A CASE STUDY EVALUATION OF CLUSTER DESIGN IN RESIDENTIAL DEVELOPMENT

by

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CHAPTER I

INTRODUCTION

Since World War II Americans in overwhelming numbers have rushed to the suburbs to establish their modern-day homesteads. They have, in the main, come anticipating the enjoyment of the much promoted amenities of semi-rural living -- the freedom from congestion and the uncluttered beauty of the natural country side. They have settled, however, in sterotyped subdivisions where nearly identical houses stand on nearly identical plots of ground under a canopy of absolutely identical telephone and electric utility poles and wires. But at least they were on the edge of the countryside and close to the sought-after environment. More often than not, by the next year they are observing this countryside also fading from view as the adjacent land is decimated by the next subdivision built for the next wave of suburbanites.

The suburban home owner is now in an interesting situation. He has, from the outset, lost most of the amenities for which he has and is paying dearly. He pays in several ways. These include the high cost of his new home and the proportionately higher costs of "special assessments" to pay for the often uneconomical lengths of streets, sewers, and water supply systems which his low density area demands.

The direct cost of his additional automobile is in the long run probably less an expense than the many hours which he gives commuting back and forth to work. He bears an increased tax load as his share of the costs of providing new schools and municipal services in a suburban community whose only tax base is the homeowner. Millions of Americans have demonstrated their acceptance of these costs -- only to see the environment they are paying for disappear as the bulldozers continue to work.

The broad view history of residential land design in the United States is easily discernible by looking at a street map of practically any long established city or town in the country.

Except where extreme topography has dictated otherwise, the housing areas in the central part of the city are characterized by a rigid rectilinear street pattern enclosing a double row of deep narrow lots. This once utilitarian design persisted through custom long after the need to keep outdoor privies and horses as far from the house as possible had vanished. The higher density of houses of the era (demanded by the constraint of walking distances before the automobile) did result in rather efficient service by public utilities as technology advanced. And, without question, the symmetry of the system simplified the work of abstractors, surveyors, and the like.

On the traffic engineering side, however, making all the streets straight and of the same width encourages their use by fast through traffic and truck traffic which should not go through residential areas. Thus, in the last fifteen years, for asthetic reasons, and in an effort to discourage fast traffic the gridiron has been replaced with curvilinear street patterns in new development throughout the country. The speed with which this change swept the country is of interest. Figures 1 and 2 illustrate as well as any the two basic designs.

These photos also point out very graphically that the curvilinear street system in itself does very little to relieve the mechanical monotony of the gridiron system. The lots may be larger and better shaped but still all the land is used with none left open. Ironically, in older sections of cities, built before land prices became so high, parks close to housing areas are fairly common. This situation is, unfortunately, seldom true in modern suburbia.

By the late 1950's suburban community governments were acutely aware of their problems, and, encouraged by those home owners still on the fringe, began to attempt to stifle growth by making it more and more expensive. The device was large lot zoning. The idea was that with a very large minimum lot requirement the high cost of land and utilities would prevent many people from buying. New people would then simply have to go somewhere else to live. It soon became apparent that this device did not work in the long run. The press of an exploding and affluent urban population was too great.

In the words of William Whyte:

> "Large lot zoning was not keeping the subdivisions in check; it was making them chew up more and more of the landscape. This not only looked like hell, it was proving costly for the community to service."[1]

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[1]William H. Whyte, Cluster Development (New York: American Conservation Association, 1964), P. 11.

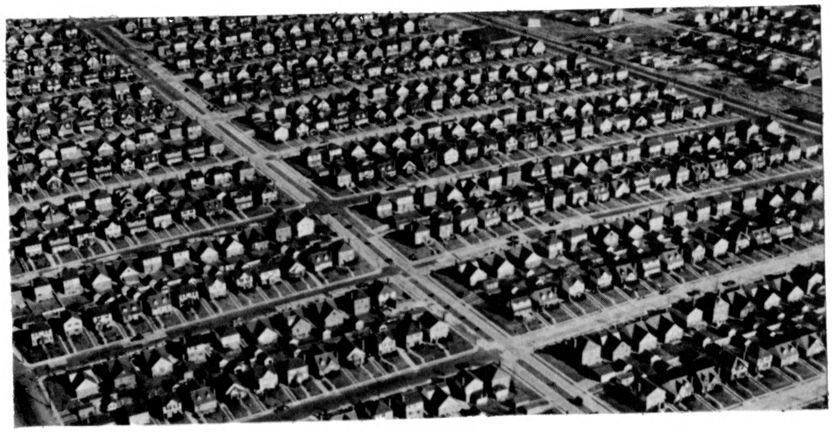

FIGURE 1

An Example of the Gridiron Pattern

FIGURE 2

An Example of the Curvilinear Pattern

On the developer's side also the conventional pattern of subdivision design has become increasingly difficult to handle. The soaring price of land and the costs of improving it are becoming a larger and larger proportion of total housing costs. In certain areas, in the last five years, developers have been on the verge of pricing themselves out of the market. From their standpoint one solution would be to squeeze in more houses, but minimum size lot zoning will not allow them to use this solution. Therefore, the dilemma becomes apparent; the traditional system of subdivision design not only destroys the environment, it is also very costly for all concerned -- the homeowner, the general public, and the developer.

In 1960 the Urban Land Institute authorized five separate studies to be made into the field of residential development. The program has been largely implemented by the publishing of T.B. 40[2] in Jan. 1961, T.B. 47[3] in Dec. 1963, T.B. 52[4] in May 1965, and T.B. 57[5] in Jan. 1967. In addition T.B. 50[6], 1964 covers a closely

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[2] Harman, O'Donnell & Henninger Assoc., Inc., New Approaches in Residential Land Development: A Study of Concepts and Innovations: Technical Bulletin 40. (Washington D.C.: Urban Land Institute, 1961).

[3] Harman, O'Donnell & henninger Assoc., Inc., Innovations vs. Traditions in Community Development: A Comparitive Study in Residential Land Use: Technical Bulletin 47. (Washington D.C.: Urban Land Institute, 1963).

[4] Jon Krasnowiecki, Richard F. Babcock, and David N. McBride, Legal Aspects of Planned Unit Residential Development: Technical Bulletin 52. (Washington D.C.: Urban Land Institute, 1965).

[5] Carl Norcross and Sanford Goodkin, Open Space Communities in the Market Place: Technical Bulletin 57. (Washington D.C.: Urban Land Institute, 1966).

[6] Byron R. Hanke and Others, The Homes Association Handbook: Technical Bulletin 50. (Washington D.C.: Urban Land Institute, 1964).

related subject. One last study to complete the series will deal with comparative engineering costs for various subdivision design schemes; it is still to be published. The first two studies created a great deal of interest across the country. Virtually all writers on the new trends in residential design have made reference to them.

On the surface the problem seems most difficult. How can one reconcile the need for higher density to hold down cost with the need for more open space for a better environment? A closer look at today's curvilinear subdivisions begins to suggest an answer. Many areas of wasted spaces are revealed. For example: side and front yards which take up valuable space but are so sized and offer so little privacy that they are largely unsuccessful for either utilitarian or astheitc purposes. Practically every subdivision on other than perfectly flat ground is plagued with some grossly over-size lots because of difficult terrain features. Even on level ground, arbitrary curving of streets within straight sided section line land parcels in itself creates odd shaped and wasteful lots.

The apparent best answer to the dilemma, generally referred to as <u>cluster design</u>, is really a re-emergence of an old principle which in simplest terms says:

> Group the houses closer together on the most buildable portions of the area and combine the space saved into common greens.

This definition can cover a broad range of development from separate detached houses on only slightly smaller lots, to attached houses in the form of duplexes, to townhouses, to multi-story housing units, or even to apartement towers surrounded by large expanses of park areas.

In theory, the problem seems to be solved. The dwelling units will now be more densely placed and will require shorter street and utility connections. In addition, these denser groupings are located on the most buildable terrain lowering the lineal foot/square foot costs of the structures and of the already shorter connecting links, because of reduced grading and excavation costs. The large common green areas which wind through the development are accessible to each residence. These areas, when properly designed, are large enough to be utilized for safe play areas, pedestiran and bicycle paths, and offer long, unobstructed sight lines for visual enjoyment from each dwelling unit. In most cases the more unbuildable areas are the most asthetic so there is little conflict between these two objectives; i.e., preservation of the best of the natural landscape and keeping the development costs at a reasonable level.

It is possible to find examples of the general cluster building principle as far back in history as one wishes to look. Many examples before modern times, however, were devised as defensive fortifications and have little bearing on the present day problem. The roots of the present concept can be observed in certain early American residential designs in New England where houses were grouped around common greens.

In the late 1920's Henry Wright and Clarence Stein designed, in the plan of Radburn, N. J., the first modern American example of cluster land planning. Basically, they backed the houses up around cul-de-sacks so that they fronted on planted pedestrian areas which opened onto a larger common green area. They might well have set an excellent trend for future residential development throughout the country. But the great depression of the '30's and the World War of the early '40's obscured their excellent ideas.

The unprecedented suburban building boom beginning in the middle '40's pushed forward with no continuation of Radburn's open space preservation ideas. It is interesting to note that in Great Britain the open space principles were used to a very great extent in their New Town Movement following the War. Why then were these ideas so universally ignored in the United States? There were probably several reasons. First, there was the overwhelming demand for shelter upon the return of service men. They needed homes fast and generally took whatever they could get. Naturally, in this kind of market, they often got hastily designed houses in non-professionally planned housing areas. Secondly, unlike any other country in the world, Americans had vast amounts of land available in combination with many automobiles. This combination is still the general situation except that well located land around many urban centers is becoming scarce, and congestion on connecting highways and at destination points is diminishing the distance compensating advantage of the automobile. Third, and ironically, one of the major factors preventing the adoption of new innovations in residential land planning has been our laws. The very zoning ordinances, subdivision regulations and covenants which were designed as protection for the home owner have done much to prevent him from obtaining a better environment. A look at the laws governing a typical subdivision makes this point clear. First, there will be an overall zoning classification which restricts the area to only single family detached homes on a definite minimum sized lot. The accompanying "Subdivision regulations" will state that each of these detached houses must set X number of feet from the street and side and rear lot lines. The minimum width of the street will be set. In addition, the protective covenants may set many other restrictions ranging from minimum floor area, to shape of the roof, to type of ground cover permitted.

The good points of such regulations, notwithstanding, it becomes clear that this type of zoning has placed definite limitations on design innovation and has pre-determined to a large extent the design of the residential area without regard to the topography. This method of control requires an overly strict uniformity of density which often results in complete desecration of the landscape. In the words of Laurance Rockefeller:

> "In a land wasting pattern that has used ten acres to do the work of one, houses on equal spaced lots have been splattered all over the landscape and the streams and woods and hills have been ruthlessly obliterated."[7]

It appears obvious that the standard zoning methods are a definite block to any type cluster development. Happily, in the last two or three years many cities and towns have become aware of

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[7]Whyte, Cluster Development, p. 8.

the possibilites of the cluster idea and have enacted ordinances to allow for them. The usual method is to use density zoning, often based upon the existing minimum lot size zoning ordinances already on the books. If, for example, a developer wishes to develop a parcel of land (generally 20 acres or more), the city gives him a choice of control measures. He may develop the land conventionally under the standard zoning regulations with, for instance, a 15,000 sq. ft. minimum lot. On the other hand, under the new Planned Unit Development or Community Unit ordinance he may be allowed to put his houses on smaller lots as long as the total number of houses does not exceed a certain number. In other words, under the new ordinance, the city may say: "Do not exceed an average density of 2 houses per gross acre on this 40 acre parcel." The developer is then limited to 80 houses, but he may now locate them on small lots and leave the rest of the parcel open, on condition that his overall 40 acre design is approved. Ordinances which contain this essential thought are now coming into use in many parts of the country. They effectively clear away what has previously been a major stumbling block to residential cluster designs.

CHAPTER II

CASE STUDY OBJECTIVES

In an effort to illustrate a cluster design, a parcel of land was selected and developed for residential use. Two basic land design schemes were developed, with variations for each. One design is along traditional curvilinear lines while the other makes use of the cluster principle. The final designs are compared and evaluated against specific design objectives set forth at the outset. The case study designs are intended also to serve as a reference point for somewhat broader discussion of various aspects of cluster development in general. A certain amount of background data on the study area and the design process is included. It is felt that the reader should become familiar with the land and some of the design procedures important in successful land planning.

BACKGROUND AND OVERALL OBJECTIVES

In November, 1966, the Long Range Planning Staff of the City Planning Department of Kansas City, Missouri, published a study dealing with alternate courses of growth for Kansas City North.[1] Their planning area encompasses approximately 400 square miles north of the Missouri River. About half of the area is within the present city limits of Kansas City, Missouri.

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[1] City Planning Department, Kansas City, Missouri, _Alternatives For Growth: Kansas City North_ (Kansas City: City Planning Dept., 1966).

The 231 acre case study site lies within the Kansas City North planning area, and inside the present city limits.

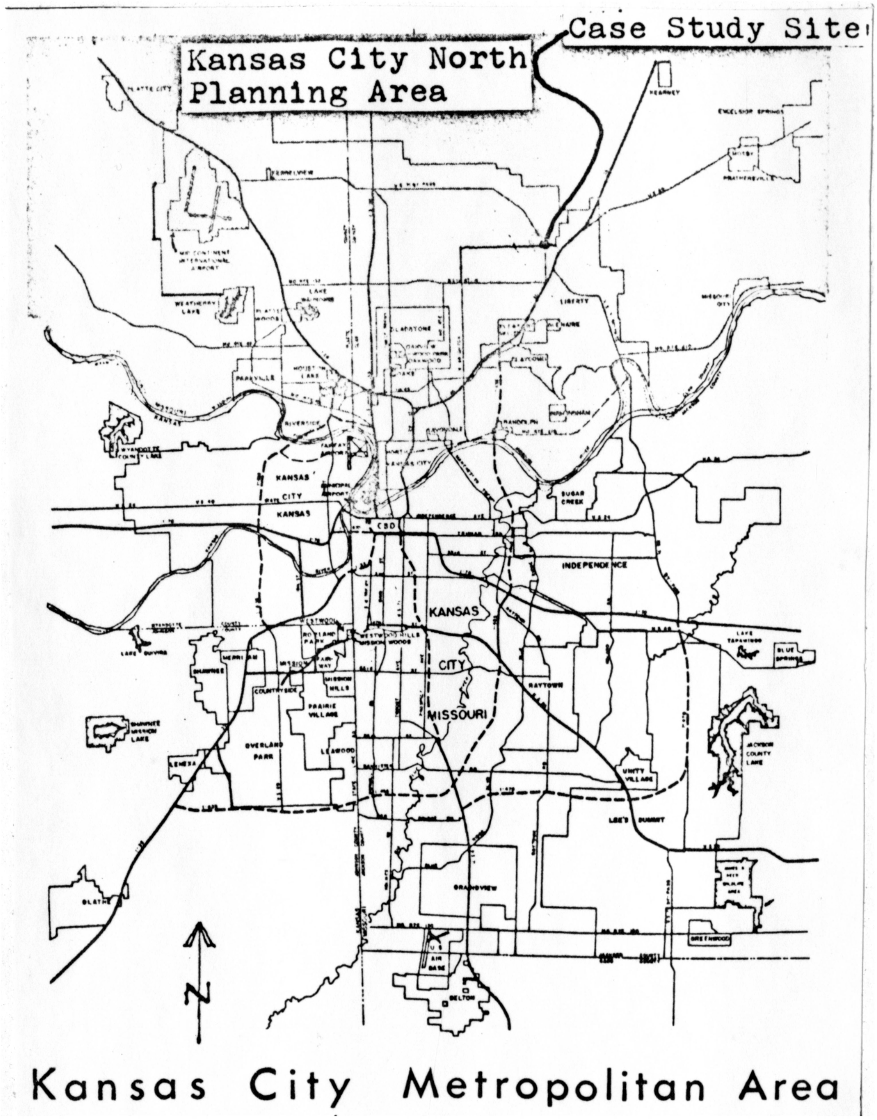

FIGURE 3

Map of Kansas City Metropolitan Area

A complete discussion of the factors affecting the future growth of the northern portion of the Kansas City Metropolitan Area is not within the scope of this study. Information gained from the planning report, from discussions with members of the Kansas City Planning Department, and from independent analysis led to the following conclusions as to the future of the case study area:

1. It is probable that land in the vicinity of and including the case study site will become most feasible for some type of residential[2] development.
2. At this time it is impossible to say definitely what income class of people will wish to live on this site or on its immediate surroundings.
3. There is a definite possibility that, because of the size and diversity of the metropolitan area, the site under study *may* be able to "take its choice" as to what types of people (i.e. age, income level, etc.) it will ultimately serve.

Therefore *overall objectives* of this case study were to:

1. Explore various design possibilities for residential development on the site.

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[2]In the broad sense of the term - to include small commercial services, etc.

2. Compare and evaluate the designs chiefly from an internal standpoint; i.e., determine which type of residential development is best suited to the land in terms of specific design objectives.

In the actual situation, the next step would be subsequently to evaluate the housing and the site designs considering, in the light of time, now evolving <u>external</u> marketing criteria. Only then should the final decision as to which specific scheme to use be made. As an example, if the Liberty, Missouri, area begins to develop as a "prestige" area, this <u>external</u> market factor possibly pointing to single family detached housing would be weighed against possible <u>internal</u> economic advantages of higher density attached units.

SPECIFIC DESIGN OBJECTIVES

In this consideration, as in any other type of design, definite objectives or design goals are required. These objectives were set forth as a first step in the design process and are relied upon as the basic criteria by which to evaluate the final solutions. The correct selection of these objectives and an adequate understanding of their relative importance is necessary for successful design. Certain criteria have been suggested by studies which have questioned the public about environmental factors which are of greatest importance to them. For example, research by William Snaith indicated four common motivations for home buying were, in order: (1) Concern for children, (2) Privacy,

(3) Convenience, (4) Need for individuality.[3] A recent study of 721 homeowners in open space communities by the Urban Land Institute places safety, in terms of separation of pedestrian and vehicles high on the list, along with privacy and convenience.[4] It must be remembered, however, that such studies may be misleading if taken as all inclusive. Most persons in this country, for instance, take essentials such as an adequate sewerage system and a healthful water supply for granted. Obviously the residential designer who did likewise would find himself in serious error.

The following design criteria were isolated. It was considered that the essence of a good living environment and a sound developer investment is contained in the adequate satisfaction of these design objectives:

I <u>MINIMUM COST</u>, consistant with adequate satisfaction of the other design criteria and <u>health and safety code</u> requirements.

A. Development Costs

(1) Streets and Pedestrian ways

(2) Sanitary sewer system

(3) Water Supply System

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[3] William Snaith, "Homebuilding's Happy Future," <u>Business Week</u>, (May, 1967), p. 85.

[4] Norcross and Goodkin, <u>Open Space Communities ...</u>, pp. 5-6.

(4) Storm drainage

(5) Required earthmoving

B. Maintenance Costs

II <u>HEALTH AND SAFETY</u>

A. Sewer and water supply

B. Pedestrian/vehicle separation

C. Protection from dangerous physical features

III <u>VISUAL QUALITY</u>

A. General Aesthetic Appeal

(1) Road locations and view from roads

(2) Dwelling unit sites and view from units

(3) Provision for preservation of selected natural terrain features

(4) Provide framework of spaces for aesthetic development

(5) Provide designating feature at major entrance points to development area

IV <u>FOSTER SOCIAL INTERACTION</u>

A. Provide for individual privacy while fostering social interaction when desired.

V. <u>AREA EXTENSION AND PROTECTION</u>

A. Design so that area may become part of a greater whole, and perhaps influence surrounding development.

B. Consider visual protection (of major views, etc.) so area may function as a successful entity, if necessary.

METHODOLOGY

The design process employed in the development of the cluster schemes generally followed that method advocated by John Simonds.

The process, after the initial site selection, is thought of in terms of:

1. Site Analysis
2. Plan Concept
3. Site Structure Diagram[5]

For this particular study the site analysis relied upon aerial photographs of the site, a topographic survey map made from the aerial photographs, and a personal foot reconnaissance. The topographic survey map and an on-the-site reconnaissance appear to be essential in giving one an adequate knowledge of the site. The aerial photographs, while probably not absolutely indispensible, did prove most helpful. Since most of the topographic survey maps are now made by photographic means, photos are readily available in many metropolitan areas.

A photograph of the visual reconnaissance record, or site analysis diagram, of the case study area is included as figure 4. The actual physical designing was done on top of a topographic survey map, which had been shaded to enhance the relief, with the site analysis diagram and aerial photographs close at hand.

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[5] John Ormsbee Simonds, <u>Landscape Architecture: The Shaping of Man's Natural Environment</u> (New York: McGraw-Hill, 1961), pp. 43-57.

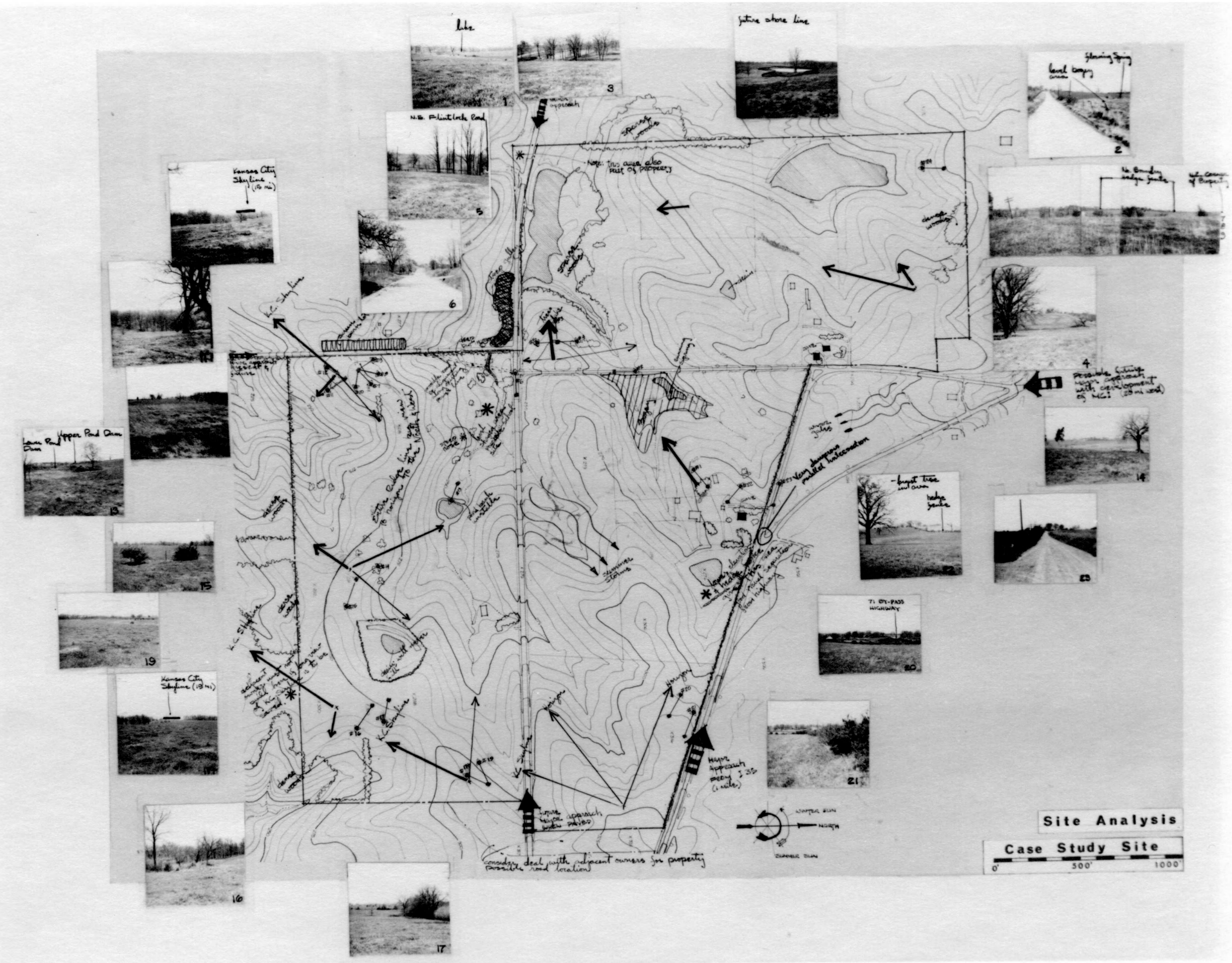
Site Analysis
Case Study Site
0' 500' 1000'
Kansas City Skyline (18 mi)
Upper Pond Dam
71 BY-PASS HIGHWAY

FIGURE 4

With these aids the plan concept evolved as the designer's interpretation of how the physical environment might be used to its best advantage in fulfilling the specific design objectives. The plan concept stage flows rather naturally into the site structure stage as the concept is continually refined and its elements take on the actual sizes and shapes demanded by their functions and, in many cases, the applicable codes and ordinances. In this case the Kansas City Zoning Ordinance[6], and Subdivision Regulations[7] were frequently consulted.

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[6]Kansas City, Missouri, Zoning Ordinance: Chapter 65 Revised Ordinances 1956 as Amended to March 31, 1965, (1965, pp. 5-6, 80-86.

[7]Kansas City, Missouri, Subdivision Regulations: Chapter 67 Revised Ordinances, prepared by City Plan Commission, 1954, pp. 1-11.

CHAPTER III

PLAN PRESENTATION

The following is a presentation of the design schemes which were developed for this study, with some basic discussion and description. Chapter IV contains a more detailed discussion and comparative analysis of the designs in terms of the specific design objectives isolated in Chapter II. In order to obtain a comparison it was intended that each design scheme be a reasonable representation of its basic theory. Both curvilinear designs, for instance, are considered exemplary of the type of subdivision design which is being accepted and has been accepted many times over by developers, city governments, and the buying public in the last 20 years.

PLAN I: CURVILINEAR

The curvilinear development of 461 building lots, represented by figure 5 was designed to meet the requirements of zone R-1 aa, Kansas City Zoning Ordinance. Zone R-1 aa is the lowest density one family dwelling district in Kansas City, requiring 15,000 square feet as the minimum lot area. (The case study site is presently zoned RA-for agricultural uses. Single family dwellings would require a minimum three acre lot with no change in the zoning classification.) The front yards and rear yards in the RL-aa zone must have a minimum depth of 25% of the total depth of the lot, but need not be more than 30 ft. A side yard is required at each side of every dwelling with a minimum width of 10% of the width of the lot, but need not be more than 8 ft. The minimum mean width of a lot is 100 feet.

In this design the pavement width of all interior streets is 30 feet (face to face of curb). Since all the new streets have houses fronting directly upon them, provision for parking at the curb is necessary. The right of way width of interior streets is 50 feet, the minimum required. No block length exceeds the 1320 ft. maximum length.[1]

The open space left in this plan, which would presumably be dedicated to the city equals the 5 percent suggested, but not required, by the regulations.[2] This open space is clearly left in those two areas of the site where it would be most difficult to locate dwelling units because of either terrain or circulation considerations. It is of course true that additional and perhaps better located open space could be provided elsewhere on the site by the arbitrary block out of several lots. It must be pointed out, however, that this could be done only at a direct cost increase to the future homeowner. There would simply be fewer lots among which to divide the fixed costs of land, streets, utilities, etc. For this reason, the suggested open space acreage was met, but not exceeded in this plan.

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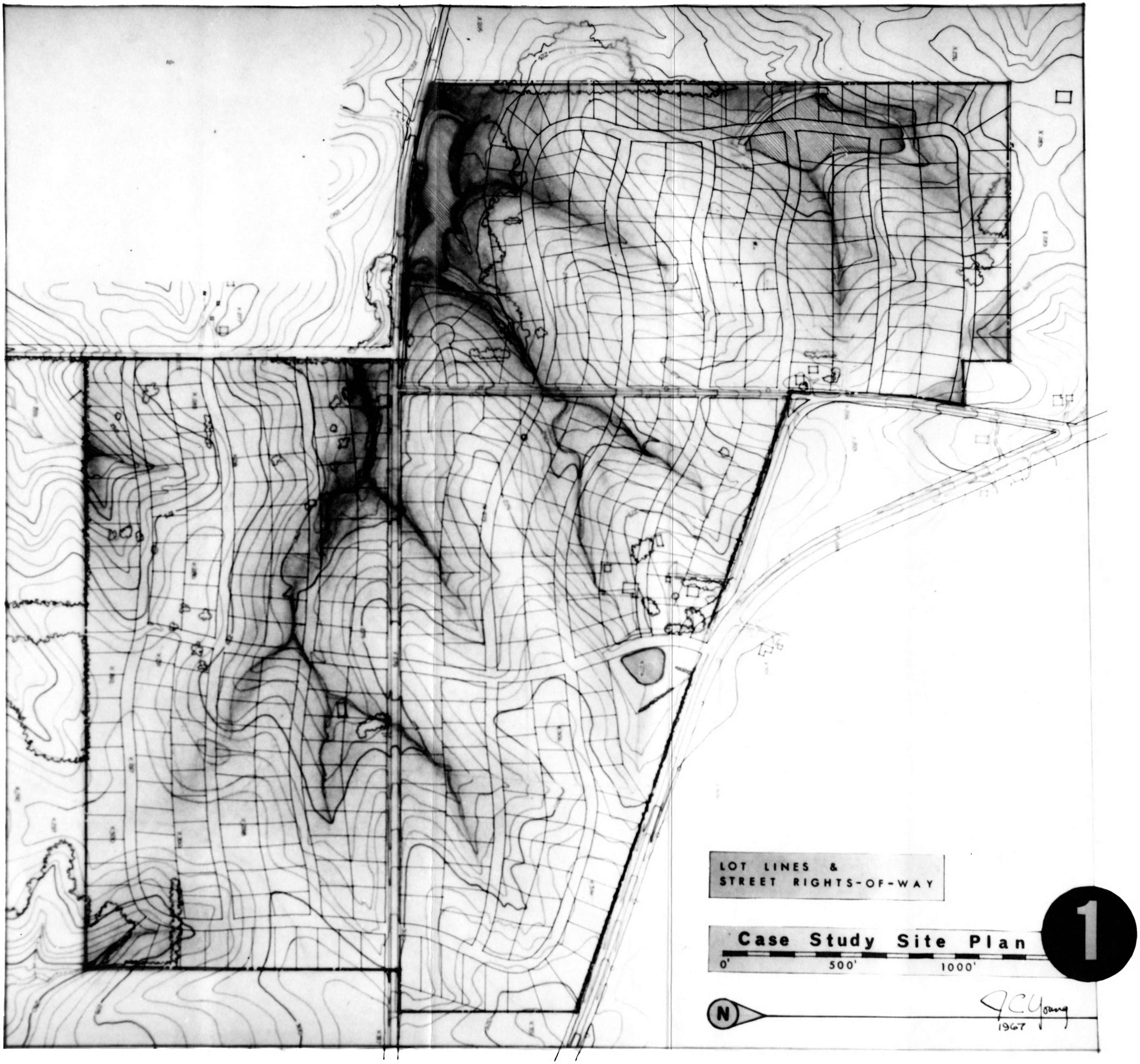
[1] _Kansas City Subdivision Regulations_, pp. 3-4.

[2] _Ibid._, p. 11 of Introduction.


LOT LINES &
STREET RIGHTS-OF-WAY
Case Study Site Plan
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1
N
J C Young
1967

FIGURE 5

It was mentioned earlier that the already existing N.E. Flintlock Road, and N.E. 96th Street which bisect the property are definite constraining factors affecting the design. It is in the area of N.E. 96th Street that the only major question of this design's legality (i.e., complience with the existing city ordinances) arises. The governing subdivision regulations state, in part, that:

> "Whenever the proposed subdivision is adjacent to... the right of way of a limited access freeway, expressway, or major thoroughfare, provision should be made for a marginal access street approximately parallel and adjacent to the boundary of such rights of way, or for a street at a distance suitable for the appropriate use of land between such street and the right of way."[3]

N.E. 96th Street is now an improved gravel road (See photograph no. 6, Fig. 4) but proposed long range planning[4] indicates that it is likely to become a major thoroughfare linking 71 Bypass (Mid-Continent Trafficway) with the proposed major Shoal Creek Park less than two miles away. The fact that Kansas City has already begun negotiations for park land adds credence to this possibility. Therefore there is reason to believe that the City Commission might properly disallow a design in which there is direct access to individual houses from N.E. 96th Street. The correction of this possible deficiency was a major reason for the development of the <u>modified curvilinear</u> plan, which follows.

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[3] <u>Ibid</u>., p. 3.

[4] Kansas City, Missouri, <u>Alternatives for Growth...</u>, p. 4.

PLAN 2: MODIFIED CURVILINEAR

As the title implies, this design illustrated in Figures 6 and 7, is a modification of the previous plan. This scheme is also designed to meet the requirements of the R-laa zone with a 15,000 square ft. minimum lot. As shown, certain of the lots do fall slightly under the 100 ft. mean width minimum, and would have to be adjusted if the area is eventually zoned R-1 aa, rather than R-1 a. As pictured this plan yields 436 lots/dwelling units.

There are two major differences between Plan 1 and Plan 2. The first is the addition of an access road and accompaning open space, and the second is the preservation of a 3 acre lake and surrounding land on the north west portion of the site. In considering the first point, it was deemed more desirable to use a frontage road directly adjacent to N.E. 96th Street and thereby increase the distance between living quarters and the major thoroughfare, than to take the road inside one lot depth and thereby put 42 lots in a double frontage condition. In order to obtain the necessary ramp distance the frontage street was pulled back approximately 100 ft. at each intersection, isolating a sizable wedge of land in each case. While they are unsuitable for houses, these wedges offer interesting possibilities as entrance features, a point which will be discussed later.

The preservation of the second lake area added 9.6 acres to the open space column and of course, reduced the total number

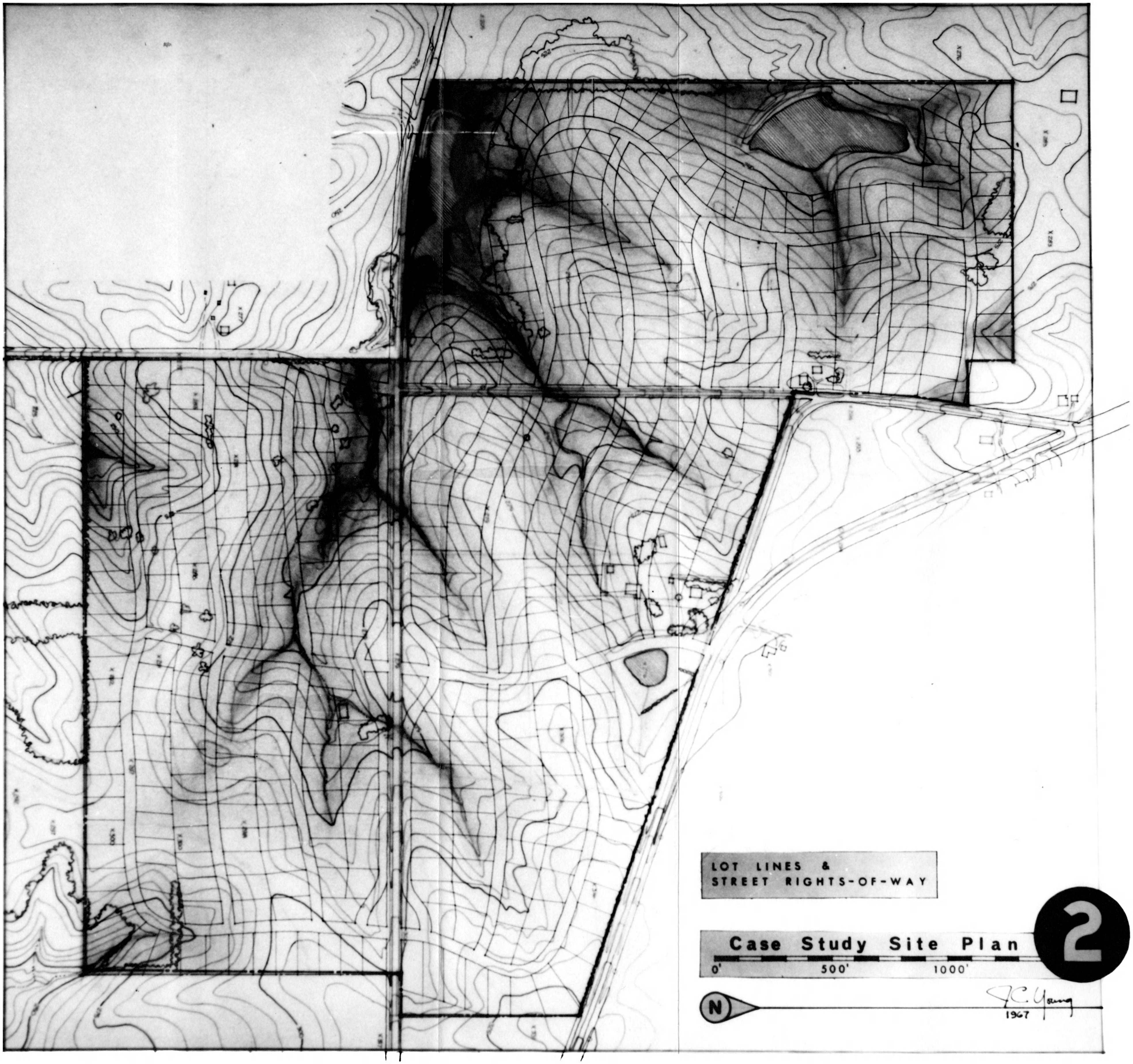
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FIGURE 6

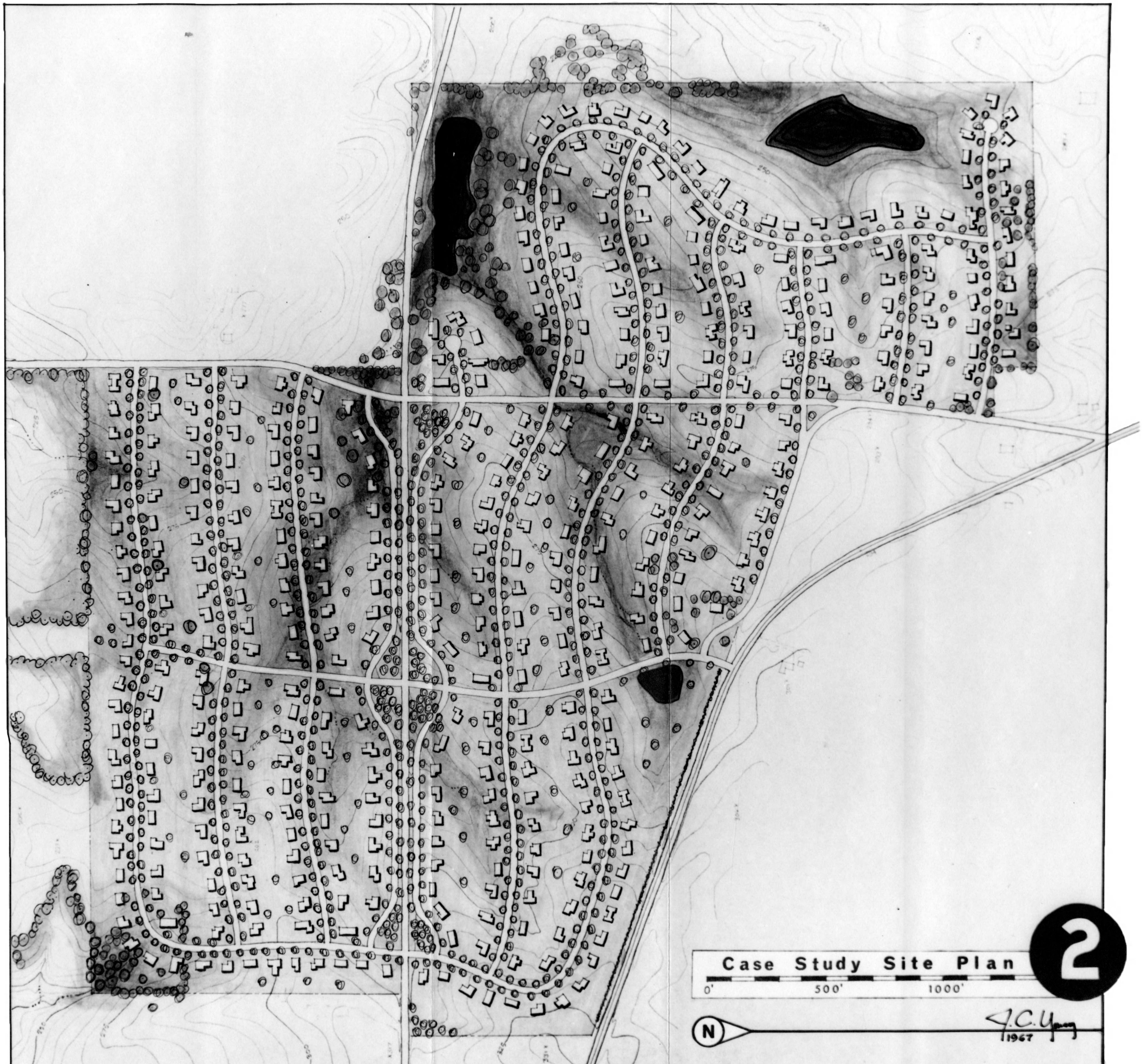

FIGURE 7

of lots yielded by the property. Justification for this action would have to be based upon an idea that the increased amenity offered by the open area was worth the extra cost per lot required by the reduced number of saleable dwelling sites. This cost would be mollified to some extent in this case since the lake already exists. The removal costs required if it were turned into building sites would not be incurred. It should be noted that this is not the same situation as the preservation of the lower lake for two reasons. First, the lower lake is situated in a strong, continually running drainage area; its removal would yield few additional lots. Secondly, the lower lake area was required to make up the minimum open space asked by the city government. Any additional open space provided under the rules of traditional subdivision design is generally made at a nearly direct cost increase per dwelling unit. The ability to provide additional open space without the direct cost increase is one of the sought after advantages of the <u>cluster plan</u> which is described next.

PLAN 3: DETACHED UNIT CLUSTER

The single family detached unit cluster plan of figures 8 and 9 is designed to comply with the requirements of the <u>Community unit projects</u> section of the recently amended, Kansas City zoning ordinance.[5]

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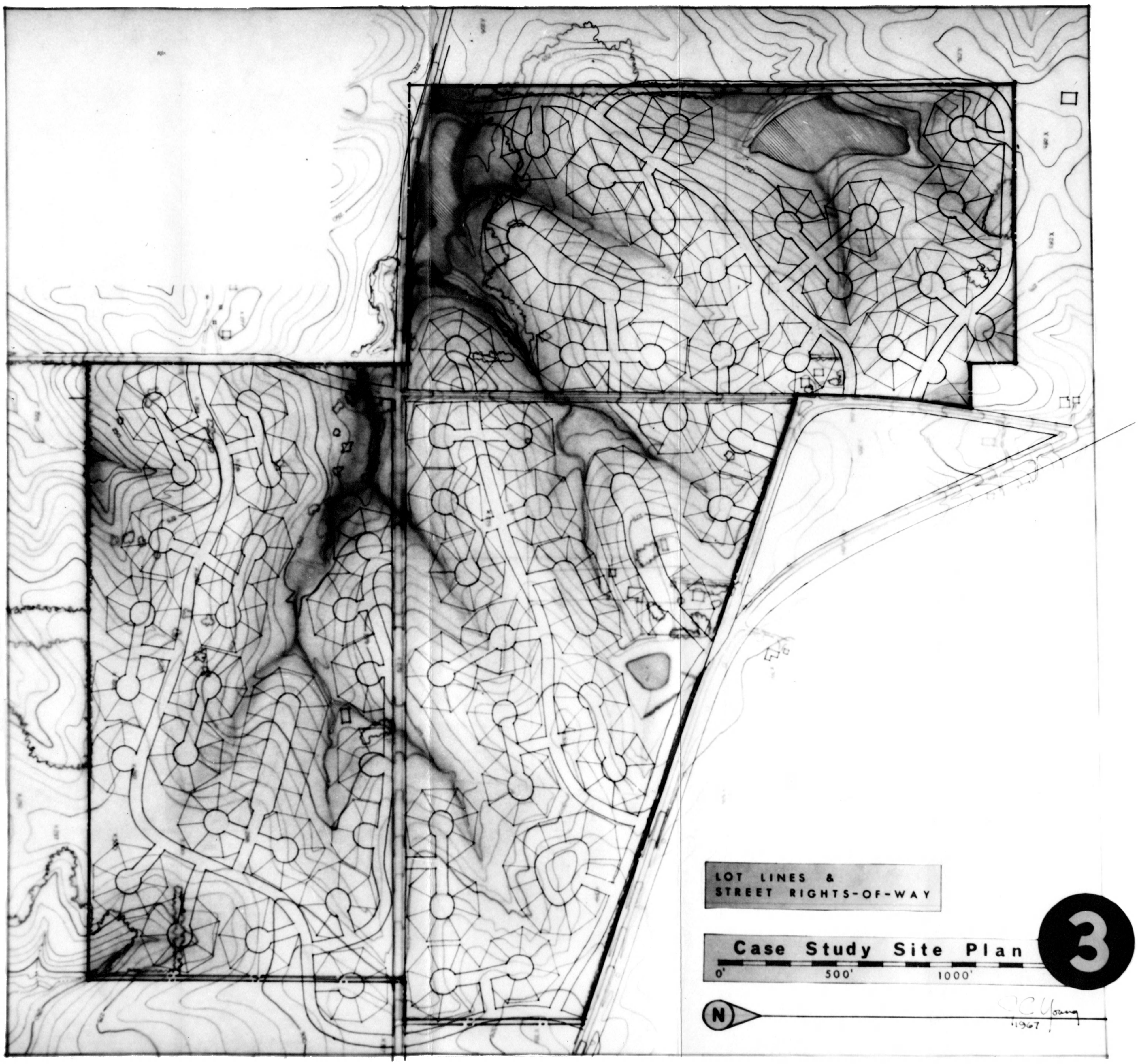
[5]Kansas City, Mo., <u>Zoning Ordinance</u>, pp. 80-85.

In general, the ordinance states that, under specified conditions, on properties of 20 acres or more, certain of the restrictions normally applied to residential development in the zone may be waived. For example, if the total plan is approved by the planning commission, the <u>minimum lot area</u> per dwelling unit requirement may be dropped. The total number of dwelling units on the property, however, must not exceed that which would be possible under traditional application of minimum lot standards of the zone in which the property is located. This ordinance, therefore, is the key which allows flexibility in residential design not previously possible.

This freedom from the minimum lot standard allowed the designer to really proceed according to the method described on page 17. A cursory glance at the topography of the site shows that the land takes on a strong natural pattern largely independent of the shape of the property boundary lines. The land form is seen to be controlled by a strong pattern of high ground on and immediately bordering the site on the east and north. This high ground emits a series of gentle broad-topped finger ridges all of which aim generally toward a point near the junction of N.E. 96th Street and the west property line. The natural drainage ways between the fingers culminate at the lower lake, which drains the major portion of the property.

The general scheme of Plan 3 is to place the internal circulation routes upon the high ground, the dwelling units at the intermediate and high-intermediate elevations, with the lower elevations to be left open as common green space. A considerable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STREET RIGHTS-OF-WAY
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1967

FIGURE 8

FIGURE 9

amount of selected high ground was also included in open space preservation in order to achieve variety, facilitate access to major green areas, and to preserve short and long range views from the circulation routes. These considerations will be discussed later.

The dwelling units (single family houses in this plan) were located around cul-de-sac or closed end loop streets off the main circulation road. The broad topped ridges provided sufficient space for efficient use of these configurations. Since no houses front directly upon the internal circulation routes, there is no requirement for parking on them. For this reason the pavement width for these roads was set at 20 ft., within the standard 50 ft. right of way. Since these routes follow the high ground no curbing or guttering was required. The small drainage requirement at this level is handled by a broad turf swale which doubles as an emergency "pull off" area in case of car trouble. (See fig. 10)

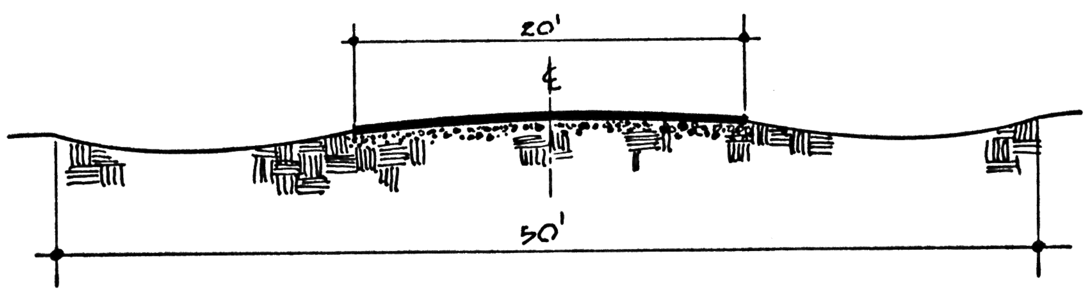

FIGURE 10

Typical High Road Cross-Section

The cul-de-sac and loop street stems which have 2-way traffic are 30 ft. wide to allow for overflow parking, with standard curb and gutters or monolithic curb. It should be noted that the cul-de-sac loop "turn arounds" designed for this study differ from the standard ones found in most curvilinear subdivisions, which use a 70 ft. diameter pavement within a 100 ft. right of way. In this design, the outside width of the loop is set at 96 ft. with a length of 106 ft. This width allows for a possible provision for guest parking in the center. Furthermore, the larger turning radius makes it much easier for emergency vehicles, fire trucks, and snow plows to negotiate the turn. The loop itself was designed to be oneway; pavement width is set at 20 ft., allowing for additional curbside overflow parking. Space was provided for covered storage (attached garage or carport) for two cars per house on the individual lots. The cul-de-sac design with possible center guest parking specified in this plan and pictured in fig. 11 is a modification of a design suggested by Harman, O'Donnell and Henniger Assoc. in a study for the Urban Land Institute.[5]

Plan 3 as shown in the overall scheme of fig. 8, uses an average privately owned lot size of about 8500 sq. ft.. It shows seven dwelling units placed around each full cul-de-sac. If, instead, eight units were placed on lots averaging 7500 square ft., the total number of building sites provided on the case site would be raised from 479 to 532. Thus, one of the basic design decisions

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[5] Innovations vs. Traditions in Community..., pp. 82-85.

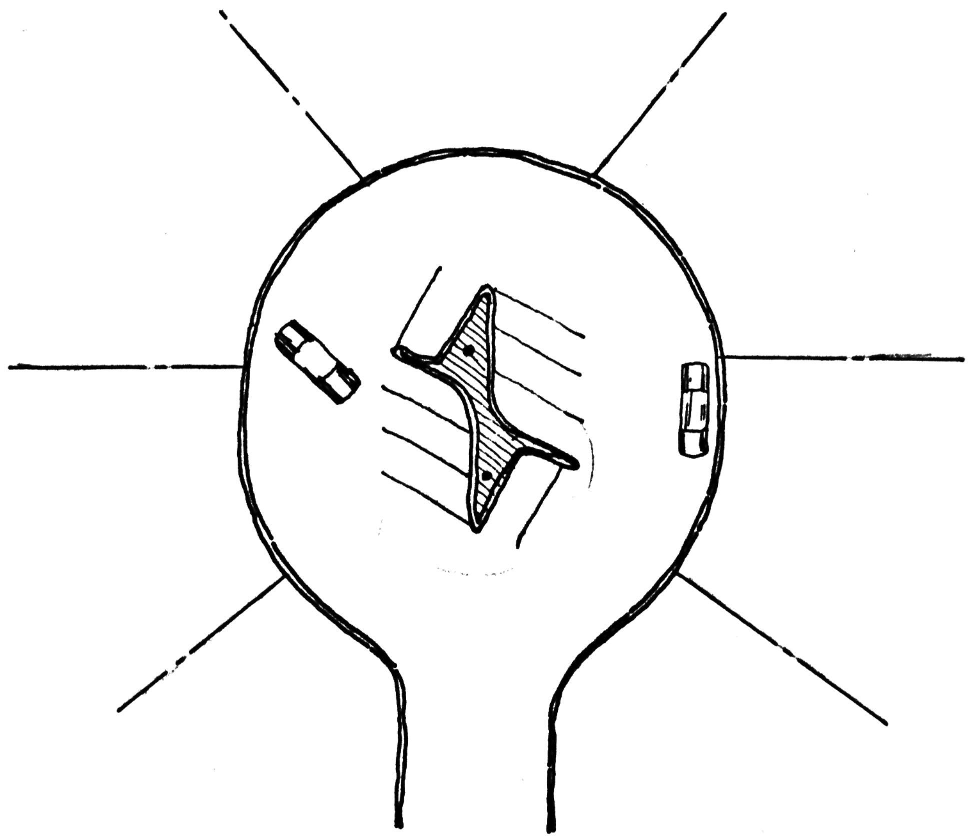

FIGURE 11

Typical Cul-de-sac Design

which immediately confronts the cluster designer is highlighted. How many individual dwelling units should the land carry? What is the limit to which the private lot may be reduced even with adjacent, good quality open space? Conversely, how much area must be left open in order to achieve a total environment better than that of the traditionally designed subdivisions of the same zone, but still marketable to the same income groups? Obviously this is a complex question influenced by a wide variety of factors ranging from such details as topography, size of individual segments of the open space and their degree of adjacency to land costs and development costs, and considerations concerning the extent of control which the land designer will have over the housing structure design.

In the case of Plan 3, the upper limit was set by the Kansas City Zoning Ordinance, after the assumption was made that the case study site will eventually be zoned R-1aa. The ordinance states that the total number of single family houses must not exceed the gross acreage minus the public street right of way, divided by the minimum lot area of the governing zone. Therefore an approximation of the legal limit may be obtained by estimating the total public streets area which will be required and performing the calculation above. Estimating a 20 percent[6] reduction

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[6] Community Builder's Council, The Community Builders' Handbook (Washington D.C.: Urban Land Institute, 1960), p. 105.

in the gross area, the total number of residences may not exceed 546. It is interesting to note that this limit is a substantial increase over the number of lots actually obtained in Plan I. This would be the usual case since even the easiest of terrain would not allow all lots to be sized at their exact minimum.

The Federal Housing Administration also offers some guidelines as to the intensity to which a site may be used for various types of dwelling units, based upon their Land-use Intensity Rating.[7]

Obviously one cannot conclude that the maximum number of building sites allowable under the law is the right number to provide on any given piece of topography, for a good living environment or even from the developer's financial standpoint. Some cities have attempted to determine this question of "What size cluster lot will offer comparable amenity to a larger lot in a conventional subdivision?" Table 1, from the Louisville, Kentucky zoning ordinance is an example of such an attempt.[8] Reference to the "Min. Lot Area" row of the table indicates that a 10,000 sq. ft. cluster lot would be equivalent to a 20,000 sq. ft. conventional lot. A 6,000 sq. ft. cluster lot would equal a 12,000 sq. ft. standard lot. Direct interpolation from this table to the case study site would indicate that each of the single detached unit lots should contain 7,500 sq. ft.

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[7]Federal Housing Administration, Planned-Unit Development With a Homes Association: Land Planning Bulletin No. 6 (Washington D.C.: F.H.A., 1964), pp. 23-26.

[8]"Density Zoning Allows Open Spaces," Tract Development: Vol. 2 (Chicago: Cast Iron Pipe Research Assn., N.D.), p. 30.

COMPARISON OF THE MINIMUM REQUIREMENTS OF CONVENTIONAL ZONING AND CONTROLLED DENSITY ZONING (CDZ) IN SINGLE-FAMILY DISTRICTS

	Conv. R-1 Zone	CDZ R-1 Zone	Conv. R-2 Zone	CDZ R-2 Zone	Conv. R-3 Zone	CDZ R-3 Zone	Conv. R-4 Zone	CDZ R-4 Zone	Conv. R-5 Zone	CDZ R-5 Zone
Front Yard (ft)	30	25	30	25	30	25	30	25	25	25
Side Yard (ft)	20	10	15	7.5	10	6	10	5	5	5
Side Yd.—total for both (ft)	(a)	30	(a)	22.5	(a)	18	(a)	15	(a)	15
Street Side Yd. (ft)	30	25	30	25	30	25	30	25	25	25
Rear Yard (ft)	25	25	25	25	25	25	25	25	25	25
Lot Width (ft)	150	100	100	75	75	60	60	50	50	50
Lots—frontage on turn arounds	(b)	65	(b)	60	(b)	50	(b)	50	(b)	50
Min. Lot Area (sq. ft.)	40,000	18,000	20,000	10,000	12,000	6,000	9,000	5,000	6,000	5,000
Lot Depth	125	(b)	125	(b)	125	(b)	125	(b)	(b)	(b)

a. Not stated in ordinance, but would be at least twice the single side-yard setback required by conventional zoning. b. Not stated in ordinance.

TABLE 1

Comparison of Minimum Area Requirements: Cluster Lot Vs. Conventional Lot

Looking at it from the over-all gross density standpoint, it is possible to find some information. William Whyte lists 12 existing detached house cluster developments which he considers "... a fairly sizeable cross section of the most significant developments in the U.S....as of Jan. 1, 1964."[9] Of these, eight have overall densities of 1 to 2 units per acre; three have densities of 2 to 3 units per acre; the remaining one carries only .28 units per acre.

Such rules of thumb, now becoming available as experience in the field is beginning to build, are of some initial help. The final determination of this problem, however, relies heavily upon the designer and his judgement of how the units and topography may best be utilized to achieve the environment he visualizes. Once the design has been developed it may be possible to make some modifications within it to make it more nearly meet the requirements of cost and marketability studies. A change in Plan 3 from seven to eight units around each full cul-de-sac might be such a modification, should a market analysis suggest that persons in this area want single family homes but could more readily afford the proportionally lower development costs which would accrue with this increase in total lot number. It was considered that an increase in density beyond this point, however, would be unwise unless the constraint that all dwellings be single detached units was dropped. It was this thinking that led to the development of Plan 4, a modification of the Plan 3 design, to make use of <u>attached</u> single family units.

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[9] Whyte, <u>Cluster Development</u>, pp. 91, 102-106.

PLAN 4: ATTACHED UNIT CLUSTER

If the decision as to the number of individual single family houses to put on a given site is hard, the same decision with reference to multi-family or attached units is infinitely more difficult. The attached living unit is a natural product of the cluster idea. It is perhaps a progressively purer manifestation of the theory. If it is good to reduce the amount of "wasted" space in side yards between houses in conventional subdivisions in favor of smaller clustered lots, why not eliminate this space entirely by putting several units together? It has been rather convincingly demonstrated that skillful design with modern materials can achieve a greater degree of privacy this way than is presently enjoyed in traditional subdivisions. And, if this is a better idea why not stack the units on top of each other and save even more open space? Indeed, why not put all of the units into one apartment tower with one road leading to it, and leave the rest of the 240 acres open for golf courses, bridle paths, fishing lakes, etc.? Presumably the Kansas City Planning Commission would allow the development of such a plan even in a R-1aa zone as long as the tower contained no more than 546 families. Very possibly such a unit would provide the same amount of living space at a lower cost per family because of efficiency in construction, utilities and street patterns.

The fact that this scheme was not adopted for the case study site has to do with the ever present problem of marketability. Would the near future home owner seeking to live on the site choose such an arrangement, and if so, could he be counted upon to pay as much for it? Conversely, could today's developer be expected to risk his investment in such a venture without the opportunity to derive a much higher gain to off-set his presumably greater risk?

That this type of scheme was not developed in Plan 4 is not to say definitely that it would be wrong. This again became a matter of judgement based upon some knowledge of the strong trend of the American public to look for lower density housing at the fringe areas of a city. This consideration led to the decision that the attached units for this site should be of the "townhouse" variety; that is, some units would share a common sidewall and would perhaps contain two levels, but in no case would one family's living unit be located above another's. This decision in itself does little in helping to determine an exact or even narrow density range. William Whyte, in listing 21 existing town house developments across the country, shows densities ranging from 6.6 units per acre to 56 units per acre.[10] Of the 5 developments listed as Townhouse: Suburban, 4 showed densities of 10 or 11 units per acre; the fifth's density was 25.9 units per acre, well above that of many of the Townhouse: City developments.

The Federal Housing Administration suggests that one story townhouses or atrium houses at 5 or 6 to the gross acre are

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[10] *Ibid.*, pp. 92-100.

comparable to moderate one story detached homes at 3 or 4 to the acre in a conventional subdivision.[11]

One of the most impressive developments of the suburban townhouse variety, located in Southbury, Conn., (80 miles from N. Y. City) was just completed in early 1967.[12] It was designed by Charles Warren Callister, and indications are that it is a very successful venture. In this design from 2 to 6 units are grouped into one and two story buildings with a gross project density of only 2.8 units per acre.

The relative status given to townhouse dwelling units by the buying public is most pertinent to this density decision. If it was felt that the public would consider such attached unit space as equal to space in detached housing, it would seem logical to provide exactly the same number of units (479) that were developed in Plan 3. Then, even more acreage could be devoted to the open space sector. In some areas of the country this seems to be the case. The townhouse boom in Southern California, for instance, has found several of the largest builders switching to townhouses exclusively. Since 1964, the FHA has had to send extra personnel to Los Angeles to process townhouse applications. Numerous articles in the trade magazines indicate that growing numbers of persons from all age groups and income classes are coming to

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[11]Federal Housing Administration, Planned-Unit..., p. 25.

[12]"Here's What It Takes to Create a Brand-new Market," House and Home, XXXI (April, 1967), p. 76.

prefer this type of structure. Most of the townhouse units sell for less, however, than do the more expensive detached homes in the developer tracts.

In an article for the Journal of Social Issues, Robert Gutman discusses the tendency of humans to endow objects with status meanings.[13] It is possible that many in the Kansas City area at present would consider an attached unit as a downward move even if the townhouse unit offered amenities not found in detached homes of the same cost. It is possible that this feeling may change if more and more attached units of a luxurious nature are built. A study for Business Week Magazine predicts that one half of all residential construction in the 1970's will be some type of attached unit dwellings.[14]

In the final analysis, the density decision for Plan 4, as represented in Fig. 12, was based upon the decision that the amount of <u>open space</u> would be held about constant. Then the space gained by the relative land use efficiency of attached units, and some size reduction per unit, would be used to increase the gross density of the development. Thus the final outcome should be a lower cost per unit to help offset the suggested "lower status" of the attached unit. Since the gross density would be higher, the site should yield at least an equal return on investment.

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[13]Robert Gutman, "Site Planning and Social Behavior," <u>Journal of Social Issues</u>, XXII (Oct., 1966), pp. 103-115.

[14]William Snaith, "Homebuilding's Happy Future," <u>Business Week</u>, (May, 1967), p. 85.

FIGURE 12

Plan 4 is represented in a different fashion in that the "white blocks" are not intended to be viewed as schematic buildings, but rather as areas within which the townhouse units and their attached car storage spaces are to be located. While it may be possible to successfully separate the land design from the structure design in the detached scheme of Plan 3, it becomes increasingly difficult to do so with higher density attached unit development. The average townhouse units for this study are envisioned as containing 1500 to 1800 square feet of living space on two levels with attached storage for two automobiles. The units are combined into groups of no less than two nor more than six. The majority of the townhouses contain three family units. This scheme allows the construction of 794 units, approximately one and a half times as many as in the detached cluster plan, with approximately the same amount of common space left open.

Only the main circulation system is designated in Fig. 12. Sufficient area within the clusters is available for guest and overflow parking. Each townhouse unit was visually orientated to its adjacent open space and long range view, a point which will be discussed in the design objectives analysis of the next chapter.

CHAPTER IV

COMPARATIVE ANALYSIS

This chapter discusses and compares the designs just presented in terms of the specific design objectives discussed in Chapter II. Where it is considered illustrative of a particular subject, reference is made to other residential developments. The discussion following centers around aspects of visual quality, health and safety, development costs, and area protection and extension.

VISUAL QUALITY

Visual quality was a major objective in this case study. It is a proper end in itself. This statement should appear initially, since it was considered from the outset as a primary goal; <u>not</u> as some "nice to have" objective to be considered only after "more important, need to have" objectives were fulfilled. Too often this latter method results in a gross waste of dollars as attempts are made to improve a basically poor esthetic environment by surface treatments which are powerless to change the overall effect of a poorly organized space arrangement. Architects and designers often grope for all manner of justification for their designs to the exclusion of aesthetic reasons. Perhaps this is still a reaction to the days when the profession put the quest for aesthetics above all else -- to the detriment of other essential aspects. Consider, for example, the element of "open space". In certain locations the space will be needed for recreation or safe pedestrian areas. In other places this space is required for vehicle sight distances. In other instances we may need open space purely for visual enjoyment. Therefore no attempt will be made to obscure this objective or to justify any attempts at visual quality on some other grounds, in order to make it seem more "practical". If anyone doubts the human need for pure aesthetics, he need only to drive down a residential street and consider the tremendous sums which individuals have spent trying to make the front elevations of their houses more attractive. Unfortunately, a strongly displeasing pattern has often been built into a neighborhood at its inception, and no individual residence treatment can do much to change it.

There are several standpoints from which it is possible to consider visual quality in a residential area. It may be "viewed from afar" or "viewed from within". It is the latter with which most of this discussion will deal; i.e., the view which may be had from the internal circulation routes and dwelling unit sitings. Some comments should be made about the first thought, however.

View From Afar

The photograph below illustrates what can happen to a natural hillscape, which is an important visual element in many cities. Surely a different design scheme could have prevented the complete destruction of this natural landscape.

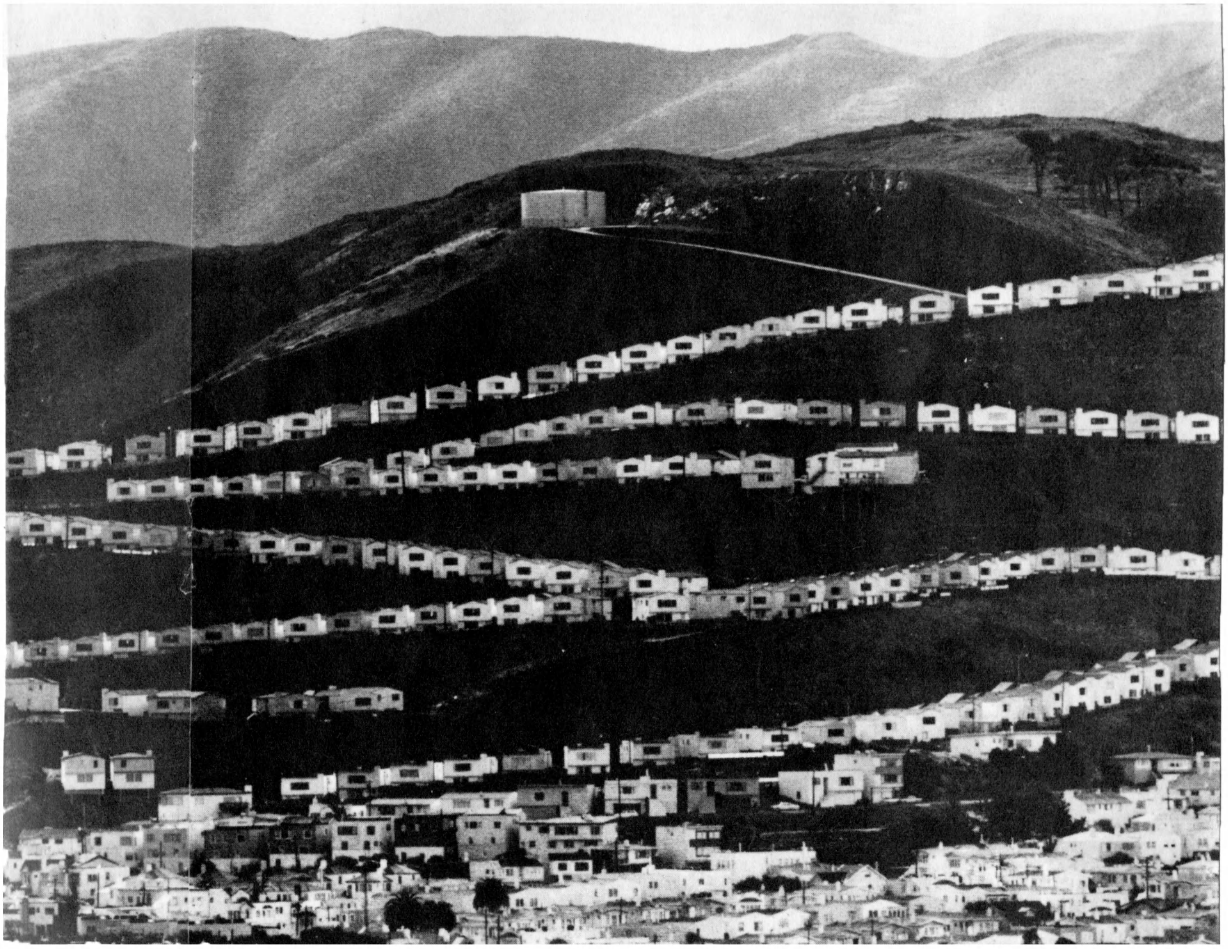


FIGURE 13

Example of Housing Conflicting With Natural Landscape

The picture of Figure 13 has little direct relation to the case study site but does make a strong case for the idea that, in low density housing areas particularly, the natural terrain must be respected if a successful visual result is to be achieved.

On a smaller scale, the photograph below illustrates how houses located on the extreme top of a hill can abruptly break up the natural horizon line. If these two houses had been located only a few feet below the crest, their effect would have been mollified considerably.

FIGURE 14

Example of Houses on Crest of Hill

This possibility was a major consideration in deciding to locate the main collector roads of Plan 3 and 4 on the highest ground, following the "ridge" lines. This plan forces the actual housing units to lower elevations, keeps them off the skyline to some extent, and causes all development to follow the natural contour of the site. This procedure, coupled with the planned tree groupings, should go far in preserving a natural appearance for the horizon when this area is viewed from a distance. This type of consideration was not possible in the development of the curvilinear Plans 1 and 2. The position of the site boundry lines and existing city streets coupled with the minimum size lot requirement prevented all but slight variation for topography. Thus we see in Plans 1 and 2, a man made network superimposed over, and competing with, the natural terrain system.

Entry Considerations

The site analysis diagram (Figure 4) shows the major approaches to the site to be from the east -- on 71 by-pass (Mid-Continent Trafficway) and N.E. 96th Street. The decision made for Plans 3 and 4 was to develop the intersections of these roads with the eastern edge of the site as the locations for major entrances.

Since this is the highest ground on the property (a hundred feet higher than the lowest point, west of the lower lake) a person driving in here would have a fine panorama of the development and of the country beyond stretching to the distant horizon. The device of dividing the main internal circulation route with a 15 ft. planting strip in this location was incorporated to give visual indication that this is a main entry way.

In Plan 2, the four way intersection of N.E. 96th, with the cross collector street, and the intersection of Mid Continent Trafficway with the collector street were considered the main entry points. The relatively large wedges of open space isolated by the frontage road, if properly defined with trees and other plant material, could make a strong entrance statement. Likewise the four acre open space and pond which borders the collector street at its junction with Mid-Continent Trafficway could be developed into a powerful entry space with a spaciousness not often found in traditional subdivisions. There is no land reserved in Plan 1 for the development of entry spaces with the exception of that at the junction of N.E. 96th Street and the west boundary of the site. Traffic from the proposed Shoal Creek Park would first approach the site at this point. The fact that open space is available on both sides of N.E. 96th Street at this point provides the opportunity for a very pleasing secondary entrance here in all plans. The proposed re-routing of Fintlock Road at its juncture with 96th Street in Plans 2, 3, and 4, which would result in open land on both sides of the road would provide similiar possibilities, but indications are that the number of persons approaching from this direction would be rather insignificant.

Street and Road Aesthetics

The reader's attention is now directed to figures 6 and 23 which illustrate the relative amounts of guaranteed open space that would be provided in Plans 2 and 3. Plan 2 is seen to have open land reserved only at the several entry points and around the two lakes. Plan 3 reserves open space throughout the site including relatively small wedges of land all along the internal circulation routes. These small wedges would provide the variety and depth necessary for the implementation of an effective planting design, when used in combination with the larger open spaces which occasionally penetrate to the circulation routes. Within these spaces, an overall planting design could be developed which would treat the driver to a wide variety of visual space interactions. These will range from tight corridors where trees and hedges insure privacy for close dwelling units, to large open volumes, where the trees are pulled back to incorporate large grassy areas in the road perspective. In many places large planting (i.e., trees, hedges, etc.) will be omitted entirely to open medium distance views within the development (to the lakes and large open spaces and long distance views beyond the development area. As an example, an 800 foot section of the circulation road on the south east part of the property is aligned so that the driver has a rather spectacular view of the Kansas City skyline (12 miles away) framed by a dense stand of virgin timber.

FIGURE 15

Example of a Corridor Space

FIGURE 16

Example of a Medium-Distance View

FIGURE 17

Example of a Distant View

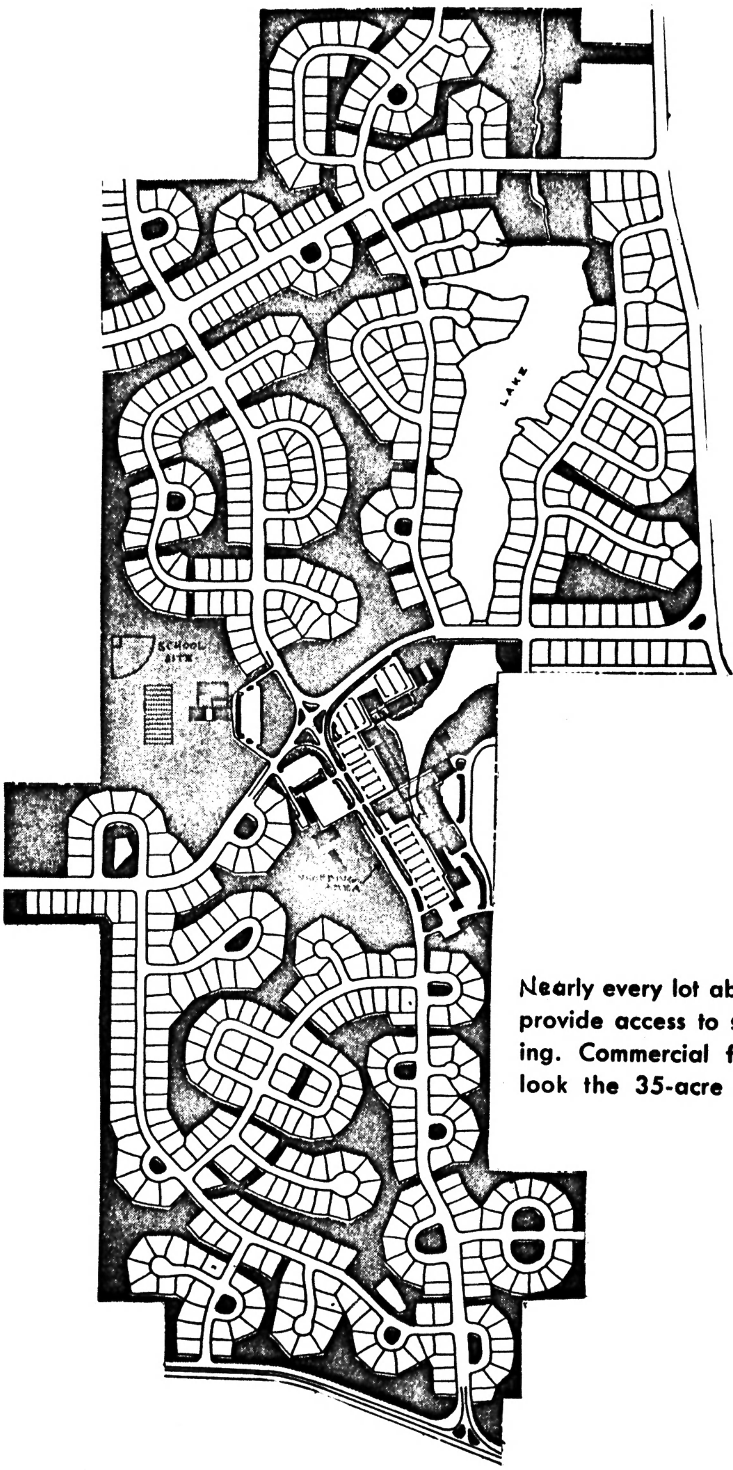
The only area available within most of the Plan 2 design for controlled planting is the 10 to 15 ft. right-of-way strip between the streets and the front yards of the houses which is broken by driveways at a fairly regular and frequent interval. Because of the thinness of this strip and the usual desire to open the house fronts to street view, the planting design is, in general, limited to "tree-lining" with canopy type trees. While this effect is an obvious improvement over no planting at all, it cannot offer the variety, space modulation and view opportunities possible with a less rigid spacial pattern.

In short, the difference in aesthetic effect between these two basic designs from the circulation standpoint, would be driving through a park with only glimpses of dwelling units, as opposed to driving exclusively between two rows of house fronts.

Dwelling Unit Sitings

As suggested earlier, within the general definition of cluster development there is a wide spectrum of choice as to actual design left to the designer. Even if the additional constraints of a specified cluster lot size and the exclusive use of single family detached units are added there still remains considerable design latitude. From a review of a number of existing cluster designs it appears that two rather divergent ideas are evolving within the "detached house school," which are more than variation due to differences of topography, etc. The scheme developed for this case study is an example of one school of thought. An overall look at Fig. 9 or 23 shows that the common open spaces form an interconnecting lattice which weaves through the entire development giving nearly every house a direct visual and physical access to major open space areas. This comment is not meant to imply that all designs of this "class" follow any other common pattern such as Plan 3's predominate use of the modified cul-de-sac or its insistence that no dwelling units front directly upon the circulation routes. It is the dispersal of common space in varying sized parcels throughout the entire housing area which forms the bond between these designs. As another example, the plan of Parkwood in Durham, North Carolina is illustrated in Fig. 18.

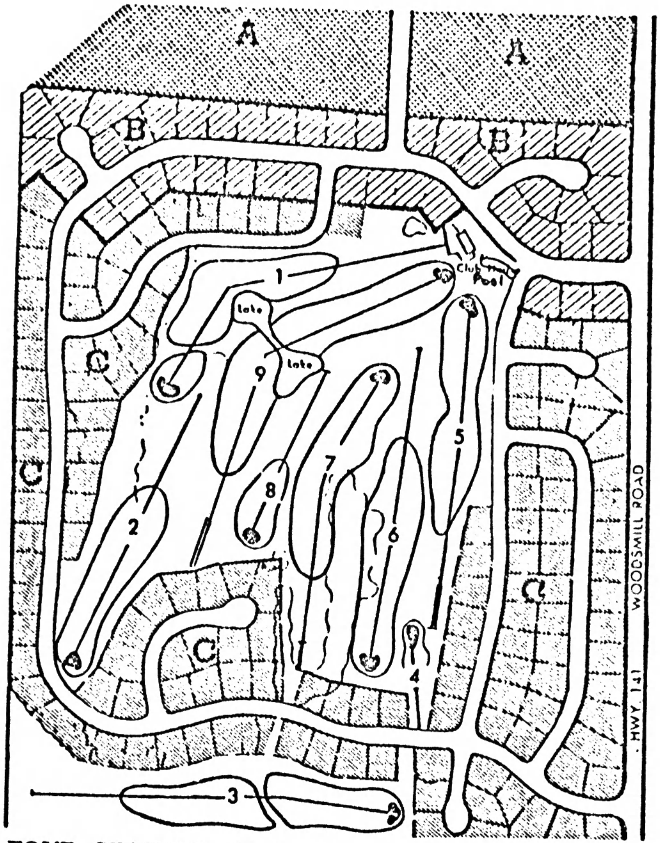
The other idea favors the grouping of the open space into generally larger parcels which are located near, but not necessarily adjacent to all privately owned building lots. See Fig. 19.



Nearly every lot abuts parkland. Trails through the woods provide access to school with a minimum of street crossing. Commercial facilities, centrally located, will overlook the 35-acre artificial lake.

FIGURE 18

Example of Interweaving Open Space



FOUR SEASONS, St. Louis, uses 47 acres for highly successful golf course, which has club house and pool (upper right). The course is par 35, 2900 yards in length. Total project has 138 acres, 130 homes, and 298 apartments.

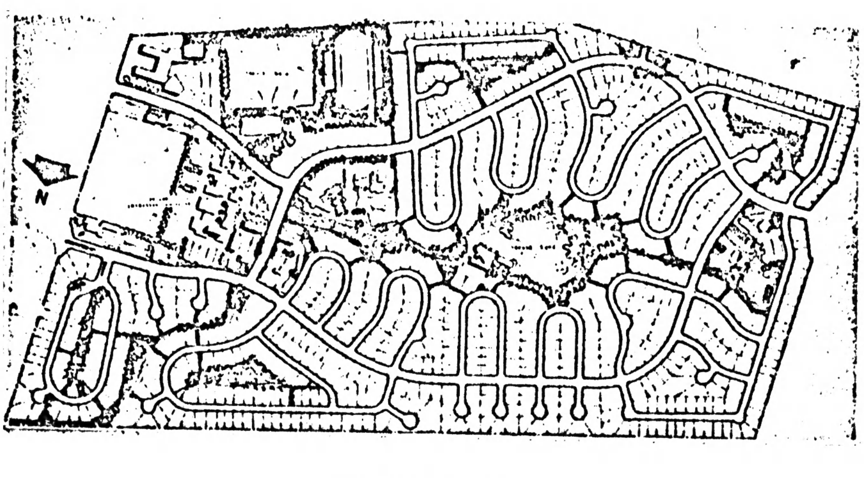


FIGURE 19

Examples of Concentrated Open Space

Interestingly, by use of this interpretation, the west 80 acres of the case study property, Plan 2, might be properly considered as a cluster design.

Proponents of this latter method argue that the larger open spaces are easier to maintain, give opportunity for a wider range of uses, and that the compact grouping of more dwelling units on one part of the site lowers street and utility costs. Those who lean toward the former idea suggest that dwelling units which do not have direct visual and physical access to common green areas are really not enjoying the benefits of the natural landscape preservation, which is a particularly serious situation since they no longer have as much space on their own lots to create at least some outdoor amenity.

The difference between these two concepts in implemented reality is often not so distinct as to demand a definite choice between them. The most successful plans, in the author's opinion, are those which do encompass large open spaces, but which at the same time grant all dwelling units visual and physical access through the use of smaller fingers of common green. This opinion, therefore, was a guiding influence in the development of Plans 3 and 4.

The open space of the case study cluster plans was designed primarily so as to be successful as natural countryside for visual enjoyment and unorganized recreational activity. Therefore little change in the natural landscape other than a rather extensive tree planting program is considered absolutely necessary. Care was taken, however, to insure that these open spaces were so sized and located as to give considerable flexibility concerning open space development.

In the development of Plans 3 and 4, no single design criteria was considered more important than the orientation of each dwelling unit toward the best view possible. It was considered very desirable that a person be able to look out in at least one direction and see an important portion of the open terrain. It was felt that one of the great underlying economics of the cluster idea is the fact that several persons can look out over the same large open space and feel that "this is mine". This concern for open space vista is easily descernible in the attached unit plan. (See fig. 12). Here, each individual townhouse area's orientation is determined primarily by the possible views open to its dwelling units, rather than according to a predetermined pattern relative to the access road. Once this determination was made, it was possible to make minor adjustments to obtain the desired effect from within the vehicle access area. The result is a most interesting variety of "vehicle side" spaces. Some turn out to be very informal in character with much space flow out toward the common greens. Others, which will be more tightly defined by townhouses at right angles to each other, suggest development in a formal balanced way.

Taking Plan 2, as represented in fig. 7, at face value could lead to an erroneous impression that the area taken up by the back yards of each house is a valid open space. Actually, an open environment is almost never achieved, even visually, in such space since it is chopped, divided, and blocked every few feet by fences, lot line markers, and uncoordinated individual lot improvement attempts. Could this area be used, with proper control, for common greens? Possibly, with <u>some</u> improvement over the present situation, but the rigid pattern of Plan 2 imposes such severe limitations as to make this possibility at best, an inferior solution. Such open space would not follow the natural contour, and would be of such a size and shape as to preclude many design/development possibilities. Few natural features could be preserved and those that were would probably be easily visible only to adjacent dwellings.

<u>Preservation of Selected Terrain Features</u>

Preservation is one of the most basic opportunities provided by the skillful use of cluster planning. The same concept which allows the designer to group dwellings and open space into more efficient packets, also affords him the flexibility of choosing the location of these oepn spaces. Of course preservation is possible with traditional design. This fact was highlighted earlier in the discussion of Plan 2, which preserved the upper lake <u>at a cost of 21 lots</u>. The cluster principle also gives the designer the maneuverability to preserve many smaller features which, taken together, can go far in easing the raw look of recent development. In addition to the obvious larger terrain features preserved, Plans 3 and 4 allow for the saving and proper display within common spaces of such elements as a huge single oak tree (500 ft. west of the east pond) and a dozen mature white locust trees within the elongated loop street nearby. This kind of adjustment was made with relatively little effort in connection with trees, streams, hills and views throughout the site. These considerations were made possible through a thorough knowledge of the site (see Methodology) and the flexible framework of the cluster principle.

HEALTH AND SAFETY

Water Supply and Sewerage

The interconnecting requirements of safe water supply and sewage removal are placed first since even a minor compromise, healthwise, would likely disqualify any one of the plans no matter how advantageous it might be in other respects.

In general terms, the water supply system in a residential development must deliver an adequate supply of pure water under sufficient pressure to satisfy the personal and fire protection needs of the residents. The multi-detailed code requirements which must be met in the design of such a system are all aimed at safeguarding this two-pronged objective. For example, all water supply system lines must be separated by at least 10 feet horizontally from the sanitary sewer lines. If this separation is not possible, at cross points for instance, the lines must be encased in concrete. Fire hydrants must be located within 500 ft. of all buildings. The supply lines must be placed below the freeze line. The system must have several points of supply to provide even pressure, and to allow maintenance with minimum disruption of service. To safeguard against possible stagnation, and for other reasons, the supply network must be looped at frequent intervals. Dead-ended supply lines must not exceed a specified length.[1]

The sanitary sewer network is a closed system of straight pipes[2] and manholes. Manholes are required for maintenance purposes and are located at changes in direction (horizontally or vertically), at junction points (except house line with laterals), and at intervals of about 400 ft. on straight sections of line. Since, at the scale of this case study, it is seldom considered desirable to pump sewage, the lines were designed to continuously flow downhill.

Figures 20 and 21 show the horizontal alignment of the water supply and sewerage systems for Plans 2 and 3 respectively. Assumptions were made in both cases as to outside system connection points, based on discussions with Kansas City planning officials. In comparing the plans, it is seen that greater separation between water and sewer is obtained in the cluster layout. Once the systems are separated by the minimum ten foot requirement, however, further separation is of doubtful benefit. The Plan 2 water system is made up entirely of "loops", generally considered to be superior. On the other hand, the cluster plan embodies the loop principle also, and all "dead-end" branches used are well below the maximum allowable length. Because of the general dwelling

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[1] Ernest W. Steel, Water Supply and Sewerage, ed. Rolf Eliassen (New York: McGraw-Hill, 1960), p. 133.

[2] In some cities gently curving pipes are allowed.

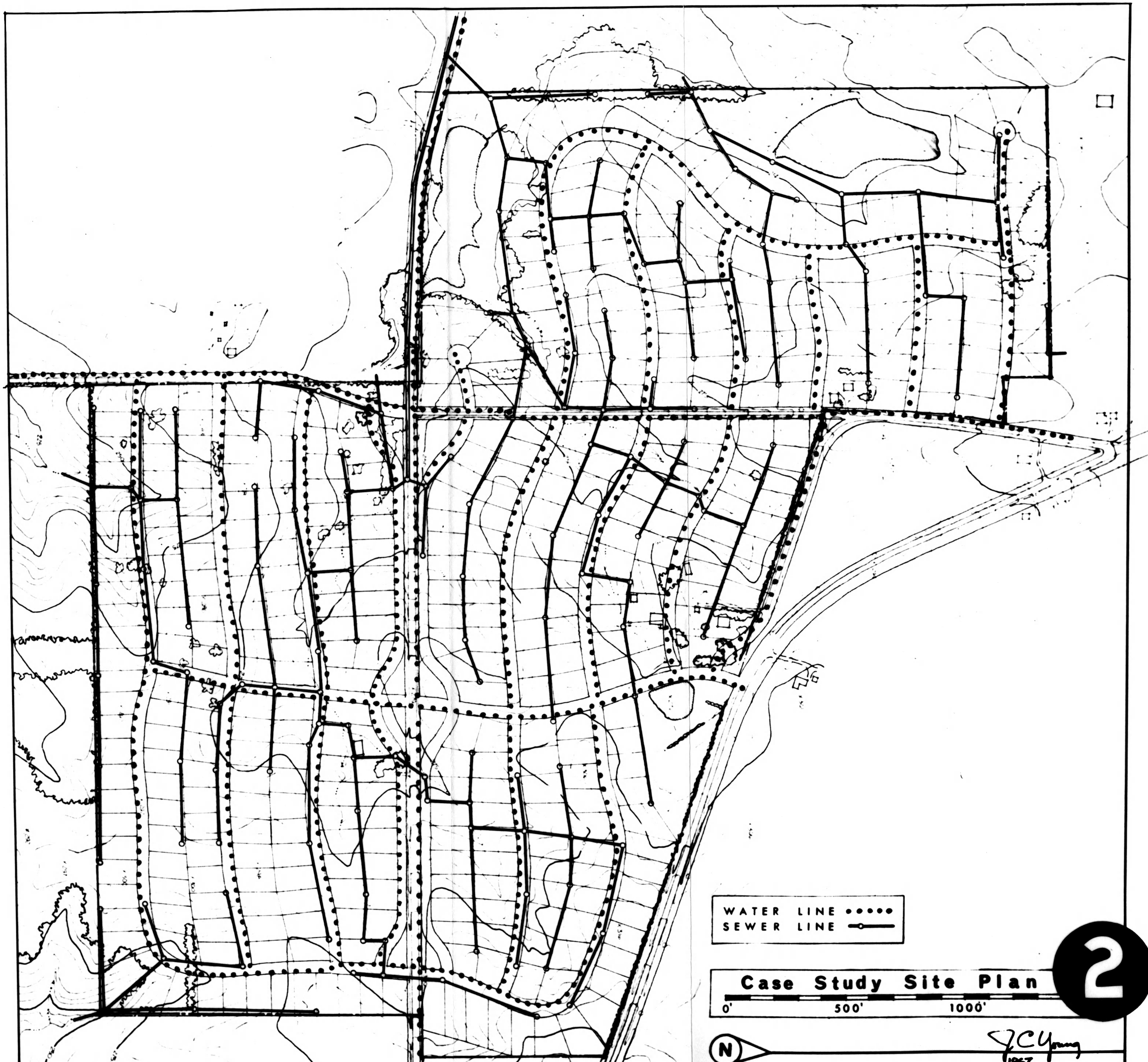

FIGURE 20

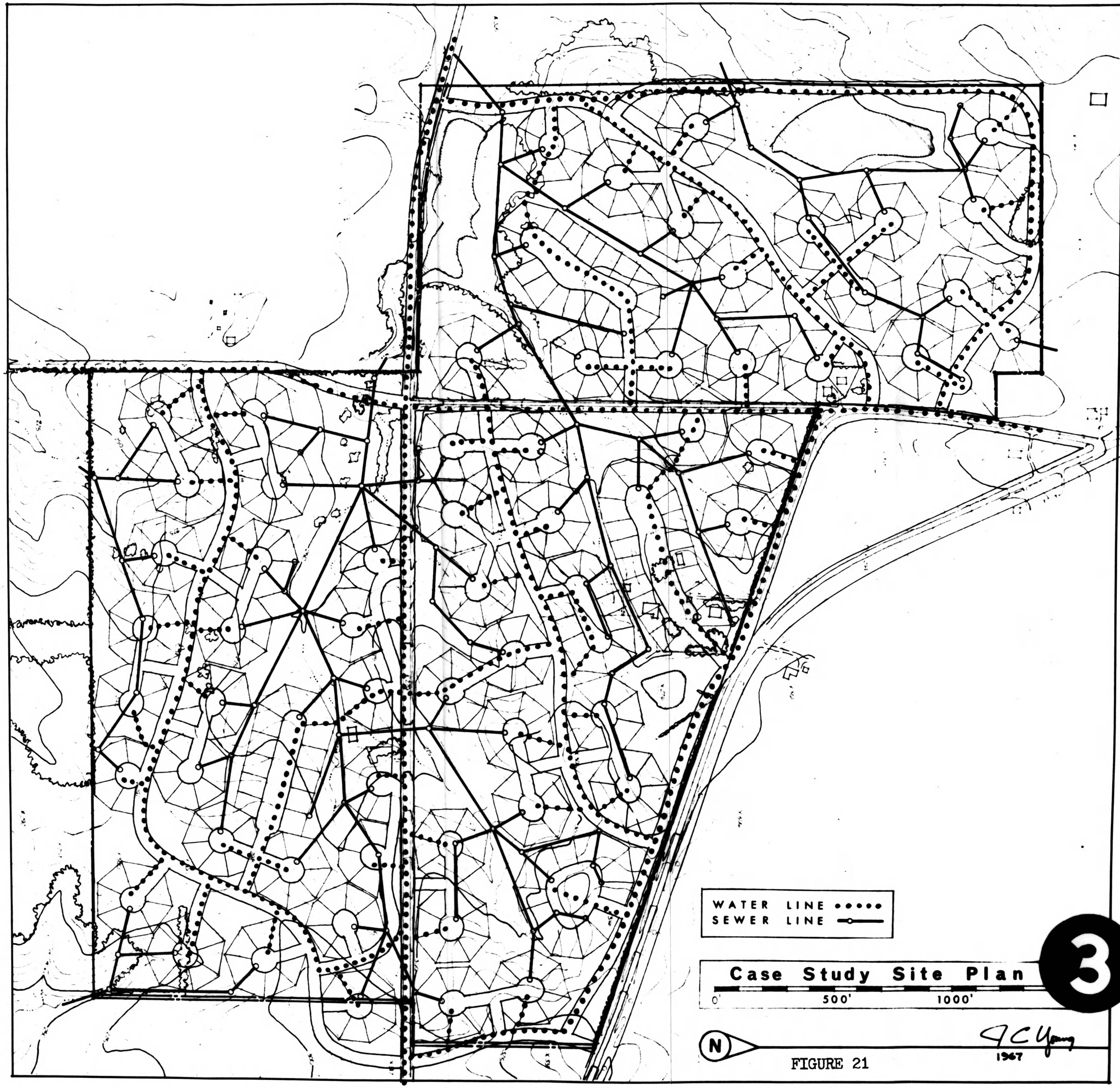
WATER LINE
SEWER LINE
Case Study Site Plan
0'
500'
1000'
N
J C Young
1967
3

FIGURE 21

unit locations in Plans 3 and 4, the sewer laterals approach from lower elevations on the "common space" side. This direction of approach eliminates the elevation difficulty often encountered when houses areound cul-de-sacs are served with sewer lines from the street side.

In the final analysis, both systems are considered equally adequate to perform their intended function.

Pedestrian-Vehicular Separation

The inherent danger present in any transportation/circulation system which "mixes" people and automobiles is so obvious that it would seem trite to mention it - were it not for the fact that this situation is so universally ignored in today's residential areas. On the grounds that "people drive everywhere these days" the simple device of sidewalks beside the streets has even been dropped almost entirely in subdivisions. The everyday observation of small children walking in the streets enroute to elementary schools should, in itself, be enough to suggest reappraisal of this idea. There is no reason to belabor the point when comparing the case study plans in this respect. On the other hand (Plans 1 and 2), all houses front directly upon streets which do little to discourage through traffic. In Plans 3 and 4, no dwelling fronts upon any street which could even be used for through traffic. Even though speed limit signs and crude devices like "speed bumps" can be placed upon the streets of Plans 1 and 2, little positive control over the determined speeder is possible. On the other hand it is nearly impossible to drive fast on a short street which can be seen to end in a cul-de-sac just ahead.

If a child living in Plan 1 or 2 were to decide to explore beyond the confines of his own lot, he would either proceed via the street or the carefully manicured front yards of his neighbors. The same child in Plans 3 or 4 may traverse large areas, (straight line distances of up to a half mile) without ever crossing or even walking beside an automobile street. And his wandering will be done entirely on land upon which he has a perfect right to be. The construction of two or three pedestrian underpasses could bring a large portion of the entire developed area within the range of his "auto-safe" hike.

FIGURE 22

Example of a Pedestrian Underpass

Water Hazard

Once adequate attention has been given to the water supply, sewerage, fire protection, vehicle circulation and pedestrian flow systems, the major obstacles to a safe and healthful environment on the case study site have been considered. Some mention, however, must be made concerning the potential danger of the lakes and smaller pond, if only to acknowledge its presence. Since the two lakes are more than 15 feet deep at their deepest points and the pond about eight feet, it would certainly be possible for a non-swimmer to drown in any one of them. If absolute safety were the only consideration, they would all be drained. This procedure was not recommended since it was felt that the enjoyment which these bodies of water would provide residents in both visual and physical ways (boating and fishing) warranted the acceptance of this potential risk.

PHYSICAL COMPARISONS

The statistical data of Table 2 was compiled for use in cost comparisons, and to illuminate certain aspects of the designs.

The gross area of 231 acres does not include the roadway and road right-of-way areas of N.E. 96th Street or Flintlock Road. It does include all other area within the boundary lines.

The statistics dealing with the open space are of interest. Over one-third of the land is left open in Plans 3 and 4. At least as important as the amount of open space in the cluster plans is the rather even dispersion of open land throughout the development.

It is seen that the street surface area of Plans 2 and 3 is almost the same. This situation would be disappointing were it not for the previous discussion.[3] These figures bear out the fact that

[3] See page 55 .

wide dispersal of the open space will probably result in more street length than would be needed in cluster plans with more compact open space. In spite of this fact the case study cluster design requires somewhat less street area than does Plan 2 even though it services 43 more lots and contains substantial lengths of divided and looped street for improved visual quality. The reduced street area in Plan 1 is due entirely to the omission of the frontage roads off 96th street. Since it is very likely that this plan of direct access to a major thoroughfare would not be approved, this savings really has little meaning.

A substantial savings in sanitary sewer length is indicated-about 25% - in the cluster design. Preliminary profile checks indicated a possible depth advantage also in the cluster plan, but a detailed design would be required to substantiate this possibility. It was felt that the fairest comparison was on the basis of total length and number of manholes.

The number of valves required and lengths of water supply line were very close in all schemes. The cluster plans required a 25% increase in the number of fire hydrants necessary to meet the code.

As would be expected, the storm water runoff is handled more easily in the cluster design. The combined savings in curb and gutter and storm sewer apparatus represent a major cost advantage for Plans 3 and 4. In general, the cluster plans keep all dwelling units away from the natural drainage areas and out of the potential "flood plains". The entire storm drainage system consists

PHYSICAL COMPARISONS

	PLAN 1	PLAN 2	PLAN 3	PLAN 4
Gross Area (acres)	231	231	231	231
Number of Dwelling Units	461	436	479	794
Gross Density (Units per acre)	1.99	1.93	2.07	3.45
Open Space (not including street r-o-w) (Acres)	11.9	23.9	79.1	same as Plan 3
% of gross area in Open Space	5.1	10.3	34.3	-do-
Street R-O-W Area (acres)	33.3	37.4	44.0	-do-
% of gross area in Street R-O-W	14.4	16.2	19.0	-do-
Street Surface Area (sq. ft.)	858,914	972,914	966,645	-do-
Curb and Gutter (lineal ft.)	57,650	65,250	53,500	-do-
Sanitary Sewer (all 8 in. dia.) (lineal ft.)	39,850	39,050	29,850	-do-
Sewer Manholes	168	162	134	-do-
Water Supply (all 6 in. dia.) (lineal ft.)	30,650	29,650	29,900	-do-
Fire Hydrants	35	34	45	-do-
Valves	58	57	60	-do-
Storm Sewer (lineal ft.)	10,250 (15"to54")	9970 (15"to54")	6000 (12"to18")	-do-
Inlet Boxes	57	56	57	-do-
Manholes	24	24	4	-do-

TABLE 2

of inlets and small diameter (12" to 18") underground piping which take the relatively light amounts of runoff to the natural drainage ways. The more rigid pattern of the curvilinear plans places housing and streets at high, intermediate, and low elevations. Since many lots are located in the natural drainage ways, a more extensive storm sewer network is required. Since a substantial portion of this network is required at the low elevations, large lengths of big diameter conduit are needed, greatly increasing the "per foot" cost. It may be that a cost benefit analysis would suggest the sacrificing of several (12 to 18) lots in Plans 1 or 2 in order to reduce the amount of large diameter piping needed. The irony of this situation is the fact that even with the extra cost involved, the drainage system of Plans 1 and 2 is probably inferior to that of the cluster design. Both storm sewer systems were designed to handle quantities of runoff which would normally be exceeded only once in two years.

COST

Cost analysis is always difficult. It is particularly so when these estimates are made on the basis of preliminary design in a relatively new field. In addition, each development site has its own characteristics, and each design solution has its own cost advantages and disadvantages. Even so, virtually all of the material reviewed by the author stated that good open space design increased the profit potential for the developer, as well as creating a better living environment. This increased profit potential has two sides: (1) lower development costs and (2) increased saleability. Most, though not all, literature points to lower development costs. Nearly all writing suggests improved marketability. William Alubin, a Mass. developer,[4] states

> "The builder who thinks of it (cluster design) primarily as a way to cut his development costs is in for an unpleasant surprise. The rewards of good (open space planning) come in the form of increased saleability."

He points out that savings in streets, utilities, etc. are often "canceled out" by money spent on increased recreational facilities. This subject is explored in the next chapter.

The case study cost analysis, illustrated in Table 3, attempts to arrive at rough absolute costs for each design. The unit prices are believed to be about right for the Kansas City area in 1967. Obviously these costs are subject to considerable fluctuation. It would therefore be much more advisable to consider these costs from a relative, rather than absolute, viewpoint.

These costs contain no provision for sidewalks, or landscaping and seeding on individual lots. No paving cost on the existing Flintlock Road or N.E. 96th Street was included.

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[4] "This scaled-down PUD could be a milestone in small project planning," House and Home, July, 1966, p. 65.

In general, these figures are considered to be conservative from the cluster standpoint. Where the relative cost advantage for the cluster design could not be conclusively demonstrated on the basis of preliminary design, none was claimed. For example, it is easy to think that the road and lot rough grading costs would be less for the cluster design. The lots are smaller and the circulation routes contain fewer "ups and downs". Centerline profiles indicated that the curvilinear road network seldom exceeds the 10% allowable grade, however; hence it could not be said that a large amount of cutting and filling would be absolutely required. Therefore rough grading costs were applied at a constant rate for both design schemes.

It should be noted that the estimated average sales price for the cluster lots was considered to be the same as for the larger lot of the curvilinear plan. There is some evidence to suggest that the lots in a cluster plan will bring a higher price. In an area of Milwaukee, conventional lots were priced at $6000, while adjacent smaller lots in a cluster plan were bringing $8000.[5] Even if the selling price is the same, there is a substantial profit advantage to the cluster lots if they sell faster. The interest paid for borrowed capital is an important factor.

As previously mentioned, Plan 1 probably does not meet the minimum Kansas City subdivision Regulations, so its cost is

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[5]Pratt Institute, Cluster Design: A Look at Brookhaven, (New York: Pratt Institute, [1966]), p. 18.

COST COMPARISONS

	PLAN 1	PLAN 2	PLAN 3	PLAN 4
Number of Dwelling Units	461	436	479	794
Street Pavement (Bituminous macadom with base) @ .30 per sq. ft.	$257,674	$291,874	$289,994	same as Plan 3
Curb and Gutter @ 2.50 per lin. ft.	144,125	163,125	133,750	-do-
Sanitary Sewer @ 4.00 per ft. @ 2.0.00 per m.h.	194,680	190,220	147,540	-do-
Water Supply @ 4.00 per ft. @ 200.00 per valve @ 175.00 per fire hydrant	140,740	136,550	139,470	-do-
Storm Sewer @ 20.00/ft. 54"dia. 15.00/ft. 42" 12.00/ft. 36" 11.00/ft. 27" 8.00/ft. 24" 6.50/ft. 18" 5.50/ft. 15" 5.00/ft. 12" @ 200.00/ 5' inlet @ 125.00/ $2\frac{1}{2}$' inlet @ 210.00 / manhole	111,600	109,000	40,970	-do-
Street Excavation and Grading @ 12% of paving cost	32,000	36,300	36,200	-do-
Lot Grading @ 100.00 per lot	46,100	43,600	47,900	-do-
Street Culverts @ 10.00 per ft.	5,950	5,950	4,250	-do-
Upper Lake Removal	2,000	---	---	---

(continued next page)

TABLE 3

COST COMPARISON CONTINUED

	PLAN 1	PLAN 2	PLAN 3	PLAN 4
Planning and Engineering @ 6%	$ 55,615	$ 58,222	$ 50,149	-do-
Underground Electric Service @ 150.00 per lot	67,600	65,500	71,800	-do-
Street Lighting @ 250.00 per fixture	14,300	13,500	17,500	-do-
Land Cost @ 1500.00 per acre	346,000	346,000	346,000	-do-
Interest on Investment @ 6%	85,000	87,500	79,600	-do-
Total Cost	1,503,884	1,547,541	1,405,628	-do-
Total Cost Per Lot	3,260	3,540	2.940	1,770[1]
Planting 2000 8' to 10' deciduous trees @ 20.00 ea. 500 6' to 7' pines @ 15.00 ea. Patch seeding in open space @ 2000.00	---	---	47,500 1,453,128	
Adjusted Cost Cluster Lots	---	---	3,040	1,830[1]
Estimated Lot Sales Price	4,000	4,000	4,000	
Estimated Gross Return	1,844,000	1,744,000	1,916,000	
Estimated Gross Profit	340,156	196,459	510,372	

[1]Land development cost per individual dwelling unit in the townhouse plan.

TABLE 3 CON'T.

somewhat beside the point. The Plan 4 figures rather strikingly illustrate the economy principle of attached units, even at a low density, when one is considering land development costs per dwelling unit. The most meaningful cost comparison is between Plan 2 and Plan 3 since, in both cases, the ultimate product could be the improved lot with no structure. It is seen that each cluster lot could be developed for $500 less than for a Plan 2 lot, even with the addition of $47,500 worth of planting in the open spaces. Thus, while providing more potential profit for the developer, the cluster plan also allows the homebuyer the priviledge of buying trees instead of extra sewer pipe.

AREA PROTECTION AND EXTENSION

The cluster plans for this case study were designed to function successfully within the present boundaries of the site. (The exception to this was the use of a small portion of adjacent property on the east so that the entrance road might be safely junctioned with N.E. 96th Street at the top of the hill, rather than in a blind spot behind the crest.) In the design process, therefore, consideration was given to protection for the site environment should important features of the adjacent land be altered. For example, this thinking was employed in determining the final location of that portion of the circulation route paralleling the Mid-Continent Trafficway. While a widening of this highway to four lanes <u>might</u> destroy the existing ten foot high hedge, which could be re-planted, it would not interfere in any way with the internal circulation road. A somewhat different type of problem is indicated in areas like the south property boundary. Here, the dense woods and the large clearing on the ajoining property play important roles in the overall visual environment of the area. What if the owner decides to cut down all of the trees, and also builds houses on the high ground of the clearing, destroying the long view to the city skyline? This dismal possibility was one of the reasons that all land immediately ajoining the property line was put into common green area. Thus, in the above event, a controlled program of tree planting inside the case study site could be implemented which would eventually lead to an approximation of the original concept. Of course the long range view of the skyline could not be recaptured. But there is space available in which screening with plant material could be employed to create a substitute environment in the form of a small park space.

Far more interesting than these "negative" possibilities, however, is the opportunity contained within Plans 3 and 4 for cooperation with neighboring land toward the further expansion of the open spaces for the mutual benefit of all. This prospect becomes even more fascinating when it is noted how naturally this expanded plan could fit into the newly proposed park and parkway system now being developed by the Long Range Planning Staff in Kansas City. These possibilities are diagrammed in figures 23 and 24. It is felt that this expansion proposal, if implemented, would stand as an important step taken toward an ultimate goal of cluster planning: the joining of "...separate open spaces into a network that will weave the outdoors into the very heart of the metropolitan areas."[6]

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[6] Whyte, Cluster Development, p. 8.

CHAPTER V

OPEN SPACE CONSIDERATIONS

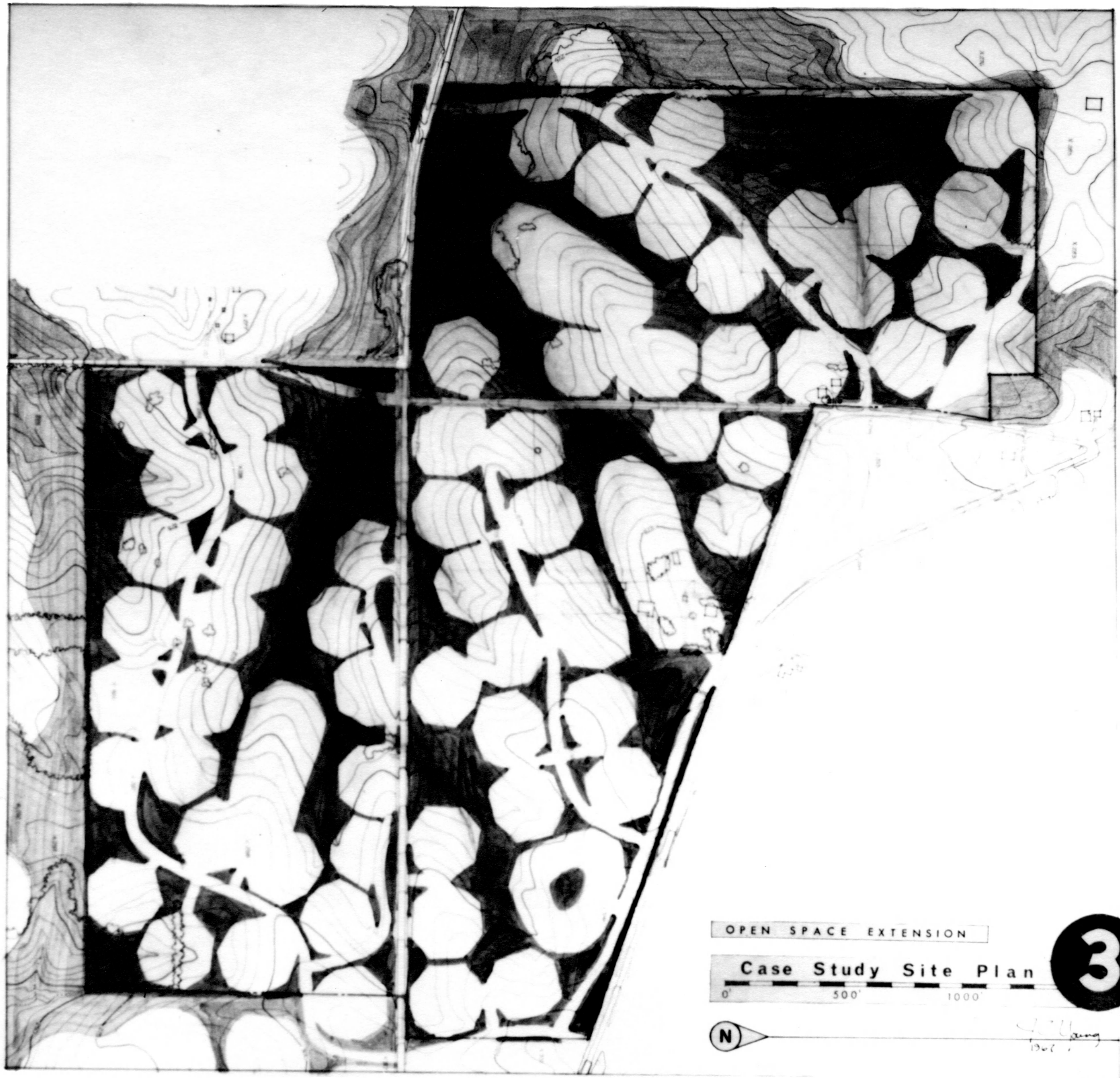
The preceding chapter mainly discussed and compared various aspects of the case study plans which were common to all the plans. The incorporation of large amounts of open space in plans 3 and 4 brings up several questions which have direct application principally to the cluster designs. It is these points - concerning the development, ownership and maintenance of the open spaces - which will now be discussed.

OPEN SPACE DEVELOPMENT

It was stated earlier that the open space of the case study cluster plans was designed to be successful left as natural countryside. Therefore, considerable attention was devoted to plant material landscaping with little in the way of man made improvements. It was also mentioned that this was not the only solution possible within the design framework of plans 3 and 4. Certain other possibilities will now be discussed.

Some of the most interesting ideas concern the chance to realign neighborhood groupings through development of the interwinding open spaces. In the traditional pattern of plan 2 immediate neighbors are generally considered to be houses adjacent to and "facing" each other across the vehicle street. In their case, the street becomes the unifying element. Unfortunately, it is also something of a block to social interaction between the units of the neighborhood which it defines. The same situation

FIGURE 23



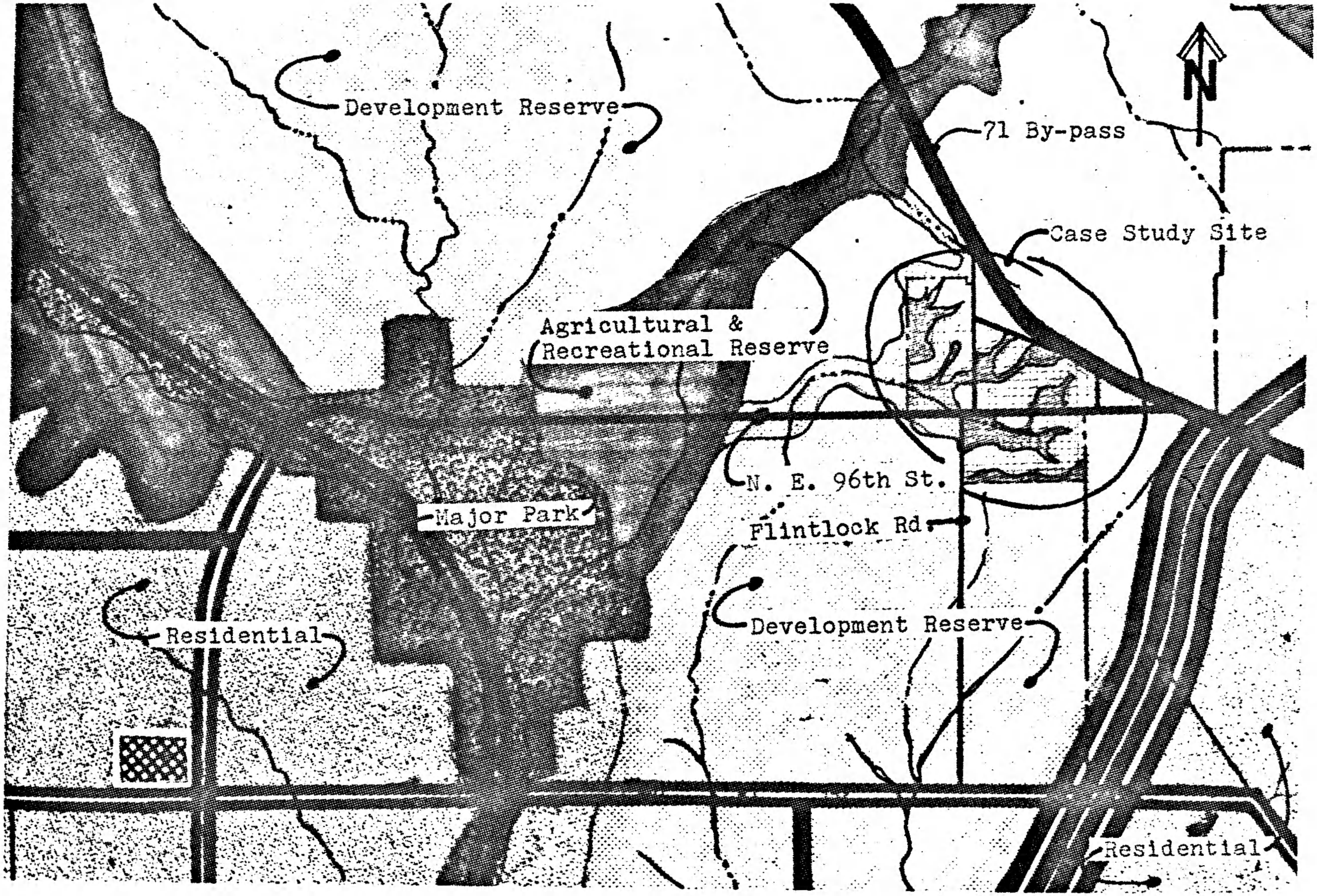


FIGURE 24
Integration of Case Study Open Space With Proposed Kansas City Parkway System

is generally true in the case study cluster plans as they now stand. In their case, however, the absence of through traffic does improve the quality of the neighborhood. The average person views the arrangement as shown below, thinking of it as "houses grouped around a cul-de-sac" or as "townhouses facing each other across a loop street." (See Fig. 25, "Usual Neighborhood Alignment.")

Could not the environment be also viewed as houses grouped around a central pedestrian space served from the rear by access streets? (See Fig. 26, "Possible Neighborhood Alignment.") It would be possible to create such a space feeling, with proper development of the green space to encourage its use. Pedestrian paths, benches, flower gardens, fountains, etc., immediately come to mind. In parts of the suburban town house development of Fig. 27 this goal has been achieved. Here the pedestrian green, rather than the automobile road, is the chief neighborhood delineator.

Some of the larger green areas of plans 3 and 4 should be left open since any structure would detract from their visual purpose. The space that protects the view of the Kansas City skyline is a case in point; the space between the circulation road and the upper lake is another.

Two of the largest open areas are dominated by the lakes which they contain. The careful design of lake accesories to encourage boating, fishing, and picnicing should be considered. Sensitive design of these facilities is extremely important since the natural landscape could be easily overpowered.

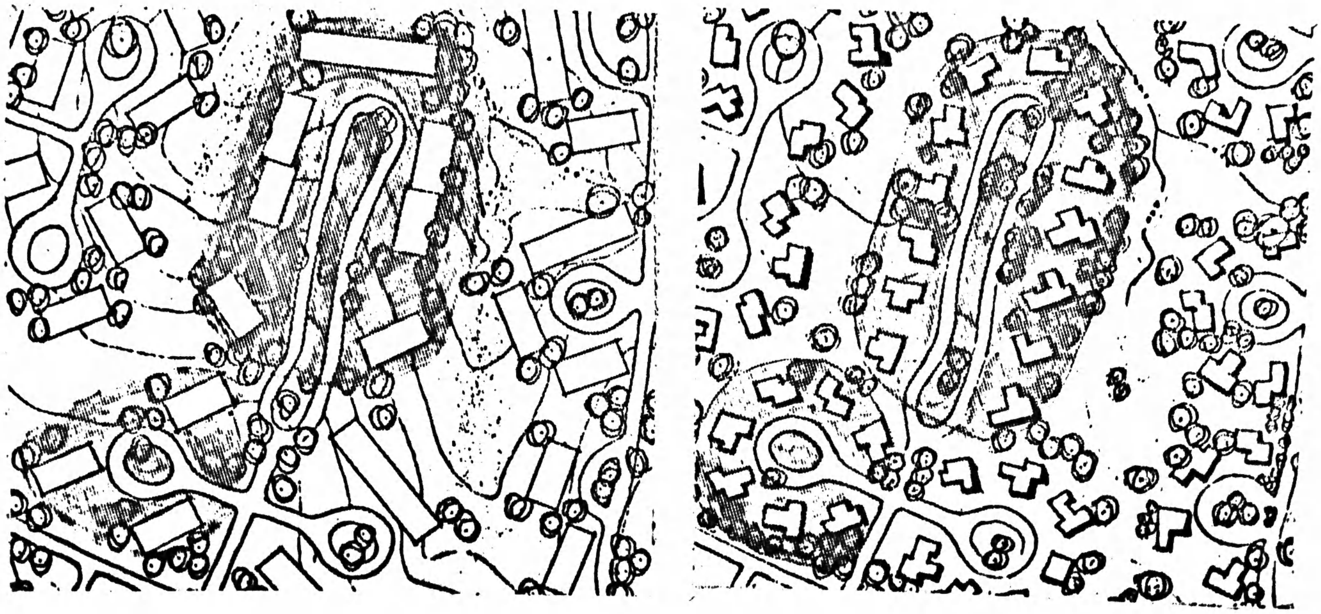


FIGURE 25

Example of Usual Neighborhood Alignment

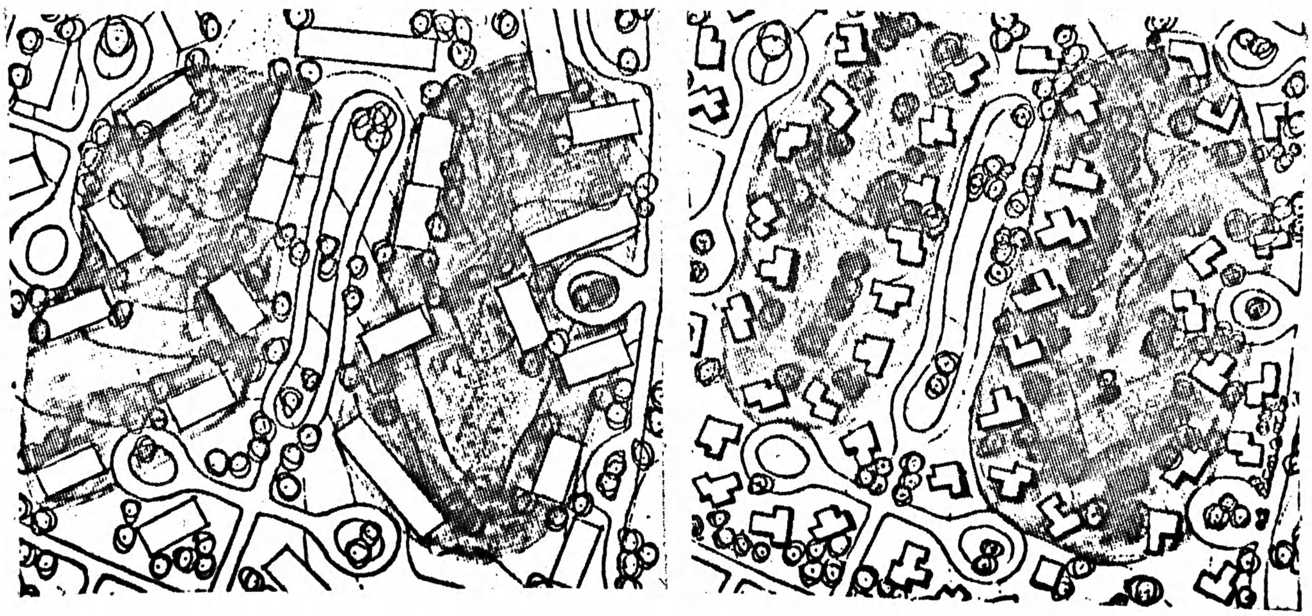


FIGURE 26

Example of Possible Neighborhood Alignment

FIGURE 27

Example of Pedestrian Space Development

The large open space to the Southeast of the Flintlock-96th Street junction is probably the most versatile area of the case study site. Its location and topography make it suitable for a number of uses. It contains a broad, level, well treed area considerably below the dwellings on the surrounding high ground. This elevation difference would make it possible to use some fairly large structures here without destroying the visual effect of the area when viewed from above. This area probably would be considered adequate for an elementary school. This is a definite possibility since the plan 3 population would support 1/2 of an optimum size school.[1] A complete system of pedestrian/bicycle paths located entirely within the community's open space network would provide safe circulation for children. Consideration should also be given to the development of this space into a concentrated recreation center containing a swimming pool, etc. and a year around club house.

There is some difference of opinion between authors concerning the development of open spaces and the degree to which this development should take place in advance of a community's establishment. Some sociologists feel that architects and land planners place too much importance on physical design as a means of influencing behavior without really knowing their effect. Robert Gutman wrote, in an article on site planning:

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[1]Mary McLean (ed.) Local Planning Administration (3rd ed.; Chicago: The International City Managers' Association, 1959) p. 115.

> "Studies of the influence of site plan aesthetics always have been rare, even while the designers of sites continue to found their solutions on an endless variety of unproven, speculative assumptions concerning the behavioral significance."[2]

Reference is often seen to sight cases where the children play in areas other than the playground or where adults gather to talk somewhere besides the park provided for that purpose. The inference here for the case study site seems to be: "Wait and see how the people who live here use the space, and then provide the facilities. Let them decide if they want a facility and where they want it located." This argument seems weak even upon initial consideration. Would it be correct to conclude that adults do not enjoy walking, and therefore do not need pedestrian paths, just because they are not often seen walking in an unimproved field?

In December, 1966, the previously mentioned study of 28 residential communities in the United States was published. Its purpose was ".....to determine how successful open space planning and related ammenities have been" in terms of public acceptance.[3] This study appears to be a conscientious effort to determine the effect of these implemented site designs.

In short, the above analysis concluded that open space is an important positive influence on home buyers, particularly those from the middle and higher income groups. Of the 721

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[2] The Journal of Social Issues, XXII, No. 4, 109.

[3] Hoccross and Goodkin, "Open Space Communities in the Market Place...", p. 1.

families interviewed, 72 percent placed their open space environment at equal or higher importance than their individual dwelling unit. The study further concluded that development of at least part of the open space for recreational purposes is an important marketing factor. It states flatly that "buyers respond immediately to recreation". "They use it and enjoy it."

The most popular recreation facilities--by a wide margin--were those for swimming and water sports. This situation held true even in parts of the country where the pool could be open only three months of the year. Bicycle riding in non-automobile areas was popular, as was walking. (Forty one percent stated that they walked more). In specialized situations, golf courses and horse-back riding facilities were successful.

The study suggested that, in general, it is better to concentrate the major organized recreation facilities in one area, rather than to disperse them to several places. The authors stated:

> "More and varied equipment can be located there, one recreation director can be in charge, and from a marketing viewpoint, one well equipped area that is finished early makes a better impression on visitors than a small area with the promise of other small areas later."[4]

Finally, the study results were very clear on the point that open space facilities should be planned and implemented before the dwelling sites/units are sold. The public wants to see what it is getting. People are skeptical of promises. They do not

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[4] *Ibid.*, p. 8.

want to wait until later to decide the what and where of these main facilities. Even if all facilities cannot be built in advance they should be designed in advance. Definite dates and conditions for completion should be set down for the homebuyer.

If one accepts these study findings, then he must also accept the fact of increased responsibility for the planner-designer. The designer must be able to anticipate and/or influence the desires of the future homeowner if his facilities are to be of optimum value.

Facility Expenditure

Any consideration of recreation facilities or other physical development within the open spaces inevitably leads to the question of money. How much can a developer afford to spend on such things? How much can the homeowners be expected to contribute toward capital investments, and how much on a continuing basis for maintenance cost? If one accepts the premise that the major open space facilities must be provided at the outset, this acceptance puts the major capital investments cost on the developer's shoulders. He will look at such expenditures as an investment which will return dividends in terms of faster lot and dwelling sales or higher market value for his salable units. The relatively few developers who have begun to build on the open space principle vary widely in their opinions, as would be expected at this early stage. A developer's expenditure in open space facility equal to $125 dollars per lot is considered by some to be appropriate. A St. Louis developer[5] with eight years experience in the field believes that recreation facilities can be justified as a sales asset up to $250 dollars per house. On this basis the developer of case study Plan 3 could justify an open space development expenditure of $120,000. This estimate is based upon the developer's feeling that he can get at least $250 more per house because of these added amenities. Perhaps, if he creates a really outstanding environment with excellent recreation facilities, he could get $500 or $1000 more per house for his initial $250 added investment.[6] The developer should never lose sight of the fact, however, that more money does not automatically create a better environment. In some cases the most successful open space may be the one left in its natural state.

TELEPHONE AND ELECTRICITY DISTRIBUTION

If the open space environment is to be completely successful attention must be given to the prevention of unwanted "developments". The greatest offenders are the overhead electric, and telephone services. The more recent inovation of cable T.V. has added a third set of poles and wires in some areas of the country. These networks are distractingly ugly in traditional plan schemes even when they can be relegated to back lot lines. They have a

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[5] Ibid., p. 44.

[6] Ibid., p. 45.

much more devestating effect on cluster design units which often do not have definite "fronts" or "rears". It would be most unfortunate if the main circulation routes of plans 3 and 4 were lined with poles, negating the efforts to preserve a natural horizon line. It would be even worse to allow these wires to crisscross the common greens. The only adequate solution is underground service. The cost is always higher than that of the overhead system, but has now been lowered to as little as a 50 percent increase in some parts of the country. This estimate is tempered by the fact that the cost increase is still several hundred percent in other areas. It appears that some utility companies actually prefer to keep the underground costs high in order to improve their bargaining position in their promotion of "all electric" homes. ("We will put the electric service underground free if you will go to all electric heating and cooling.")

Some recent ideas on the subject may have an important effect in reducing costs of underground systems. These include semi-underground networks which bury the cables but mount the transformers, connections and auxiliary equipment on surface pads. Advancing technology is a continual help.

> "One plastic conduit already on the market provides for electricity as well as... [cable T.V.]... telephone, remote metering, and programmed music."[7]

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[7]"Underground Residential Distribution," Architectural Record, Jan., 1966, p. 184.

Indications are that by 1970 more than 70 percent of all new residential development will have underground distribution. Some feel that by 1975 virtually all new development will be serviced underground.[8] If this prediction comes true, it will be a considerable boon to the aesthetic environment of our residential areas.

OPEN SPACE OWNERSHIP

Before discussing the problem of open space maintenance costs, the larger question of ownership and administrative control over the common areas must be resolved. Three possible solutions which have been used are the following:

(1) The open space is actually part of privately owned lots. This space is kept open by covenants or deeds restrictions placed upon each lot owner.

(2) The open space is deeded to the city as park land.

(3) The open space is owned in common by all home owners in the development and is administered through a home owners' association.

The open space by "deed restriction" method is an extension of the covenant system commonly used in all types of residential development. In an effort to protect certain features, the property owner accepts certain limitations on how he may use his own property beyond those specified by city ordinances.

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[8] *Ibid*.

There are several bad aspects to this kind of control. First, the enforcement of these restrictions is difficult. The police power of the municipality stands behind a city zoning restriction. The enforcement of a covenant restriction requires court action against the offender initiated by his neighbors. Even if this effort is undertaken by the other homeowners the covenants have not always stood up in court. Aside from the enforcement difficulties, this author believes that restrictions on what a man can do with his own property should be kept to a minimum. As an illustration of the problems which can be created with this type of restriction the following case is related.

In California, a great deal of newspaper coverage was given to a man being prosecuted by his neighbors for planting ivy, rather than grass, in his front yard. His neighbors were legally correct. The covenant which required a certain kind of grass to be planted in all front yards of this traditional subdivision was based on sound aesthetics. The front yards were small. Restricting all ground cover to one material gave the eye an unobstructed view and made the area seem less congested. In spite of these facts public opinion seemed to be strongly on the side of the "lone individual who was merely trying to exhibit a bit of individuality in an automated world."

This situation would not have arisen if the residential area had been designed originally so that the commanding visual elements were controlled on public or common land. If the openess of this area had been established by a publicly owned parkway this episode would not have occurred. In cluster developments the most important visual elements are designed and maintained professionally. The smaller individual house lot does not offer as much potential hazard to the whole development. Accepting this principle it would be unwise to put the ownership of separate parcels of open space into the hands of individuals.

The method of deeding the open space to the city government is not considered good in most cases. In the first place, cities are not likely to accept the gift, with the responsibility of maintenance attached. This land would also be lost from the tax roll. Secondly, if the city does own the property it becomes open to all citizens. This situation would likely be unacceptable to the homeowners.

Therefore, the third way - the homeowners association - is the nearly universally accepted method for ownership and control of the common areas in the development. This idea is not new. There have been many traditional residential developments all across the country which have relied upon this method of control. Some working associations go back 125 years. The Country Club developments of J. C. Nichols pioneered this method in Kansas City in the 1920's.

The concept is simple. The association, made up of the individual homeowners, takes deed to the open space. With money raised by prorata assessment, the association maintains the property and pays the taxes required from it. The implementation of this concept has been simplified greatly since the publication of Technical Bulletin 50, by the Urban Land Institute.[9] This study, undertaken for the Federal Housing Administration, analyzed 349 homeowners' associations, and contains a wealth of information concerning how the association should be set up and run.

In his discussion of the subject, William Wythe pointed out that while there can be considerable variation, certain "common denominators" are important to all successful associations:[10]

1. "The homeowners' association must be set up before the houses are sold.
2. Membership must be mandatory for each home buyer, and any successive buyer.
3. The open space restrictions must be permanent, not just for a period of years.
4. The association must be responsible for liability insurance, local taxes, and the maintenance of recreational and other facilities.
5. Homeowners must pay their pro rata share of the cost, and the assessment levied by the association can become a lien on the property.
6. The association must be able to adjust the assessment to meet changed needs."

The marketing study committee discussed this subject of homes associations with many developers. It found them to be strongly in favor of this method for open space control. The benefits pointed out by these developers were interesting and are therefore quoted below:[11]

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[9] Hanke and Others, The Homes Association Handbook.

[10] Whyte, Cluster Development, p. 37.

[11] Norcross and Goodkin, "Open Space Communities in the Market Place...," p. 69.

1. "A homes' association provides a way for eventual ownership management, and handling of maintenance costs for open space or any other community facility.

2. It increases property values by assuring that appearances will be kept at a high standard.

3. It provides a logical and easy way for homeowners to share in the payment of maintenance costs from the time the first family moves in.

4. It is the best means of keeping homeowners interested and active in the affairs of the community.

5. It permits swimming pools, community buildings, recreation facilities, and other such activities to be grouped legally into a non-profit association. Since the association is not a "club", the assessments are not subject to the usual 25 percent club tax.

6. Because the association is non-profit, assessments on property it owns are more likely to be kept low.

7. An association lets a developer withdraw when he wishes to do so. He and his heirs are not tied to the property.

8. An association permits a developer to give responsibility for numerous burdensome tasks to the homeowners: policing of open areas, deciding on hours and operational practices for a swimming pool, making rules for a teen-age club, and enforcing covenants on fence designs. These and a host of other small problems often cause friction between homeowners and a developer.

9. A well-planned, well-managed homes association is a most valuable sales tool. Salesmen can convincingly tell prospects that they will become part owners of community facilities and have a voice in running them, and that through the association they will meet their neighbors easily and share in activities. Most important, the association helps to maintain property values."

Maintenance Cost

Mention of open space maintenance brings up the question of the homeowners' assessment. How much will be required is certainly dependent in part upon the extent of facility development. A swimming pool and club house will obviously cost more to maintain than will an area of open grass. It is difficult, however, to make accurate generalizations here. A listing of thirteen detached house and suburban townhouse developments[12] shows monthly assessments ranging from one dollar to forty dollars. Eight of the developments charge under ten dollars. The five others each assess over thirty dollars per month. In these cases there is little apparent correlation between the services offered and the costs involved. For example, one 138 acre development (density 2.9 units per acre) offering 47 acres in common space, with golf courses, swimming pool, and club house, charges 40 dollars a month. Another, with a density of only one unit per acre, and 440 out of 600 acres open, offers a 27 hole golf course, swimming pool, fishing pond and riding stable and charges only ten dollars per month. For dues of a dollar and a half per month, 146 acres including a 35 acre lake are maintained by one homes' association. Three dollars per month keeps up a small park and swimming pool in another.

All these differences point up the fact that there are many variables affecting the homeowner's continuing assessments. A complete analysis of the facilities involved and degree of service and maintenance desired is required. It is interesting to note that a ten dollar per house per month assessment on a full Plan 3 would provide more than 55 thousand dollars each year.

CASE STUDY OPEN SPACE DEVELOPMENT

The final decision as to what type of physical development will be specified for the open spaces of Plans 3 and 4 was deferred for the time being. It was felt that further study is required considering various external factors. The outcome of the "area extension" proposal of Chapter 4, and the judgement of the Kansas City School Board concerning the location of the future elementary school are two such factors. The comments in this chapter were intended to indicate some of the many possibilities which are allowed by the flexibility of a cluster design.

CHAPTER VI

CONCLUSIONS

The following conclusions are based on the case study site and the case study site designs. The same conclusions may or may not apply to other topography and other design variations of the cluster principle. In applying these conclusions to other projects, one must first make judgments as to the similarities and diversities between this site and design, and his proposed project. This consideration is particularly true when making estimates on development costs.

Cost

For the study site, a considerable development cost advantage is indicated for the cluster plans. The estimated gross profit from Plan 3 is well over twice that of Plan 2. This increased profit potential was due in part to the lower cost of sanitary sewer and storm drainage systems. The other major factor was increased lot yield. This factor was based upon a value judgment - deciding what size cluster lot compares with the selected Plan 2 standard lot. Obviously, if the minimum size Plan 2 lot had been smaller, the comparative gross profit results would have been altered. The converse is also true; eight lots, instead of seven, around each cluster cul-de-sac would have made the potential profit comparison better from the Plan 3 standpoint.

A maintenance charge for upkeep of the common areas is a definite necessity in the cluster developments. Its amount will depend upon the extent of facility development within the open space. If no large facility expenditure is anticipated, an initial charge of $10 per month per dwelling is recommended to cover grounds care and continuing tree planting and other landscaping. After a few years of operation, this figure could be adjusted to meet actual requirements. Whether this maintenance cost is higher or lower than that required for the traditional subdivision is difficult to say. In many cases it comes to a decision as to how much extra time an individual homeowner spends taking care of a larger traditional lot, and how much his time is worth.

Ownership

The best vehicle for common space ownership and administrative control in the cluster plans is the Homeowners' Association.

Safety

There is no question but that the safest environment, from the standpoint of pedestrian/vehicular separation, is offered by the cluster design of Plans 3 and 4. This is important since this factor is the most dangerous aspect of today's residential development.

Visual Quality

Better visual quality is difficult to prove since it relies heavily upon the subjectiveness of individual taste. There appears to be little doubt, however, that the case study cluster plans, which allow a high degree of flexibility, provide a superior framework within which visual beauty can be preserved or created. It is the designer's opinion that Plans 3 and 4 offer a substantial aesthetic advantage over Plans 1 or 2 from all visual quality aspects set forth in the specific design objectives of page 15.

Social Interaction

It appears that the cluster plans offer greater possibility for social interaction between immediate neighbors because of the cul-de-sac configurations. If attention is given to further development of the common greens, whole neighborhoods may be re-aligned and extended, greatly increasing opportunities for social interaction. The addition of recreational facilities within the larger open areas gives added opportunity for community-wide sociability.

Since the houses of Plan 3 are only slightly closer together than those of Plan 2, there is little difference between the two as to the degree of privacy afforded each family. This factor becomes increasingly major in the design of the higher density townhouses, however.

GENERAL CONCLUSION

Upon evaluation of the case study development plans, it was considered that the cluster designs of Plans 3 and 4 would provide the best residential environment. The final decision as to the Plan 3 individual houses versus the Plan 4 townhouses, versus a more densely populated townhouse development, was deferred, pending the stabilization of now evolving marketing criteria.

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PICTURE CREDITS

Fig. 1, 2, 16, 22	<u>Cluster Design</u>. A Look At Brookhaven (New York, Pratt Institute)
Fig. 3	<u>Alternatives For Growth: Kansas City North</u> (Kansas City, Missouri: City Planning Dept.
Fig. 13	Life Magazine.
Fig. 18	<u>Tract Development</u>, Cast Iron Pipe Research Assn.
Fig. 19	<u>Technical Bulletin 57,</u> Urban Land Institute.
Fig. 24	City Planning Dept., Kansas City, Missouri.
Fig. 27	House and Home Magazine

A CASE STUDY EVALUATION OF CLUSTER DESIGN IN RESIDENTIAL DEVELOPMENT

by

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AN ABSTRACT OF A MASTER'S THESIS

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In the past twenty years, many American families who have moved to the suburbs to enjoy the much promoted amenities have been disappointed. They found that many of the sought after benefits, including the "wide open spaces" and beauty of the natural countryside, had been destroyed by the process of building their subdivision. One of the major causes of this situation has been our zoning ordinances which, in requiring wastefully large building lots, have (1) forced up the price of developed land considerably and (2) caused the decimation of vast amounts of countryside, as houses on equal spaced lots are regimented over the land with little regard to the natural features.

A growing awareness of the problem has prompted many cities to adopt "density zoning" ordinances which pave the way for cluster design in residential development. This system groups the dwelling units on smaller lots on the most buildable portions of the land, and combines the space saved into common open space areas.

In an effort to explore this idea, an actual tract of land (231 acres in metropolitan Kansas City) was selected and developed for residential use based on both conventional and cluster design schemes. The designs were then evaluated and compared using the predetermined parameters of Cost, Health and Safety, Visual Quality, Social Interaction, and Area Extension and Protection.

Throughout the report, where pertinent to the point discussed, reference is made to other writings dealing with cluster-designed developments which have been built in various parts of the country. A chapter dealing with the subjects of open-space development, ownership, and control is included.

In general, the results of this study indicate that the case study cluster designs offer at least some advantage over the case study traditional designs in each of the measuring criteria. Substantial cluster advantage was indicated in the areas of cost, safety and visual quality.