

SITE PLANNING AND DEVELOPMENT FOR  
A NEIGHBORHOOD UNIT IN MANHATTAN, KANSAS

by

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TABLE OF CONTENTS

|                                                       | Page    |
|-------------------------------------------------------|---------|
| INTRODUCTION . . . . .                                | 1 - 3   |
| I. DEFINITION OF SITE PLANNING . . . . .              | 4 - 15  |
| A. What is a Site? . . . . .                          | 4       |
| B. What is Planning? . . . . .                        | 4       |
| C. What is Site Planning? . . . . .                   | 7       |
| D. What is the Process of Site Planning? . . . . .    | 11      |
| II. DEFINITION OF A NEIGHBORHOOD UNIT . . . . .       | 16 - 24 |
| A. A Neighborhood Unit Defined . . . . .              | 16      |
| B. The Functions of a Neighborhood Unit . . . . .     | 17      |
| C. Size of the Neighborhood Unit . . . . .            | 18      |
| D. Physical Features of a Neighborhood Unit . . . . . | 19      |
| E. The Elements of a Neighborhood Unit . . . . .      | 20      |
| F. Neighborhood Boundaries . . . . .                  | 21      |
| G. Conclusion . . . . .                               | 22      |
| III. THE SITE IN TAIWAN . . . . .                     | 25 - 42 |
| A. Physiographic Setting . . . . .                    | 21      |
| B. Population in Taiwan . . . . .                     | 31      |
| C. Climate . . . . .                                  | 32      |
| D. Rainfall . . . . .                                 | 32      |
| E. Temperature . . . . .                              | 35      |
| F. Family Type in Taiwan . . . . .                    | 36      |
| G. Spatial View of Taiwan . . . . .                   | 38      |
| H. Conclusion . . . . .                               | 41      |



| Table of Contents (continued) |                                                       | Page      |
|-------------------------------|-------------------------------------------------------|-----------|
| IV.                           | THE SITE IN MANHATTAN, KANSAS . . . . .               | 43 - 97   |
|                               | A. Site Selection . . . . .                           | 43        |
|                               | B. Site Evaluation . . . . .                          | 53        |
|                               | C. Site Inventory and Resource Analysis . . . . .     | 61        |
| V.                            | THE PLANNING OF THE SITE . . . . .                    | 98 - 118  |
|                               | A. Type of Uses . . . . .                             | 98        |
|                               | 1. Market Analysis for Housing and Residential<br>Use | 98        |
|                               | 2. Market Analysis for Commercial                     | 110       |
|                               | B. Elementary School . . . . .                        | 114       |
|                               | C. Open Space . . . . .                               | 115       |
|                               | D. Linkage . . . . .                                  | 115       |
|                               | E. Lands Use Concept . . . . .                        | 115       |
| VI.                           | THE PLANNING CONCEPT . . . . .                        | 119 - 124 |
|                               | A. Mixed Uses . . . . .                               | 119       |
|                               | B. Open Space System . . . . .                        | 120       |
|                               | C. Circulation . . . . .                              | 122       |
|                               | D. Estimated Population on the Site . . . . .         | 123       |
| VII.                          | DESIGN CONSIDERATIONS . . . . .                       | 125 - 129 |
|                               | A. Residential Areas . . . . .                        | 125       |
|                               | B. Commercial. . . . .                                | 128       |
|                               | C. Design Data . . . . .                              | 129       |
| VIII.                         | GENERAL DEVELOPMENT PLAN . . . . .                    | 130 - 135 |
|                               | A. Master Plan . . . . .                              | 130       |
|                               | B. Sanitary Sewer Plan . . . . .                      | 132       |
|                               | D. Storm Sewer Plan . . . . .                         | 134       |

| Table of Contents (continued)                     | Page      |
|---------------------------------------------------|-----------|
| IX. PROTOTYPE . . . . .                           | 136 - 152 |
| A. Description . . . . .                          | 136       |
| B. Planning and Design Considerations . . . . .   | 136       |
| C. Design Data of Prototype. . . . .              | 147       |
| D. Typical Apartment Structures . . . . .         | 148       |
| E. Model Presentation for the Prototype . . . . . | 149       |
| BIBLIOGRAPHY . . . . .                            | 153       |
| APPENDICES                                        | 156 - 166 |
| APPENDIX I . . . . .                              | 156       |
| APPENDIX II . . . . .                             | 157       |
| APPENDIX III . . . . .                            | 158       |
| APPENDIX IV . . . . .                             | 162       |
| APPENDIX V . . . . .                              | 164       |
| APPENDIX VI . . . . .                             | 165       |
| ABSTRACT                                          |           |

## INTRODUCTION

Since the conclusion of the second world war the population in Taiwan has rapidly increased which created the problem that the level sites are used up and Taiwan's planners are thinking about developing housing on steep sites to keep up with population growth.

A piece of land on a sloping site in Manhattan, Kansas, was selected as a case study to serve as typical terrain in Taiwan for the purpose of the design. The reasons are: First, only a few cities in Taiwan have a master plan or a land use plan. Therefore, it is very hard to get a development in Taiwan to fit into the fabric of the city. Second, the convenience of the site provides a good chance to plan a neighborhood unit development on the sloping site. The author can then take this experience back to Taiwan and offer suggestions for improving development for the steep sites of Taiwan.

This study involves the preparation of a general development plan for a neighborhood unit which is conceived as housing, employment, and service on a 1,215 acre site south east of Manhattan, Kansas.

The purpose of this study will be: 1) To design an attractive functional neighborhood unit to absorb a portion of the future growth of Manhattan, Kansas. 2) To educate the people who are not fully familiar with the concept and procedure of site planning. 3) To furnish a method for those who are interested in, or working on site planning. 4) To show how site planning is applicable to sites in Taiwan and to provide the products of this study to Taiwan planners for review as a guide in Taiwan's further development.

Through the site planning process, a planning and design concept will be formulated. After the concept is established, a general development plan for this site will be prepared.

The procedure for this study will be to:

1. Gather cultural and natural data relating specifically to this site and the surrounding areas obtained from county and city offices, library research; reports, documents, newspapers, site inspections, aerial photography maps and topographical maps
2. Each cultural or natural feature which may effect the land use plan is mapped seperately on a transparent medium. They are then overlayed and development cells are mapped. A development cell being a portion of the site that has a homogenous character; i.e. the same slope, vegetation, orientation, view, elevation,

geology, etc. A cell would be a complete portion of the site, not divided by an existing cultural feature such as a road, or easement, or natural feature such as a drainage channel or rock ledge.

3. One can then identify development cells that are suitable or unsuitable for proposed uses.
4. Develop design criteria and a design concept.
5. Formulate a general development plan.
6. Demonstrate how the prototype development plan may be adapted to provide housing on steep slopes in Taiwan.

The basic principles of land use will be the same all over the world with respect to how the cells are used; one possible difference will be the "techniques applied and the materials used." Sometimes, the design concept is the same, but with different aesthetic levels.

This study will not please everyone; indeed, it will be fortunate if it succeeds in pleasing anyone. Instead, the results will serve as a starting place to consider what compromises can be made so that the proposed development will not destroy the natural features of the site and the natural features of the site will not inhibit the development. It will function as an attractive neighborhood development.

Hopefully, this study could serve as an educational tool for examining the complexity of human land usage in Taiwan.

## CHAPTER I

### THE DEFINITION OF SITE PLANNING

In the introduction, we discussed the procedure of site planning. If the process of site planning could be well understood and applied, the designer will be successful. The first point is to know what site planning is and what the procedure of site planning is.

#### A. What is a Site?

The dictionary is usually a good beginning source for locating a definition. In the American Heritage Dictionary, the word "site" is defined as the place or plot of land where something was, is or is to be located.<sup>1</sup>

This definition is very clear and gives specific and definite guidance to knowing, "What is a site?".

#### B. What is Planning?

Planning as a profession is relatively young when compared with other, more established professions such as law, medicine and engineering. The planning profession is still evolving and is expanding rapidly. The profession is experiencing

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<sup>1</sup>William Morris, "The American Heritage Dictionary" (Houghton Mifflin Comp.) pp. 1210.

great changes; new methods and techniques are being formulated and tested out, and they are being applied in the field.

The definition of planning has changed quite radically in recent years. Until the early 1960s, planning was generally recognized as an activity dealing only with a physical aspect of a city or region. Today, planning encompasses more than just city and regional planning. Other aspects of planning include such diverse endeavors as human resource planning, social service planning, economic planning, natural resource planning, business and corporate planning, military planning, site planning and many others.

Due to the current diversity of specialties within the planning profession, the word "planning" denotes different connotations to different groups of people. Not even the theorists and practitioners within the profession can readily agree upon one specific, clear-cut definition!

The complexity of the functions of planning and multiplicity of the specialties within the planning field have created many incompatible and contending definitions. Perhaps what is required is not a specific, clear-cut definition but a general definition - a definition that can link and generalize all the common elements of the planning profession.

An acceptable planning definition, according to John R. Seely, "must be sufficiently definite to give guidance, but also sufficiently vague to allow flexibility in subsequent

interpretation (i.e. change under the guise of permanence).<sup>2</sup>

The American Heritage Dictionary gives the following meanings to the verb "planning".

"1. To formulate a scheme or program for the accomplishment or attainment of ...

2. To have as a specific aim or purpose

3. To draw or make a graphic presentation of ..."<sup>3</sup>

Also, in the Standard College Dictionary, the verb "to plan" is defined as "to form a scheme or method for doing, achieving, etc." All of these definitions are far too vague and do not give any specific, definite guidance as suggested by Seeley. Under these definitions, planning becomes a very common activity which anyone can perform. It does not carry any professional connotation.

Alan A. Altshuler, a political scientist and planning theorist, defines planning as "simply the effort to infuse activity with consistency and conscious purpose."<sup>5</sup> Again, Altshuler's definition is too simple and vague. He fails to point out the definition with any professional character.

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<sup>2</sup>John R. Seeley, "What is planning? Definition and strategy", (Journal of the American Institute of planners, Volume XX VIII, No. 2, May 1962.) pp. 91-97.

<sup>3</sup>William Morris, "The American Heritage Dictionary" Houghton Mifflin Comp.) pp. 10002

<sup>4</sup>Funk and Wagnalls, Standard College Dictionary, (New York: Harcourt, Brace & World, Inc., 1966), pp. 1032.

<sup>5</sup>Alan A. Altshuler, "The city planning process: A Political analysis", (Ithaca and London: Cornell University Press, 1970), pp. 409.



Planning, as defined by P. Davidoff and T. A. Reiner, is a process for determining appropriate future action through a sequence of choices."<sup>6</sup> According to this definition, the word "determining" is used in two senses: finding out, and assuring. The word "action" is defined as the eventual outcome of planning efforts. Since the word "appropriate" implies, in general, a criteria for making decisions regarding preferred states, it explicitly follows that planning incorporates a notion of goals. The word "action" embodies specifics, and thus poses the question of relating general ends and particular means. Therefore, the P. Davidoff Reiner definition suggests that the concept of planning must be directed to problems of effectuation or implementation.

This definition is the most professional and explicit. It is sufficiently clear to provide a general description, but also sufficiently vague to allow flexibility in future interpretation.

### C. What is Site Planning?

Having studied the concept of "what is a site?" and "what is planning?" as discussed above, we can focus attention on the question: "what is site planning?" A simple definition about site planning will be "a process for determining appropriate future action through a sequence of choices on the land

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<sup>6</sup>Paul Davidoff and Thomas A. Reiner, "A choice theory of planning" (Journal of the American Institute of Planners, Vol. XX VIII No. 2, May 1962.) pp. 102-115.

or place where something was, is or is to be located."

In this research, for example, the study site is to be designed and located with many homes and public facilities so as to become an attractive neighborhood, enhancing the beauty of the city of Manhattan, Kansas.

Site planning, as defined by Kevin Lynch, is "the art of arranging buildings and other structures on the land in harmony with each other," and it is also "the art of arranging the external physical environment to support human behavior. It lies along the boundaries of architecture, engineering, landscape architecture, and city planning, and it is practiced by members of all these professions."<sup>7</sup>

Harvey M. Rubenstein defined site planning simply. He wrote that "site planning is the art and science of arranging the uses of portions of land and is professionally exercised by landscape architects, architects, planners and engineers." (see Figure 1)<sup>8</sup>

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<sup>7</sup>Kevin Lynch, "Site Planning", Second Edition, (Massachusetts: The M.I.T. Press.) 1971, pp. 1-3.

<sup>8</sup>Harvey M. Rubenstein. "A guide to site & environmental planning" (New York: John Wiley and Sons Inc.) 1969, pp.1

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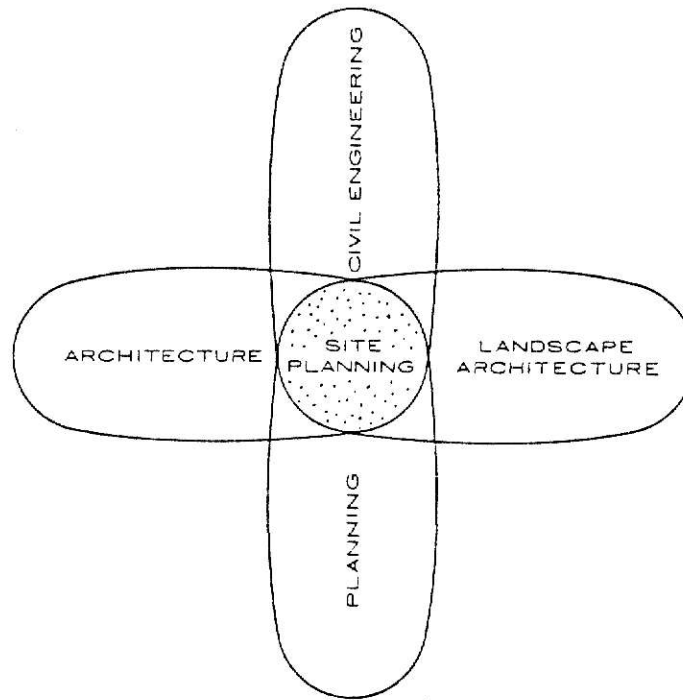


Figure 1

As discussed by Kevin Lynch and Harry M. Rubenstein, site planning means that the object of site planning is the "external physical environment," (e.g. buildings and structures) and that this object will be arranged in a harmonious way to support human behavior planning done by architects, landscape architects, engineers and city planners. The most important point that both of them emphasize is that "site planning should be professionally exercised by architects, landscape architects, engineers and city planners." From figure 8, each type of professional plays an important role in making the site planning program successful.

The Community Builder's Handbook states that "land and site planning involve matters of site selection and the determination, allocation and location of specific land uses, and the determination of specific uses for definite areas of land

and the planning of these areas in such a manner that the structure, the means of access and communication, the vehicular and pedestrian traffic, the open space for recreation, and the areas for houses or other uses are coordinated to produce a unified development which can be built economically, operated efficiently, and maintained or marketed at normal expense. It is a technique that requires the assistance of a person or persons with training and experience in this particular field."<sup>9</sup> This definition about site planning states more detail and gives a sense of what site planners do on the site. Also, it emphasizes that any person participating in the site planning field should be well trained and experienced. We can thus understand how important the site planner's role is!

Kevin Lynch's definition for site planning is the most simple, professional and the most easy to understand. It is very clear and provides a wide and general description without placing limitations on the objects of site planning.

Objects, like the site itself, are always specific and particular. They depend on the situation and the values of the client. In any case, the site planner hoping to modify existing values must at least understand the situation from which he hopes to depart and take the responsibility to clarify objectives.

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<sup>9</sup>J. Ross McBeever, ed., The Community Builder Handbook, (Washington D.C.: Urban Land Institute, 1968). pp. 25-77.

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In this case study, to include all the objects necessary on the site for a neighborhood unit development, an analysis of influencing factors must be completed in order to determine the best methods of integrating the operation into the landscape. This process of review and analysis is known as site planning.

#### D. What is the Process of Site Planning?

The formal process begins with an understanding of the persons for whom the site is being planned and a definition of what their role will be in deciding upon the features of that plan. Next comes an analysis of the situation: a study of the site itself and also of the whole structure of power, values and technology within which the project must be carried out. Finally a design is created - a form that the site will be given to fulfill the program.<sup>10</sup>

The process of site planning begins with the gathering of basic data relating specifically to the site under consideration and the surrounding areas. The data should include such items as master plans and studies, zoning ordinances, base and aerial maps, surveys, topographic data, geological information, the hydrology of the area, types of soils, vegetation and existing easements. After all the available information has been obtained, it must be examined and analyzed. One of the first objectives is to establish the site's advantages and limitations. On the

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<sup>10</sup>Kevin Lynch, "Site Planning", Second Edition, (M.I.T. Press.). 1971, pp. 4.

basis of these conclusions, it is then possible to determine where the land is suitable for the proposed use. If the land is found suitable, the data must be analyzed further to establish other specific parameters of the site. These include such items as the best areas for building locations because of soil conditions, areas to avoid because of steep slopes, areas with soil erosion problems because of drainage patterns, or areas to be left in their natural state because of vegetation.<sup>11</sup>

In site planning, as in other forms of problem solving, the critical thinking process of research, analysis, and synthesis makes a major contribution to the formation of design decisions. Research material may be gathered from existing projects, books, photographs, or experiments. The designer must formulate his program and list the elements required to develop the project. Being open-minded is essential to creativity. The site planner must constantly strive to ward off preconceived thoughts or influences which might close his mind to worthwhile ideas.

The site planning process for a neighborhood unit does not differ significantly from other types of development. It involves the consideration of three basic phases:

1. Collection and recording of information.
2. Analysis of information to determine influential and pertinent factors affecting planning decisions.
3. Formulation of the development plans.

<sup>11</sup>Joseph De. Chiara and Lee E. Koppelman, "Site Planning Standards", (New York: McGraw-Hill Book Comp.), 1974, pp. 1.



Data collection encompasses information relating to the operation, such as social, economic, political and environmental considerations. In addition, site selection criteria must be analyzed to choose suitable locations for the operations.

Individual sites should be reviewed and analyzed by gathering specific data including:

a. NATURAL

1. Slope data
  - . Maximum % of slope
  - . Minimum % of slope
2. Relief data
  - . Highest elevation
  - . Lowest elevation
3. Soil data
  - . Depth of topsoil and subsoil
  - . Location and classification of soil type
4. Geological data
  - . Depth to bedrock
5. Hydrological data
  - . Surface runoff pattern
  - . Location of streams, lakes, ponds and wells or springs
  - . Floodplain location
6. Vegetation data
  - . Location of existing vegetation
  - . Existing vegetation types
7. Perceptual data
  - . Views into and upon the site at ground level and  
aerial oblique

## 8. Climatic

### b. CULTURAL

#### 1. Site survey data

- . Property line survey
- . Easements and rights of way
- . Location of roads; type, classification and condition
- . Location and volume of utilities such as water, power and gas
- . Reproducible aerial photograph of a workable scale; (1" = 200 or 400') preferably at the same scale as the contour map
- . Contour map with slope indications
- . Existing conditions

#### 2. Land use data

- . Existing and future zoning and land use
- . Development trends and patterns
- . Access to transportation routes

#### 3. Regulation

- . Review all local, county and state and federal regulation that will relate to the site development
- . Determine the format that plans and data must be prepared for submission and approval
- . Determine schedule of submission of plan and public review and approvals.

The next step in the site planning process is the analysis of this information to determine the potentials of the site for adequately accommodating neighborhood unit operations.

This information should be considered along with a thorough review of the neighborhood's functional operations to determine use patterns and capabilities as influenced by the site, such as:

1. Function and Characteristics of the operation
2. Traffic circulation patterns
3. Spatial requirements

After a thorough review and analysis of all influencing factors, design studies are conducted to determine the best functional and environmental relationships in terms of site organization, landform and plant material arrangement. From the preliminary design studies, the final development or master plan is formulated to serve as the guide for construction. The master plan can also provide a basis for cost estimates, capital investment requirements and construction feasibility studies.

## CHAPTER II

### DEFINITION OF A NEIGHBORHOOD UNIT

#### A. A Neighborhood Unit Defined

The neighborhood unit is not some sociological phenomenon; it embraces no particular theory of social science.

The American Heritage Dictionary defined the noun "neighborhood" as "A district considered in regard to its inhabitants or distinctive characteristics." This definition is far too vague and does not state what a consideration for a district "in regard to its inhabitants" is.

One of the earliest authorities to attempt a definition of the difference to some degree and to provide a definition of the neighborhood in fairly specific terms was Clarence A. Perry. Although opinions differ to some degree, the definition as set forth in the Regional Survey of New York and its environs, 1929, is still a valid statement. Perry described the neighborhood unit as that populated area which would require and support an elementary school with an enrollment of between 1,000 and 1,200 pupils. This would mean a population of between 5,000 and 6,000 people. Developed as a low-density

dwelling district with a population of 10 families per acre, the neighborhood unit would occupy about 160 acres and have a shape which would render it unnecessary for any child to walk a distance of more than one-half mile to school. About 10 percent of the area would be allocated to recreation, and through traffic arteries would be confined to the surrounding street, internal streets being limited to service access for residents of the neighborhood. The unit would be served by shopping facilities, church, a library, and a community center, the latter being located in conjunction with the school.<sup>12</sup>

Garrette Eckbo described the neighborhood as clusters of houses related to school, shopping, church, recreation, and part at the local scale of  $\frac{1}{4}$  to  $\frac{1}{2}$  mile radius, making up the majority of the area of villages, town, cities, and metropolitan areas. In the ideal neighborhood prototype, the local facilities are clustered in a neat parklike core connected to the housing by pedestrianways radiating through finger parks while on the outside, the housing connects with the world through dead-end or loop streets leading to the traffic ways which bound the neighborhood.<sup>13</sup>

#### B. The Functions of a Neighborhood

To satisfy the residents' simple social wants; it is natural

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<sup>12</sup>Gallion-Eisner, "The Urban Pattern", Third Edition, (New York, D. Van Nostrand Comp.) 1975, pp. 2830.

<sup>13</sup>Garrett Eckbo, "Urban Landscape Design", (New York, McGraw-Hill Book Comp.) 1964, pp. 177.

for families to seek the advantages which appropriately planned neighborhoods provide.

Four functions, as listed below would provide these kinds of advantages to enhance communication between the people in the neighborhood.

#### Functions of a Neighborhood Unit<sup>14</sup>

1. Maintenance
2. Learning
3. Control
4. Play

#### C. Size of the Neighborhood Unit

The neighborhood unit, or some equivalent of this unit, is repeatedly referred to in proposals for urban reorganization. The suggested form varies widely, but the essential characteristics are fairly consistent. The suggested population appropriate for a unit has ranged between 3,000 and 12,000 people. Some Authorities have expressed a desire for units of smaller size than a school district, believing the nature of the neighborhood requires a relatively small size generally 1,000 and not to exceed 1,500 families.

The American Institute of Architects adapted the neighborhood unit as the recommended "growth unit" for future urban

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<sup>14</sup>"Community Center Movement as a Moral Force", International Journal of Ethics, Vol. 30, April, 1920.

growth. The growth unit would range in size from 500 to 3000 dwelling units with populations of between 1,700 and 10,000.<sup>15</sup>

#### D. Physical Features of a Neighborhood Unit

The major function of a neighborhood unit is to embody the reality of loose-knit and close human relationships. This is the kind of social aspect to be considered.

Also Robert E. Park and E. W. Burgess stressed the physical features of a neighborhood unit:

1. Land use
2. Density
3. Street patterns
4. Natural boundaries and
5. Amount of open space

For physical planners, it is very important to consider the physical features and through the process of site planning, utilize land well and design public facilities allowing people to move conveniently and perform the function of the neighborhood unit.

The point is that social aspects as well as physical features are important in the design of a successful development.

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<sup>15</sup>Gallion-Eisner, "The Urban Pattern" Third Edition. (New York, D. Van. Nostrand Comp.) 1975, pp. 285.

### E. The Elements of a Neighborhood Unit

Acceptance of the neighborhood concept implies that adequate housing consists not merely of the individual homes, no matter how well planned or how well located; but that all residential and community facilities and services required for the shelter, health and convenience of the residents of a neighborhood must be included in the neighborhood, or must be made available to its residents.

Several types of elements, therefore, comprise the housing environment. These may be grouped in the following principal categories:

1. Residential facilities:

Buildings and land devoted exclusively to dwelling and direct accessory uses. These include houses and the immediately surrounding space for gardens, drying yards, driveways, garages, etc.

2. Neighborhood community facilities:

Educational, social, cultural, recreational and shopping facilities used in common by families in the neighborhood. The common characteristic of these facilities is that they are used by one member or more of the normal family almost every day.

3. Utilities and services:

Water supply, light, and fuel supply, telephone, storm and sewage disposal, other water disposal, fire protection and police service.



#### 4. Circulation:

All the installations required for the surface transportation of persons and goods to and from the dwelling units and between dwellings and community facilities. These elements consist primarily of walks for pedestrians and streets for private and public transportation. They include related elements such as parking space, traffic controls and circulation lighting.

#### F. Neighborhood Boundaries

The existence of logical boundaries for a neighborhood is often more significant in determining its actual area than considerations of population or overall dimensions. Natural boundaries such as rivers and topographic barriers will frequently delineate neighborhoods. Existing or proposed transportation routes, traffic arteries, parkways or railroads will also act as boundaries. Industrial areas, commercial districts and landscape parks are other elements which frequently form borders of a neighborhood.

Every development area should be planned in relation to the whole city and especially to the bordering districts. The neighborhood boundaries should be so selected that the development will include all parts of the district which, by their location, land use and relationship to the territory surrounding them, logically form a part of the proposed neighborhood.

## G. Conclusion

C. Perry originated the idea of a neighborhood as a planned community, self-contained with respect to the basic needs of collective living, and large enough to maintain an elementary school. He believed that the school could be used to bring the people together and to generate social consciousness.

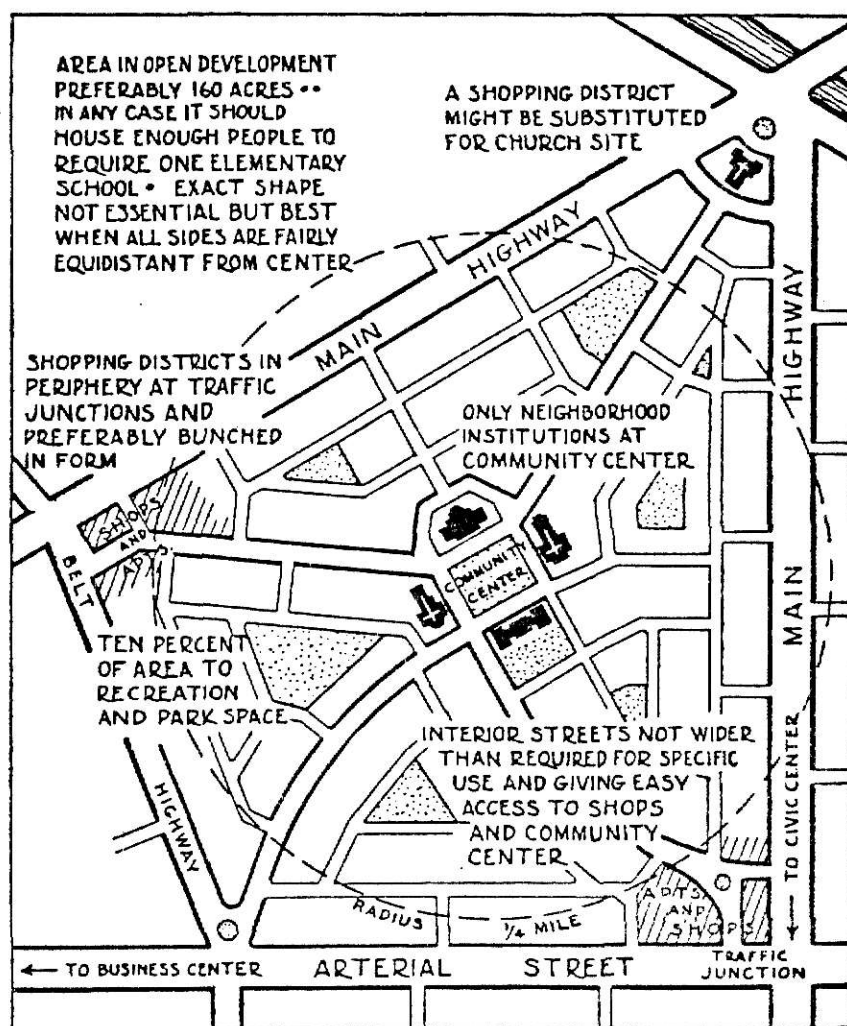
(Figure 2)

Generally, the neighborhood unit is defined as an urban unit with a functional arrangement of its environmental elements. Those elements being the circulation system, the built-up areas and the open spaces, the building sites, and the recreational, educational and social welfare facilities.

So, the concept of a neighborhood depends essentially on matters of physical arrangement. It has social implications in that it aims at promoting the conscious participation of residents in community activities.

Despite the variations, the principle of the neighborhood unit runs through all considerations for social, physical and political organization of the city. It represents a unit of the population with basic common needs for educational, recreational, and other service facilities, and it is the standards for these facilities from which the size and design of the neighborhood emerges.

The site planners should do the best to 1. create a sense of place that is the gathering together of community services



PERRY'S PLAN FOR THE NEIGHBORHOOD UNIT

Figure 2: Charts help to dress up a report.  
This chart illustrates the basic essentials of Perry's neighborhood unit plan.

Source: The Neighborhood Unit, Monograph I of  
Vol. 7 of Regional Survey of New York,  
1929.

and facilities; 2. provide a feeling of scale in human dimension; 3. enhance relationships among people; 4. encourage a community of purpose, expectation and action. The absence of such central places in metropolitan areas of sprawl takes away opportunities for the sense of a true neighborhood.

## CHAPTER III

### THE SITE IN TAIWAN

The research conducted here should be adaptable to other conditions. The condition of most interest here is its applicability to Taiwan. Let us first understand Taiwan.

#### A. Physiographic Setting (See Figure 3)

Off the eastern coast of Asia lie the mountainous island arcs of the Western Pacific. The island chain closest to the continent marks the edge of the Asiatic continental shelf. Taiwan, one of the islands of this chain, is the largest island between Japan and the Philippines.

Taiwan resembles a tobacco leaf in shape and is about 244 miles long and approximately 90 miles wide at its broadest point. The island, with a total area of about 13,880 square miles, is slightly smaller than the States of Massachusetts, Rhode Island, and Connecticut combined.

The surface geology of the island varies in age from very recent alluvial deposits to early sedimentary and crystalline rocks. The structure, relatively simple for the most part, is formed by a tilted fault block running roughly northeast to

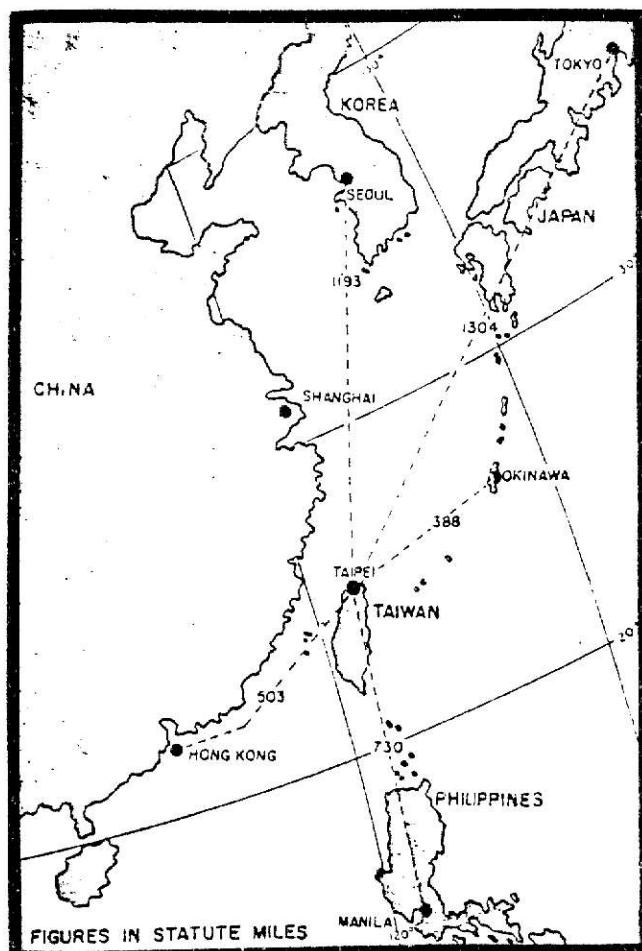


Figure 3: Geographical position of Taiwan

Sources : Chiao-Min Hsieh, Taiwan-Ilha Formosa, A Geography in Perspective (Washington: Butterworths, Inc., 1964), pp.4

southwest along the entire length. The steep slope of this tilted block faces east and the rock mass slopes more greatly to the west. The tilted block is composed primarily of old rocks, some of which have been subjected to heat and pressure.

Because of the terrain, scarcely more than one-third of the land area is arable. (See Figure 4) The mountains are mostly forested, with some minerals, chiefly coals, in the northern end.

On the east coast, slopes fall away to the pacific. To the west, the level sediments lie just below the surface of the sea. (Figure 5) As a result, the deposits of rivers have filled the shallow waters and extended the land 15 to 30 kilometers westward from the foothills, giving Taiwan a larger proportion of useful and level land than Japan or the Philippines. (See Figure 6 about stream distribution in Taiwan.)

The shore line of Taiwan is simple and fairly straight. The total length is 1,593 kilometers. A number of coral reefs lie off the southern end of the island; built up along the island's shores during the pleistocene period. However, the area covered by these reefs are small.<sup>16</sup>

The fundamental topographical feature of Taiwan (See Table 1) is the central range of high mountains running from the

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<sup>16</sup>Chen Kas-Tang, China Year Book (Taiwan: China Publishing Co., 1979) pp. 39

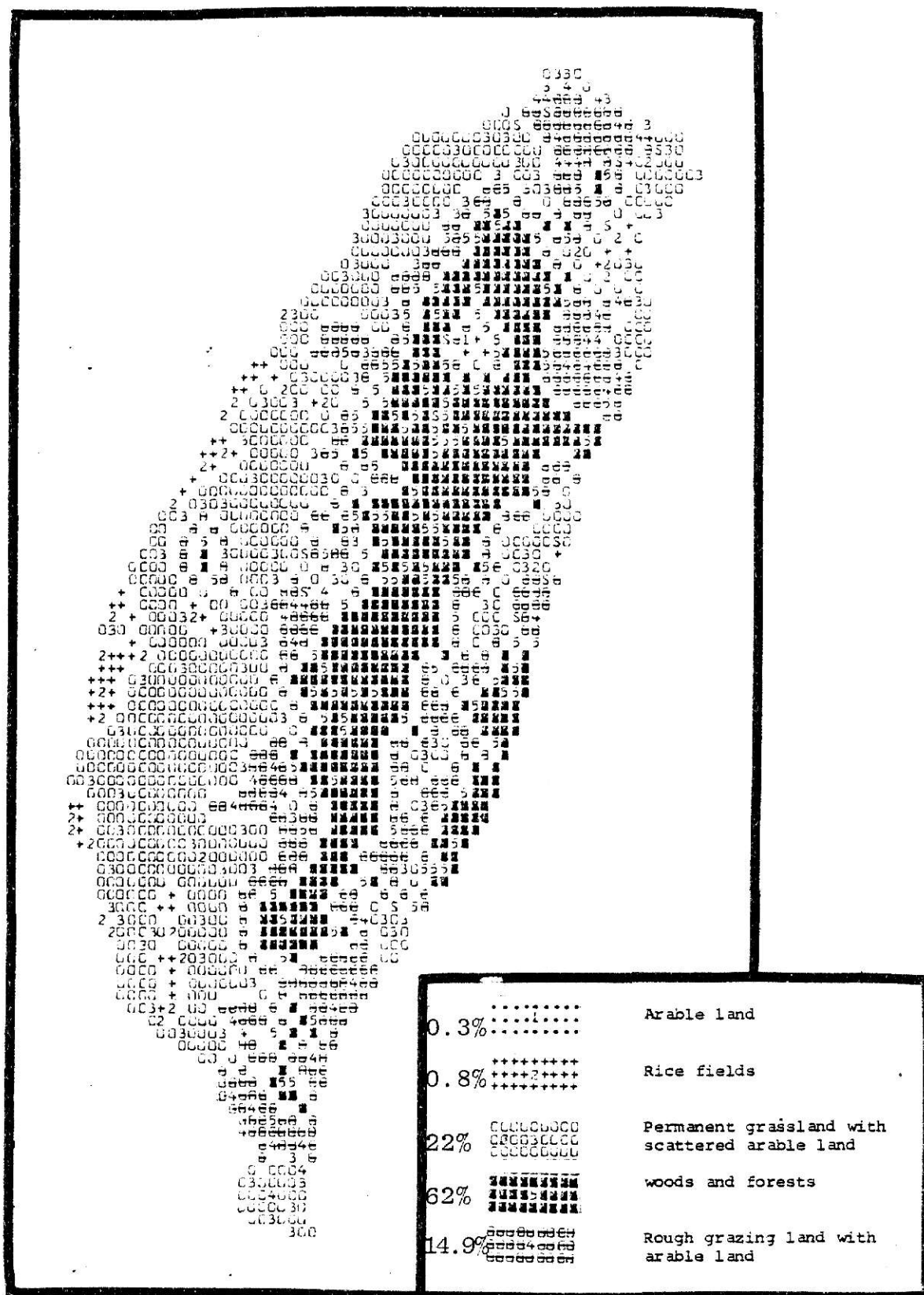


Figure 4: Classification of agricultural land use in Taiwan

Resource: "Comprehensive Development Planning for Taiwan Area", (Housing and Urban Development Department) 1973, pp. 10



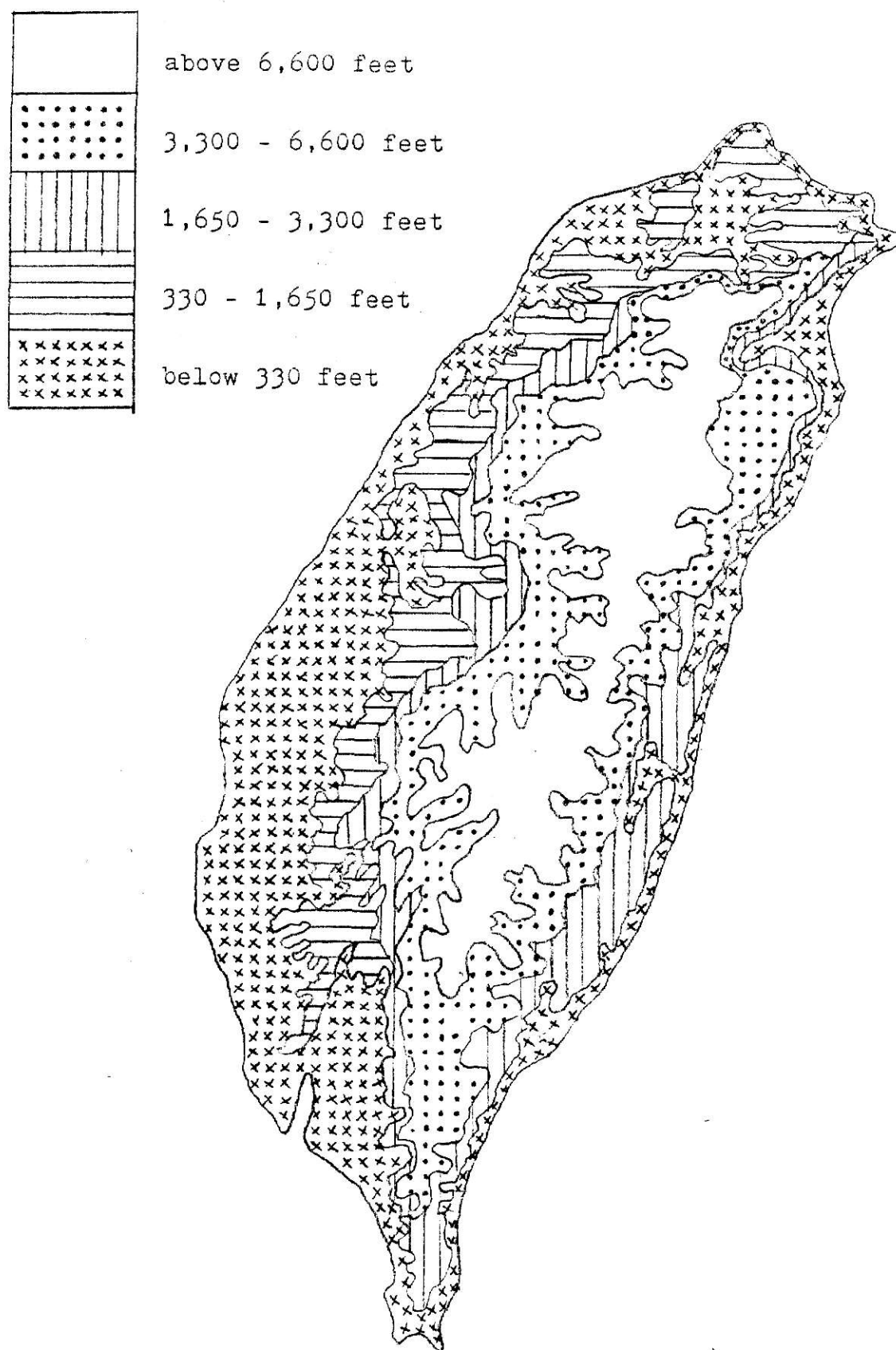


Figure 5: Topography of Taiwan

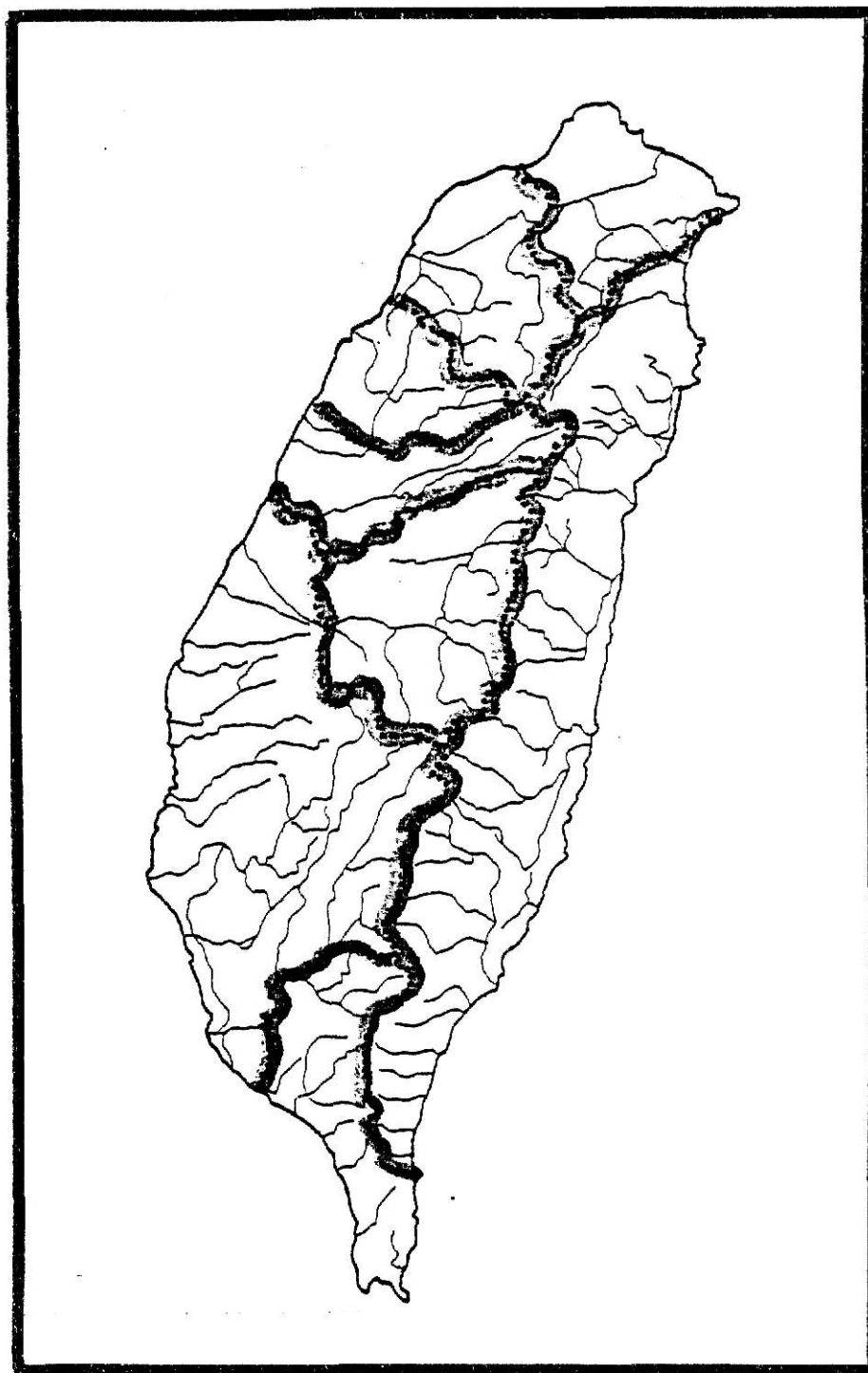


Figure 6: Distribution of streams in Taiwan

northeast corner to the southern tip of the island. Based on differences in elevation, relative relief character of rock formation and structural pattern, the island can be divided physiographically into five major divisions: Central Range, Volcanic mountains, Foothills, Terrace Tablelands and Coastal Plains and Basisn.<sup>17</sup>

Table 1: Area of Major Land Forms

| Land Form            | Square Kilometers | Percentage |
|----------------------|-------------------|------------|
| Mountains            | 22,835            | 63.5       |
| Basalt and Mesa      | 108               | 0.3        |
| Foothills            | 2,265             | 6.3        |
| Terrace Tablelands   | 1,798             | 5.0        |
| Alluvial Plains      | 8,859             | 24.3       |
| Sand Hills and Dunes | 216               | 0.6        |
| Total                | 35,981            | 100.00     |

Source: The Taiwan Provincial Government

#### B. Population in Taiwan

Taiwan's population at the end of 1976 stood at over 16.5 million, with a density of 459 persons per square kilometer, making it one of the most densely populated areas of the world. United States' population at the end of 1980 stood at over 226.5

<sup>17</sup>Chen Kas-Tang, China Year Book (Taiwan: China Publishing Co., 1979) pp. 137-140.

million. With a density of 47 persons per square kilometer, making it one of the least densely populated areas of the world. (See Table 2) Taiwan has been troubled with a high birth rate and low death rate.

Taiwan's population is concentrated on the productive western coastal plains and basins and in a narrow valley paralleling the eastern sea coast. (Figure 7 shows the population distribution of Taiwan in 1976) In the rugged highlands of the interior, the only inhabitants are the aboriginal "mountain people."

#### C. Climate

As Taiwan lies off the east coast of Asia and athwart the tropic of Cancer, it is surrounded by warm currents and enjoys an oceanic and subtropical climate which is conspicuously influenced by its topography. The climate is subtropical in the north and tropical in the south. The island receives more rainfall than any other part of the Chinese Mainland. Excluding the mountain region, the mean monthly temperature in winter is above 15°C. This is favorable for the cultivation of rice and other crops, including sugarcane, pineapples and bananas.<sup>18</sup>

#### D. Rainfall

The central west coast has comparatively little rainfall. Because of the different directions of the winter and summer

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<sup>18</sup>Ibid, pp. 45

TABLE 2: Total Population, Annual Increase, Births and Deaths for Taiwan Area, 1946-1976

| Year | Year-end<br>Population | Annual<br>Increase Rate % | No. of<br>Birth | No. of<br>Death |
|------|------------------------|---------------------------|-----------------|-----------------|
| 1946 | 6,090,860              | ---                       | ---             | ---             |
| 1947 | 6,495,099              | 66.37                     | 241,071         | 14,192          |
| 1948 | 6,806,136              | 47.89                     | 263,803         | 95,340          |
| 1949 | 7,396,931              | 86.80*                    | 300,843         | 93,349          |
| 1950 | 7,554,399              | 21.29                     | 323,643         | 85,737          |
| 1951 | 7,869,247              | 41.68                     | 385,383         | 89,259          |
| 1952 | 8,128,374              | 32.93                     | 372,905         | 79,034          |
| 1953 | 8,438,016              | 38.09                     | 374,536         | 78,078          |
| 1954 | 8,749,151              | 36.87                     | 383,574         | 70,181          |
| 1955 | 9,077,643              | 37.55                     | 403,683         | 76,585          |
| 1956 | 9,390,381              | 34.45                     | 414,036         | 74,075          |
| 1957 | 9,690,250              | 31.93                     | 394,870         | 80,714          |
| 1958 | 10,039,435             | 36.03                     | 410,885         | 74,742          |
| 1959 | 10,431,341             | 39.04                     | 421,458         | 74,052          |
| 1960 | 10,792,202             | 34.59                     | 419,422         | 73,715          |
| 1961 | 11,149,139             | 33.07                     | 420,254         | 73,823          |
| 1962 | 11,511,728             | 32.52                     | 423,469         | 72,921          |
| 1963 | 11,883,523             | 32.30                     | 424,250         | 71,734          |
| 1964 | 12,256,682             | 31.40                     | 416,926         | 69,261          |
| 1965 | 12,628,348             | 30.32                     | 406,604         | 67,886          |
| 1966 | 12,992,763             | 28.86                     | 415,108         | 69,780          |
| 1967 | 13,296,571             | 23.38                     | 374,282         | 71,861          |
| 1968 | 13,650,370             | 26.60                     | 394,260         | 73,650          |
| 1969 | 14,334,862             | 50.14**                   | 390,728         | 70,549          |
| 1970 | 14,675,964             | 23.80                     | 394,015         | 71,135          |
| 1971 | 14,994,823             | 21.72                     | 380,424         | 70,954          |
| 1972 | 15,289,048             | 19.62                     | 365,749         | 71,436          |
| 1973 | 15,564,830             | 18.04                     | 366,942         | 73,476          |
| 1974 | 15,852,224             | 18.46                     | 367,823         | 74,760          |
| 1975 | 16,140,702             | 18.76                     | 367,647         | 75,061          |
| 1976 | 16,508,190             | 22.20                     | 423,356         | 76,596          |

Sources: In the table, the data for the years of 1946-1976 are obtained from the reports of household registration statistics submitted by Civil Affairs Department of Taiwan Provincial Government, Police Department of Taiwan Provincial Government and Police Bureau of Taipei Municipal Government.

\*1949 - Chinese people immigrated from Mainland China to Taiwan.

\*\*1969 - The Vietnam war caused the immigration of Chinese residents in Vietnam.

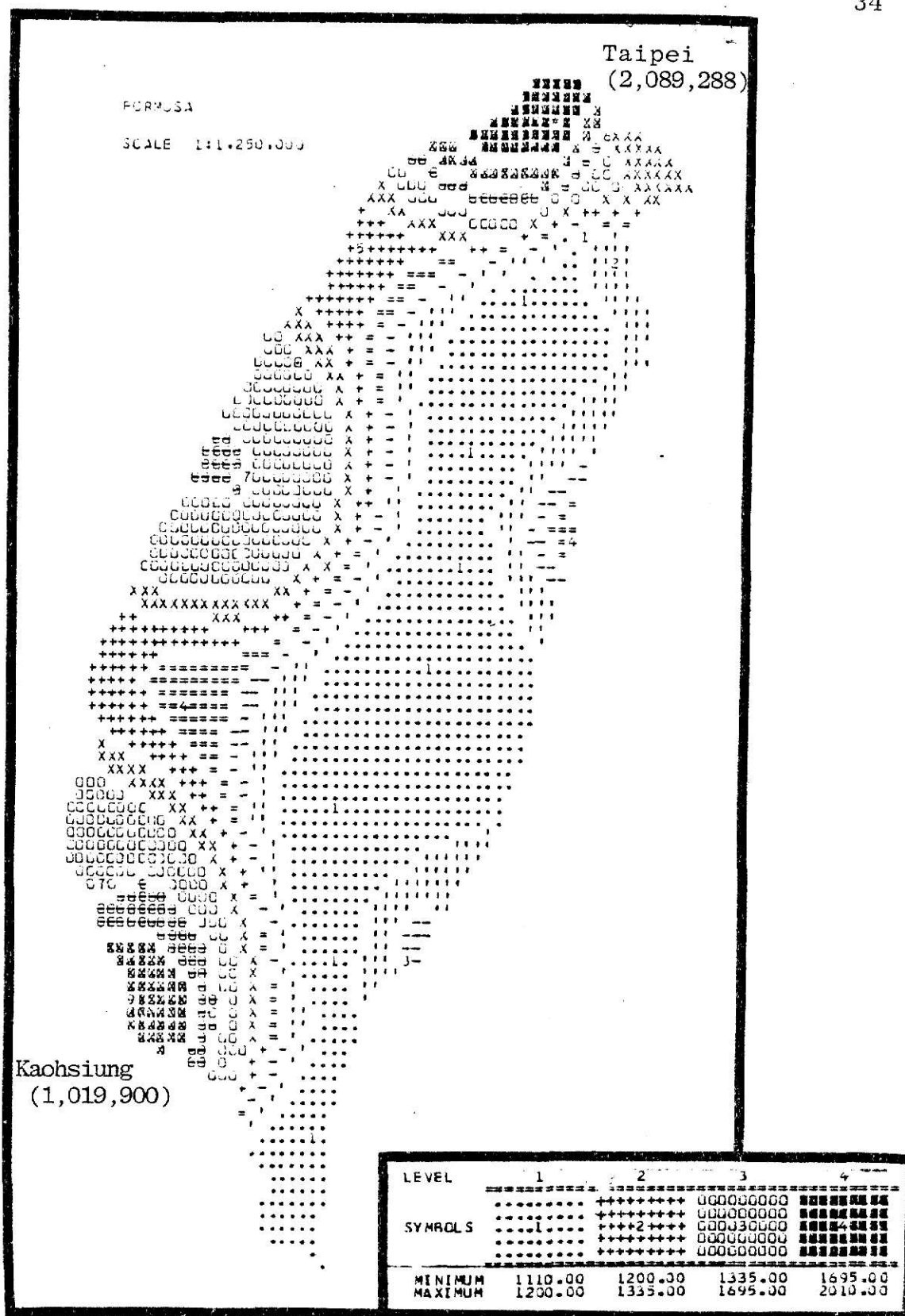


Figure 7: Distribution of population in Taiwan, 1976

Resource: "Comprehensive Development Planning for Taiwan Area", (Housing and Urban Development Department), 1978, pp. 3.

monsoons, seasonal distribution of rainfall in northern Taiwan is different from that in the south. In the winter, the north-east monsoon, picking up abundant moisture when it crosses the East China Sea, brings heavy rains to the eastern and northern sides of the island. In the summer, in the face of the prevailing southwest monsoon, the central and southern parts get more rain than the northern part. The moisture carried by the southwest monsoon and local terrestrial winds falls largely in convectional forms.

Thundershowers and typhoons often bring Taiwan heavy rainfall in summer months. Thundershowers sometimes occur several afternoons in succession, especially in June, July and August. During the typhoon season, especially in June, August and September, some windward mountain slopes may have rainfall of as much as 100 mm in 24 hours.<sup>19</sup>

#### E. Temperature

Warm currents give Taiwan a climate that makes vegetation abundant and permits two to three rice harvests a year. Cultivation of sugar cane is profitable, and such tropical fruits as bananas, pineapples, oranges, papayas and watermelons flourish. The summer is long and accompanied by high humidity, while the winter is short and usually mild. In the coldest months a thin layer of snow is visible on the peaks of high mountains. The temperature and climate are similar to that of

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<sup>19</sup>Ibid, pp. 45, 46, 43

Hawaii in the U.S.A.

Mean monthly temperature rises to 20°C in April, and remains high until November. June to September brings the hottest weather, with mean monthly temperature ranging from 25°C to 28°C. Between the northernmost and the southernmost parts of the island, there are remarkable temperature variations in summer and a differentiation of only 5.5°C in winter.<sup>20</sup>

#### F. Family Types in Taiwan

There are three different family types in Taiwan. Each has its own pattern as described in the following:

##### a. Large Family

In a traditional Chinese family group it is common for more than three generations to live under the same roof. This includes husband and wife, their grown-up sons and families, their parents, their parents, their uncles and aunts, their brothers and sisters and their families. In some cases, it also includes the husband's grandparents and some other relatives. In such a traditional Chinese family, economical interdependence is still important.

There are not many such families in Taiwan now.

##### b. Small Family

The small family usually includes husband and wife and their children. It is more likely to exist in the urban area

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<sup>20</sup>Ibid, pp. 143



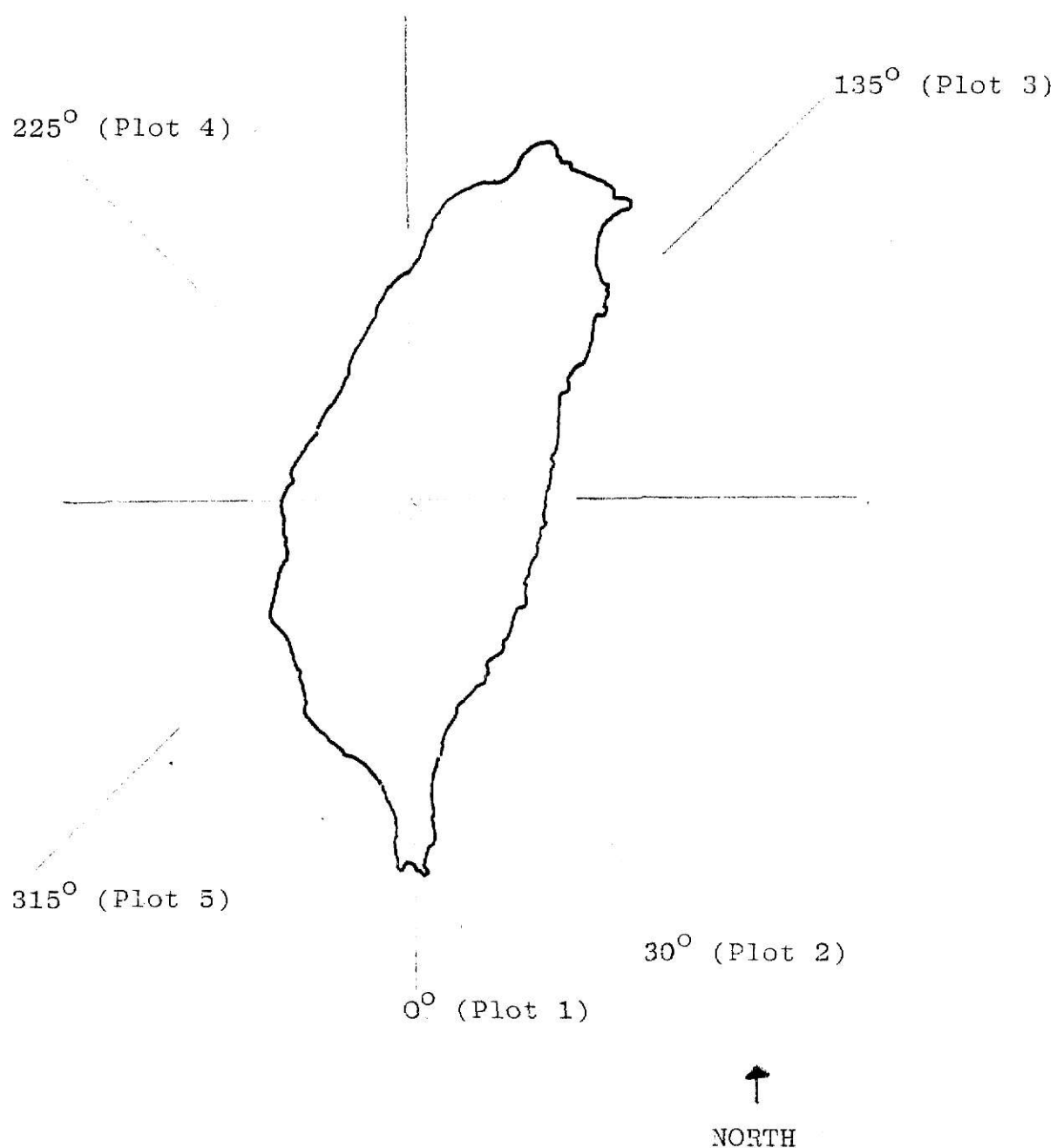
and in the middle class. It is favored by most of the young and educated people. Most of the husbands control the family finances, but they hand their income to their wives. This is the typical Chinese family of recent years.

c. Transitional Family

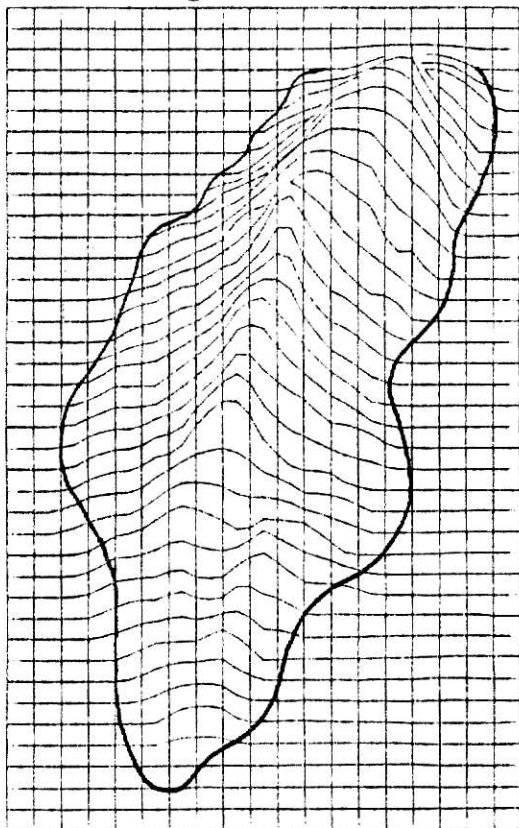
The transitional family includes husband and wife, their children, and the husband's parents. It is more likely that such a family consists of an old woman, her son and daughter-in-law, and her grandchildren. The reasons are: first, that women live longer than men and second, many women will not live with their sons until their husband dies and their youngest sons have grown up with the older lady taking care of the grandchildren. This kind of family type is more frequent if the old lady's son and daughter-in-law both have a good chance to get high pay in their society.

### G. Spatial View of Taiwan

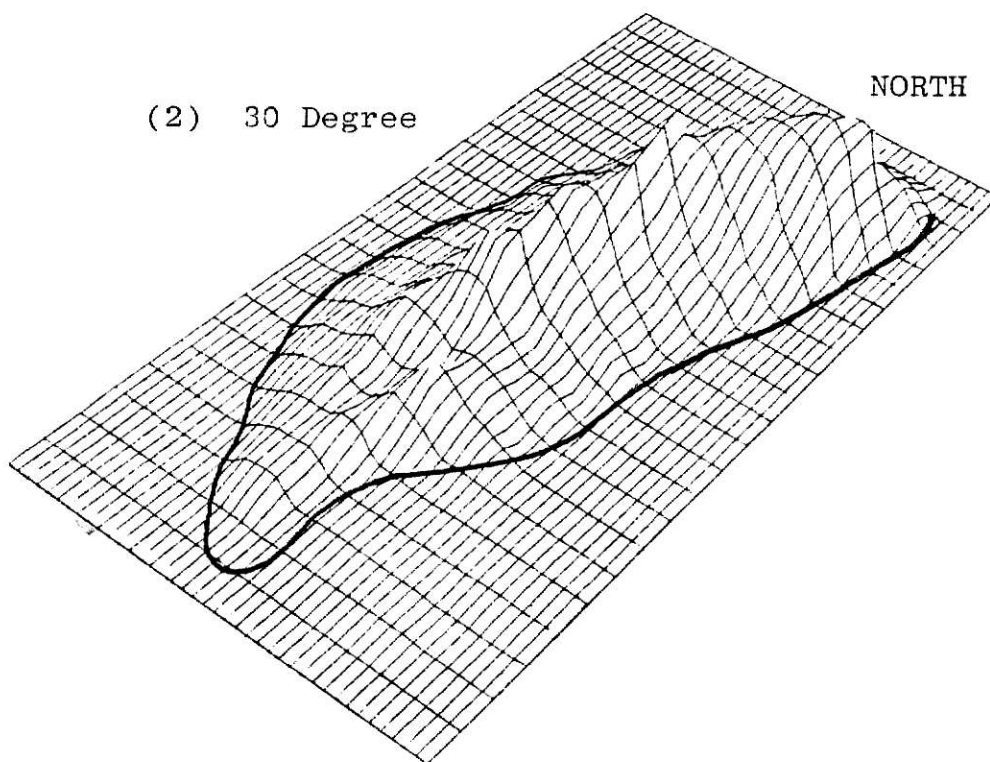
By utilizing the surface II computer system, computer drawn illustrations can communicate the visual feeling of the land area. A given site can quickly be observed in a series of drawings shown from various directions of view.



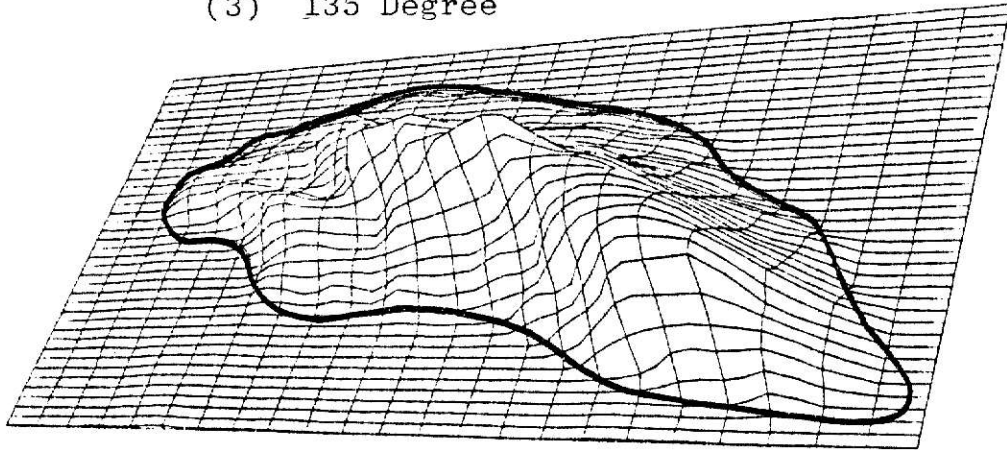
(1) 0 Degree NORTH



(2) 30 Degree

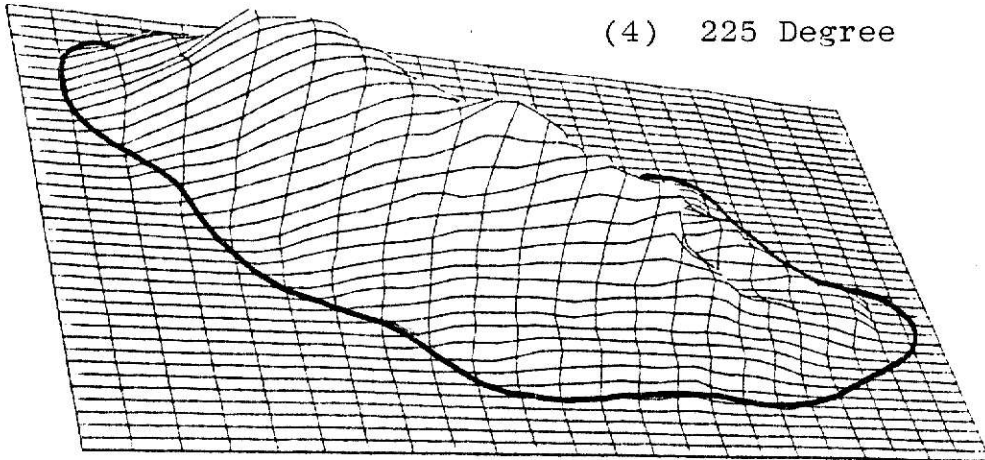


(3) 135 Degree



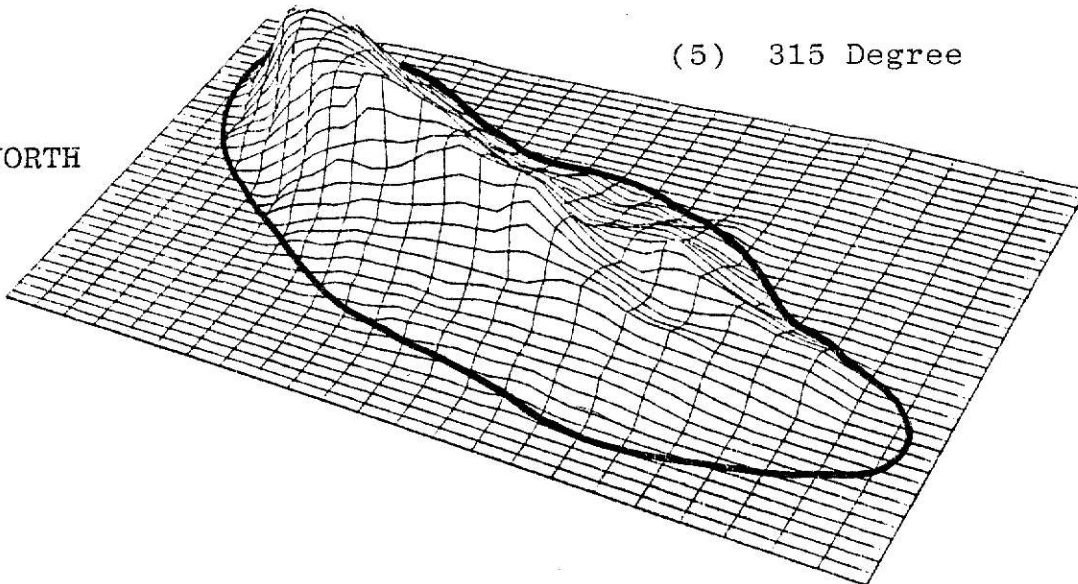
NORTH

(4) 225 Degree



NORTH

(5) 315 Degree



NORTH

## H. Conclusion

From the population data about Taiwan, we can see that the population increased year by year and that Taiwan is one of the most densely populated countries in the world.

As seen from table 1 approximately 63% of the land is mountains and herein lies the problem Taiwan is faced with; how to develop into the steeper areas so the development will not destroy the natural features and the steep terrain will not destroy the developments with mud slides, foundation failures, and increased runoff etc.

Some agricultural lands have to be kept to provide enough food for the people living in Taiwan, yet rough land with severe slopes, some woods and forests must be considered for development of housing to match the growth of Taiwan's population.

In Figure 8, the black areas together with woods and forest areas show possible areas to be considered for development of future housing in Taiwan.

There are several points of similarity between the research site and conditions in Taiwan. The most important similarities are the "characteristics of severe slope, frequent valleys and streams and the varied land-form. (Appendix I shows the slope situation in Taiwan.) A piece of land with severe slopes in Manhattan, Kansas, was selected because of physical similarities to Taiwan's areas of future growth.

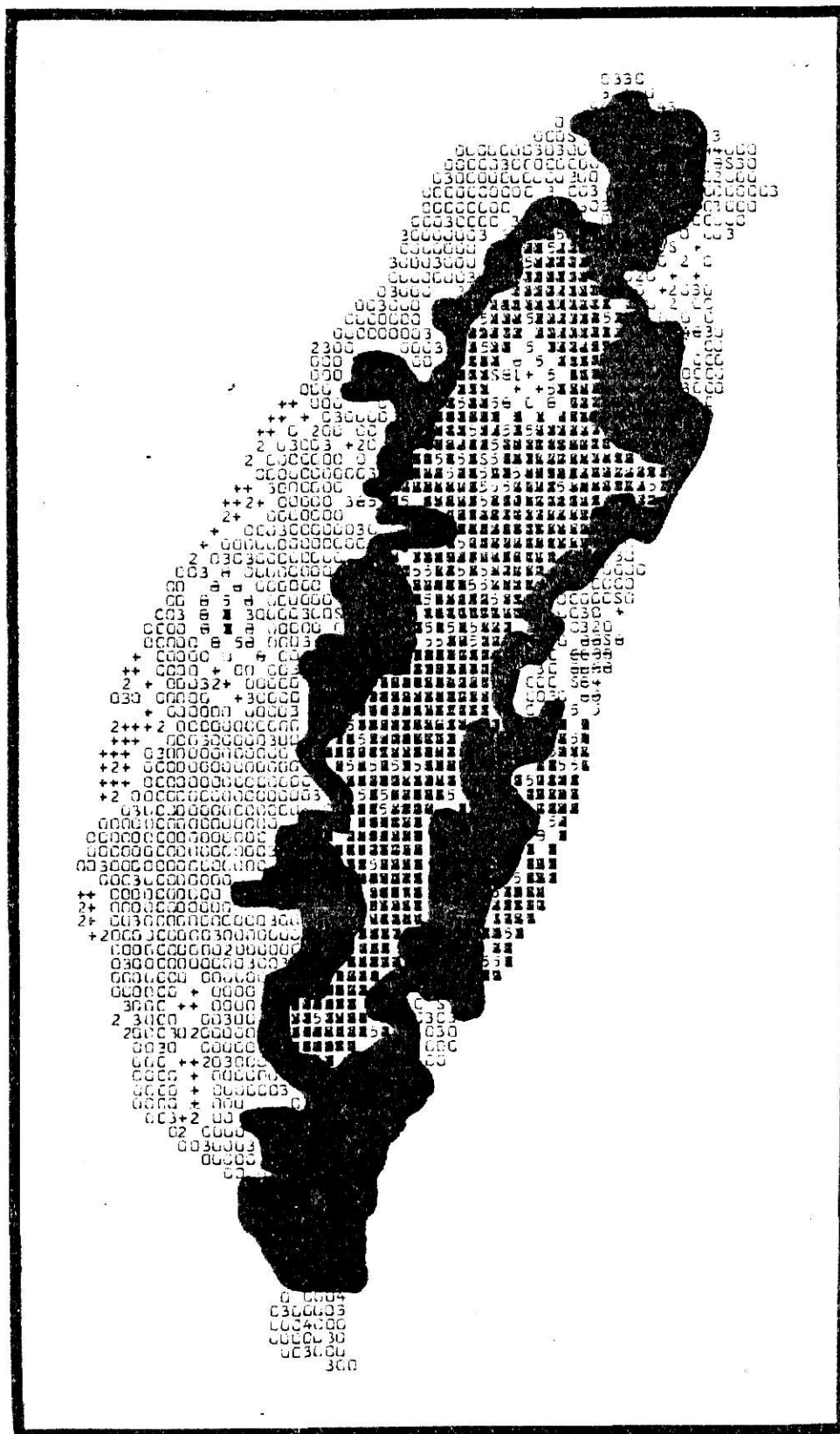


Figure 3: Black Areas show the possible areas to be developed.

## CHAPTER IV

### THE SITE IN MANHATTAN

#### A. Site Selection

##### 1. Site location

The selected site is located in the southeastern quadrant of the city, one mile from the City Limits of Manhattan. There is a strip of commercial development along Kansas Highway 177, a major arterial which links Manhattan to U.S. Interstate 70 and points east. A bridge connects this site to downtown Manhattan and it takes about 3 minutes to reach the downtown area from the site. (See appendix II)

##### 2. Development Potential of the Site

###### a. History

The area that was to become the State of Kansas was part of the land acquired by Thomas Jefferson in the Louisiana Purchase of 1803. Exploration of this land was begun almost immediately. The land was found to be unsuitable for settlement due to the absence of forests and insufficient water to support agriculture and was termed "The Great American Desert". (See Figure 9 for the Kansas State location)

During the same period, westward expansion was straining the land resources east of the Missouri River. As a solution

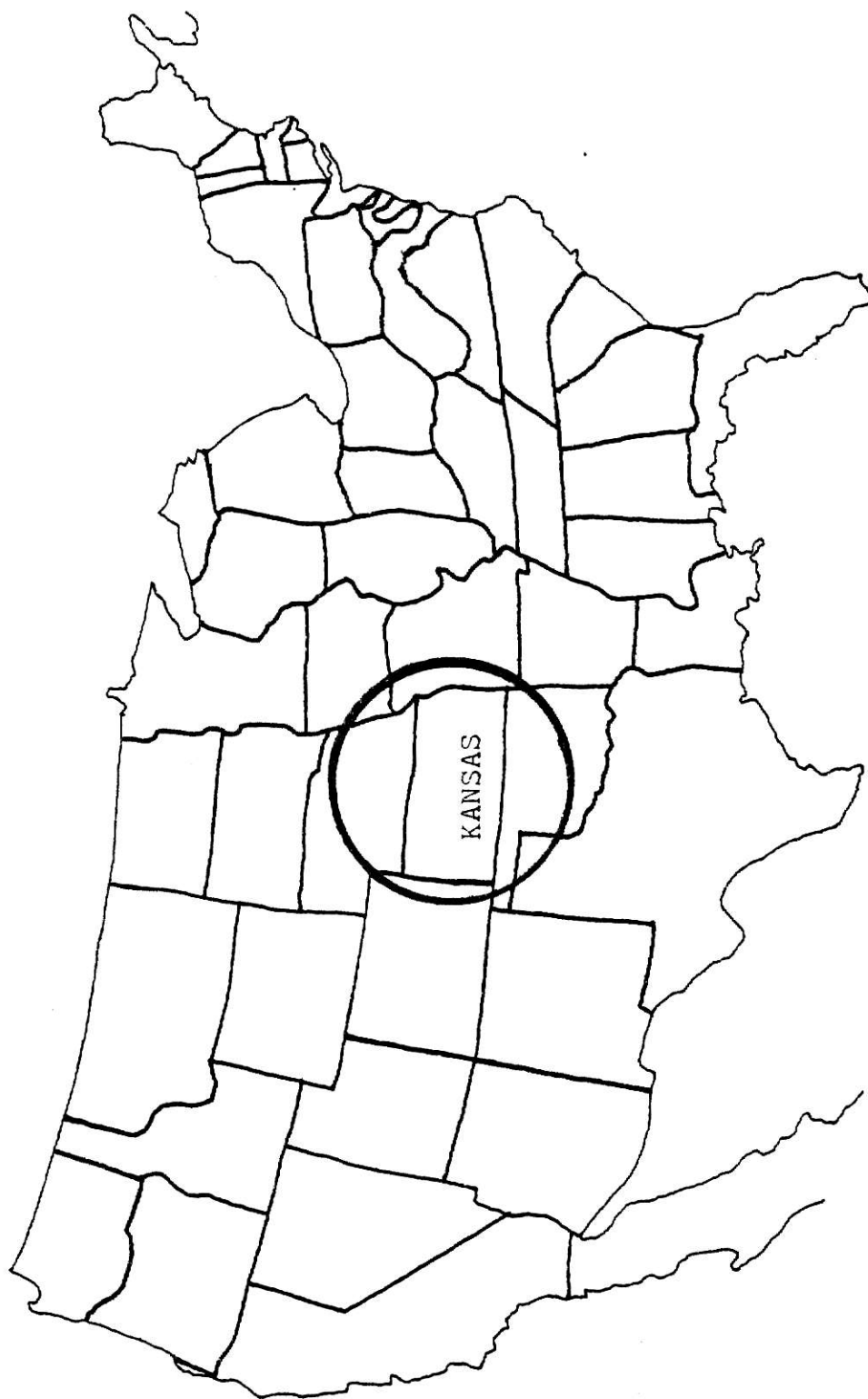


Figure 9: Kansas State Location in the U.S.A.



to this problem, a plan was devised to move tribes from the eastern areas to what is now eastern Kansas. By 1825, the federal government had completed the necessary treaties with the Kansas and Osage tribes who occupied this land, and Indian emigration began.

The westward push required increased military protection and several forts were established in Kansas at this time, including Fort Riley, constructed in 1853.

The New England Emigrant Aid Society brought the first organized colony to Riley County. This group, which arrived on March 25, 1855, was led by Colonel George S. Park of Parkville, Missouri. These settlers located a town site on the Kansas River at the southwest part of the present site of Manhattan, and named it Poleska.

Two other town sites were settled soon after Poleska. The Canton Company located a town site, Canton, at the mouth of the Blue River. The Boston Committee, led by Isaac Goodnow, founded the Community of Boston in the area between Poleska and Canton. These three settlements soon consolidated to form "The Boston Association of Kansas Territory", choosing the name Boston for the merged settlement.

In June, 1855, the steamboat "Marford", coming up the Kaw River with freight and settlers bound for western Kansas, grounded in shallow waters near the mouth of the Blue River. The Boston Association offered these members of the Cincinnati

and Kansas Land Company 320 acres of land to join the Boston settlement rather than continuing their journey west. This original offer was accepted with the condition that the name of the settlement be changed to Manhattan, to comply with the request of their New York investors. The Boston Association accepted this counterproposal, forming the settlement of Manhattan.<sup>21</sup>

Major employment in early Manhattan centered around the wheat farming to the west, with many flour and grist mills developing a thriving trade in the area.

A piece of legislation which has had far reaching and important effects upon the growth and economic development of Manhattan and Riley County as well as much of the nation was the approval by Congress of the Morrill Act in 1862. This act provided for the development of agricultural colleges in each state.

The development of Kansas State Agricultural College (now K.S.U.) was accompanied by population growth and employment diversification to meet the needs of the school, establishing Manhattan as a dynamic service center, a trend that has continued throughout its history. Manhattan is the seat of Riley County, and is located at the junction of the Big Blue and Kansas (Kaw) River, at the northern edge of the Flint Hills. It is in the northeast quadrant of the state. Figure 10 shows this location.

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<sup>21</sup>"Manhattan, Policy for growth", (Department of regional and Community Planning, 1978) pp. 1-3.

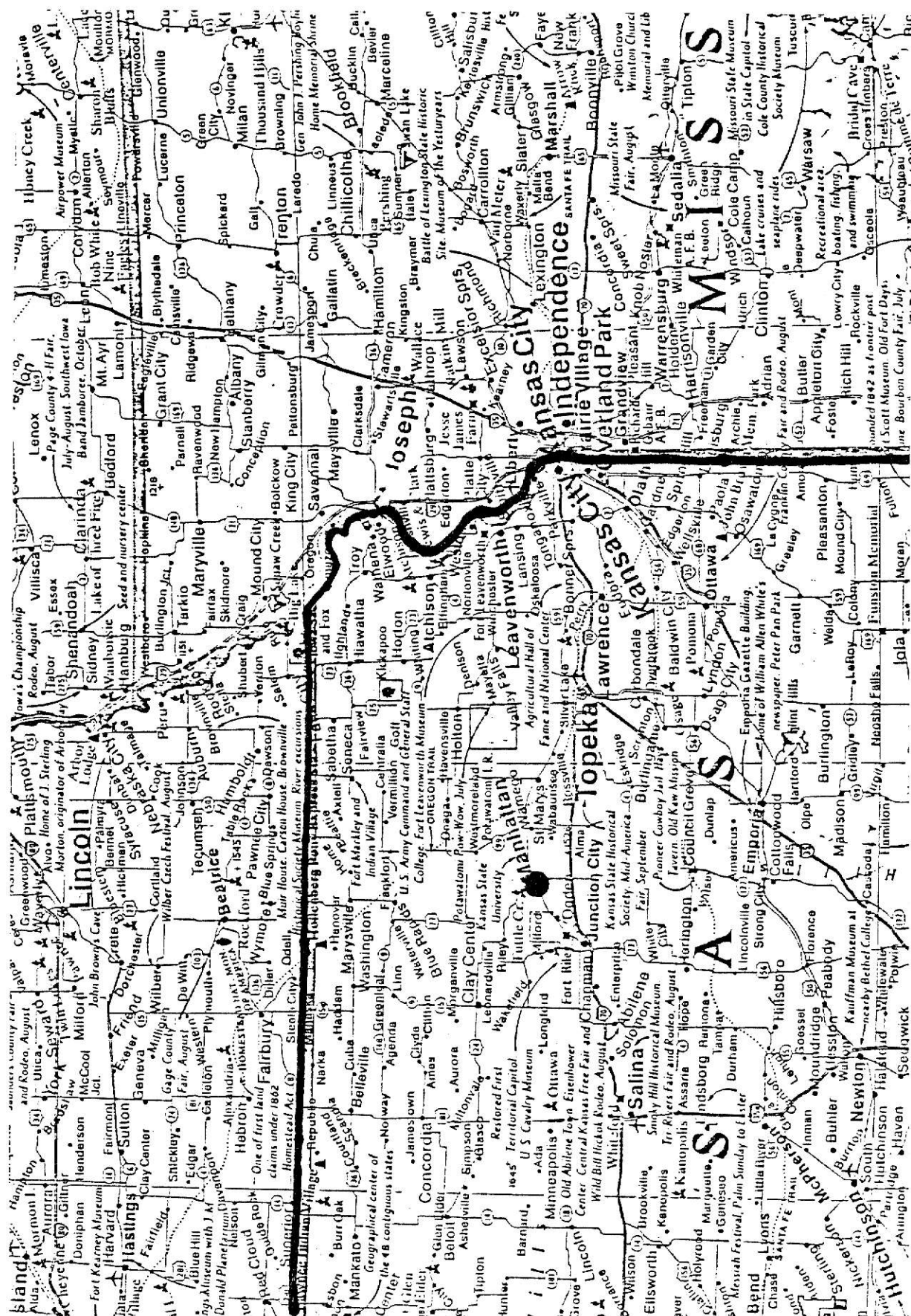


Figure 10: Geographic location of Manhattan, 39 11' N. 96 35' W  
Rand - McValley Central States, 1976

### b. Population Trends

Population is a critical factor in analyzing the development potential of a community. From the study of population, an outlook of the community can be made.

From the arrival of the first settlers in 1855 to the present, the city of Manhattan has enjoyed a constant growth in population. (See Figure 11) First, as a focal point for area agricultural activities and later as the seat of Kansas State University, the community has offered residents both a stimulating environmental setting and challenging economic opportunities. The strength of these factors is evidenced in the comparison of the community's growth to the state and nation. Particularly in comparison with Kansas, Manhattan has grown at two to four times the rate of the state. (See Table 3)

Table 3 shows two population change rates, from 1960 to 1980. It indicates very clearly that Manhattan's population increased very quickly if compared with other cities located near Manhattan. Although the University of Kansas is a big university, the population change in Lawrence was lower than in Manhattan from 1970 to 1980. Thus, the City of Manhattan has more potential for development in the future.

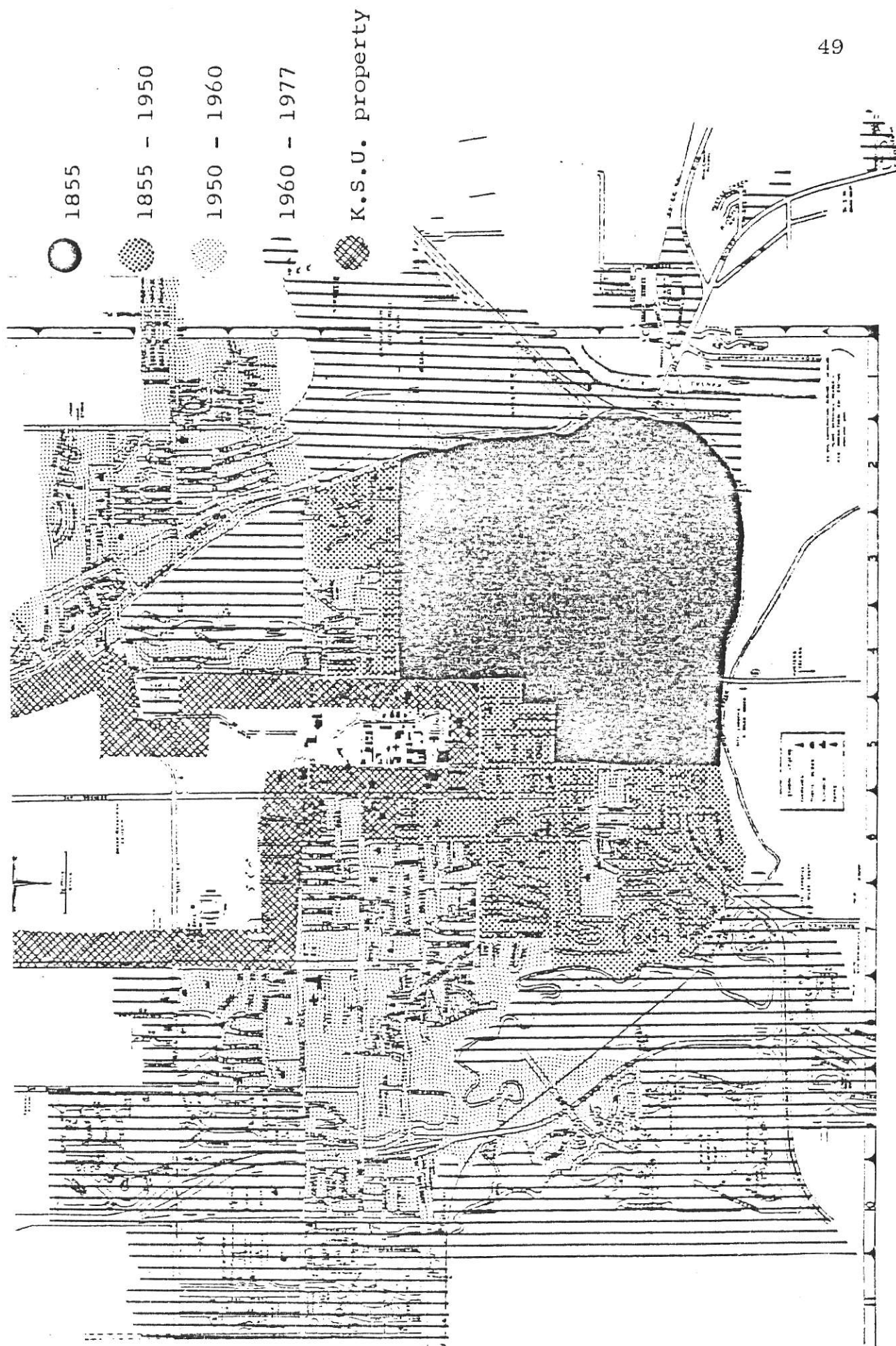




Table 3: Population Change for Manhattan, State of Kansas, and United States (1960 - 1980)

|               | 1960<br>Population | 1970<br>Population | Increase   | %Change | 1980<br>Population | Increase   | %Change |
|---------------|--------------------|--------------------|------------|---------|--------------------|------------|---------|
| United States | 179,323,175        | 203,211,926        | 23,888,751 | 13.3%   | 226,504,825        | 23,292,900 | 11.5%   |
| Kansas        | 2,178,611          | 2,249,071          | 70,460     | 3.2%    | 2,363,208          | 224,137    | 5.1%    |
| Manhattan     | 22,993             | 27,575             | 4,582      | 19.9%   | 32,482             | 4,907      | 17.8%   |
| Kansas City   | 121,901            | 168,213            | 46,312     | 38.0%   | 161,087            | -7,126     | -4.2%   |
| Topeka        | 119,484            | 125,001            | 5,517      | 4.6%    | 115,266            | -9,735     | -7.8%   |
| Lawrence      | 32,858             | 45,698             | 12,840     | 39.1%   | 52,738             | 7,040      | 15.4%   |
| Junction City | 18,700             | 19,018             | 318        | 1.7%    | 19,305             | 287        | 1.5%    |

Source: 1. 1960 United States Census of Population, Kansas

2. 1970 United States Census of Population, Kansas

3. 1980 United States Census of Population, Kansas

Table 4 indicates a decreasing growth rate for the planning area in the 1970 to 2000 projection period.

The most realistic outlook for Manhattan City's population is for an increase to about 48,320 by 2000. This projection assumes a stable increase of between 1.1 to 1.8 percent per year.<sup>22</sup>

In fact, no absolute prediction of future population can be made for any community. The 2000 population of 48,320 might be achieved as early as 1990 or as late as the year of 2010.

The important fact is that the population of Manhattan will be expected to grow in the future. As a result, more land will be needed to be developed.

Table 4: Projected Manhattan Population from 1970 to 2000

| METHOD                      | 1970   | 1980   | 1990   | 2000   |
|-----------------------------|--------|--------|--------|--------|
| Arithmetic<br>Extrapolation | 27,575 | 32,000 | 35,000 | 40,400 |
| Regression<br>(linear)      | 27,575 | 33,241 | 38,409 | 43,577 |
| Cohort                      | 27,575 | 32,144 | 35,551 | 40,815 |
| Economic base               | 27,575 | 31,845 | 36,566 | 40,387 |
| Regression<br>(Parabolic)   | 27,575 | 34,080 | 40,880 | 48,320 |

Source: Data projected by the Department of Regional and Community Planning, K.S.U. with different methods in 1978.

<sup>22</sup>Ibid, pp. 17-21

### c. Economic Prediction

Communities are not self-contained units, but rather provide goods and services to persons living beyond their boundaries. Employment can be divided into two classifications:

1. basic employment which consists of production of goods or provision of facilities or services for persons living beyond the area, and
2. non-basic employment which consists of provision of goods or services to the local community.

Table 5 has been prepared to show employment in Manhattan for the year 1970 to 2000.

Table 5: Economic Population Projection

| METHOD                   | 1970   | 1980   | 1990   | 2000   |
|--------------------------|--------|--------|--------|--------|
| Arithmetic Extrapolation | 27,575 | 32,000 | 35,000 | 40,400 |
| Regression (linear)      | 27,575 | 33,241 | 38,409 | 43,577 |
| Cohort survival          | 27,575 | 32,144 | 35,551 | 40,815 |

Source: Data was projected by the Department of Regional and Community Planning, K.S.U. with different methods in 1978.

Manhattan should continue to grow steadily but not dramatically. Its future growth will probably parallel very closely that of the natural population growth.

It is very difficult to project what effect Kansas State University will have on the economic future of Manhattan. It



is obvious a university with an eighteen thousand enrollment contributes a great deal to the economy of a town with thirty thousand people. It creates employment opportunities and enhances particular student oriented goods and services (banking, clothing, taverns, etc...). It is projected by the K.S.U. Administration that enrollment will decrease in the future. If this is true, the special employment and service categories will decline.

In summary, the economic outlook for the City of Manhattan and K.S.U. appears to be bright with major economic support. Thus, steady growth of the city can be expected in the future.

#### d. Conclusion

The development potential of the site in the Manhattan area will be positive as far as history, population and the economy are concerned.

### B. Site Evaluation

#### 1. Developable Land Area

1,215 acres of the site will serve as the design purpose.

#### 2. "Development Life" at the projected growth rate:

Because the result of the study site might be achieved as early as 1990 or as late as the year of 2010, 20 years will be suggested as the development life.

### 3. Access

Primary access is off K-177 running north and south. Ashland Road along the west provides limited access because of the terrain. (See Figure 12).

### 4. Impact on the Entrance to the City

K-177, the primary entrance to the city from the south and the Interstate Highway, could be upgraded through enforcement of city development regulations as property values and taxes increase.

The entrance to the the city has a real impact on the visual first impression of Manhattan which can help determine the economic development of the community. The mixture of land uses, signs, and substandard buildings should be cleaned up.

Development in this direction would bring the city closer to the Interstate Highway. This could attract more travellers to use city services and would allow industrial uses to be based in Manhattan with more direct access to the Interstate Highway on the south side of the bridge, which could otherwise become a bottleneck.

This eastward expansion would increase the need for improving the bridge, as local traffic would increase. The brdige can be a problem in providing emergency access to the southeast area.

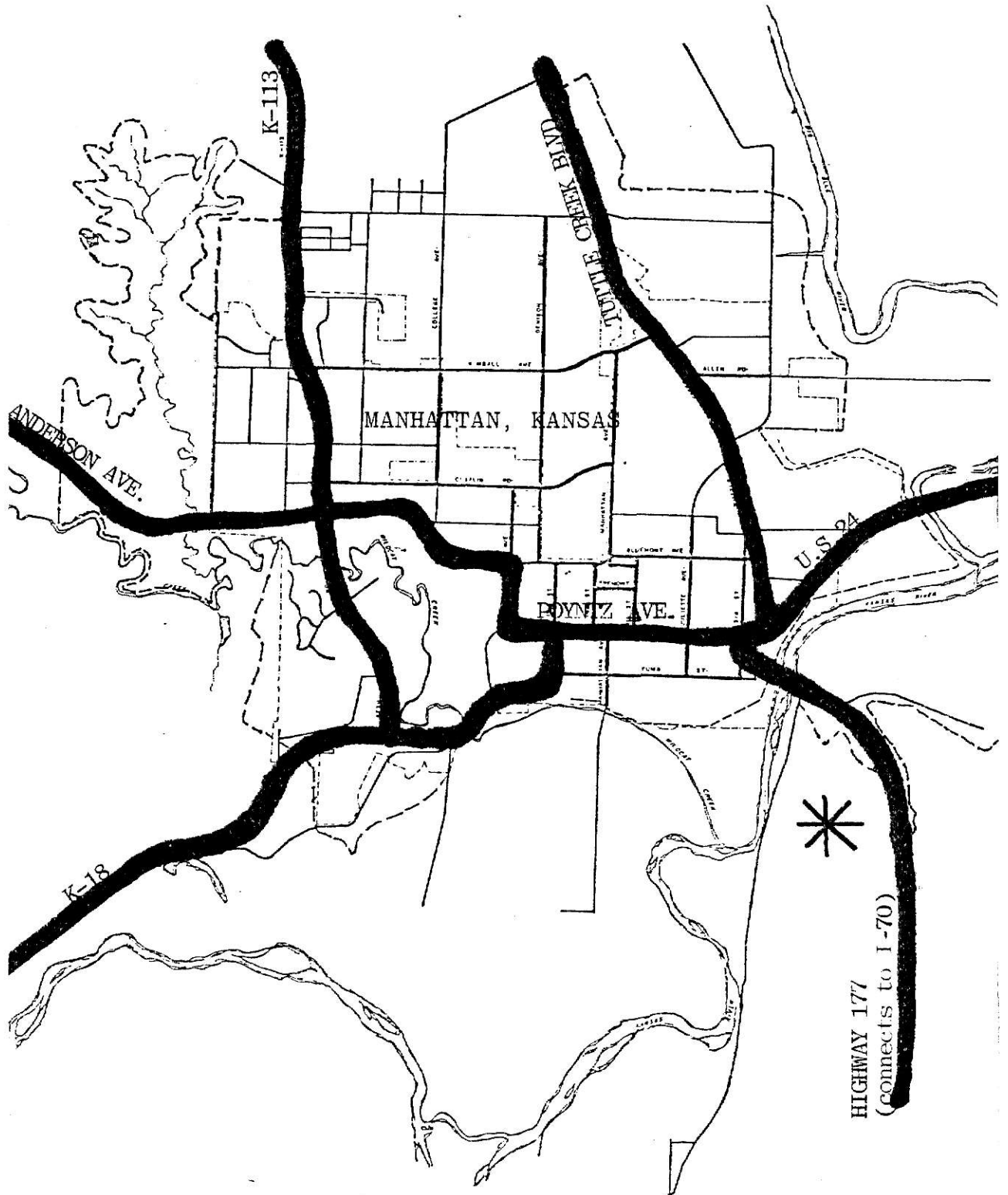


Figure 12: Major Transportation routes in Manhattan

## 5. Impact on the Existing City

The southeast district is close to downtown and the industrial area. (See land use plan for Manhattan on Figure 13). Development in this area would support the downtown as a viable regional shopping center and protect public investment in this area. Expansion of services would not require long extensions of truck lines or place a burden on the existing systems. In effect, development in this direction would tend to balance growth around the downtown.

## 6. Housing Potential

The southeast district offers the greatest variety of potential land uses of any area around the city. The location near the center of the city and along the major access to the Interstate make this district prime for commercial uses in the flatter areas of the site. The diversity of terrain will also allow a variety of residential mixtures from low-cost and higher density housing to more expensive homes on the ridge tops. The area is split up into smaller tracts of land making it difficult for developers to assemble larger tracts. (See Figure 14) This could make annexation of the area more difficult, but it would allow smaller homebuilders an equal chance to compete with the larger construction operations. A mixture of uses and mixed use developments would be likely in this area.

## LEGEND

|                                                                                                                          |             |
|--------------------------------------------------------------------------------------------------------------------------|-------------|
| <span style="display:inline-block; width:15px; height:15px; background-color:red; border:1px solid black;"></span>       | COMMERCIAL  |
| <span style="display:inline-block; width:15px; height:15px; background-color:yellow; border:1px solid black;"></span>    | RESIDENTIAL |
| <span style="display:inline-block; width:15px; height:15px; background-color:black; border:1px solid black;"></span>     | INDUSTRIAL  |
| <span style="display:inline-block; width:15px; height:15px; background-color:darkgreen; border:1px solid black;"></span> | PUBLIC      |
| <span style="display:inline-block; width:15px; height:15px; background-color:green; border:1px solid black;"></span>     | PARK        |

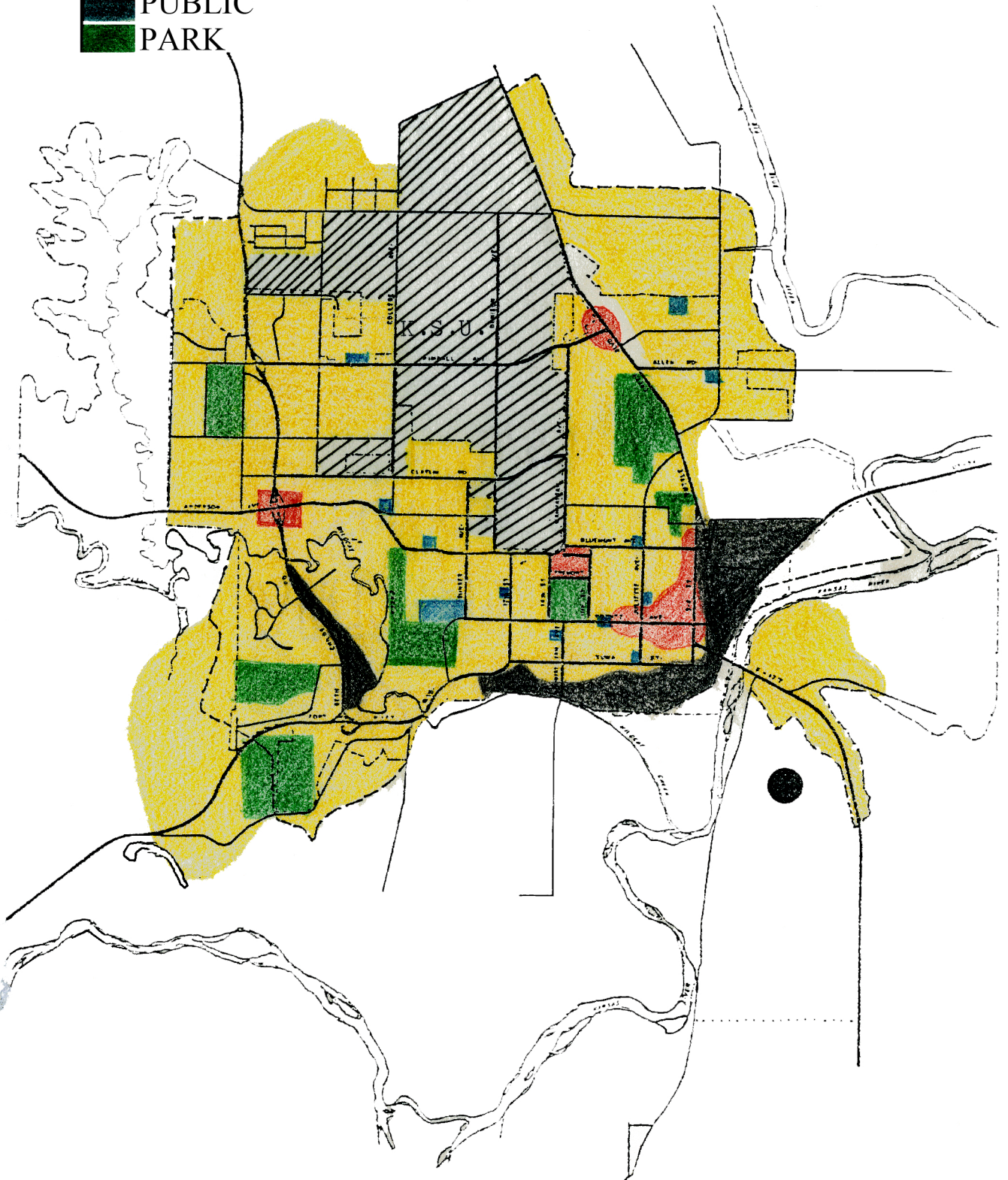


Figure 13: Land Use Plan, Manhattan, Kansas

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POOR LEGIBILITY IN  
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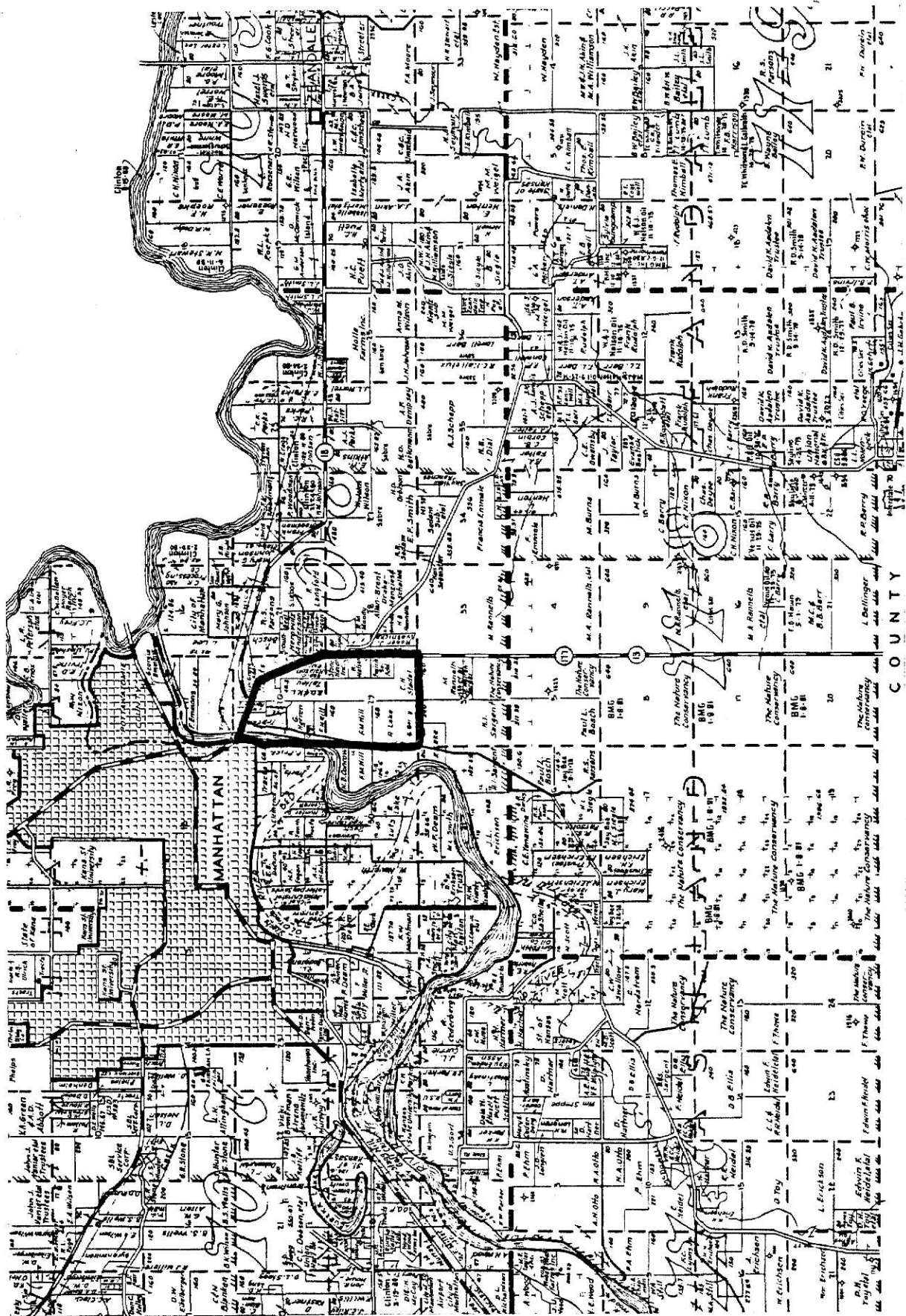


Figure 14: Ownership of the Site

## 7. Options for Future Expansion

The area is not compared with any other district in this study.

## 8. Positive Spillovers

This district offers the greatest mixture of potential residential and commercial uses. The area is close to downtown and the industrial area, cutting down trip distances, traffic and energy consumption and supporting the viability of the downtown as a regional shopping center. Growth in this direction moves the city closer to the Interstate, making this area a prime location for highway commercial uses. Including this access route in the city could help clean up this primary entrance to the city.

## 9. Negative Spillovers

Access to the area through the downtown and over the bridge makes it difficult to provide emergency ambulance and fire service to the district. A sewage treatment plant must be located by the Kansas River for drainage purposes or a pumping station added and water must be brought across the river.

## 10. Summary

Table 6 shows the positive and negative possibilities for the study site as a neighborhood unit regarding several factors of impact.



| FACTORS                         | IMPACT ON    |           | DESCRIPTION                                                                                                                     |
|---------------------------------|--------------|-----------|---------------------------------------------------------------------------------------------------------------------------------|
|                                 | NEIGHBORHOOD | COMMUNITY |                                                                                                                                 |
| <u>PHYSICAL CHARACTERISTICS</u> |              |           |                                                                                                                                 |
| 1. Soils, Geology and Terrain   | -            |           | Severe slope problems, ridge areas are stable, but have shallow bedrock. Ridge lines run north and south on each side of K-177. |
| 2. Drainage and Ground Water    | +            | +         | Drainage is predominately through central valley from south to north.                                                           |
| <u>INFRASTRUCTURE</u>           |              |           |                                                                                                                                 |
| 1. Access                       | +            |           | K-177 from viaduct over river to I-70 south of city. K-18 across north and Ashland Bottom Road along west side.                 |
| 2. Water                        | -            |           | Water could be provided over viaduct. Above 1,100 foot elevation requires booster pumps and storage reservoir.                  |
| 3. Sewer                        | +            |           | Main installed under river at Sewage Treatment Plant. Needs pump station and trunk line up valley.                              |
| 4. Storm Drainage               | +            | +         | Natural drainage directly into the Kansas River. No storm drainage structures are necessary.                                    |
| 5. Other Utilities              | +            |           | No limitations.                                                                                                                 |
| <u>ENVIRONMENT</u>              |              |           |                                                                                                                                 |
| 1. Noise                        | +            |           | Source: highway                                                                                                                 |
| 2. Wildlife and Vegetation      | +            | +         | Woodland and rangeland provide habitats. Important flora in this area, some are endangered.                                     |
| Flooding                        | +            |           | Small area west of Ashland Bottom Road along the Kansas River.                                                                  |

Table 6: Summary Evaluation for the Site

### C. Site Inventory and Resource Analysis

Development at this site, as with many other sites requires a thorough knowledge of natural resource systems, cultural features, and other relevant data. Only when this information has been gathered and analyzed can one proceed to determine possible land use allocations for the entire site.

Below is a process of realizing these purposes in a logical, sequential fashion.

#### a. Natural Resource

##### 1. Slope limitations

Development at this site, is limited by topography. This primary physical factor often determines the location and volume of site development as well as costs and volume capabilities of the entire site.

The breakdown of grades here would be under 14 percent. 14 -24 percent and over 24 percent.

The key for the slope analysis which is illustrated graphically on the slope analysis map is: (Figure 15)

under 14% white - Some restrictions, however development capability is still excellent for housing and good for roads and physical activities.

14% - 24% light - Special restrictions occur on upper slopes, access difficult, development impact could result in erosion



Figure 15: Slope

problems; housing will require special construction techniques.

over 24% black - Restricted for most development, access prohibited, severe erosion problems would occur, construction techniques would multiply housing costs.

This analysis has been extremely effective in evaluating the slope constraints on land development and road design.

Slopes can greatly restrict and limit development but they can be used to the designer's advantage. By properly utilizing slopes, situations can be created to greatly enhance a development, and blend that development in with the existing features of the site.

## 2. Relief

Prepare the relief map for the purpose of determining the lowest and highest elevations of the entire site.

This relief map (Figure 16) depicts the land configuration. The white color means the highest elevation - above 1,300 and the black color means the lowest elevation - under 1,000.

It will help the designers to know the direction of water flow from high to low elevations. This will give an idea of sewer and storm sewage placement. On this site, the Kansas River is the lowest area for placing the sewage treatment plant.



Figure 16: Relief

### 3. Soil

A knowledge of soils is important not only in terms of engineering capability but also in terms of its relevance to other natural-resource systems. The primary objective of the soil analysis is to evaluate the suitability of each soil type of the site for supporting development.

The soil types on the site for study, according to the unified soil classification system, are classified as St. Ad. Bk. Re. Ge. Cs. Ie. Iv. Tu. Eu. He. Sa. and Ca.

Figure 17 shows the distribution of the soil type on the site and table 7 indicates that silt loam and silty clay loam soils are generally most characteristic of the site. The result of the soil analysis not only illustrates the location of each type of soil on the site, but also evaluates the condition of soils in terms of suitability for development.

Generally, the soil type on the site is good for development. Only the black areas (St. soil type-stony steep land) are too variable to be rated. They are located on the over 24 percent slope areas. It should therefore be tested prior to construction by an agronomy specialist.

### 4. Geology

The type and depth of rocks on the study site are the major factors shown by the geologic map (Figure 18) and plate I.



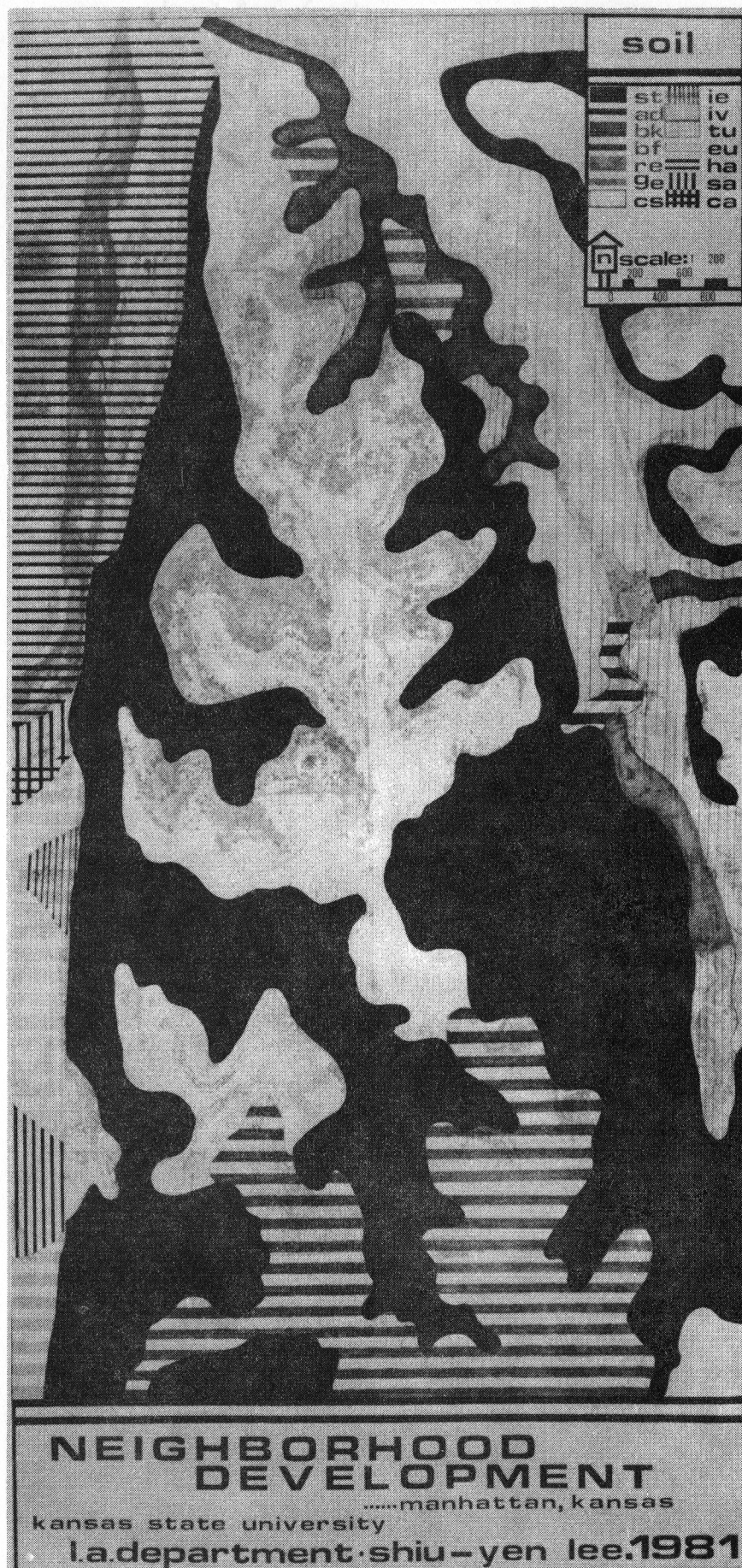


Figure 17: Soil

Table 7: Soil Survey of the Site

| Soil series &<br>map symbols | Depth to<br>bedrock | USDA<br>texture         | Topsoil            | Road<br>subgrade   | Road<br>fill       | Foundations<br>for low BLDGS             |
|------------------------------|---------------------|-------------------------|--------------------|--------------------|--------------------|------------------------------------------|
| Re:Reading                   | 4                   | Silty clay loam         | Good               | Poor               | Fair<br>to<br>Good | Moderate to<br>low shear<br>strength     |
| Ge:Geary                     | 4                   | Silty clay loam         | Good               | Fair<br>to<br>Good | Good               | No unfavorable<br>features               |
| Gs:Cline                     | 1½ to 3½            | Silty clay loam         | Fair               | Fair               | Good               | Moderate to<br>low shear<br>strength     |
| Ie:Ivan                      | 4                   | Silty clay loam         | Fair<br>to<br>Good | Poor               | Good               | Moderate shrink<br>swell potential       |
| Iv:Ivan                      | 4                   | Silt loam               | Good               | Poor               | Good               | Moderate shrink<br>swell potential       |
| Tu:Tully                     | 4                   | Silty clay loam         | Good               | Poor               | Fair               | Low shear<br>strength                    |
| Eu:Eudora                    | 10                  | Silt loam               | Good               | Poor               | Fair<br>to<br>Poor | Low shear<br>strength                    |
| Ha:Haynie                    | 10                  | Very fine sandy<br>loam | Good               | Poor               | Fair<br>to<br>Poor | Low shear<br>strength                    |
| Sa:Sarpy                     | 10                  | Fine sand               | Poor               | Good               | Good               | Very rapid<br>permeability <sup>or</sup> |
| Ca:Carr                      | 10                  | Fine sandy loam         | Fair               | Good               | Good               | Subject to<br>flooding                   |



Table 7 continued

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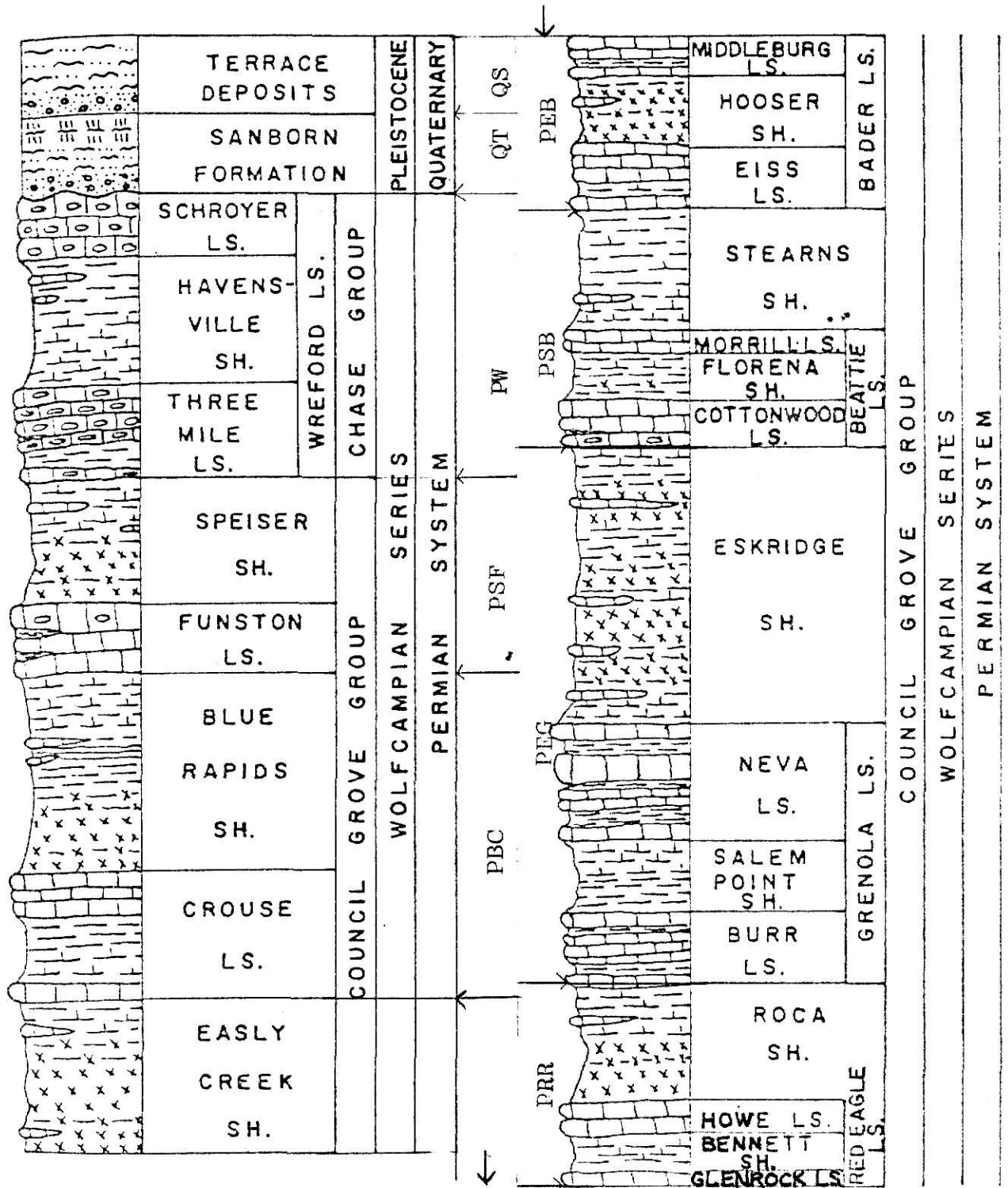
Remark: St (Stony steep land), Ad (Alluvial land), Bk (Breaks-Alluvial land complex) and Bf (Benfield) are too variable to be rated.

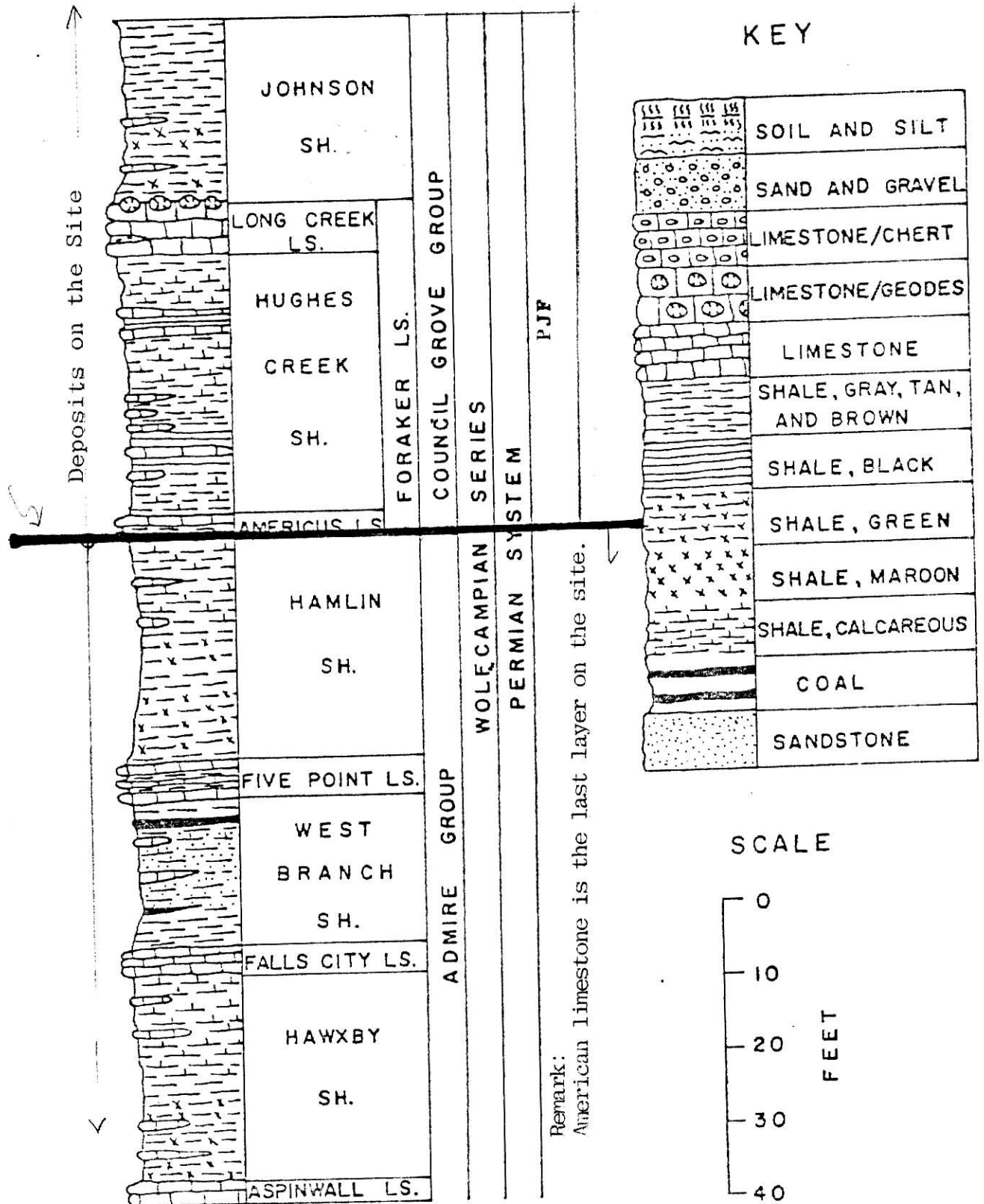
Source: "Soil Survey of Riley County and Part of Geary County", (United States Department of Agriculture), 1975 pp. 52-61.



Figure 18: Geology

Plate I





This provides general information for determining the foundation design of buildings; soils borings would also be required.

Two major types of data: type of rock and depth of rock must be gathered. Then, a geologist will interpret the borings and consider any problems that may occur concerning the geologic base and its relevance to the project.

The researcher, M.A. Gasaway III performed this kind of study regarding the surface expression of the Nemaha anticline in southeast Riley County, Kansas and gave a detailed description for plate I. Generally, the oldest rock unit represented is the Aspinwall limestone and the youngest is the Wreford limestone (both of the lower Permian system). Some of the higher hills, slopes and valleys are covered with the Sanborn formation (Pleistocene Series) while terrace deposits are found in the larger stream valleys. Appendix III depicts the detailed geological description.

Generally, there is no foundation problem on the site. Limestone is always a good foundation for building construction. Below the layer of Americas limestone, the foundations for building will cause problems.

## 5. Hydrology

The hydrography analysis determines what effects existing patterns of runoff have on the site, and locates the high points, ridges, valleys, streams, swales, etc... This will

show water sheds and drainage swales and how they will effect the planning of the site.

In the east part of the site, the longest streams run from south to north, collecting most of the rainfall, conveying it, and then emptying into the Kansas river.

In the west part of the site, there are some watersheds where water runs through to the Ashland road and then to the Kansas river. So, the Kansas river is the major feature that collects water and carries it off the site.

The high point of the site is located at the south east edge, and the elevation of it is 1381 feet above sea level. The low point is located at the intersection of the Ashland road and Highway I-77 where the bridge is. The elevation of the low point on the site is 1045 feet and the elevation of the Kansas river adjacent to the site is 1000 feet.

The hydrographic features are shown in the hydrographic map. (See Figure 19)

## 6. Vegetation

The plant communities of the site are among its most impressive features and enhance the aesthetic quality of the site greatly.

Hackberry Glen is located on the southwest portion of the site and plays the most important role in vegetation distribution. A researcher, S. Chaghtai wrote: "Hackberry Glen



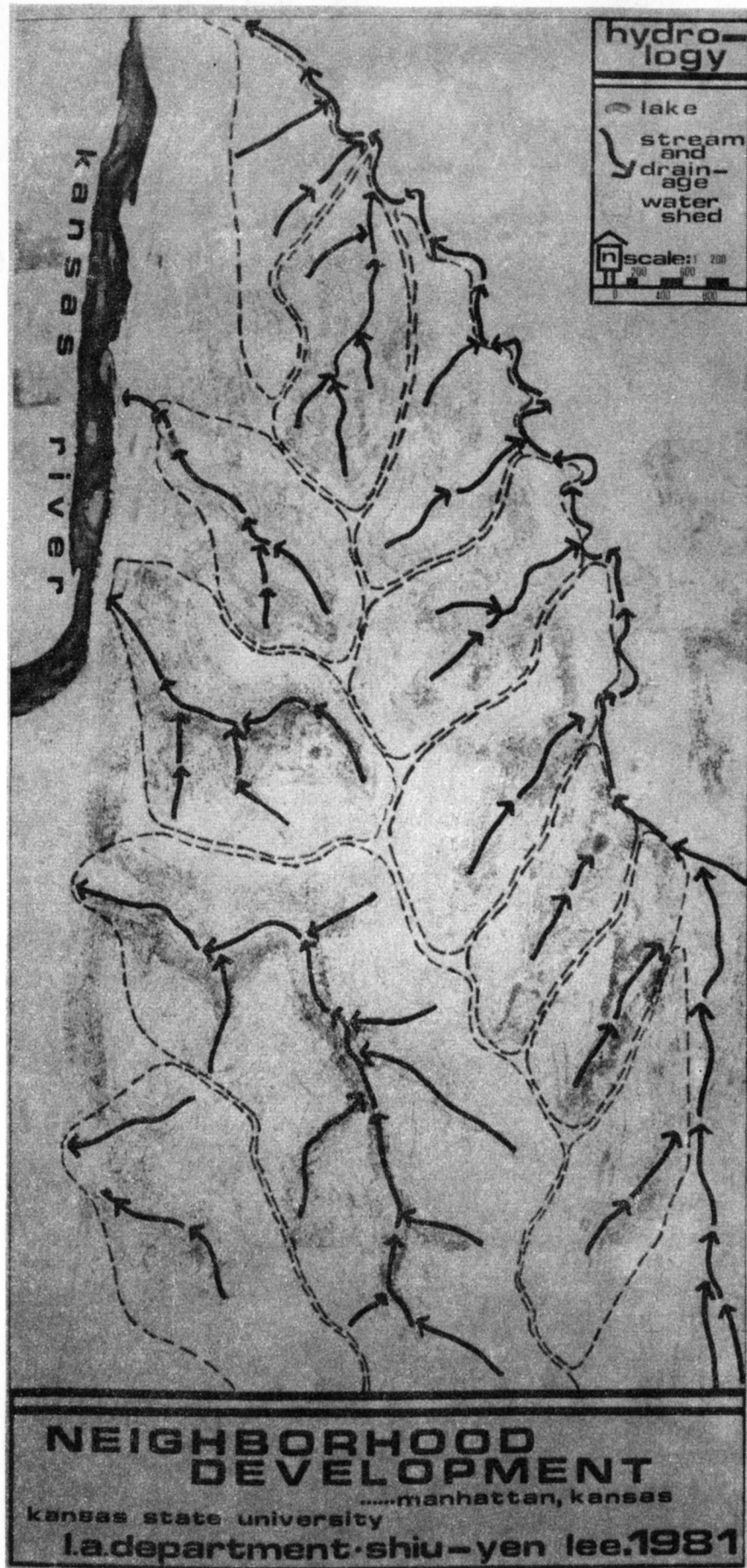


Figure 19: Hydrology

was chosen for research because it is conveniently located, has more extensive upland forests and is richer floristically than other areas near Manhattan, Kansas. He found that the variety of forest vegetation in Hackberry Glen seems best combined into three plant communities. (Figure 20).

Three plant communities in the upland forest communities of Hackberry Glen were analyzed and interpreted.

1. The Quercus - Juniperus - Ostrya community, dominated by Quercus prinoides and Juniperus virginiana occurs on rough-brocken land on steep slopes facing north, northeast, east and west. Ostrya virginiana is a dependent sub-ordinate in this community.

2. The Quercus-Cornus community dominted by Q. prinoides and Cornus drummondi was found on gentle slopes on the same exposures on Kipson-sogn soil complex above the Quercus-Juniperus-Andropogon community to which it is seral.

3. The Quercus-Juniperus-Andropogon community dominated by Q. princides, J. virginiana and Andropogon scoparius was observed on rough-brocken land on xeric steep slopes facing south, southeast and southwest. The communities have been disturbed by fire, lumbering and herbicide spray. J. Virginiana can become an important species provided fire is controlled. Q. prinoides, being a poor competitor with J. virginiana, appears to be able to form a self-perpetuating population if J. virginiana is excluded. Q. prinoides and J. virginiana





Distribution of forest communities in Hackberry Glen.

1 = Quercus - Juniperus - Ostrya community.

2 = Quercus - Cornus community.

3 = Quercus - Juniperus - Andropogon community.

Scale 1:9400.

Figure 20

appear unable to form self-perpetuating populations together on the same site.<sup>23</sup>

The location of the wooded areas and trees of the site are indicated on the vegetation map. (Figure 21) The key for this vegetation map and analysis is:

Light-grass land

Medium-deciduous trees

Dark-evergreen trees

The dark areas indicate areas covered by evergreen trees and it is better to reserve these areas for residential use because the trees provide protection from the winter wind.

## 7. Climate

The climate of Manhattan, which is classed as a Humid Continental climate zone, is considered favorable to the production of major crops and is also recognized as being one of the most healthful in the nation. The average annual temperature is 55 degrees Fahrenheit, varying between extremes of an average January minimum of 18.5 degrees Fahrenheit and a July average maximum of 93 degrees Fahrenheit.

Average annual precipitation for Manhattan is approximately 32 inches with the highest rate of rainfall occurring during the month of June. The record of precipitation in any given year occurred in 1915 with a recorded 50.82 inches.

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<sup>23</sup>S. Chaghtai "The ecology of an upland forest near Manhattan, Kansas" 1970 pp. 34-49



Figure 21: Vegetation

The driest year was in 1936 when only 25.54 inches of precipitation fell. Snow occurs from October through April with maximum falls recorded from January to March. The average annual snowfall is 18.7 inches.

The city of Manhattan lies in the path of alternating warm moist air moving north from the Gulf and currents of cold, relatively dry air moving south from the Polar regions. This condition results in frequent and abrupt changes of weather that can have a considerable effect on construction activity.

A geographical weather summary for Manhattan for the year 1980 is shown on figure 22.

## 8. Aesthetic Factors

Surface 2 is a computer software system for creation of displays of spatially distributed data. Easily understood examples of such data are measurements of the elevation of the ground collected at points on the earth's surface. The geographic coordinates of these points constitute two variables, X, and Y, and the height of the ground above sea level at each point constitutes a third variable.

Surface 2 will produce diagrams that show the continuous form of the ground in the area containing the control points.

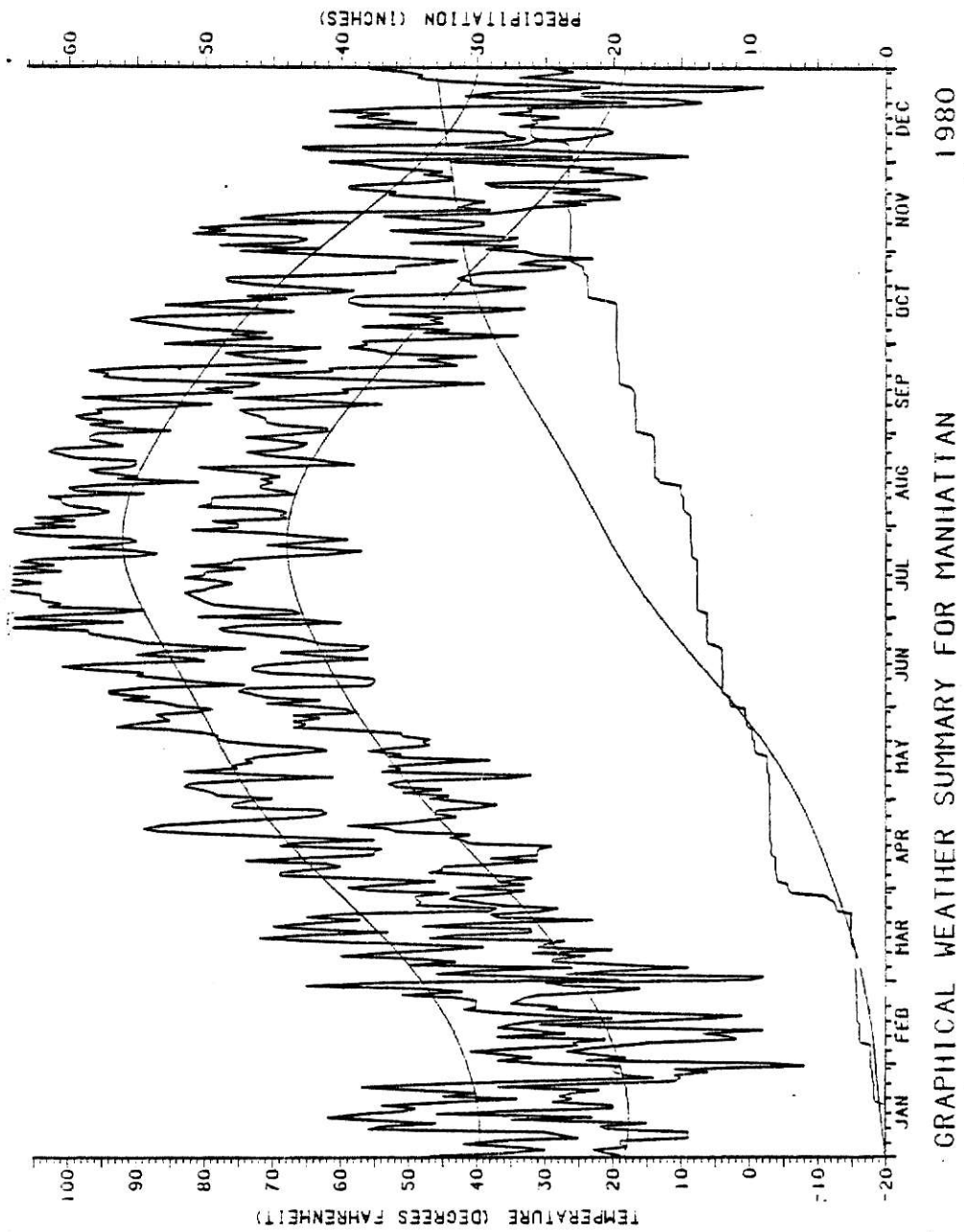
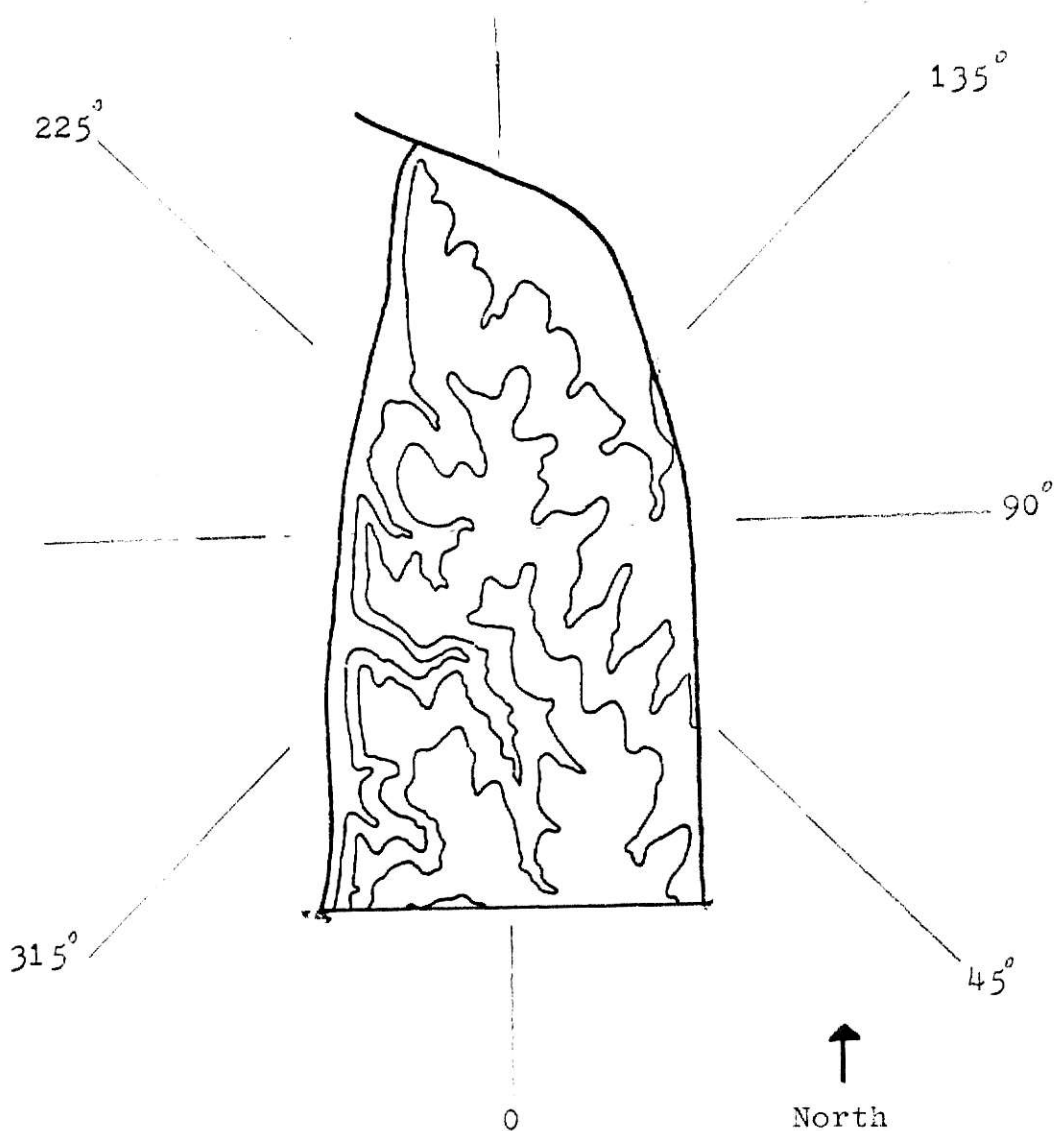


Figure 22:

The resulting form is displayed as it would appear to an observer at some specified point.

The following diagrams have been done by the computer surface 2 system to show the landform of the study site from different view angles.

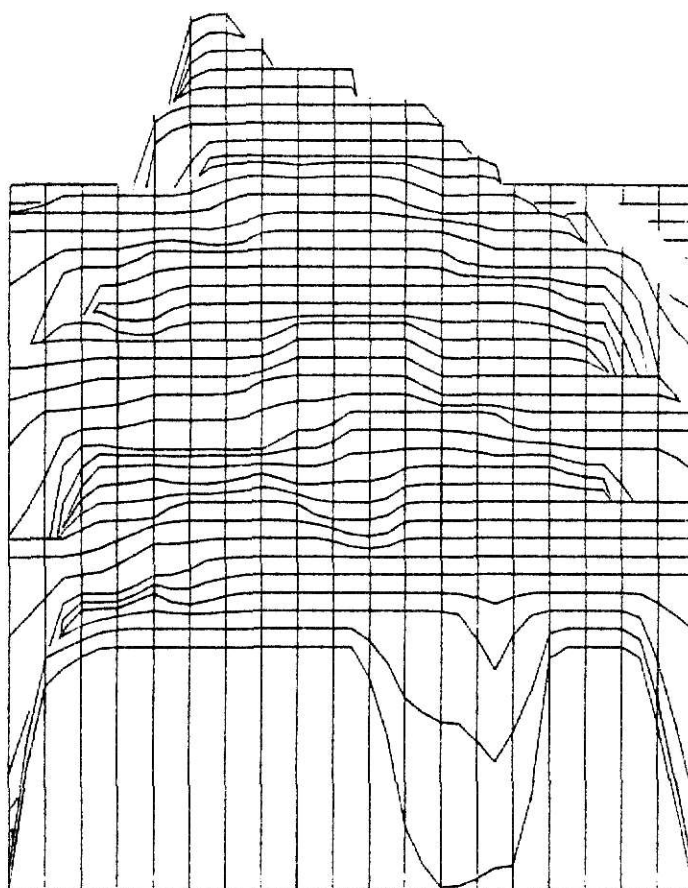




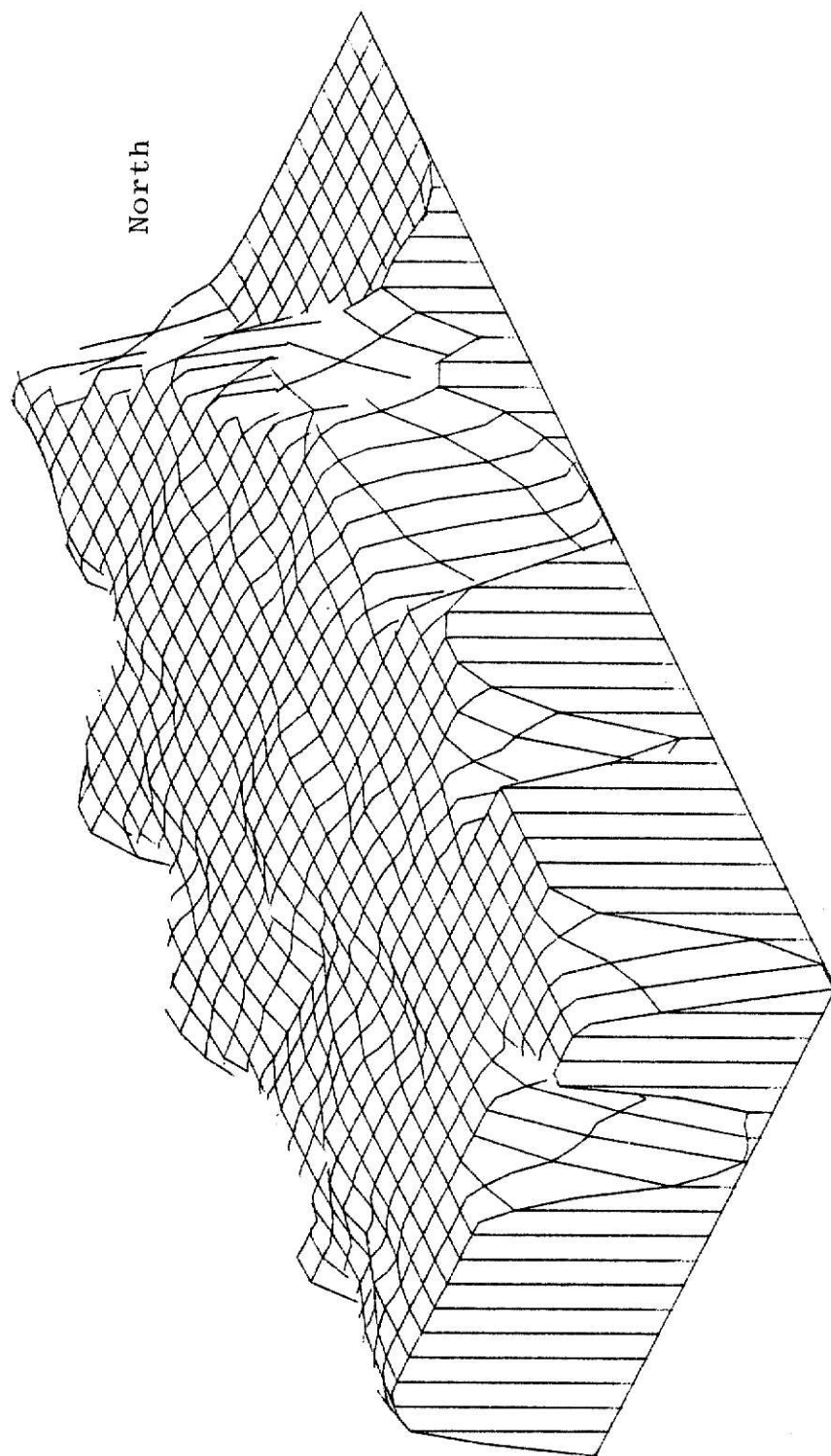
PLOT 1

0°

North

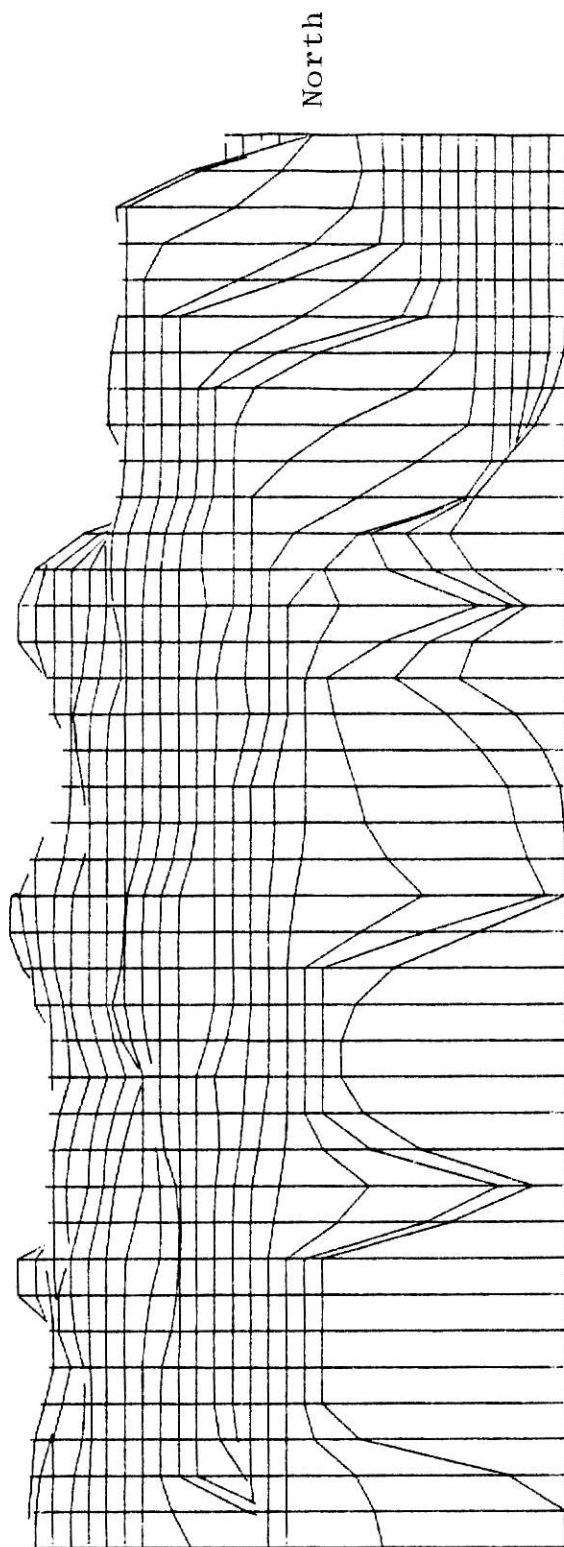


PLOT @ 45°

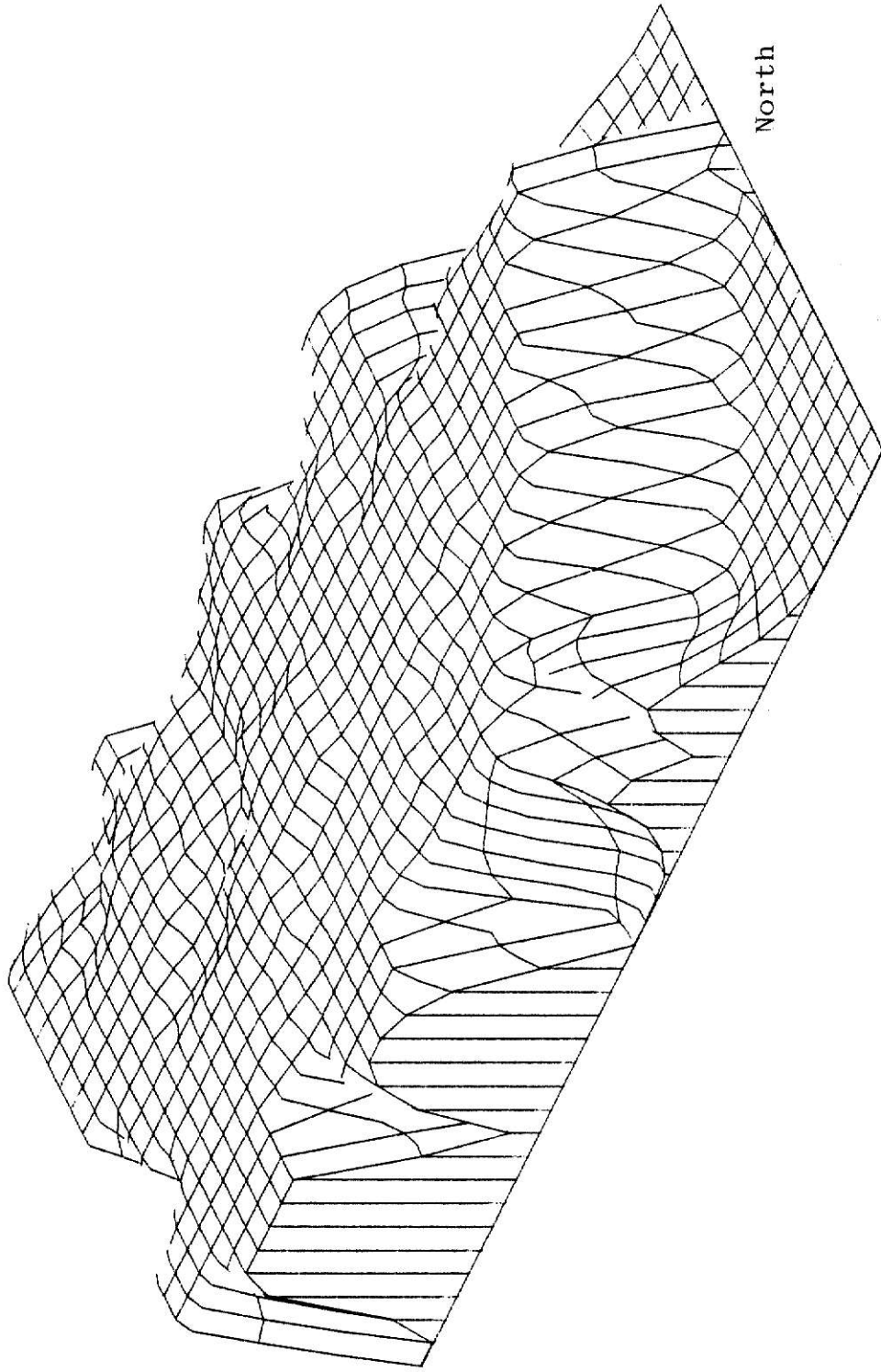




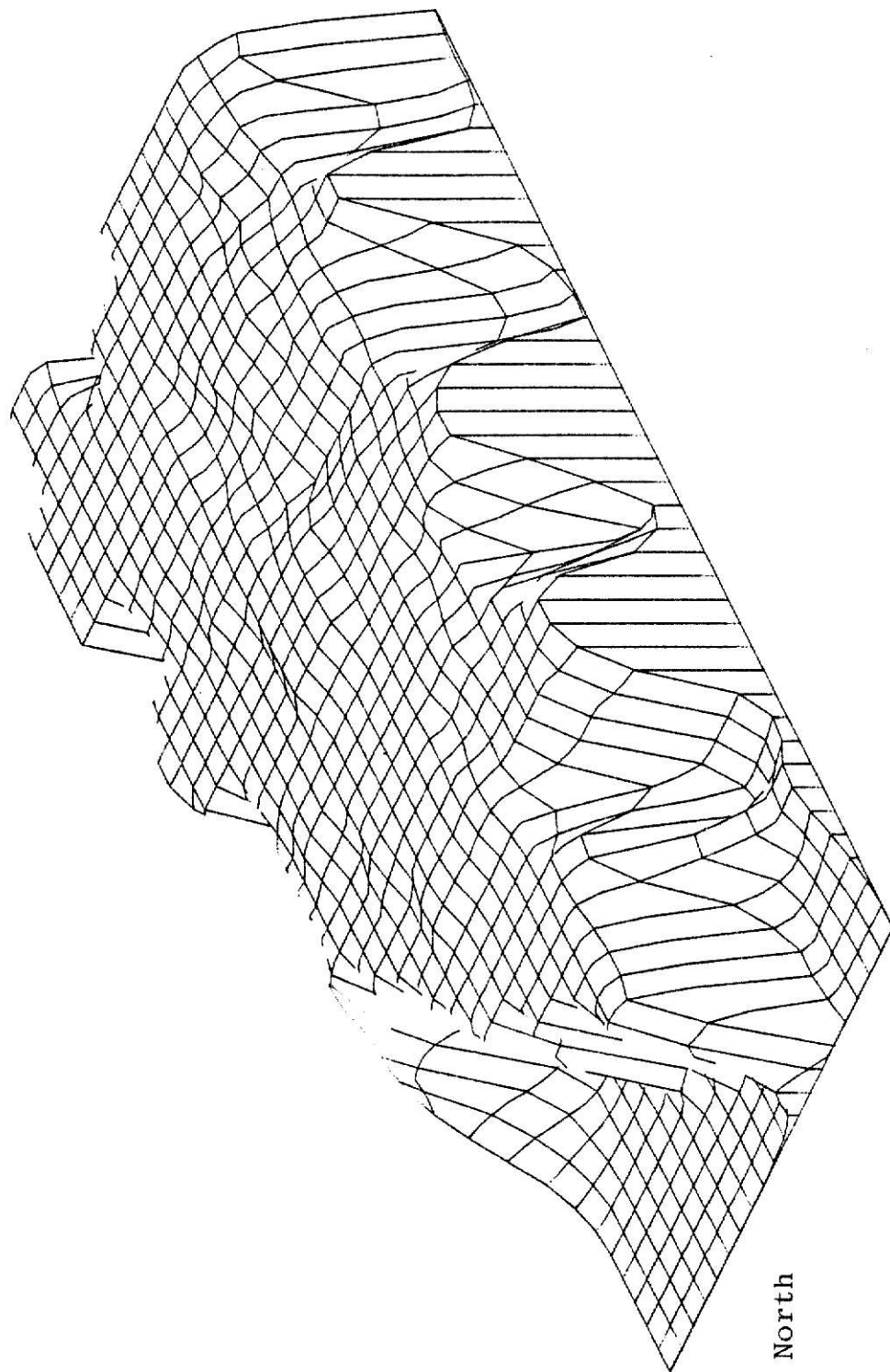
PLOT 3 99°



PLOT 4 135°

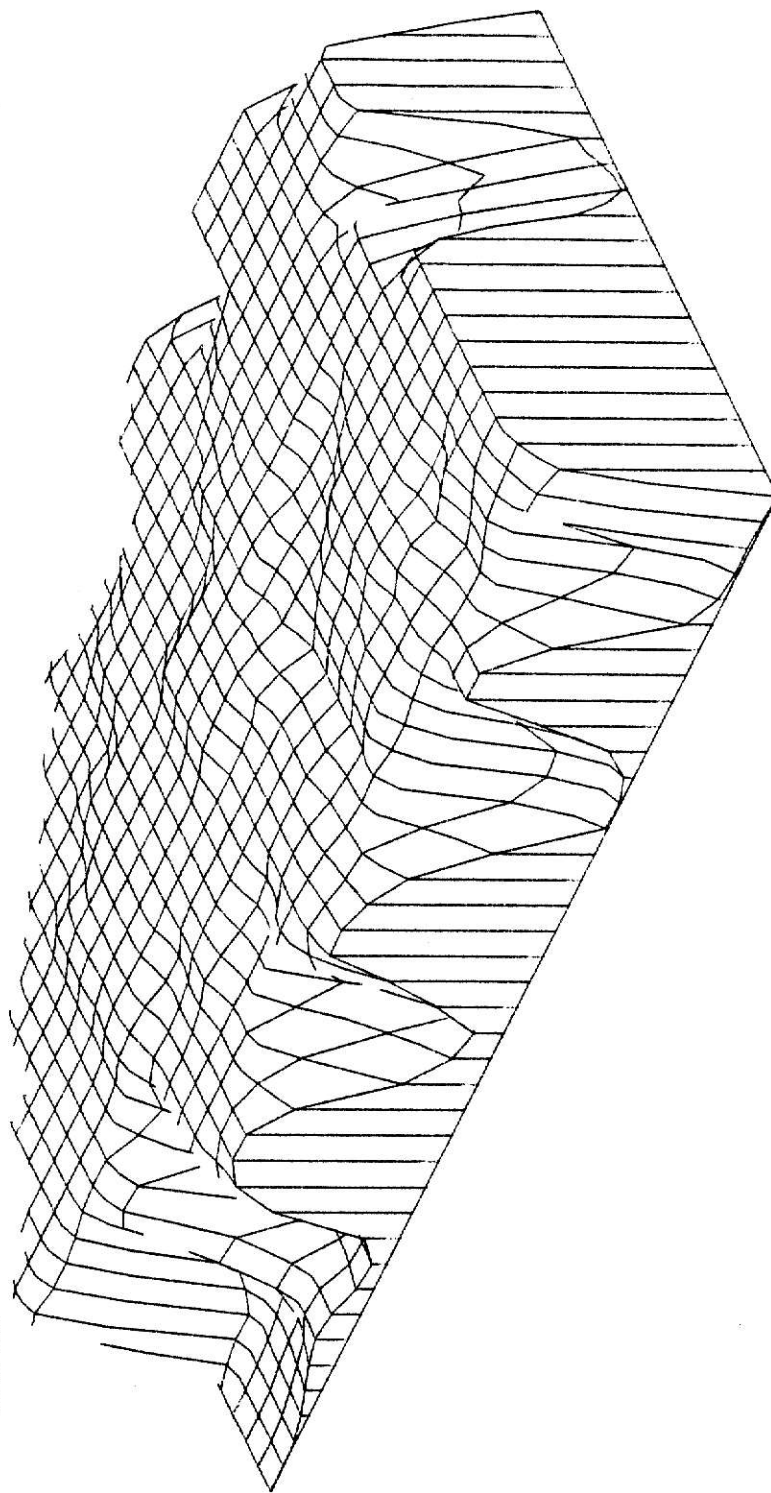


PLOT 5      225°



PLOT 6 315°

North



An alternative to visualizing the site by using the Surface II system is to take pictures to get a general visual feeling of the site.

View 1 and view 2 show the slope condition on the site. Compare to the slope situation in Taiwan (Appendix I). Both present a similarity in that the slopes on the site are generally steep. The only differing characteristic is that a lot more vegetation (shrub type) is distributed on the Taiwan site. For developing high density housing in Taiwan, it is necessary to clean up most of the shrubs before the housing can be build.

View 3 and view 4 represent the visual feeling of the existing cultural features along K-177 and on the site.

Visualizing the site gives the designer a good idea of where and how to arrange housing. (Appendix IV shows the pictures of view 1, 2, 3 and 4 for the site)

#### b. Cultural Factors

The cultural factors that would effect design decisions are shown on the cultural map (Figure 23). On this map are shown:

1. Existing land use - ownership of adjacent property.  
(easement lines)
2. Linkage - two major highways.  
(K-177 and Ashland Bottom Road-  
-- connected to U.S. 24)



Figure 23: Cultural

3. Traffic and Transit - circulation on or adjacent to  
to the site.  
(roads and driveways)

4. Utilities - sanitary and storm systems, water, gas,  
and electric power lines.  
(gas lines and power lines)

\*Sewers - On this site, every family uses a septic tank  
instead of a sanitary sewer. For high density  
development purposes, it is better to construct  
sanitary sewers instead of septic tanks.

\*Water - Water lines are just located along K-177. They  
are not shown on this cultural map.

\*Storm Sewers - Natural existing storm drainage flows  
directly into the Kansas river. No storm  
drainage structures are necessary.

5. Existing Buildings - existing structures on the site,  
(houses and garages).

6. Density and Zoning

Density is an important sociological and legal  
element in most types of development. In resi-  
dential development, it is expressed in numbers  
of families or dwelling units per acre. On the  
site, some existing residential areas are classi-  
fied as R1 and some other residential areas near  
the highway commercial areas are classified as R3.

The zoning map (Figure 24) shows proposed and  
existing zoning location. Zoning for future in-  
dustrial use is not very good on this site. A



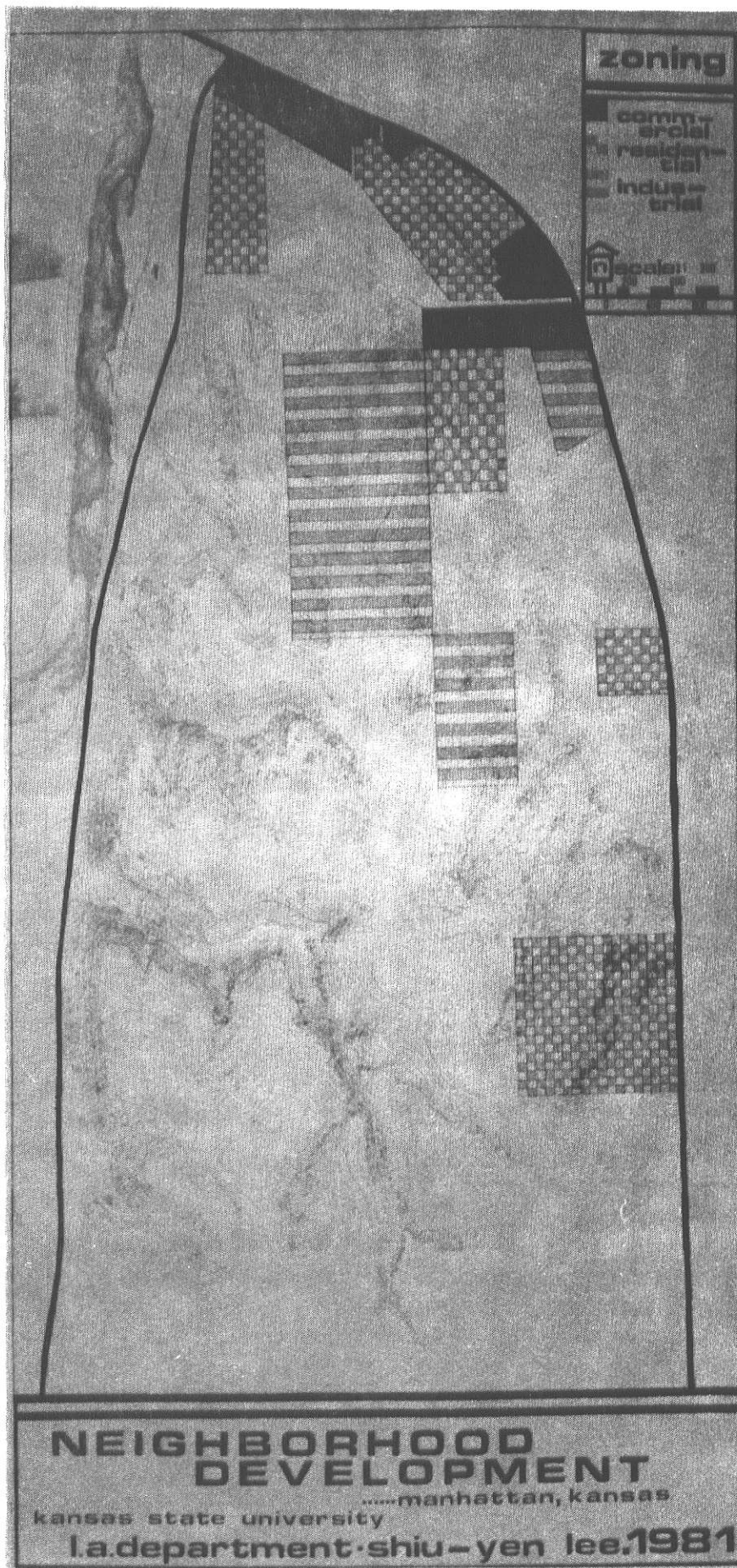


Figure 24: Zoning

lot of vegetation, good soil, and attractive views make the site very valuable as a neighborhood unit for residential use. Proposed industrial zoning would be excluded from the site.

c. Composite

Through analysis of the environmental factors, physiography, hydrology, vegetation, soil, geology, and slopes, a composite of limitations was derived delineating physical development guidelines.

The three classifications are as follows:

1. Developable: Fewest restrictions to development.  
Good accessibility, soils good for development, least restrictive slopes, and easily generated vegetation.
2. Restricted development: Existing streams, vegetation and restricted slopes are the factors restricting the site for development. Development is restricted due to destruction of vegetation that would be difficult to regenerate. Some erosion problems could come from development unless special construction techniques are utilized.
3. Not developable: Development is restricted, accessibility is difficult - Valuable vegetation would be destroyed by intensive development. Soil erosion would occur due to severe slopes and poor soils would greatly limit development. Any construction in these

areas would need to employ special construction techniques and thus greatly increase the cost of the development. (See Figure 25 for composite map)

#### d. Development Cells

By combining the composite analysis of the physical site factors, the cells for development can be mapped according to topography, stream and water flow direction, vegetation, existing roads and houses on the site.

The action of mapping cells plays an important role in letting the designer know where development could possibly occur and how to connect the cells by placing major roads allowing the people living in these cells to move conveniently without any trouble. Development cells (Figure 26) show where roads can be constructed without crossing streams. It saves money on bridge construction, because the streams form the boundaries of the development cells. The cells also help determine optimum gravity utility systems (sanitary and storm sewer) and which also determine phasing by concentrating development in single watersheds.

The development cells map indicates two classifications as follows:

1. Primary cells - General development cells are bounded by streams, vegetation and topographic features and save the vegetation of the site as much as possible.



Figure 25: Composite Plan





Figure 26: Cells

2. Secondary cells - For utilizing the land to the highest degree, some steep sloping sites with vegetation on them would be shaped as secondary cells as well as identifying southern slopes. Formulating secondary cells is the major concept for developing steep sloping areas.

Shaping the cells is the first design action and decision and the final step in the process of site planning. After this step, the layout of the land use on the site can be concentrated upon. (See Figure 27 for roads layout plan)

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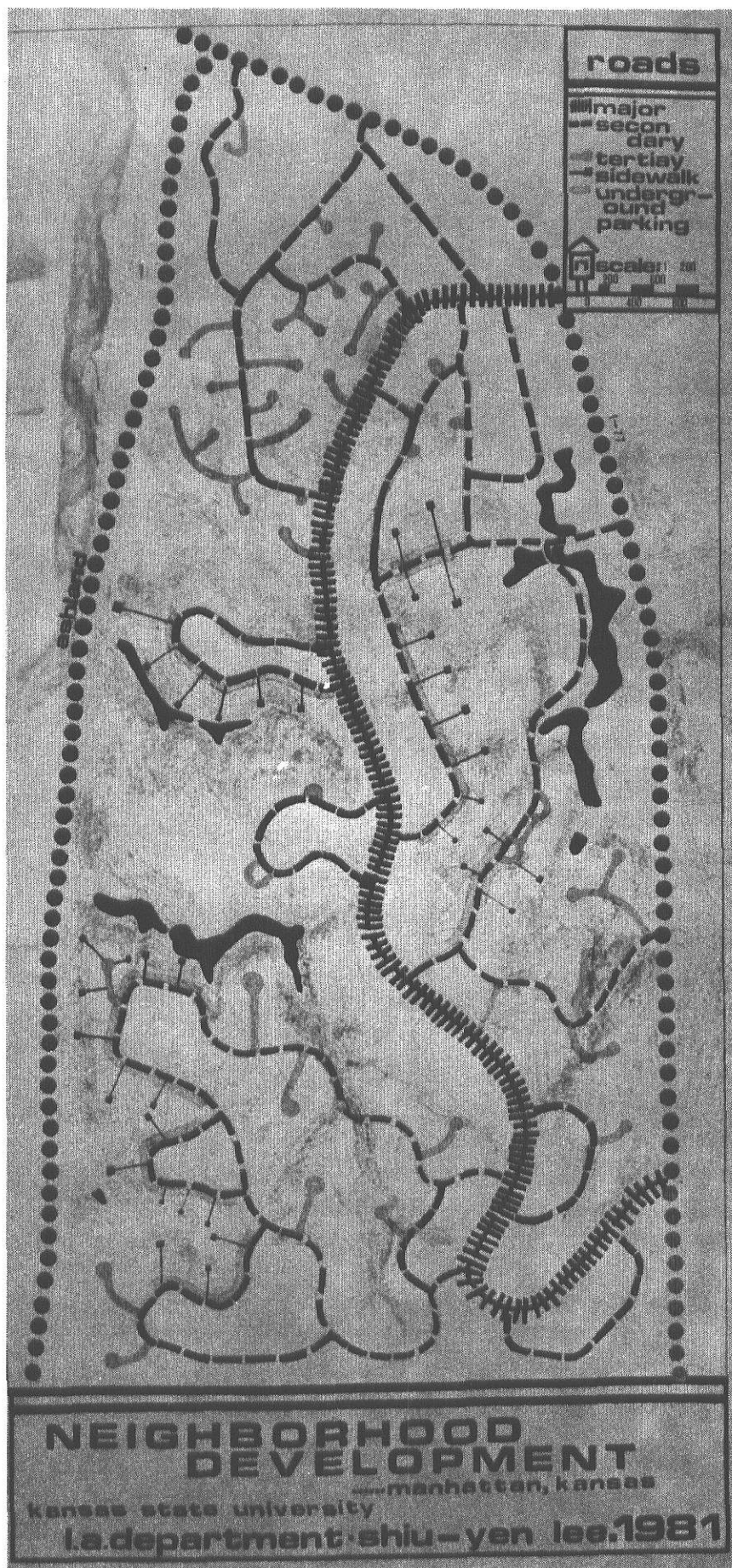


Figure 27: Roads

## CHAPTER V.

### THE PLANNING OF THE SITE

Once the site has been analyzed, the planning of the site can begin with a land use analysis.

Land use analysis is basically concerned with the decision of the cell uses and linkages between uses which will be located on the site.

#### A. Types of Use

##### 1. Market Analysis for Housing and Residential Use

The purpose of this analysis is to provide assistance and guidance in the matter of prospective and qualitative demand for housing on the site.

##### a. Factors influencing housing demand:

##### 1. Employment trends

A good measure of economic stability in a community is a well-diversified employment structure. Table 8 has been prepared to show relative increases or decreases in ten major categories of manhattan's employment structure in addition to the overall employment structure.

Table 8: Manhattan Employment

| Industry       | 1950  |      |      |        |      |      | 1960  |      |      |        |       |      | 1970  |      |      |        |   |   |
|----------------|-------|------|------|--------|------|------|-------|------|------|--------|-------|------|-------|------|------|--------|---|---|
|                | TOTAL |      |      | FEMALE |      |      | TOTAL |      |      | FEMALE |       |      | TOTAL |      |      | FEMALE |   |   |
|                | #     | %    | #    | #      | %    | #    | #     | %    | #    | #      | %     | #    | #     | %    | #    | #      | % | # |
| AGRICULTURE    | 115   | 2.0  | 108  | 7      | 0.1  | 235  | 231   | 3.0  | 4    | 0.1    | 353   | 312  | 3.0   | 2.8  | 41   | 0.4    |   |   |
| MINING         | 14    | .02  | 14   | 0      | 0    | 20   | 20    | 0.3  | 0    | 0      | 11    | 11   | 0.1   | 0.1  | 0    | 0      |   |   |
| CONSTRUCTION   | 412   | 7.0  | 402  | 10     | 0.2  | 563  | 555   | 7.1  | 8    | .1     | 629   | 624  | 6.0   | 5.6  | 5    | 0.1    |   |   |
| MANUFACTURING  | 241   | 4.0  | 188  | 53     | 0.9  | 334  | 258   | 3.3  | 76   | 1.0    | 487   | 354  | 4.0   | 3.2  | 133  | 1.2    |   |   |
| TRANSPORTATION | 307   | 5.0  | 237  | 70     | 1.2  | 289  | 242   | 3.1  | 47   | .6     | 477   | 338  | 4.0   | 3.0  | 139  | 1.2    |   |   |
| WHOLESALE      | 233   | 4.0  | 176  | 57     | 1.0  | 224  | 211   | 2.7  | 13   | .2     | 400   | 278  | 4.0   | 2.5  | 122  | 1.1    |   |   |
| RETAIL         | 1043  | 17.0 | 822  | 521    | 8.7  | 1467 | 465   | 12.4 | 502  | 6.4    | 2025  | 1211 | 18.0  | 10.9 | 814  | 7.3    |   |   |
| FINANCE        | 293   | 5.0  | 166  | 127    | 2.1  | 462  | 285   | 3.7  | 177  | 2.3    | 546   | 331  | 5.0   | 3.0  | 215  | 1.9    |   |   |
| SERVICES       | 2810  | 47.0 | 1506 | 1304   | 21.8 | 3694 | 1949  | 25.0 | 1745 | 22.4   | 5549  | 2849 | 50.0  | 25.6 | 270  | 24.3   |   |   |
| PUB. ADM.      | 526   | 9.0  | 368  | 158    | 2.6  | 510  | 355   | 4.6  | 155  | 2.0    | 644   | 441  | 6.0   | 4.0  | 203  | 1.8    |   |   |
|                | 5994  | --   | 3987 | 2307   | 33.5 | 7798 | 5071  | 65.0 | 2727 | 35.0   | 11121 | 6749 | --    | 60.7 | 4372 | 39.3   |   |   |

SOURCE: U.S. BUREAU OF CENSUS

The distribution of employment in Manhattan is well balanced between manufacturing, retail trade, services and public administration, which has had the most increase since 1950. The mining category has gained proportionally to the growth patterns of Manhattan over time.

Employment trends since 1970 indicate a continuance of this balance. It may not encourage an unusually rapid growth, but it does assist in assuring stability and provides a good base for future growth by encouraging industry and new business.

## 2. Family Income

Ability and willingness to pay for housing distinguishes effective demand from the need or desire for housing. Measurement of financial capacity of potential buyers and renters of new dwelling units is, therefore, a critical element in the analysis of local housing markets.

Table 9 shows the medium annual family income. According to data of U.S. census, Manhattan residents have higher income than the people of Riley county. This gives us a good idea of the housing type preferences of Manhattan residents.

Table 9. Using the Purchasing Power of the Dollar to Stabilize the Medium Annual Family Income  
Figures of 1960 and 1970 to 1950 Figures

| Year                                         | 1950               | 1960               | 1970               |
|----------------------------------------------|--------------------|--------------------|--------------------|
| Annual Income<br>Per Family                  | 2,967 <sup>1</sup> | 5,298 <sup>2</sup> | 9,006 <sup>3</sup> |
| Purchasing Power<br>of the Dollar            | 1,387 <sup>4</sup> | 1,127 <sup>4</sup> | 0.860 <sup>4</sup> |
| Standardize the<br>Incomes to 1950<br>Dollar | 2,967              | 4,300              | 5,610              |

Source: 1. 1950 United States Census of Population, Kansas,  
p. 62

2. 1960 United States Census of Population, Kansas,  
p. 217

3. 1970 United States Census of Population, Kansas,  
p. 329

4. Statistical Abstract of United States, 1974,  
p. 404

In summary, the higher the income, the higher consumption of housing will be in terms of space, facilities, quality and market value.

### 3. Households

The household is the unit of demand for housing. Thus, the analysis of households is the crux of the demographic analysis of housing demand.

Table 10 shows number of households and persons per household in 1960 and 1970, according to the U.S. Census of Housing. For Manhattan and Riley County, it shows both increased numbers of housing units and increased persons per household: from 2.72% to 3.04% in Manhattan, and from 9.3% to 3.19% in Riley County. This means that higher density units will be required for future housing demands in Manhattan.

Table 10. Manhattan/Riley County Population, Numbers of Households and Persons Per Household

| 1960         | Population | No. of Households | Persons Per Household |
|--------------|------------|-------------------|-----------------------|
| Manhattan    | 22,993     | 6,865             | 3.04                  |
| Riley County | 41,914     | 10,714            | 3.19                  |
| 1970         |            |                   |                       |
| Manhattan    | 26,897     | 9,091             | 2.71                  |
| Riley County | 56,788     | 14,122            | 2.93                  |

Source: U.S. Census of Population

There are several factors which influence housing demand. Of all factors, number of households, family income and employment trends are the most important points to consider in housing demand. The employment trend is the principal determinant of population growth; population is translated into households; households are the units of demand for housing; and family income controls the capacity of households to pay the price (or rent) for future housing.

b. Characteristics of the housing supply:

The purpose of this portion of the housing market analysis is to provide a general analysis of the current status of housing in Manhattan and to provide insight into anticipated future housing demands.

1. Housing Conditions

An external condition survey was undertaken simultaneously with the land use inventory. Analysis of the survey information revealed that there were 6.511\* residential housing structures within the city limits of Manhattan in October of 1967.<sup>24</sup>

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<sup>24</sup>Oblinger-Smith, Manhattan Land Use Plan. (The Manhattan Planning Board & City Commission) 1968, pp. 45.

\*The number of units stated excludes mobile homes and trailers.



The rating of housing conditions was an attempt to evaluate the external condition of each structure as objectively as possible. The purpose of the survey was to generally indicate the over all building and environmental conditions in the city. A summary of the results of the building condition survey as related to housing units is indicated in table 11.

Table 11: Housing Conidtions, Manhattan, KS, 1967

|             | No. of Units | % of Total Units |
|-------------|--------------|------------------|
| Good        | 2,839        | 43.6             |
| Fair        | 2,137        | 32.8             |
| Poor        | 1,202        | 18.5             |
| Dilapidated | 333          | 5.1              |
| Total       | 6,511        | 100.0            |

Source: Oblinger and Smith, Planning Consultants, 1968.

The results of the 1967 survey, in table 11, indicated that 2,839 housing units were in good condition and 2,137 were in fair condtition. The results of the survey indicated that there are approximately 1,202 units requiring major repairs which amount to 18.5% of the housing units. The survey also indicated that approximately 5.1% of the units apparently were not worth repairing within the present city limits of Manhattan.

## 2. Valuation and Age of Housing

Information concerning dollar values of owner occupied housing units was also tabulated by the U.S. Census of Housing enumerators. Table 12 shows this valuation information.

The greatest percentage 20.68 of owner occupied home values in 1970 were in the \$15,000 to \$19,000 range with only 3.66% in the \$5,000 or less category. The median value of owner occupied housing in Manhattan was \$10,000 in 1970 and \$13,300 in 1960.

The value of housing tends to be related to the age of the structures. Table 13 shows the age of housing units reported in the 1970 Census.

A total of 21.21% of the housing units constructed before 1960 were constructed during the 1950s, whereas 10.62% were built in the 1940s. Nearly 39.37% of all units in 1970 were over thirty years of age. The significant factor identified by the table is that nearly three-tenths of the housing units constructed previous to March, 1970 were constructed in the ten year period between 1960 and 1970.

Table 12: Value of Owner Occupied Housing in Manhattan, Kansas.  
(From 1960 to 1970)

| Value              | 1960   | Percent of Units | Change | 1970   | Percent of Units |
|--------------------|--------|------------------|--------|--------|------------------|
| Less than \$5,000  | 107    | 3.7              | -      | 107    | 3.66             |
| \$5,000 to 7,400   | 260    | 9.1              | +6     | 266    | 9.10             |
| \$7,500 to 9,900   | 380    | 13.3             | +18    | 398    | 13.63            |
| \$10,000 to 12,400 | 496    | 17.4             | +20    | 516    | 17.67            |
| \$12,500 to 14,900 | 593    | 20.8             | +7     | 600    | 20.55            |
| \$15,000 to 19,900 | 599    | 21.0             | +5     | 604    | 20.68            |
| \$20,000 to 24,900 | 187    | 6.5              | -      | 187    | 6.41             |
| \$25,000 to more   | 235    | 8.2              | +7     | 242    | 8.30             |
| Total              | 2,857* | 100.0            | +63    | 2,920* | 100.00           |

\*Units in multi-unit structures and trailers were excluded

Source: 1. U.S. Census of Housing, 1960, Kansas.

2. U.S. Census of Housing, 1970, Kansas.

Table 13: Age of Housing Units - Manhattan

| Year Range         | No. of Units | Percent of Units |
|--------------------|--------------|------------------|
| 1960 to March 1970 | 2,813        | 28.8             |
| 1950 to 1959       | 2,070        | 21.21            |
| 1940 to 1949       | 1,037        | 10.62            |
| 1939 to earlier    | 3,843        | -                |
| Total              | 9,763        | 39.37            |

Source: 1970 Census of Housing, "Housing Characteristics for States, Cities, and Counties.

### 3. Housing Type

The change in distribution of the inventory by housing type is also an important housing characteristic. From 1960 to 1970, single family housing occupied by a renter decreased from 1,067 to 960 units and over 5 unit housing increased from 487\* to 1,890\* units. Appendix V shows that single family housing occupied by the owner increased from 2,260\* units to 3,374\* units. This trend indicates to designers that single family housing is appropriate for the study site.

Thus, we can conclude that low density (1 or 2 unit) and higher density (over 5 unit) housing will be the primary housing type to be developed in the future within the city of Manhattan.

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\*The number of units stated excludes mobile homes and trailers.

#### 4. Tenure

Tenure is an occupancy characteristic of housing units and is probably the most important individual housing characteristic. The occupancy status of the housing inventory is classified in three broad categories: Owner-occupied, renter-occupied, and vacant units.

The number and proportion of owner occupied, tenant-occupied, and vacant units has historical and current significance. It reflects the cumulative effects of the past trends and is a basis upon which future need is determined.

In 1970, 48.3% of the occupied housing units were owner-occupied, and 51.7% were renter-occupied. Of the total housing units, 440, or 4.5% were vacant, as compared to a higher 7.4% vacancy rate in 1960, (Table 14). A vacancy rate decrease from 7.4% to 4.5% proves that the residential housing supply for the city of Manhattan is a necessary consideration.

Table 14: Tenure in Manhattan, Kansas (1960-1970)

| Tenure               | 1960          | Change | 1970          |
|----------------------|---------------|--------|---------------|
| Owner                | 3,627 (52.8%) | -4.5%  | 4,498 (48.3%) |
| Renter               | 3,238 (47.2%) | +4.5%  | 4,814 (51.7%) |
| Vacant               | 594           |        | 440           |
| Total Occupied Units | <u>6,865</u>  |        | <u>9,312</u>  |

c. Demand for Housing:

Estimates of projected demand for new housing come from the net impact of the operation of the determinants of demand upon the current housing supply, and is concerned with both the quantitative and qualitative aspects of demand.

1.) Quantitative Demand for Housing

It is predicted that the Manhattan Urban Area will contain a population of 48,320 by 2000. Based on the average household size of 2.72 persons per household, it is anticipated that over 8,500 additional housing units will be needed from 1967 to 2000.

In 1968, Oblinger-Smith planning consultants predicted that there will be a population of 49,600 by 1985, and that these projections may be reached prior to or after 1985. But in 1978, the K.S.U. students published a book "Manhattan, Kansas - Policy for Growth" and projected a population of 48,320 by 2000. Both of them predicted almost the same population between 1985 and 2000. Thus, appendix VI showing the projected additional housing demand for Manhattan, the Manhattan Urban Area and Riley County, 1967-1985, is also available to show net housing demand, 1967-2000.

Currently, there are very few vacant housing units in Manhattan available for rent, so approximately

200 new housing units per year will be required to meet the demand created by the anticipated population growth.

## 2.) Qualitative Demand for Housing

Qualitative demand relates to the distribution of the net quantitative demand for new single-family housing and multi-family housing by price and rent.

There is a considerable amount of apartment use in the Manhattan area due to student housing requirements at the University. It is estimated that approximately 25% of the new housing units will be in the apartment type of structure based on present and future trends. With the assumption that 25% of the future housing units will be apartments, appendix VI shows the number of units projected for multi-family and single-family purposes.

The result, indicates that there will be a demand for approximately 190 units of single-family housing and 60 units in apartments each year.

## 2. Market Analysis for Commercial Land Use

The purpose of this analysis is to determine whether or not sufficient marked demand exists for new or expanded retail facilities in Manhattan.



Demand for retail goods in Manhattan is a function of factors that include: population in the trade area, incomes and buying habits of the population, size of the trade area, nature and policies of Manhattan retailers, and travel time to competitive retail locations outside manhattan. Not all of these factors can be precisely evaluated. Some can be evaluated only subjectively.

a. Trade-Area Population

The size of the Manhattan trade-area population depends on the ability of the retail location to attract shoppers from competitive locations. With the expansion of local retail opportunities, we would expect people from further away to spend more money on retail items in Manhattan.

The 1976 U.S. Census estimates for Riley and Pottawatomie Counties are 62,077 and 12,893 respectively. 1977 estimates made by the staff of Sales and Marketing Management magazine are 62,500 and 13,300. These estimates count students in group quarters and also permanently assigned military personnel. Combined population growth in the two counties between 1974 and 1976 was approximately 2% annually. If this trend continues to 1980, the trade-area population will be approximately 80,500.<sup>25</sup>

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<sup>25</sup>Manhattan, Kansas. Downtown Redevelopment Plan. (Manhattan City Commission, Downtoan Redevelopment Advisory Committee, Planning Consultants...etc., 1979) pp. IV-10.

b. Trade Area Income

Potential sales within a trade area is related to the incomes of the trade area's residents. Data obtained from the Kansas Statistical Abstract for 1977 indicates a total income figure for Riley County for 1975 of approximately \$300 million. Data from Sales and Marketing magazine estimates Riley County's total disposable income at \$305 million for 1977 and Pottawatomie County's at \$69 million. These figures indicate a per capita income of \$4,870 in 1975 and per capita disposable income of \$4,880 in 1977 for Riley County. Per capita disposable income for Pottawatomie County was \$5,188 in 1977.

c. Sales within the Trade Area

It is widely believed that many residents of Riley and Pottawatomie Counties shop regularly outside the two-county area. Assuming that residents of the two counties are typical Kansas buyers, their spending, whether in or out of the trade area would be expected to approximate the spending of Kansas residents statewide. Trade area (Table 15) shows lower sales within that area, which would indicate that residents are making purchases outside the trade area but within the state.<sup>26</sup>

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<sup>26</sup>Ibid, IV-11

Table 15: Per Capita Sales Average, 1977

| Merchandise        | Kansas     | Riley      | Pottawatomie | Trade area |
|--------------------|------------|------------|--------------|------------|
| Apparel            | \$ 127.69  | \$ 70.61   | \$ 70.10     | \$ 70.52   |
| Food               | 1,885.22   | 812.40     | 807.33       | 811.51     |
| Furniture          | 276.58     | 219.71     | 100.34       | 198.77     |
| Gen. Merchandise   | 766.85     | 374.38     | 903.20       | 445.08     |
| Prof/pers. service | 210.45     | 195.79     | 97.10        | 178.47     |
| Misc. Other        | 208.36     | 138.59     | 68.30        | 127.26     |
| Total              | \$3,475.15 | \$1,784.48 | \$2,047.37   | \$1,830.61 |

Source: Manhattan Downtown Redevelopment pp. 12

Riley and Pottawatomie Counties are not the only areas losing sales, as is shown in the following table. Note that Shawnee County (Topeka) is above the state average, indicating the inflow of buyers from other counties that are losing sales.

#### Conclusion

Market demand unquestionably exists within the Manhattan trade area that could support substantially expanded retail facilities. On the whole, market analysis underlines the need for any development in Manhattan to be truly competitive with shopping facilities in Topeka and possibly Kansas City. The study forecast shows that the city will need approximately 20 to 40

acres to support a wide variety of commercial activities such as services and neighborhood commercial activities by 2000. (Table 16).

Table 16: Summary of Commercial Land Use Projections in Acres, Manhattan, Kansas

| Type of Use                                                          | No. of Acres |
|----------------------------------------------------------------------|--------------|
| Central Business District                                            | 12 - 15      |
| Neighborhood Shopping Centers                                        | 16           |
| Offices, Services, Highway<br>Business and Some Convenience<br>Goods | 20 - 40      |
| TOTAL                                                                | 48 - 71      |

Source: Manhattan Base and Population Study/Forecast

#### B. Elementary Schools

There are 8 elementary schools, occupying approximately 78.4 acres, within the city limits of Manhattan. Regarding future school needs, based on Manhattan's urban area population projections, it is estimated that there will be a need for at least five new elementary schools by 2000.

Each elementary school should occupy a site of 10-15 acres, meaning 50-60 acres will be used for elementary school purposes by 2000.

### C. Open Space

The areas occupied by vegetation and restricted because of slope are most undesirable and difficult for development, and thus will be preserved as open space and recreational areas for the site (see composite map).

### D. Linkages

After the proposed land-uses have been determined, the linkages between them must be analyzed. According to the analysis, the proposed land uses on the site will be residential, commercial, educational and recreational. The following diagram (Figure 28) shows the linkage among the land uses and activities. It is not to scale and expresses nothing but the types of uses and their preferred connections.

Because the site is close to Manhattan's downtown area, to be developed into a regional shopping center, the commercial area on the site will contain primarily office uses, rather than retail uses.

### E. Land-Use Concepts

The land-use concepts are developed through the land-use diagram with the composite map of site analysis in mind.

The land-use concepts of the selected site are shown on the map (Figure 29). On the map, the low and medium density residential areas are placed on the very gentle slopes of the

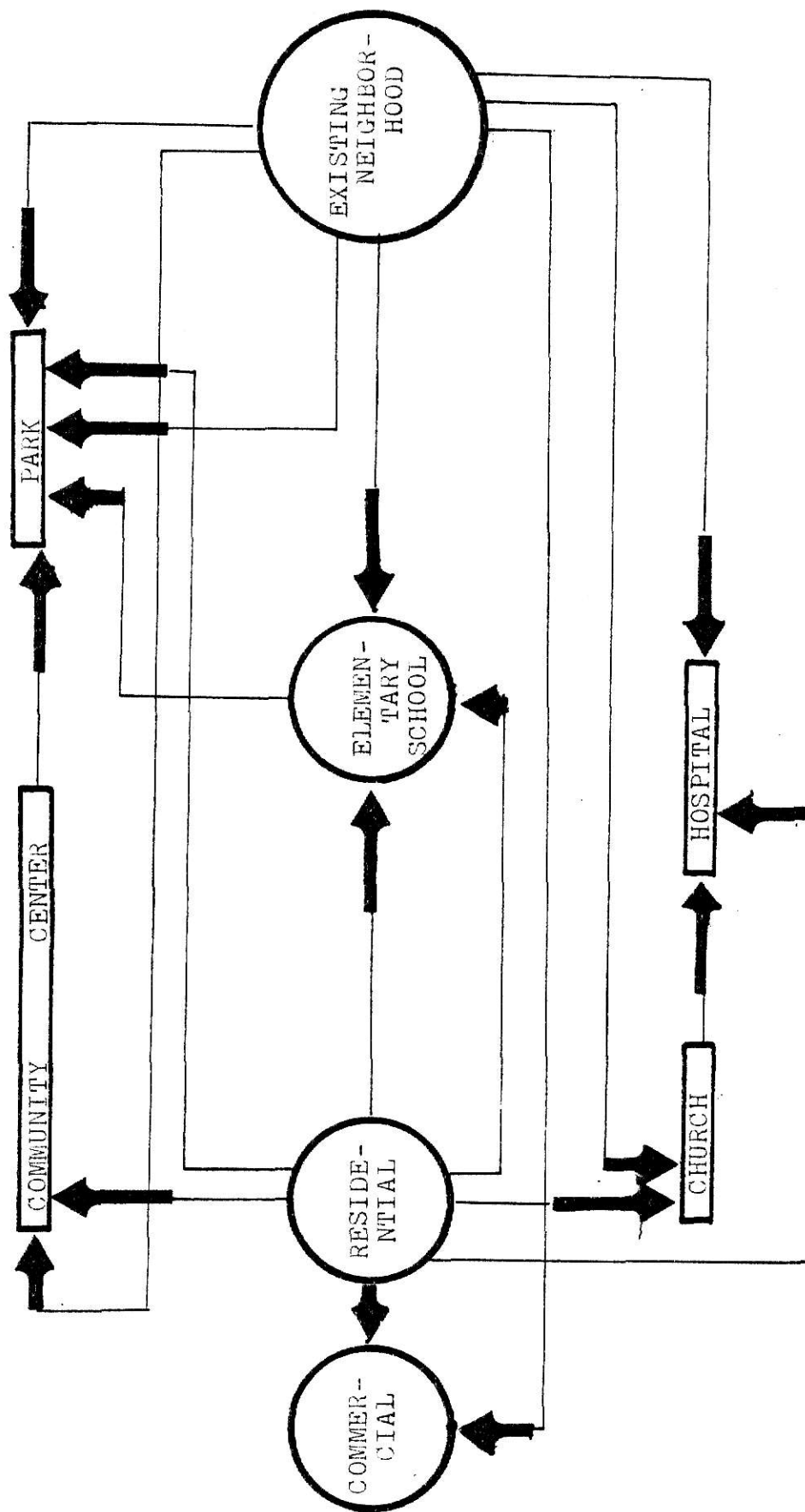


Figure 28: Land Use Diagram

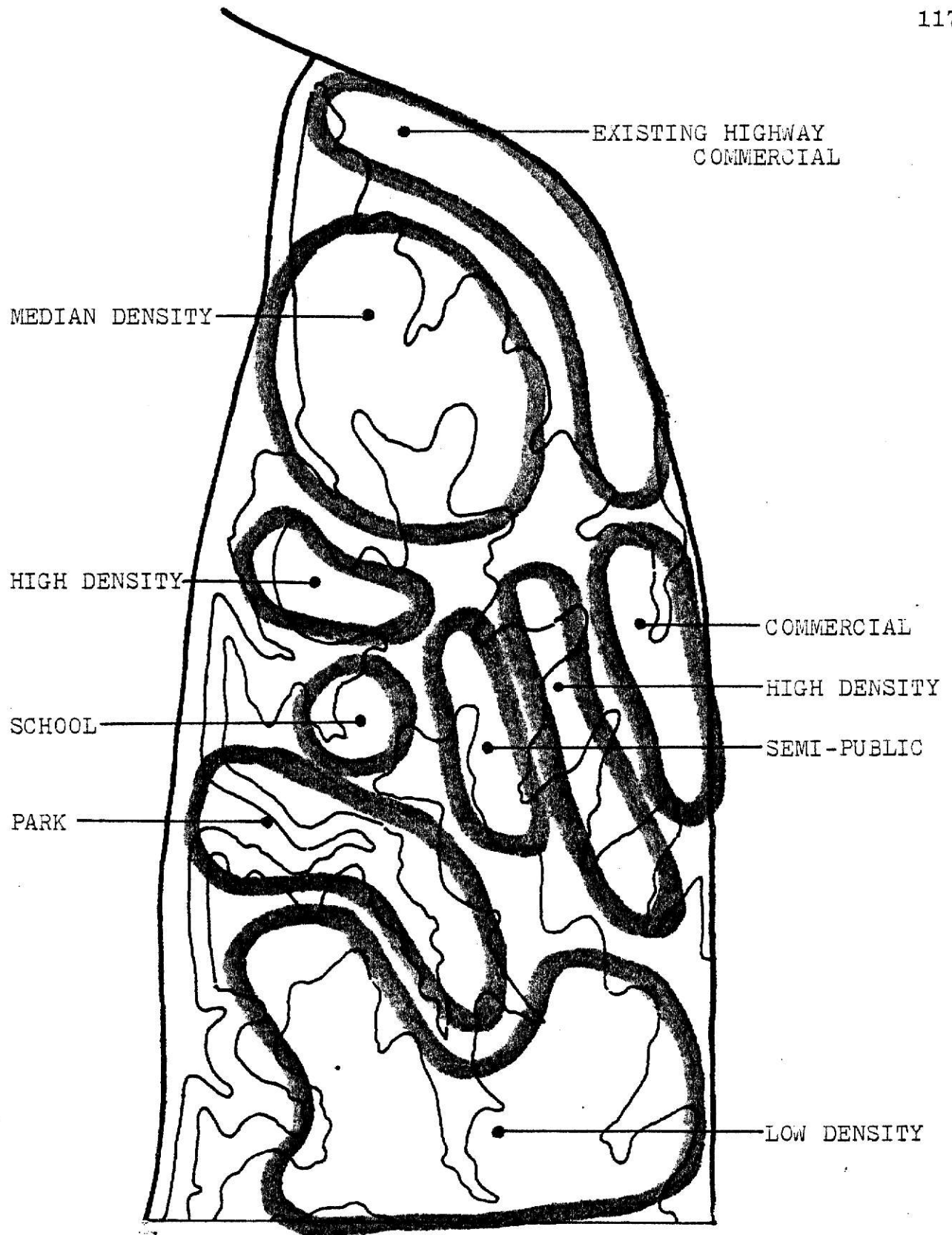


Figure 29: Land Use Concept



north and south. The high density residential area is placed on the commercial area and close to the school. The tract reserved for the elementary school is located on the center of the site. As to open space areas, the ponds and stream valleys running between the school, commercial and residential is the dominant feature.

## CHAPTER VI

### THE PLANNING CONCEPT

#### A. Mixed Uses

According to Jane Jacobs, cities need a most intricate and close grained diversity of uses that give each other constant mutual support both economically and socially.<sup>27</sup>

Mixed land use in a neighborhood permits a more constant level of activity around the clock. Also, people concerned with environmental quality have pointed out that a mixing of land use can also lessen energy consumption and harmful effects on the environment. Obviously, a walk to the corner grocery store has less severe energy and environmental implications than a mile drive to a neighborhood shopping center. It is also likely to be much more convenient.

Economically, mixed use establishes an economic multiplier in the area. Commercial establishments that have located in planned, mixed-use developments find economic advantage in the arrangement as well, because a demand is already created by the residents of the area.

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<sup>27</sup>Witherspoon, Robert, et al. "Mixed Use Development: New ways of land use." (Washington, D.C.: Urban Land Institute). 1976, pp. 96

Mixing residential, commercial and educational uses, as decided by the process of analysis, will achieve a compatible and healthy environment for the site.

As to the mixing dwelling types, the single-family, duplex, complexes, and apartments will be the major four housing types on the site. The advantages of mixing dwelling types are: avoiding monotonous repetition of a single type, reserving more land for the residents to enjoy and providing a wide diversity of housing types from which to choose.

The proper density of each type of dwelling is very difficult to choose. For every conservation, higher density is used widely on the site because of an abundance of steep slopes and vegetation. If the density is too low, it will result in high costs of land development, increased outlay for operating utility services, and long travel distances. On the contrary, if too high, it will result in low livability in terms of air, light, and open space. Therefore, reasonable densities for dwelling types on the site are listed below:

| <u>Dwelling Types</u> | <u>Dwelling Units/Per Acre</u> |
|-----------------------|--------------------------------|
| Single-Family         | 1 - 3                          |
| Duplex                | 5 - 7                          |
| Complex               | 8 - 12                         |
| Apartment             | 16 - 18                        |

#### B. Open Space System

There are basically three functions which open space serves:

1. It can meet positive human needs-both physically and pschy-  
chologically. 2. It can enhance and protect the resource  
base: the air, water, soil and plants. and 3. It can affect  
economic development decisions.<sup>28</sup>

For the site development, open spaces are kept well bet-  
ween the different types of land use according to these three  
functions as listed above. In areas developed for one or two  
family houses, where each family will own or rent an individual  
plot of land, the land devoted to residential services will  
normally be the dwelling lots. These will include the front,  
back and side yards used for driveways and private gardens.

In areas developed for multi-family dwelling units, where  
the surrounding open space is used in common by all families,  
these will include also the land used for parking areas, play-  
lots for small children and landscaped areas serving the resi-  
dnetial structures.

Areas developed for multi-use facilities, such as play-  
grounds, parks, and playfields, are placed on the central part  
of the site. Also, residential areas of the four different  
dwelling types contain open space, playground or playfield  
areas.

On the site, the lakes will be the major open space system,  
located on the east and west of the site. The east lake is  
surrounded by a hotel, shopping center and offices. The west

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<sup>28</sup>William I Goddman, Principles and Practice of Urban  
Planning. (Washington: International City Managers' Asso-  
ciation, 1968). pp. 187.

near the north of the site is overlooked by a high density residential area. The other one, on the west and close to the south of the site, plays a double role as part of a park and as the separation between park and residential areas. This lake provides the visitor of the park and the residents a good view and fresh air.

### C. Circulation System

#### 1. Vehicular Circulation

Fundamentally, vehicular circulation will follow existing countours, leading around each type of land use, not through them. Also, vehicular circulation goes around streams and valleys.

In order to avoid many potential traffic hazards, the streets are layed out in a way that discourages high speeds, discourages nonresidents from using the site as a shortcut, and avoids bisecting large open areas.

Cul-de Sacs and loops are used for providing safe access to and from homesites in small housing groups.

#### 2. Pedestrian Circulation

The purpose of the pedestrian circulation is to lead in an unbroken ribbon from residents to school, major open space areas and community facilities and also creating a safe area for childrens play. It is possible to design for the pedestrian system in a way that will not only be utilitarian, but

also be attractive. Some trails will overlook the lakes, view valleys, or other scenic areas.

Steps will be avoided when possible. Ramps, for easy change in grade will be used, as they make the transition easier for wheelchairs, as well as elderly residents. High density housing in steep areas would use mechanical sidewalks (escalators) instead of steps where the slope is over 25%.

At major crossroads, if possible, underpasses or overpasses will be provided to ensure safety from vehicular traffic.

#### D. Estimated Population on the Site

##### PROPOSED:

| Persons/<br>Unit | Acres | Units | Type          | Dwelling<br>Density | Units/Acre<br>Avg. Density |
|------------------|-------|-------|---------------|---------------------|----------------------------|
| 4                | 430   | 860   | Single Family | 1 - 3               | 2                          |
| 3.5              | 45    | 270   | Duplex        | 5 - 7               | 6                          |
| 3                | 140   | 1,400 | Complex       | 8 - 12              | 10                         |
| 3                | 45    | 765   | Apartment     | 16 - 18             | 17                         |

Formula: (Persons/Unit) X (Acres) X (Avg. Density) =  
Dwelling Units/Acre

##### EXISTING:

| Persons/<br>Unit | Acres | Units | Type          | Dwelling Units/Acre<br>Density |
|------------------|-------|-------|---------------|--------------------------------|
| 4                | 45    | 45    | Single Family | 1                              |
| 3.5              | 40    | 240   | Multi-Family  | 6                              |

Formula: (Persons/Unit) X (Acres) X Density (Units/Acre)

## Proposed population:

|                |   |     |   |       |         |     |         |
|----------------|---|-----|---|-------|---------|-----|---------|
| Single-Family: | 4 | X   | 2 | X     | 430     | =   | 3,440   |
| Duplex         | : | 3.5 | X | 6     | X       | 45  | = 945   |
| Complex        | : | 3   | X | 10    | X       | 140 | = 4,200 |
| Apartment      | : | 3   | X | 17    | X       | 45  | = 2,295 |
|                |   |     |   |       |         |     |         |
|                |   |     |   | Acres | Persons |     |         |
| Total          | : |     |   | 606   | 10,880  |     |         |

## Existing Population:

|                |   |     |   |       |         |    |       |
|----------------|---|-----|---|-------|---------|----|-------|
| Single-Family: | 4 | X   | 1 | X     | 45      | =  | 180   |
| Multi-Family   | : | 3.5 | X | 6     | X       | 40 | = 840 |
|                |   |     |   |       |         |    |       |
|                |   |     |   | Acres | Persons |    |       |
| Total          | : |     |   | 35    | 1,020   |    |       |

## TOTAL POPULATION ON THE SITE

$$\begin{aligned} &\text{Proposed Population} + \text{Existing Population} \\ &= 10,880 + 1,020 = 11,990 \end{aligned}$$

A total of 745 acres on the site are to be developed as residential areas and the total population including the children will be approximately 11,990 persons for the study site.



## CHAPTER VII

## DESIGN CONSIDERATIONS

A. Residential Areas

## 1. Lotting

## a. Lot Lines

- Should be at approximately right angles to the street or radial to a curved street.
- Normally should be straight.
- Avoid odd shaped or pie-shapped lots.
- Streets that intersect at acute angles should be avoided.

## b. Lot Size

- is a function of the customary zoning ordinance.
- lot depth should be about twice its widths.
- varies throughtout the country.
- corner lots may be required to have extra width so as to have appropriate building setbacks from both streets.
- varies among the types of dwelling units.

The lot size for each type of housing on the site, according to the densities are set as follows:

| <u>Dwelling Type</u> | <u>Lot Size</u> | <u>Density</u> |
|----------------------|-----------------|----------------|
| Single-Family        | 150X300         | 1              |
|                      | 100X200         | 3              |
| Duplex               | 65X100          | 7              |
| Complex              | 25X100          | 12             |
| Apartment            | ---             | 18             |

c. Building Lines

- Building setbacks, depending on the street right of way, ranging from 15 feet to 50 feet.
- A 25 feet setback is the minimum requirement of Riley County's Zoning Ordinance for the front and rear yards.

2. Housing Arrangements

a. Single-Family and Duplex Houses

The placement on highest part of the site for single-family will be more popular than placing single-family housing in lower areas of the site. Not only can residents get a good view, but they also can have a quite and safe place to enjoy their family life.

The duplex houses are placed on the steep slope on the south part of the site. This arrangement will place duplex houses facing the Kansas River.

b. Complex Houses

Houses with more than two units are called complex houses. These houses are placed on the gentle slopes in the north west of the site that connects to the north east areas with its existing multi-family housing.

The proposed buildings of the project are arranged in a series of five to ten units and in an irregular pattern. By clustering groups of houses, open spaces are produced which link up with the major open space

system of the site. In order to have a convenient access to the open space, the houses are designed as two-story buildings with rear gardens.

### c. Apartments

All the apartment types are placed on the steepest areas of the site and centered around the community facilities, school and commercial areas. Maximum height is three stories, usually consisting of two to three units.

The designed density for apartments is made higher than that of single-family, duplex, and complex housing, by laying the houses layer by layer from the bottom of the valley to the hill tops. The spacing between apartments is also considered in terms of adequate light and air, which are basic human requirements. 30 feet is set as the minimum spacing for apartments.

## 3. Streets and Parkings

### a. Criteria of Street Design:

- Based on maximum of 25 MPH in speed.
- Major R.O.W. width is 80 feet.

| <u>Local Street</u> | <u>Single-Family</u>           | <u>Multi-Family</u> |
|---------------------|--------------------------------|---------------------|
| - R.O.W. width      | 60                             | 60                  |
| - Pavement width    | 30                             | 30                  |
| - Curbs             | Straight                       | Straight            |
| - Cul-de-sac        | 1000 feet<br>maximum lenth     | 500 feet            |
| - Turn around       | 40 feet minimum<br>curb/radius | 50 feet             |

b. Parking

1. Single-Family

- A private garage or space, with private driveway, will be provided.
- No less than two parking spaces per dwelling unit.

2. Duplex

Two spaces per unit will be provided and parking will be handled by the following parking types:

- In a garage or carport adjacent to the house.
- Underground parking..

3. Complex Houses

Two spaces per unit will be provided and parking is provided in the front or rear of the complex houses.

4. Apartments

- One and one-half parking spaces per apartment unit will be provided.
- Additional spaces for guest parking will also be provided.
- Underground parking is the major type for the apartment.
- Streets will not be used for parking.

B. Commercial

Existing highway commercial areas provide convenience stores for the immediate needs of the residents.

The hotel and shopping center and offices on the east of the site are placed facing the major lake, also located along I-77.

This kind of strip pattern allows the site to connect well with downtown Manhattan and will enhance the relationship between them. Because these areas have good access to I-77 and are the flatest areas of the site, parking can be provided efficiently without any construction problems.

C. Design Data

| <u>Type of Uses</u>   | <u>Acres</u> | <u>% of Total Site</u> |
|-----------------------|--------------|------------------------|
| Residential           | 745          | 61.3%                  |
| Highway Commercial    | 32           | 2.6%                   |
| Offices               | 55           | 4.5%                   |
| Hotel/Shopping Center | 20           | 1.7%                   |
| Hospital              | 10           | 0.8%                   |
| Community Center      | 13           | 1.1%                   |
| Church                | 5            | 0.4%                   |
| Park                  | 85           | 7.0%                   |
| School                | 12           | 1.0%                   |
| Roads                 | 115          | 9.5%                   |
| Open Spaces           | 123          | 10.1%                  |
| Total                 | 1,215        | 100.0%                 |

## CHAPTER VIII

## GENERAL DEVELOPMENT PLAN

A. Master Plan (Figure 30)

Using the process of site planning, together with the site planner's ideas, concepts and design considerations, we can obtain a final plan to fulfill the design program.

Generally, in the master plan, there is a major concern about how to utilize the land well because of land situated in different slope situations: level, gentle or steep.

Major considerations for land use Placement:

- a. Parks, the school, church, community center and hospital are placed in the center of the site.
- b. Commercial uses of land are placed along highway 177.
- c. Semi-public buildings are to be placed on the level areas.
- d. Residential buildings are placed on gentle and steep slopes.



Figure 30: Master Plan

B. Sanitary Sewer Plan (Figure 31)

The proposed sewage treatment plant will be constructed at the lowest elevation which is located on the Kansas River along the northwest part of the site.

There are three major sewer mains on the site:

- a. Along highway 177, serving the residential areas located along both sides of the highway.
- b. Along the longest stream, which is the lowest elevation through the site. It serves the entire eastern section of the site.
- c. Along Ashland Bottom Road, serving the western section of the site.





Figure 31: Sanitary Sewer Plan

C. Storm Sewer Plan (Figure 32)

Surface drainage was utilized wherever possible. This was accomplished by locating all residential development on higher elevations. Collector roads were placed along ridge-lines wherever possible to reduce the amount of overland water draining into the streets, thus providing positive drainage. Curb cuts are utilized wherever possible to allow overland flow into existing swales and reduce the amount of subsurface drainage needed.

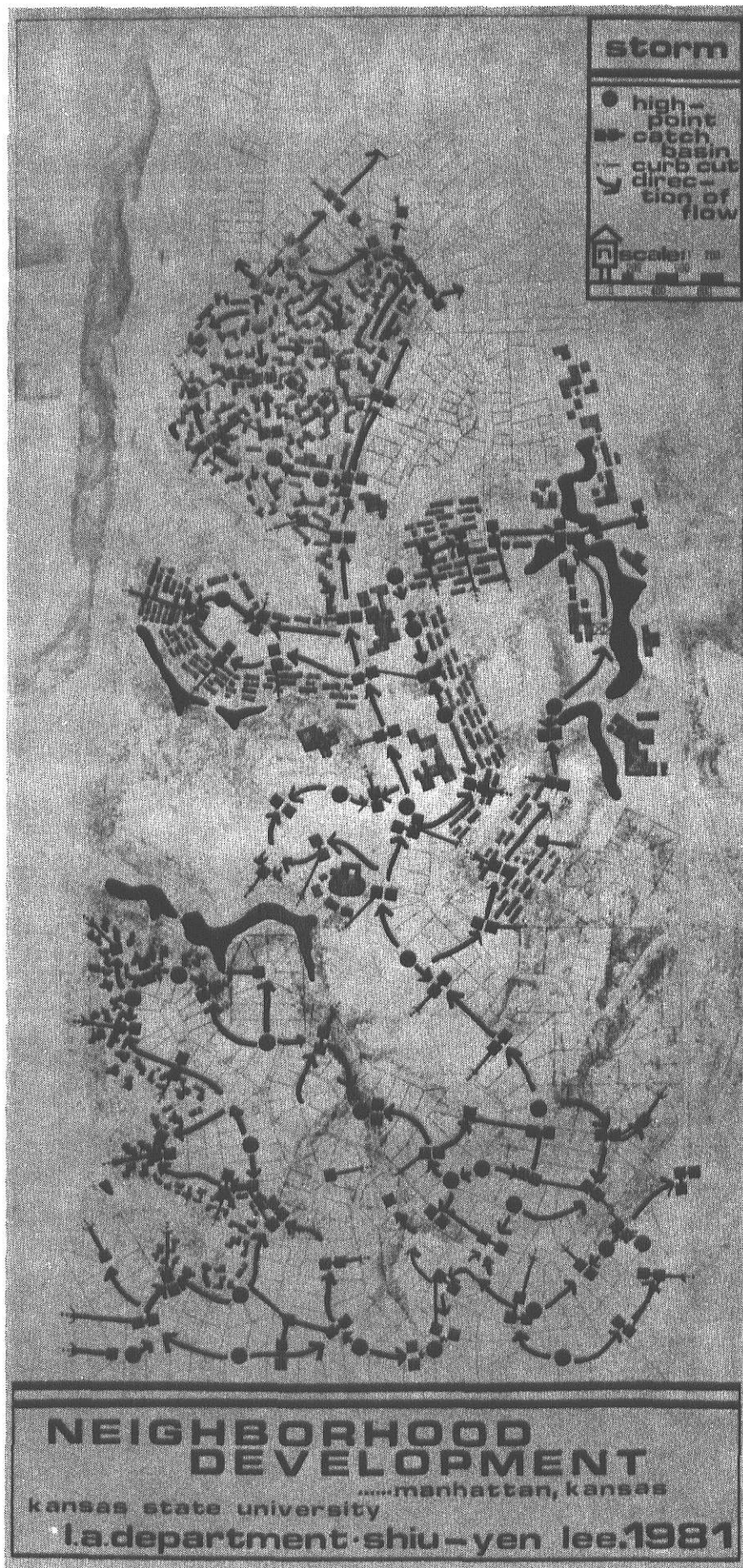


Figure 32: Storm Sewer Plan

## CHAPTER IX

### PROTOTYPE

A primary form and pattern to be used was selected on the center of the site (Figure 33 and Figure 34). This prototype will provide a major design concept exploring housing developed on steep areas. In Taiwan, there is not enough housing for the people because of a shortage of land relative to too many people, so, this prototype will help designers to solve Taiwan's problem.

#### A. Description

The apartments are placed on steep and sloping sites to face the lake and public facilities are placed on the flat area on the top of the hill. (Figure 35).

#### B. Planning and Design Considerations

##### 1. Arrangement:

The apartments will be divided into three groups and be regarded as three small neighborhood units. (See Figure 36)

Public facilities - tennis courts, swimming pool and baseball field, are the major recreation areas serving residents in this area. For providing more convenience,



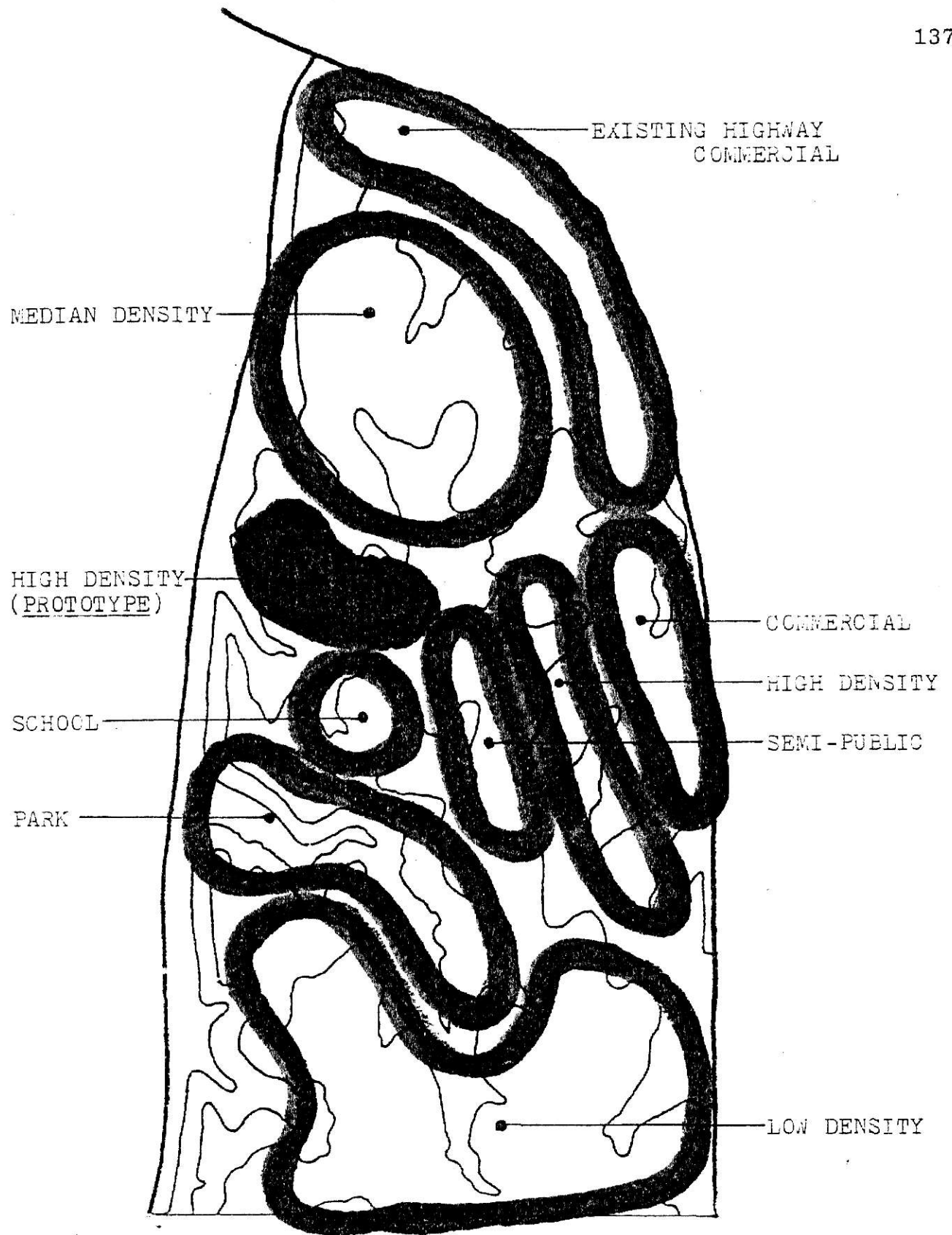
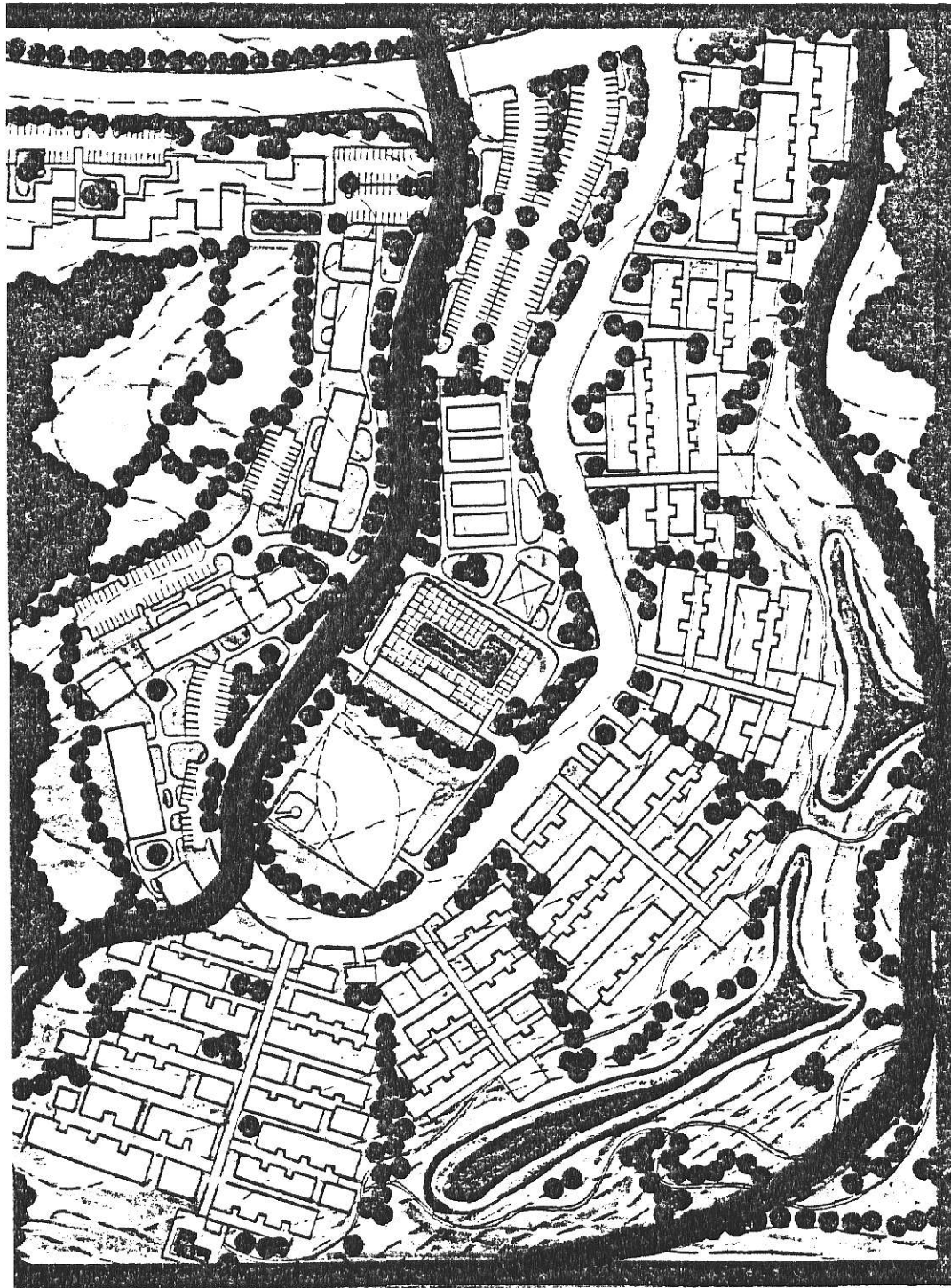


Figure 33: Location of Prototype



•TOTAL  
POPULATION  
(1428)

•TOTAL ACRES  
(28)

•TOTAL UNITS  
(476)

•SERVICE PARKING  
(140)

•UNDERGROUND  
PARKING  
( 800)

•ACTUAL UNDER-  
GROUND PARKING  
NEEDED  
(714)



Figure 34: Boundary of Prototype

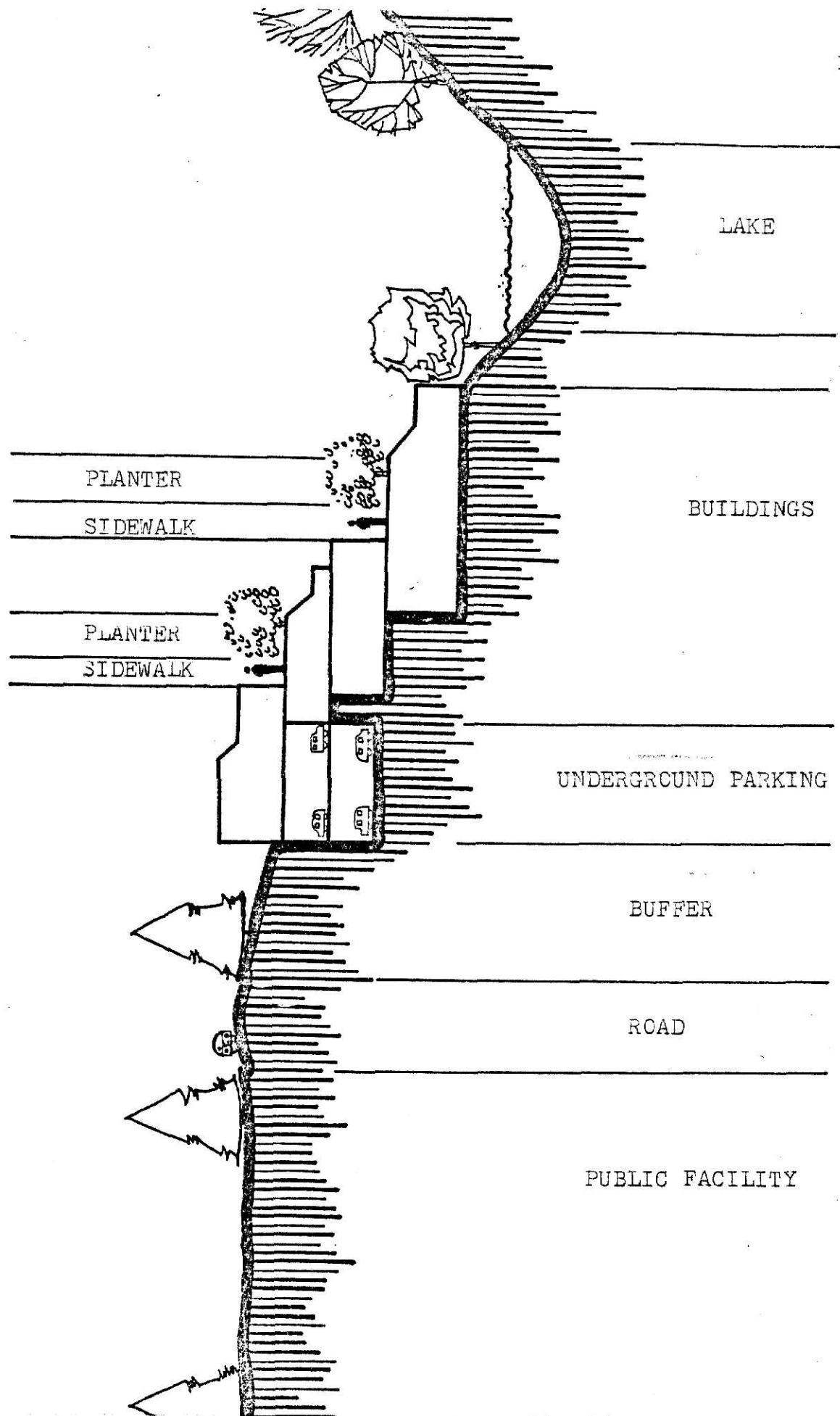


Figure 35: Elevation of Prototype

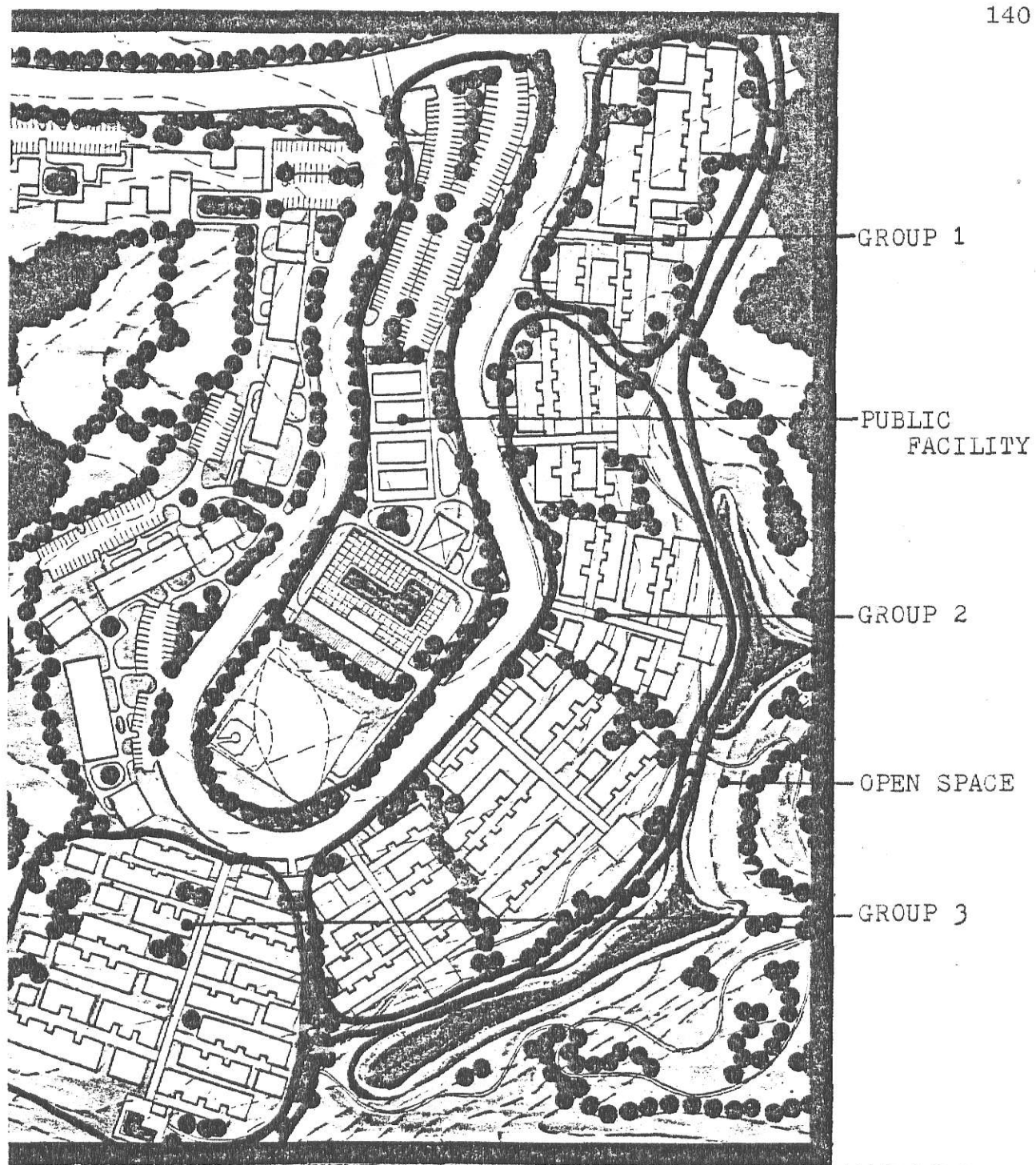


Figure 36: Groups on Prototype



residents in group 1 and group 3 will have their own swimming pools as recreation centers. Retail stores are placed in the center of these three unit groups, and are also close to the public facilities. (See Figure 37)

## 2. Circulation: (Figure 38)

- Major road provides major circulation leading out of this area to highway 177.
- The east of the site is the community center. Crosswalks are placed between service parking and the community center.
- Service parking will be used to serve people in three directions as below:
  1. people going to the community center.
  2. guests visiting residents of the apartments.
  3. people using the public facilities of this area.
- Underground parking is placed under the apartments with six entries.
- Escalators are the major feature carrying people to their apartments. There are joints between the escalators for providing more interest and the joints are also considered to be the entrance-exit for going out of the escalators. (Figure 39)

The design concept for the site is adapted from the Tahara'a Hotel on Tahiti Island. The difference is the transportation system carrying the people on the top of the hill to the bottom of the valley. Elevators are the means for transporting people to different levels of the hotel and escalators are provided for this purpose on the prototype of the site. Figure 40 shows a photograph of the Taraha'a Hotel.

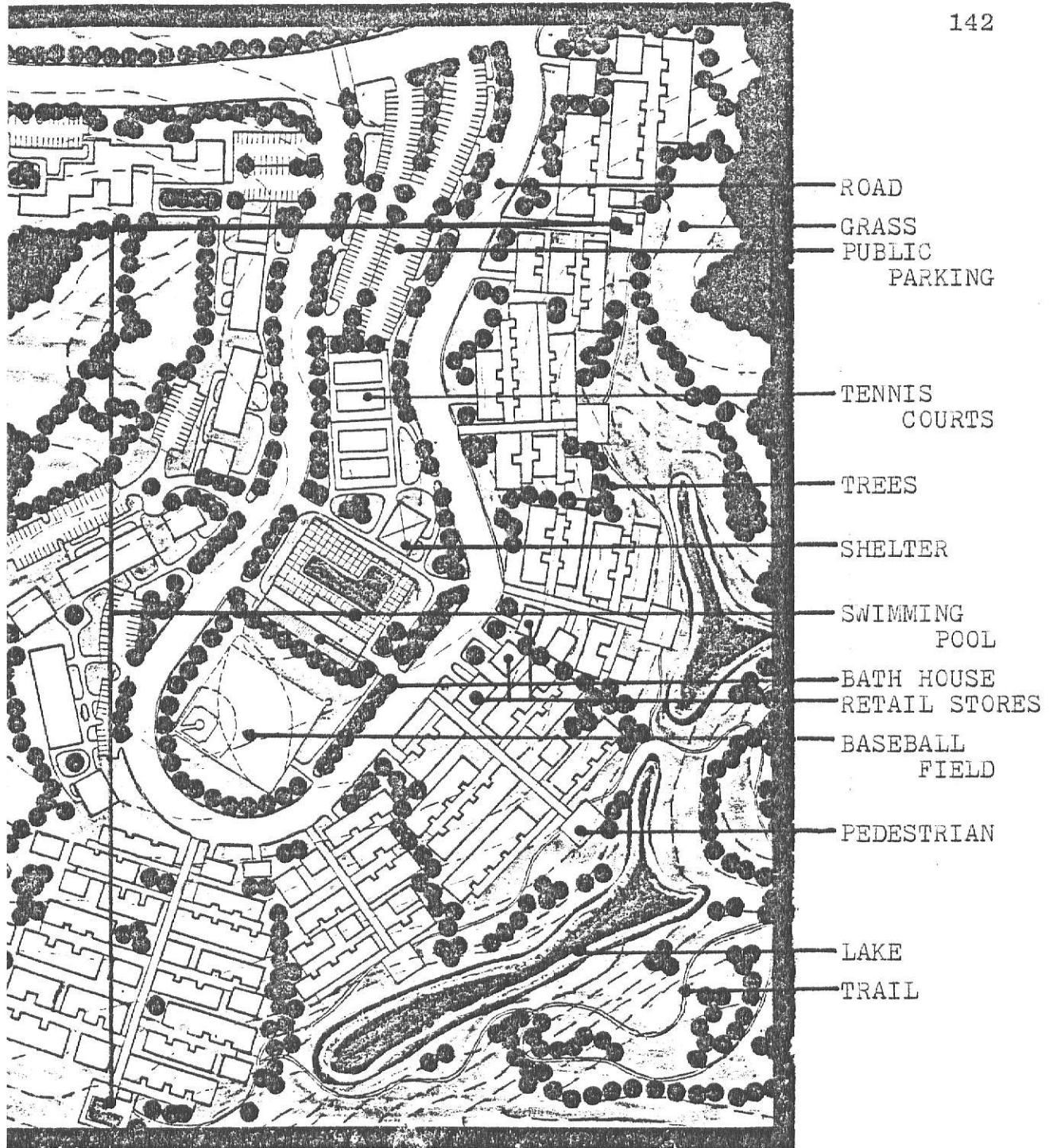


Figure 37: Type of Land Use

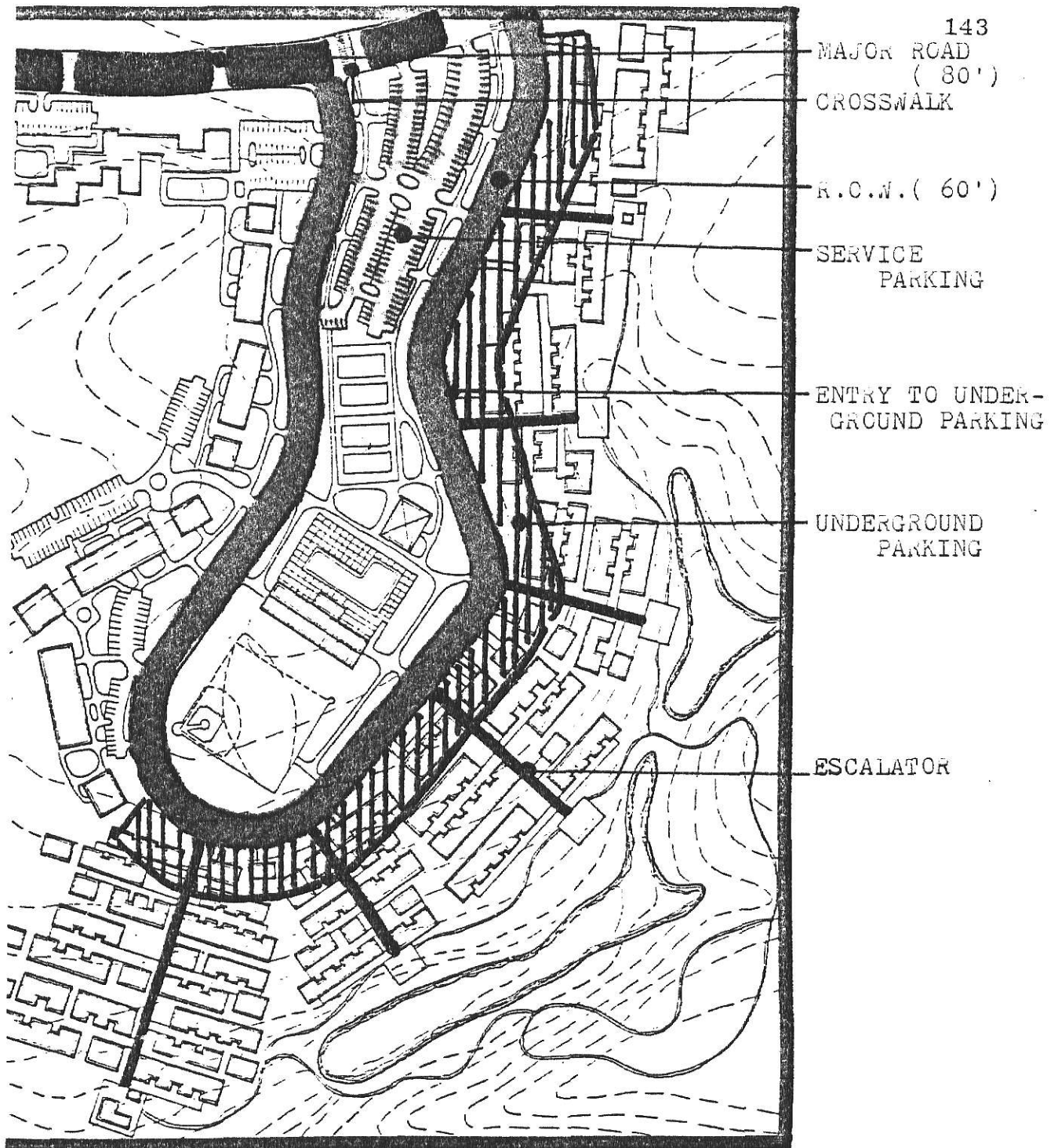


Figure 38: Circulation

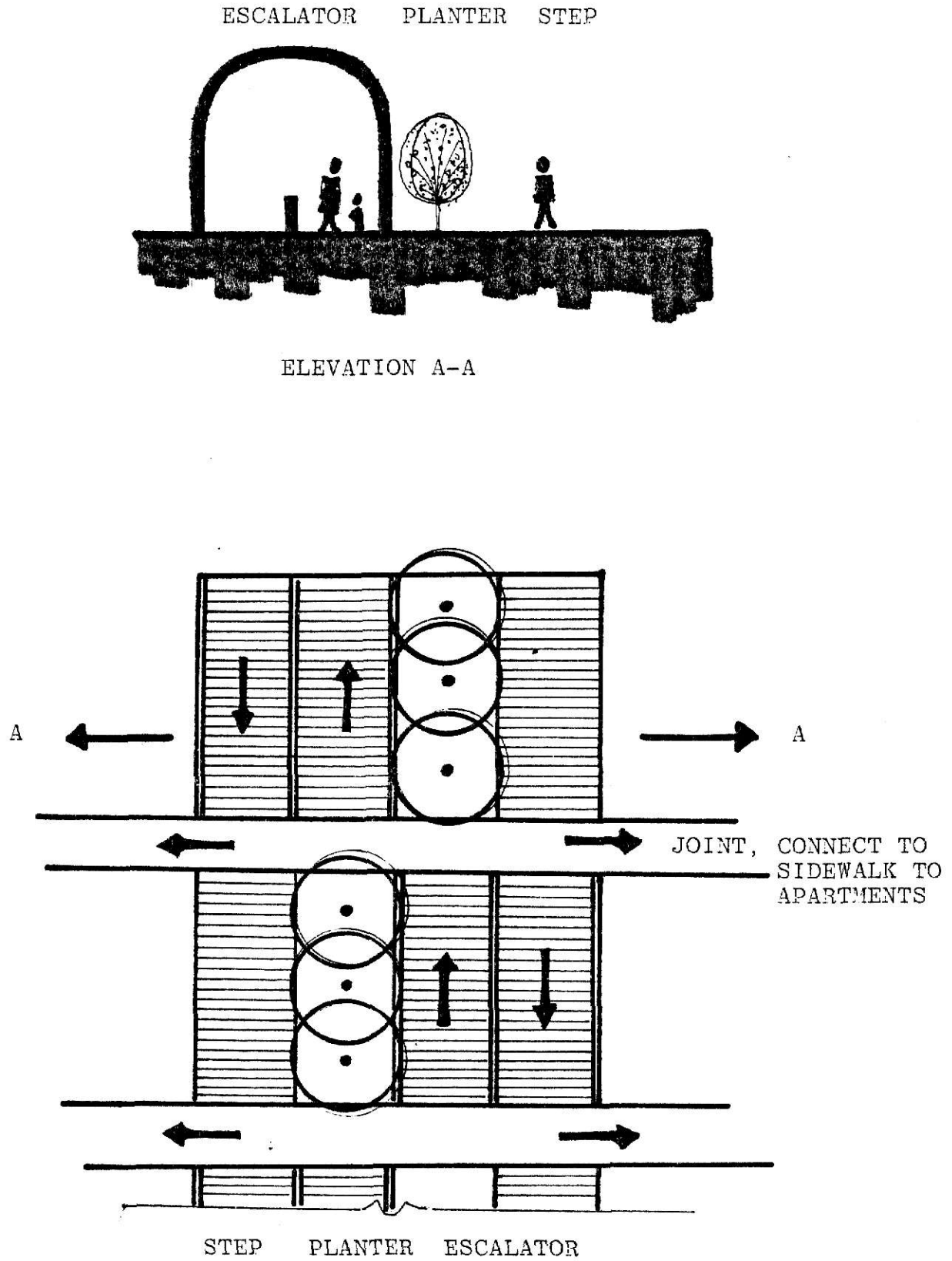


Figure 39: Design of Outdoor Escalator

TAHARA'A (De luxe) — P.O. Box 1015 — Papeete  
Cable address: TAHARAAHOTEL, Phone: 8 11 22

201 air-conditioned rooms overlooking historical Matavai Bay. In Mahina, 6 miles east from Papeete, 9 miles east from airport. Black sand beach, travel desk, drugstore, beauty parlor, barber shop, restaurant, grill room, snack bar, cocktail lounge. Swimming pool, trap shooting, tennis courts. Tahitian musicians and dance. Dance orchestra.

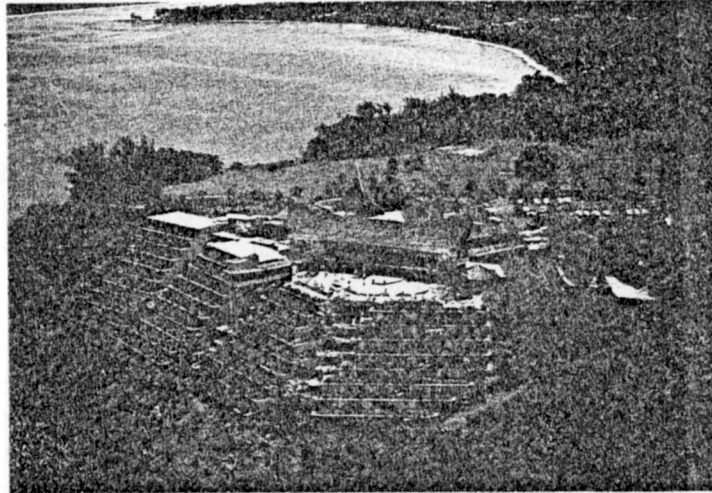


Figure 40: Photograph of Tahara'a Hotel

If we apply the design of the Tahara'a Hotel to the study area, the result will be an arrangement similar to that shown in figure 41.

Comparison of the two alternative arrangements:

|                       | <u>Alternative 1</u><br><u>Figure 35</u> | <u>Alternative 2</u><br><u>Figure 41</u> |
|-----------------------|------------------------------------------|------------------------------------------|
| Units                 | Less Units                               | More Units                               |
| Open Space            | More Open Space                          | Less Open Space                          |
| Transportation        | Escalator<br>(20% - 40% slope)           | Elevator<br>(over 40% slope)             |
| Vision of Residential | Good                                     | Fair                                     |

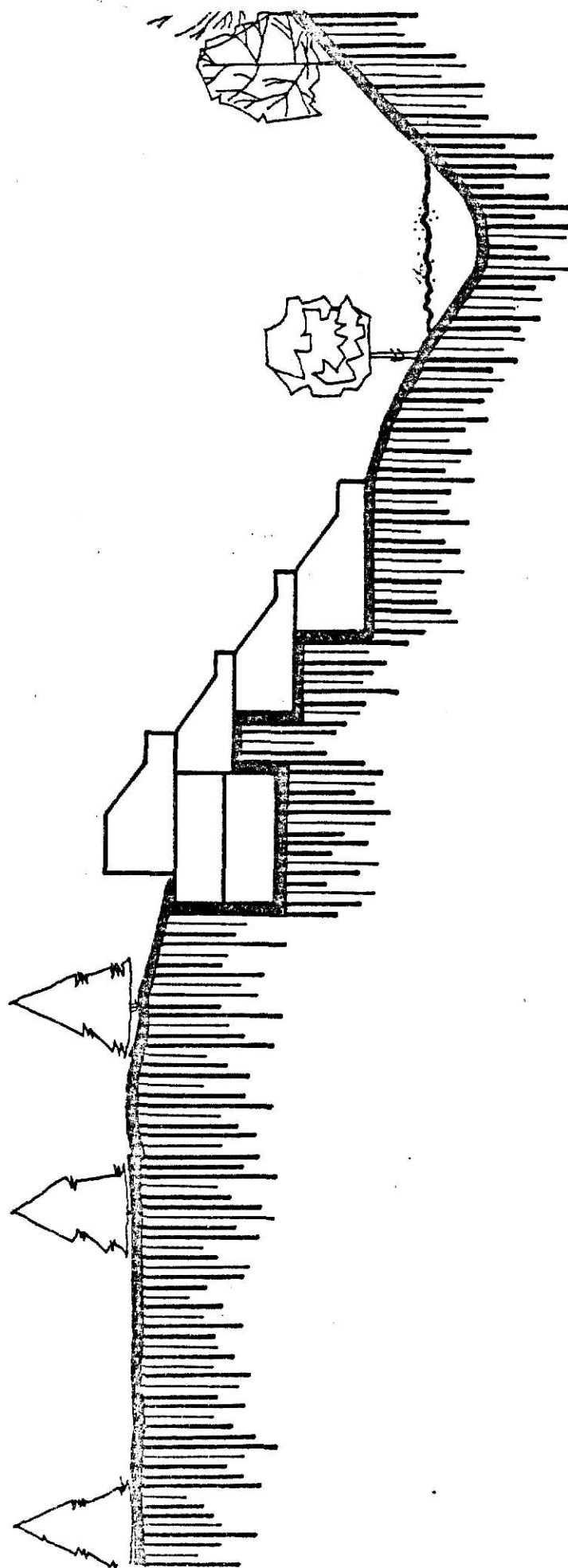


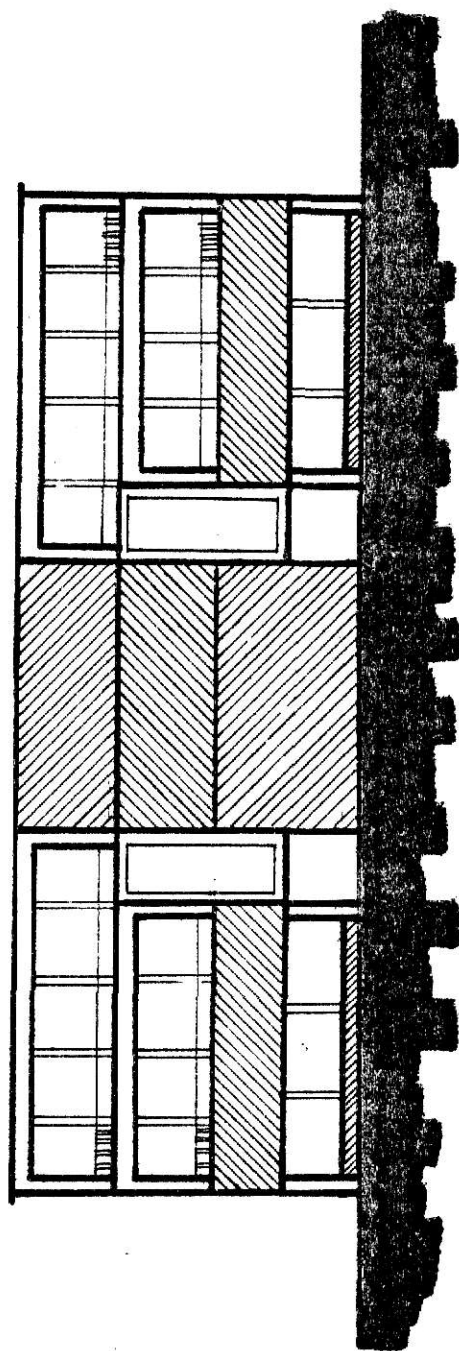
Figure 41: Elevation of Compact Prototype (Building Arrangement)

Both alternatives could be used in Manhattan, but it is better to use alternative 2 in Taiwan to catch up with the population growth. Alternative 1 is to be chosen as the major arrangement type of apartments on the site. The reasons for choosing alternative 1 are 1. To match with the density of Manhattan. 2. To provide open space between the apartments considered to be very important for human environment.

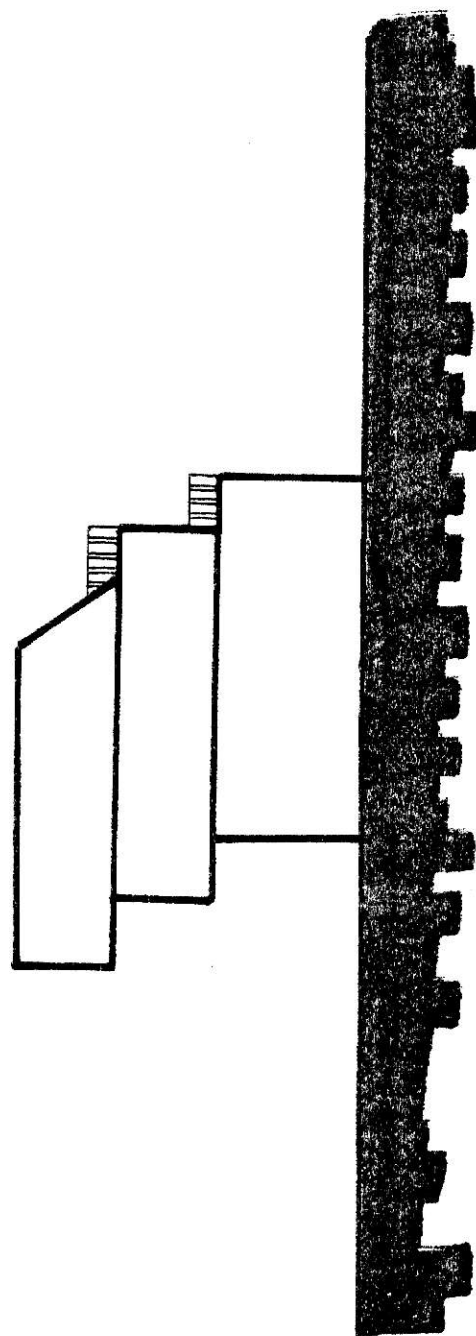
### C. Design Data for the Prototype

|                                          |   |                                                               |
|------------------------------------------|---|---------------------------------------------------------------|
| Dwelling units/acre                      | : | 17                                                            |
| Total acres                              | : | 28                                                            |
| Persons/unit                             | : | 3                                                             |
| Total population                         | : | 1,428 (17 X 28 X 3)                                           |
| Total units                              | : | 476 (17 X 28)                                                 |
| Total service parking                    | : | 140 parking stalls                                            |
| Total underground parking                | : | 400 (one story)<br>800 (two story)                            |
| Actual underground parking spaces needed | : | 720 parking stalls<br>(1.5 cars/unit X 476 total units = 720) |



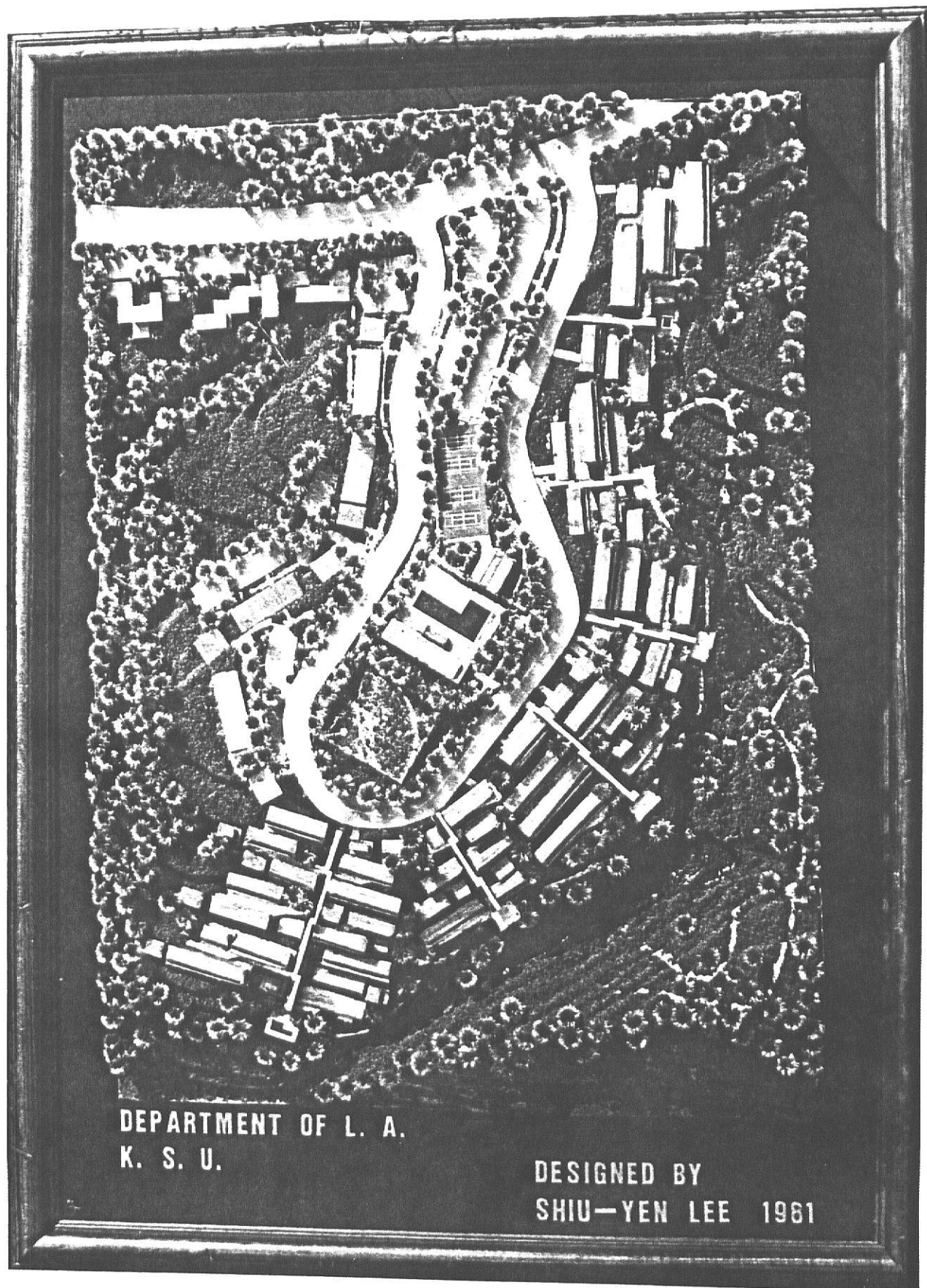
D. Typical Apartment Structures

BUILDING FACADE



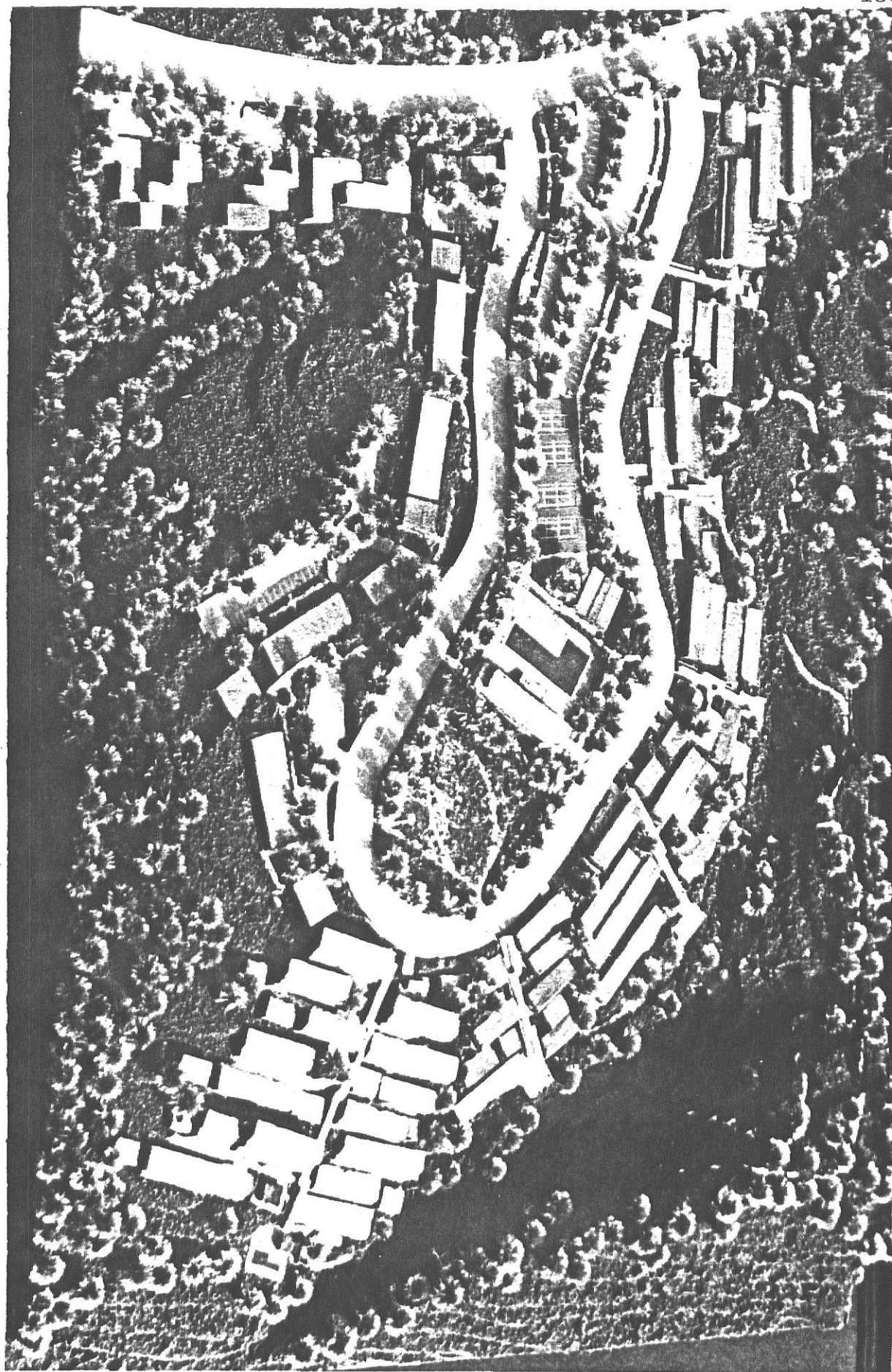
SIDE VIEW OF BUILDING

#### E. MODEL PRESENTATION FOR THE PROTOTYPE

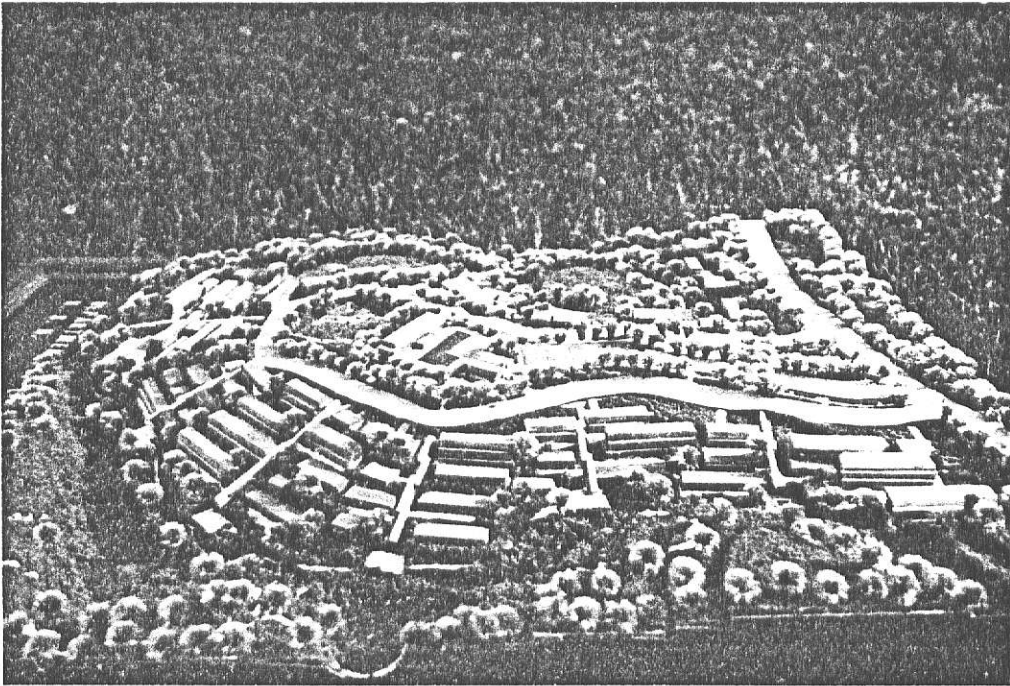
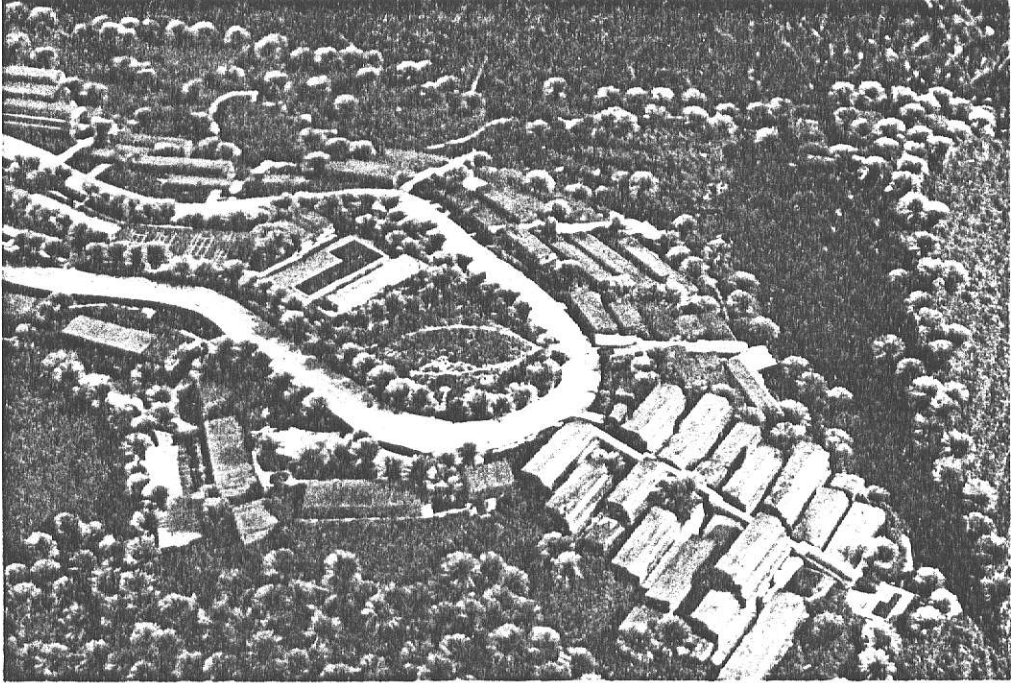


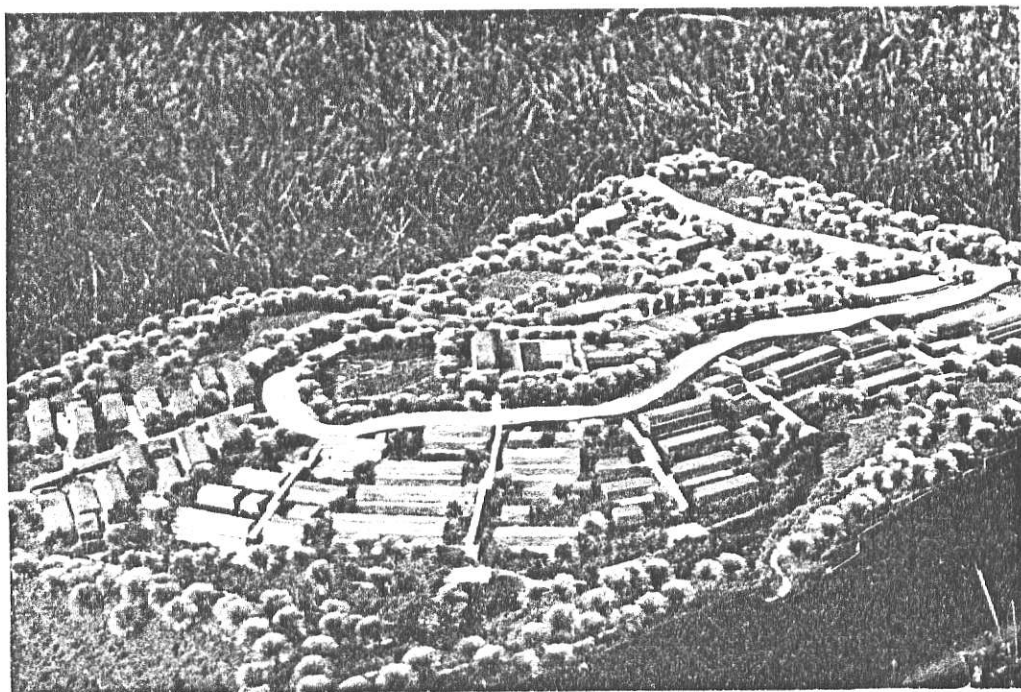
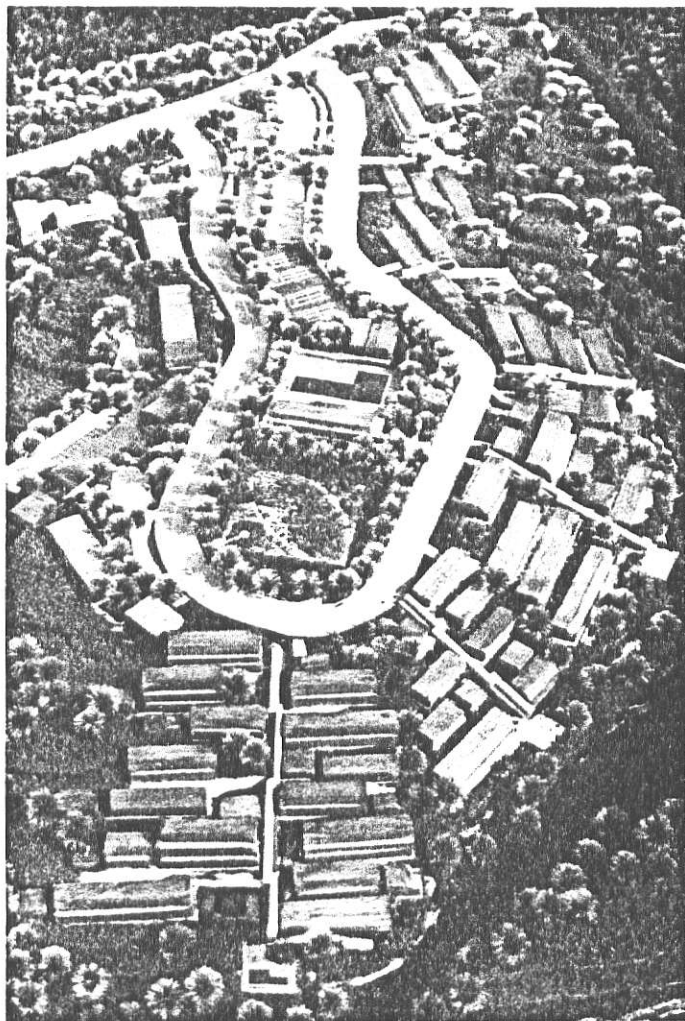
DEPARTMENT OF L. A.  
K. S. U.

DESIGNED BY  
SHIU-YEN LEE 1961









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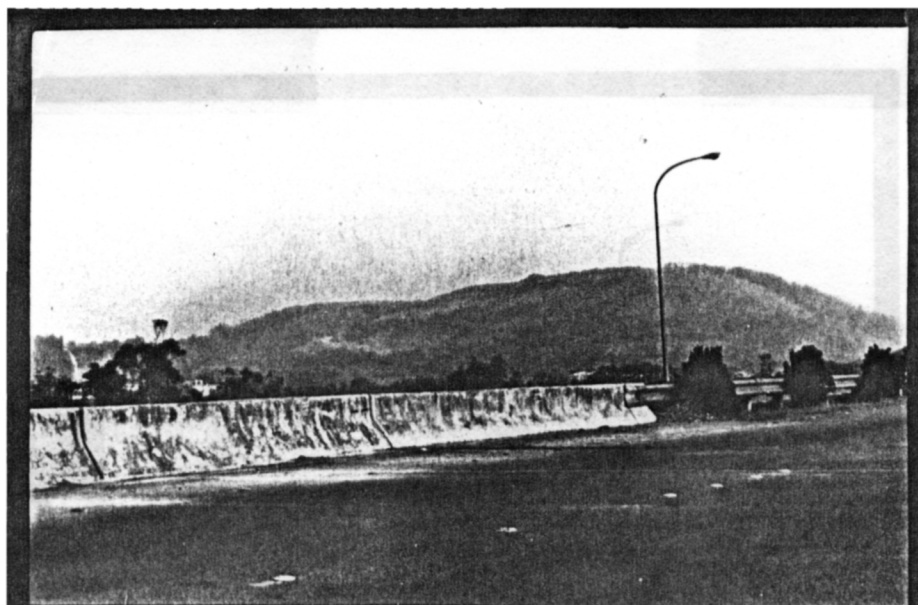
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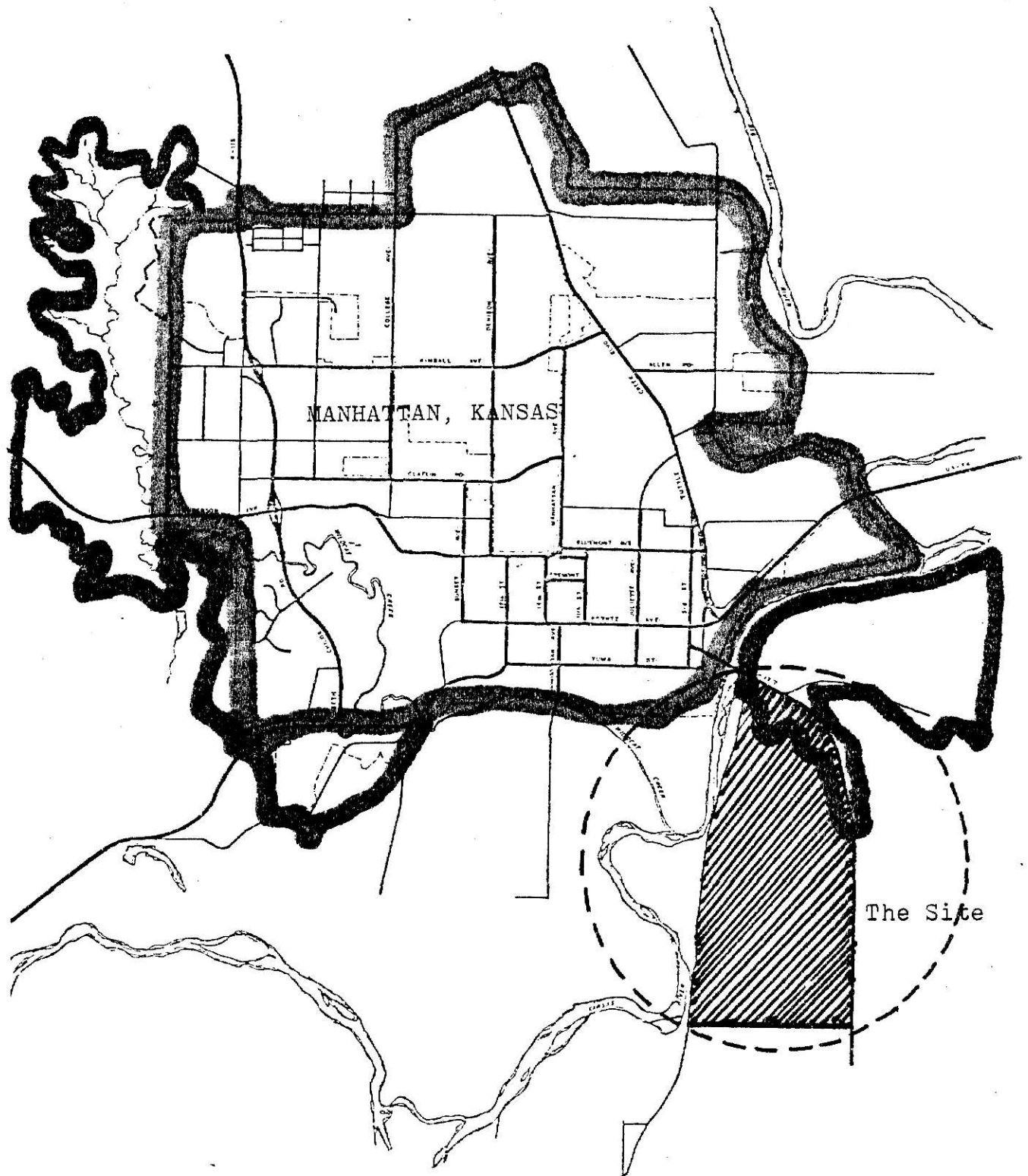
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## APPENDICES

## Appendix I: Site Situation in Taiwan



## Appendix II. Site Location in Manhattan



### Appendix III. Detailed Geological Description of Manhattan Site

#### 1. Quaternary System

Pleistocene Series - The Pleistocene Series is represented in this area by terrace deposits and the Sanborn formation. These sediments are unconsolidated, non-marine in origin, and were deposited by wind, streams or mantle creep. The Sanborn formation formed by the wind occurs on the tops of most of the interstream areas and along some of the valley sides. The stream-deposited terrace sediments are present along all of the major streams and some of their tributaries and are usually restricted to the stream valley.

1. Terrace Deposits - The Terrace deposits are composed of materials laid down by present-day streams in earlier cycles of deposition. These deposits are predominantly red-brown to dark-gray silt and clay that tend to be sandy in some areas. Some chert and limestone gravels occur in the basal part of the deposit. The terrace materials tend to stand in vertical banks. The thickness of these deposits average about 10 feet in this area.

2. Sanborn formation - The Sanborn formation occurs on the crests of interstream areas, along the margins of the terraces of the larger streams, in the valleys of their tributaries and also on the limestone benches at various levels above the streams.

The Sanborn formation consists of materials deposited by wind, slopewash, streams and through the action of soil or mantle creep. This formation is predominantly gray-brown to red-brown silt and clay with some chert and limestone gravels in the basal part. The thickness of the formation ranges from 2 feet on the crest of the interstream areas to some 20 feet in the larger valleys and averages about 10 feet.

Permian System = The Permian system consist of, in descending order, the Guadalupian, the Leonardian and the Wolfcampian series. Only those rock units of the Wolfcampian series crop out. The Wolfcampian series is divided into three groups which are, in descending order, the Chase, Council Grove and Admire.

- a. Chase Group - The Chase group is the uppermost group of formations in the Wolfcampian series.

Wreford Limestone Formation - The Wreford limestone is composed of the schroyer limestone member in the upper part, the



Havensville shale member in the middle, and the Threemile limestone member in the basal part. The average thickness of this formation is about 36 feet.

b. Council Grove Group - The Council Grove Group is the middle group of formations in the Woldcampian series. This group is composed of the Speiser shale down to the Foraker limestone.

1. Speiser Shale Formation - Speiser shale outcrops are invariably associated with those of the Threemile limestone. This shale forms the nearly vertical slope between the limestone benches formed by the Threemile limestone above the Funston limestone below.

The Speiser formation is a silty, calcareous and vari-colored shale, although in some places the formation is entirely tan, gray and olive-drab zones. The average thickness of the Speiser shale is about 16 feet.

2. Funston Limestone Formation - Outcrops of Funston limestone are associated with those of the Speiser shale and forms a hillside bench just below the prominent terrace formed by the Threemile limestone bench.

The Funston limestone is generally soft, massive, argillaceous and weathers blocky to porous. The limestone is gray to light gray and weathers tan-gray. The average thickness of the formation is about 9 feet.

3. Blue Rapids Shale Formation - Although the outcrops of the Blue Rapids shale tend to be associated with those of the Speiser shale and Funston limestone, it is found to crop out on top of some of the lower interstream areas.

The Blue Rapids shale is a silty, calcsareous and thin-bedded shale that is light gray to gray-brown to tan with a vari-colored zone at the base. The average thickness of the shale is about 25 feet.

4. Crouse Limestone Formation - Outcrops of the Crouse limestone are generally associated with those of the Blue Rapids shale. The upper unit of the Crouse limestone forms a broad, flat, hillside bench.

The Crouse formation consists of two limestones, the upper being very thin-bedded, platy limestones with numerous thin shale partings, whereas the lower limestone is massive. The limestone in general is hard, dense, weathers blocky to platy, and is gray to brown and weathers tan-gray. The average thickness of the Crouse limestone is about 16 feet.

5. Easley Creek Shale Formation - The Easley Creek shale is almost invariably associated with the Crouse limestone but does crop out with the Bader limestone on some of the lower valley slopes.

The Easley Creek formation is predominantly a silty, calcareous shale that is tan to gray in the upper part while the middle is gray-green to gray and maroon at the base. The shale is thin-bedded to blocky. A thick, hard, massive, tan-gray limestone occurs in the upper part of the Easley Creek formation. The average thickness is about 20 feet.

6. Bader Limestone Formation - The Bader limestone is composed of the Middleburg limestone member in the upper part, the Hooser shale member in the middle, and the Eiss limestone member in the lower part. The average thickness of this formation is about 22 feet.

7. Stearns Shale Formation - The Stearns shale crops out generally on the valley slopes of the interstream areas. It is generally associated with the cottonwood limestone below.

The Stearns formation is mostly a silty, calcareous, gray to olive-drab shale that weathers light gray to tan. It is thin-bedded to blocky and thin beds of shaly limestone occur in the middle part. The Stearns shale is unfossiliferous and its average thickness is about 15 feet.

8. Beattie Limestone Formation - The Beattie limestone is composed of the Morrill limestone member in the upper part, the Florena shale member in the middle, and Cottonwood limestone member in the lower part. The average thickness of the formation is about 15 feet.

9. Eskridge Shale Formation - The Eskridge shale crops out beneath the Cottonwood limestone in some places but also crops out on valley slopes above the Neva limestone where the Cottonwood limestone is absent.

The Eskridge formation is predominantly a calcareous shale, silty in some zones and clayey in others, and vari-colored. The upper part is tan, gray and green with maroon, purple, green and tan-gray zones constituting the lower three-fourths of the formation. There is a persistent, thin bed of hard, massive, argillaceous and tan limestone in the upper part of the formation. The average thickness is about 35 feet.

10. Grenola Limestone Formation - The Grenola limestone is composed of the Neva limestone member in the upper part, the Salem point shale member in the middle, and the Burr limestone member in the lower part. The average thickness of the formation is about 33 feet.

11. Roca Shale Formation - The Roca shale tends to crop out on the lower valley slopes. It is sometimes associated with the Burr limestone.

The Roca shale formation is a silty and clayey, calcareous and vari-colored shale. A persistent bed of thin, hard limestone occurs near the top. The Roca shale is the lowermost of the vari-colored Permian shales. Its average thickness is about 15 feet.

12. Red Eagle Limestone Formation - The Red Eagle limestone is composed of the Howe limestone member in the upper part, the Bennet shale member in the middle, and the Glenrock limestone in the lower part. The average thickness of the formation is about 11 feet.

13. Johnson Shale Formation - The Johnson shale is associated with the Foraker limestone below.

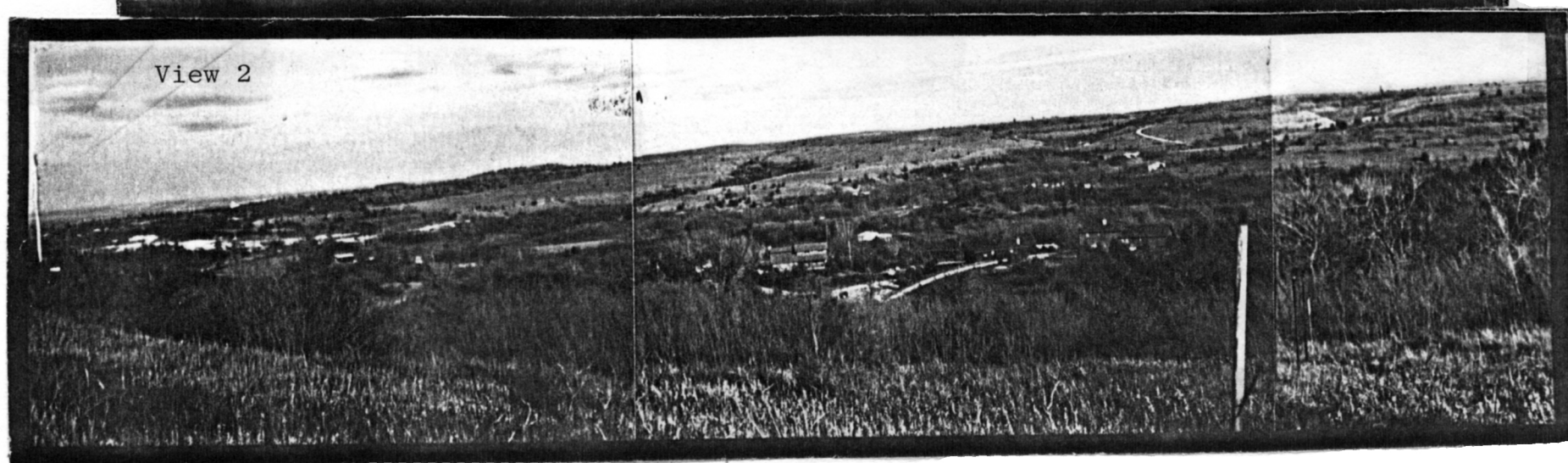
The Johnson formation is a thick, silty, calcareous, gray-green to olive drab shale that contains numerous thin calcareous lenses and limestones. It is thin-bedded to blocky and unfossiliferous. The average thickness of the formation is about 25 feet.

14. Forker Limestone Formation - The Forker limestone is composed of the long Creek limestone member in the upper part, the Hughes, Creek shale member in the middle, and Americus limestone member in the lower part. The average thickness of the Foraker formation is about 45 feet.

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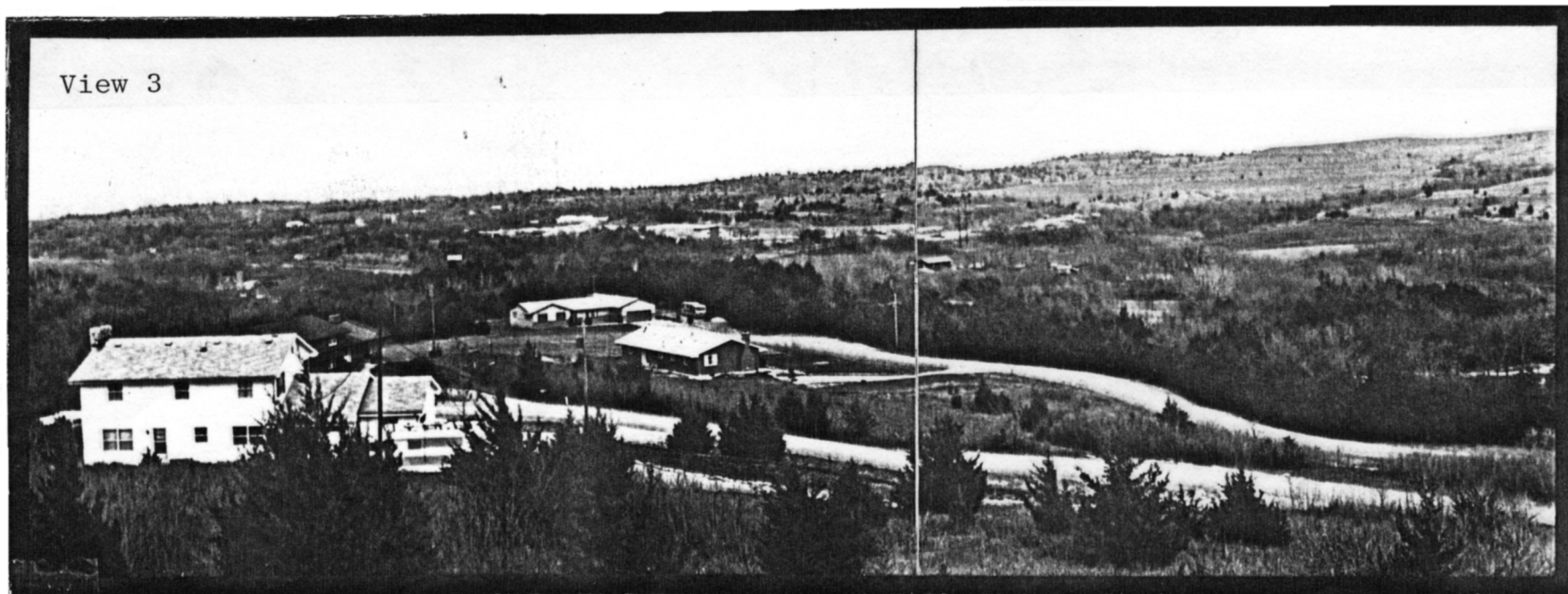
Source: M.A. Gassaway, "Surface Expression of the Nemaha Anticline in South-east Riley County, Kansas, 1959.  
pp. 14-31.

#### Appendix IV: Site Situation in Manhattan





View 3



View 4



Appendix V: Housing Type in Manhattan, Kansas (1960 and 1970)

---

| 1960<br>Owner |            | 1960<br>Renter |            |
|---------------|------------|----------------|------------|
| 1             | 2,660      | 1              | 1,067      |
| 2 or more     | 783        | 2              | 863        |
| Trailer       | <u>184</u> | 3 and 4        | 817        |
| Total         | 3,627      | 5 to 9         | 328        |
|               |            | 10 or more     | <u>159</u> |
|               |            | Total          | 3,238      |

| 1980<br>Owner  |            | 1970<br>Renter |           |
|----------------|------------|----------------|-----------|
| 1, attached    | 17         | 1, attached    | 929       |
| 1, detached    | 3,357      | 1, detached    | 31        |
| 2              | 495        | 2              | 928       |
| 3 and 4        | 176        | 3 and 4        | 963       |
| 5 or more      | 99         | 5 to 9         | 752       |
| Mobile Home or |            | 10 to 19       | 679       |
| Trailer        | <u>335</u> | 20 to 49       | 361       |
| Total          | 4,479      | 50 or more     | 98        |
|                |            | Mobile Home or |           |
|                |            | Trailer        | <u>82</u> |
|                |            | Total          | 4,828     |

| 1970<br>Vacant for Rent |           |
|-------------------------|-----------|
| 1                       | 143       |
| 2 to 4                  | 61        |
| 5 to 9                  | 34        |
| 10 or more              | 20        |
| Trailer                 | <u>28</u> |
| Total                   | 286       |

---

Total Year round units for 1970 in Manhattan - 9,763

Source: 1970 Census of Housing



Appendix VI. Net Housing Demand, Manhattan, Manhattan Urban  
Area and Riley County (1967 - 2000) in Units

| Source of Demand                                      | Manhattan                     | Manhattan<br>Urban Area | Riley County<br>(Total in County) |
|-------------------------------------------------------|-------------------------------|-------------------------|-----------------------------------|
| New Housholds                                         | <sup>2</sup> 4,000 -<br>5,000 | <sup>1</sup> 5,800      | 6,800                             |
| New K.S.U. Students<br>(Living in Private<br>Housing) | <sup>2</sup> 1,000 -<br>2,500 | <sup>1</sup> 2,500      | 3,000                             |
| Vacancy Factor                                        | <sup>2</sup> 100 - 200        | <sup>1</sup> 200        | 200                               |
| Total                                                 | <sup>2</sup> 5,100 -<br>7,700 | <sup>1</sup> 8,500      | 10,000                            |

Source: 1. Oblinger-Smith, Planning Consultants, 1968.  
2. The actual location of new construction, within the city or without, is to a degree a matter of policy - particularly in the case of student housing. The range shown here illustrates likely possibilities.

Note: This table refers to a net housing demand. The figures do not include new units needed to replace existing units which may be destroyed or demolished through natural causes or through redevelopment programs.

## Net Housing Demand by Type, Manhattan Urban Area

(1967 - 2000)

| Type of Units |              | No. of Units Projected |
|---------------|--------------|------------------------|
| Single-Family | 8,500 X 75%  | 6,375                  |
| Apartments    | 8,500 X 25%  | 2,125                  |
| Total         | 8,500 X 100% | 8,500                  |

Source: Oblinger-Smith, Planning Consultants, 1958.

SITE PLANNING AND DEVELOPMENT FOR  
A NEIGHBORHOOD UNIT IN MANHATTAN, KANSAS

by

SHIU-YEN LEE

B.A. College of Chinese Culture, 1977

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AN **ABSTRACT** OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF LANDSCAPE ARCHITECTURE

Department of Landscape Architecture

KANSAS STATE UNIVERSITY

Manhattan, Kansas

1981

The level sites in Taiwan are used up and Taiwan Planners are thinking about developing housing on steep sloping sites to keep up with population growth. Developing a neighborhood unit, on a steep, sloping site in Manhattan, Kansas, is to be used as an example which we can apply to sites in Taiwan or any other site with similar conditions.

This study involves the preparation of a general development plan for a neighborhood unit which is conceived as a multi-purpose neighborhood of housing, employment, and service for about 8,000 to 15,000 people on a 1,215 acre site south east of Manhattan, Kansas.

This study scope is:

1. Concept of site planning
2. Concept of a neighborhood unit
3. The site
4. The planning of the site
5. The planning concept
6. Design considerations
7. The general development plan
8. Prototype

Through the site planning process, one can arrive at a planning and design concept. After a concept is established, a general development scheme for this site will be prepared to fulfill the program.

The purpose of this study is:

1. To acquaint people who are not familiar with the concept and procedure of site planning.
2. To furnish a method for those who are interested in or working on site planning and design development.
3. To show how site planning is applicable to sites in Taiwan and provide the products of this study to Taiwan Planners for consideration as a guide to further development in Taiwan, recognizing that densities may need to be higher in Taiwan.

The object is to set up a process for site planning of a neighborhood unit with this knowledge which would best serve the needs of City Planners in Taiwan.

The results will serve as a starting place for considering what comprises can be made so that the majority of the people using the area will have a valuable experience. Hopefully, this study can serve as an educational tool for examining the complexity of human land use in a small and valuable area.