treatment, and disposal plan for the study area for a ten (10) year period. This study shall cover all sources and considerations that have a bearing on the most feasible and economical collection, treatment, storage and disposal techniques and locations of present and future collection, treatment and disposal sites. Maximum use shall be made of available information from federal, state and local sources concerning present and projected population and densities; present and future industries; utilities; solid waste collection, treatment and disposal facilities; present and anticipated land, air and water usages; present and future highway, transportation and circulation patterns; present and projected sources of solid wastes; property assessment and road records; soils studies, geology, hydrology; comprehensive air pollution, sewerage, water resources, public water supply and other related comprehensive studies; and local and regional land-use and development plans.

2. Local provisions for regulation of storage, collection, transportation, disposal and other solid waste management activities.

3. Documentation of community problems associated with the presently used or the lack of storage, collection, transportation, processing and disposal subsystems.

4. Development of recommendations for the present and future long-term management of the following special wastes; brush, trees, demolition wastes, bulky wastes, industrial wastes, agricultural wastes, junked automobiles and other wastes which may require special collection, handling, treatment, or disposal.

5. Consideration of the feasibility of recycling of solid wastes in the selection of each alternative solid waste management system.

6. Selection, from the alternative proposals, one plan for development and implementation. Justification for the selected solution shall be included in the plan. Site needs shall be presented and a schedule developed for land acquisition. A practical timetable for the completion of the necessary steps involved in the implementation of the recommended plan shall be presented. An outline of the action required by each individual unit of government involved shall be included.

7. Development of a sound method for financing each element of the

proposed plan, based on cost estimates. Revenue financing, general obligation financing, and other reasonable methods may be analyzed individually and in combination. The methods used shall be detailed to apportion annual charges or estimate tax rates shall be detailed. The financial analyses shall be developed in sufficient detail to provide the counties with adequate base for financing the program within the study area.

8. Provision for periodic updating of the plan to take advantage of any new techniques in solid waste management practices. (Authorized by K.S.A. 1970 Supp. 65-3405: Effective January 1, 1972).

28-29-16. APPROVAL

No official adopted solid waste management plan shall be approved by the Department unless it contains the information required by K.S.A. 1970 Supp. 65-3405 and these regulations. All information regarding status of current solid waste management practices shall be collected, summarized if necessary, and reported to the Department on forms furnished by the Department. The required solid waste inventory data shall be filed with the Department at least sixty (60) calendar days prior to submission of the official plan.

In evaluating plans for approval, the Department shall take into consideration the following factors:

A. Compatability of the solid waste management plan with the existing governmental structure of the county. The plan must take into consideration the area's ability to finance the service.

B. Clarity of allocation of the responsibility for implementing each element of the plan.

C. Workability of the technology proposed in the plan.

D. The reasonableness of the cost. The action plan must attempt to provide the desired level of benefits to the people at a reasonable cost.

E. Flexibility of the plan to respond to seasonable changes in loadings, changes in objectives such as shift from disposal to recycling of solid wastes, or changes in technology and program.

In the event that an official plan is disapproved by the Department, written notice together with a statement of reason for such disapproval shall be sent to each county and city included in such official plan. Any county or city or combination thereof shall upon submitting a written request within ten (10) days after receipt of notice of disapproval, be afforded a hearing before the Board or its designate to set forth its views as to why the official plan should be approved. At such hearing, the county or city may present information and data in addition to that submitted with its solid waste management plan, revisions and amendments. Upon the basis of evidence presented at such hearing, the Board shall within sixty (60) days after such hearing either affirm, modify, or revoke its disapproval of the official plan. (Authorized by K.S.A. 1970 Supp. 65-3405: Effective January 1, 1972).

28-29-17. AMENDMENT OR REVISION

When the Department determines that the official adopted solid waste management plan or any part thereof is inadequate to the counties, county, or city to which it relates because of changed or newly-discovered facts, conditions or circumstances, the Department may upon written notice require an amendment or revision of such official plan, provided that no such amendment or revision shall be required within one (1) year of the date of Department approval of such official plan or the last revision or amendment thereof. (Authorized by K.S.A. 1970 Supp. 65-3405: Effective January 1, 1972).

# APPENDIX D

## SOLID WASTE DISPOSAL ACT

(Public Law 89-272 -- 89th Congress, S. 306, Approved October 20, 1965)

An Act to authorize a research and development program with respect to solid waste disposal, and for other purposes.

## TITLE II -- SOLID WASTE DISPOSAL

### Short Title

Sec. 201. This title (hereinafter referred to as "this Act") may be cited as the "Solid Waste Disposal Act."

### Findings and Purposes

Sec. 202.

(a) The Congress finds --

(1) that the continuing technological progress and improvement in methods of manufacture, packaging, and marketing of consumer products has resulted in an ever-mounting increase, and in a change in the characteristics, of the mass of material discarded by the purchaser of such products;

(2) that the economic and population growth of our Nation, and the improvements in the standard of living enjoyed by our population, have required increased industrial production to meet our needs, and have made necessary the demolition of old buildings, the construction of new buildings, and the provision of highways and other avenues of transportation, which, together with related industrial, commercial, and agricultural operations, have resulted in a rising tide of scrap, discarded and waste materials;

(3) that the continuing concentration of our population in expanding metropolitan and other urban areas has presented these communities with serious financial, management, intergovernmental, and technical problems in the disposal of solid wastes resulting from the industrial, commercial, domestic, and other activities carried on in such areas;

(4) that inefficient and improper methods of disposal of solid wastes result in scenic blights, create serious hazards to the public health, including pollution of air and water resources, accident hazards, and increase in rodent and insect vectors of disease, have an adverse effect on land values, create public nuisances, otherwise interfere with community life and development;

(5) that the failure or inability to salvage and reuse such materials economically results in the unnecessary waste and depletion of our natural resources; and

(6) that while the collection and disposal of solid wastes should continue to be primarily the function of state, regional and local agencies, the problems of waste disposal as set forth above have become a matter national in scope and in concern and necessitate federal action through financial and technical assistance and leadership in the development, demonstration, and application of new and improved methods and processes to reduce the amount of waste and unsalvageable materials and to provide for proper and economical solid waste disposal practices.

(b) The purposes of this Act therefore are --

(1) to promote the demonstration, construction, and application of solid waste management and resource recovery systems which preserve and enhance the quality of air, water, and land resources;

(2) to provide technical and financial assistance to states and local governments and interstate agencies in the planning and development of resource recovery and solid waste disposal programs;

(3) to promote a national research and development program for improved management techniques, more effective organizational arrangements, and new and improved methods of collection, separation, recovery, and recycling of solid wastes, and the environmentally safe disposal of nonrecoverable residue;

(4) to provide for the promulgation of guidelines for solid waste collection, transport, separation, recovery, and disposal systems; and

(5) to provide for training grants in occupations involving the design, operation, and maintenance of solid waste disposal systems.

Definitions

Sec. 203. When used in this Act:

(1) The term "Secretary" means the Secretary of Health, Education and Welfare; except that such term means the Secretary of the Interior with respect to problems of solid waste resulting from the extraction, processing, or utilization of minerals or fossil fuels where the generation, production, or reuse of such waste is or may be controlled within the extraction, processing, or utilization facility or facilities and where such control is a feature of the technology or economy of the operation of such facility or facilities.

(2) The term "State" means a state, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, and American Samoa.

(3) The term "interstate agency" means an agency of two or more municipalities in different states, or an agency established by two or more states, with authority to provide for the disposal of solid wastes and serving two or more municipalities located in different states.

(4) The term "solid waste" means garbage, refuse, and other discarded solid materials, including solid waste materials resulting from industrial, commercial, and agricultural operations, and from community activities, but does not include solids or dissolved material in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial waste water effluents, dissolved materials in irrigation return flows or other common water pollutants.

(5) The term "solid waste disposal" means the collection, storage, treatment, utilization, processing or final disposal of solid waste.

(6) The term "construction," with respect to any project of construction under this act, means (a) the erection or building of new structures and acquisition of lands or interests therein, or the acquisition, replacement, expansion, remodeling, alteration, modernization or extension of existing structures, and (b) the acquisition and installation of initial equipment of, or required in connection with, new or newly-acquired structures or the expanded, remodeled, altered, modernized or extended part of existing structures (including trucks and other motor vehicles, and tractors, cranes, and other machinery) necessary for the proper utilization and operation of the facility after completion of the project; and includes preliminary planning to determine the economic and engineering feasibility and the public health and safety aspects of the project, the engineering, architectural, legal, fiscal, and economic investigations and studies, and any surveys, designs, plans, working drawings, specifications, and other action necessary for the carrying out of the project, and (c) the inspection and supervision of the process of carrying out the project to completion.

(7) The term "municipality" means a city, town, borough, county, parish, district, or other public body created by or pursuant to state law with responsibility for the planning or administration of solid waste disposal, or an Indian tribe.

(8) The term "intermunicipal agency" means an agency established by two or more municipalities with responsibility for planning or administration of solid waste disposal.

(9) The term "recovered resources" means materials or energy recovered from solid wastes.

(10) The term "resource recovery system" means a solid waste management system which provides for collection, separation, recycling, and recovery of solid wastes, including disposal of non-recoverable waste residue.

Research, Demonstrations, Training and Other Activities

Sec. 204.

(a) The Secretary shall conduct, and encourage, cooperate with, and render financial and other assistance to appropriate public (whether federal, state, interstate, or local) authorities, agencies, and institutions, private agencies and institutions, and individuals in the conduct of, and promote the coordination of, research, investigations, experiments, training, demonstrations, surveys, and studies relating to --

(1) any adverse health and welfare effects of the release into the environment of material present in solid waste, and methods to eliminate such effects;

(2) the operation and financing of solid waste disposal programs;

(3) the reduction of the amount of such waste and unsalvageable waste materials;

(4) the development and application of new and improved methods of collecting and disposing of solid waste and processing and recovering materials and energy from solid wastes; and

(5) the indentification of solid waste components and potential materials and energy recoverable from such waste components.

(b) In carrying out the provisions of the preceding subsection, the Secretary is authorized to --

(1) collect and make available, through publications and other appropriate means, the results of, and other information pertaining to, such research and other activities, including appropriate recommendations in connection therewith;

(2) cooperate with public and private agencies, institutions, and organizations, and with any industries involved, in the preparation and the conduct of such research and other activities; and

(3) make grants-in-aid to public or private agencies and institutions and to individuals for research, training projects, surveys, and demonstrations (including construction of facilities), and provide for the conduct of research, training, surveys, and demonstrations by contract with public or private agencies and institutions and with individuals; and such contracts for research or demonstrations or both (including contracts for construction) may be made in accordance with and subject to the limitations provided with respect to research contracts of the military departments in title 10, United States Code, Section 2353, except that the determination, approval, and certification required thereby shall be made by the Secretary.

(c) Any grant, agreement, or contract made or entered into under this section shall contain provisions effective to insure that all information, uses, processes, patents and other developments resulting from any activity undertaken pursuant to such grant, agreement, or contract will be made readily available on fair and equitable terms to industries utilizing methods of solid waste disposal and industries engaging in furnishing devices, facilities, equipment, and supplies to be used in connection with solid waste disposal. In carrying out the provisions of this section, the Secretary and each department, agency, and officer of the federal government having functions or duties under this Act shall make use of and adhere to the Statement of Government Patent Policy which was promulgated by the President in his memorandum of October 10, 1963. (3 CFR, 1963 Supp., p. 238.)

## Special Study and Demonstration Projects on Recovery of Useful Energy and Materials

Sec. 205.

(a) The Secretary shall carry out an investigation and study to determine --

(1) means of recovering materials and energy from solid waste, recommended uses of such materials and energy for national or international welfare, including identification of potential markets for such recovered resources, and the impact of distribution of such resources on existing markets;

(2) changes in current product characteristics and production and packaging practices which would reduce the amount of solid waste;

(3) methods of collection, separation, and containerization which will encourage efficient utilization of facilities and contribute to more effective programs of reduction, reuse, or disposal of wastes;

(4) the use of federal procurement to develop market demand for recovered resources;

(5) recommended incentives (including federal grants, loans, and other assistance) and disincentives to accelerate the reclamation or recycling of materials from solid wastes, with special emphasis on motor vehicle hulks;

(6) the effect of existing public policies, including subsidies and economic incentives and disincentives, percentage depletion allowances, capital gains treatment and other tax incentives and disincentives, upon the recycling and reuse of materials, and the likely effect of the modification or elimination of such incentives and disincentives upon the reuse, recycling and conservation of such materials; and

(7) the necessity and method of imposing disposal or other charges on packaging, containers, vehicles, and other manufactured tools, which charges would reflect the cost of final disposal, the value of recoverable components of the item, and any social costs associated with nonrecycling or uncontrolled disposal of such items.

The Secretary shall from time to time, but not less frequently than annually, report the results of such investigation and study to the President and the Congress.

(b) The Secretary is also authorized to carry out demonstration projects to test and demonstrate methods and techniques developed pursuant to subsection (a).

(c) Section 204 (b) and (c) shall be applicable to investigations, studies, and projects carried out under this section.

## Interstate and Interlocal Cooperation

Sec. 206. The Secretary shall encourage cooperative activities by the states and local governments in connection with solid waste disposal programs; encourage where practicable, interstate, interlocal, and regional planning for, and the conduct of, interstate, interlocal, and regional solid waste disposal programs; and encourage the enactment of improved and, so far as practicable, uniform state and local laws governing solid waste disposal.

## Grants for State, Interstate, and Local Planning

Sec. 207.

(a) The Secretary may from time to time, upon such terms and conditions consistent with this section as he finds appropriate to carry out the purposes of this Act, make grants to state, interstate, municipal, and intermunicipal agencies, and organizations composed of public officials which are eligible for assistance under Section 701 (g) of the Housing Act of 1954, of not to exceed 66 2/3 per centum of the cost in the case of an application with respect to an area including only one municipality, and not to exceed 75 per centum of the cost in any other case, of --

(1) making surveys of solid waste disposal practices and problems within the jurisdictional areas of such agencies and

(2) developing and revising solid waste disposal plans as part of regional environmental protection systems for such areas, providing for recycling or recovery of materials from wastes whenever possible and including planning for the reuse of solid waste disposal areas and studies of the effect and relationship of solid waste disposal practices on areas adjacent to waste disposal sites,

(3) developing proposals for projects to be carried out pursuant to Section 208 of this Act, or

(4) planning programs for the removal and processing of abandoned motor vehicle hulks.

(b) Grants pursuant to this section may be made upon application therefor which --

(1) designates or establishes a single agency (which may be an interdepartmental agency) as the sole agency for carrying out the purpose of this section for the area involved;

(2) indicates the manner in which provision will be made to assure full consideration of all aspects of planning essention to area wide planning for proper and effective solid waste disposal consistent with the protection of the public health and welfare, including such factors as population growth, urban and metropolitan development, land use planning, water pollution control, air pollution control, and the feasibility of regional disposal and resource recovery programs;

(3) sets forth plans for expenditure of such grant, which plans provide reasonable assurance of carrying out the purpose of this section;

(4) provides for submission of such reports of the activities of the agency in carrying out the purposes of this section, in such form and containing such information, as the Secretary may from time to time find necessary for carrying out the purposes of this section and for keeping such records and affording such access thereto as he may find necessary; and

(5) provides for such fiscal control and fund-accounting procedures as may be necessary to assure proper disbursement of and accounting for funds paid to the agency under this section.

(c) The Secretary shall make a grant under this section only if he finds that there is satisfactory assurance that the planning of solid waste disposal will be coordinated, so far as practicable, with and not duplicate other related state, interstate, regional, and local planning activities, including those financed in part with funds pursuant to Section 701 of the Housing Act of 1954.

Grants for Resource Recovery Systems and Improved Solid Waste Disposal Facilities

Sec. 208.

(a) The Secretary is authorized to make grants pursuant to this section to any state, municipal, or interstate or intermunicipal agency for the demonstration of resource recovery systems or for the construction of new or improved solid waste disposal facilities.

(b) (1) Any grant under this section for the demonstration of a resource recovery system may be made only if it (A) is consistent with any plans which meet the requirements of Section 207 (b)(2) of this Act; (B) is consistent with the guidelines recommended pursuant to section 209 of this Act; (C) is designed to provide area wide resource recovery systems consistent with the purposes of this Act, as determined by the Secretary, pursuant to regulations promulgated under subsection (d) of this section; and (D) provides an equitable system for distributing the costs associated with construction, operation, and maintenance of any resource recovery system among the users of such system.

(2) The federal share for any project to which paragraph (1) applies shall not be more than 75 per cent.

(c) (1) A grant under this section for the construction of a new or improved solid waste disposal facility may be made only if --

(A) a state or interstate plan for solid waste disposal has been adopted which applies to the area involved, and the facility to be constructed (i) is consistent with such plan, (ii) is included in a comprehensive plan for the area involved which is satisfactory to the Secretary for the purposes of this Act, and (iii) is consistent with the guidelines recommended under Section 209, and

(B) the project advances the state of the art by applying new and improved techniques in reducing the environmental impact of solid waste disposal, in achieving recovery of energy or resources, or in recycling useful materials.

(2) The federal share for any project to which paragraph (1) applies shall be not more than 50 per cent in the case of a project serving an area which includes only one municipality, and not more than 75 per cent in any other case.

(d) (1) The Secretary, within ninety days after the date of enactment of the Resource Recovery Act of 1970, shall promulgate regulations establishing a procedure for awarding grants under this section which --

(A) provides that projects will be carried out in communities of varying sizes, under such conditions as will assist in solving the community waste problems of urban-industrial centers, metropolitan regions, and rural areas, under representative geographic and environmental conditions; and

(B) provides deadlines for submission of, and action on grant requests.

(2) In taking action on applications for grants under this section, consideration shall be given by the Secretary

(A) to the public benefits to be derived by the construction and the propriety of federal aid in making such grant;

(B) to the extent applicable, to the economic and commercial viability of the project (including contractual arrangements with the private sector to market any resources recovered);

(C) to the potential of such project for general application to community solid waste disposal problems; and

(D) to the use by the applicant of comprehensive regional or metropolitan area planning.

(e) A grant under this section --

(1) may be made only in the amount of the federal share of

(A) the estimated total design and construction costs, plus

(B) in the case of a grant to which subsection (b) (1) applies, the first-year operation and maintenance costs:

(2) may not be provided for land acquisition or (except as otherwise provided in paragraph (1) (B) for operating or maintenance costs;

(3) may not be made until the applicant has made provision satisfactory to the Secretary for proper and efficient operation and maintenance of the project (subject to paragraph (1) (B)); and

(4) may be made subject to such conditions and requirements, in addition to those provided in this section, as the Secretary may require to properly carry out his functions pursuant to this Act. For purposes of paragraph (1), the non-federal share may be in any form, including, but not limited to, lands or interests therein needed for the project or personal property or services, the value of which shall be determined by the Secretary.

(f) (1) Not more than 15 per cent of the total of funds authorized to be appropriated under Section 216 (a) (3) for any fiscal year to carry out this section shall be granted under this section for projects in any one state.

(2) The Secretary shall prescribe by regulation the manner in which this subsection shall apply to a grant under this section for a project in an area which includes all or part of more than one state.

Recommended Guidelines

Sec. 209.

(a) The Secretary shall, in cooperation with appropriate state, federal, interstate, regional, and local agencies, allowing for public comment by other interested parties, as soon as practicable after the enactment of the Resource Recovery Act of 1970, recommend to appropriate agencies and publish in the Federal Register guideline for solid waste recovery, collection, separation, and disposal systems (including systems for private use), which shall be consistent with public health and welfare, and air and water quality standards and adaptable to appropriate land-use plans. Such guidelines shall apply to such systems whether on land or water and shall be revised from time to time.

(b) (1) The Secretary shall, as soon as practicable, recommend model codes, ordinances, and statutes which are designed to implement this section and the purposes of this Act.

(2) The Secretary shall issue to appropriate federal, interstate, regional, and local agencies information on technically-feasible solid waste collection, separation, disposal, recycling, and recovery methods, including data on the cost of construction, operation, and maintenance of such methods.

Grants or Contracts for Training Projects

Sec. 210.

(a) The Secretary is authorized to make grants to, and contracts with, any eligible organization. For purposes of this section, the term "eligible organization" means a state or interstate agency, a municipality, educational institution, and any other organization which is capable of effectively carrying out a project which may be funded by grant under subsection (b) of this section.

(b) (1) Subject to the provisions of paragraph (2), grants or contracts may be made to pay all or a part of the costs, as may be determined by the Secretary, of any project operated or to be operated by an eligible organization, which is designed --

(A) to develop, expand, or carry out a program (which may combine training, education, and employment) for training persons for occupations involving the management, supervision, design, operation, or maintenance of solid waste disposal and resources recovery equipment and facilities; or

(B) to train instructors and supervisory personnel to train or supervise persons in occupations involving the design, operation, and maintenance of solid waste disposal and resource recovery equipment and facilities.

(2) A grant or contract authorized by paragraph (1) of this subsection may be made only upon application to the Secretary at such time or times and containing such information as he may prescribe, except that no such application shall be approved unless it provides for the same procedures and reports (and access to such reports and to other records) as is required by Section 207 (b) (4) and (5) with respect to applications made under such section.

(c) The Secretary shall make a complete investigation and study to determine --

(1) the need for additional trained state and local personnel to carry out plans assisted under this Act and other solid waste and resource recovery programs;

(2) means of using existing training programs to train such personnel; and

(3) the extent and nature of obstacles to employment and occupational advancement in the solid waste disposal and resource recovery field which may limit either available manpower or the advancement of personnel in such field.

He shall report the results of such investigation and study, including his recommendations to the President and the Congress not later than one year after enactment of this Act.

Applicability of Solid Waste Disposal Guidelines to Executive Agencies

Sec. 211.

(a) (1) If --

(A) an executive agency (as defined in Section 105 of Title 5, United States Code) has jurisdiction over any real property or facility the operation or administration of which involves such agency in solid waste disposal activities, or

(B) such an agency enters into a contract with any person for the operation by such person of any federal property or facility, and the performance of such contract involves such person in solid waste disposal activities,

then such agency shall insure compliance with the guidelines recommended under Section 209 and the purposes of this Act in the operation or administration of such property or facility, or the performance of such contract, as the case may be.

(2) Each executive agency which conducts any activity --

(A) which generates solid waste, and

(B) which, if conducted by a person other than such agency, would require a permit or license from such agency in order to dispose of such solid waste, shall insure compliance with such guidelines and the purposes of this Act in conducting such activity.

(3) Each executive agency which permits the use of federal property for purposes of disposal of solid waste shall insure compliance with such guidelines and the purposes of this Act in the disposal of such waste.

(4) The President shall prescribe regulations to carry out this subsection.

(b) Each executive agency which issues any license or permit for disposal of solid waste shall, prior to the issuance of such license or permit, consult with the Secretary to insure compliance with guidelines recommended under Section 209 and the purposes of this Act.

National Disposal Sites Study

Sec. 212. The Secretary shall submit to the Congress no later than two years after the date of enactment of the Resource Recovery Act of 1970, a comprehensive report and plan for the creation of a system of national disposal sites for the storage and disposal of hazardous wastes, including radioactive, toxic chemical, biological, and other wastes which may endanger public health or welfare. Such report shall include: (1) a list of materials which should be subject to disposal in any such site; (2) current methods of disposal of such materials; (3) recommended methods of reduction, neutralization, recovery, or disposal of such materials; (4) an inventory of possible sites including existing land or water disposal sites operated or licensed by federal agencies; (5) an estimate of the cost of developing and maintaining sites including consideration of means for distributing the short- and long-term costs of operating such sites among the users thereof; and (6) such other information as may be appropriate.

Labor Standards

Sec. 213. No grant for a project of construction under this Act shall be made unless the Secretary finds that the application contains or is supported by reasonable assurance that all laborers and mechanics employed by contractors or subcontractors on projects of the type covered by the Davis-Bacon Act, as amended (40 U.S.C. 276a-276a-5), will be paid wages at rates not less than those prevailing on similar work in the locality as determined by the Secretary of Labor in accordance with that Act; and the Secretary of Labor shall have with respect to the labor standards specified in this section the authority

and functions set forth in Reorganization Plan Numbered 14 of 1950 (15 F.R. 3176; 5 U.S.C. 133z-15) and Section 2 of the Act of June 13, 1934, as amended, (40 U.S.C. 276c).

Other Authority Not Affected

Sec. 214. This Act shall not be construed as superseding or limiting the authorities and responsibilities, under any other provisions of law, of the Secretary of Health, Education, and Welfare, the Secretary of the Interior, or any other federal officer, department, or agency.

General Provisions

Sec. 215.

(a) Payments of grants under this Act may be made (after necessary adjustment on account of previously made underpayments or overpayments) in advance or by way of reimbursement, and in such installments and on such conditions as the Secretary may determine.

(b) No grant may be made under this Act to any private profit-making organization.

Section 216.

(a) (1) There are authorized to be appropriated to the Secretary of Health, Education and Welfare for carrying out the provisions of this Act (including, but not limited to, Section 208), not to exceed $41,500,000 for the fiscal year ending June 30, 1971.

(2) There are authorized to be appropriated to the Secretary of Health, Education, and Welfare to carry out the provisions of this Act, other than Section 208, not to exceed $72,000,000 for the fiscal year ending June 30, 1972, and not to exceed $76,000,000 for the fiscal year ending June 30, 1973.

(3) There are authorized to be appropriated to the Secretary of Health, Education and Welfare to carry out Section 208 of this Act not to exceed $80,000,000 for the fiscal year ending June 30, 1972, and not to exceed $140,000,000 for the fiscal year ending June 30, 1973.

(b) There are authorized to be appropriated to the Secretary of the Interior to carry out this Act not to exceed $8,750,000 for the fiscal year ending June 30, 1971, not to exceed $20,000,000 for the fiscal year ending June 30, 1972, and not to exceed $22,500,000 for the fiscal year ending June 30, 1973. Prior to expending any funds authorized to be appropriated by this subsection, the Secretary of the Interior shall consult with the Secretary of Health, Education and Welfare to assure that the expenditure of such funds will be consistent with the purposes of this Act.

(c) Such portion as the Secretary may determine, but not more than 1 per centum, of any appropriation for grants, contracts, or other payments under any provision of this Act for any fiscal year beginning after June 30,

1970, shall be available for evaluation (directly, or by grants or contracts) of any program authorized by this Act.

(d) Sums appropriated under this section shall remain available until expended.

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE

# APPENDIX E

## COMMUNITY SOLID WASTE PRACTICES

## COMMUNITY DESCRIPTION REPORT

Form Approved
Budget Bureau No. 68-S-67022

1 | 11 12

1. STATE (2 3) | 2. COUNTY (4 5 6) | 3. COMMUNITY (7 8 9 10) | 0 1 (13 14)

4. DOES THE COMMUNITY OPERATE OR EXERCISE JURISDICTION OVER ALL OR ANY PART OF A SOLID WASTE COLLECTION OR DISPOSAL SYSTEM? *(Check appropriate categories)* (15 16)

| | COLLECTION | DISPOSAL |
|---|---|---|
| OPERATE | ☐ YES ☐ NO | ☐ YES ☐ NO |
| EXERCISE JURISDICTION | ☐ YES ☐ NO | ☐ YES ☐ NO |

(17 18)

5. IF THE COMMUNITY IS A COUNTY, DISTRICT, OR OTHER POLITICAL JURISDICTION CONTAINING INCORPORATED PLACES, LIST SUCH INCORPORATED PLACES INCLUDED IN THIS COMMUNITY

a. (19 20 21 22) b. (23 24 25 26) c. (27 28 29 30)

*IF ADDITIONAL ENTRIES ARE REQUIRED, CHECK HERE* ☐ (31) *AND MAKE ADDITIONAL ENTRIES IN ITEM #39.*

6. IF THE COMMUNITY IS A COUNTY, DISTRICT, OR OTHER POLITICAL JURISDICTION CONTAINING INCORPORATED PLACES, LIST SUCH INCORPORATED PLACES THAT HAVE BEEN OR WILL BE SURVEYED SEPARATELY

a. (32 33 34 35) b. (36 37 38 39) c. (40 41 42 43)

*IF ADDITIONAL ENTRIES ARE REQUIRED, CHECK HERE* ☐ (44) *AND MAKE ADDITIONAL ENTRIES IN ITEM #39.*

7. POPULATION OF COMMUNITY, 1960 CENSUS. (45 46 47 48 49 50 51)

8. EST. CURRENT POPULATION (52 53 54 55 56 57 58)

9. TOTAL AREA OF COMMUNITY *(Sq. miles)* (59 60 61 62)

10. WHICH PLANNING AGENCIES INCLUDE SOLID WASTES AS PART OF THEIR COMPREHENSIVE PLANNING? *(Check all appropriate categories)*

63 ☐ NO AGENCY 64 ☐ LOCAL 65 ☐ COUNTY 66 ☐ REGIONAL

## STORAGE

11. LEGISLATIVE-ADMINISTRATIVE REGULATIONS GOVERNING ON-SITE STORAGE *(Check appropriate categories)*

| SOURCE | GARBAGE REGULATIONS YES | GARBAGE REGULATIONS NO | GARBAGE ENFORCED YES | GARBAGE ENFORCED NO | OTHER REFUSE REGULATIONS YES | OTHER REFUSE REGULATIONS NO | OTHER REFUSE ENFORCED YES | OTHER REFUSE ENFORCED NO | *Do not use* |
|---|---|---|---|---|---|---|---|---|---|
| HOUSEHOLD | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (67 68) |
| COMMERCIAL | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (69 70) |
| INDUSTRIAL | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (71 72) |
| AGRICULTURAL | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (73 74) |
| INSTITUTIONAL | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (75 76) |

12. LEGISLATIVE-ADMINISTRATIVE REGULATIONS FOR ON-SITE STORAGE ENFORCED PRINCIPALLY BY *(Check one only)*

☐ NO ENFORCEMENT
☐ OPERATIONAL AUTHORITY
☐ POLICE
☐ HEALTH AUTHORITY
☐ OTHER _____ *(Specify)*

(77)

## COLLECTION

13. SUPERVISION FOR WORK PERFORMANCE OF PRIVATE COLLECTORS PROVIDED PRIMARILY BY *(Check one only)* (78)

☐ NONE ☐ HEALTH DEPARTMENT
☐ PUBLIC WORKS DEPARTMENT ☐ OTHER _____ *(Specify)*

14. COLLECTION WORK PERFORMED BY *(Estimate to nearest 10% volume for each type of refuse. Rows should add horizontally to 100%)* (13 14) 0 2

| SOURCE | PUBLIC AGENCY | PRIVATE COLLECTOR | INDIVIDUAL |
|---|---|---|---|
| HOUSEHOLD | (15 16) | (17 18) | (19 20) |
| COMMERCIAL | (21 22) | (23 24) | (25 26) |
| INDUSTRIAL | (27 28) | (29 30) | (31 32) |
| INSTITUTIONAL | (33 34) | (35 36) | (37 38) |
| DEAD ANIMALS | (39 40) | (41 42) | (43 44) |
| ABANDONED VEHICLES | (45 46) | (47 48) | (49 50) |

15. CLASSES OF HOUSEHOLD REFUSE NOT COLLECTED *(Check appropriate categories)*

| | |
|---|---|
| GARBAGE | ☐ |
| RUBBISH | ☐ |
| YARD REFUSE | ☐ |
| ASHES | ☐ |
| COMBUSTIBLES | ☐ |
| NON-COMBUSTIBLES | ☐ |
| BULKY ITEMS *(Refrigerators, etc.)* | ☐ |
| OTHER *(Specify)* | ☐ |
| OTHER *(Specify)* | ☐ |
| OTHER *(Specify)* | ☐ |

16. HOUSEHOLD REFUSE COLLECTION FREQ.

| TYPES OF REFUSE COLLECTED SEPARATELY | 1 PER WEEK | 2 PER WEEK | OTHER | |
|---|---|---|---|---|
| COMBINED COLLECTION | ☐ | ☐ | ☐ | (51) |
| GARBAGE | ☐ | ☐ | ☐ | (52) |
| RUBBISH | ☐ | ☐ | ☐ | (53) |
| YARD REFUSE | ☐ | ☐ | ☐ | (54) |
| ASHES | ☐ | ☐ | ☐ | (55) |
| COMBUSTIBLES | ☐ | ☐ | ☐ | (56) |
| NON-COMBUSTIBLES | ☐ | ☐ | ☐ | (57) |
| BULKY ITEMS *(Refrigerators, etc.)* | ☐ | ☐ | ☐ | (58) |
| OTHER *(Specify)* | ☐ | ☐ | ☐ | (59 60) |
| OTHER *(Specify)* | ☐ | ☐ | ☐ | (61 62) |
| OTHER *(Specify)* | ☐ | ☐ | ☐ | (63 64) |

# COMMUNITY DESCRIPTION REPORT (Page 2)

## COLLECTION

### 17. DEAD ANIMALS COLLECTED ANNUALLY

| | FIGURES AT LEFT REFER TO: NUMBER OF ANIMALS | TONS OF ANIMALS | ARE THESE FIGURES ESTIMATES? |
|---|---|---|---|
| LARGE ANIMALS (65 66 67) | ☐ | ☐ (68) | ☐ YES ☐ NO |
| SMALL ANIMALS (69 70 71 72 73 74) | ☐ | ☐ (75) | ☐ YES ☐ NO |

### 18. NUMBER OF ABANDONED VEHICLES COLLECTED ANNUALLY

(Enter number) (76 77 78 79 80)

### 19. AVERAGE MANPOWER (MAN-YEARS) AND EQUIPMENT USED FOR COLLECTING COMMUNITY SOLID WASTES (13 14) 0 3

| | | SOURCES OF WASTES: HOUSEHOLD COMMERCIAL INSTITUTIONAL | STREET CLEANING | INDUSTRIAL |
|---|---|---|---|---|
| PUBLIC | COLLECTORS AND DRIVERS (Man-years) | 15 16 17 18 | 19 20 21 22 | 23 24 25 |
| | COMPACTOR TRUCKS (Number) | 26 27 28 29 | 30 31 | 32 33 |
| | OTHER VEHICLES (Number) | 34 35 36 | 37 38 39 | 40 41 |
| PRIVATE | NUMBER OF FIRMS | 42 43 44 45 | 46 47 | 48 49 50 51 |
| | COLLECTORS AND DRIVERS (Man-years) | 52 53 54 55 | 56 57 | 58 59 60 61 |
| | COMPACTOR TRUCKS (Number) | 62 63 64 65 | 66 67 | 68 69 70 |
| | OTHER VEHICLES (Number) | 71 72 73 74 | 75 76 | 77 78 79 80 |

### 20. INDICATE AMOUNTS (MEASURED OR ESTIMATED) OF COMMUNITY SOLID WASTES COLLECTED ANNUALLY

| CLASSIFICATION | MEASURED | ESTIMATED | TONS | YARDS |
|---|---|---|---|---|
| REFUSE (Household) (13 14) 0 4 | (15 16 17 18 19 20 21) | (22 23 24 25 26 27 28) | ☐ | ☐ (29) |
| REFUSE (Commercial) | (30 31 32 33 34 35 36) | (37 38 39 40 41 42 43) | ☐ | ☐ (44) |
| REFUSE (Combined household and commercial) | (45 46 47 48 49 50 51) | (52 53 54 55 56 57 58) | ☐ | ☐ (59) |
| REFUSE (Industrial) | (60 61 62 63 64 65 66) | (67 68 69 70 71 72 73) | ☐ | ☐ (74) |
| REFUSE (Agricultural) (13 14) 0 5 | (15 16 17 18 19 20 21) | (22 23 24 25 26 27 28) | ☐ | ☐ (29) |
| REFUSE (Institutional) | (30 31 32 33 34 35) | (36 37 38 39 40 41) | ☐ | ☐ (42) |
| DEMOLITION AND CONSTRUCTION REFUSE | (43 44 45 46 47 48) | (49 50 51 52 53 54) | ☐ | ☐ (55) |
| STREET AND ALLEY CLEANINGS | (56 57 58 59 60) | (61 62 63 64 65) | ☐ | ☐ (66) |
| TREE AND LANDSCAPING REFUSE (13 14) 0 6 | (67 68 69 70 71) | (72 73 74 75 76) | ☐ | ☐ (77) |
| PARK AND BEACH REFUSE | (15 16 17 18 19) | (20 21 22 23 24) | ☐ | ☐ (25) |
| CATCH BASIN REFUSE | (26 27 28 29 30) | (31 32 33 34 35) | ☐ | ☐ (36) |
| SEWAGE TREATMENT PLANT SOLIDS AND PUMPING STATION CLEANINGS | (37 38 39 40 41) | (42 43 44 45 46) | ☐ | ☐ (47) |

## DISPOSAL

21. AGENCY PRIMARILY RESPONSIBLE FOR RECOMMENDATIONS FOR LOCATION AND DEVELOPMENT OF NEW DISPOSAL SITES OR FACILITIES (Check one only) ☐ NONE ☐ HEALTH AUTHORITY ☐ OPERATIONAL AUTHORITY ☐ OTHER (Specify) _____ (48)

22. AGENCY PRIMARILY RESPONSIBLE FOR REGULATION OF DISPOSAL FACILITY OPERATIONS (Check one only) ☐ NONE ☐ POLICE ☐ OTHER (Specify) _____ ☐ OPERATIONAL AUTHORITY ☐ HEALTH AUTHORITY (49)

23. IS ON-SITE OPEN BURNING OF DEMOLITION, CONSTRUCTION, AND/OR LAND CLEARANCE WASTES . . . PRACTICED? ☐ YES ☐ NO REGULATED? ☐ YES ☐ NO (50 51)

24. IS BACKYARD BURNING OF HOUSEHOLD REFUSE . . . PRACTICED? ☐ YES ☐ NO REGULATED? ☐ YES ☐ NO (52 53)

25. IS ON-SITE OPEN BURNING OF COMMERCIAL, INSTITUTIONAL, INDUSTRIAL AND/OR AGRICULTURAL WASTES . . . PRACTICED? ☐ YES ☐ NO REGULATED? ☐ YES ☐ NO (54 55)

# COMMUNITY DESCRIPTION REPORT (PAGE 3)

## DISPOSAL

**26. INDICATE BELOW THE NUMBER OF REDUCTION AND/OR DISPOSAL SITES UTILIZED BY THE COMMUNITY'S PUBLIC COLLECTORS, PRIVATE COLLECTORS AND/OR INDIVIDUAL HAULERS (*Enter Numbers*)**

| SITES | PUBLICLY OPERATED | PRIVATELY OPERATED |
|---|---|---|
| LAND DISPOSAL SITES | 56 57 | 58 59 |
| INCINERATORS | 60 61 | 62 63 |
| TRANSFER STATIONS | 64 65 | 66 67 |
| HOG FEEDING LOTS | 68 69 | 70 71 |
| COMPOST PLANTS | 72 | 73 |
| TEPEE BURNERS | 74 75 | 76 77 |
| OTHER *(Specify)* | 78 | 79 |

*Do not use* 80 — 0 — 7 — 13 14

**27. REDUCTION AND/OR DISPOSAL SITES SERVING THE COMMUNITY**

TOTAL 15 16 — NUMBER OUTSIDE COMMUNITY 19 20 — NUMBER WITHIN COMMUNITY 17 18

**28. USE OF COMPLETED LAND DISPOSAL SITES**

*(List no. of sites in each category as applicable)*

| COMPLETED SITE USE | NUMBER |
|---|---|
| RECREATIONAL AREA OR PARK | 21 22 |
| PARKING LOT | 23 24 |
| LIGHT CONSTRUCTION | 25 26 |
| HEAVY CONSTRUCTION | 27 28 |
| AGRICULTURE | 29 30 |
| NO SPECIFIC USE | 31 32 |
| OTHER *(Specify)* | 33 34 |
| *Do not use* 35 | |
| OTHER *(Specify)* | 36 37 |
| *Do not use* 38 | |
| OTHER *(Specify)* | 39 40 |
| *Do not use* 41 | |

**29 NUMBER OF PROMISCUOUS DUMPS WITHIN THE COMMUNITY'S BOUNDARIES KNOWN TO BE ACTIVE**

*(Enter Number)* 42 43

IF INFORMATION IS NOT AVAILABLE CHECK HERE ☐

**30 ESTIMATED NUMBER OF HOUSEHOLD GARBAGE GRINDERS INSTALLED**

*(Enter Number)* 44 45 46 47 48 49

**31. ESTIMATED NUMBER OF GARBAGE GRINDERS IN COMMERCIAL AND INSTITUTIONAL ESTABLISHMENTS**

*(Enter Number)* 50 51 52 53 54

**32. ESTIMATED NUMBER OF ON-SITE INCINERATORS SERVING APARTMENT HOUSES, COMMERCIAL AND INSTITUTIONAL ESTABLISHMENTS**

*(Enter Number)* 55 56 57 58 59

**33. ESTIMATED NUMBER OF HOUSEHOLD ON-SITE INCINERATORS**

*(Enter Number)* 60 61 62 63 64

## BUDGET AND FISCAL

**34. COMMUNITY FUNDS BUDGETED FOR COLLECTION OF SOLID WASTES FOR CALENDAR OR FISCAL YEAR, 1967**

a. EXCLUDING CAPITAL EXPENDITURES

$ 65 66 67 68 69 70 71 72

b. CAPITAL EXPENDITURES ONLY

$ 73 74 75 76 77 78 79 80

**35. COMMUNITY FUNDS BUDGETED FOR DISPOSAL OF SOLID WASTES FOR CALENDAR OR FISCAL YEAR, 1967** — 0 8 — 13 14

a. EXCLUDING CAPITAL EXPENDITURES

$ 15 16 17 18 19 20 21 22

b. CAPITAL EXPENDITURES ONLY

$ 23 24 25 26 27 28 29 30

**36. CLASSES OF REFUSE FOR WHICH COLLECTION AND/OR DISPOSAL FUNDS HAVE BEEN BUDGETED FOR CALENDAR OR FISCAL YEAR, 1967**

| REFUSE CATEGORY | COLLECTION | DISPOSAL |
|---|---|---|
| REFUSE *(Household)* | 31 ☐ | 32 ☐ |
| REFUSE *(Commercial)* | 33 ☐ | 34 ☐ |
| REFUSE *(Industrial)* | 35 ☐ | 36 ☐ |
| REFUSE *(Agricultural)* | 37 ☐ | 38 ☐ |
| REFUSE *(Institutional)* | 39 ☐ | 40 ☐ |
| STREET AND ALLEY CLEANINGS | 41 ☐ | 42 ☐ |
| DEMOLITION AND CONSTRUCTION REFUSE | 43 ☐ | 44 ☐ |
| TREE AND LANDSCAPING REFUSE | 45 ☐ | 46 ☐ |
| PARK AND BEACH REFUSE | 47 ☐ | 48 ☐ |
| CATCH BASIN REFUSE | 49 ☐ | 50 ☐ |
| SEWAGE TREATMENT PLANT SOLIDS AND PUMPING STATION CLEANINGS | 51 ☐ | 52 ☐ |
| DEAD ANIMALS | 53 ☐ | 54 ☐ |
| ABANDONED VEHICLES | 55 ☐ | 56 ☐ |
| OTHER *(Specify)* | 57 ☐ | 58 ☐ |
| OTHER *(Specify)* | 60 ☐ | 61 ☐ |
| OTHER *(Specify)* | 63 ☐ | 64 ☐ |

☐ 59 ☐ 62 ☐ 65

## COMMUNITY DESCRIPTION REPORT (Page 4)

| 37. NAME AND TITLE OF PERSON COMPLETING FORM | ORGANIZATION AND ADDRESS | DATE OF SURVEY<br>DAY (66 67) MONTH (68 69) YEAR (70 71) |
|---|---|---|
| | | |

38. IF SOURCES OTHER THAN REPORTER DESIGNATED IN ITEM 37 WERE UTILIZED IN COMPLETING THIS FORM, INDICATE BELOW THE SOURCES USED AND ITEM NUMBER(S)

DATA SOURCES

| NAME OF PERSON | TITLE | ORGANIZATION | ITEM NUMBER(S) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

39. CONTINUATION ITEMS

| ITEM NO. | ADDITIONAL INFORMATION |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

40. REMARKS *(Attach additional sheet if necessary)*

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE

Form Approved
Budget Bureau No. 68-S-67022

COMMUNITY SOLID WASTE PRACTICES

# LAND DISPOSAL SITE INVESTIGATION REPORT

2 1 195

1. STATE (2 3) 2. COUNTY (4 5 6) 3. SITE LOCATION *(Political Jurisdiction)* (7 8 9 10)

4. NAME OF SITE (11 12 13) 5. ADDRESS OF SITE (14) 6. DATE OF SURVEY DAY (15 16) MONTH (17 18) YEAR (19 20)

7. NAME OF PERSON COMPLETING FORM 8. TITLE 9. ORGANIZATION AND ADDRESS

10. POLITICAL JURISDICTIONS SERVED BY LAND DISPOSAL SITE

| NAME OF POLITICAL JURISDICTION | ESTIMATED PERCENTAGE OF JURISDICTION SERVED BY SITE | AVERAGE DISTANCE OF SITE FROM CENTER OF SOURCE AREA *(Miles)* |
|---|---|---|
| (21 22 23 24) | (25 26) | (27 28) |
| (29 30 31 32) | (33 34) | (35 36) |
| (37 38 39 40) | (41 42) | (43 44) |
| (45 46 47 48) | (49 50) | (51 52) |

*FOR ADDITIONAL ENTRIES, CHECK HERE* ☐ (53) *AND MAKE ENTRIES IN ITEM #45*

11. SITE OPERATED BY (54)
- ☐ PUBLIC AGENCY
- ☐ PRIVATE AGENCY

12. SITE OWNED BY (55)
- ☐ PUBLIC AGENCY
- ☐ PRIVATE AGENCY

13. IS OPERATION REGULATED BY A HEALTH AUTHORITY? ☐ YES ☐ NO (56)
IF YES, INDICATE LEVEL OF PRINCIPAL AUTHORITY *(Check one only)* ☐ COMMUNITY ☐ STATE ☐ COUNTY ☐ OTHER _____ *(Specify)* (57)

14. GENERAL CHARACTER OF SITE *(Check one only)*
- ☐ QUARRY OR BORROW PIT
- ☐ GULLY-CANYON
- ☐ LEVEL AREAS
- ☐ OTHER _____ *(Specify)*
- ☐ HILLSIDE
- ☐ MARSH, TIDELAND OR FLOOD PLAIN

*Do not use* (58)

15. YEAR SITE PLACED IN OPERATION 19 (59 60)

16. ANTICIPATED LIFE REMAINING *(Years)* (61 62 63)

17. TOTAL AREA OF SITE *(Acres)* (64 65 66 67)

18. AREA TO BE USED FOR LAND DISPOSAL *(Acres)* (68 69 70 71)

(72 73)

19. ZONING / LAND USE SURROUNDING FACILITY *(Check predominant type only)*

ZONING
- ☐ NONE
- ☐ RESIDENTIAL
- ☐ COMMERCIAL
- ☐ INDUSTRIAL
- ☐ AGRICULTURAL
- ☐ OTHER _____ *(Specify)*

LAND USE
- ☐ RESIDENTIAL
- ☐ COMMERCIAL
- ☐ INDUSTRIAL
- ☐ AGRICULTURAL
- ☐ OTHER _____ *(Specify)*

20. IS USE OF COMPLETED SITE PLANNED? ☐ YES ☐ NO
IF YES, CHECK PREDOMINANT USE ONLY
- ☐ RECREATIONAL AREA OR PARK
- ☐ PARKING LOT
- ☐ LIGHT CONSTRUCTION
- ☐ HEAVY CONSTRUCTION
- ☐ AGRICULTURE
- ☐ OTHER _____ *(Specify)*
- ☐ USE NOT DETERMINED

(74)

21. WILL PUBLIC AGENCY CONTROL COMPLETED SITE USE? ☐ YES ☐ NO

22. MATERIAL USED FOR COVER *(Check one only)* ☐ NONE ☐ EARTH ☐ OTHER _____ *(Specify)* (75 76)

23. FREQUENCY OF COVER *(Check one only)* ☐ NONE ☐ DAILY *(End of each working day)* ☐ DAILY *(Except face)* ☐ OTHER _____ *(Specify)*

24. IS SPREADING AND COMPACTION OF REFUSE HANDLED IN APPROXIMATELY TWO-FOOT LAYERS OR LESS? ☐ YES ☐ NO (77 78)

25. NUMBER OF DAYS DISPOSAL SITE COULD NOT BE USED BECAUSE OF WEATHER CONNECTED CONDITIONS *(Enter average per year)* (79 80)

2 (14)

26. GENERAL CHARACTER OF OPERATION *(Judgment evaluation - check appropriate categories)*

| APPEARANCE | IS BLOWING PAPER CONTROLLED? | IS BLOWING PAPER CONSIDERED TO BE A NUISANCE? | ROUTINE BURNING | ARE THERE SURFACE DRAINAGE PROBLEMS? | ARE THERE LEACHING PROBLEMS? |
|---|---|---|---|---|---|
| ☐ SIGHTLY<br>☐ UNSIGHTLY<br>(15) | ☐ YES<br>☐ NO<br>(16) | ☐ YES<br>☐ NO<br>(17) | ☐ NONE<br>☐ UNCONTROLLED<br>☐ PLANNED AND LIMITED<br>(18) | ☐ YES<br>☐ NO<br>(19) | ☐ YES<br>☐ NO<br>(20) |

# LAND DISPOSAL SITE INVESTIGATION REPORT (Page 2)

196

27. CONTROL PROGRAMS

| | | YES | NO | Do not use |
|---|---|---|---|---|
| RODENT CONTROL PROGRAM | NEEDED | ☐ | ☐ | 21 |
| | PROVIDED | ☐ | ☐ | 22 |
| FLY CONTROL PROGRAM | NEEDED | ☐ | ☐ | 23 |
| | PROVIDED | ☐ | ☐ | 24 |
| BIRD CONTROL PROGRAM | NEEDED | ☐ | ☐ | 25 |
| | PROVIDED | ☐ | ☐ | 26 |
| DUST CONTROL PROGRAM | NEEDED | ☐ | ☐ | 27 |
| | PROVIDED | ☐ | ☐ | 28 |
| ODOR CONTROL PROGRAM | NEEDED | ☐ | ☐ | 29 |
| | PROVIDED | ☐ | ☐ | 30 |

28. IS LOWEST PART OF FILL IN WATER TABLE? ☐ YES ☐ NO — 31

29. FIRE PROTECTION ☐ NONE ☐ WATER ☐ FIREBREAK ☐ OTHER _____ (Specify) — 32

30. NUMBER OF TIMES FIRE CONTROL EQUIPMENT WAS REQUIRED AT SITE IN THE PAST YEAR [33][34][35]

31. IS SALVAGING PERMITTED? ☐ YES ☐ NO — 36

32. IS SALVAGING PRACTICED? ☐ YES ☐ NO — 37

33. ESTIMATED NUMBER OF LOADS DEPOSITED DAILY (Average)

| FROM PUBLIC COLLECTION VEHICLES (Enter number) | FROM PRIVATE COLLECTION VEHICLES (Enter number) | FROM OTHER VEHICLES (Specify) (Enter number) |
|---|---|---|
| [38][39][40] | [41][42][43] | [44][45][46] |

34. ARE QUANTITATIVE RECORDS KEPT IN ANY FORM? ☐ YES ☐ NO Do not use [47]

35. QUANTITIES OF SOLID WASTES RECEIVED ANNUALLY

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TONS WEIGHED | | [48] | [49] | [50] | [51] | [52] | [53] | [54] |
| TONS ESTIMATED | | [55] | [56] | [57] | [58] | [59] | [60] | [61] |
| CUBIC YARDS | [62] | [63] | [64] | [65] | [66] | [67] | [68] | [69] |

36. GENERAL CLASSIFICATION OF SOLID WASTES ACCEPTED AT DISPOSAL SITE (Check those accepted)

☐ HOUSEHOLD [70] ☐ INDUSTRIAL [72] ☐ INSTITUTIONAL [74]

☐ COMMERCIAL [71] ☐ AGRICULTURAL [73] ☐ INCINERATOR RESIDUE ONLY [75]

37. CHECK ANY ITEMS LISTED BELOW WHICH ARE EXCLUDED FROM THE DISPOSAL SITE

- ☐ [15] ALL PUTRESCIBLES
- ☐ [16] ALL NON-COMBUSTIBLES
- ☐ [17] ALL COMBUSTIBLES
- ☐ [18] GARBAGE
- ☐ [19] DEAD ANIMALS
- ☐ [20] WASTE OIL
- ☐ [21] SEWAGE SOLIDS
- ☐ [22] JUNKED AUTOMOBILES
- ☐ [23] LARGE APPLIANCES
- ☐ [24] DEMOLITION WASTES
- ☐ [25] CONSTRUCTION DEBRIS
- ☐ [26] STREET SWEEPINGS
- ☐ [27] TIRES
- ☐ [28] HAZARDOUS MATERIALS
- ☐ [29] OTHER (Specify) _____
- ☐ [31] OTHER (Specify) _____
- ☐ [33] OTHER (Specify) _____

38. EQUIPMENT AVAILABLE (Average utilized daily)

| | NUMBER | |
|---|---|---|
| DRAGLINE OR SHOVEL-TYPE EXCAVATORS | [35] | [36] |
| SCRAPERS (Self-propelled) | [37] | [38] |
| TRACTORS (Track or Rubber Tire) (Bulldozer or High Lift Loader) | [39] | [40] |
| TRUCKS | [41] | [42] |
| OTHER _____ (Specify) Do not use [43] | [44] | [45] |
| OTHER _____ (Specify) Do not use [46] | [47] | [48] |

39. TOTAL NUMBER OF EMPLOYEES ON SITE (Average daily) [49][50]

40. HOURS OF DAILY OPERATION (On a 24-hour clock) BEGIN [51][52] END [53][54]

41. NUMBER OF DAYS OPERATED PER WEEK [55]

42. ANNUAL OPERATING COST (Including supervision and equipment maintenance) $ [56][57][58][59][60][61][62]

43. IS THIS A SANITARY LANDFILL? ☐ YES ☐ NO — 63

44. IF SOURCES OTHER THAN REPORTER DESIGNATED IN ITEM 7 WERE UTILIZED IN COMPLETING THIS FORM, INDICATE BELOW THE SOURCES USED AND ITEM NUMBERS

| NAME OF PERSON | TITLE | ORGANIZATION | ITEM NUMBER(S) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

PHS-4944-2 (4-67)

## INDUSTRIAL QUESTIONNAIRE

Solid Wastes Defined- Decomposable and non-decomposable material which are useless or discarded resulting from normal community activities, except body wastes, and including garbage, rubbish, ashes, and street cleanings.

1. Description of Business _____

2. Location _____
City or Township County

3. Number of Employees (Full time equivalent) _____

4. Who collects the solid wastes that is produced by your firm? _____

5. Do you anticipate a change in the firm's operation which would result in increased or decreased amounts of solid wastes generated per week in the next 13 years?
No Change |_| Decline |_| Increase |_| Please estimate the amounts of increase or decrease in pounds per week.

1970 _____ 1971 _____ 1972 _____ 1973 _____ 1974 _____ 1975 _____

1976 _____ 1977 _____ 1978 _____ 1979 _____ 1980 _____ 1981 _____

1982 _____ 1983 _____ 1984 _____

Please estimate the amount of present generation per week _____ Cubic yards/week

6. With reference to the table below, please write the percentages in the spaces that pertain to your firm in columns 1,2, and 4. Please "X" in the appropriate spaces in column 3 which concerns the handler.
Column 1 seeks the percentages of each type of waste generated by your firm.
Column 2 seeks the percentage of solid waste which is salvageable by type of waste. This should not include imperfect products which are reprocessed.
Column 3 seeks to identify the types of handler utilized to dispose of each type of waste.
Column 4 seeks to identify the percentage of each type of solid waste which is disposed on property owned by the firm regardless of location.

| | TYPE | 1. Percent of the total generated solid waste | 2. Percent Salvaged | 3. Handlers: Company | Contractor | Municipal | 4. Per cent of Solid waste that is disposed on own property |
|---|---|---|---|---|---|---|---|
| COMBUSTIBLE | Paper & Cardboard | % | % | | | | % |
| | Wood | | | | | | |
| | Garbage | | | | | | |
| | Other (Specify) | | | | | | |
| | | | | | | | |
| | | | | | | | |
| NON-COMBUSTIBLE | Ashes | | | | | | |
| | Metal Shavings | | | | | | |
| | Tin Cans | | | | | | |
| | Plastics | | | | | | |
| | Other (Specify) | | | | | | |
| | | | | | | | |
| | | | | | | | |
| PROBLEM | Chemicals | | | | | | |
| | Sludge | | | | | | |
| | Salt | | | | | | |
| | Nuclear | | | | | | |
| | Other (Specify) | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | TOTAL = 100% | | | | | |

7. Does your firm have any disposal units at your site? Yes |_| No |_| If yes then please indicate the amounts of solid wastes that are disposed in the following types of disposal units and answer questions.
a. Incinerator (fuel is used) - _____ lbs. per week. What is done with the residue after incineration?

b. Outside Burner- _____ lbs. per week. What is done with the residue after burning?

c. Garbage Grinder _____ lbs. per week.
d. Compactor _____ lbs. per week. What is the density of the compaced waste _____ lbs. per cubic yards.

8. Is any solid waste buried on the firm's own property? Yes |_| No |_| If Yes, is it at the plant location? Yes |_| No |_|. How much solid waste is annually deposited on the site _____ Tons per Year. What is the expected life in years of the present site? _____ Years

# APPENDIX H

## PRELIMINARY ENGINEERING SURVEY FOR SANITARY LANDFILL SITES

Richard W. Eldredge

I SITE IDENTIFICATION_____

II SITE LOCATION_____

_____

III ACREAGE_____ACRES

LENGTH_____ WIDTH_____
(Provide Sketch of Irregular Sites)

IV OWNER OF RECORD_____

OWNER'S REPRESENTATIVE (IF ANY)_____

_____

A AVAILABILITY_____

B PRESENT USAGE_____

C TERMS AND CONDITIONS

1 LEASE: PRICE PER ACRE_____PER YEAR;

TOTAL COST _____PER YEAR

2 SALE: PRICE PER ACRE_____;

TOTAL COST_____

V LAND CHARACTERISTICS

A GENERAL DESCRIPTION_____

_____

_____

B DRAINAGE

NATURAL_____ _____ACRES

STORM SEWERS_____ _____ACRES

FARM TILE_____ _____ACRES

OPEN DITCH_____ _____ACRES

(Provide Sketch of Drainage Facilities if Other than Natural)

C RAINFALL

Quantity Estimate

SPRING_____INCHES

SUMMER_____INCHES

FALL_____INCHES

WINTER_____INCHES

D OUTFALL (DESCRIBE CRITICAL CONDITIONS UP TO ONE MILE DOWNSTREAM OF OPEN DRAINS, ETC.)

_____

_____

E GROUND COVER

Estimated Acreage

1 HEAVILY WOODED_____

LIGHT BRUSH_____

GRASSES OR PASTURE_____

CULTIVATED_____

2 ESTIMATED CLEARING COST_____PER ACRE

(REDUCE CLEARING COST BY ANY AMOUNTS RECEIVED FROM SALE OF TIMBER)

3 SUGGESTED METHOD OF CLEARING_____

_____

F AGRICULTURAL SOIL CLASSIFICATION

_____% SAND

_____% SILT TEXTURE CLASSIFICATION_____

_____% CLAY_____

(See Page 209-Soil Survey Manual USDA)

G ATTACH BORING LOGS OF REPRESENTATIVE TEST HOLES, BORED TO DETERMINE WATER TABLE AND SOILS PROFILE (Logs of Nearby Wells May Be Used In Lieu of Test Borings - If The Area Presents a Generally Consistant Soils Pattern)

H IF COVER MATERIAL IS NOT AVAILABLE AT THE SITE - WHERE WILL IT BE OBTAINED?_____

_____

WHAT COSTS ARE INVOLVED?_____

_____

OWNER (COVER MATERIAL)_____

VI OPERATIONAL SUPPORT

A FIRE PROTECTION

1 WHO IS RESPONSIBLE FOR FIRE PROTECTION?_____

_____

2 WHAT ARE THE COSTS, IF ANY?_____

_____

3 WHERE IS THE NEAREST WATER SOURCE FOR FIRE-FIGHTING?_____

_____

4 FOR DRINKING WATER?_____

_____

B ARE THERE ANY OTHER SOURCES OF WATER WHICH MIGHT BE ADVERSELY AFFECTED BY A LANDFILL?

_____

_____

C UTILITIES

| | On Site | Nearby (State Where) |
|---|---|---|
| WATER | _____ | _____ |
| GAS | _____ | _____ |

ELECTRICITY_____ _____

TELEPHONE_____ _____

SANITARY
SEWERS_____ _____

STORM
SEWERS_____ _____

VII PHYSICAL AND GOVERNMENTAL CONSIDERATIONS

A OPERATIONAL REQUIREMENTS

1 CITY_____

2 COUNTY_____

3 STATE_____

4 WATER BOARD_____

5 HEALTH DEPARTMENT_____

6 PLANNING COMMISSION_____

7 OTHER_____

PROVIDE COMMENTARY ON EXTENT OF CONTROL
AND COPY OF SPECIFIC REQUIREMENTS

B ZONING

1 ZONING CLASSIFICATION_____

2 ENFORCEMENT AGENCY_____

3 RESTRICTIONS - IF ANY_____

_____

4 ACTIONS NECESSARY TO USE SITE_____

_____

C EXISTING OPERATIONS

1 DISPOSAL TECHNIQUES SERVING THE SAME AREA____

_____

2 SUMMARY OF REFUSE DISPOSAL HISTORY IN THE AREA
(Include Adjacent Areas if Pertinent)

_____

_____

D LAND USE OF ADJACENT PROPERTIES

| | South | West | North | East |
|---|---|---|---|---|
| 1 RESIDENTIAL | ____ | ____ | ____ | ____ |
| 2 COMMERCIAL | ____ | ____ | ____ | ____ |
| 3 LIGHT INDUSTRIAL | ____ | ____ | ____ | ____ |
| 4 HEAVY INDUSTRIAL | ____ | ____ | ____ | ____ |
| 5 RURAL | ____ | ____ | ____ | ____ |
| 6 MIXED | ____ | ____ | ____ | ____ |

IF LAND IS NOT ZONED MARK USE "0"
IF LAND USE AGREES WITH ZONING MARK "Z"
IF LAND USE AND ZONING DO NOT AGREE MARK "V"

VIII SITE ACCESS

A ROADS MAINTAINED BY:

1 CITY_____

2 TOWNSHIP_____

3 COUNTY_____

4 STATE_____

5 INTERSTATE_____

6 OTHER_____

EXPLAIN:_____

_____

B TYPES OF ROAD SURFACE

1 CONCRETE_____

2 ASPHALT_____

3 SEAL COAT_____

4 SOIL CEMENT_____

5 GRAVEL_____

6 CRUSHED STONE_____

7 DIRT_____

8 OTHER_____

C BRIDGES

1 LOCATION_____

2 LOAD LIMIT_____

3 CONDITION_____

(Include Information on All Bridges in Immediate Vicinity)

D RAILROAD CROSSINGS

1 GRADE CROSSING_____ VISIBILITY_____.

2 ELEVATED_____ CONDITION_____.

3 UNDERPASS_____ HEIGHT_____.

E DISTANCE TO COMMUNITY CENTER

1 PROBABLE MAXIMUM HAUL DISTANCE_____
(ONE WAY)

2 PROBABLE MINIMUM HAUL DISTANCE_____
(ONE WAY)

3 PROBABLE AVERAGE HAUL DISTANCE_____
(ONE WAY)

4 AVERAGE TIME OF AVERAGE HAUL_____
(ONE WAY)

5 CHARACTERISTICS OF AREA ADJACENT TO MAJOR HAUL ROUTES__

_____

IX RECOMMENDED PROCEDURE

A PROPOSED LANDFILL METHOD

1 TRENCH_____

2 CUT AND COVER_____

3 AREA_____

4 RAMP_____

5 OTHER OR COMBINATION_____

(Attach Detailed Recommendations)

B PROPOSED COMPLETED SITE USE

1 PARKS_____

2 PLAYGROUNDS_____

3 AGRICULTURE_____

4 PARKING_____

5 LIGHT INDUSTRIAL_____

6 OTHER_____

DESCRIBE_____

_____

_____

C PROPOSED MAXIMUM FINISHED ELEVATION:_____

_____

D ESTIMATED CAPACITY OF SITE:_____

_____

X POPULATION DATA

A POPULATION SERVED BY LANDFILL

1 NOW_____

2 NEXT TEN YEARS_____

B TOTAL AREA POPULATION

1 NOW_____

2 NEXT TEN YEARS_____

XI SUMMARY:_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

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_____

Report Submitted By:_____

Date_____

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